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Final Report

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

Consultant : MITSUI MINERAL DEVELOPMENT ENGINEERING CO., LTD. (MINDECO)

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Final Report

Yuji Nishikawa and Team Members

List of Final Report for each study field

FR-1 GIS database, Kazushige Wada
FR-2 Economic Geology, Masaharu Marutani
FR-3 Institutions and Capacity, Jennifer C. Clark
FR-4 Mining, Infrastructure and Environment, Kazuki Shingu
FR-5 International Competitiveness Element and Downstream Potential of Mining Industry, Richard T. Thompson
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1. Preface

The Lao mining sector consists of 5 main groups: 1) metal minerals (base metals, iron, precious metals, and rare metals), 2) industrial minerals, 3) construction materials and dimension stones, 4) gems, and 5) solid fossil fuels. Until the early 1990s, only small mines and artisanal gold mines were operated, due to insufficient surveys and research on underground mineral resources. In other words, the importance of mining's contribution to the Lao economy had been neglected and resource potential was unrealised. This may have been largely due to the fact that Laos is a landlocked country surrounded by mountains and has fallen behind in its development of infrastructure.

After the gold and medium size copper deposits of the Sepon Mine were planned and developed by an Australian company in 2003, foreign companies changed their views on Laos' underground resource potential, especially for gold and base metals. At the same time, mining was recognized in the Lao PDR as a powerful means to acquire foreign currency, and after 2003/2004 its contribution to GDP became of significant value due to gold exports. Since then, mining has assumed a more important position in the Lao economy. Specifically, mining represented 2.4% of GDP in 2004, but is forecast to reach more than 10% in 2006. Its growth is amazingly rapid and has been accelerated by increasing metal prices since 2004, by growing mineral markets in neighbouring countries and the growth of the Chinese economy.

However, the government mining authority has many tasks such as formulating mining policies, reviewing the activities of its organizations and institutions, capacity building of the mining industry management, collating existing data for promoting exploration and constructing a database, and building on the survey data. These tasks will all contribute to poverty eradication and development of the economic base through promotion of the Lao mining industry. In June, 2006, the DGM of the MIH was reorganized into the MEM and improving its mining sector is a new objective.

The investment procedure is complicated and the negotiation and conclusion of exploration agreements are slow because of this. In some cases the procedure has even been halted. Solving these problems is an uphill task. Furthermore, there are geographic restrictions such as a shortage of infrastructure which is a handicap to investment promotion. Also, in some areas there are unexploded bombs and mines from the time of the Indochina War, which need time and money to remove. Industrial technologies for mining have not been introduced to government or private companies due to the past lack of activity in the Lao mining sector and its foundation is very weak.

To solve these problems and promote the mining industry, it will be necessary to link the development of underground resources with their economic contribution to social development. The purpose of this survey is to understand the current status of the Lao mining industry, to identify the main issues and to formulate a sector plan for sustainable mining development.

2. Tasks Assigned for Study and Implementation Content of the Study

The study covers the entire Lao mining sector, and its main tasks are as follows:

1. Geological data and its assessment
2. Evaluation of the economic potential for Lao mineral resources
3. Institutional strengthening measures
4. Assessment of international competitiveness factors for investment
5. Set the basic design of the GIS database.
6. Assess the mining sector and formulate the growth scenarios.
7. Identify tasks for mining promotion and prepare an action plan.
8. Propose projects for intervention by the Bank.
9. Formulate a mining policy.

However, a new survey on the formulation of mining policy was added to the main tasks after the discussion between the DGM, the MIH, the Bank and the study team held during the Second Local Survey (April 13 to April 28, 2006). Eleven months have passed since the study started in January 2006, and five local surveys (including a follow-up survey in neighbouring countries) as well as five at-home tasks have been undertaken in the meantime. The current state of mining activities, institutions and infrastructure is now well understood. In addition, the geological data was assessed, the concept design of the GIS database was completed, and an inventory for prospects and ore deposits was prepared for assessing the economic viability of the ore deposits and mineral potential. Furthermore, problems of institutions and mining activities were identified in order to review the needs for institutional strengthening. At the same time, international competitiveness factors and the possibilities for down-stream businesses were analysed. These investigations represent an attempt to assess the economic contribution of the entire mining sector. Finally, a draft policy for development of the mining sector was formulated, and an action plan and projects for intervention by the World Bank were proposed.

This Draft Final Report was prepared by incorporating opinions collected earlier from the relevant departments of the government and companies through Interim and Progress Workshops.

It should be noted that the workshops were held on Jan. 27 2006 for the Inception Report, and on June 28 2006 for the Progress Report. Also a Consultation with Stakeholders was held on Sep.26 and 27, 2006 to attain an appropriate orientation for formulating the sector plan of the mining sector, based on the Final Draft Report. This Final Report was prepared, including comments from the Bank, government, and private sector, based on the TOR shown in Table 1.

Table 1 Results of the Study

Task	Item	Results
Mining Policies	Formulating a policy	Formulation of an effective policy for mining promotion
Geological data and assessment	Assessment of data	Assessment of effectiveness and digitization of DGM geological data
	Assessment of GIS data	A basic design
Evaluation of the economic potential of mineral resources	Inventory	Preparation of a list of prospects and ore deposits from existing data
	Economic evaluation	Assessment of economic potential
Strengthening institutions	Current state	Listing of barriers to mining activities
	Strengthening means	Formulation of institutional reform and strengthening means
Promotion of investment and downstream and spin-off industries	Evaluation of international competitiveness	Identification and analyses of competitiveness factors for investment in exploration and development
	Downstream/spin-off business	Survey on potential industrial minerals
Mining activities	Assessment of activities	Characteristics and state of mining industry
	Role of mining industry	Clarification of mining industry in macro-economy
	Assessment of infrastructure	Current state of infrastructure
Assessment of mining sector and scenario of its growth	Assessment of the sector	Assessment of the sector
	Scenario of growth	Formulation of the scenario for 3 cases

It should be noted that the technical transfers have been implemented through this study mainly for the DGM. Various technical subjects were transferred during seminars and On-the-Job Training (OJT).

Table 2 Training Program for Technical Transfers

field	Subject	Method		Points for transfer
		A	B	
Database	Introduction of GIS	F	F	Role and use of GIS
	Data-entry		F	Method and procedure
	Information disclosure	F		Method and role, Use of website
	GIS operation		F	Mutual use of GIS and database
Economic Geology	Economic evaluation	F		General evaluation method
	Calculation of ore reserves		F	Basic principle, Methods for ore deposit types
	Evaluation of potential		F	Method for ore deposit types
	Exploration methods		F	Exploration sequence
	Mineral test		F	Purpose and use
Inst ituti	Institutional strengthening	F		Comparison with other countries and effects
	Capability development	F		General methods
Compet itivenes	Competitiveness factors	F	F	Important tasks for investment promotion
	Assessment of investment climate	F		Viewpoints from the private sector
	Mining business	F		Structure of mining industry
Enviro nment	Environmental impacts of mines	F	F	Important factors
	Mining operation and environmental management	F		Characteristics of mining operations and their environmental management

A: seminar or workshop; B: on-job-training or individual instruction; F: finished

3. Potential of Mineral Resources and Economic Evaluation

The potential of mineral resources and economic evaluation are described in detail in the draft final report by the economic geology expert (FR-2). Laos is situated in a geologically favourable area of mineral resource potential:

- The country contains strata of the Palaeozoic to Mesozoic eras and Late Palaeozoic to Middle Mesozoic granitoids. It is in an orogenic belt where tectonic faults have developed along three folding zones, one of which is NW-SE trending and two of which are NE-SW trending.
- Typical metallic deposits are of hydrothermal copper and gold deposits, which are formed from the intrusion of granitoids and of sedimentary zinc deposits, which are formed in limestone and carbonate rocks.
- Various metallic and non-metallic deposits have formed in the complicated geology and are potential mineral resources for the country.

3.1 Inventory

Information on mineral deposits and prospects in Laos has been compiled in a database using data collected by BGS, ESCAP and DGM. There are a total of 572 deposits and prospects. These are only indications of deposits and prospects and there is little information that provides details of geology and mineralisation, reserves and grades of mineral deposits. However, as a result of classifying all the data, 47% of these 572 deposits and prospects were found to contain gold, copper, lead and/or zinc (Fig.1).

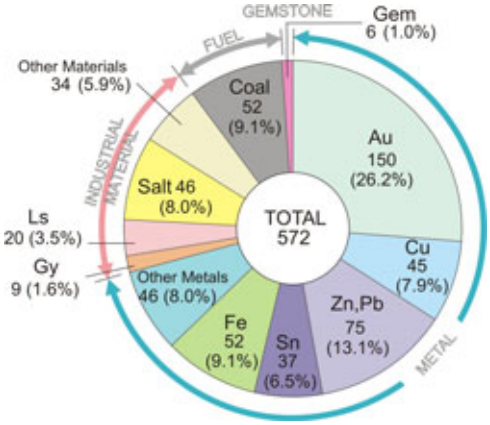


Fig.1 Classification of Deposits and Prospects by Commodity

There are 97 ore deposits where ore reserves have been reported from exploration reports and the feasibility studies of individual companies. Reserves and resources of these major deposits are summarized in Table 3. The combined gold total of the Sepon and Phu Bia mines accounts for 92% of total gold reserves. Copper of the Sepon and Phu Bia mines accounts for 98% of the total copper reserves. These results of exploration activities carried out by international operators emphasise the importance of exploration.

Table 3 Major Metallic Resources

Metal	Number of Mineral Deposits	Resources (Metals, Reserve Base)	Major Deposit
Gold	5	107t (72t)	Sepon, Phu Bia
Copper	4	3,297,000t (1,676,000t)	Sepon, Phu Kham
Zinc	2	— (12,710t)	Kaiso, Puda

(An inventory is attached in the final report (FR-2) of the economic geology expert.)

The 572 deposits and prospects in the inventory are almost all at the grass root stage. Data need to be obtained on minerals, ore grade, altered zones and geology to link types of mineralization with scale and grade. The present data are not sufficient as basic data for promoting exploration. Data obtained through the original exploration of the DGM and the development survey of JICA (2006-2009), which has already started, need to be added as they are obtained and will provide useful information for investors. Ore reserves estimates registered at the DGM differ in accuracy for each deposit and in future the DGM must adopt a standard procedure for ore reserve calculation and reporting. (Well known standards, such as are available in Australia and Canada, are advised. The use of one of these systems will provide transparency that will be needed to encourage investors.)

3.2 Potential of Mineral Resources

Taking account of the deposits and prospects listed in the inventory, geological features and characteristics of deposits and mineral potential zones are represented in Fig.2.

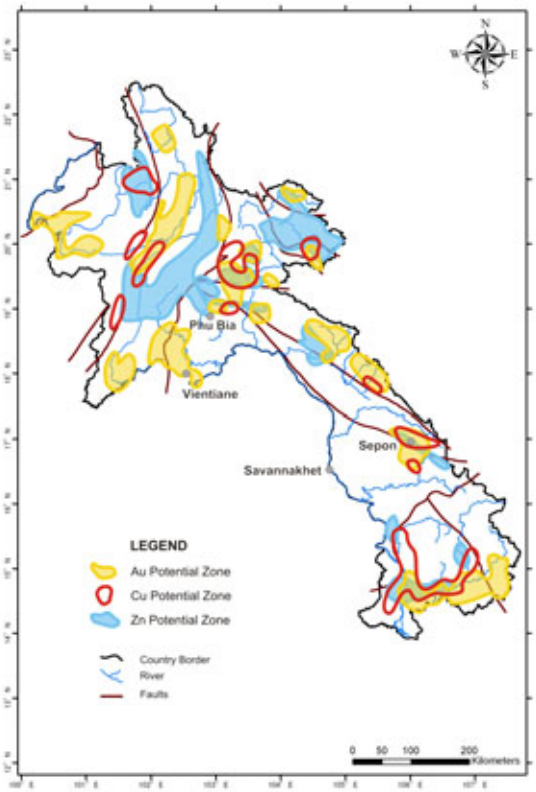


Fig.2 Map of Potential Mineral Resources

- Zones with potential for gold, copper and zinc are widely distributed throughout Laos, especially in the three fold belts.
- Zones with gold potential occur throughout the country but are concentrated along the faults around granitic rocks of the Late Palaeozoic era.
- Zones with copper potential are distributed around the Phu Kham deposit and south of the Sepon deposit. The Sepon deposit is situated around an inflection point of the NW-SE trending fold belt.
- Zones with zinc potential are distributed throughout the country, especially in and around the NE-SW trending fold belt.

Because mineral deposits in Laos are characterized by mineralisation related to orogeny, industrial minerals related to igneous rocks, i.e. gypsum, rock salt, potash rock salt, and barite, have high potential.

Exploration has been particularly active around the Sepon deposit and the potential for copper is assumed to be 4 to 5 times the reserves confirmed to date. Gold potential is also presumed to be similar to copper potential. The existence of the Phu Kham porphyry copper deposit suggests that another large copper deposit could be found somewhere in the area. Recently, while drilling, an Australian exploration company discovered a Mississippi Valley Type deposit of sedimentary zinc deposits in limestone and the evidence suggests that this could be large scale. Though there are currently few known zinc reserves, further large zinc deposits could be discovered. Thus, the potential total metal content of copper, gold and zinc deposits is assumed as follows:

- Gold 500 to 600 tonnes
- Copper 8 to 10 million tonnes
- Zinc 2 to 3 million tonnes

Tin occurs in quartz vein and placer deposits which are related to granitic rocks of the Late Palaeozoic era, and reserves of tin ore are potentially extensive. The potential for potash may be 50 billion tonnes, for kaolin 70 million tonnes and for gypsum as much as 100 million tonnes.

3.3 Economic Evaluation of Metallic Deposits

Economic evaluation of metallic resources using existing data only provides estimated values of tonnage and worth. With the small extent of exploration, many prospects are too little understood to suggest the existence of economic mineralization. Evaluations have been made in the light of the Sepon and Phu Bia projects and other foreign company data. Economic evaluation is used as the basis of scenarios for development of a mining sector; accordingly, economic evaluations of gold, copper and zinc are used here because those metals have high economic value and securing markets for them is not so difficult.

3.3.1 Preconditions

- Models of mineral deposits have been created using deposits which are confirmed in Laos and neighbouring countries (Table 4).
- Metal prices are based on the average, maximum and minimum values of the past 15 years.
- Standard capital costs, production, working costs and sales conditions are based on the models of mineral deposits. Transportation costs, royalties, income tax, etc. are based on interviews carried out during this survey and feasibility studies on the Sepon and Phu Bia projects.
- Economic evaluation was made using the general DCF method.

Table 4 Preconditions of Economic Evaluation

Metal	Case	Scale	Grade	Contained Metal	Annual Metal Production	Production Method
Cu	Case 1	Large	2.5% Cu	650,000 t	52,500 t	Open pit, SXEW
	Case 2	Small	3.0% Cu	135,000 t	13,100 t	Underground, concentrating
Zn	Case 3	Middle	8% Zn	320,000 t	30,000 t	Underground, concentrating
Au	Case 4	Large	3.0g/t Au	51 t	4.9 t	Open pit, CIL
	Case 5	Small	4.0g/t Au	4 t	380 kg	Open pit, CIP

3.3.2 Results of Economic Evaluation

As a result of cash flow analysis of a simulated 10-year production plan (FR-2), several proposed development models could be profitable at average metal prices that were prevailing between 1991 and 2005 (Table 5). As an example, an economic simulation of a large-scale copper deposit is shown in Appendix 10. Calculated values in this simulation are used as fundamental data for scenarios of mining sector development on assumed numbers of mineral deposits to be developed until 2025. Royalty and income tax might be affected by metal prices, and tax revenue revenues might be affected by changes in royalty and income tax rates. Therefore, it should be noted that not only fixed rate, but also rate deviation, must take metal price fluctuations into consideration.

Table 5 Results of Economic Evaluation

Metal	Case	Scale	Metal Amount*	Average Metal Price**	Annual Revenue (million $)	IRR (%)	NPV (million $)	Royalties* (million $)	Taxes* (million $)
Cu	1	Large	52,500 t	2,200 $/t	116	15	3	2.9	13.1
	2	Small	13,100 t	2,200 $/t	29	22	9	0.7	3.4
Zn	3	Middle	30,000 t	1,000 $/t	35	23	14	0.9	4.7
Au	4	Large	4.9 t	350 $/oz	56	22	12	1.4	4.7
	5	Small	380 kg	350 $/oz	4	30	2	0.1	0.5

Note: * annual base, ** average LME price during the past 15 years

3.4 Economic Evaluation of Industrial Materials

The economic evaluation of industrial minerals has targeted those having the potential to increase industrialisation through downstream business based on existing markets in Laos and adjacent countries. Three kinds of minerals - gypsum, kaolin and potash- were selected for economic

evaluation.

3.4.1 Preconditions

- Deposits and mines confirmed in and around Laos were created as models of mineral deposit development (small-scale and open pit).
- The prices of commodities were determined based on the sales prices of an operating mine in Laos and the export prices to Japan from Thailand, Malaysia and China.
- Standard capital costs, products, operating costs and transportation costs were estimated based on information gleaned from interviews.
- The Discounted Cash Flow method was used to make the economic evaluation

3.4.2 Results of Economic Evaluation

Within the price bands (low, average and high) established from the results of the ten-year cash flow analyses, average prices appear to produce satisfactory profit (Table 6). When considering the Laotian resource potential for industrial materials, the values calculated in this simulation will provide fundamental modelling data for a mining development scenario based on assumed numbers of exploitable mineral deposits until 2025.

Table 6 Results of Economic Evaluation of Industrial Materials

Mineral	Scale	Product	Price	Annual Revenue (k $)	IRR (%)	NPV (k $)	Royalties (k $)	Taxes (k $)
Gypsum	Small	80,000 t/y	22 $/t	1,848	16	33	46	92
Kaolin	Small	102,000 t/y	80 $/t	8,160	23	1,797	204	639
Potash salt	Small	62,000 t/y	160$/t	5,910	25	2,830	148	836

3.5 Potential and Investment Promotion

Which mineral kinds and what scale of ore deposits would be most appropriate as mineral resources potentials were studied for exploration and development in the Lao PDR, based on the economic evaluation results.

The large copper and gold deposits might be excavated as large scale mines which need both capital and technology for exploration and development, and international operators would be most appropriate to address them. Also, it might be possible to combine junior companies, which can fund exploration, with major Euramerican companies for development. Medium deposits might be also excavated by international operators, which are mainly mid-sized Euramerican companies. Small scale ore deposits could be developed by neighbouring countries or joint ventures of Laos and neighbouring countries, other than mid-sized Euramerican companies. Small gold or zinc ore deposits could be excavated by Laotian companies.

Titanium and sapphire have already been mined by Laotian companies. Placer deposits can thus be excavated by local companies. It is reasonable that local companies or joint ventures between Laos and neighbouring countries could develop kaolin, gypsum and potash salt.

There are actually many restrictions in exploration and development for mining operators,

such as insufficient information, legal barriers, shortages of technology, deficits of trained engineers, insufficient financing, etc. Therefore, it would be desirable to carry out promotion-measures on assumed development targets.

Table 7 Resources Potentials and Development Companies

O.D	Kinds of mineral	P	scale (US$ million)	Appropriate Company	Barriers to attracting investors	Investment promotion
Large	Cu	H	100-300	I (major)	• MEPA • Lack of information • Lack of skilled laborers & engineers • Lack of infrastructure	• Participation of junior companies • Geological survey by DGM
	Au	H	50-150	I (major) I (medium)		
Mid	Cu	H	50-100	I (medium)		
	Zn	H	20-60			
	Au	H	20-50			
Small	Cu	H	10-50	I (medium)、N	• Lack of information • Lack of technology • Lack of financing • Lack of skilled laborers & engineers	• Exploration support system • Financing for development • Technical instruction • Financial system • Technical introduction
	Au	H	2-20	L, N, I (medium)		
	Zn	H	5-20	R, L		
	Ti	M	0.5-20	L		
	Sapphire	M	0.5-1	L		
	Kaolin	H	0.5-10	R, L		
	Gypsum	H	0.3-3	L		
	Potash	H	0.5-25	L, R		
	Stomes	H	0.1-1	L		

(explanatory note) O.D: Ore deposit scale P: potential H: high M: medium L: low

Appropriate company: I: international operator R: regional operator L: Laotian operator

3.6 Capacity Building

The development of the Sepon and Phu Bia mines suggests the possibility of further mineable deposits. To promote the exploration and development of mineral resources with domestic and foreign investment, the MEM, as the lead agency in the mining sector, understands the need to define mineral potential and to provide this information to investors. Geological maps at 1:200,000 scale were made with the support of Vietnam and JICA, and mapping technology transfer has been achieved. In future, when making and publishing 1:50,000 scale maps as the basis of geological survey, it will be necessary to create a long-term integrated capability within the geological survey at both individual organizational levels. Technical improvement is required, including geological mapping and laboratory analysis of mineral deposits. It will also be necessary to increase the number of general staff and geologists.

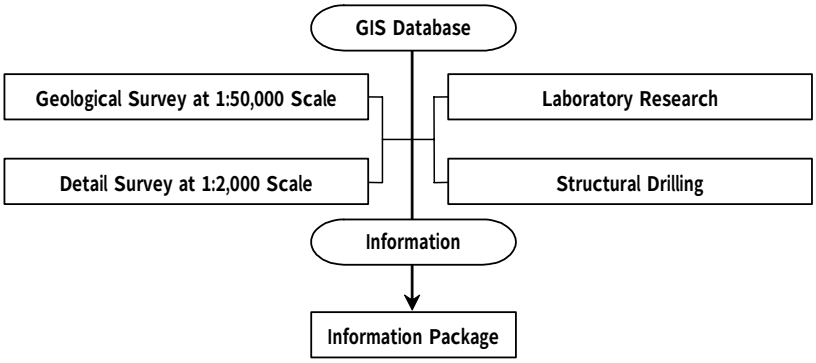


Fig.3 Systematic Settlement of Information and Provision to Investors

Table 8 Capacity Building Program

	Phase 1				Phase 2			
Projects	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year
1/50,000 geological map	■	■	■	■	■	■	■	
1/2,000 detail survey				■			■	■
Information package				■				■
Laboratory research							■	■
Structural drilling					■	■	■	

4. A Vision and Strategy for the Mining Sector

4.1 A Vision

Lao resources are composed of a variety of minerals and the mining sector should be developed by maximising their use. Not only metallic mineral resources, whose contribution to the economy is high, should be developed, but also non-metallic mineral resources including coal, which can link with down-stream business. By 2025, copper production could reach 200,000t and gold production 20t, which are double the projected production figures for the Sepon and Phu Bia mines in 2008. This could be achieved by opening four new mines of the Sepon Mine class.

Furthermore, non-metallic minerals could be sold in markets both inside and outside of Laos, especially kaolin, potash and gypsum, which should be prioritised for promotion to create a core of domestic industrialisation. The current small mines need to improve their management and new small mines should be developed mainly by Laotian investors to enable more than 10% of the profits in the mining sector to be earned and distributed locally.

Excluding artisanal gold miners, the number of workers directly employed by the mining sector may rise to 15,000 or more by 2025. (Note that as many as 4 times this number may be employed in associated support activities) It is likely that mining will become a key industry, substantially driving the Laotian economy by 2025. Currently there is little foundation for the mining industry, such as mining technology, institutions, infrastructure, information, management, environmental protection, HRD (human resources development). It is indispensable to build this foundation with support from international organisations and donor countries in order to achieve the vision mentioned above. It will be necessary for the MEM, as the lead agency in the mining sector, to supervise production activities and environmental protection in an even-handed manner.

By 2025, revenues from mining activities may reach US$100 million and accumulated revenues could be US$1billion - an important source of revenue for the national treasury that could make a major contribution to poverty eradication.

Regarding environmental management, it is desirable to strengthen the environmental departments of the government to work more efficiently. MEM should take the initiative for keeping a balance between environmental protection and production.

4.2 Growth Scenario of the Mining Sector

It is extremely important for growth in the mining sector to attract foreign investment for large-scale ore-deposits following the aforementioned example of the Sepon Mine. Therefore, it is vital to eliminate as many institutional and physical barriers as possible. While it is generally believed that mineral resources potential is high in the Lao PDR, there is presently little detailed data available to confirm this. Accordingly, a first step will be to prepare geological and ore-deposit data in order to activate investment in exploration.

The mineral resources of Laos are almost all at the “grass roots” stage, meaning that it would likely take 2-3 years to move into the general exploration stage after candidate sites are selected. However, if MEM (Ministry of Energy and Mining) promotes accelerated surveys by DGM, foreign investors can participate from the general exploration stage. But in order to attract foreign investors/participants, especially juniors, it is necessary to improve mining law and MEPA.

Second, the long time periods to explore, develop, and exploit a mine should be recognized. Generally, 10 years are required to move from the general exploration stage, to detailed exploration, to evaluation of deposits and ore calculations, and finally to the stage where a decision is made on whether or not to undertake a feasibility study to develop a medium- to large-scale mine.

Exploration costs depend on the location, size, type, shape, depth, etc., of the ore deposit. About US$10-50 million is required just to reach the pre-feasibility study stage. In the case of a medium-scale zinc deposit in an underground mine in Peru, an output scale of 1,000 tons/day required $25 million in exploration costs, including costs for drift exploration work underground. In this case, the entire exploration process took about 10 years.

In another example from Peru, this time of an open pit porphyry copper mine which produces 30,000 tons of ore/day, about US$40 million was spent for exploration work.

After the exploration work, the feasibility study, if one is to be made, requires another 2-3 years, and an investment of another US$2-10 million. Then, after the feasibility study is completed, another 2-3 years would be required to engineer and construct the mine. If the mine site is to have schools, a hospital, housing, recreation facilities, etc., then the mine developer will have to negotiate with the local community and local government to determine who would bear or share the costs. These negotiations would further extend the time required for a mine to come into production. Therefore, given the above situation, it could take some years for the government to start receiving revenue (income taxes and royalties) from a mine. This time horizon, however, could be significantly shortened if more geo-science information is available and if the process to grant the exploration license moves forward with dispatch. Also, the length of time could be shortened if the investing company explores around an existing mine and views small to medium sized operations as an initial target.

4.2.1 Prerequisites for Growth Scenarios

Certain prerequisites are needed to stimulate growth in the sector. Improvement of the investment climate is important as is building and promoting exploration and development capacity for the next 19 years until 2025 in light of the Results of the Economic Evaluation shown in Table 5. Generally speaking, it takes 10 years to develop a mine through the exploration, Feasibility Study and construction stages. There are exploration risks in Laos, which is still at a grass-root stage, if an ore-deposit is discovered and subsequently developed to produce metals to contribute to the Lao socio-economy. There is not yet any exploration activity by western junior companies, which are

very good at exploration. The following points are the prerequisites for growth:

- Promotion of surveys by the DGM to improve information on geology and ore-deposits in the short term.
- Eliminate the various restrictions on junior companies, encouraging them to view investment in Laos positively and to invest in exploration in the short term without complicated procedures.
- Increase the budgets that impact on the mining sector, capacity building and strengthening of human resources.
- Accelerate the construction of infrastructure in potential mining areas.
- Use actively and confidently taxes received from the mining sector (i.e. royalty and income tax) to improve the sector and its infrastructure.

Based on this vision, two cases may be postulated for doubling mining production by 2025 compared with 2008, in the light of the aforementioned perquisites. These are "Expanded Growth" and "Basic Growth". These cases are compared with the "Status Quo" below to illustrate the differences between them (see Table 9).

Table 9 Comparison of Growth Scenario with Status Quo

Case		Copper production in 2025	Main Actions to Attain Goal	Foreign investment
growth	Expanded Growth	300,000t	• budgeting to sector improving with larger priority • rapidly improving investment climate	Rapid promotion
	Basic Growth	200,000t	• budgeting to sector improving with priority • improving investment climate	Promotion
Status Quo		100,000-150,000t	• budgeting as same as currently • partially strengthening institution & capacity	Status quo

4.2.2 Setting the scene for the Growth Scenario

It is easy to illustrate the growth scenario by using a schematic to show the potential for future progress in the mining sector with either the "Expanded Growth" or the "Basic Growth" concept used to attain the final goal (see Fig. 4). This shows the relationship between the year in which mines to be developed should be opened, the number of mines according to operational scale and the improvements in information and exploration which may be achieved with DGM surveys. An "Action Plan" will be continued to 2020 and after this a "Capacity Building Plan" (both to be described later), and it will be necessary to renew the policy and review the sector. The opening of small mines in 2010 will result from the current exploration projects. The opening of mines in 2015 is in line with the proposition to promote exploration by mainly foreign investors after 2008. In reality, this means shortening the time needed for exploration which might not be easy. The conditions to be established to underpin the growth scenarios are shown in Appendix 1.

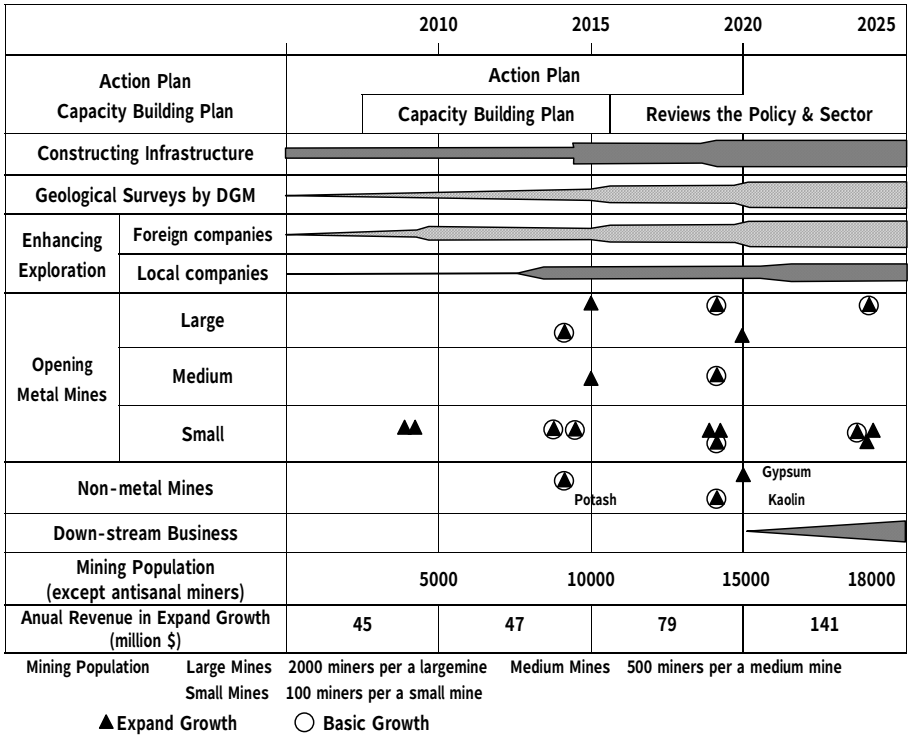


Fig.4 Growth Progress of the Mining Sector

4.2.3 Production in the Growth Scenario

Based on Table 11 and Appendix 1, the estimated production trends of copper and gold are shown in Fig.5 and 6 respectively. From these figures, production after 2008 will remain almost at the same level until 2015. This is because there will be virtually no exploration projects to develop through to production by 2015 given the state of current exploration plans. Logically, a full exploration programme will have to be implemented in many areas after the Phu Bia Mine begins its full production in 2008. In total, six mines need to be opened by 2015 and begin production in 2016 (see Fig.4 and Appendix 1). However it will be difficult to open these mines by 2015 without promoting exploration. With improved data, capacity building, human resources education and an improved investment climate, there will notable differences in exploration promotion between the "Expanded Growth" and the "Basic Growth" scenarios, which will result in sharply different levels of mine production.

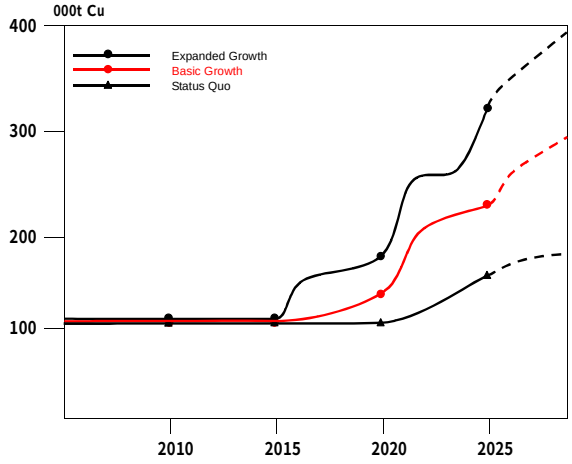


Fig.5 Estimated Annual Production of Copper

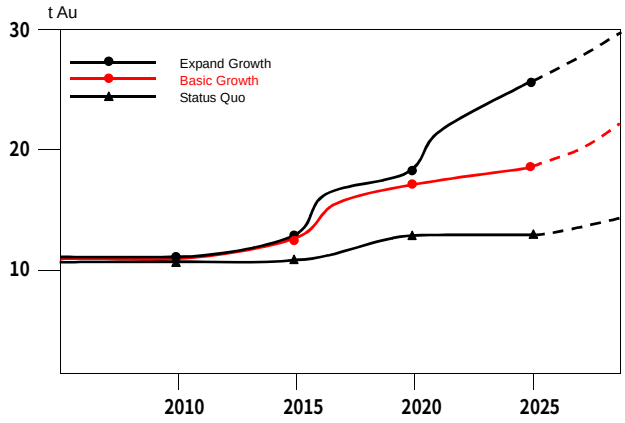


Fig.6 Estimated Annual Production of Gold

4.2.4 Revenues in the Growth Scenario

Annual mining taxes consisting of royalties and income taxes are estimated, based on Table 5 and Appendix 1. The production period is from the year following mine opening until 2025 and accumulated mining taxes means the sum of all annual mining taxes collected over the production period. (These are annual revenues of the mining sector and accumulated revenues respectively.) Each case given results in differences in annual mining tax. This is because figures for estimated production described in (1) are used.

Revenue in the “Expanded Growth” scenario is estimated to be US$141million and in the “Basic Growth” is estimated to be US$101million in 2025. Accumulated revenues are US$1,333million and US$1,043million respectively. Table 10 – trends, and Fig.7 and 8 illustrate the sharp differences between the two cases after 2020.

Table 10 Annual Mining Tax and Accumulated Tax with growth projections (US$ million)

Division		2010	2015	2020	2025
Annual Tax	Expanded Growth	45	47	79	141
	Basic Growth	45	47	58	103
	Status Quo	45	46	47	65
Accum. Tax	Expanded Growth	91	324	720	1,333
	Basic Growth	91	324	613	1,043
	Status Quo	91	321	557	807

NB1: charging tax begins in 2009. 2: tax＝ royalty＋income tax

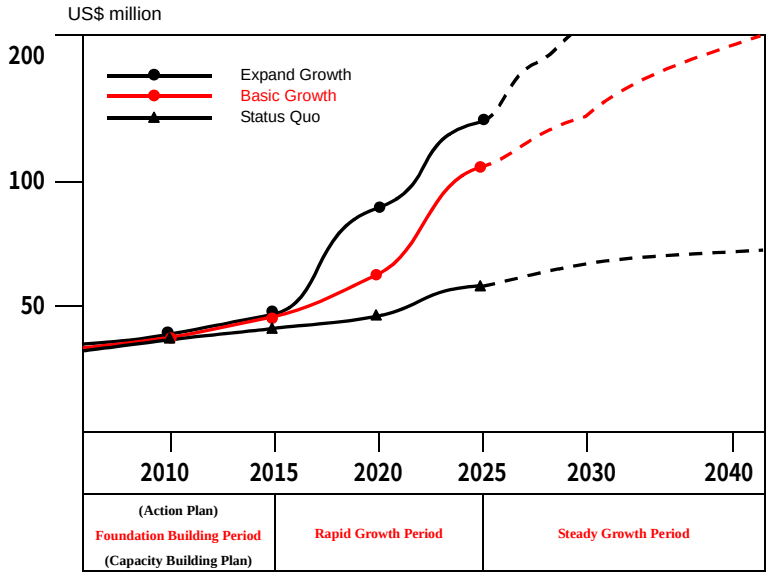
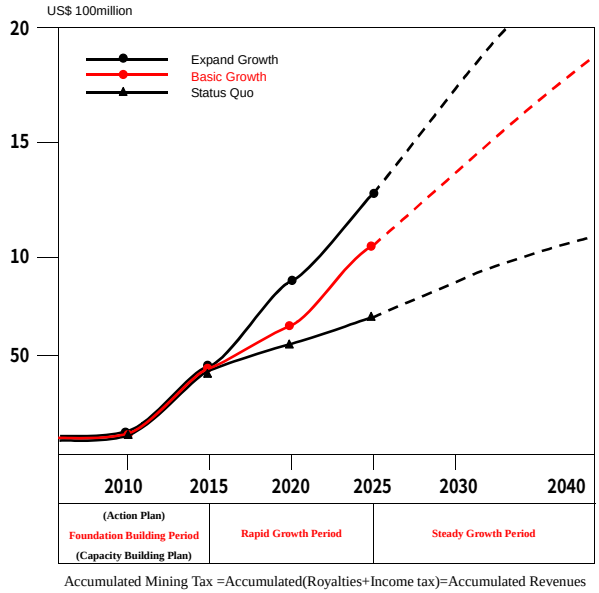


Fig. 7 Trends in Annual Mining Taxes by Growth



Accumulated Mining Tax =Accumulated(Royalties+Income tax)=Accumulated Revenues

Fig. 8 Trends in Accumulated Mining Taxes by Growth

It should be noted some external and internal factors were not considered. More specifically, price fluctuation, tax income (including royalty), uncertainty of investment in exploration and development depending on foreign investors, and production deviation followed by ore grade change were not included as external factors, and establishment of new institutions, improvement of tax rate (including royalty), progress of building capability, government investment in mining sector, government disposal of unexploded bombs, and strengthening new infrastructure were not included as internal factors. However, if these factors were considered, tax income in each

case (expanded growth, basic growth and status quo) might be changed even in 2015.

Table 11 Changes Caused by External Factors (tax income includes royalties.)

Case	1. tax income change from price fluctuation		2. tax income change from rate changed by price fluctuation		3. production deviation due to ore grade change		4. uncertainty of foreign investment
	Low	High	Low	High	Low	High	
Expanded Growth	＋	＋＋	＋	＋＋	0	＋＋	＋＋
Basic Growth	0	＋	0	＋	0	＋	＋
Status Quo	－－	0	－－	0	－	0	0

(Note) ++: considerable increase +: increase 0: no increase -: decrease --: considerable decrease
grade change: High is 25% more than this report, Low is 25% less than this report.

NB) 1. If prices decrease, small status quo mines may possibly go into the red because they have not improved their management. However, they can pay tax in the case of expanded and basic growth.
2. If a tax rate that varies according to price fluctuations is established by the Mining Law, tax income will increase in the case of expanded growth, but will decrease in the case of continuing low prices. FR-2 shows the differences in tax income according to rates with less than high prices.
3. Production deviation due to ore grade will not cause any changes to tax income in the case of expanded or basic growth, because of operators' improvement of management and production. However, without growth, mines will suffer from a lack of income, especially small mines that cannot take measures against grade downturns.
4. In the case of expanded growth, increased exploration and development by foreign investors will contribute to increased income through employment and purchasing, but will not link directly with tax income from mining production.

Table 12 Solutions to Progress Barriers

Case	Institution[1]	Infrastructure[2]	Unexploded bombs[3]	Information	Budgeting the sector
Expanded Growth	++	++	++	++	Considerable increase
Basic Growth	++	+	+	+	Increase
Status Quo	0	0	0	0	Same as present

(Note) ++: considerable improvement +: improvement 0: no change (same as present)

NB) 1. There is no difference in institutions between expanded and basic growth, because most institutional reforms require huge investments.
2. Expanded growth will enable investments in infrastructure construction across the country because of the increased tax income. Basic growth will not bring as much progress as expanded growth.
3. Increased tax income will enable more budgeting for disposal of unexploded bombs.
4. Increased tax income will lift budgeting the mining sector, and can improve information systems.

These kinds of solutions to progress barriers will not be linked with tax income, but are expected to have the effect of increasing tax income after 2008, to increase investment in the mining sector, to attract more foreign investment, and to realize improved management of small mines and organization of artisanal gold miners. Tax income will thus change according to the growth scenario.

4.3 Strategy

A strategy is needed to implement each of the "Expanded Growth" and "Basic Growth" cases described above. The mineral resource potential of the Lao PDR provides the basis for a

mining industry and it is essential that the Lao Government prepare a long-term sector plan and devise measures to implement it. In this study, an Action Plan is proposed as well as a Capacity Building Plan (4.4), the implementation of which may be funded by the World Bank.

More than 10% (US$4-5 million in 2010) of revenues from the mining sector should be used to build the foundations of the mining sector and its growth. New technologies must be introduced through programs supported by international organisations, donor countries and adjacent countries. This means that more geological and mineralisation surveys will have to be implemented by the MEM (DGM) to assist with exploration promotion. Attracting investors, particularly Western companies, is an effective method for developing the mining sector over the short term. (see Fig.9).

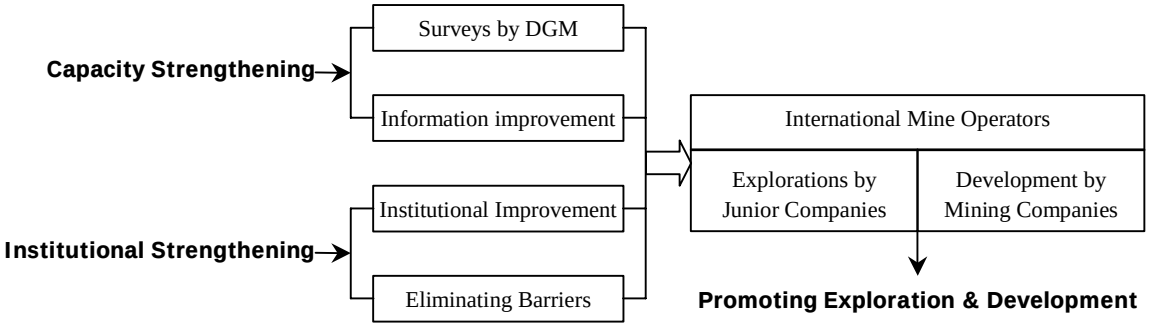


Fig. 9 Mining Promotion Strategy for the Near Future

Long-, middle- and short-term plans to broaden the scope of mining sector activities should be formulated with long term vision and clear objectives for the “Foundation Building Period”, the “Rapid Growth Period” and the “Steady Growth Period” (see Table 13). Formulation of the plan for the foundation building period is needed now, referring to the “Basic Growth” plan as a model.

Table 13 Identification of Strategic Development of the Mining Sector

2007	2015	2025	2045
Foundation Building Period	**Rapid Growth Period**	**Steady Growth Period**	
• Implement Action Plan. • Implement Capacity Building Plan. ⇩ • Strengthen institutions. • Eliminate barriers. • Promote surveys and information. • Improve investment climate. • HRD	• Review and renovate the policy. • Strengthen the sector. ⇩ • Construct infrastructure in the potential areas. • Expand investment promotion. • Strengthen local offices & improve information. • Industrialize down-stream business. • Manage Technical Center.	• Expand target minerals. • Manufacture mining products. ⇩ • Strengthen local investment. • Build a smelter. • Metal manufacturing business. • Improve development capacity. • Skills-up of mining workers.	

An authority must be established as the environmental leader of the government during the Foundation Building Period. The “Action Plan for Implementation of Environmental Legislation (the World Bank, July 2004)” recommends strengthening the management capability of DGM. DGM should formulate environmental standards and regulations, prepare guidelines for environmental protection, and set up a monitoring system for establishing its base as a leading authority according

to these recommendations.

4.4 Action Plan and Projects proposed for World Bank Intervention

4.4.1 Action and Capacity Building Plan for Bank Intervention

As shown in the mining sector policy for development of the mining sector and "Sector Plan for Sustainable Development of the Mining Sector in the Lao PDR", it is necessary to implement policies for solving problems related to organisational reform, improvement of laws and regulations, institutional strengthening, capacity building, data compilation, etc. It is an important task for the government and MEM to implement the vision identified in this study which will aid poverty reduction and economic development through mining activities.

Currently both the Laotian government and MEM do not have adequate funding, methods and technology to carry out these tasks. Therefore, they need to be addressed strategically and schematically with support from donor countries and international organizations. Realizing the Action Plan for 3 years is an urgent problem. Furthermore, the partial Capacity Building Program as Action Plan needs to be realized, as well as beginning the Capacity Building Project within few years. It is recommended in the foreseeable future that the MEM, which leads the mining sector, should be promoted as well as the whole sector. The "Capacity Building Plan" is proposed here as a project for World Bank intervention because a comprehensive resolution of mining issues is needed throughout the Lao sector.

The Action Plan is a program designed to eliminate barriers in the mining sector for a short period (several months to one year) without large investment (no more than US$ 1 million), because the mining sector has already begun to grow. It is desirable that the Capacity Building Plan, which will take eight years to complete with intervention from the World Bank, form a basis for the development of the mining sector when combined with the synergistic effects of the Action Plan. The "Action Plan" and "Capacity Building Plan" are described point by point in FR-7.

4.4.2 Relationship between the Action Plan and the Capacity Building Plan, with proposed interventions from the World Bank

Various tasks are described in the "Sector Plan for Sustainable Development of the Mining Sector in the Lao PDR". The DGM was reorganised in light of current mining activities but the largest task is to build capacity in the mining sector and solve the pressing problems. The Capacity Building Plan must be linked with systematic building and improvement in the mining sector, both strategically and comprehensively. The Action Plan is a program designed to be carried out within a short time to achieve quick resolution of pressing problems, such as the elimination of simple barriers. The key issue with both plans is to implement a policy which will provide the foundation for development of the mining sector. This relationship is shown in Fig.10. Transparency and clear systems for collecting tax, revenues and expenditures are assured, following the contract issued for this purpose to an international consultant and financed by the IDF in August 2006.

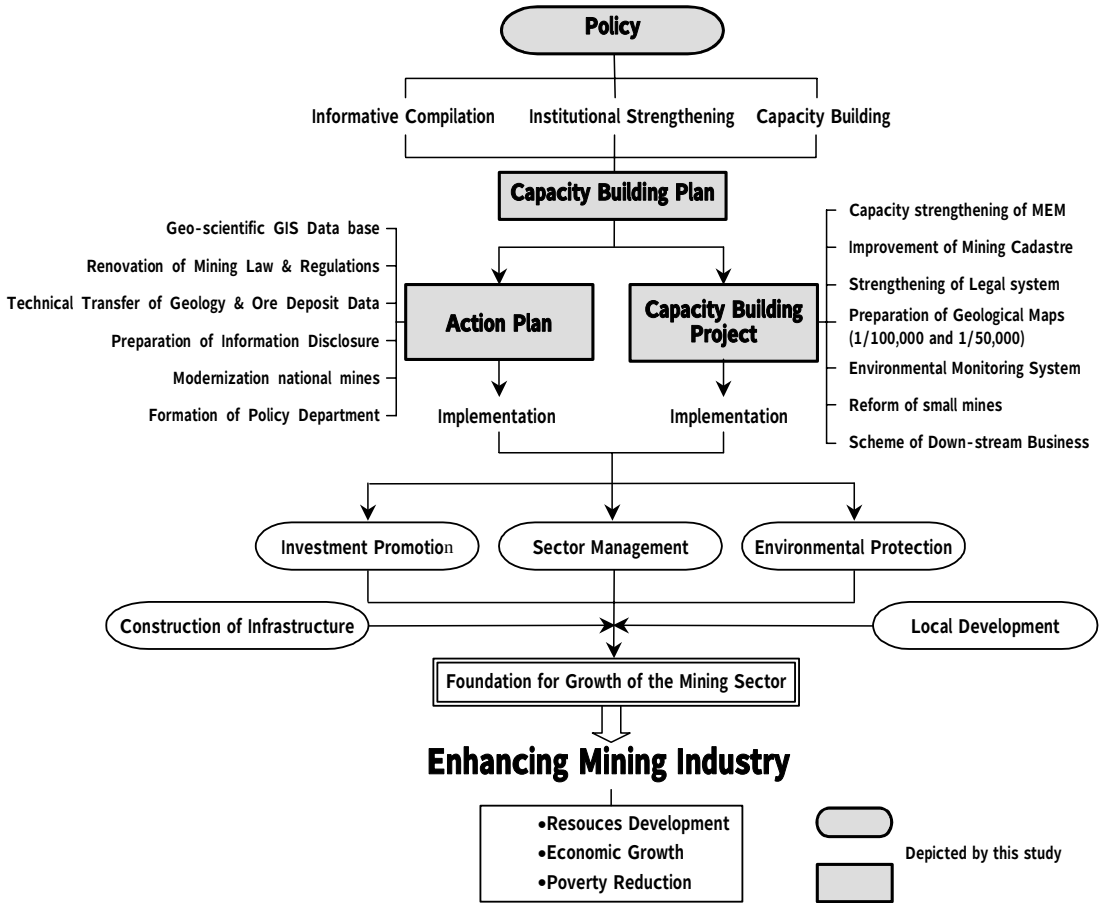


Fig.10 Relationship between Action Plan and Capacity Building Plan

	Year	1	2	3	4	5	6	7	8	9	10
Capacity Building Plan	Action Plan				review						
	Capacity Building Plan Project	preparation									

Fig.11 Schedules of the Two Plans

The Action Plan in the Capacity Building Plan will be implemented first and the Capacity Building Project will follow. Before the completion date of the first action plan, a 3-year action plan will be formulated to continue the work of the first action plan. The Capacity Building Project will need a total of eight years to be completed (seeFig.11).

4.4.3 Action Plan

Targets of the Action Plan are to carry out the urgent tasks in the Capacity Building Plan as mentioned above and to link these tasks with building the foundation for growth of the mining sector. International consultants will implement this plan which demands close coordination with

counterparts in the MEM, as well as transfers of their knowledge, information and technology. Funds for this program would come from consultancy trust funds of World Bank members, supported by donor countries with contributions from international mining companies and others. The World Bank and MEM will need to jointly evaluate the results of the program. Investment in the program is estimated to be US$ 40,000 to US$1 million (see Appendix 7). The Action Plan should be started immediately following completion of the “Sector Plan for Sustainable Development of the Mining Sector in the Lao PDR” (in Dec. 2006).

4.4.4 Capacity Building Project

The purpose of the Capacity Building Project is to systematically, strategically and comprehensively build the capacity of the mining sector. The Project calls for the implementation of this Capacity Building Plan to be considered by the World Bank or donor countries for funding with joint credits or grant aids, based on the results of the present “Sector Plan for Sustainable Development of the Mining Sector in the Lao PDR”. Because the Laotian government will receive the loan it would be advisable to have the participation of financing organizations such as the World Bank, donor organizations, and donor countries. It appears that altogether about US$30 million will be required. After completion of the “Sector Plan for Sustainable Development of the Mining Sector in the Lao PDR”, the 8 year Capacity Building Project should enter a 2-year preliminary phase to consider the intended programs and implementation period, system costs, management and evaluation methods and effectiveness.

The program is divided into Phase 1 and Phase 2, each of which has a 4-year implementation period. The Capacity Building Project is designed to help give MEM sustainability, rationalize the role of the government and promote investment from the private sector.

Phase 1 will consist of programs for building capacity in the mining sector through systematisation, personnel development, compiling the 1:50,000 geological maps, developing geological infrastructure based on geo-scientific and geophysical surveys, and environmental management, among other things (see Appendix 8).

Phase 2 will consist of establishing an investment promotion office and implementing programs for capacity building of the mining sector, compiling the 1:50,000 geological maps, coordinating geological information from the results of geological drilling, and mineral data development (see Appendix 8).

In addition, programs to stimulate regional economic development will be implemented based on feasibility studies for downstream projects and revision of the small-scale mining management system. (see Fig.12).

It should be noted that the total expenses for the Action Plan are estimated to be about US$3 million, the total expenses for the Capacity Building Project are estimated to be about US$30 million, and the grand total investment required for the Capacity Building Plan with Bank

intervention is estimated to be about US$33 million.

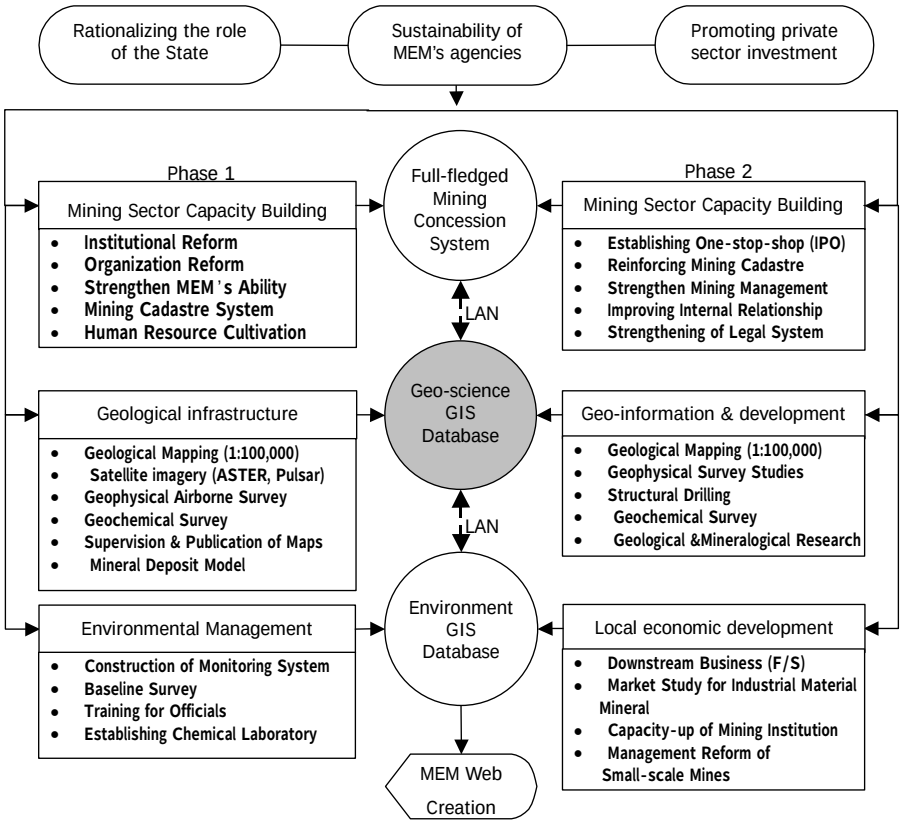


Fig.12 Capacity Building Plan of the Lao Mining Sector

4.4.5 Human Resources Development (HRD)

Capacity building in HRD is a key issue in building the foundations of the mining sector. It will be implemented within the Action Plan in the short-term, and also implemented by the Capacity Building Plan in the long-term. Target capacity building issues to be dealt with are as follows:

- Geological Survey
  - Mapping, drawing, teaching of various exploration and survey methods
  - Geo-chemical exploration, geo-physical exploration
  - Calculation of ore-reserves, evaluation of resources
  - Chemical analysis technology
- Improving the quality and quantity of data
  - GIS database (programs, operation)
  - Website (operation)
  - Satellite image processing and analysis
- Mining Technology
  - Basic technology for mining, mineral processing and production planning

- Mine safety, environmental protection
- Feasibility Study technology, economic evaluation

- Mining Management
  - Mining cadastre, permission system
  - Mine management technology
  - Mining information analysis
- Policy
  - Formulating policies, medium/long-term strategies, drafting laws and planning institutions.
  - Designing organizations, business concept
- Investment Promotion
  - Promotional measures, planning and managing seminars
  - Preparing materials for investment promotion
- Environmental Management
  - Investigations into environmental contamination, chemical and data analyses of environmental pollutants
  - Baseline surveys, monitoring systems and their methods
- Mine Accounting/Management
  - international accounting standards, company accounting
  - company management
  - budgeting and forecasting

Building the mining foundation requires broad capacity building throughout the mining sector and it will not be possible for the current staff (DGM 64 persons in April 2006) to implement this. Once the "Capacity Building Plan" is completed at least 130 persons will be needed to man the DGM. It will be necessary to train the current staff, to transfer personnel from other ministries and to employ new staff for geology, mining, mineral processing, IT and desk jobs. Long-term on-the-job (OJT) training must be planned and implemented systematically and the working conditions and eventually salaries for all staff should be improved. On-the-job training needs to be linked to programs in the Action and Capacity Building Project.

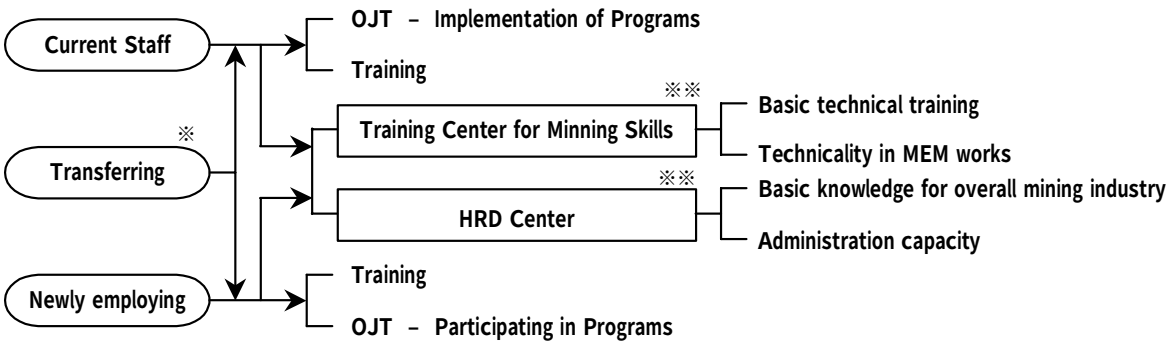


Fig.13 Basic Concept for HRD

The Action Plan and Capacity Building Project will contain prepared step-by-step programs for each work activity and so capacity will gradually be built up within each program. An example of capacity building for mining cadastral management is shown in Table 14:

Table 14 Example of Step - by - Step Capacity Buildin

year	program	content	HRD
2007	Mining Cadastre Management System (Action Plan)	Systematization of the current method	Basic skills
2008	Overall Mining Cadastre System (Capacity Building: Phase 1)	Overall management system (expansion including local offices)	Increasing & training stuff Overseas training, overall technology
2012	Strengthen Mining Cadastre (Capacity Building: Phase 2)	Linkage in the ministry, expansion of link system with database	Nurturing system engineers

This table shows how the step-by-step approach can be effective for technical HRD when linked with organisational capacity building.

4.5 Road Map for Mining Sector Development in the Immediate Future

Based on a vision for the mining sector, mining sector development should be implemented by following step-by-step measures for sector strengthening to be implemented by the MEM. In other words, capacity building to attract investment to the sector can enable the Lao PDR to maximise revenues from it. Actions needed are:

a. Providing systemisation and transparency for managing revenues from mining activities.

b. Improving the Mining Law, including eliminating barriers such as MEPA, and assuring transfer of mining rights.

c. Including an article for fair and equitable mining taxes (royalties and income tax) in the Mining Law.

d. Simplifying, systemising, accelerating and making transparent procedures for mining concessions.

e. Formulating and implementing regulations and guidelines related to the Mining Law.

f. Increasing financial budgets and staff for the mining section of MEM.

g. Strengthening HRD and capacity building of the MEM.

h. Improving the survey capacity of the DGM and strengthening its information system.

5. Mining Policy

Since its establishment in 1975, the DGM has been the agency of the MIH that is responsible for geological surveys, analysis, mining supervision and issuing mining concessions. It is financed from the budget of the central government and operates in cooperation with international organizations and donor countries. However, before the Sepon Mine opened, the DGM's activities had been very limited owing to its small budget and staff. It had been involved mainly with issuing mining concessions, supervising small mines of mostly industrial and construction minerals and working as a counterpart in international geological surveys of the Lao PDR. Once the Sepon Mine started production, activity in the mining industry increased. However, the DGM is still run by a small organization, with its small budget and small staff although the workload has grown significantly.

In these circumstances, the Ministry of Energy and Mines (MEM) was established in June, 2006 for organizational expansion of the DGM and a study on the mining sector has been started by the new organization. It will be difficult to develop the Laotian mining industry if the resources development and mining promotion are not based on the country's own mining and sector management policies. Moreover, it is essential to strengthen the relevant institutions and build their capabilities.

According to published documents (prepared by DGM and MIH in 2001, Bangkok), the strategy of the Laotian mining sector is to:

- Promote sustainable use of national mineral resources;
- Promote systematic exploration by the latest multi-disciplinary technology;
- Promote investment in small-scale mines for rapid development;
- Formulate a mid-term plan for the development of large-scale mines.

However, the DGM has no mining policy yet as the government is in the process of developing this, so the strategy mentioned above has not yet materialized. Therefore, the study team attempted to formulate a draft mining policy based on the current state of mining activities (Appendix 6), so that the DGM, as the government's authority, may take the lead in the mining sector. The following points are particularly important for mining policy:

- Promoting sustainable mining development by linking it to the National Development Strategy and National Growth and Poverty Eradication Strategy (NGPES).
- Establishing a climate for private investment promotion (foreign and domestic).
- Building government capacity throughout the entire mining sector.

Considering the above points, "Input to formulate a mining sector policy statement (Appendix 6)" was prepared, including the following items. The possibility of formulating this policy should be discussed.

- Conducting geological surveys for clarifying the characteristics and distribution of mineral resources.
- Compiling information such as survey data and disclosing it for investors' use.
- Establishing an investment-promotion office (one-stop-shop) for the mining sector to attract private investment.

The DDFI currently provides one-stop-shop service, but there are many different aspects of mining investment, such as promoting exploration. Therefore, it is desirable to establish an investment-promotion office that specializes in the mining sector.

- Helping national mines to make the transition to commercial management by merging some and eliminating others, and by educating their management.
- Building and strengthening the capacity of government to administer the mining sector.
- Systematically and continuously nurturing labour for the mining sector.
- Eliminating institutional barriers to mining promotion and establishing a management system with appropriate institutions and organisations.
- Improving small mines and artisanal miners through institutional and technical support.
- Assuring the transparency of revenues derived from mining activities, e.g. taxes and royalties, and their expenditures.
- Providing transparency in the appropriate expenditure of these revenues in a fair and impartial way so that they contribute to mining sector promotion.
- Coordinating the legal framework related to the mining sector based on international best practice so as to foster a healthy mining sector.
- Establishing and strengthening an environmental management system that is effective in protecting the environment from mining activities.
- Linking rural development with mining activities so that mining contributes to local communities.
- Educating citizens about mining by establishing continuous communication between the government and local residents.
- Maintaining openness about mining activities by using transparency and disclosure of information as basic tools of government policy. (It should be noted that the basic principles of the policy are fairness, transparency and disclosure) of information in mining activities.
- Creating the necessary institutions for implementation of the policy.

6. Current State of the Institutions and their Strengthening

Regarding institutional strengthening, the expert on institutions reported this in detail in her final report (FR-3).

6.1 Current State of Institutions in the Mining Sector

The institutions in the mining sector must play a leading role for sustainable mining development, and should be run efficiently. The following points are particularly important in understanding the current state of the institutions.

- Do they attract investment and promote exploration and development?
- Does the mining authority of the government work safely and effectively to administer and supervise the mining industry?
- Are the revenues from the mining industry, such as taxes and royalties, used efficiently, transparently and fairly by the appropriate institutions?

In this study, the Mining Law, organization of the government mining authority (MEM), procedures for obtaining mining concessions and MEPA were selected as the key issues related to the points mentioned above. These were studied in depth to evaluate their current condition and to clarify the core issues. Accordingly, institutional strengthening is indispensable for development of the mining sector, and so it was included in the policy statement mentioned above and the means of implementation is described in the “Action Plan” (FR-7).

6.1.1 Mining Law

The current Mining Law (revised 1995 Mining Law) was implemented in 1997, and the enforcement regulations, used to implement the Mining Law, were promulgated in the same year. As a result, the Mining Law was essentially brought up to international standards to attract foreign investors. However, the following points could be barriers to mining promotion.

- According to Article 23, “When a mining right is awarded, the government invests jointly in it ”, but the specifics for government equity (the government right) are not determined.
- In the case of withdrawal from mining production or dissolution of a mining company, Article 34 stipulates that the assets (machines, facilities, etc.) that belonged to the mining company “shall become the property of the government”, except when the government decides otherwise. Thus, there is a major risk to the mining company of losing the residual value of its investment at the time of mine closure or cessation of activity.
- If a foreign company obtains an exploration/mining right, it must obtain permission for business activities, but the procedure takes considerable time. (198 days in 2004, World

Bank, East Asia PREM – 07.2006)

- Royalties are specifically determined not in the Mining Law, but in MEPA, which is subject to negotiation with the government.
- In the enforcement regulation of the Mining Law, Article 7 (2) stipulates that a foreign investor in the mining business "should enter into MEPA". Therefore, the mining activities are regulated by both the Mining Law and MEPA.
- In Mining Law #37, a mining company "shall obtain permission from the government to sell mining products". This could be a brake on free enterprise and does not ensure a free market.
- Royalties and income tax from mining activities should not be set at a fixed rate, but be linked to international commodity prices and related to the scale of the operation. They must be fair and appropriate.
- Furthermore, the procedure and rules for transfer of mining rights to a third party are also unclear, and the requirement for companies abandoning exploration rights to submit the data they obtained to the government is a barrier for promoting exploration and a disincentive for participation by "junior" companies, which play an important role in exploration activities in the West.
- Mining rights are not given to artisanal gold miners who are operating illegally.

Therefore, it is necessary to review the legal framework, including the Mining Law, and bring it up to international standards to encourage investment (Fig.14).

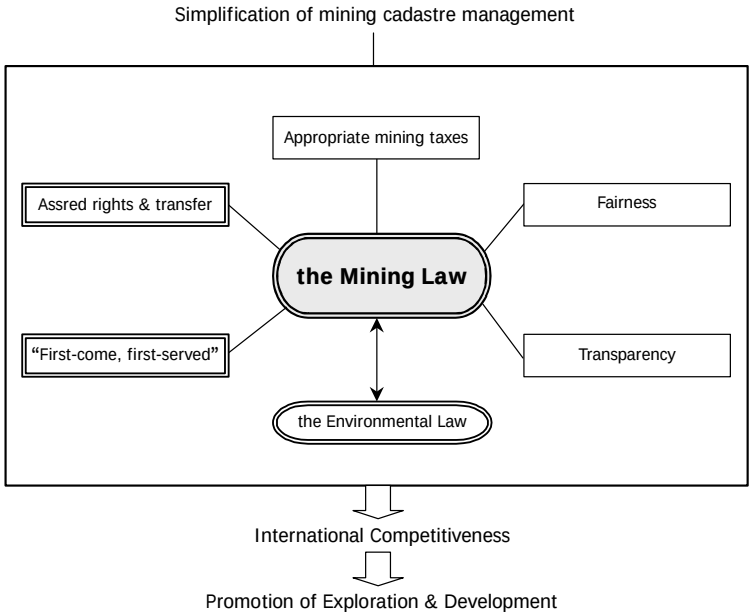


Fig.14 Scheme and Role of the Mining Law

6.1.2 Organization and Capacity

The government mining authority (MEM) is managed according to the role and organization defined for it in the Mining Law. The MEM cannot fulfil its current role and function in

the mining sector due to staff shortages, an inefficient organizational structure, inadequate technology, management, and plans, and a lack of technical knowledge and expertise. There is no organizational capability or procedure to react sufficiently to important mining issues, (e.g. cyanide spills) in the MEM, which consists of 4 divisions and a centre with 64 staff (including 30 geologists).

The organization and capacity of the mining sector is extremely limited compared to neighbouring countries, such as Vietnam and Thailand. So, the organization is not suitable for collecting economic contributions derived from natural resources, for managing social development or for ensuring the safety of inhabitants from natural disasters. The organizational capacity is limited (Table 15), as follows:

Table 15 Current State of Government Mining Authority

Field	Work	Current state
Planning	formulate policies, institution and planning manage the budget	・ In charge of executive officers in DGM ・ Division of responsibility is unclear.
supervising mines	Supervise and manage mine activities	・ In charge of mining cadastre, but almost no actions, and no organizational capacity.
	Assess technologies	・ No organization capacity in safety, environment, etc. ・ Same in feasibility study and EIA.
environmental protection	Manage the environment	・ Few activities, under effective Environmental Law. ・ No organizational capacity.
Managing concession	Mining cadastre	・ Consisting of Mine Inspection, License and Environment Divisions. ・ Only License Division is effective.
Office work	Accountancy and general affairs	・ Work limited by staff shortage.
International window	International cooperation	・ Corresponded by executive officers. ・ Work is done by relevant Department.
	Promote investments	・ Few activities.
Geological surveys	Geological surveys	・ Conducted by 2 Divisions (Mapping, Mineral resources) ・ Few surveys due to staff and machine shortages.
	Improvement of resource information	・ Conducted by Dept. of Information with Div. of GIS, Library and Museum. ・ Shortage of staff and equipment to compile information. ・ Limited disclosure of information
	Research and analysis	・ In charge of Mineral Analysis Center. ・ Shortage of staff, facilities and technology.

(N.B.) : no function in DGM at present.

It should be noted that the investment promotion at the DGM website has just begun, and joint workshops have already been held, with the Australian Embassy in September 2005, and with the Thai Department of Mineral Resources in August 2006. Also, new regulations for the mining sector were promulgated to promote investment. Furthermore, environmental management has been strengthened by implementing environmental regulations for mining activities and by providing for examination of EIA. However, there are still many issues that must be resolved in order to enhance organizational ability. For example:

- Information is not shared, used or organized due to the small scale of the Geo-Mines

Information Centre.

- There is no department formulating the policies, strategies and institutional development needed to provide direction for the mining sector.
- There is no department to supervise mining activity by overseeing safety, technology environmental and social issues.
- There is a shortage of capacity to assess the feasibility studies, the EIA's and the mandatory reports of private companies.
- The Geological Survey Department is too small to protect land, mineral resources, and national assets.
- Procedures to determine important matters are unclear within the organization.

It is difficult for the mining sector to demonstrate its organizational capacity because there is no organized and powerful leader in Lao PDR. The MEM staff consists mainly of geologists and a few engineers for mining, mineral processing, and smelting matters. Also, there are no legal or economic professionals to support the mining sector.

6.1.3 MEPA

The MEPA (Mineral Exploration and Production Agreement) defined within the detailed enforcement regulations of the Mining Law, is a contract between the government and the foreign investor. MEPA's are also applied to domestic investors in medium-large scale mining businesses. The MEPA is drafted based on negotiations between the government and investors but its content is never disclosed to the public. The Committee for Planning and Investment is in charge of the MEPA, and the Department of Promotion and Management of Domestic and Foreign Investment (DDFI) is responsible for applications, negotiations and contracts with investors. This department also coordinates these tasks with the relevant authorities, such as the MEM. The main procedures are shown below:

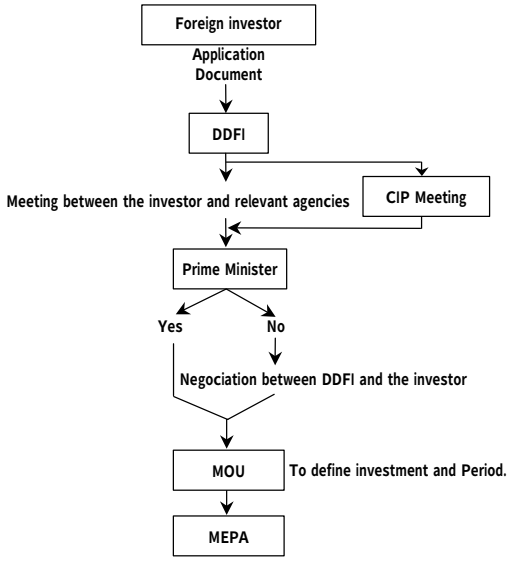


Fig. 15 Flow-Sheet of MEPA Procedures

The MEPA has the following characteristics and can be a barrier to exploration promotion and development:

- The MEPA is not published and its content is unknown.
- The mining tax system is different from general taxes, corporate taxes, and royalties, and is determined in negotiations with the investor about the MEPA. In short, it is a 'special arrangement'.
- Investment amounts and periods of projects are fixed, which limits flexibility for investors.
- The government has the option to obtain equity.
- The MEPA is treated as a confidential document which is not transparent. Its opacity creates concerns regarding the covert use of government funds in mining activities.
- It is likely that the local (provincial) governments receive royalties in the MEPA and the central government receives income tax. This is not an appropriate and harms fair way to distribute the revenue.
- There is a wide gap between provinces with many mines and provinces without mines. This can negatively impact healthy local development. ("Haves and have-nots" issue)
- The negotiation of the MEPA is said to take a long time (sometimes more than a year). This is very likely to have a negative impact on mining promotion.

On the other hand, it might be recognized as an advantage to assure the tenures of the mining concessions including continuing development from exploration by MEPA. Therefore, such advantages and disadvantages of MEPA should be discussed within the government. After a consensus is reached, the structure of the MEPA should be revised accordingly.

6.1.4 Acquisition and Management of Mining Concessions

There are some serious problems in acquisition procedures for mining concessions other than the MEPA. For example, there is no computer-aided mining concession management system (cadastral system) for the procedures in MEM to automatically check overlapping of concession areas, and data-entry errors and the present manual procedures may lead to human errors. Also, this may result in inadvertent taxation errors for concessions to licensees, because there is no automatic notification system. Further, licensees must cover MEM staff inspection-related expenses caused by MEM budget shortages. To address these issues, the following policies need to be implemented in the concession management division of MEM:

- Consolidated management of applications and mining concession areas using a GIS database system (concrete recommendations are shown in 5.4 'Information Settlement').
- Data and peripheral sharing by Local Area Network (LAN) in DGM offices

The number of DGM staff must also be increased and capacity should be built through training and workshops to strengthen the knowledge and understanding of the MEM's role in order to move forward with these measures in the future. These measures will lead to shorter time from

application to issuing, and will also lead to simpler disclosure of mining concession ledgers and restricted areas for mining activities. The current manual procedures are only based on dedicated staff and negative information disclosures may be obstacles to future investment, especially from foreign companies.

If this situation continues, it will create long and complex procedures for foreign investors to obtain their mining licenses and may decrease the effectiveness of preferential treatment for foreign investors (duty exemption, etc.) as stated in the mining law.

6.2 Institutional Strengthening

The main targets for institutional strengthening are the legal frameworks such as the Mining Law, reorganization of the mining sector, capacity building, addressing the MEPA, and the procedures regarding investment and permissions.

6.2.1 Legal Frameworks such as the Mining Law

The main revision points for the Mining Law have already been described in 6.1.1. In order to strengthen the institution for the entire mining sector, the Foreign Investment Law and procedures for investment and import/export must also be improved and revised. The current laws and procedures are not favourable for a government that expects direct foreign investment, because they sometimes conflict with investment promotion. Issues in the Foreign Investment Law include limitations on foreign employees (who need work permits and are limited to less than 10% of all employees), decrees without prior notification, promulgation of announcements (sometimes more effective than the law) which all discourage investment. Laos, without sufficient mining engineers and skilled workers, needs to apply more flexibility in its regulation of foreign worker numbers. To attract investment, Lao institutions must be strengthened together with a review of relevant laws and procedures regarding all mining activities. After scrutinising the legal framework and procedures, it is clear that institutional strengthening is required.

Sometimes investment conditions and climate create international competition and the MEM must realise that tested good conditions, institutional structures and legal procedures acceptable in other countries can be adopted to strengthen Lao's international competitiveness.

6.2.2 Organization and Capacity Building

Reorganization was implemented in June 2006, and the MIH-DGM was changed to the MEM; the DGM component is under study to be organized into 2 departments (see Fig.16).

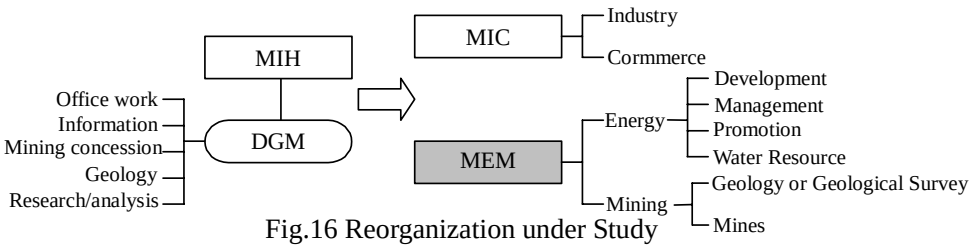


Fig.16 Reorganization under Study

This study has not yet been fully examined, and its function has not been investigated. In this study, the examples of Chile, Australia, Mongolia and Tanzania were investigated. The basic elements of the organization are the Department of Mines, including the Mining Cadastre, Geological Survey, Department of Environment, Information Service Center and Department of Policy, which formulates policies and plans. Those departments do not currently exist within the DGM and need to be created (shown in Table 15), as well as a Resource Information Centre, which will analyse resource information and, in future, provide information to others. Also, a Business Management department must be established to supervise and coordinate all units and act as a 'think tank' to formulate policy and plan institutional development, providing direction to the emerging mining sector. Table 16 shows a basic scheme for the mining section in MEM. A tentative organization sample is shown in FR-3. An idea for the MEM organization is shown in Appendix 9.

Table 16 Basic Scheme of Mining Section in MEM

Department	Role
Policy	• Formulate policies, institutions, strategies, plans, laws, etc. • Lead the overall mining sector.
Mine	• Manage the mining cadastre (establish a Room.). • Collect mining information. • Manage mining activities (technologies, safety).
Environment	• Manage mining environmental protection. • Examine monitoring and EIA that is currently conducted by STEA.
Information Services	• Compile and publish information of geology and ore deposits. • Manage the website. • Promote investments.
Geology	• Geological surveys. • Geological research. • Manage Chemical Analyzing Laboratory.

However, institutional strengthening also means increasing staff, training staff, delivering mining knowledge and technology, providing the ministry with computers and IT systems, compiling information, employing experts and engineers, and improving competitiveness. Institutional strengthening and capacity building are shown in "4. A Vision and Strategy for the Mining Sector", and concrete plans are shown in FR-7.

6.2.3 Addressing the MEPA

It is hard for investors and government authorities in the mining sector to find any merit in the MEPA. The government administers of the MEPA have less than sufficient staff and the time it takes to negotiate is so long that its contractual value is questionable. It has merit only for provinces that have mines producing internationally saleable commodity products. The basic problem derives from a self-supporting accounting system historically based on decentralisation policy. It impacts on the alignment of provincial and central government, in which finance should take priority. In future, it will further aggravate the relationship between provinces. The time has come to either abolish or completely standardise a fully transparent MEPA, as it will not be easy to

promote mining with the MEPA in its current format.

Even if MEPA were retained, there would be various options. For instance, there is a Mongolian example. Mongolia partially changed its Mining Law in July, 2006. The Mongolian government can keep its right only in "strategic ore deposits" which account for more than 5% of GDP. MEPA could thus be retained in only some limited ore deposits. Frankly speaking, MEPA should not target exploration. Also, small ore deposits might not be appropriate for MEPA.

MEM basically recognizes the importance of abolishing MEPA, but it is important to discuss official views on MEPA in the future.

6.2.4 Procedures and Permissions

As mentioned above in 6.1.4 institutional strengthening of the procedures used to obtain mining concessions is related to institutional strengthening for simplifying, shortening and rendering transparent the procedures and permits for mining activities. In other words, systemisation will be an instrument of institutional strengthening. For example, submitting the various documents for import/export procedures is time consuming and requires payment of service charges – this needs to be simplified.

The Mining Law only defines procedures and permissions related to mining activities and so implementing systems and transparency in related regulations will have many positive effects. It should be noted that the conditions for private small and medium-size enterprises (SME's) under the planning of ADB include establishing a 'one-stop-shop' system, which would have a beneficial impact on the mining sector by reducing the current complexities, by providing an investment guide, and by simplifying all relevant documentation.

6.3 Recent Changes in the Mining Sector

The contribution of the mining sector to the Laotian economy has increased enormously since the activities of the Sepon and Phu Bia mines began. Prior to this, the mining sector did not have the status of an important industry, as mining activities were pursued mainly by small regional operators. The success of the international operators has underlined the importance of the mining industry and increased expectations of its capacity to contribute to poverty reduction. It is necessary for the reorganised MEM, responsible for the mining sector, to take immediate action to build on this recent change by taking the lead in mining promotion. The study team has highlighted those actions which impact on the overall mining sector (see Table 17).

The MEM comprises a mining section, and an energy section which has already built industrial foundations in the Lao PDR. The MEM has sufficient potential to grow into an important ministry and drive the Laotian economy. In future, the MEM organization will need to capitalise on the synergy between its two sections, for example combining mineral resources development with energy development by focusing electricity supply into areas of mineral resources development.

Table 17 Governmental Roles before and after Participation of International Operators

Item	Before	After including future
Main operators	• Regional operators • Artisanal gold miners	• International operators (including junior companies) • Regional operators • Artisanal gold miners
Mining Organization	• Department (DGM)	• Ministry (MEM)
Sector Manager	• DGM	• MEM
Formulate Policy and Strategy	• Fragile	• To be strengthened
Restriction of Investment	• MIH kept it. • Unclear in transferring the mining right.	• MEM abolishes it. • Freely transferring the mining right.
Mining Tax (including royalty)	• Determined by negotiations. • Unclear content.	• To be regulated by the Mining Law.
Managing Mining Cadastre	• inefficient • influenced by MEPA.	• Overall systemization. • Functionable.
Procedures to attain the Mining Right	• Complicated. • Takes a long time.	• First-come, first-served. • Speedy actions.
Mine Safety/Environmental Protection/Guidelines	• None	• To be systemized with the Mining Law.
Environmental Management	• None	• To be systemized.
Information	• A little	• To be strengthened. • To link with the GIS database.
Artisanal Gold Miners	• Illegal operation. • Not administrated.	• To be organized. • To be legalized.
HRD	• Poor opportunity	• To be strengthened systematically.

6.4 Gender Issues and the Mining Sector

As is the case with other countries, there are few women in Laos who are officially employed in the mining industry. However, in Sepon there are many jobs for women in administrative fields, and many women are already working in various capacities at the Sepon Mine.

In contrast, there are almost no women employed at small-scale mines. However, at unofficial artisan mines, women and children make up at least 70% of the workforce. They are forced to work at or in rivers to earn money for daily living.

In Western mining companies, there is usually a distinct gender-based division of labor. At production sites, for exampe, there are few if any female workers. This is in stark contrast to former Soviet bloc countries, where many women worked in underground mines. In those countries, there were few problems resulting from gender-based differences. Some mining area communities even had child-care facilities

Looking at the historical background of gender-based division of labor, the small number of employment opportunities for women in the mining industry has been a worldwide phenomenon. However, today the sector is being required to create a work environment that is not discriminatory against women by resolving issues associated with the gender-based division of labor. In Laos, it is essential to create work environments, including in local communities and government, in which

there is a good social understanding of the traditional roles of women in housekeeping, child-rearing, and child-care.

Against this backdrop, it is essential that mines be automated through the introduction of advanced machinery and IT equipment that require little skill or strength to operate. Also, if artisan gold miners joined together and established cooperatives, it could help to free women and children from excessively hard labor. This in turn could help to bring gender equality to artisan mining operations.

For its part, MEM needs to create and improve job environments by incorporation the above gender considerations into policies and institutions.

7. Information Management

A detailed description is shown in the report prepared by the GIS expert (FR-1).

7.1 Assessment of Geological Data

7.1.1 Usage Status of the GIS Database

Varieties of databases have been constructed by government and international organizations in Lao PDR, including a database for the Mekong River by MRC, a fundamental geographic information and infrastructural database by NGD, a forestry, soil, and land-use distribution database by MAF, an electric power supply database by MIH, and so forth (Table 18). These datasets can be used as fundamental information for a future Geo-science database in the DGM, which would provide an information highway to mineral resources in Laos.

Table 18 Representative GIS Database in Lao PDR

Organization	Content	System
NGD[1)]	Management of fundamental geographic and infrastructural data to create topographical maps covering the whole country	ArcInfo/ArcView/ ArcMap
MRC[2)]	Database of information management covering from natural environment to human activities in the Mekong river basin	ArcInfo/ArcView/Arc Map
MAF[3)]	Management of land suitability maps of soil for agriculture covering the whole Lao PDR	ArcInfo/ArcView
UXO Lao	Management of the clean-up of the UXO impact and bombing zone areas by a customized GIS system called IMSMA	Integration of ArcView & Access

1) NGD: National Geographic Department, 2) MRC: Mekong River Commission, 3) MAF: Ministry of Agriculture and Forests

7.1.2 The GIS Database in the DGM

One of the largest issues in databases constructed in various organizations is “mutual usage” among the organizations. Though in most cases data can be obtained by submitting official request letters to the data possessors, there is no standard letter format, it takes time, and it is sometimes hard to find the persons in charge, even for Laotian staff members. At present, this is done using the personal networks of the Laotian staff members.

The NGD is the only organization that manages data for fundamental geographic information, and it may undertake a role of active leadership for mutual data exchange. It needs to set up a liaison council, which should be a cross-ministry organization, and to unify and simplify proceedings for mutual usage of GIS datasets among related organizations.

In developed countries, related government ministries and agencies that possess GIS databases connect their data servers to the Internet, and provide such information to the public. Thus, the scheme of mutual usage of fundamental GIS datasets is called a “clearinghouse”. Even in Laos, the liaison council mentioned above is expected to play a role in the set-up of such a “GIS data clearinghouse” in the future. Standardization of the GIS data also should be done in parallel with the creation of the “clearinghouse”.

7.1.3 GIS Database in DGM

The GIS at the DGM has been used to create, manage and store geological and mineral resource maps, such as the 1:1,000,000 geological maps produced by the BGS, a mineral resource map produced by the ESCAP project, and twelve 1:200,000 geological maps completed by INTERGEO (Vietnam), a distribution map of mining concession areas, and so on. However, these datasets are insufficient as a foundation database for geological and mineral resources due to database management issues, such as missing data, errors and mixing of data types, and cases where the GIS database is not linked to the bibliographic database supported by UNESCO.

7.1.4 Technical Level in Information Technology

Although the DGM has four staff members with fundamental GIS technical skills, (one upper intermediate, one intermediate, and two beginners), there are not sufficient staff to implement a future Geo-science database. In order to resolve the issues mentioned above and broaden GIS use, technical capability and personnel education must be improved. Regarding hardware (PC and peripherals), the capabilities of the present PCs are insufficient for GIS operation and there is no data-sharing or peripheral-sharing because there is no Local Area Network in the DGM offices. There are also problems such as expired licences and obsolete software applications.

7.1.5 Mining Concession Division Data and managing system

In ordinary operations for mining concession application procedures in the Mining Concession Division, inspection of applied areas are made as shown in the bluish zone of Fig. 17. Application documents are submitted to each staff member who manages categorized concession datasets, which are divided by mining law. The applied areas are compared with existing mining concession areas stored in the GIS dataset to avoid overlapping, and the results are reported to the staff responsible. The GIS operator in the Geo-Mines Information Centre may assist this procedure occasionally as shown in reddish zone of Fig. 17. However, in the current mining concession data management in the DGM, GIS is not used for data management, but only for checking overlapping areas. In order to carry out comprehensive and efficient concession data management in the DGM, a full-fledged mining concession data management system, combining the GIS and text databases, should be implemented based on the preliminary concession data management system and the Geo-science GIS database.

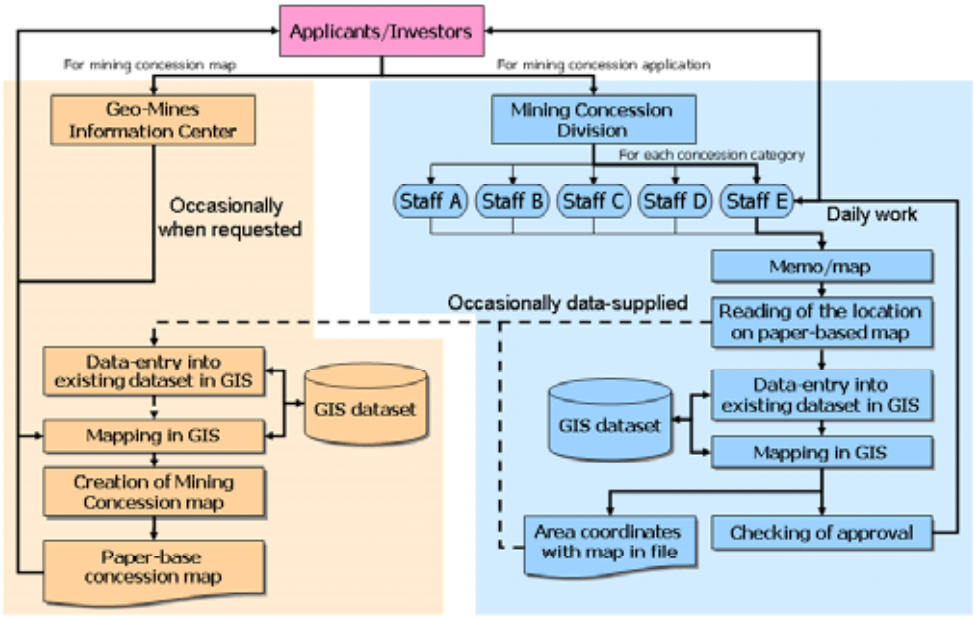


Fig.17 Flows of mining concession data management and concession map creation

7.1.6 Geophysical data

Airborne and ground geophysical surveys for mining and oil exploration have been conducted by mining concession licensees in the Lao PDR. These privately developed geophysical maps are constrained by confidentiality clauses. Even if the concession areas have already been relinquished, the datasets are not available to the DGM. Though the status should be improved with the goal of effective usage of stored datasets, extravagant measures of information disclosure might reduce mining development companies will to invest. Therefore, regarding the disclosure of geophysical datasets in those relinquished areas, the MEM and DGM should carefully discuss and consider a future management plan for them. The principles for such data management should be described in the administrative instructions of mining law.

From a technical point of view, though geophysical datasets submitted from licensees are stored in cartridge tapes, there is no tape reading equipment and no appropriate software in the DGM, so it is not possible to output geophysical anomaly maps such as these at the present time.

A management approach for effective future utilization of such stored data will need to be considered.

7.2 Information Disclosure by Website

Various kinds of mining related information, from mining policy and laws to geological and mineral resources, have been disclosed through the DGM website (http://www.dgm.gov.la/). Concession area distribution, sampling status of geo-chemical data, and so on, are shown on the website, and general information relevant to mineral resources potential is also disclosed effectively. However, there are several issues that still need to be resolved as shown in Table 19.

Table 19 Present Status of DGM Website

Item	Present status
Data up-date	No up-date for content is very rare, for instance, mining concession information is still showing a situation of December, 2003.
Related information	No several relevant information for mining activities, like statistics of mining sector, protected or reserved areas, UXO distribution zones etc.
Government announcement, News	A lack of government's announcements like recent mining policy and infrastructural data which are inevitable for mining developers
Communication with clients	No mutual information exchanges between DGM and clients via Internet

Information disclosed on a website is only attractive to investors on condition that it is continuously refreshed, augmented and up-dated. Keeping in mind 'What is the purpose of a website?' it will be necessary to supply a variety of additional information for potential investors in the spirit of good service and 'The client comes first". On the other hand, the MEM was established by reorganising existing institutions and it has no website, so in future, an MEM portal website will have to be developed, with links to all Lao mining-related websites.

7.3 General Design of Geo-Science GIS Database

7.3.1 Stored Data

Data in Geo-science GIS databases should comprise currently stored GIS datasets in DGM and various kinds of GIS data collected from government offices and international organizations. In addition, several datasets have been created, edited, and stored. For instance, although the mineral resource datasets of ESCAP and BGS were created independently, some datasets were redundant or missing (see Fig.18). Therefore, an integrated mineral resource data table was newly created from the both datasets in this study.

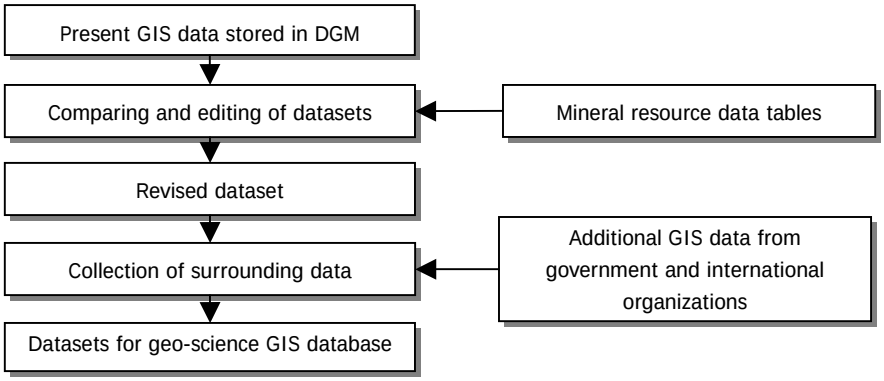


Fig 18 Work flow of data stored in the Geo-Science GIS database

Various kinds of spatial datasets have been collected for the future Geo-science the GIS database, and are already stored in the current GIS database. Several maps shown in Fig.19 were created based on fundamental GIS datasets from several organizations.

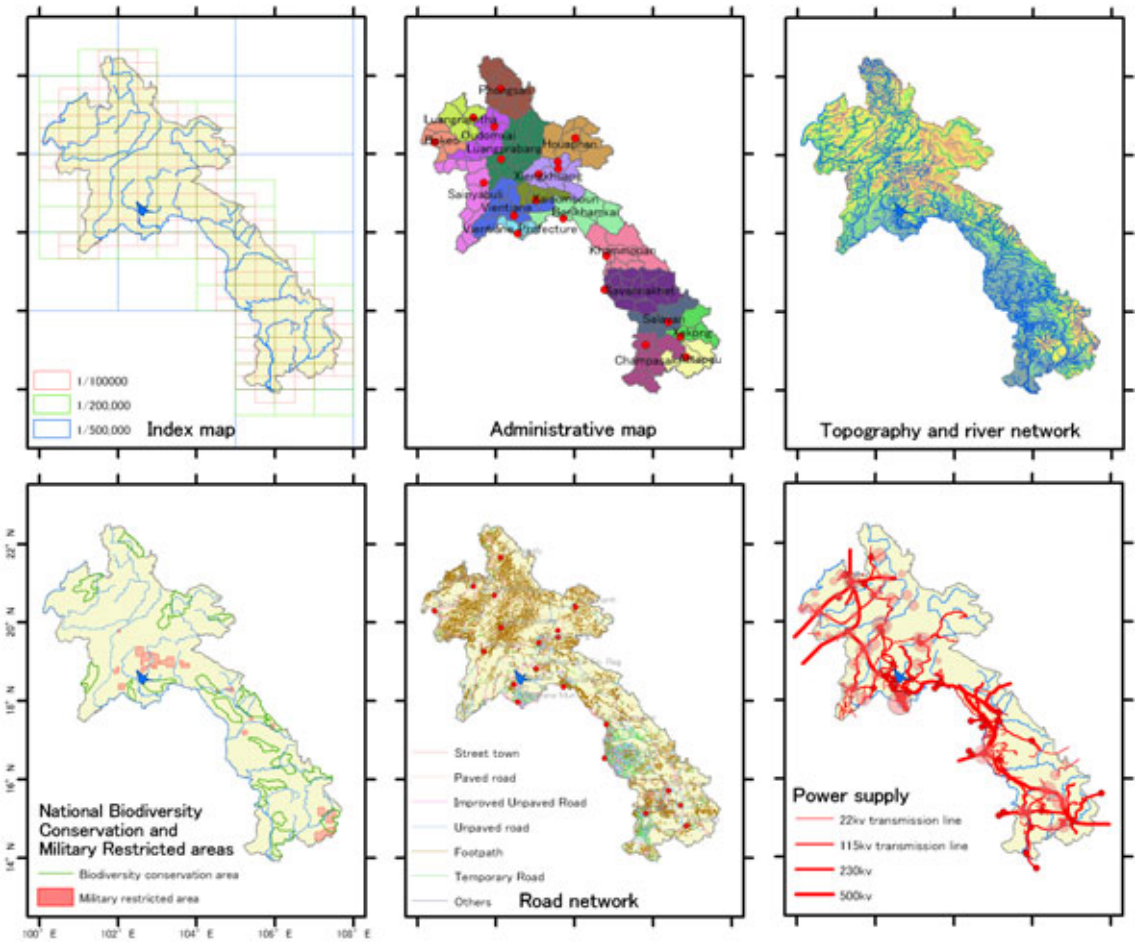


Fig.19 Example outputs of collected representative GIS datasets

7.3.2 General Structure

The Geo-science GIS database was designed based on the following requirements:

- The database should integrate the present GIS database with the bibliographic databases of the GIS and RDB.
- User interface should be customized for the DGM users to link between the GIS and the text database.
- Consolidated management should be enabled by data sharing via LAN.

Figure 19 shows the general structure of the Geo-science GIS database comparing the present GIS datasets with a future full-fledged mining concession data management system. For the main mineral resource and geochemical datasets, the basic data table structure and relationships among the tables are described in detail in FR-1, and the current and latest datasets are already stored in the tables.

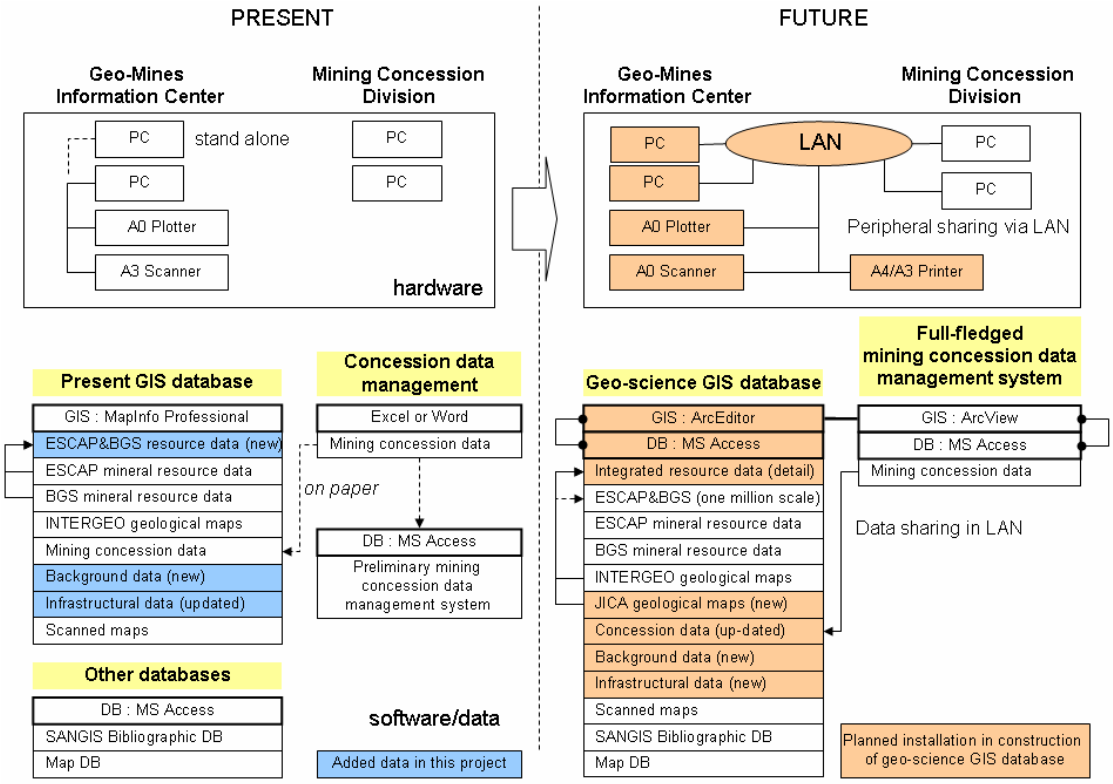


Fig.20 General Image of the Geo-Science GIS Database

7.4 Information Settlements

7.4.1 Future Plan

The basic design and a large quantity of collected data will be used for the future Geo-science GIS database in this project. The data ranges from infrastructural to geographic information, and will be used for the fundamental construction of the database supplied for exploration activities. From now on, the basic design of the geo-science GIS database will be based on this general design. The JICA project, 'Geological Information Development Plan for the Lao PDR" was started in June 2006 and is supposed to create geological maps with scales from 1:200,000 to 1:10,000 and to revise the country's 1:1,000,000 geological maps. The maps created by this project will be included within the scope of the Geo-science GIS database and installed at the MEM based on the general design of the Geo-science GIS database.

Thus the future Geo-science GIS database will be an extended system of the present GIS datasets and should include the existing bibliographic database. Mining concession data should be managed in a future fully-fledged mining concession data management system. The Geo-science GIS database system and the fully-fledged mining concession data management system should be linked via LAN to the DGM (Fig.21).

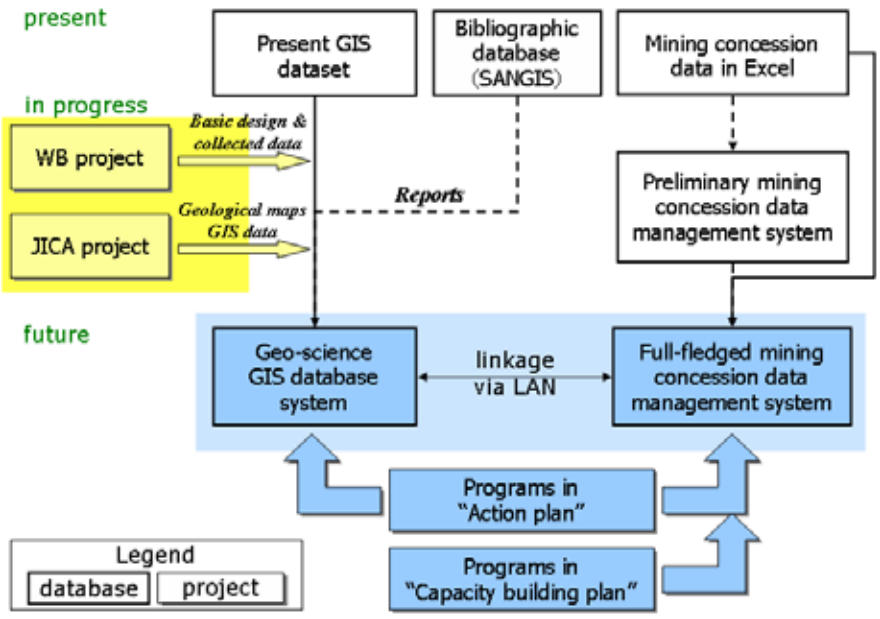


Fig.21 Geo-science GIS database and its peripheral database systems in DGM

7.4.2 Training of DGM Staff

The construction and maintenance of future geo-science GIS database will require technical training for DGM staff to improve their database and GIS skills (Table 20). In order to cope with recruitment difficulties, a comprehensive plan for long-term temporary employment of IT, remote-sensing, and geophysical specialists from Europe, United States, Japan, Thailand etc., is needed. This will require preferential funding through capacity building projects, to improve the competencies of the present DGM staff by providing specialised training. Over time, recruitment of new IT graduates and the effective use of existing human resources from other Ministries and also job realignment within the DGM should be considered, maintaining a policy of "the right person for the job".

Table 20 Required Further Training Courses for the GIS and Database Issues for Present DGM

Section	Present technical level of candidate trainee	Number of staff	Content of training					Target class
			GIS ArcEditor			Database Access		
			B[2]	M[3]	A[4]	B[2]	M[3]	
Geo-Mines Information Centre	Upper-middle level[1]	1	○	○	○	○	○	GIS project manager
	Middle level[1]	1	○	○	○	○	○	GIS assistant manager
	Beginner level[1]	2	○	○	—	○	—	GIS operators
	Other staff	4	○	○	—	○	—	2 operators & 2 technicians
Mining Concession Division	Middle level[1]	1	○	○	○	○	○	DB+GIS manager
	Other staff	1	○	○	—	○	○	DB+GIS operator
		4	—	—	—	○	○	2 operators & 2 technicians
Geological Division	middle level[1]	1	○	○	—	○	○	RS technician
	Other staff[1]	1	○	○	—	○	○	Geophysicist

1): GIS Experienced staff, 2):B: Basic, 3): M: Middle, 4): A: Advanced

This database and GIS training can be administered by GIS companies in Vientiane, ESRI Thailand or by invited foreign experts. Based on the training of IT and new staff mentioned above, the following technical organizational structure can be created and required for future geological and mineral resource data management in the DGM.

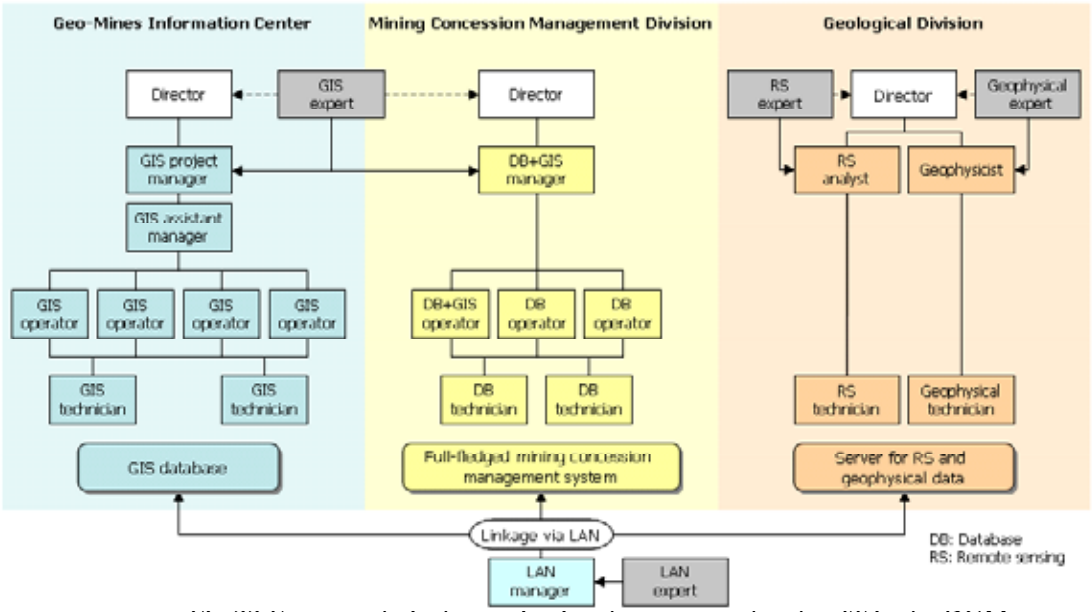


Fig.22 Future technical organizational structure related to IT in the DGM

7.4.3 Future IT usage

The IT revolution is also expanding in the mining sectors of the world, and mining-related governmental agencies in many countries are strengthening management operation by using IT. Even in MEM and DGM, it is essential to use IT effectively for data management and to disclose the appropriate information to domestic and foreign investors for acceleration of mining activities in Lao PDR.

The following three items are fundamental preconditions for sustained growth of IT in the DGM through actions contained in the “Action Plan” and ”Capacity Building Plan”.

- Devise measures to maintain employment of IT engineers
- Maintain hardware and software
- Set-up of broadband infrastructure for Internet connections

At present, the shortage of IT engineers is a universal issue, and there is employment competition among IT engineers in various fields. This situation can also be seen in the GIS specialists in Lao PDR. Appropriate countermeasures might be required to protect headhunting of such skilled engineers. Especially before staff members take long-term IT training, closing an employment agreement, which restricts them leaving their present job for couple of years, might be one solution. However, even if this measure is taken, it would still be hard to protect against drainage of engineers to private companies. To solve this issue, the setting up of a technical school to

expand the number of IT engineers in Lao PDR should also be considered.

Rapid innovation in the IT world continues, and obsolescence is a serious issue. In order to maintain and increase the level of IT in the DGM, it will inevitably be necessary to upgrade hardware and software, and it is important to take appropriate budgetary steps to considering those upgrades. Also, down time between projects should be minimized or in order to conduct continuous maintenance support.

A delay in the of establishment of Internet lines is a common issue in developing countries, and this is an obstacle to performing ordinary tasks in the DGM. Nowadays, broadband Internet connections are a prerequisite condition in IT usage. Installation of DSL (Digital Subscriber Line) is a viable option for broadband Internet connections in the DGM.

8. Current State of Mining Activities and its Tasks

8.1 Position of Mining in the Macro-Economy

The macro economy and roles of the mining industry are reported by the economic expert in DR-6.

8.1.1 Mining Industry in the Macro-Economy

Although various reforms have been implemented under the market economy, Lao PDR has structural problems such as chronic trade and budget deficits. Following introduction of the market economy, stabilisation of the macro-economy and reform of financial institutions, the Lao macro-economy has been stable, in terms of economic indices, since 2001. However, the value of the Laotian currency is still being eroded by inflation. In the government's 2004/2005 budget, revenues were US$336.0 million and expenditures were US$522.4 million (see Table 21).

Table 21 Budget of the Government (in millions US$)

Year	Revenue			Expenditure			Deficit
	total	tax	Non-tax	total	Current	capital	
2000	205.8	166.3	39.5	335.2	127.8	207.4	-129.4
2001	243.4	198.2	45.2	382.2	149.6	232.6	-138.8
2002	283.4	229.1	54.3	381.6	166.8	214.8	-98.2
2003	297.3	245.3	51.9	418.0	199.2	195.3	-120.7
2004	346.0	284.5	61.5	522.4	247.6	235.2	-176.4

Many policies have been implemented to support the National Poverty Eradication Plan (NPEP, 2003) and the National Growth and Poverty Eradication Strategy (NGPES, 2004). Structural problems in the Laotian economy could be solved by industrial growth and associated increases in revenue and GDP. In addition to increasing GDP with revenue from the electric power industry, the mining industry started contributing to the macro-economy, increasing its share of GDP from 0.1% in 2001 to 2.4% in 2004. The industrial structure shows a somewhat lower share of the mining sector (see Fig.23). Total sales from the Sepon Mine in 2005 were about 300% higher than in the previous year (Table 22). In 2008 when the Phu Bia Mine begins full production of the Phu Kham deposit, its share will certainly increase.

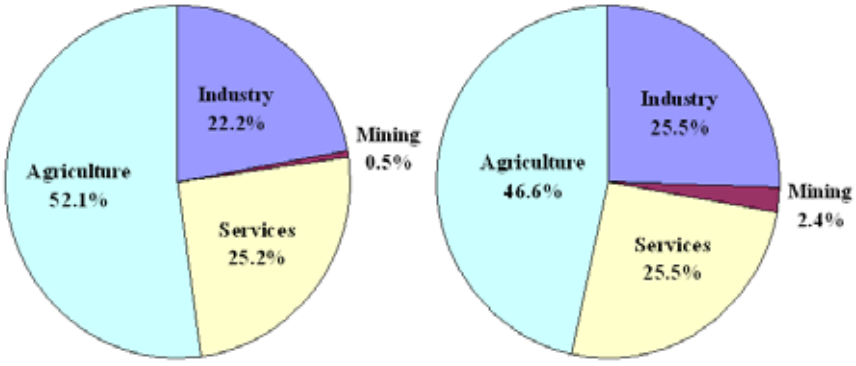


Fig.23 Industrial Structure

Table 22 Comparison of Sales Amounts in 2004 and 2005

Mine	sales amount	
	2004	2005
Sepon Mine	US$56.3 million	US$149.4million
Phu Bia Mine	-	US$0.1million
Total	US$56.3 million	US$149.5million

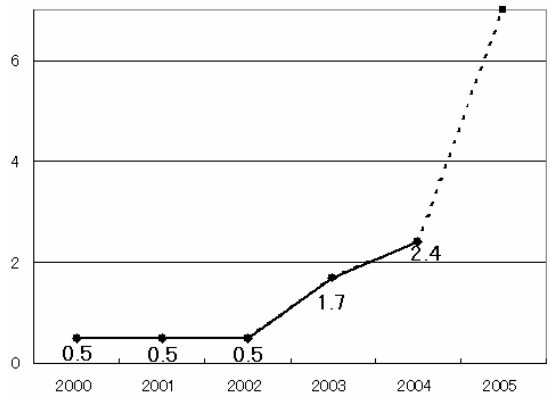


Fig.24 Sales Trends in the Mining Industry

8.1.2 Role of the Mining Industry

The mining industry impacts directly on the macro-economy by improving infrastructure, increasing employment, developing rural communities and enabling new spin-offs and downstream businesses. The mining industry also contributes much to poverty reduction (Fig.25). Revenues such as royalties and income taxes from the industry were estimated to be 4-5% of total national revenues in 2005 and it is reasonable to assume that these revenues will increase in line with the growth of the mining industry.

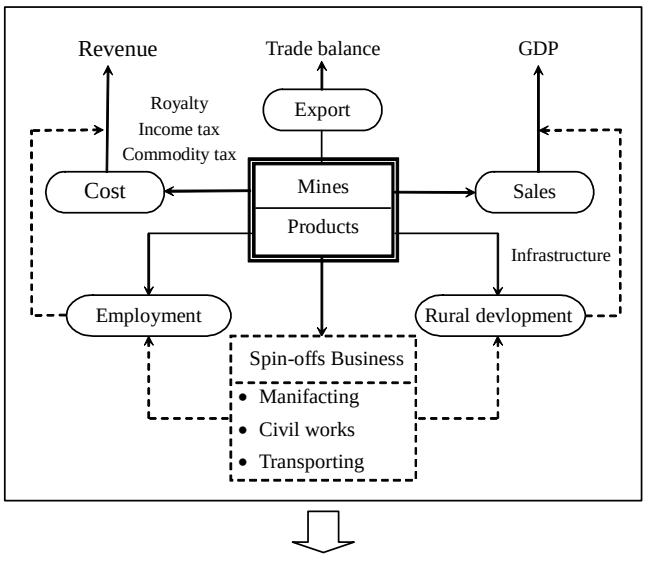


Fig.25 Relationship between the Macro-economy and the Mining Industry

However, not only such direct contributions, but also indirect contributions might be

expected. Area population might be increased by employing new workers (5,000 to 10,000 workers for a large mine), and new businesses such as agriculture, livestock farming, transportation, retail trade, etc. would be created for supplying food and materials with new employment. Area economies would be expanded by this new employment, and finally revenues would be increased through mining production as well as workers wages, trading materials, etc. These revenues would enable expenditure for the mining sector and mine area communities. Partial revenues could also be utilized for a community development fund to improve social facilities such as local hospitals, infrastructure, etc. In turn, these would contribute widely to poverty reduction.

The current Lao PDR tax collection system is not transparent, and all local taxes are not gathered by the central government. Therefore, the unfairness and uncertainty of the tax collection system will be a large obstacle for revenues from the mining sector in local areas. It is important to directly link the systemization of accurate tax-collection by the central government to poverty reduction.

8.2 Current State of Exploration Activities

As of January 2006, there were 121 mining concessions. These were held by 33 domestic companies and 35 foreign companies. The foreign concession holders consisted of 24 Chinese, 11 Vietnamese, 6 Thai, 5 Australian, 4 Russian companies, whose targets are gold and copper. Domestic companies target sapphire, barite, tin, etc. (Fig.26).

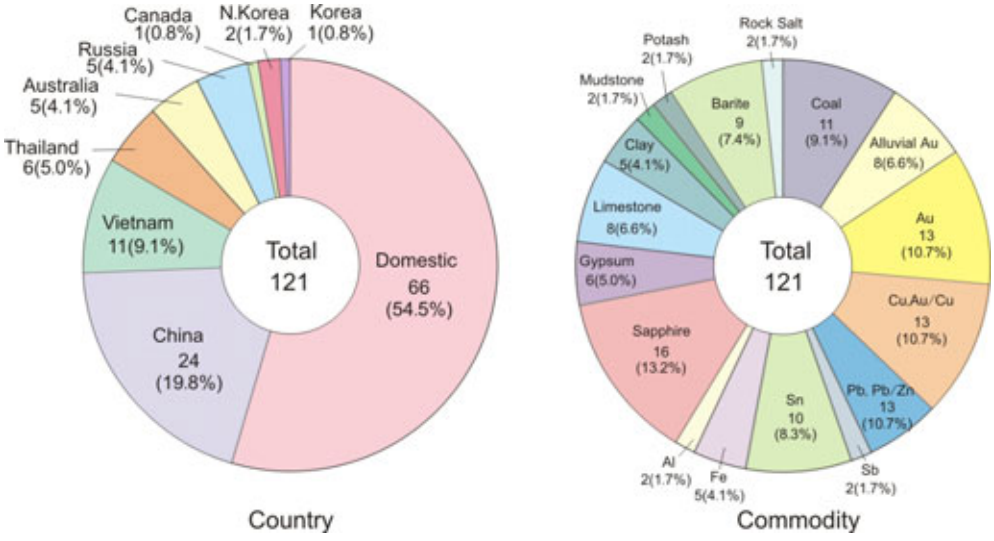


Fig.26 Mining Concessions

Most exploration activities in Laos are undertaken by companies from neighbouring countries. However, there is no participation from “junior” companies which have become so important in the West. This may be due to the relatively unattractive investment climate resulting from the Mining Law, MEPA, and other problems. On the other hand, the domestic companies target only those few minerals which can be developed with limited technology and finance. This stresses the importance of nurturing domestic companies and creating viable financial markets.

8.3 Current State of the Mining Industry and its Tasks

The mining expert describes details of the mining industry in his progress report (FR-4).

8.3.1 Structure and Characteristics of the Lao Mining Industry

Lao mining activities are broadly categorized within the following three groups:

1. Large/medium-scale mines with modern production systems (international operators)
2. Small-scale mines without modern production systems (regional operators)
3. Artisanal gold mining without registered mining rights or any systems (artisanal miners)

The number of production sites in each category increases in descending order from 1 to 3, but 1 has by far the largest economic impact on the Lao economy. The structure of the mining industry can be illustrated by the triple-layer diagram shown in Fig.27. A comparison of this three-layer structure shows distinct differences but no reciprocal relationships between the 3 categories (Table 23).

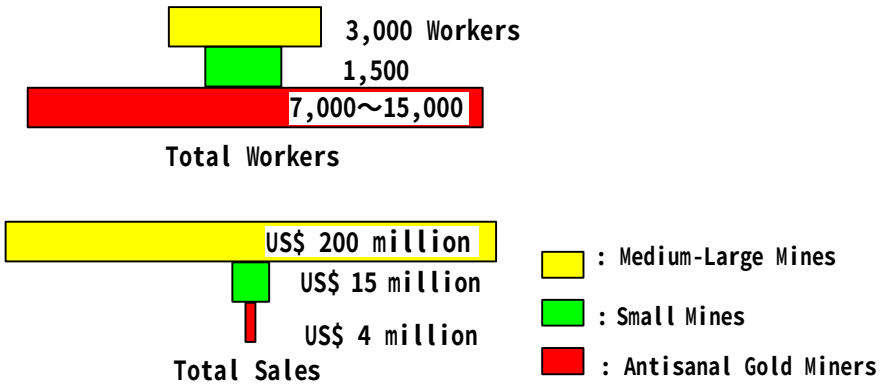


Fig.27 Diagrammatic Structure of the Lao Mining Industry

Table 23 Comparison of Mine Operators in Laos

Item	International Operators	Regional Operators	Artisanal Miners
Capital	Large and attainable overseas	Small & attainable regionally	None
Technology/Facility	Modern & covers in all processes	Old & manual in mining	None
Labor Force	Organizational & attainable inside and outside of the country	Small and part-timers inhabitants	Mainly local farmers
Environmental Technology/Measures	Well managed	None	None
Exploration	Systematically done	A little or none	None
Office Management	Utilizing IT technology.	Manual calculation	None
Infrastructural Ability	yes	A little or none	No
Measure for Rain	yes	Stop during the rain season	Stop during the rain season
Organization	Stable	Weak	None
HRD	Positively yes	None	None

It is very hard to evaluate the exact state of the Lao mining industry, because there is no relevant compiled information such as production and financial data. The situation is the same with the national mines (Table 24).

Table 24 Characteristics of the Laotian Mining Industry

Item	Medium-large mines	small mines	artisanal miners
Capital	Australian	local/neighboring countries	None
Technology	Modern	Traditional	None
Product(s)	Gold/electric copper	metal concentrate/industrial materials	gold particles
Employees	500 ~ 2,500 workers	10 ~ 1 50 workers	Household
Environmental consideration	Existing	None	None
Mining rights	Existing	Existing	none (partially existing)
Engineers	Distributed into each field	partially distributed	None
Sales	US$90million/mine	US$10,000 ~ 1million	US$200 ~ 800/household

- Exploration for medium-large scale deposits which could be expected with modernized production systems has not yet fully materialized despite the rich resource potential. Small companies are exploiting deposits with inadequate exploration; sometimes without any exploration at all.
- Basic infrastructure such as roads and electric power, etc. is underdeveloped and this is a barrier to promoting exploration and development. Also, the construction of infrastructure is highly dependent on loans from international organizations and/or donor countries. Another barrier is very high seasonal rainfall, which can force small mines to temporarily shut down as roads become impassable and open pits flood.
- Most of the JV mines are associations of partners from adjacent countries and local investors.
- Most of the locally-worked Lao mines use simple traditional technology, and their main product is crude ore.
- Artisanal gold mining provides additional income to rural inhabitants but leads to illegal excavation with machines brought from neighbouring countries.
- It is hard to obtain exact production and financial data for mines other than medium/large-scale Australian-managed mines.
- The roles and locations of national mines, including mines belonging to the Ministry of Defence, are not clear, and in that sense the Government of the Lao PDR is competing with private companies. Characteristics of the national mines are as follows:
    - Vice ministers take the responsibilities of board members.
    - There are many mines with debt but most of them have no repayment plans. Sixty percent of profits are paid to the ministries.
    - Mine staff are allocated from the ministry in charge and other ministries.

- Some mines try to form joint ventures with foreign companies due to the shortage of technology and funds.
- For financing, the personal assets of the mine directors are sometimes offered as collateral.

8.3.2 Main Mines

The mining expert reported on the current state of working mines including the Sepon and Phu Bia mines, and the artisanal gold mining in his draft final report (DFR-4). There are currently 35 working mines in the country. The main mines are shown in Table 25.

Table 25 Main Working Mines in Laos

Company name (*: National company)	Mine name	kind of mineral	nationality (*: government)	capital	reserve	ore production in 2005	average grade of ore
unit	-	-	-	000US$	tons	tons	-
Lane Xang Minerals	Sepon	gold	Australia	39,908	86,340,000	2,659,948	2.77g/t Au, 4.99g/t Ag
Lane Xang Minerals	Sepon	copper	Australia	167,321	4,946,154	643,771	5.80% Cu
Phu Bia Mining	Phu Kham	gold	Australia	15,321	21,400,000	400,567	1.63g/t Au
Lao-Korean Tin Mines	N/D	tin	JV (Lao-N. Korea	N/D	3,122,595	56,749	0.21%
Padeng Industry Public Co. Ltd	Kayso	zinc	Thailand	400	27,000	791	＞30%
Phialat Gold Panning	Phialat	gold	Laos-China	200	24,000	120	25g/t
Lao International Trade and Service *	Houaixay	sapphire	Laos*	150	10	80kg	N/D
Gypsum Mining Co. Ltd*	N/D	gypsum	Laos*	N/D	18,116,900	179,869	94.88%

(N.B.) Data for No. 7, 10, 15, 18, 30 are collected by the World Bank Team Other data are given by DGM
N/D: No Data N/A: No Available

In Laos, there are 32 producing mines without modern production systems. There are 13 national mines, which include 7 mines managed by MIH, 5 mines managed by the Ministry of

Defence, and one mine managed by the Ministry of Commerce. There are 12 mines with foreign investment, including 6 Chinese, 3 Thai, and 2 Vietnamese. Most of these mines are mining ore using old, inefficient and inappropriate machines and the ore processing is not mechanized. Nevertheless, through employment, these mines are important providers of cash to their immediate communities.

8.3.3 Artisanal Gold Mining

Much artisanal gold mining is conducted on the Mekong River and its tributaries. These operations are not officially registered and are carried out mainly by farmers supplementing their income during the dry season when water levels are low. Some villagers increase the purity of panned gold by means of amalgamation, which may contaminate the surrounding environment with mercury. Therefore, UNIDO, in association with the DGM, has undertaken a sociological survey on artisanal gold mining in Luang Prabang Province since 2003.

The mining process and the use of mercury vary between villages situated on the Mekong River and villages situated on the Nam Ou River. The process of ore extraction on the riverbank, on ephemeral islands or from the riverbed using simple tools like iron bars is similar for each of the surveyed villages. However, for villages along the Mekong River, mercury is traditionally added at the panning stage to form an amalgam with alluvial gold particles. Villages on the Nam Ou River do

not typically use mercury to form an amalgam with gold, but rather use a form of gravity separation by heating and drying the sieved and panned material and periodically blowing away the concentrate surrounding the gold particles. In the Nakadok region, about 1,000 people used to work on the banks of the Nam Houay for artisanal gold, but this activity was declared illegal in early 2006.

At the confluence of the Nam Kata River, vertical shafts are excavated to extract gold but the miners do not use mercury. Around the Nam Ke River in April 2004, the military took over the mining concession where local residents had been engaged in artisanal gold mining, which is not currently permitted.

The main characteristics of artisanal gold mining are as follows, based on field investigation carried out in Luan Prabang, Savannaket and Borikhamxay provinces:

- In many instances, mining appears to be an important source of cash income, although agricultural activities represent the principal occupation of villagers in the region.
- Typically, households involved in gold mining produce between 10 and 40 grams of gold per year (an average of approximately 24 grams which corresponds to an average village total of approximately 0.6kg per annum).
- There are some cases in which artisanal miners with oxygen cylinders go under water to excavate a comparatively large amount of mud on the river bottom. (They earn US$50 a day on average).
- Most artisanal miners are not aware of the potential health implications of exposure to mercury. The addition of mercury to the excavated ore generally occurs on the riverbank, resulting in contamination of the soil substrate and the adjacent watercourse.

8.3.4 Tasks of Mining Activities

The particular structure of the Laotian mining industry stems from three roots:

- A history of small-scale mining by regional operators with scant capital.
- International operators which have established production within a short period
- A DGM which has not been able to take a lead due to its shortage of experts for mining management.

Even at present, regional operators do not have sufficient capacity to manage mines. To promote the Lao mining industry, it is essential to strengthen the supervision system of mining activities, to construct and manage a mine ‘model’ for small-scale modern mining, and to train the DGM staff in regulating large/medium-scale mines such as the Sepon Mine. Furthermore, small loan facilities for local companies and entrepreneurs are needed to promote exploration and development of industrial/metal minerals.

Regarding aritsanal gold mining, it is important that the MEM recognise that it will not be possible to stop artisanal mining for many years. The current household digging needs to be organised into village excavation cooperatives operating with mining licenses in agreed ‘zones’

based on traditional mining areas (Fig.28).

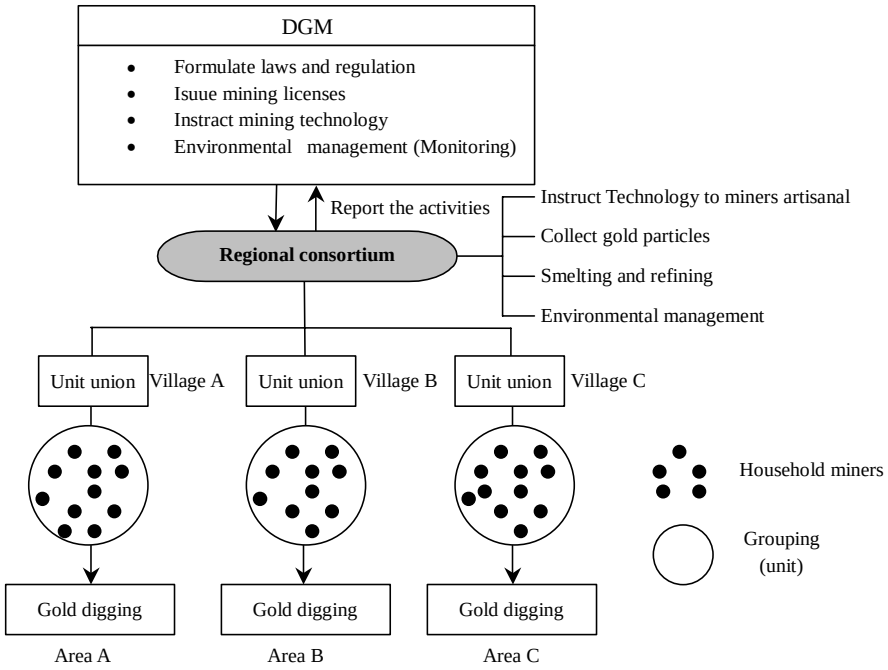


Fig.28 Basic Concept for Organizing Artisanal Miners

For that purpose, the Mining Law should authorise artisanal gold mining as a development right. It is possible to build a reciprocal relationship between mine operators by reorganizing and training artisanal gold miners and modernizing small mines to conduct 'best-practice' mining activities, which will activate the mining sector. Therefore it is better to regulate the activity where it can be policed and made socially and environmentally safe.

The three types of mine operators have completely different operational scales and methods, so it is important to apply promotional measures appropriate for each operator (Table 26).

Table 26 Appropriate Measures for Each Operator

operator	Main measures
International Operators	• eliminate barriers • review the Mining Law • information service • construct infrastructure
Regional Operators	• improve management • lease system for machines • establish a new financial system
Artisanal Gold Miners	• give mining rights • organize artisanal miners • instruct technology and environmental protection

Organization of artisanal gold miners will enable expanded production and increased profits through systematic and efficient small machine mining operations. Programmed mining will assure operational continuity, and will allow DGM to grasp the production situation to manage artisanal gold mining, which will eventually lead to the full and optimal utilization of Laotian

national resources. An organized consortium of individual businesses will relieve women and children of the economic burden of buying mercury and tools, the physical burden of arduous labour in the water, and will promote healthy and safe living conditions. The marketing route for gold concentrate (product) will also be organized to enable periodic trading and the abolishment of mercury use. These types of organization will require specific policies and a legal framework for artisanal gold miners. Also, MEM will need to conduct technical instruction, campaigns for environmental awareness, and various supporting activities.

8.4 Current State of Lao Infrastructure and Associated Tasks

The current state of Lao infrastructure and relevant plans for improvement are reported in the final report (FR-4) by the mining expert.

8.4.1 Roads

Ninety percent of financing for transportation (by road and river) in Laos DPR depends on international organizations and donor countries. From 2002 until 2010, there are plans to construct a total of 1,399km of roads, mostly extensions or improvements of No. 2, 3, 8, 9, 12 and 13 National Roads, with a budget of US$316 million. Some of these have been completed already. There are several international projects, such as the Improvement Project for Logistic Systems and Traffic Safety Project funded by the Asian Development Bank and the Vehicle Transportation Improvement Project funded by the World Bank.

There are a few national roadways (No.1 to 18) in the country, but some roads constructed during the French Colonial Period are currently out of use (such as the south section of No.1). No.13 (south-north) is the most important national highway, followed by No.9 (east-west) and No.7 (east-west). The main national roads have been developed adjacent to the Mekong River, and are closely tied to the current population distribution and economic activities.

There are several problems with roads, such as:

- Laotian roads have surface dressing, but their structural strength is only 9.1 t/axle, which is weaker than roads in other countries, like Thailand, 11t/axle.
  Road maintenance is insufficient.
- There are very few local road builders.
- Road maintenance is insufficient.

Fig.29 Current State and Main Maintenance Plans of Laotian National Roads

8.4.2 Electricity

Lao PDR has plenty of hydraulic power resources, and its potential hydraulic power is estimated at 18 million kW. The currently utilised hydroelectric power generation system produces 630,000 kW, which is only 3.5% of total potential. Electricité du Laos (EDL), a national company under the MIH, manages the main system of power generation, transmission and supply. The EDL exports surplus electricity to Thailand and also imports electricity for areas without transmission lines from Thailand, China and Vietnam.

Electric supply consists of two kinds:

- “on-grid”, which comes directly from power transmission lines, and
- “off-grid”, which comes from independent generators.

“On-grid” electric supply is managed by the EDL, but the power transmission system is not sufficient and not networked throughout the country, which is divided into 4 electric supply regions (northern, central 1, central 2 and southern regions). Fig.30 shows power transmission lines and power supply regions in the Lao PDR.

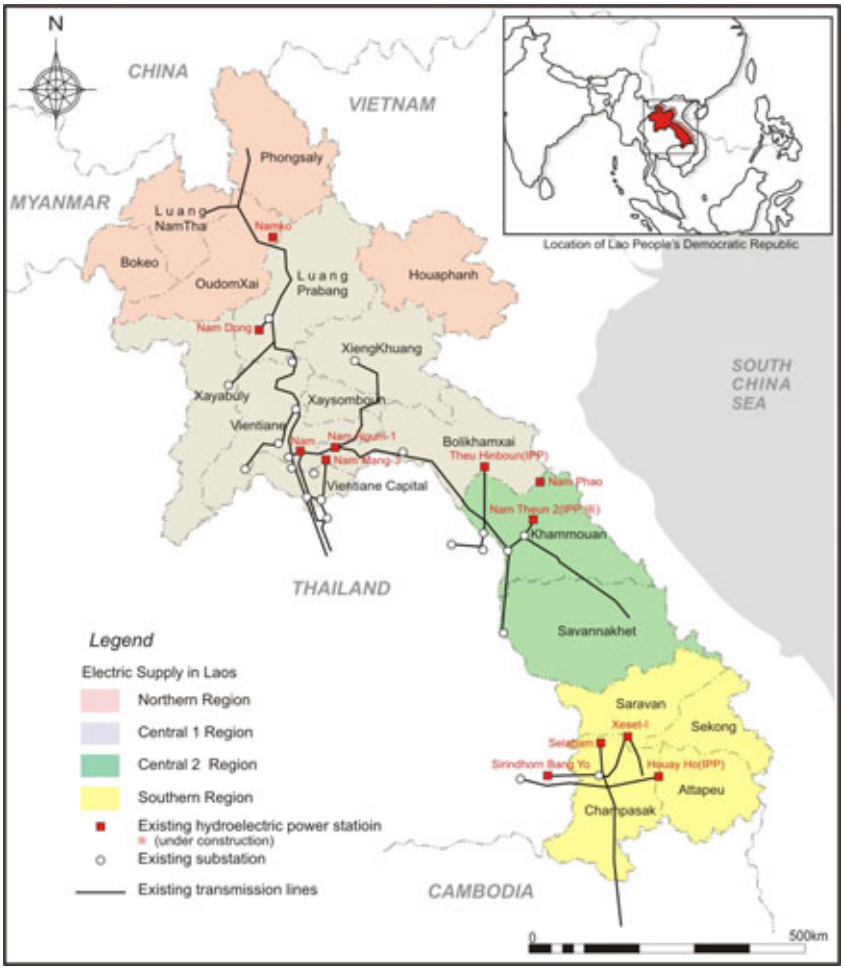


Fig.30 Power Transmission Lines and Power Supply Regions in Laos

The Lao Government announced a goal of electrification of 90% of households by 2020 in the socio-economic development policy published in March 2001. Also, the government announced a goal of electrification of 70% of households by 2010 in NGPES. Power development projects are separated into the following 2 types, according to different objectives:

a. Development projects for hydroelectric plants for domestic consumption and,

b. Development projects for hydroelectric plants for exporting power.

8.4.3 Railways

A new railway is being constructed by Australian aid from the Friendship Bridge, in northern Thailand, to Ban Thanaleng, located about 15 km to the southeast of Vientiane. There is a Thai railway in the mid-Mekong region which will be extended 2.6km into Lao territory to Ban Thanaleng, where a new station will be constructed. There is an ambitious idea to extend this railway to the north and south via Vientiane but this is unlikely to happen in the near future, due to low traffic volume (passengers and transportation tons).

8.4.4 Water supply

Piped water supply facilities are limited and installed in only urban areas. Urban average coverage is less than 40%, and total coverage including rural areas is less than 10%. The official water supply networks in Lao PDR are insufficient. Therefore, in rural areas the water needed for mining development must be provided by the mine developers.

8.4.5 Infrastructural Development Tasks to support Mining Development

In considering the whole Lao territory, infrastructural construction is only just beginning. So far, no infrastructure projects have been planned or constructed in co-ordination with current mining activities or potential mining areas. However, the situation has been changing since the Sepon and Phu Bia Mines were opened and the mining industry began to contribute to the national economy. It should be noted that constructing infrastructure in co-ordination with mining activity can facilitate promotion of the mining industry and increase its economic contribution over time.

However, the government basically cannot afford to, and is not in a position to finance all of the infrastructure needs of mines. Therefore, the government needs to clarify which basic infrastructure will be constructed by the government, and which additional infrastructure will require investment by the developers. The roles and responsibilities for infrastructure maintenance also need to be defined. The rules for BOT when transferring rights to public ownership will likely be adopted. Case-by-case negotiations between the government and developers for infrastructure construction will also likely be needed, based on the regulations mentioned above. Globally, there are various different solutions for infrastructure construction, and case studies from several countries need to be considered for appropriate adoption by Lao PDR.

Recently the DGM was reorganized into the MEM, which is also responsible for the power generation sector of the national economy and is an important infrastructural consideration. Closer relations between mining and energy should work in favour of developing the Laotian economy.

Table 27 Current Situation and Tasks of Infrastructure

Item	Current situation	Tasks
Road	Resources development near roads.	Road construction to mineral potential areas.
Electricity	Electricity production mainly for city supply and exportation.	Supports for construction of small power plant for local supply.
Railway	Very short distance under construction.	Construct a main route.
Water supply	Mainly for cities.	Support of water facilities for mining development and its communities.

Based on the expected growth of mining activities by 2025 (4. A Vision and Strategy for the Mining Sector), cumulative revenues from mining activities are estimated to be US$ 1 to 2 billion, which corresponds to between 3 and 7 times the cost of road construction cost during the 6 years following 2006. Without partial allocation of revenues from mining activities to road construction for the areas of resource potential, the burden on investors of infrastructural

development will make it very difficult to promote mineral exploration. Concerning electrical power, the shortcomings of the electric network will hamper the profitability of Feasibility Studies for resource development. The MEM should establish a system which supports the construction of power plants, primarily for mine development but also for providing electricity to surrounding communities. If a new large copper mine cannot implement an SX-EW production system like the Sepon Mine, it will need to transport a large amount of copper concentrates to foreign countries for processing. But truck transport would be much more expensive than rail haulage. Therefore, extending the railway network would facilitate mining promotion. A location map showing infrastructure and ore-deposits is attached in Appendix 2. The importance of constructing infrastructure in consideration of resources potential cannot be emphasised enough.

8.5 Current State of Environmental Consideration and Environmental Management Plans

The mining expert described the natural and human environments, NBCA's and cultural heritage, ethnic minorities, military conservation areas, and the current state of environmental management in his final report (FR-4).

The main administrative authorities for the mining industry in Lao PDR are STEA and DGM. The current state of environmental management is described as follows:

- The relevant laws for the mining industry related to the environment are the Laotian Constitutional Law, Environmental Protection Law, Environmental Protection Regulations, Environmental Assessment Regulations, Mining Law, Mining Regulations, Environmental Protection Regulations for the Mining Sector, Law on Water and Water Resources, Land Law, Forest Law, etc. These laws and regulations must be reviewed systematically from the viewpoint of the mining industry.
- Lao environmental standards have not yet been established but some provisional standards are in place and environmental standards used by international organizations and advanced mining countries have been adopted as reference compliance standards.
- The main administrative authority for the mining industry in the Lao PDR is the DGM, now a part of the MEM. The DGM issues exploration and mining licences and maintains the environmental protection policy, promotes environmental protection by providing information and regulations for environmental protection, and also encourages investors to recognise the importance of the environment.
- However, legal regulations have not been implemented due to the lack of capacity, knowledge and technology in the organisation.
- STEA is legally required to implement environmental management and monitoring activities but does not currently implement any environmental monitoring due to budgetary constraints.
- An Environmental Compliance Certificate is needed to obtain licences for exploration or

mining after examination and approval by STEA. (However, STEA employed a foreign consultant to examine the Sepon EIA report, indicating a lack of confidence in its own capacity)

- Detailed decrees on regulating mining activities have been relaxed so that the DGM may conduct its environmental management duties. They will need to be completely fulfilled in the future.
- No baseline survey has yet been made to provide backup data for environmental monitoring.

The EIA is examined by STEA and mine development is overseen by the DGM. However the EIA is closely linked to the mine development plan and so it is desirable for the MEM to manage exclusively both the EIA and mine development by absorbing some of the functions and organization of STEA. The MEM needs to cooperate and coordinate with other ministries when developing mines around restricted areas such as NBCAs, Cultural Heritage Sites, Military Conservation Areas, etc.

Also, measures need to be taken to eliminate some redundant procedures still used in the investing and permitting processes. In future ministerial reorganisations, it would be wise to remove these obstacles.

Currently, there is no comprehensive environmental plan for the entire country. Generally, countrywide environmental plans include environmental management programs for the mining sector. Under such countrywide plans, each agency can work together. Mining environmental management is also administratively effective for environmental protection of the Laotian land. The national environmental plan is directly connected to the protection of land, forest, biodiversity, and cultural heritage. Furthermore, the environmental plan has functional effects on environmental administration by specifically showing the roles of each agency, such as the above-mentioned partial redundancy of STEA and MEM, from an organizational viewpoint.

The “Action Plan for Implementation of Environmental Legislation” created by Australian Trust funds (the World Bank, July 2004) pointed out the need for detailed quality standards, and concluded that Lao PDR has chosen a route for the administration of environmental legislation which is not commonly found in other countries, and that DGM should be a leading agency for its administration. Also, it gave principal recommendations for environmental management, as follows;

- Environmental standards in the mining industry should be issued by DGM.
- Management of environmental legislation in the mining industry by DGM
- General Guidelines should be issued by DGM for specific environmental aspects.
- Establishment of a monitoring infrastructure within DGM.
- Analytical work within DGM has to be strengthened.

These recommendations show the agencies and roles in mining environmental administration, which are essential. The content of these recommendations should be included in future environmental plans.

9. International Competitiveness Factors and Potential for Downstream Activities

The expert of investment promotion describes the international competitiveness and potential for downstream activities in his final report (FR-5).

9.1 International Competitiveness Factors

Strategies for attracting direct foreign investment are vital for promoting the Laotian mining industry. However, there are some physical and institutional constraints which affect the investment climate, most of which can be overcome. It will be necessary for the government to work to eliminate these barriers to mining promotion. This action will strengthen international competitiveness.

9.1.1 Factors Constraining International Competitiveness

There are many physical and institutional constraints in the Lao mining sector (Table 28). Natural constraints such as the geographical handicaps (landlocked, mountainous, etc.) have a direct impact on infrastructural development. However, various types of support have already been given to Lao DPR by international organizations such as the World Bank and donor countries including Japan. For example, the construction of the North-South and East-West Corridors under GMS (Great Mekong Sub-region) of ADB, which will be completed in 2007, could effectively solve Laos' physical constraints. The Lao PDR and neighbouring countries (Vietnam, China, Thailand, Cambodia and Myanmar) would possibly form a large market (population: 250 million and GDP: US$190 billion) by forming organic logistic and transport links. It is necessary to position the Laotian mining industry to serve this gigantic market.

Although physical constrains are being overcome, there are still institutional constraints such as customs clearance procedures. Overcoming institutional barriers will be costly and time-consuming for some items such as improving IT skills and training staff for investment promotion, but most are legislative and executive matters that can be resolved by government action.

Table 28 Main Barriers and their Effects

Category	Barrier	Reason for being a barrier
Physical	Landlocked	Transportation for exporting products
	Mountainous geography	High cost for infrastructure
	Rainy season	Stoppage of production in open pits
	Shortage of infrastructure	High cost for exploration and development
	Unexploded bombs	High cost for clearing bombs
Institutional	Tax system	Complicated and obscure
	Legal framework	Some disadvantages for investment such as demise
	Shortage of information	Large risk and hard decision for exploration
	MEPA	Obscure contents and long negotiations
	Procedures and permission	Long time, high cost, delay in development plan
	Lack of engineers & experts	Difficult to obtain staff in Laos
	No financial market	Hard to obtain domestic finances
	Lack of policies	High risk for investment, little potential for improvement
	Lack of workers	Much time and money required for training

9.1.2 Advantages in International Competitiveness

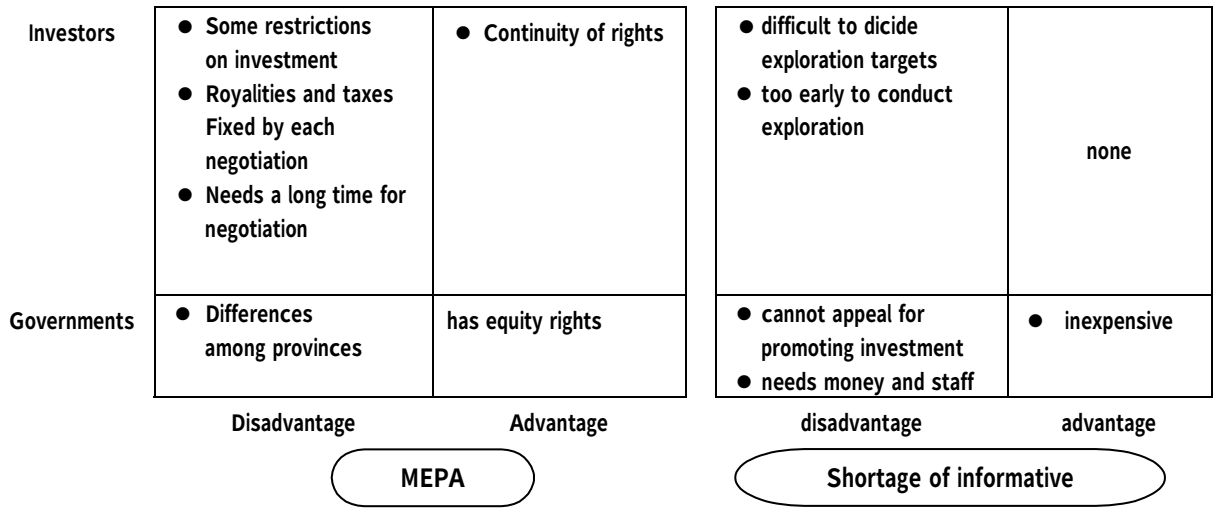
The following points are some of Laos' advantages for mining promotion.

- Low labour cost (one third of Bangkok, Thailand).
- Large potential for mineral deposits and high development potential (the Sepon Mine is a tangible example of development potential).
- There are five neighbouring markets, including the gigantic Chinese market.
- There is low political risk under the stable political system.

9.1.3 Analyzed Institutional Barriers and their Tasks

Most of the institutional barriers stem from the budgetary deficit and dogmatic institutions of government. To be successful, investment promotion must strike a balance between the needs of investors and the needs of the host government so as to achieve coexistence and co-prosperity (i.e. 'win-win'). In Laos, institutional reform will be required before mining investment promotion can be initiated. For example, by any analysis there are not many advantages in MEPA and the lack of information is also a serious drawback. Also, the current Lao approach excessively favors the government (Fig 31).

Fig.31 Example of Analyzed Barriers



Similarly, the Mining Law does not have any beneficial effect on international competitiveness, especially with regard to MEPA and the transfer of mining rights, even when compared with similar countries (Table 29).

Table 29 Comparison of Mining Laws

Item	Laos	W. Australia	Chile	Tanzania
Exploration License	prospect : 2 years x 2 times extension reconnaissance survey : 3 years x 2 times extension	5 years	Courts decide	1 year + 2 times extension
Mining License	30 years + 2times extension (10 years/time)	21 years	Courts decide	25 years + extension
Contract Mining	Yes	No	Yes	Yes
License Procedure	Application, (MEPA should be conclude)	Application	Application	Application
License Transfer	Yes (necessary to get a permission)	Yes	Yes	Yes
Royalties	Opacity (about 2.5%)	Cu : 7.5% on ore, 5% on concentrate, 2.5% on metal. Au : 2.5% on net smelter return but exempt first 2500oz	Unknown	3% Net back value

The current Laotian mining promotion activities do not attract mining investment, but the abolishment of MEPA might (Fig.32).

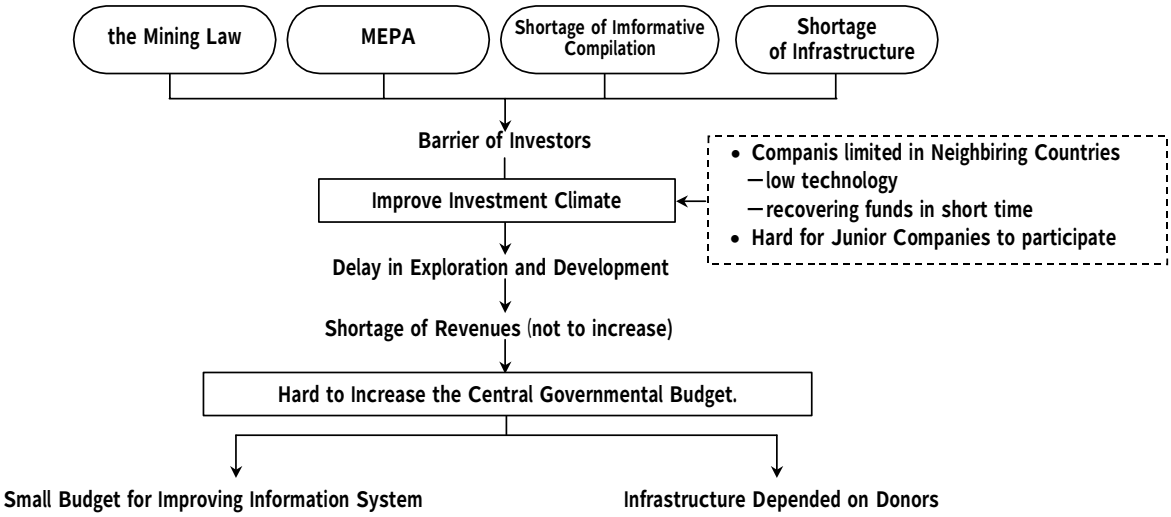


Fig.32 Current State of Laotian Mining Activities

9.1.4 Analysis and Discussion on International Competitiveness

A comparative analysis was made with the objective of identifying, roughly, the situation of international competitiveness of the Laotian mining sector, in comparison with neighbouring Vietnam and the Mongolian case administered by international mining operators, through information analysis and survey interviews. Additionally, these were compared with the Thailand situation, positioned as an emerging industrial economy in the Indochina region (Table 30).

Table 30 Comparative Analysis of International Competitiveness

Factor		Laos	Vietnam	Mongolia	Thailand
Infrastructure	Road	C	B	C	A
	Railway	D	C	C	A
	Port	D	A	D	A
Technology	Exploration	C	B	C	B
	Mine	D	B	B	B
	Smelter	D	B	B	A
Labour	Engineer	C	B	B	B
	Skilled worker	D	B	C	A
Information on geology & ore		D	C	B	B
Resources potential		A	A	A	B
Legal & institutional framework		C	C	B	B
Environmental protection		D	C	C	A
Finance		D	C	C	A
Demands	Domestic	D	A	C	A
	Regional	A	A	B	A
Unexploded bombs		B	C	D	D

N.B. A: Very Good/High B: Good/Middle C: Poor/Low D: Bad/None

Compared with its neighbour Vietnam which has similar legal situations as the Lao PDR, Laos has much less competitiveness. With Mongolia (considered as a mining country), Lao PDR has a little advantage in respect to its infrastructure, but its legal and institutional framework is a disadvantage and it is understandable why international mining operators are more attracted to Mongolia. The Lao PDR is especially deficient with respect to its labour force, information availability, legal and institutional frameworks and financial disclosure. For these reasons, the Lao PDR must improve and implement strategies to eliminate these deficiencies and enhance its international competitiveness. This can be achieved with the involvement of international mining operators and other external organizations.

9.2 Potential for Downstream Activities

9.2.1 Current State of Business Potential and Associated Targets

The potential for downstream businesses and spin-offs from the mining industry is generally very high. However, there is neither a technical base nor sufficient funds in Lao PDR, so it is not easy to get such businesses started. The MIH is promoting small- and medium-scale industry but does not consider industrialisation using mineral resources. The current state of downstream industries and spin-offs is summarized as follows:

- Production of 60,000t/year of electrical copper has begun at the Sepon Mine. All products are exported.
- All electrical wires are imported from Thailand and China (240,000t in 2005). A plant for producing electrical wire is being planned by a Vietnamese company.
- Cement is produced by Lao and China JV enterprises.
- Transportation is monopolised by Thai transporters (44 companies registered).

- There is a technical base for downstream businesses due to the Laotian agricultural tradition.
- The manufactured products from mineral raw materials are almost all imported, while considerable domestic demand exists.

Generally speaking, the economic growth of developing countries is stimulated by production and consumption of non-metals such as industrial minerals. Development of industrial minerals and associated downstream businesses need only a little financing. It is possible to obtain these resources in the country and excavate them easily owing to the shallow disposition of deposits. Thailand and Vietnam intend to increase extraction of Laotian industrial minerals for growing downstream businesses. The high potential for downstream and spin-off businesses in the three categories of the Laotian mining sector is illustrated in Table 31.

Table 31 Potential for Downstream and Spin-Off Businesses

Item	Type of business	Reason
Metal products	processing cathode copper to copper wire	Producing only copper metal. All copper wire is imported
Industrial minerals	ceramics, construction and fertilizers	High mineral resources potential. Some mines are producing industrial minerals.
Spin-off business	transportation, construction and manufacturing	It is possible to acquire technologies in accordance with mining activities.

The potential mineral resources of Lao PDR are quite varied, but the types of minerals currently produced are few. There is only one smelter in the country (copper by SX-EW), so for manufacturing purposes, metals must be imported (which also demands a higher level of technology and a lot of capital). As Tables 30 and 31 clearly show, due to the mineral resources potential, technical capability and the amounts of investment involved, downstream business opportunities will be limited to industrialization achievable with industrial minerals for the foreseeable future. Considering neighbouring markets and the growth in consumption of industrial raw materials, a reasonable approach would be to prioritize the mining of gypsum, potash and kaolin in Laos.

Gypsum, potash and kaolin are non-metallic resources used to manufacture construction materials, fertilizer and ceramics, which are basic domestic industries in many countries. Significant potential for these minerals exists in Laos. Furthermore, there are ready export markets such as Thailand and Vietnam. Therefore, these are primary targets for mining development (Fig.33).

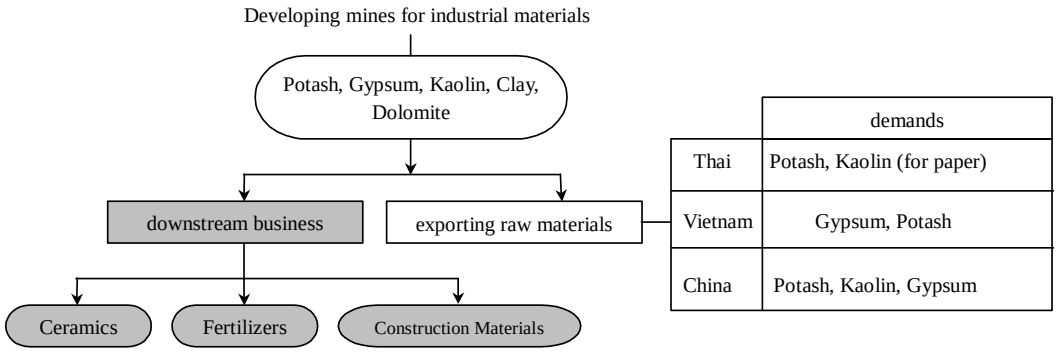


Fig.33 Downstream Business from Industrial Minerals

Laotian sapphires are exported to Thailand, which imports 95% of its sapphires, mostly from countries such as Madagascar. If processing quality is improved sufficiently, Laos could increase its market share in Thailand, and might even be able to export sapphires to Japan.

9.2.2 Tasks

The main tasks needed to create downstream business are to introduce technology, obtain financing, develop domestic and international markets and educate workers. Regarding industrial minerals, it will be necessary for the MEM to conduct a full evaluation of Lao resources to develop mines with local and foreign funds and to introduce technologies which add value using industrial processes. Regarding electrical wire and cable, it will be necessary to conduct a feasibility study to assess local and regional needs for electrification, power networks and the construction of power plants, following research into the long-term market for power transmission lines.

It will also be necessary to resolve the institutional barriers such as the tax system and procedures for investment, and those financial systems and structures which adversely affect the formation of joint ventures. Measures to be taken for each task are as follows:

- Financing - Loans from international organizations and donor countries (such as two stage-loans, etc.), will provide Lao PDR with funding to conduct exploration, development and industrialisation processes.
- Technology - There are already downstream industries in Thailand and Vietnam, so more JV's with Thai or Vietnamese companies need to be encouraged and implemented.
- Marketing - Laos has a market for electric wire and cable. There are also markets for industrial minerals in Thailand and Vietnam. Industrial mineral products are targeted to the domestic market.
- Training – JV's with Thai companies would be particularly appropriate because of the similarity in languages.

Capacity building also needs to be supported by international organizations and donor countries. From an investor's point of view, investing in downstream businesses for industrial minerals will become attractive and feasible when the market needs match the resources supply capacity. Sine-qua-non conditions required by the operators are the development of the investment environment (laws, institutional framework, information system) of Lao PDR and the availability of skilled workers (Table 32).

Table 32 Investment Factors for Downstream Businesses of Industrial Minerals

Strength	Weakness
• Immersed in an wide regional market including China • Potentiality in mineral resources	• No basement for technology • Most of the information on mineral resources potential is incipient
Opportunity	**Task**
• Economical development of China and intensification of the industrialization in Indochina • Investment environment are opened by The World Bank and the donor countries	• Promotion of geological survey by MEM (DGM) • Training of technicians • Adequacy of the financial system to ease investment promotion

END OF the REPORT

APPENDICES

Appendix 1　Basic Requirements for Studying Growth System

1. Approximate Metal Production of Large Mines in 2008

mine	Copper production	Gold production
Sepon Mine	60,000t	6t
Phu Bia Mine	50,000t	5t
total	110,000t	11t

2. Basic Requirements to Study Mining Revenues to Set Mining Taxes

Category		Kind	Annual production	Price	Royalty	Income tax	Revenue
Metal Mine	Large	Copper	52,500t	$2,200/t	2.9	13.1	16.0
		Gold	4.9t	$350/oz	1.4	4.7	6.1
	Medium	Zinc	30,000t	$1,000/t	0.9	4.7	4.9
	Small	Copper	13,100t	$2,200/t	0.7	3.4	4,1
		Gold	0.38t	$350/oz	0.1	0.5	0.6
Non-metal Mine	Gypsum			$22/t	0.46	0.092	0.552
	Potash			(KCL)$160/t	0.148	0.836	0.984
	Kaolin			$80/t	0.204	0.639	0.843

N.B. based on economic evaluation of FR-2

3. Number of Mine Start-ups Needed to Achieve Planned Growth

(Year given is mine-opening-production starts the following year)

Case	2010	2015	2020	2025	計
Expanded Growth and Basic Growth indicating＊	-	Large Cu 1 Large Au 1＊	Large Cu 1＊ Large Au 1	Large Cu 1＊	Large Cu 3 (2＊) Large Au 2 (1＊)
	-	Medium Zn 1	Medium Zn 1＊		MediumZn2(1＊)
	Small Au2＊	Small Cu 1＊ Small Au 1	Small Au 1＊ Small Cu 2	Small Au 2 Small Cu 1＊	Small Au 5 (3＊) Small Cu 5 (2＊)
		Non-metal Potage 1	Gypsum 1 Kaolin 1＊		Small 3(2＊)
Status Quo	Small Au1	Small Au1	Small Au 1	Large Cu 1 Potage1	Large 1 Small 3 Non-metal 1

4. Mining Taxes and Accumulated Taxes as a Consequence of Growth

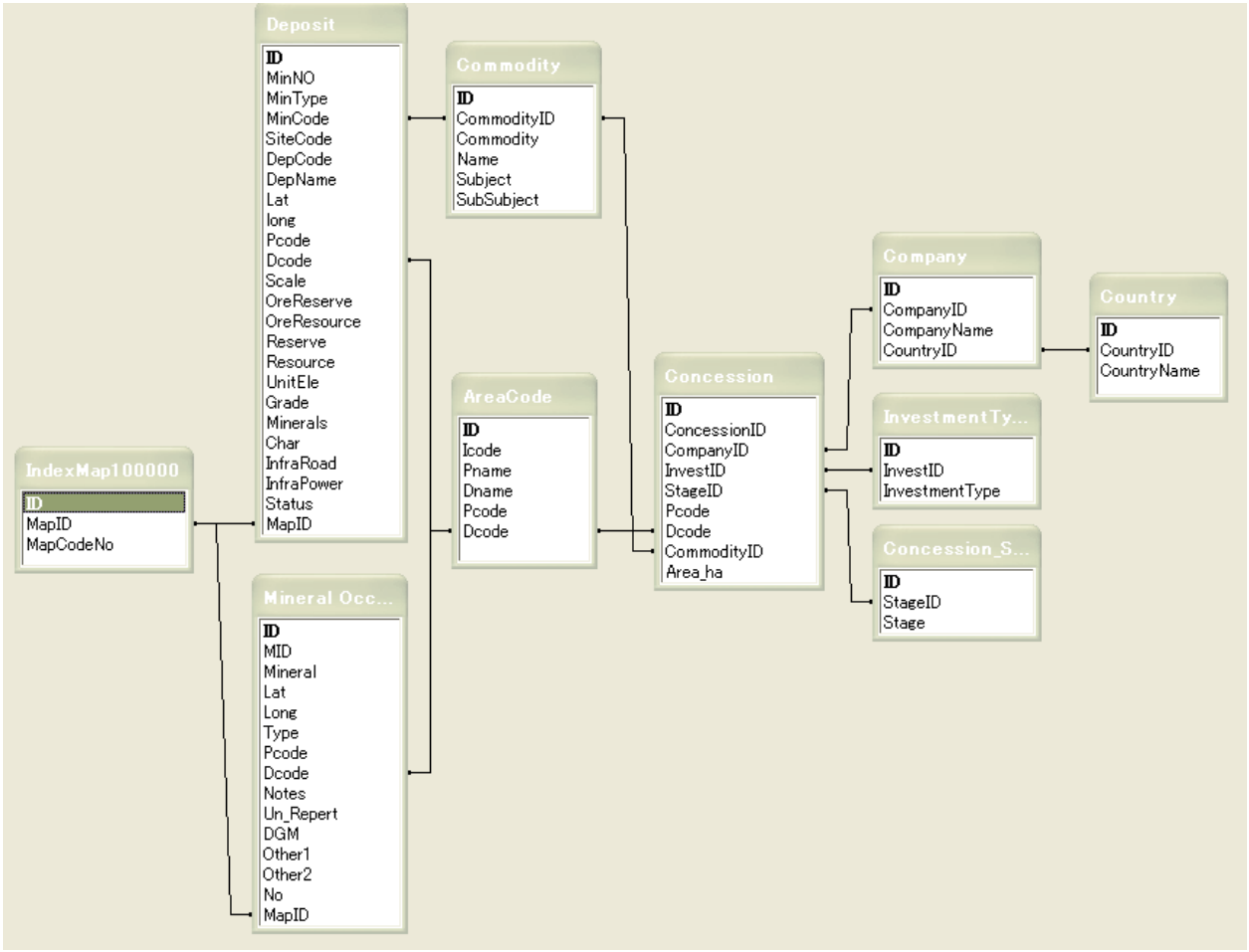
Category		Producing mines		Tax charging period	Expanded Growth		Basic Growth		Status Quo	
					Annual Tax	Accum. Tax	Annual Tax	Accum. Tax	Annual Tax	Accum. Tax
Metal Mines	Exist. Large **	Sepon, Phu Bia (Cu)		17 years 2009-2025	32	544	32	544	32	544
		Sepon, Phu Bia (Au)		17 years 2009-2025	12	207	12	207	12	207
	2010 *	Small Au 2		15 years 2011-2025	1	18	1	18	0.6	9
	2015*	Large	Cu	10 years 2016-2025	16	160				
			Au	10 years 2016-2025	6	61	6	61		
		Medium	Zn	10 years 2016-2015	5	49				
		Small	Cu	10 years 2016-2015	4	41	4	41		
			Au	10 years 2016-2015	0.6	6			0.6	6
	2020*	Large	Cu	5 years 2021-2025	16	80	16	80		
			Au	5 years 2021-2025	6	31				
		Medium	Zn	5 years 2021-2025	5	25	5	25		
		Small	Cu2	5 years 2021-2025	8	41				
			Au	5 years 2021-2025	0.6	3	0.6	3	0.6	3
	2024*	Large	Cu	1 year 2015	16	16	16	16	16	16
		Small	Cu	1 year 2025	4	4	4	4		
			Au2	1 year 2025	1	1				
	Total				134	1,287	97	999	62	785
Non-metal Mines	2015	Potash		10 years 2016-2025	1	10	1	10		
	2020	Gypsum		5 years 2021-2025	0.6	3				
		Kaolin		5 years 2021-2025	0.8	4	0.8	4		
	2024	Potash		1 year 2025					1	1
	Total				2.4	17	1.8	14	1	1
Exist. Mines***	Small mines Artisanal miners			12 years 2009-2020	1	14	1	14	1	14
				5 years 2021-2025	3	16	3	16	1	6
	Total				4	30	4	30	2	20
Grand Total					141	1,333	103	1,043	65	807

N.B.) *: "year" means mine-opening year, production starts its next year.

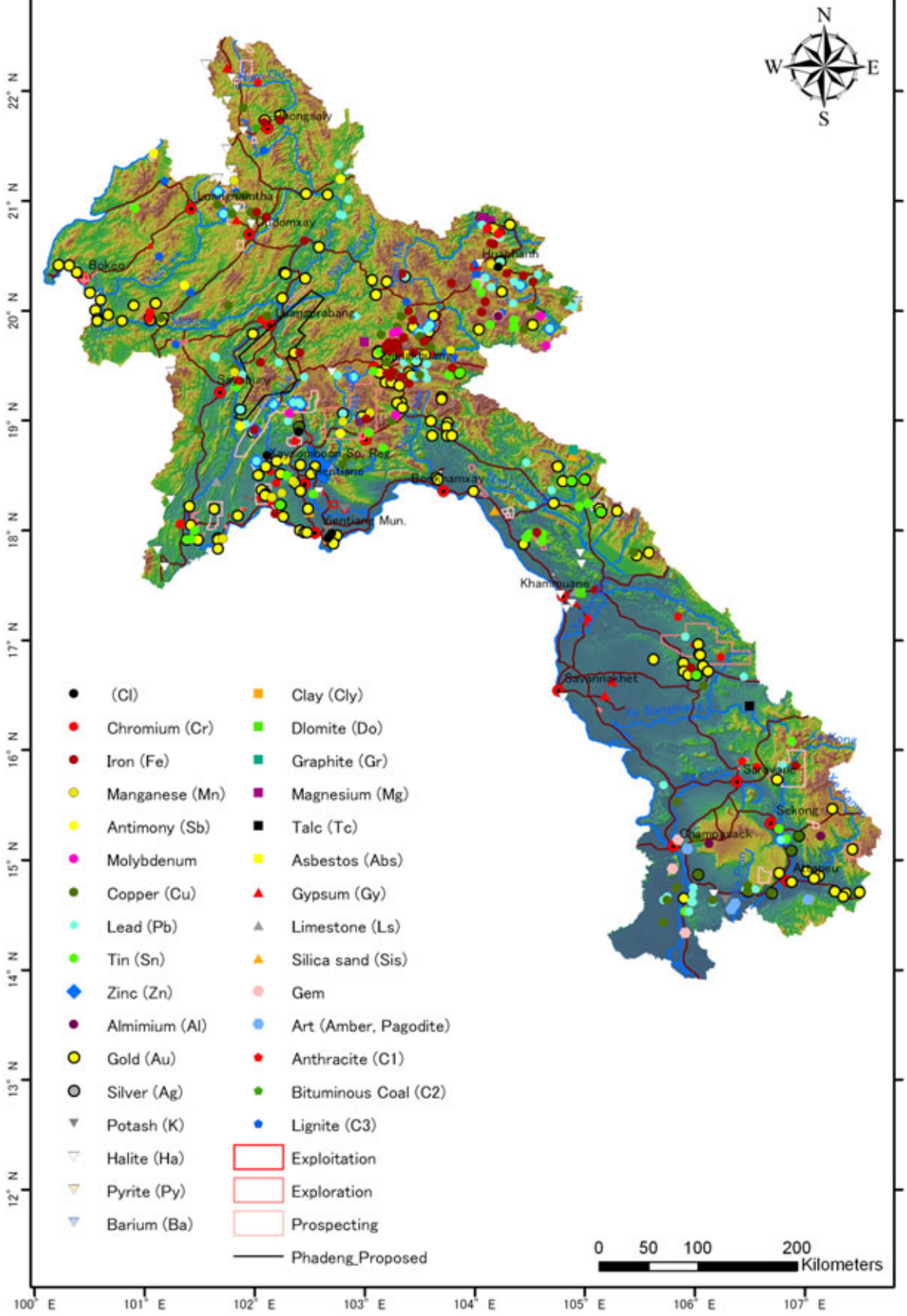
**: Existing large mines starts their full production in 2009.

***: Tax-charging starts at 2009. Existing mines consists of small mines and artisanal miners which are currently under operation. Their accumulated tax is about US$20million. Profit rates for "Expended Growth" and "Basic Growth" are 10% for 12 years, and their income tax rates are 35%. Sales. Their sales after 2021 are estimated to be US$ 40million for 5 years, and their profit rates are 15%. Sales for "Status Quo" are estimated to be US$ 20million.

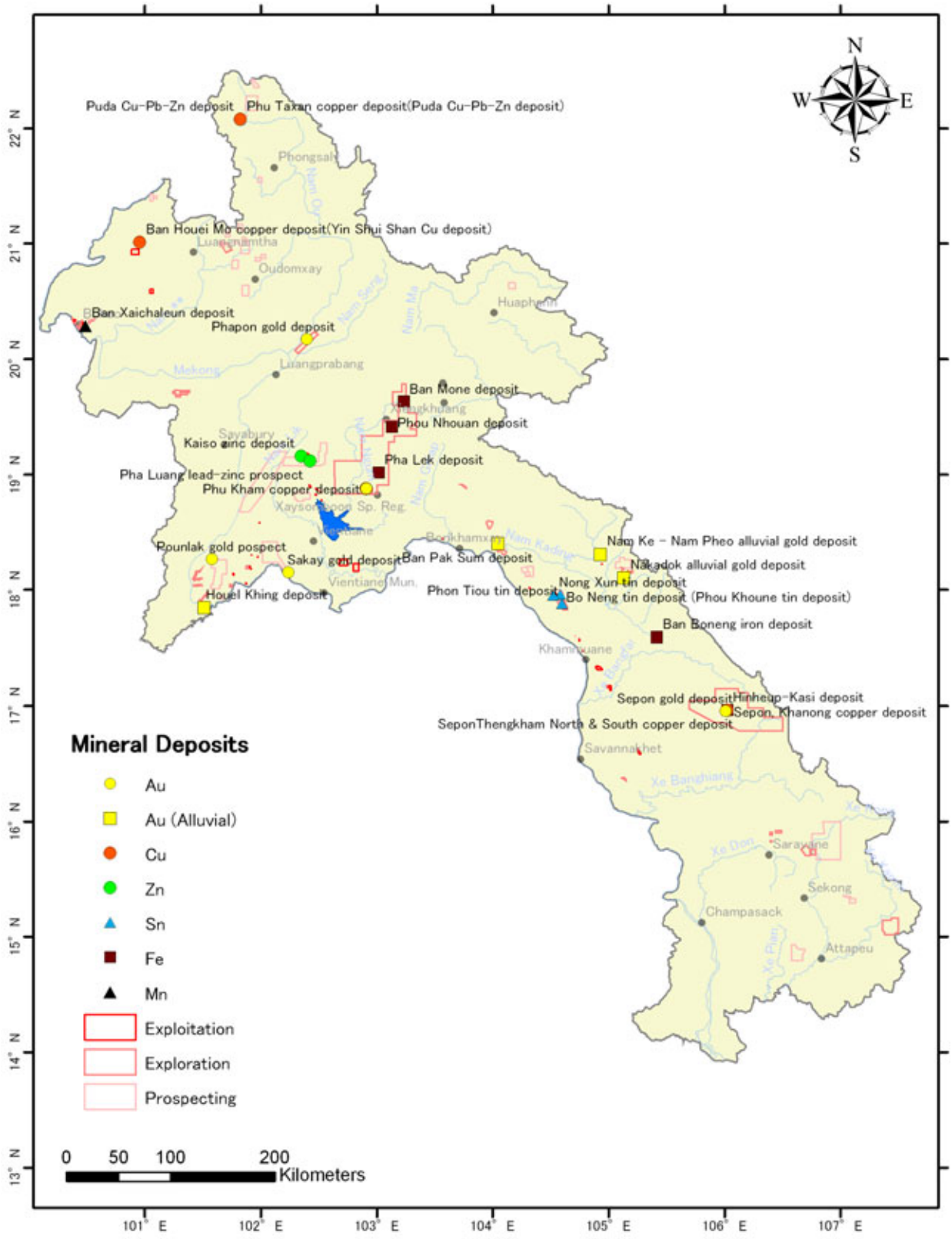
Appendix 2 Relationship of Database Tables designed for Mineral Resource Data in the new Geo-Science Database



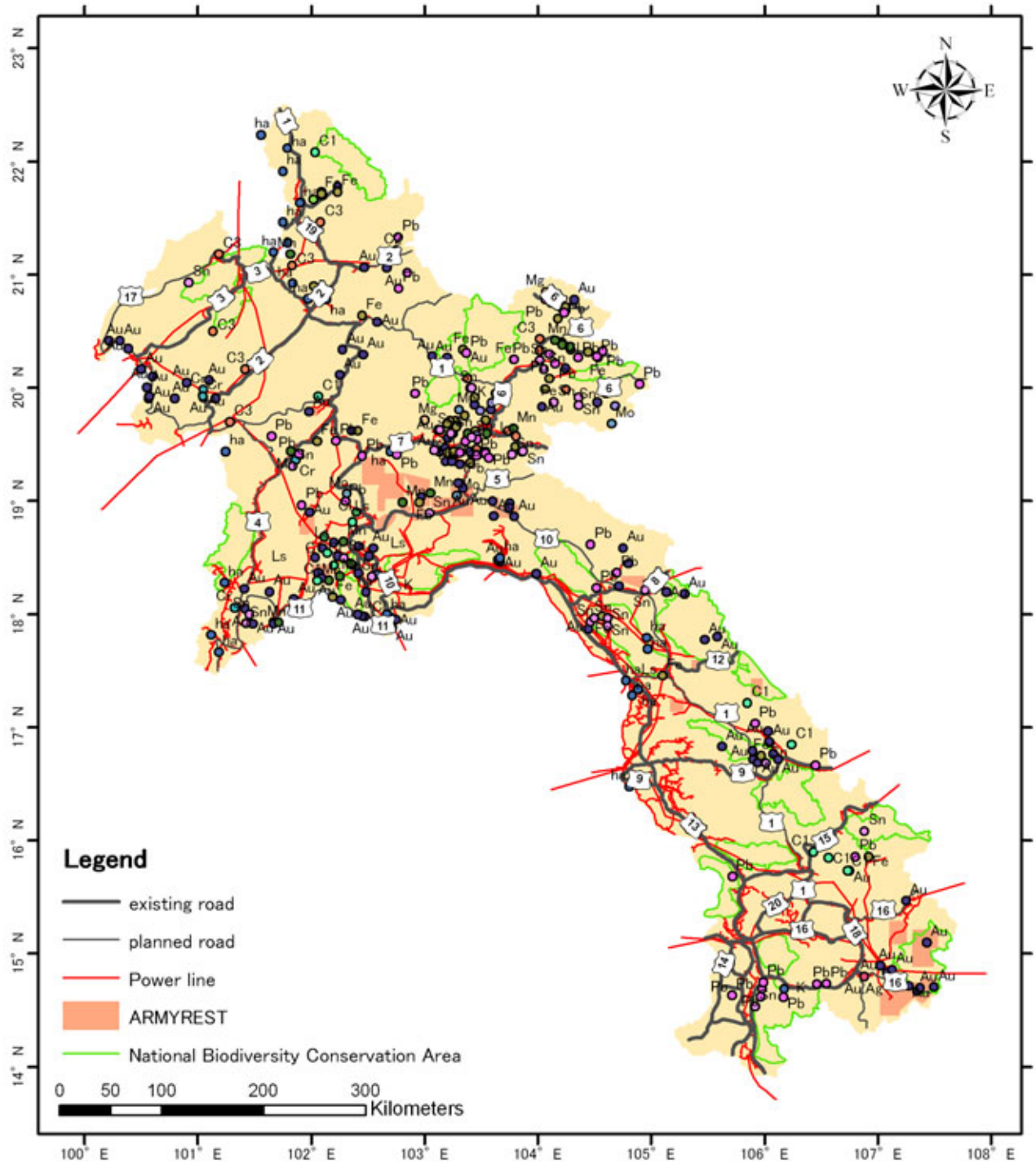
Appendix 3 Mineral Resources Map



Appendix 4 Location of Major Mineral Deposits



Appendix 5 Mineral Resources and Infrastructure



(Refer to Appendix 3 for legend of mineral resources)

Appendix 6 Inputs to Mining Sector Policy Statement Formulation

In June 2006, the Ministry of Energy and Mines (MEM) was created from the Ministry of Industry and Handicraft (MIH). The purpose of MEM is to "promote sustainable growth in development of mineral and energy resources by using private investments for sustainable growth," and to "create a regulatory climate and transparent administrative system" to achieve this goal. Furthermore, the growth of the mining and energy sectors should "contribute to economic growth and poverty reduction."

The Lao mining sector consists of five main groups: 1) metallic minerals (base metals, iron, precious metals and rare metals), 2) industrial minerals, 3) construction materials and stone, 4) gems, and 5) solid fossil fuels. Current players in the Lao mining sector are international mining companies, regional operators, and artisanal gold miners. The full-scale participation of international mining companies since 2000 indicates the vast potential of mineral resources in Lao PDR and has also highlighted the need for review and reform of the mining sector.

1. Vision and Expectations of the Mining Sector

The current strategy for the mining sector is included in the MIH's planning document on mineral and mining activities for 2006-2010. The document envisions an annual mineral production increase of 11.47%, increased investment in infrastructure in areas of mineral potential, expansion of investment opportunities for foreign investors, encouragement of domestic investment, improvement of the national and provincial management of mining activities, capacity building of the government, preparation of geological maps for mineral resources and an increased budget for resources evaluation, among other things. All of these items are indispensable for developing the mining sector and if successful, will help to increase revenues, create spin-off industries, increase employment and reduce poverty.

Based on the mineral potential of the Lao PDR, production of the mining sector in 2025 is expected to be three times as high as the current level owing to the development of 5-6 mines at the same scale as the Sepon Mine (annual production of 300,000t of copper or 2t of gold), as well as small mines and artisanal gold mining. Mineral revenues in 2025 are expected to reach US$1.0-1.5 billion. Over the next 20 years, mining should produce total revenue of about US$1-2 billion and employ about 15,000 workers. Therefore, the mining industry will contribute sufficiently to economic growth by greatly enhancing revenues, and stabilizing employment through mining activities and spin-off industries such as civil engineering, transport, and manufacturing. By that time, the mining industry might be account for 25% of GDP. Also, economic activities will grow through regional development and construction of infrastructure resulting from mining activities. Accordingly, mining development means economic development, and it will help to reduce poverty

at the individual, local, provincial and national levels.

To accomplish this goal, it is necessary to implement an effective mining policy. In other words, there is a need to systematically strengthen and stabilize the mining sector, to build capacity, to compile resources information, to survey resources potential, to improve the investment climate, to introduce and transfer relevant technology, to assure fair and appropriate government budgeting for the mining sector as well as transparency of revenues and expenditures, to efficiently manage mining agencies, to train and nurture human resources and to implement legal regulations for the long term.

2. Players in the Mining Sector

The Laotian mining sector has been changed drastically by the entry of international mining companies during the past several years. The main players in the sector used to be regional operators, national companies, local Lao investors and joint-ventures with neighboring countries which managed small mines with old methods and machines in the traditional manner. The current situation of regional operators is the same as before. Artisanal gold miners without mining concessions also have earned a marginal livelihood at the fringes of the sector.

The success of the international mine operators in gold and copper mining during 2003 to 2005 increased the mining share of GDP by a factor of 24, i.e. 0.1% in 2001 to more than 2.4% in 2004, and to nearly three times the 2004 figure by end 2005. International mine operators have not only contributed to the macro-economy, but also employed 3,000 workers and introduced modernized machines, facilities, systems and technologies. Their importance to the Lao economy is quite evident and this has attracted the interest of major mining companies and many investors elsewhere in the world.

The players in the Lao mining sector consist of three groups: international mining companies, regional operators and artisanal gold miners. The most urgent, pressing issues for international mining companies are to allow technicians and engineers from abroad to work in the industry by abolishing institutional barriers to their entry and to reduce the huge investment risk for exploration and development through improvement of the legal, fiscal and regulatory climate. The urgent, pressing issues for regional operators are to institute modern production systems and improve company management. Also mid-small scale mines managed by national companies must be privatized. The informal and now illegal artisanal gold mining sector must be completely overhauled and organized, to establish a national management scheme regulating co-operatives at village and district level. These co-ops should be legalized and granted rights to become concession-holding players in the sector. Such action will formalize a sector which is otherwise nearly impossible to control and will gradually introduce environmental and safety issue understanding to some of the poorest in Lao society. With appropriate mechanisms this action may also increase the efficiency and

profitability of these traditional miners.

The most important type of player in the mining sector is the international mining companies who lead the sector and contribute largely to economic growth. However, to place the mining sector at the core of the Laotian economy acting as the driving force for poverty eradication, the three scales of player described above must work with the MEM to achieve co-existence and work cooperatively for their mutual benefit by 2025.

3. Roles of the Lao Government and MEM

The government of the Lao PDR is thoroughly committed to stimulating national development through the National Growth and Poverty Eradication Strategy (NGPES). The NGPES is at the center of the national development agenda and reflects the government's policy and strategy framework to achieve the country's goals for 2020. The Lao government has outlined the following strategic priorities to promote sustainable growth, coupled with continuous social progress and equity through NGPES:

- Enhance human resource development through education, particularly basic and vocational training, at all levels in the formal and informal sectors.
- Develop and modernize social and economic infrastructure in order to facilitate economic development in each region of the country and to accelerate regional and international economic integration.
- Promote industries using domestic natural resources and actively promote small and medium-sized enterprises (SMEs) and handicraft production.
- Develop and promote all economic sectors, particularly the private sector, including foreign direct investment (FDI) in order to expand business opportunities, placing emphasis on export-oriented sectors that have a comparative advantage.

Therefore, providing an adequate environment, including reforms, to enable growth and development continues to be a top priority of the government. According to NGPES, future growth enhancing investments and development priorities which reflect the economic potential of the country's natural resource base have been identified by the government as a vehicle for increasing national revenues and thus for eradicating poverty. Strengthening the rule of law and continuing policy reform are an integral part of the government's commitment to improve administration. For its part, the government should implement a system of decision-making as a foundation of society and work to make public administration transparent, effective, efficient and inexpensive Given the awareness of the state of the mining sector, the government, in order to achieve this vision, must abolish the institutional and physical restraints on mining promotion, make appropriate budgetary allocations, strengthen the ability to implement suitable measures, improve the legal framework, and

help the mining sector spur social and economic development in a stable and equitable manner.

The Department of Geology and Mines (DGM), an agency of the Lao government, has been responsible for the mining sector since 1975, and has been involved with geological surveys, mineral analyses, mining administration, and issuance of mining concessions under the MIH. The DGM has been in charge of technical and executive affairs with limited budget and staff (64 employees as of April 2006). The World Bank's "Sector Plan for Sustainable Development of the Lao PDR" concluded that the organization, staff and facilities of the DGM are inadequate. In June 2006, DGM became a central part of the MEM, whose organization must be quickly built for it to be active in policy making, administrative management, technical management, geological surveys and environmental protection, as outlined in the study. Also, it needs to have a role in governing the mining sector governance and new investment promotion driven focused on the private sector.

Since 2001, the current roles and responsibilities of the DGM have braded since the successes of the international mining companies. However, having the capacity to comprehensively and efficiently manage the sector is insufficient. The DGM must become the driving force for sector development. As part of the role mentioned above, the MEM must be a functional and transparent organization which works continuously with local communities and the private sector in an effective and positive manner. Therefore, the MEM must administer the sector in a way that will derive the maximum benefit from the mineral resources production brought through institutional strengthening and capacity building.

4. Decision Making and Ties between the Government and Private Sector

The reorganization of the MIH to the MEM requires reform of the decision-making system. A transparent, effective and fair decision-making system is needed at the MEM. According to the World Bank's Sector Plan, the mining field of MEM consists of five departments: Policy Formulation, Mines Management, Environmental Protection, Information Services and Geological Survey. Decisions are made by the Supreme Council (Minister and vice-Minister and Director of Department, when needed.) and the Directors Council within the ministry. Accordingly, roles of each council, the extent of their authority, and the relationship between them and the functions of the two councils must be considered. Also, IT is indispensable for communicating the decisions of the councils inside and outside the ministry.

For the government of Lao PDR, which previously has had regional autonomy, building relationships between the central agency, provinces and local communities is a new concept. The mining sector is closely connected with rural development. The MEM, which is the permitting authority for resources development, needs to make mine developers adhere to the environmental and social considerations for the development area, protect the community from mining impacts, to extract the maximum benefits from mining activities, and link them with the sustainable

development of the community.

“ The Local Development Council” consists of central government agencies and local governments that discuss resource development, infrastructure and creating local employment and is a forum for reaching consensus by incorporating opinions of local residents. Also the “Mining Development Conference” is held between the MEM and local governments to encourage cooperation to reduce or eliminate negative factors through resource development. Sustainable development of the mining sector is impossible without ties between the government and private sector. The Mining Committee was established to share information and encourage cooperation between the MEM, local governments, communities and the private sector.

The Mining Committee, which is a fair and transparent organization, has subcommittees on themes such as infrastructure, unexploded bombs, environmental protection, institutions and regulations, etc. to identify problems and discuss solutions. It is desirable for donor countries and international organizations to participate in this committee as observers. Resolutions of the committee should be on the agendas of the councils mentioned above, when necessary. Groups such as mining associations recognized by the government should be organized as a window on the private sector and residents should be represented by local organizations.

5. Policy Concepts and Formulation

The MEM needs to implement the following actions for the most appropriate policy and governance for the mining sector:

(1) Policy

- Establish harmony and stabilization in NGPES, reduce poverty, and lead the mining sector to prosperity.
- Improve the regulatory environment and construct the infrastructure for the profitable recovery of Lao mineral resources through socio-economic development under NGPES.
- Establish the conditions and climate to attract and retain local and international private investors.
- Address institutional barriers and build the institutional capacity for increasing management efficiency.

(2) Administration

- Exert central government authority over mineral resources located throughout the country.
- Stimulate and mobilize local and international private investment in mineral exploration and development.

- Increase tax revenues to the central government from mineral production and ensure adequate disclosure thereof.
- Strengthen government supervisory institutions to distinguish clearly between the roles and responsibilities of the regulator and national mines.
- Promote scientific and geological investigation into the nature and extent of Lao mineral resources and make such information available to the public and potential investors.
- Seek to ensure that communities benefit from extractive industries and, where possible, link local economic development to mining projects involving small and medium mines.
- Seek broad support from effected communities through informed consultation and capacity building at the local level.
- Ensure, in cooperation with STEA, that mining operations are conducted in an environmentally and socially sustainable manner through the enforcement of legislation and creation of an Environmental Protection Department and that operators conduct proper environmental impact assessments (EIA) and develop and implement environmental management plans.
- Establish adequate frameworks and capacity to implement mine closure/well rehabilitation and ensure the financial means to do so.
- Prepare technical guidelines using accepted best practices.
- Provide adequate institutional and technical support to help improve small-scale mines.
- Apply internationally accepted policies to protect communities against impacts associated with mineral production.
- Coordinate donor programs and work with other government ministries in a manner consistent with the ministry's policies and the broader objectives of the government.

(3) Institutional Strengthening and Management Capacity Building

Institutions need strengthening in order to improve administrative efficiency for sustainable development of the mining sector. Specifically, this entails building a system and capacity for formulating policy for the mining sector, building capacity for resources development, resources production and environmental protection management, strengthening the investment promotion, and improving laws and regulations, among other things.

1) Build a system and capacity for formulating mining sector policy.

MEM will formulate and implement policies for both the energy and mining sectors. MEM

will establish an organization to play a leading role in the development of the mining sector not only by formulating mining sector policy but also by preparing drafts for strategic plans, laws, regulations and standards, etc. An effective system related to these matters will have to be created.

DGM in MIH had inadequate organizational capacity to formulate policy. It is likely that joint work with experts from the World Bank or donor countries will be needed for capacity building, similar to work being undertaken at other ministries such as the Finance Ministry.

2) Strengthen investment promotion.

Under provision of the current Investment Law, MEPA (Mineral Exploration and Production Agreement) is mandatory and has been affecting investment promotion in the mining sector. Since MEPA, which is regulated by both the Investment Law and Enforcement Regulation of the Mining Law, is based on negotiation with the government, it requires much time and complicated procedures to finalize a contract. At the same time, transparency and fairness can not always be sufficiently ensured. Its impacts on international mining companies, the most important players, are so large that they deterred from investing in Laos. This makes it more difficult to maximize the profit from the mining sector and promote its growth.

It is MEM's role to stimulate foreign and domestic investment in the mining sector. Reconsidering these matters, simplifying the investment procedures, and increasing efficiency and transparency will provide for greater fairness. Based on the "Sector Plan for Sustainable Development of the Mining Sector in Lao PDR" prepared by the World Bank, legal/investment experts from the World Bank etc. will be needed to assist MEM with reviewing the Investment Law and Mining Law.

3) Improve the laws and regulations.

The Mining Law, Enforcement Regulations of the Mining Law and laws related to environment are applied to all investors, domestic and foreign, in line with international norms. The laws and regulations need to be made fairer and more transparent to allow stakeholders in the mining sector to retain more profits. Regulations related to the mining technologies, mine safety, and environmental protection from mining activities will be continuously improved together with the Mining Law for the future development of the mining sector. Drafting and revising laws and regulations should be carried out with support from the World Bank, inter alia.

4) Internationally competitive mining tax

A mining tax program, including royalties, related to the Investment Law and Mining Law, is subject to fairness and transparency. This will result from reviewing 2) and 3) mentioned above, and improve the current tax system, which is not competitive internationally. It must also cover financial stability for all the certified taxpayers, including financial conditions

such as depreciation, amortization, carry-over of losses, etc.

5) Supporting system for regional operators and artisanal gold miners

Regional operators, especially Lao investors and national mine operators, have been coexisting with the local community, and their products include all kinds of minerals. Accordingly these communities have played a central role in the development of the Lao mining sector. A supporting system must be created to improve technology and management that will make mining activities safer and more productive. It is particularly important that the system will make state-owned mining companies become more robust through privatization after management is improved. Illegal artisanal gold miners should be re-established as operators with mining concessions once legal reform are complete. Furthermore, an organization for artisanal miners, with supporting institutions for introducing production technologies, environmental guidelines and external services should be established and include a training center, information center and information center.

6) Management of mining concessions

IT must be used to make management of mining concessions more effective and functional n. However, IT has not yet been adapted to systemized the approval, maintenance and administration of mining concessions due to complications associated with MEPA and insufficient IT introduction. Simplification of procedures and management is needed to provide mining concessions with fairness and transparency, together with investment procedures and improving the Mining Law and its regulations.

(4) Compilation/Disclosure of Information and Capacity Building

In order to achieve this objective, the MEM must provide within its organization for the skills training of technicians. It is also necessary to compile and increase the amount of geological and mining information for Lao's socio-economic development as well as for exploration and exploitation promotion.

1) Geological surveys

Capacity for geological mapping has been steadily building through 1/200,000 geological map projects supported by the Vietnamese and Japanese governments. To continue capacity building for geological mapping, a Geological Survey has been established at the MEM. Technician number can be increased in the immediate future by technical transfers supported by donor countries and international organizations. For exploration of mineral resources, it will be necessary to compile 1/50,000 geological base maps. This can be used not only for the important public services but also for natural disaster mitigation, environmental protection, management of water resources, construction of infrastructure, and environmental and land utilization plans. Surveys for this must be carried out with Lao

government funding and support from donor countries and international organizations, with the following conditions:

- Personnel for conducting the survey, including new recruit, will be trained in modern geo-science methods and re-skilled in terms of regional mapping, etc.
- Resource assessments will be conducted for development priorities to be established.
- Geologic mapping and resource assessment on a regional scale will be conducted as sub-contractor to private firms.

2) Constructing a geo-scientific database, strengthening information structure, and disclosing information

Geological survey data will be compiled and saved in the geo-scientific database mentioned above. Currently existing data is stored in the GIS database but the system is technically inadequate and understaffed. Based on the GIS database design described in "Sector Plan for Sustainable Development of the Mining Sector in Lao PDR" prepared by the World Bank, the database can be implemented by compiling information, increasing staff and building capacity to provide the private sector with the geological information. This database will also provide government authorities and agencies with relevant information and may be created with financial support from donor countries, international organizations and the national budget. This will require the following actions:

- The MEM will sell reports on geological surveys and geological maps at a reasonable price to provide information on geology and resources as a public service. To provide this information, MEM will establish a new department which will renovate and expand the current website.
- The MEM will prepare a database which includes mining information such as quantitative data on production, exports, imports, sales, etc. to be disclosed to the public.
- The MEM will produce data sets and materials to promote investments in promising areas of mineral potential.

(5) Sector Promotion and Industrial Transformation

Institutional strengthening and capacity building are indispensable for promoting the sector, but the government alone does not have the capacity to provide enough capital to develop mineral resources. Sector development can be stimulated by private domestic and foreign investments. The number of locally-operated mines is much higher than international large mines and artisanal gold miners are far more numerous than workers at international and locally-operated mines.

To promote the mining sector, international mining companies, regional operators and artisanal gold miners need to coexist and be encouraged to cooperate with one another, as mentioned above. Therefore, MEM will devise supporting measures, such as a financial system for operators like micro-credit, a system for leasing mining equipment. Micro-credit should be made possible within the scope of the "mining promotion fund" which will be financed with profits (revenues) from the mining industry. Methods to establish and manage it will be determined as a condition of long-term, low-interest loans provided with support from donor countries and international organizations. The lease system for mining equipment would work in the same way. Promotion of the mining sector is closely related to the development of local communities. Thus, measures must be implemented to create synergistic effects from infrastructure construction, social system, resource development and production activities. Furthermore, it will be possible to create employment opportunities, and stimulate spin-offs and relevant businesses. Industrialization of mineral resources products means efficient use of resources which are national assets for the Lao PDR. Possibilities of downstream-industrialization are significant and numerous. Industrial production of cement, ceramics, metals, fertilizers is mainly based on industrial mineral products from the mining sector. Industrialization is vital for Lao's economic growth. MEM will establish an "Industrial Center for Mineral Resources Use" where the private sector will provide instruction in planning, technical introduction, financing and personnel training.

(6) Revenue Collection and Broader Benefit Assessment

All taxes and royalties from mining activities must be submitted directly to the national treasury under the collection system with efficiency, fairness and transparency. For revenue collection, the MEM will establish a management system that targets all mine operators. Revenue from mining activities will be provided to the nation's general fund to be used in a wide range of fields. The return of revenue back to the mining sector will help to reinforce the effects and benefit assessments of mining activities. A department will be created in the MEM to maximize revenue collection and assess the broadening of its use.

(7) Sustainability of Community Development and Environmental Protection

Community development must be made sustainable by minimizing and mitigating social and environmental impacts of local communities from development and production activities of mineral resources. For that purpose, the MEM will establish guidelines which reflect social and environmental impacts in the legal framework. MEM will establish a system with oversight and a penalty system to regulate illegal mining activities. To achieve these goals, there must be capacity building to manage the social and environmental impacts from mining activities on communities. The main ministry in charge of formulating and implementing policies for the development of the

mining sector is the MEM, which has a diversified range of missions. Roles of the government, the MEM and responsible departments include the following:

1) Government

- The national budget should provide for adequate logistic, infrastructure, equipment and financial support for the public institutions.
- The government should administer the mining sector to enhance fairness and transparency, striking a balance between local governments and communities.
- The government should emphasize the importance of capacity building in the mining sector and prioritize personnel training.

2) MEM

- The MEM should implement institutional strengthening for managing mineral resources, prepare the necessary organizations, increase appropriate staff, and realize capacity building for the professional development of staff.
- The MEM should increase the ability of local offices to strengthen the alliance between the central and local governments.
- The MEM should establish institutions such as the “Local Development Council” and “Participatory Conference”, to promote local development based on the concepts of co-existence and co-prosperity among resources developers, local developers and community, preparing guidelines when needed.
- The MEM will be responsible for institutional strengthening of the management of mineral resources, and also for coordinating the relationship between other ministries such as Ministry of Finance, STEA, and the Ministry of Commerce and Industry.
- The MEM will create a supporting network of universities, educational institutions, communities, groups and NGOs to strengthen the mining sector, when needed.
- The mining section of the MEM has functions such as policy-making and administration, mining concession service, inspection and supervision of mines, environmental protection, mines safety, geological surveys. The MEM will disclose and manage its organization and role.
- The MEM will manage the sector and promote private investments in exploration, development and production.
- The MEM will coordinate activities to obtain investment support from donor countries and international organizations, creating a department for international cooperation.

3) Responsible Departments

- Will play a leading role in formulating policies, laws, strategies, etc., for the sector.
- Will prepare procedures (permission, issuance) for mining concessions (exploration, exploitation), and establish a system for mining cadastral management.
- Will review environmental protection plans, environmental impacts during mining operations, conduct environmental monitoring, and improve environmental management for mining.
- Will improve mine management by overseeing mine safety during operations, establishing regulations and guidelines for mine safety.
- Will promote surveys based on geological survey plan and improve capacity to implement scientific analyses on geological structure, resource potential, etc., in the Lao PDR.
- A laboratory affiliated with the Geological Survey will be used to improve technology and facilities to provide wide-ranging analytical services, including analyses for environmental protection (A list of requirement is annexed to this Appendix).
- An Information Service Department will improve the scientific GIS database, and provide the private sector with information on investment promotion, environmental protection, social considerations and publish it when needed.

The MEM seeks to build mineral sector administration to stimulate economic and social development, bring stability to rural areas, fight poverty, and bring prosperity through broad-based and equitable economic growth. Support and investment from donor countries and international organizations are needed to achieve these goals. This support and investment, as well as Lao government funding, will ensure that the nation moves forward while building upon a strong minerals sector. This document is our commitment to actions that will sustain national development and the people of Lao PDR for years to come.

Appendix 7 Scheduling of Action Plan

Scheduling of Action Plan

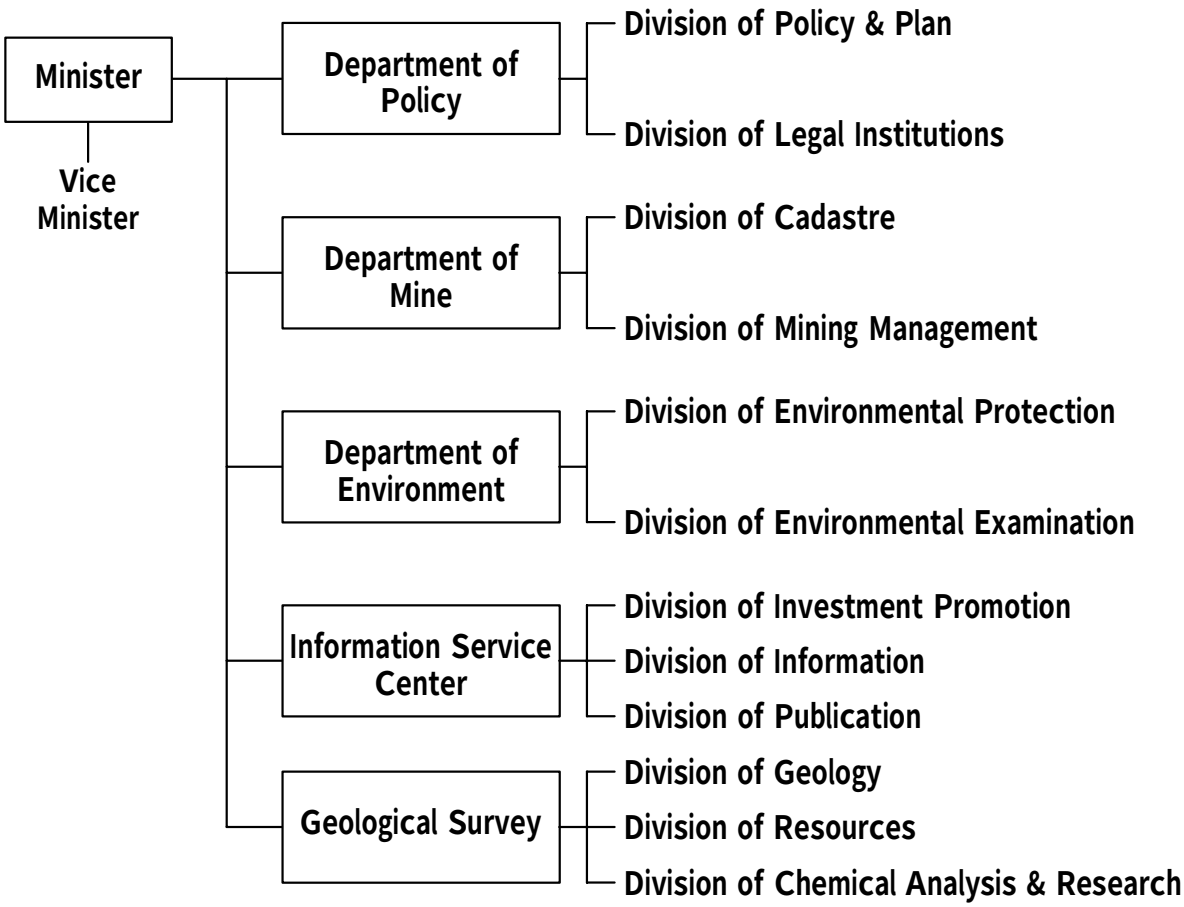
Program	Timeframe	Objective	Needs for capacity building	Estimated budget (US$000)		
				Consultant	training	Total
1. Renovating Laws and Regulations						
• Reviewing the Mining Law and its Regulations	01/07–04/07	• Improve investment climate	• Legal training	40	6	46
• Reviewing relevant tax systems	01/07–06/07	• Enhance oversight etc.	• Taxation expertise	36	4	40
• Legislating artisanal gold mining	01/07–06/07	• Legislate artisanal mining	• Legal training	30	5	35
• Reviewing the Investment Law	03/07–08/07	• Improve investment climate & procedures	• Relevant legal training	36	4	40
2. Improving the Information System						
• Geo-scientific GIS database & associated training	03/07–03/08	• Improve information	• GIS operation training	500	200	700
• Building a website for MEM	01/07–06/07	• Introduce MEM and promote investment	• Setup of website	43	7	50
• Expanding the website for mining section	01/07–06/07	• Promote investment	• Maintenance of website	46	4	50
• Improving archives (IT)	01/07–10/07	• Compile information for investment	• Informative compilation	54	6	60
• Brochure for promoting investment	10/07–06/08	• Promote investment	• Compilation and appeal	30	5	35
• Investment guidebook	10/07–03/08	• Promote investment	• Preparing a guidebook	54	6	60
• Opening seminars for promoting investment	01/08–06/08	Promote investment	• Preparation of seminars	33	7	40
3. Technical Training						
• Standard for calculating ore reserve	01/07–06/07	• Evaluate resources	• Ore-reserve calculation	45	5	50
• Analyzing technology for pollutants	03/07–03/08	• Introduce analyzing technology	• Technical acquirement	240	8	320
• Mining technologies for small mines	01/08–12/08	• Improve technology & introduce new one	• Technical acquirement	250	100	350
• Technology to evaluate resources	01/08–06/08	• Evaluate resources	• Knowledge acquirement	45	5	50
4. organizational Management						
• Establishing Department of Policy	01/07–12/07	• Establish Department of Policy	• Formulation of policy	80	10	90
• Guideline for small scale mining	06/07–12/07	• Improve small mines	• Artisanal management	45	5	50
• Mining Cadastre management system	04/07–03/08	• Systemize management of the cadastre	• System technology	180	20	200
• A consortium for artisanal gold miners	04/07–03/08	• Organize artisanal gold miners	• Management skills	110	10	120
• Administrating mines	06/07–12/08	• Improve and transparentize management	• Management means	280	20	300
• Instruction of accounting system	04/07–05/09	• Adopt international accounting standard	• Financial statement	90	10	100
• Improving management of national mines	06/08–12/08	• Improve management of national mines	• Mine management	80	10	90
• Preparation to establish a mining fund	06/08–05/09	• Support mines financially	• Management of fund	45	5	50
• Planning a loan system for small mines	01/09–06/09	• Formulate a plan for loan system	• Formulate loan system	36	4	40
• Designing an organization of MEM	01/07–06/07	• Design a new organization for MEM	• Organization	43	7	50
• Establishing a Mining Association	08/07–12/08	• Strengthen base for the mining sector etc.	• Management	28	2	30
5. Industrializing Industrial Minerals						
• Marketing research	06/08–12/08	• Grasp demands for industrial minerals	• Means for research	55	15	70
• Devising a business concept	08/08–03/09	• Formulate a vision for business	• Methods for formulation	55	5	60
• Evaluating resources and surveys planning	06/07–12/07	• Formulate a survey plan	• Method for formulation	37	3	40

Appendix 8 Scheduling of Phase 1 and Phase 2

Scheduling of Phase 1 and Phase2

	Program	Term	Objective	Needs for capacity building	Estimated budget (US$000)		
					Consultant	training	Total
Phase 1	1. Mining Sector Capacity Building 1						
	• Institutional Reform	One year	• Review and establish institutions	• Reviewing methods	80	20	100
	• Organizational Reform	One year	• Reform organizations for the sector.	• Building system	43	7	500
	• Capacity Strengthening of MEM	2.5 years	• Improve capacity for administration	• Capacity strengthening	250	15	400
	• HRD	3.5 years	• Develop human resources for the sector	• Knowledge acquisition	600	200	800
	• Overall Mining Cadastre System	1.2 years	• Strengthen organization and nurture staff	• Designing system	200	100	300
	2. Geological Infrastructure						
	• Geological Maps (1/50,000)	4years	• Prepare geological maps	• Surveying methods	5,500	500	6,000
	• Satellite Images	2 years	• Promote exploration	• Image processing	230	70	300
	• Airborne Surveys	2 years	• Promote exploration	• Analysis methods	3,800	200	4,000
	• Geo-Chemical Surveys	2 years	• Promote exploration	• Analysis methods	1,700	300	2,000
	• Publishing Geological Maps	0.8 years	• Promote exploration	• Marketing skills	800	200	1,000
	• Building Ore-deposits Models	one year	• Promote exploration	• Model building methods	400	100	500
	3. Environmental Management						
	• Setup of Monitoring System	2 years	• Protect environment	• Monitoring methods	500	150	650
	• Baseline Surveys	2 years	• Protect environment	• Surveying methods	1,200	300	1,500
	• Setup of Management System	2 years	• Protect environment	• Management methods	270	30	300
	• Chemical Laboratory	1.5 years	• Supply analysis services	• Analysis skills	1,200	300	1,500
Phase 2	4. Mining Sector Capacity Building 2						
	• Establish one-stop-shop	2 years	• Promote investment	• Knowledge of promotion	200	50	250
	• Strengthen Mining Cadastre	One year	• Manage Mining Cadastre		160	40	200
	• Strengthen Mining Management	One year	• Strengthen management of the sector	• Management know-how	80	20	100
	• Strengthen Relations within Ministry	One year	• Strengthen inter-relations in MEM	• Management capacity	50	10	60
	• Strengthen Legal Institution	One year	• Review the Laws and Regulations	• Capacity of paperwork • Legal knowledge	80	20	100
	5. Develop Geological Information						
	• Geological Maps (1/50,000)	2.5 years	• Promote investment	• Preparation of maps	5,000	1,0000	6,000
	• Geo-physical Surveys	1.5 years	• Promote investment	• Surveying technology	1,200	300	1,500
	• Structural Drilling	2.5 years	• Promote investment	• Drilling technology	4,700	300	5,000
	• Geo-Chemical Explorations	1.5 years	• Promote investment	• Analysis methods	1,000	500	1,500
	• Geological Surveys of Ore Deposits	1.5 years	• Promote investment	• Mineral research methods	80	20	100
	6. Local Economic Development						
	• Feasibility Study for Downstream Business	1.5 years	• Formulate strategy for downstream business	• Formulation methods	370	30	400
	• Training Center for Mining Skills	0.8 years	• Formulate a plan for the Training Center	• Training methods	90	10	100
	• Local Technical Service Center	0.8 years	• Establish Local Technical Service Center	• Technical supports	170	30	200
	• Small Mines Management Reform	2 yeas	• Build a business foundation for small mines	• Instruction methods	230	70	300

Appendix 9 Concept of Organization for MEM



Appendix 10 Economic Simulation of a Large-Scale Copper Deposit

			Year										
	Item	unit	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%