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The economic impact of the Sepon mine

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Prepared for Lane Xang Minerals Limited

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*Centre for International Economics
Canberra & Sydney*

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Summary

- The Sepon copper and gold mine, located in central Laos, is a major economic operation, with significant impacts on the Lao economy.
- Since the start of production (gold in 2003 and copper in 2005), the mine has contributed to Lao national income through direct contributions to government revenue, the purchase of a range of Lao goods and services, and employment of Lao nationals.
- Directly, the mine has contributed up to 5.67 per cent of Lao GDP. Indirectly, it has contributed up to an additional 2.56 per cent, bringing its total impact to up to 8.23 per cent.
- This converts to an important contribution to growth in GDP (total value of Lao production) or GNI (income accruing to Laos) per person. Estimates with a simulation model of the Lao economy suggest that without the mine, GDP per person would have grown at 4.8 per cent a year between 2003 and 2009. With the mine, it grew at 5.7 per cent per year.
- Similarly, GNI per person would have grown at 8.2 per cent a year between 2003 and 2009, but with the mine it grew at 8.9 per cent a year.
- The mine operators have gone to some trouble (consistent with their agreement with the Lao Government) to provide local employment and business opportunities. This has resulted in considerable mine based employment in the local area, as well as the development of business enterprises.
- The mine employs up to 40 per cent of the local workforce and up to 70 per cent of local cash income. It has led to substantive increases in local income per capita, well beyond what would have happened in the absence of the project.
- The establishment of a trust fund has allowed considerable funding for local infrastructure, health and educational facilities.
- At the local level, the mine operates as much like a successful development project as a commercial enterprise. It is, therefore, an excellent example of how the use of natural resources can, in fact, contribute to human development.
- Operations and outcomes from the Sepon project indicate that fears of a 'resource curse' affecting Laos can be effectively dealt with through appropriate approaches to the mining task.

1 Introduction

This report

The report presents an evaluation of the economic impact of the Sepon gold and copper mine on the Lao economy. The overall approach is to consider each of the major economic flows associated with the mine, and to compare these with overall economic activity in Laos. In order to assess some of the indirect effects, the report presents results from an economywide model used to assess the 'multiplier' effects of mine incomes.

Because of its size and nature, it is inevitable that the Sepon mine will have a significant impact on the overall economy. Indeed, the mine is not large by international standards, but in the context of Lao economic development has a disproportionate effect.

The development potential of mining projects is often misunderstood, particularly in a cross country context where poor practices are seen to have created economic problems. The Sepon mine provides an excellent case study of how foreign investment can bring the capital and technical and managerial skills to generate substantial economic resources that can create a foundation for further economic growth, while at the same time working towards sustainable livelihoods for the local communities surrounding the mine.

The report is structured as follows:

- the remainder of this introduction provides some background to the mine and its recent performance, some comments on the evaluation approach adopted in this report, as well as a note on the challenges involved in making economic assessments given a lack of reliable data;
- Chapter 2 discusses the context of Lao economic and human development within which the mine operates;
- Chapter 3 examines the economics of each of the aspects of the mine's operations. This is the first step in exploring the economic impacts of the mine;
- Chapter 4 considers the contribution of the mine to Lao GDP and economic growth – both directly through first round revenues and expenditures, and indirectly through so-called multiplier effects throughout the economy.

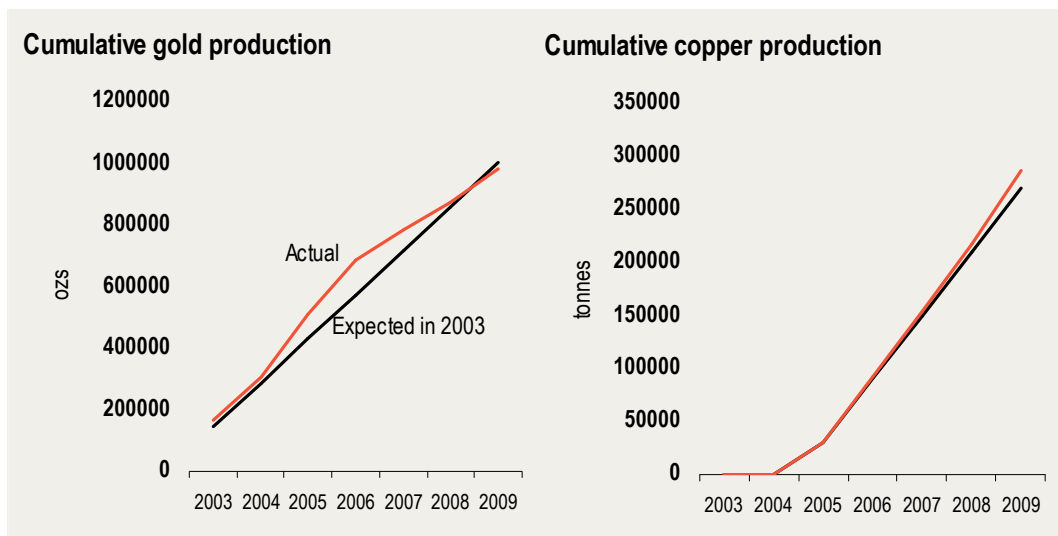
- Chapter 5 considers the longer term regional effects of the mine, particularly in the context of the need to develop sustainable incomes for communities surrounding the mine.
- Chapter 6 concludes.

Background to the mine

The Sepon gold and copper mine is located in central Laos – in the Vilabouly District of Savannakhet Province, 50 to 70 km west of the Vietnamese border. The project has been producing gold since 2003 and copper since 2005. The start of production was the culmination of exploration and development for the previous decade, beginning with initial exploration in 1990, a Mineral Exploration and Production Agreement (MEPA) in 1993, followed by continued gold and copper exploration, construction of a gold plant in 2002, and construction of a copper plant in 2005.

For most years since production commenced, the Sepon mine has met or exceeded initial expectations when processing facilities were first established (see chart 1.1 which shows cumulative output of gold and copper compared with expectations in 2003).

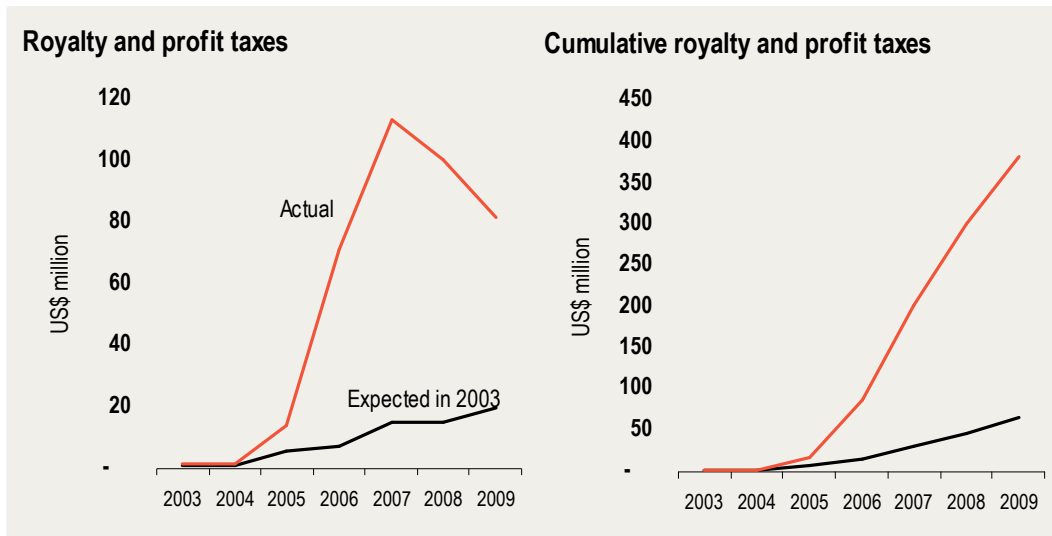
1.1 Mine production compared with expectations



Data source: LXML, CIE estimates

This matching of output to expectations has actually led to greater than expected economic outcomes, illustrated, for example, with royalty and profit tax payments to the Lao government. These have been much greater than expected in recent years resulting in a very large cumulative difference between expectations and outcomes, as illustrated in chart 1.2.

1.2 Government revenue from the mine compared with expectations



Data source: LXML, CIE estimates

A wide range of economic effects

As a major investment project, the Sepon mine has a wide range of economic effects on the Lao economy – both directly and indirectly, and in the short and long term. These effects are broadly summarised in the chart 1.3.

The initial input to the economy is the export sales of the mine's production. While some of these sales are used to fund returns to the capital invested in the mine, they are also used to pay all the various costs of mining, as well as royalties and taxes paid to the Lao government.

Some of the mine expenditure on various costs accrues as income to Lao nationals, in particular to mine employees, employees of contractors, and local suppliers of goods and services consumed by the mine.

As well as these direct flows, the mine will have a number of flow on (or multiplier) effects as both expatriate and Lao beneficiaries of mine spending in turn spend their income on other goods and services. Care needs to be taken when estimating these flow on effects, however, as there may also be indirect costs of mine spending, particularly through effects of the Lao real exchange rate. The analysis of indirect effects presented below uses an economy wide model of Lao to capture the net flow on effects of mine activity.

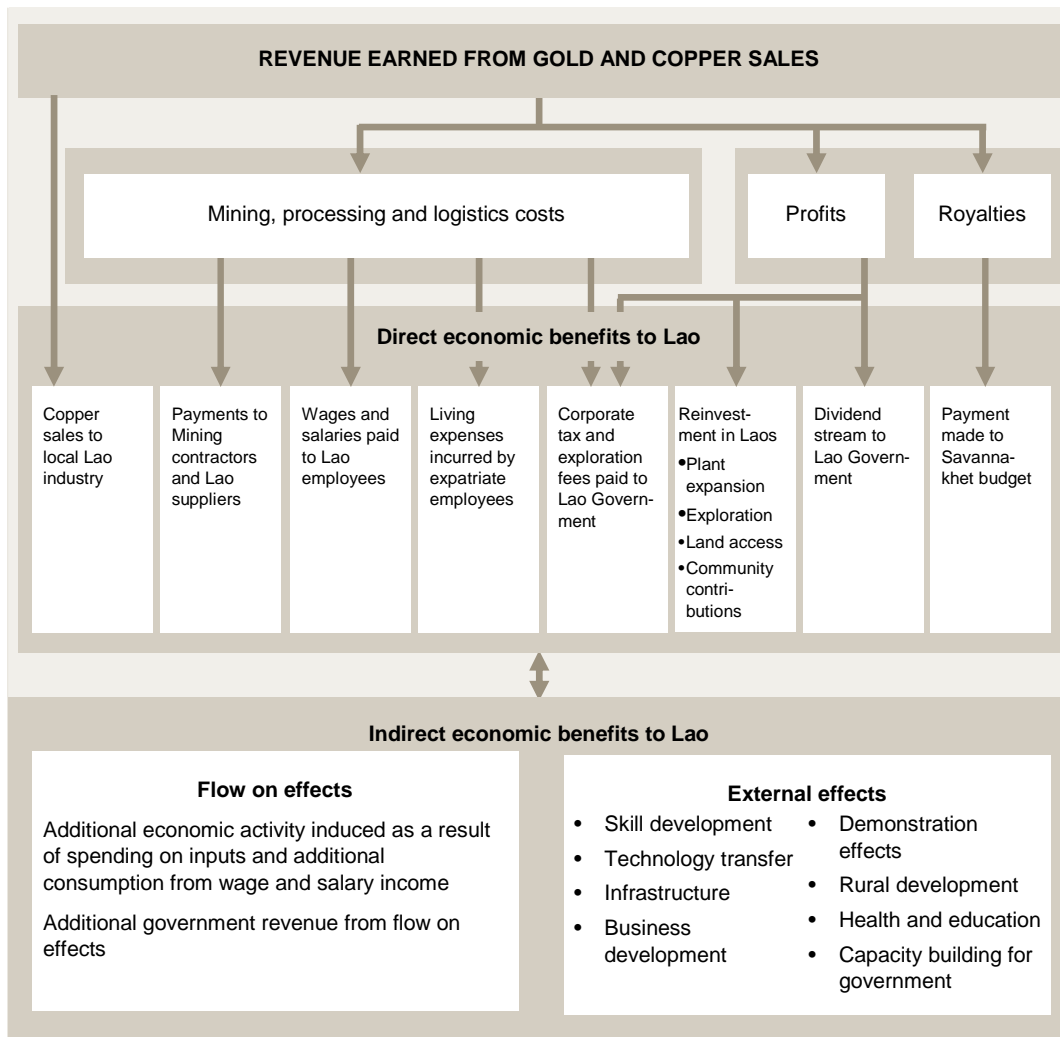
The mine also has a number of effects that are less tangible than the direct and indirect income flows. Particularly at the local level, the mine is concerned with generating sustainable income opportunities for villagers. To achieve this, the mine seeks to purchase as much as possible of its needs from the local area. To date, this

has meant the purchase of food, locally made sample bags, mine uniforms and some other services.

As part of securing these goods and services, the mine has made significant progress in increasing the local contractor spend on services, particularly mining contracts, camp services and customs clearance. Along with this, the mine has actively encouraged the development of local businesses and has recently contracted local small enterprises to manage a range of services at the mining camp (including housekeeping, grounds, shops and bars). While currently the revenues for these enterprises depend on the mine, the skills and expertise developed in establishing and maintaining them are transferable.

In addition, the mine is actively supporting the development of textiles and handicraft activities in the villages around the mine.

1.3 The flow of economic effects from the Sepon mine



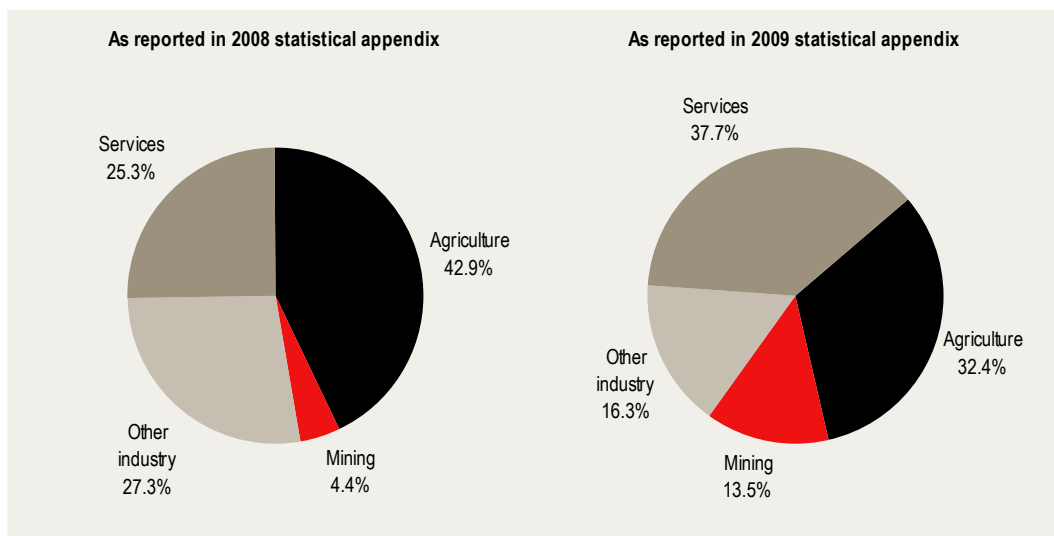
The mine also contributes to economic development within the local region by funding a variety of activities through a development fund.

The overall evaluation approach taken in this report is to consider each of these flows in turn, and to compare them with economywide outcomes for the whole Lao economy. Basic economic identities are used to assess the overall impact of the mine, while an economywide model is used to assess the flow on impacts.

A caveat on data

Data availability and reliability is very mixed in Laos. As chart 1.3 illustrates, relatively small changes such as rebasing GDP accounts can lead to a very different picture of the structure of the economy. Chart 1.3 shows the structure of the economy for 2006, using two different data sets (national data as reported by the IMF in 2008, versus national data as reported by the IMF in 2009). Both data sets report on the same economy, but give a very different picture of how that economy is structured. This makes structural analysis, and flow on economic impact analysis very challenging – and likely to be subject to considerable revision over time.

1.4 Different views of the Lao economy in 2006



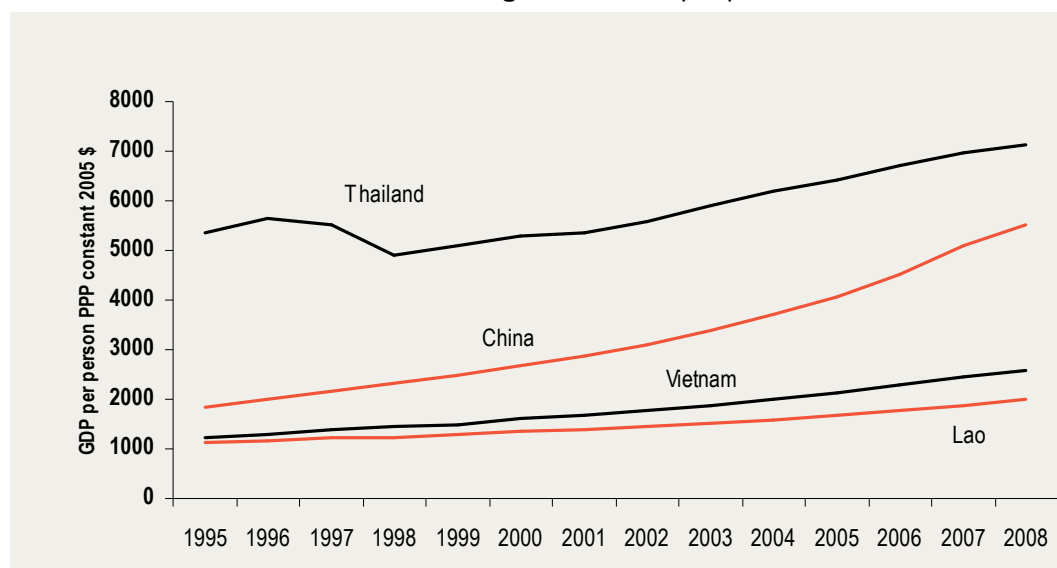
Data source: IMF, CIE estimates

2 *The context: Lao growth and human development*

Background

Laos is a relatively poor country, growing well in a region that is also rapidly growing. The overall growth performance of the Lao economy has been impressive in recent years – with GDP per person growing at around 6 per cent a year. But Lao remains poor in the region: the average level of economic welfare in Laos is around three quarters of that of Vietnam and just over a third of that of China. And while Lao is growing well (with its income growing slightly faster than that of Thailand), the incomes of Vietnam and China continue to accelerate away from it (chart 2.1).

2.1 Economic welfare: Lao versus neighbours GDP per person in PPP^a terms

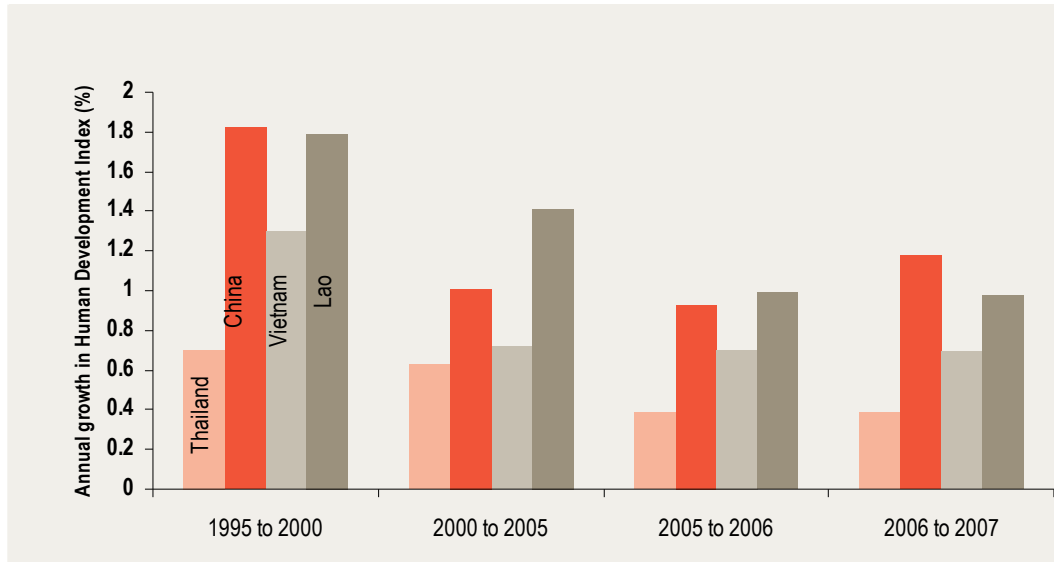


^a PPP refers to 'purchasing power parity' and is a way of putting GDP levels of different countries on a comparable basis.
Data source: IMF, World Bank, CIE estimates

Lao has experienced relatively strong growth in an overall index of human development, showing that it has been able to convert economic gains into human development gains (chart 2.2). Nevertheless, it continues to lag in important respects. For example, life expectancy at birth is just under 65 years in Lao, compared with 74

years in Vietnam, and 73 years in China (all compared with around 80 years in high income economies)¹.

2.2 Annual growth in Human Development Index (HDI) ^a



^a The HDI is a composite measure of progress along a number of indicators of human welfare
 Data source: United Nations Human Development Database.

Lao’s economic growth

Like most developing economies, the Government of Lao has set a number of economic objectives – generally targeted at increasing growth and making sure this is evenly distributed amongst the whole population.

To maintain economic growth, Lao will need to:

- continue the process of economic integration (to allow gains from trade with other countries, as well as within Laos);
- focus increasingly on education (to create the human capital needed for sustainable growth) and;
- create an environment for technological development – particularly to allow the efficient use of Laos’ natural resource base – as well as to create the possibility of trade in other goods and services.

Much of Laos’ recent economic growth has been a consequence of the productive export of a range of natural resources – particularly mineral resources. This early dependence on natural resources is not surprising. Laos has a low population density, mountainous geography and underdeveloped infrastructure which together

¹ World Bank, World Development Indicators

mean that domestic market integration is weak. Combined with relatively low productivity in manufacturing (and limited prospects for a low cost labour intensive manufacturing strategy) these features mean that natural resources will inevitably play an important role as a lever to ongoing economic growth.

Indeed, without natural resource development – in particular, hydropower and mining – Laos will not be able to achieve the goals of its National Growth and Poverty Eradication Strategy (NGPES)².

The economics of mining and development

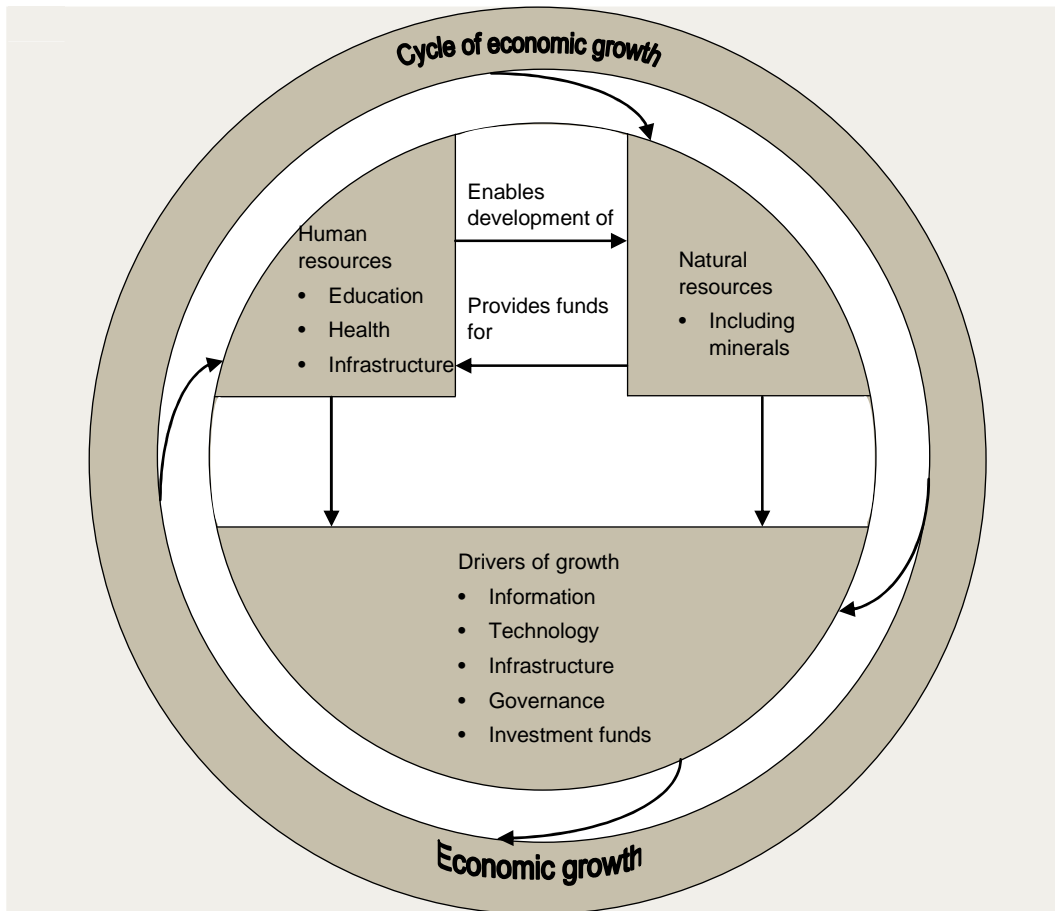
Fundamentally, mining can contribute to Lao economic development by providing a source of economic resources (most notably, revenue for the government) to allow investment in the various drivers of human development and by providing employment and business development opportunities to Lao nationals.

The economic resources provided through the sale of minerals amount to a major impetus to an overall cycle of economic growth (chart 2.3). The use of natural resources provides funds for a variety of human resources, which themselves constitute drivers of economic growth (as well as enabling the further development of natural resources). The mining activity itself also directly contributes to economic growth by providing business development opportunities and employment (both directly and indirectly).

Productive mining is capital and technology intensive activity. The particular advantage of mining undertaken as a foreign investment project is that the investors bring with them the capital needed to undertake productive mining operations, as well as the technology necessary to do so.

² The NGPES is the strategic framework under which all of the Lao Government's future growth and poverty eradication programs will be developed and implemented. The NGPES is the result of a process that started in 1996 when the 6th Party Congress defined the long-term development objective as freeing the country from the status of least-developed country (LDC) by 2020. It is available at www.undplao.org.

2.3 Resources and economic growth



Of course, managing the transfer of mineral wealth into other forms of productive capital involves a variety of policy challenges. The UNDP³ recently argued that the mining sector has ‘low human development potential’ because it may lead to ‘export enclaves’ with little connection to the domestic economy or because it may result in a ‘Dutch Disease’ – essentially an appreciation of the real exchange rate, which makes life difficult for other exporting industries. In addition, effective use of mineral revenues requires sound policy frameworks to ensure funds are not wasted or dissipated on ‘rent seeking’ activities. Finally, commodity prices are subject to fluctuations, leading to further policy challenges in planning future revenues and expenditures.

There is, of course, international evidence that some countries have not negotiated these challenges well (see for example, Humphreys et al 2007). But the dominance of these problems is by no means inevitable, nor do they necessarily detract from the overall positive contribution of mining to development (see, for example, Lederman and Maloney 2007).

³ UNDP (2006).

Some of these challenges are beyond the scope of a single project – establishing sound policy frameworks that avoid the pitfalls of rent seeking and poor funding allocation is a task that will require all of the expertise of international organisations such as the UN. But of the factors within a mining company’s control, the Sepon project provides an interesting illustration of how mining can take place in a way that generates maximum sustainable benefits for the host country. In particular, as will be illustrated further below:

- the mine has sought to maximise linkages within the economy;
- it has sought to increase the skills and capital base within the economy to mitigate the real exchange rate effects;
- it has so far managed through a period of commodity price fluctuation;
- it has sought to provide practical assistance to government, particularly at the local level.

3 *Economic characteristics of mine operations*

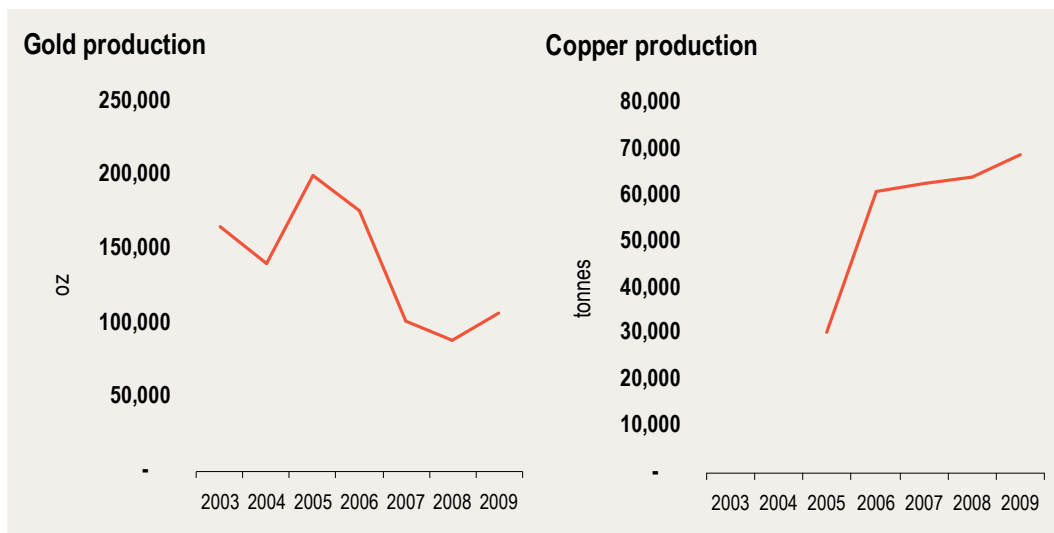
This chapter sets out the key features of the mines operations, and where appropriate compares them with national or local economic aggregates.

Mine production and revenues

Production

Production of gold commenced in 2003, and production of copper in 2006. Chart 3.1 summarises production volumes for each of these. Gold production is currently around 100 000 ounces a year, but was 200 000 ounces at its peak. Copper production has increased to around 70 000 tonnes per year, with a recent average of 60 000 to 65 000 tonnes a year. Sepon is not a large copper mine by international standards (some mine produce up to 400 000 tonnes per year, with production of more than 150 000 tonnes not uncommon).

3.1 Gold and copper production



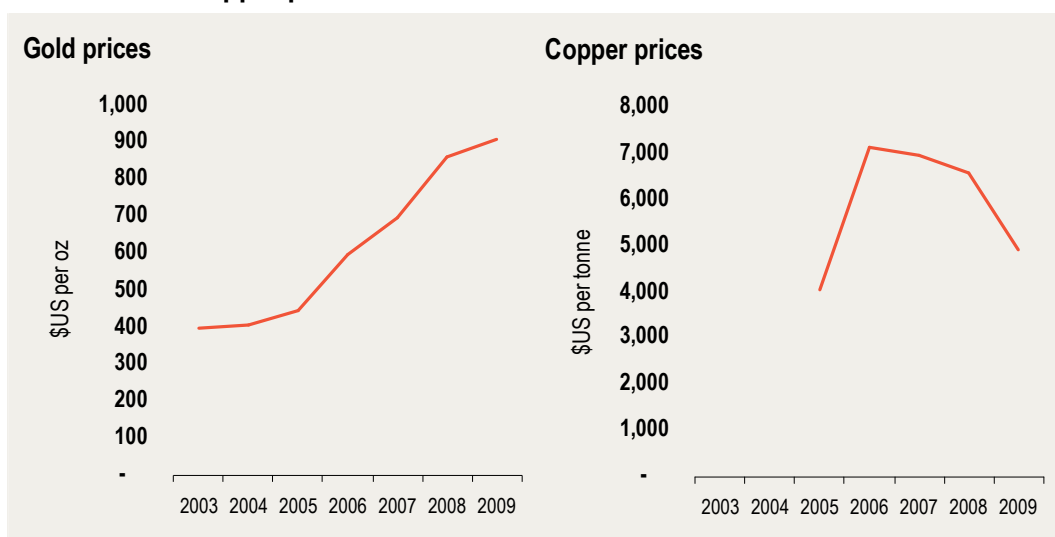
Data source: LXML

Prices

The prices obtained for this output depends on a range of factors, but are essentially determined by world market conditions. The world price of gold remains very strong, with a continual increase since production at Sepon commenced. The price of copper has generally increased rapidly in recent years, but has fallen during the current global economic slow down.

It is interesting to note that both the gold and copper prices actually received are considerably higher than expected before production commenced. In 2003, for example, the gold price was expected to be \$US350 per ounce (compared with the average since production commenced of \$620 per ounce) while the copper price was expected to be \$1 870 per tonne (compared with the actual average of \$5 930 per tonne). The recent decline in the copper price needs to be interpreted in this context.

3.2 Gold and copper prices



Data source: LXML

The prospects for gold and copper prices are generally considered to be good. Gold prices are expected to remain high – driven by investment demands (as an alternative to the devaluing US dollar) as well as official demands (as central banks continue to purchase gold)⁴. Copper prices are expected to increase throughout 2010, to be higher than the levels in 2009. This is particularly driven by Chinese demand for copper, while OECD copper consumption is also expected to recover⁵.

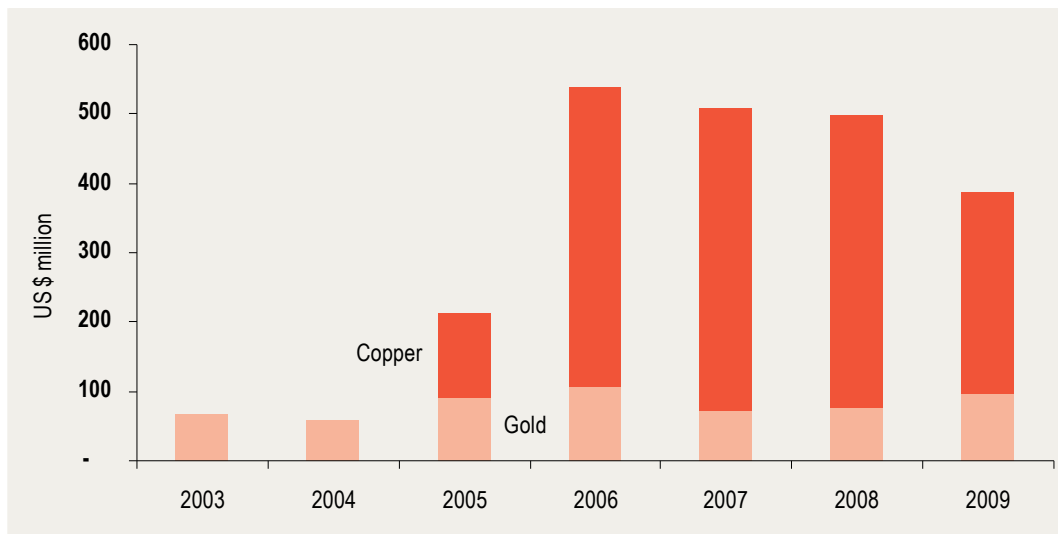
⁴ ABARE (2009) p. 676-678

⁵ ABARE (2009) p. 690-693

Total value of production

The total value of production started in 2003 at around US\$65 million and increased to a high point of \$540 million, and is currently around \$430 million (chart 3.3). The value of production depends, of course, on the quantity of production and on prices. The value of gold production has remained roughly constant despite declining volumes because of the increase in the gold price.

3.3 Value of gold and copper production



Data source: LXML

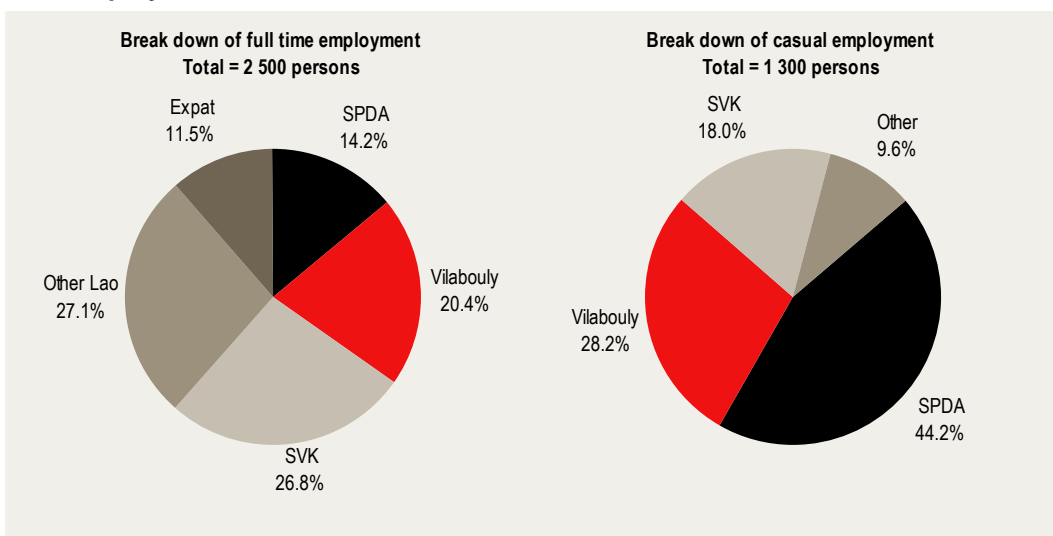
The value of copper production has declined slightly despite increasing physical production because of the recent decline in price.

Mine employment

Sepon mine employment varies over time, but on average employs around 2 500 persons permanently, and 1 300 persons casually. In February 2010, employment was 3 360 permanent employees and 1 470 casual employees.

Chart 3.4 shows the breakdown of this employment by worker origin. For full time employees, more than half from either Savannakhet (SVK) or elsewhere in Laos, while around one fifth come from Vilabouly, and around 14 per cent from within the Sepon Project Development Area (SPDA). For casual employees, the majority come from the local region (either SPDA or Vilabouly).

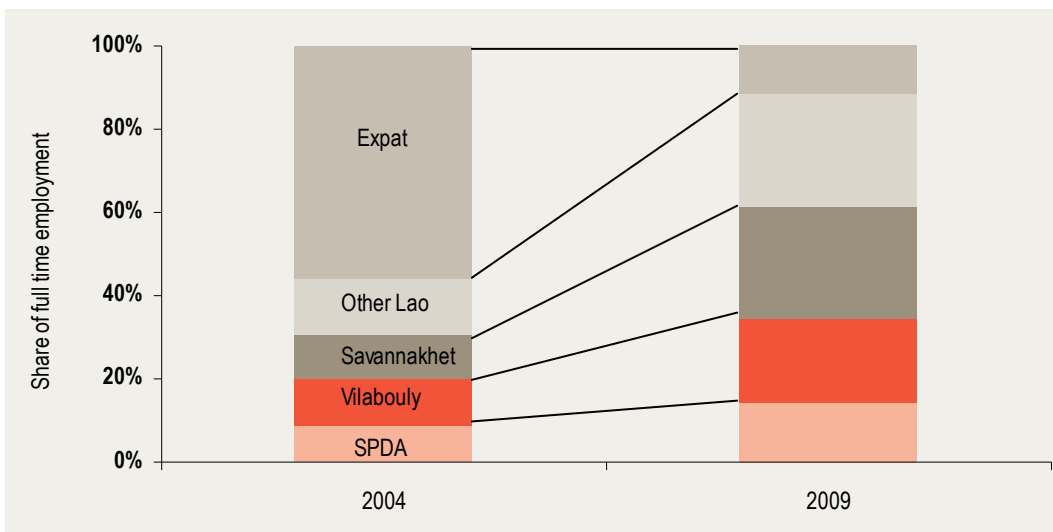
3.4 Employment and its breakdown Persons



Note: SPDA refers to the Sepon Project Development Area, representing the five closest villages to the mine
 Data source: LXML

Over the course of development of the mine, the importance of local employment has increased steadily (chart 3.5).

3.5 The changing composition of full time employment

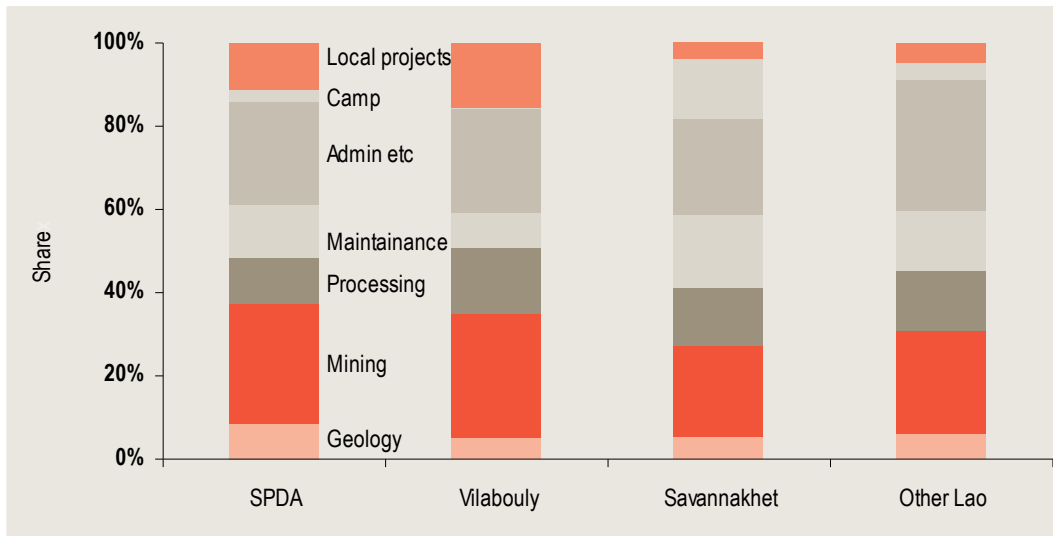


Note: During 2004, LXML was conducting construction work. While this inflates expat employment levels relative to 2009, the trend to localisation of positions remains dominant.

Data source: LXML

Local full time employees are engaged across the full range of activities within the mine and the larger project operations. The broad distribution of these activities is consistent across all the workforce sources (chart 3.6).

3.6 Employment areas for full time Lao employees

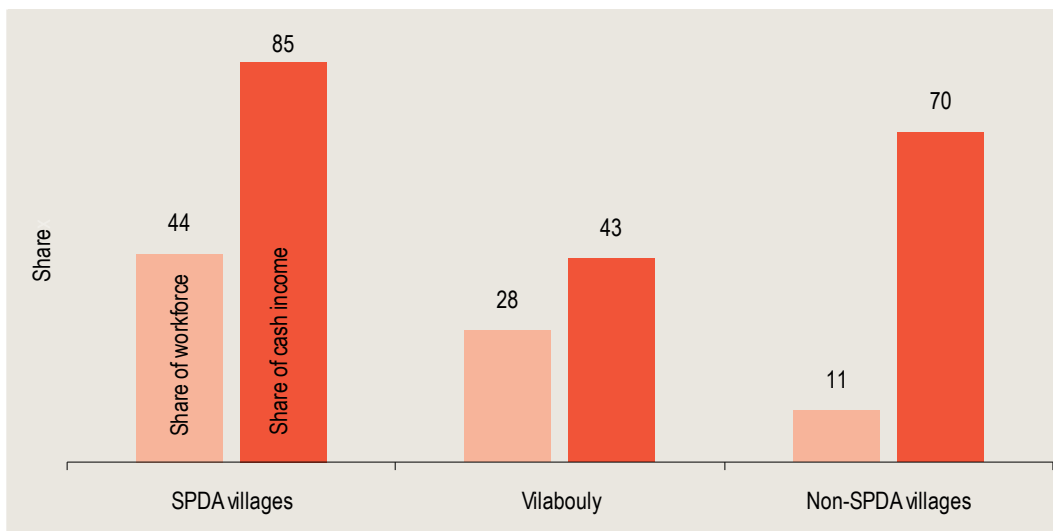


Data source: LXML

Employment in the context of the local economy

Employment in the mine is a significant source of jobs and income in the local villages and town. Chart 3.7 shows the share of the local workforce employed by the mine, as well as the share of local cash income that comes from mine wages. In the SPDA villages, the mine employs 44 per cent of the workforce with the subsequent wages accounting for 85 per cent of cash income. In Vilabouly town, the mine employs 28 per cent of the workforce with these wages accounting for 43 per cent of cash income. It is interesting to note that some of the other income sources in Vilabouly are from business activities that are themselves related to the mine. In non-SPDA villages, the mine employs 11 per cent of the workforce, with the wages accounting for 70 percent of cash income in these villages.

3.7 Share of employment and cash income coming from the mine

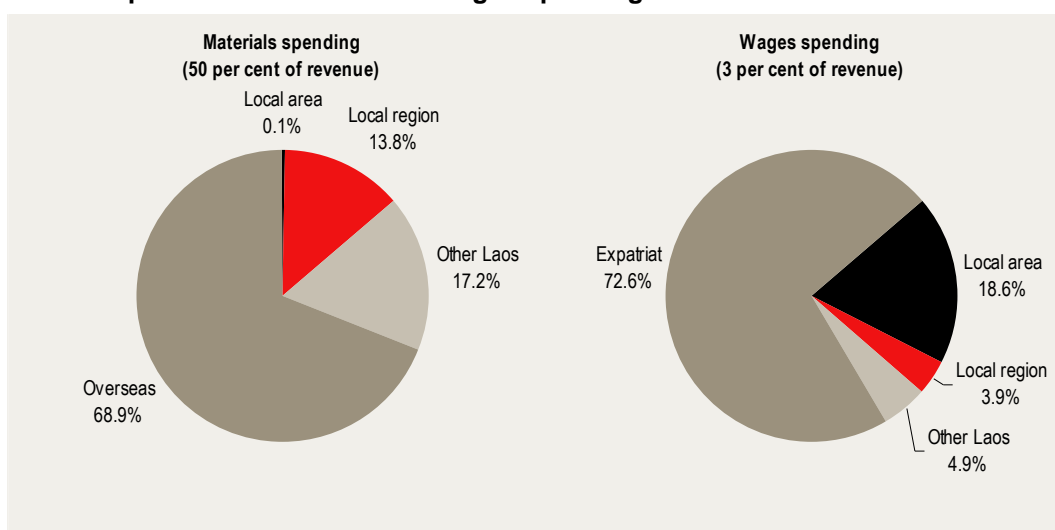


Data source: Earth Systems Lao (2008).

Composition of mine expenditure

While changing year to year, broadly speaking, around 53 per cent of mine revenue is spent on wages (local and expatriate) and materials (equipment etc) costs, both in Lao and from imported sources. Chart 3.8 shows how wages and materials spending are in turn composed.

3.8 Composition of material and wages spending



Data source: LXML

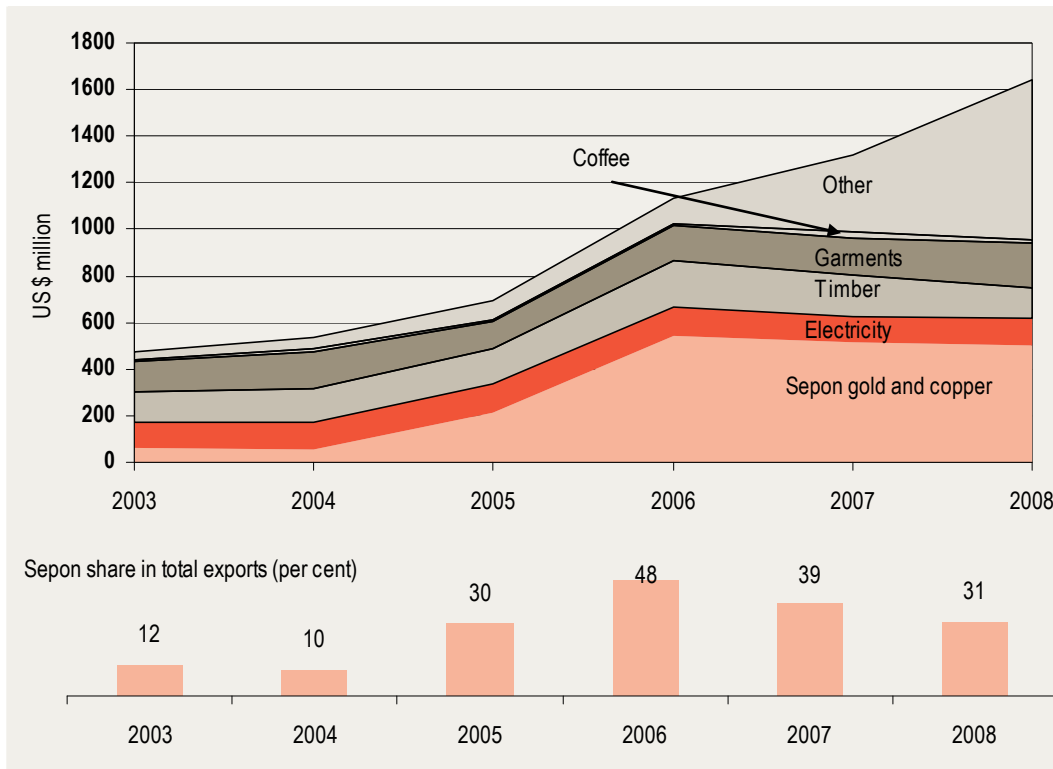
For materials, just under 70 per cent are imported, along with 17 per cent coming from the broader Lao economy, 14 per cent from the local region, and 0.1 per cent from within the local area.

For wages spending, almost 30 per cent is spent within Lao, mostly within the local area.

Exports

Exports from Sepon constitute a significant proportion of Lao's total exports (chart 3.9). Currently, around a third of total exports come from Sepon gold and copper (although this was almost 50 per cent in 2006). Indeed, around three quarters of total export growth between 2003 and 2006 was a result of exports of gold and copper from Sepon.

3.9 Lao exports



Data source: IMF, LXML, CIE calculations

Contribution to government revenue

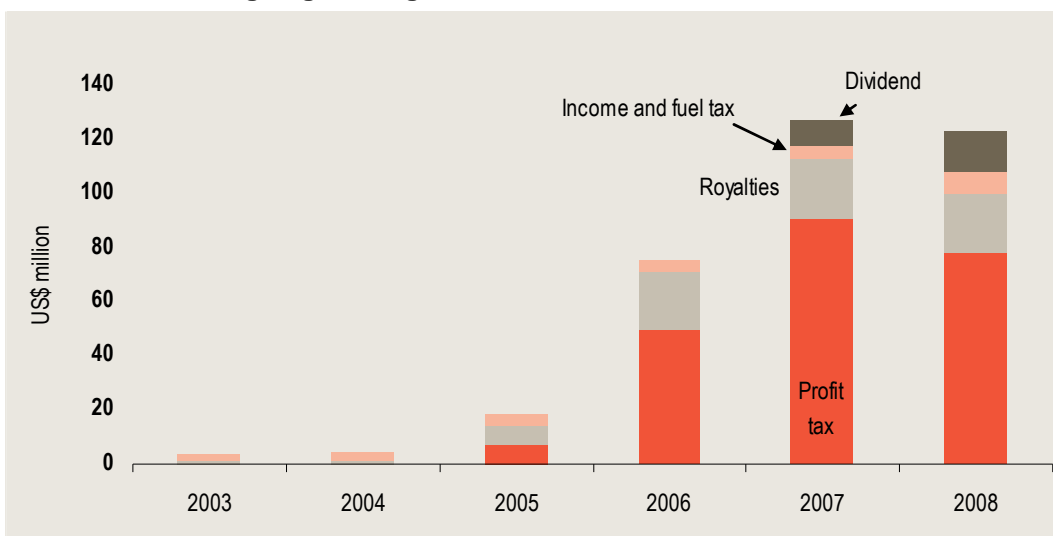
Direct payments to government

Around 25 per cent of mine revenue is spent on taxes or government costs of various kinds. As illustrated in chart 3.10, the largest of these is the profits tax, accounting for between 60 and 70 per cent of revenue paid to the government. The profits tax was not payable until 2005, and since then has increased substantially.

Royalties are the next largest payment to government, currently accounting for around 18 per cent of payments to government. The majority of these royalties come from copper production.

Income and fuel taxes and dividends account for the remaining payments to government. Income and fuel taxes have been paid in all years, but dividends only commenced in 2007.

3.10 Mine revenue going to the government

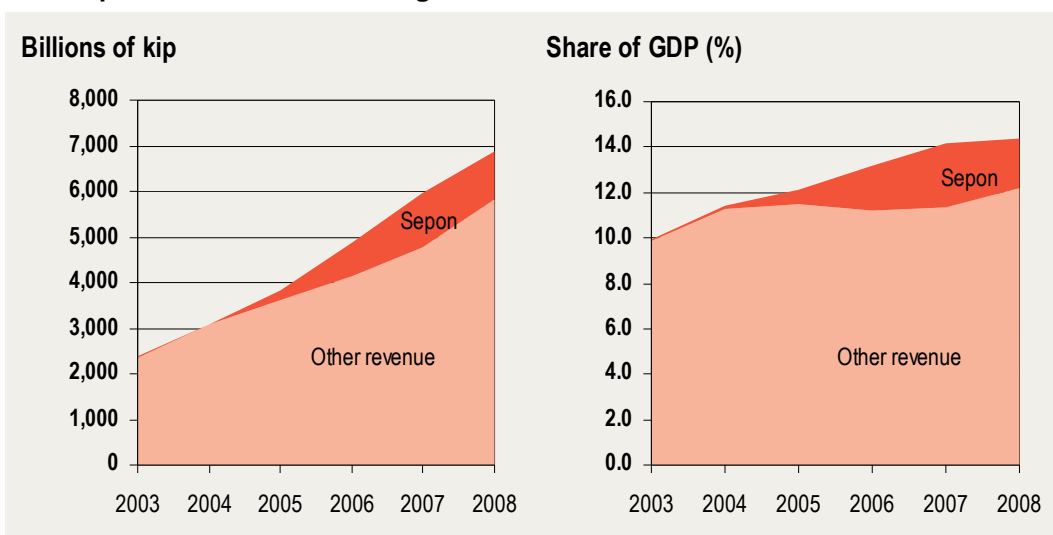


Data source: LXML

Contribution to overall government revenue

These various sources of revenue make a major contribution to overall government finances (chart 3.11). Sepon’s share in total government revenue has increased from 1 per cent in 2003 to around 15 to 20 per cent currently. As a share of GDP, Sepon revenue has increased from 0.1 per cent in 2003 to 2.8 per cent currently.

3.11 Sepon contribution to total government revenue



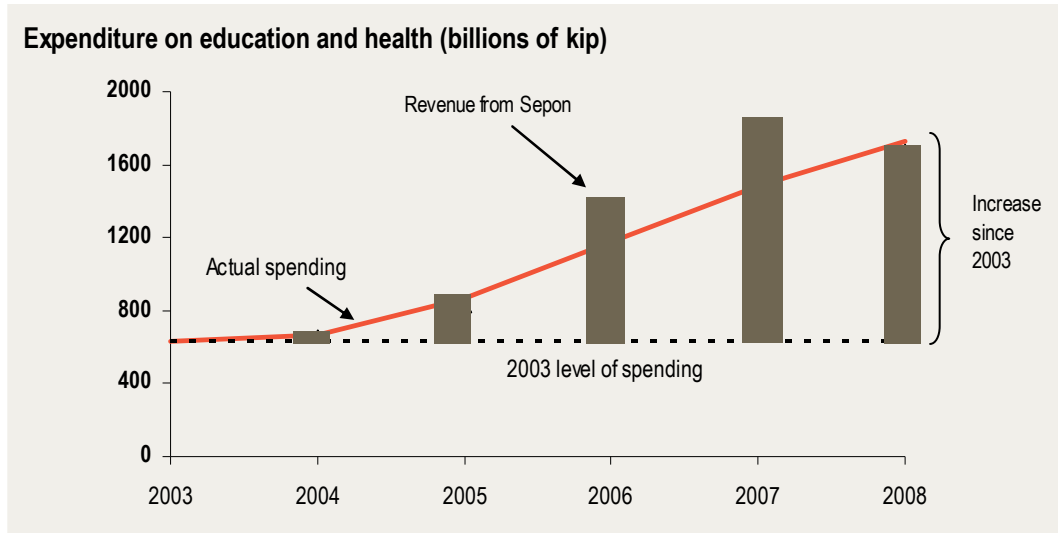
Data source: LXML, IMF, CIE calculations

Understanding the magnitude of the revenue

To illustrate the magnitude of Sepon payments to the government, chart 3.12 looks at the increment in education and health spending since 2003 (when mine production

started) and overlays on this government revenue from Sepon. The chart shows that all of this increment to spending, plus a little more, could have been financed with revenue from Sepon.

3.12 Government revenue from Sepon relative to the increase in Government spending since 2003



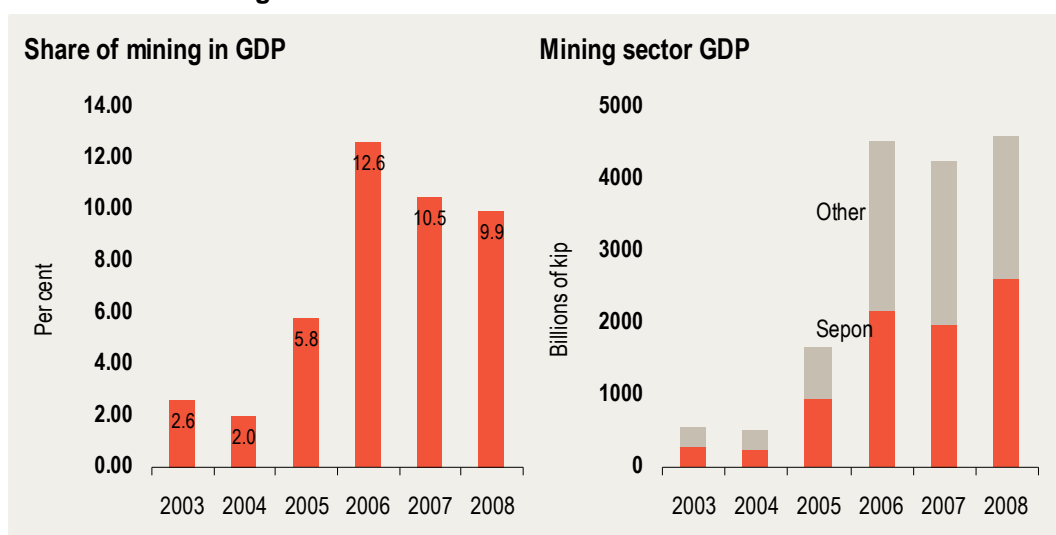
Data source: IMF, LXML, CIE calculations

4 *Measuring mine contributions to the economy*

As a major source of export revenue, it is inevitable that the Sepon mine is making a significant contribution to Lao GDP.

The mining industry itself plays an important role in Lao GDP, accounting for up to 13 per cent of GDP in some years (left panel of chart 4.1). In most years, more than half of this was a consequence of the Sepon mine (right panel in chart 4.1).

4.1 Share of mining in GDP



Data source: IMF, LXML, CIE calculations

The direct share of the Sepon mine in GDP

The share of the mine in GDP can be calculated in two ways: from the 'income' or the 'expenditure' sides of the national GDP identity.

GDP from the expenditure side

From the expenditure side, GDP is defined as consumption (C) plus investment (I) plus government expenditure (G) plus exports (E) less imports (M):

$$\text{GDP} = C + I + G + X - M.$$

The direct (first round) share of Sepon in GDP can be calculated by focusing on the trade component of the GDP identity: that is, initially assuming that Sepon only contributes to exports and imports. In this case, the share of Sepon in GDP can be calculated as:

$$\text{Sepon share of GDP} = (\text{Sepon share of exports}) \times (\text{share of exports in GDP}) \\ \text{minus} \\ (\text{Sepon share of imports}) \times (\text{share of imports in GDP})$$

Table 4.2 summarises the information for this calculation. In 2008, for example, Sepon was responsible for 38 per cent of national exports, and 10 per cent of national imports. In the same year, exports were 30 per cent of GDP, while imports were 52 per cent of GDP. Thus, the share of Sepon in GDP is $(0.38 \times 30 - 0.1 \times 52)$, which equals 6.2 per cent.

4.2 Calculating the share of Sepon in GDP from the expenditure and income sides

	2003	2008	2009 ^a
From the expenditure side			
Share of Sepon in total exports (%)	13	38	30
Share of exports in GDP (%)	22	30	30
Share of Sepon in total imports (%)	4	10	10
Share of imports in GDP (%)	37	52	52
Implied share of Sepon in GDP (%)	1.4	6.2	3.8
From the income side			
Value added from Sepon (billion kip)	290	2 620	2 040
GDP (value added, billion kip)	21 300	46 200	52 400
Implied share of Sepon in GDP (%)	1.4	5.7	3.9

^a Values for 2009 are estimates for the full year

Source: IMF, World Bank, LXML, CIE calculations

In 2003, the Sepon mine directly accounted for 1.4 per cent of GDP, increasing to 6.2 per cent in 2008, and declining slightly in 2009 to 3.8 per cent.

GDP from the income side

From the income side, GDP is defined as the sum of 'value added' from all activities (including indirect taxes paid). Value added is defined as the payments to labour (wage costs) and capital (returns on investment). Value added for Sepon can be calculated from mine data: it is essential the residual after materials costs are taken away from mine revenue. The bottom section of chart 4.2 shows Sepon value added compared with total value added (that is, GDP). The share of Sepon in total GDP calculated this way is very similar to that calculated from the expenditure side.

The indirect contribution to GDP: using an economywide model

In order to assess the indirect or flow on effects of the Sepon mine on the Lao economy, we developed an economywide (or CGE) model. The theoretical structure is based around the 'ORANI-G' framework frequently used for developing single country economic models, while the data was constructed from a number of sources – most importantly an input-output table developed by the ADB, to which we added detail relevant to the Sepon mine.

ORANI-G is an applied general equilibrium modelling framework which has been applied in a number of countries. It is derived from the ORANI GE model of the Australian economy which has been extensively used for policy analysis in Australia for nearly three decades. ORANI-G (the 'G' stands for 'generic') is a version of ORANI developed at the Centre of Policy Studies at Monash University designed to serve as a basis for constructing a straightforward CGE model of any economy for which data is available. An ORANI-G approach has been applied to a variety of countries including China, Thailand, South Africa, Korea, Pakistan, Brazil, the Philippines, Japan, Ireland, Vietnam, Indonesia, Venezuela, Taiwan and Denmark.

The ORANI-G framework has the advantage of being transparent, with the underlying code for the generic model freely available (although it does require specialist software to run).

The data to implement the model was derived from an input-output table of Savannakhet developed by the ADB (Azra et al 2006). This table is the only input-output representation of Lao available. It is not ideal, in that it only applies to a single region, rather than the whole economy. Further, given the rapid changes in the Lao economy, its underlying structure runs the risk of being seriously out of date.

We modified the ADB table first by scaling all its aggregates up to national values (using the standard RAS procedure for updating input-output tables) and then modifying the data underlying the mining row and column to reflect data from LXML and other sources.

Implementing the model also requires a number of choices about behavioural parameter values. Needless to say, there are no empirical estimates of these parameters for Lao, so we have used a synthetic set in order to implement the model. They are broadly based on equivalent parameter values for Thailand and Vietnam.

There are both advantages and disadvantages in using the resulting framework to examine the flow on effects of the Sepon mine. On the plus side, it provides a systematic means of examining the magnitude of income 'multipliers' using what is known about the structure of the Lao economy, rather than relying on arguments by analogy from neighbouring countries – many of which are really quite different to Lao.

On the minus side, the state of data on the Lao economy is probably not strong enough to really support sophisticated GE modelling, so there is a risk in the model providing very misleading results.

On balance, we consider the GE model to be a useful tool, but it is important to be aware that the overall results have a great deal of uncertainty associated with them.

The GE ‘multiplier’

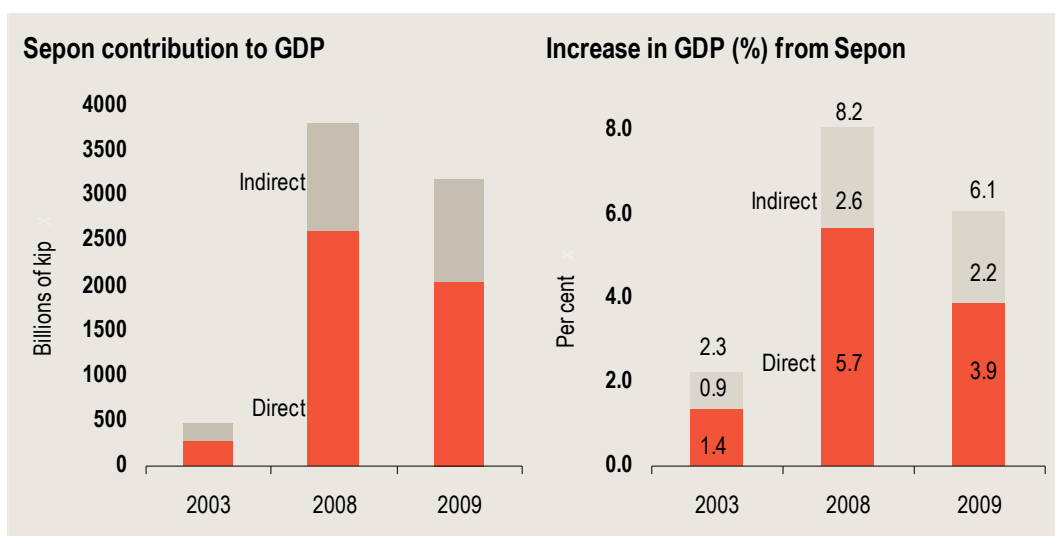
The idea behind using a GE model is to calculate the magnitude of the flow on or linkage effects of mine income. Mine spending results in a series of spending changes, leading to indirect (second and third round) changes in GDP. The ratio of the initial increase in output to the ultimate change in GDP can be thought of as the GE multiplier for the mine. The GE multiplier differs to an ‘input-output’ multiplier in that it also takes into account the indirect cost effects of mine spending – in particular on the real exchange rate – and so accounts for the possibility that output in other sectors may be affected by the mine.

Because the operations of the mine have changed over time (in particular, employing more local labour and purchasing more local materials), the indirect effect has also changed over time.

Chart 4.3 shows the economywide estimates of the direct and indirect contribution of the mine to GDP. These are based on model produced multipliers relating mine production to GDP of 0.7 in 2003, 0.9 in 2008 and 0.96 in 2009. That is, in 2003, every \$1 of mine output led to a \$0.7 increase in GDP, and so on. Note that this is a multiplier relating output (total value of production) to GDP (a value added measure). The implied contribution to GDP multipliers are shown in chart 4.3.⁶

⁶ Note that these multipliers are smaller than those reported in the CIE’s 2006 report. There are two broad reasons for this. First, the structure of the overall Lao economy has changed since that report, as noted above. Second, while the previous report used multiplier effects based on results from Vietnam and Thailand, for this report we have constructed an economywide model specifically for Laos. The multiplier effects in this model are smaller because the overall Lao economy is more import intensive than previously measured.

4.3 Direct and indirect contribution to GDP^a



^a These calculations are based on GDP from the income side

Data source: CIE estimates based on model simulations

Accounting for the direct and indirect effects on GDP, these estimates suggest that in 2003, the mine contributed 2.3 per cent to GDP (1.4 per cent direct and 0.9 per cent indirect), in 2008 it contributed 8.2 per cent (5.7 per cent direct and 2.6 per cent indirect), and in 2009 it contributed 6.1 per cent (3.9 per cent direct, and 2.2 per cent indirect). Note that this indirect contribution is net of any effects of other sectors that may be related to an exchange rate appreciation as a result of mine operations. That is, the mine makes a positive net contribution despite any 'Dutch Disease' issues.

Another way of understanding the indirect contribution

In order to provide some order of magnitude check of the size of the indirect effects of the Sepon mine, it is possible to use the GDP identity from the expenditure side, this time allowing for the flow on effects of mine income on government spending and consumption.

Considering numbers for 2008: the mine contributes around 2 per cent of GDP to government revenue (chart 3.11). Assuming that the import intensity of government spending is the same as for the economy as a whole (52 per cent), then this revenue contributes approximately a 1 percentage point increase in GDP (a 2 percentage point increase in G, but a 1 percentage point increase in M, with a net effect of 1 percentage point).

Of the direct increase in GDP, around one half (3 percentage points) contributes to local income. Assuming this is all consumed (or equivalently, assuming that any savings are reinvested in Lao), and assuming the import intensity of consumption is the same as the economywide average, then this contributes to a 1.4 percentage point increase in GDP.

Considering both of these effects (government spending of 1 percentage point, and consumption of 1.4 percentage points) this is a total indirect effect of 2.4 percent. This is the same order of magnitude as the model generated estimate of 2.6 per cent. This illustrates that the import intensity of the economy is an important determinant of the effect of mining on GDP.

Effect on the real exchange rate

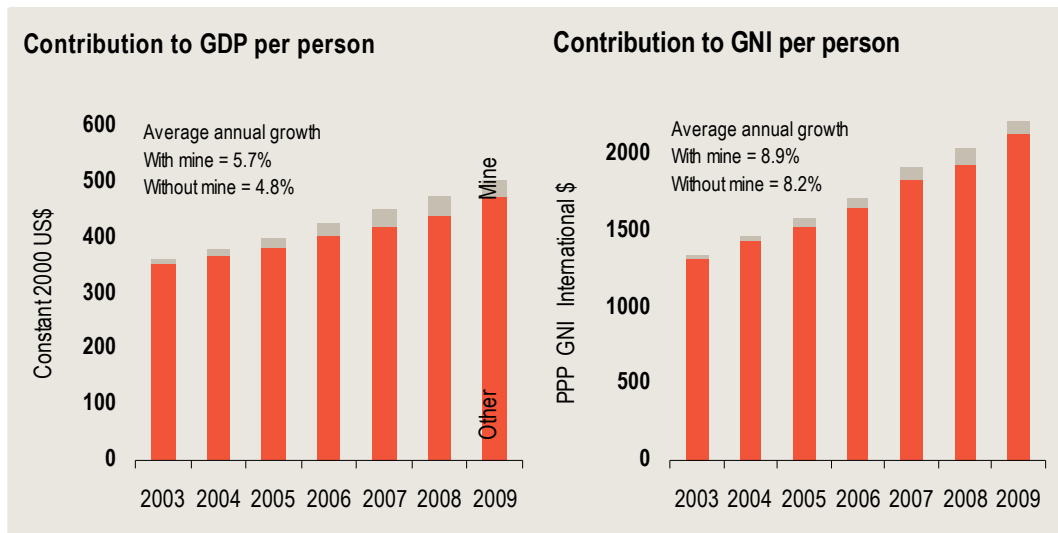
Simulations with the economywide model suggest that the mine’s production has resulted in around a 0.7 per cent real appreciation of the currency per year that the mine has been in operation. In total since 2003, this implies around a 4 per cent real appreciation since 2003. The Lao currency has actually appreciated (in real terms) by 32 per cent since 2003. Thus, Sepon has made a relatively small contribution to observed currency appreciation.

Implications for growth

Chart 4.4 illustrates what this means for GDP and GNI per person. Realised growth in GDP per person was 5.7 per cent a year between 2003 and 2009. Without the mine, this would have been 4.8 per cent a year. Thus, the mine has contributed to a 1 percentage point increase in GDP per person.

The mine’s contribution to GNI per person is slightly smaller, around 0.7 percentage points a year.

4.4 Sepon contribution to economic welfare



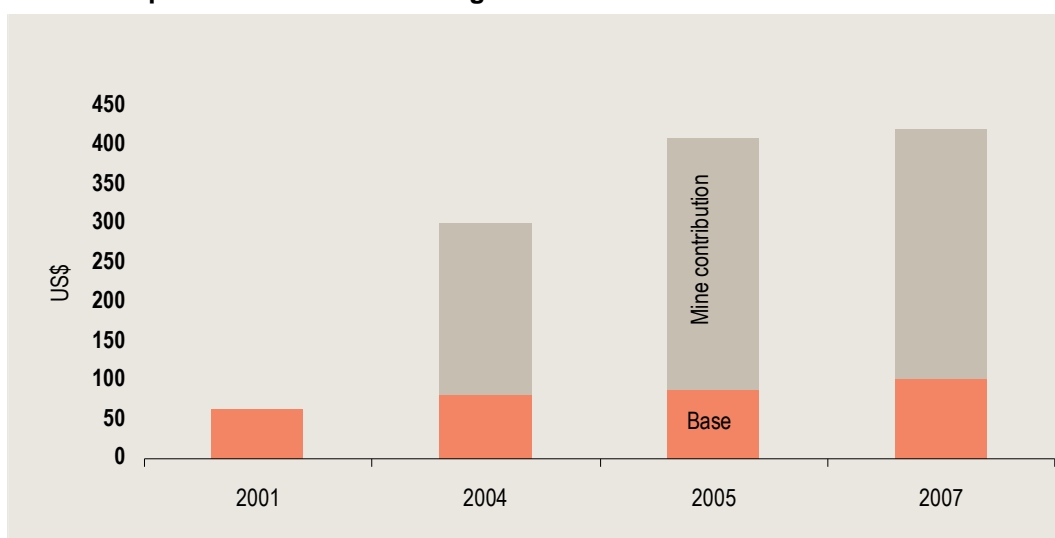
Data source: World Bank, CIE estimates using CGE model.

Contribution to SPDA income

Estimates of per person income in the SPDA (from household surveys, see Earth Systems Lao 2008) show that income has increased dramatically since 2001.

Assuming that without the mine per capita income for these villages would have grown at the national average, then as chart 4.4 illustrates, the majority of income growth in these villages is due to the mine. These estimates imply that in 2007, SPDA village per capita income was 310 per cent higher than it would otherwise have been in the absence of the mine.

4.5 Per capita income in SPDA villages



Data source: CIE estimates based on Earth Systems Lao (2008)

5 *Other indirect effects*

Long term assets at the local level

A key feature of the Sepon mine operations is the focus on sustainable development at the local level. This takes a number of forms, but the common feature is the construction of long term human and physical assets.

Business development

The mine supports a variety of local business activities: both to service the needs of the mine, but also to establish businesses that are independent of mine activities and so have a life after mining has ceased.

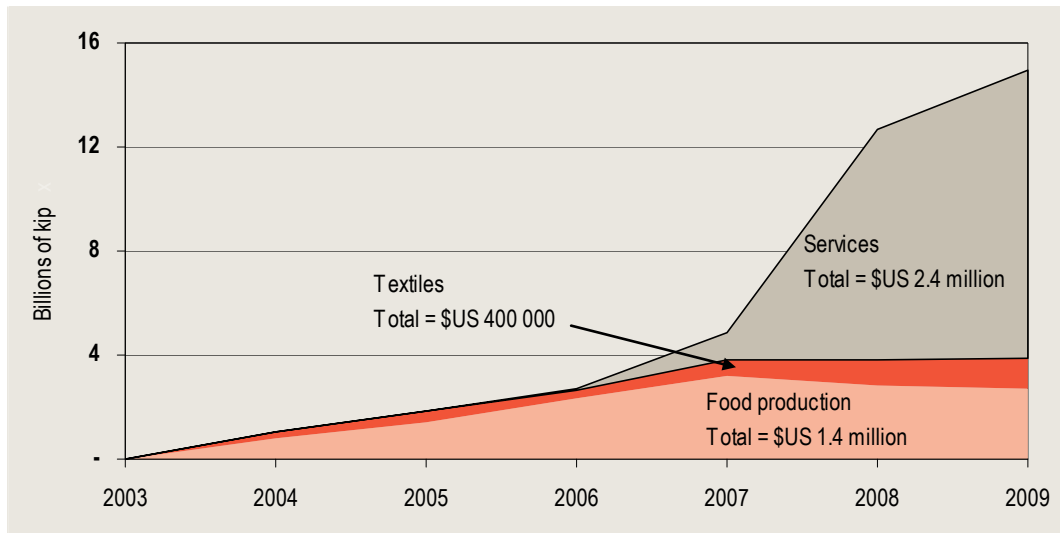
Recently, the mine has formally contracted a number of activities including camp laundry and housekeeping, camp maintenance and camp shops and bars. Local businesses bidding for this work were provided with formal training and mentoring in business planning and proposal development, and continue to be supported and advised in their ongoing activities.

Business development support has been provided for a variety of activities. Chart 5.1 summarises key income flows from these activities. Over the period, income from food production activities amounted to \$US1.4 million (expressed in real 2009 dollars). Income from textiles came to US\$400 000 while income from service related activities came to \$2.4 million.

Chart 5.2 provides a breakdown of the elements of each of the key sets of activities. The majority of income from food production came from vegetables, although pigs were also significant. Within textiles, the sale of sample bags to the mine has been important, along with sales of clothes from Vilaboutique, a local 'label'.

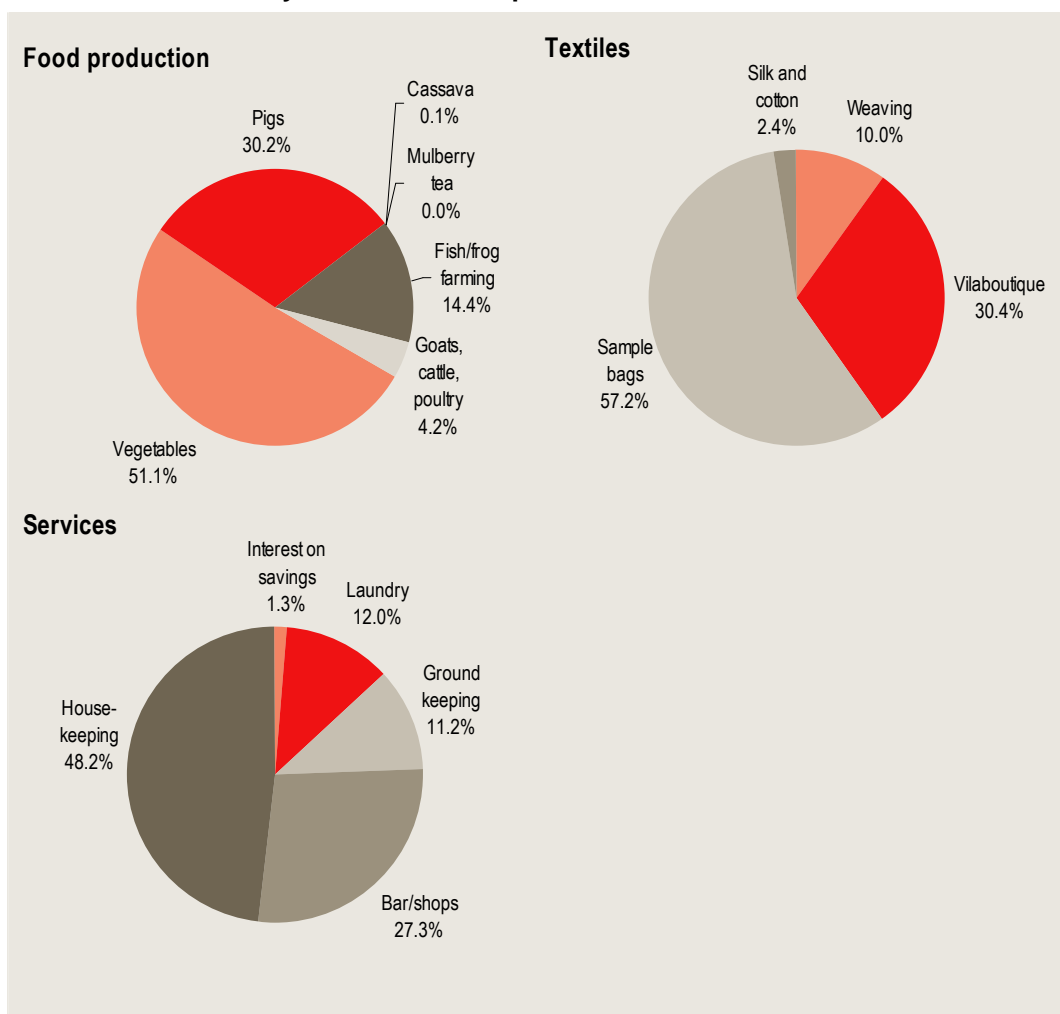
The services activities basically cover the businesses providing services to the mine camp, including housekeeping, bars and shops, grounds keeping and laundry.

5.1 Income from business development activities Constant 2009 dollars



Data source: LXML

5.2 Breakdown of key business development income sources 2003-2008



Data source: LXML

Training

The Sepon project provides a range of training facilities for its staff – both during and pre-employment. The mine provides an Apprenticeship Program and a Pre-Employment Technical Training Program. These programs (delivered in conjunction with the Royal Melbourne Institute of Technology) provide training in a range of areas including electrical, engineering, carpentry and joinery and automotive technology. The direct training budget is currently US\$2.36 million which is just a part of the \$5.6 million human resources development budget.

Social sustainability and trust funds

LXML's annual community relations budget is greater than US\$5.8 million. This budget encompasses community development, community outreach, sponsorships, compensation, mitigation and research. Part of this budget includes the US\$500,000 per annum Sepon Development Trust Fund (SDTF) which commenced in 2003. The fund started at US\$200,000 but has been increased over time and has so far contributed US\$2.9 million to development work in Vilabouli. A separate discretionary Social Mitigation Fund contributes an additional US\$500,000 to mitigate specific mining impacts and to deliver long term sustainability outcomes for the community beyond mine life.

The SDTF allocation funding to a number of key areas including:

- **Education.** The fund has been used to build and maintain local schools as well as to provide basic educational materials and to provide scholarships to local villagers.
- **Health.** The fund has been used to provide buildings equipment to Vilabouly hospital, to help develop a maternity ward and to provide funding for expert medical visits.
- **Agriculture.** The fund has been used to develop agricultural business activities as well as to provide training to villagers in a variety of activities along with the construction of market buildings.
- **Industry and handicrafts.** The fund has supported the provision of electricity to a dozen villages as well as providing funding for handicraft production and training.
- **Transport, communication and infrastructure.** The fund has been used to construct, seal and maintain roads connecting villages in the region as well as to construct bridges. The fund has also been used to repair powerlines, provide power transformers and water supply facilities.
- **Tourism.** The fund has been used to develop the capacity for the district to attract and service tourists. This includes repairs to guest houses, support for local activities and the production of brochures and other material.

UXO clearance

According to the UN, 2 million tonnes of bombs (many antipersonnel cluster bombs) were dropped on Laos between 1964 and 1973. With high failure rates, this has led to a significant problem with unexploded ordnance. Across all Laos, there are estimated to be 300 UXO victims per year, of which deaths are around 105 per year (Griffin et al 2008).

Since exploration at Sepon commenced, the mine has cleared over 100 000 UXOs from over 3 500 hectares of land (with no injury). This provides a major contribution to development in the local area given that almost no land is free of UXO and poses a constant threat to farming.

Investment demonstration effects

Sepon mine was the first major foreign direct investment and the first large scale mine in Laos. As such it broke new ground in terms of dealing with government, business, and the community. It demonstrates the potential for foreign direct investors and shows that the country risks associated with investment may not be as high as previously thought.

Foreign direct investment in a least developed country such as Laos has another significant impact – it demonstrates to potential foreign investors that the Lao government is open to foreign investment and that a large investment in mining such as the Sepon mine can be successful. Since Sepon commenced mining investment has increased rapidly, including the Panaust Phu Kham operations as well as a number of Chinese, Vietnamese, and Australian firms currently exploring gold, copper, and other minerals throughout Laos.

Although the mining sector in Laos is relatively small by international standards, the country has large mineral wealth deposits that will help it develop into a viable long term industry. While only 30 per cent of the country has been surveyed, around 550 mineral deposits have been found (UNDP 2006).

The large potential for mineral extraction and the success of the Sepon mine means the Lao government can now develop an industry that will bring in additional economic benefits associated with foreign direct investment, thereby leading to further poverty reduction and greater capacity building. The rapid increase in foreign investment since Sepon commenced operations can in part be put down to the demonstrated success of major projects. Importantly, Laos is now seeing light industry in the form of downstream copper processing relocating to Laos. A development the company has been quick to support with local supply.

Business demonstration effects

Business demonstration effects are derived from the Sepon mine working with Lao businesses in developing international business practices within day to day transactions. These are expected to lead to improved productivity for the Lao business and build capacity to increase the competitiveness of Lao businesses in the export market. There are three primary types of business demonstration effects from the mine. These include:

- international commercial frameworks;
- safety standards; and
- environmental standards.

International commercial framework

As part of supplying Sepon mine, the supplies and logistics department at LXML require a good commercial framework and appropriate business skills. Establishing good business practices with Lao suppliers promotes a more competent and reliable supplier base and provides an incentive for other businesses wishing to supply to the mine to improve their practices. It also generates confidence in dealing with other businesses in Laos and internationally, thereby helping them to invest and plan for the future.

In addition, the mine also demonstrates good employment practices to other Lao businesses as they are world class. Sepon mine provides workers with above average wages, modern equipment, world class working conditions, continual training, and promotions in recognition of good work.

Safety in the workplace

Sepon mine is also demonstrating good practice in safety throughout the workplace. In fact, safety is considered to be one of the most important considerations at the mine. This is demonstrated by the large amount of resources devoted to safety training and the mine's motto 'Zero Harm'. The safety knowledge imparted on Lao businesses improves their business practices and develops the potential for them to expand their business to a wider variety of markets in the future.

Environmental management

Sepon mine is also setting the benchmark in environmental management for mining in Laos. In 2008 the mine achieved ISO14001 accreditation for its environmental management systems which commits the operation to a strict regime of continual improvement and audit. The mine's Environmental and Social Impact Assessment (ESIA) that was initially undertaken in 2001 and updated periodically (most recently

2009) set the standard for other Lao mining companies and have provided the Government with a measure to assess other environmental and social impact assessments.

As a consequence, the environmental management programs implemented by LMXL at Sepon mine have been successful at limiting the sites environmental footprint. Project impacts are restricted to actual disturbance areas and any impacts on the Namkok are understood to be limited. As pits and waste rock storage facilities are opened and closed, LXML constantly reviews its environmental management strategies so that lessons learnt from past experiences can aid in improving the environmental management of future project expansions.

6 *Conclusions*

Observed outcomes from the mining activities at Sepon indicate that it is making a significant contribution to the Lao economy – both economywide and at the local level. There are few other projects in Laos providing the general development impetus generated by the Sepon mine. When compared with the Nam Theun hydroelectric project – itself receiving considerable support from development agencies – Sepon is likely to provide greater overall benefits. This illustrates the potential for private investment to provide development prospects for the Lao economy.

While some concern has been expressed about Laos dependence on natural resources for its recent economic growth, an appropriate policy response to this is to work on removing barriers to other sectors, rather than to trying to limit the sustainable use of natural resources. Indeed, the Sepon project illustrates – particularly at the local level – that resource revenues can be used as a lever to developing the human and physical capital needed to effectively engage in a variety of economic activities.

There is no evidence in the operations of the Sepon mine that Laos is yet suffering from a ‘resource curse’. With appropriate mineral development – including an understanding of the factors that have made Sepon successful – there is no reason why mineral development cannot continue to provide significant growth prospects for the Lao economy.

References

- Abuzar A, Secretario F, and Suan, E 2006 *Development of an Input-Output Framework: An Application to Savannakhet, Lao PDR*, Economics and Research Department, Asian Development Bank. Available at www.adb.org/statistics/ics/lao/Technical-Paper-Input-Output.pdf
- ABARE (Australian Bureau of Agricultural and Resource Economics) 2009 *Australian Commodities* vol. 16, no. 4, December Quarter. ABARE, Canberra.
- Earth Systems Lao 2008 *Sepon Project Socio-Economic Household Survey Report* prepared for Lane Xang Minerals Limited.
- Griffin R, Keeley R and Sayyasouk, P 2008 *UXO Sector Evaluation Lao PDR June-July 2008 Final Report* available at www.undplao.org.
- Humphreys M, Sachs J and Stiglitz J (Eds) 2007 *Escaping the Resource Curse* Columbia University Press, New York.
- Lederman D and Maloney W (Eds) 2007 *Natural Resources: Neither Curse nor Destiny* The World Bank Washington and Stanford University Press California.
- UNDP 2006 *International Trade and Human Development Lao PDR 2006: The Third Lao PDR National Human Development Report*, United Nations Development Program. Available at www.undplao.org/whatwedo/bgresource/humandev/UNDP-NHDR06c.pdf
- World Bank 2005 *Project Appraisal Document for the Nam Theun 2 Hydroelectric Project* March 31. Available at <http://www.worldbank.org/laont2>.