Valuation of Natural Resources

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VALUATION OF NATURAL RESOURCES :

TIN MINERAL
INDONESIA CASE

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ABSTRACT

Like other mineral properties, tin minerals are different from real properties in many ways. Some of those differences are the impossibility to view, the difficulties to take measurement of properties to be valued, and therefore required complex analysis in determining the value.

To arrive at value by applying the discounted future earnings , identifying the income becomes the critical step, since the income is a function of the mineral produced and the selling price, which is the later relatively fluctuative in the international market.

Effort in understanding the mining process to "finished" products and analyzing the market competition in tin industry, has made a conclusion of US$ 543 million being the value of tin mineral in Indonesia as per June 30th, 1995.

VALUATION OF NATURAL RESOURCES :
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INDONESIAN CASE

The Indonesian territory that consists of about 70% water and 30% land area and spread over approximately thirteen thousand islands possess a great deal of natural resources.

They are among others : forestry.
oil and natural gas
geothermal
gold.
coal.
tin.
copper, etc.

For the purpose of the workshop, this paper will deal with minerals, and specifically focus on the tin mineral valuation that undertaken in Indonesia not long time ago, as the case study.

The Indonesian tin belt which is approximately 800 kilometers streches from the islands of Kundur and Karimun in the morthwest to the islands of Bangka and Belitung in the southeast.

The Indonesian tin belt is the partially submerged southeastern continuation of the major tin belt which stretches approximately 3,000 kilometers from Southern China through Malaysia before it reaches the Indonesian islands in the South China sea.

Valuation.

When we talk about valuation, it reminds us that the first thing has to be done is to identify the problem : what asset to be valued, purpose of valuation, and methodology.
Having in mind the above , the discussion will also be presented following the same sequence , i.e : Asset to be valued ;
Purpose of valuation ;
Concession Rights ;
Valuation Methodology, and
Case Study.

Asset to be valued.

As mentioned in the topic of this paper, the asset to be valued is the natural resources, in this case mineral. Minerals property differ from other type of real property in that they literally suffer depletion and therefore essentially irreplaceable.

Like any other natural resources, mineral is considered as raw material that needs to be exploited and will be processed into marketable finished or semi finished products.

The valuation subject is not like land and building, where it is possible to view and then to assess the various factors influencing value. Minerals are hidden from view beneath the earth's surface, therefore a test must be carried out to ascertain the quality and quantity of mineral which is present.
The said tests, however, are not discussed in this paper.

Because the minerals are to be valued, it must be possible to extract them, process them and bring them into a state for marketing. Thus, the mining engineering problems and their solutions will affect the value of the minerals.

The minerals must also be marketable. The market is commonly regional, national, or even international rather than local. Whether this is possible or not often depends on the economics of extraction and processing, and the cost of transporting the mineral to the market.
The valuer must understand the concepts involved in those processes, weighing the various factors to arrive at an overall view of the risk involved.

Purpose of Valuation.

According to the Indonesian Constitution 1945, all natural resources are owned by the people of Indonesia, and therefore have to be exploited, and managed for the benefits of the people.

Having in mind the above, practically no private party can possibly "own" natural resources, but only the mining right granted by the government for a certain period of time.
The said mining right is usually not considered as part of the asset of the company or the concession holder, and therefore is not appeared in the company balance sheets.

We all understand that it is the client who normally decides the purpose of the valuation, for they know what valuation is undertaken for.

In this case, the valuation of tin mineral was undertaken for the purpose of giving information to the prospective investors, when the company holding

the concession was going public. By having information of what the resources worth, the investors are expected to have more confidence in the company, and at the same time feel assured of the availability of the raw material.

The valuation reports of the resources are then usually separated from the other asset valuation reports like land, buildings, and plant and machinery ; which appear as "assets" in the company's financial reports.

Mining Rights.

Under Indonesian Law, all natural resources are owned by the people and controlled by the state. Mining activities in Indonesia are governed by the Mining Law, Number 11 of 1967 as implemented by Government Regulation Number 32 of 1969 (as amended). Under this Law the Minstry of Mines and Energy of the Republic of Indonesia is authorized to licence persons to undertake mining activities, including the exploration and exploitation of mineral resources.

Mining activities by Indonesian nationals are carried out under a mining authorization (in Indonesia known as "Kuasa Pertambangan" or KP). Foreign parties may participate in mining activities through a Contract of Work between the Government and an Indonesian limited liability company in which the foreign investor holds equity.

The Mining Law classifies the phases of a mining project as general survey, exploration, exploitation, processing and refining, transportation and sale of minerals. Generally, separate KP's are issued for each of these stages by the Ministry of Mines.

Under Indonesian Law, a dispensation from the Ministry of Mines is requested for any holder to hold an area of more than 10,000 hectares under exploration KP's or more than 5,000 hectares under exploitation KP's.

Details of the types of KP's are outlined in the table below .

Table 1. TYPE OF KP's.

Type of KP's	Duration (years)	Max. no of extention	Length of each extention (years)	Max. area (hectare)
General Survey	1	1	1	5,000
Exploration	3	2	1	2,000
Exploitation	30	2	10	1,000
Processing & Refining	30	unlimited	10	
Transportation & Sale	10	unlimited	5	

There are some requirements that have to be fulfilled by the concession holders in order to keep the concession or mining right at hand.
One of the most important requirement is the environment control. The concession holder is obliged to control the environmental impact of their operation and on restoration of mining or concession area.

An independent expert is also assigned to monitor progress and act as an environmental auditor to the company.
The audit covers some subject areas on which the company needs to concentrate controlling and minimizing environment impacts.

These area are :

Mining operation,
Reclamation & rehabilitation program
Waste management
Fuel management ;
Water quality and conservation ;
Air quality ;
Environment monitoring ;
Socioeconomic commitment ;
Management system.

Should the government find the company does not comply with the requirement, the concession right may be temporarily suspended.

Valuation Methodology.

As we all know the traditional approach like comparative approach is known as the most reliable approach to arrive at value. However, the application is limited by the availability of market evidence.
In the case like Indonesia, where the natural resources nor the mining rights are not transferable, the sales comparison data for similar asset is out of question.
Even if "comparables" can be found internationally, they are often part of a complex sale, so it is impossible to extract data on a single property.

Another reason why the sales approach is inapplicable is that mineral properties change in value so rapidly that may be caused by development of new ore body, production of subtantial amount of the previously known ore, cut down the operating expenses, or installation a new method for processing.

Understanding the assets to be valued and the stream of earnings, the value of natural resources is derived through the application of Discounted Future Earnings Methods.
Through this method, the economic value of the resources is the present worth of its expected future earnings. The earnings may be influenced by many factors, current conditions, and the costs are varied. The net return is created that can be capitalized into value after the probable life of the resources is established.

The model usually uses constant costs and prices and the Net Present Value (NPV's) are then determined at more than just one discount rates.

The basis of the model is taken from the company's financial model and production schedule, covering a period of projected production time.
Naturally where considered necessary the basic data prepared by the company may be modified to take account of changes considered appropriate following the technical visits carried by the experienced valuer/s.

In order to carry out the valuation of natural resources, some basic data are required and therefore have to be gathered sufficiently through competent and reliable sources of information.

Required Data.

The basic data that required for undertaking mineral valuation may be obtained from the company's key personnel through direct interviews, the company's record questionaires, as well as personal observation of the assigned valuers.
The data related to reserves estimation is obtained from the reports of geologist and or geophysicists.

The basic data are among others :

a. ***Mineral Reserves ;***
b. ***Production Schedule ;***
c. ***Revenues ;***
d. ***Operating and Capital Costs ;***
e. ***Plant and Equipment.***

a. Mineral Reserves.

The estimation of reserve is a critical step in the valuation of mineral property. It has no value if it costs more to extract the mineral than the producer can sell it for.

Based on the strength of the underlying definition of economic factors and recovery factors, minerals are devided into proven reserves and probable reserves.

Proven reserves is defined as measured resources of which detailed technical and economic studies have demonstrated that extraction can be justified at the time of the determination and under specified economic condition.

Probable reserves is defined as measured and or indicated resources which are not yet "proven" but for which detailed technical and economic studies have demonstrated that extraction can be justified at the time of the determination and under specified economic condition.

Every mineral deposit is finite. Its proven reserves may expand with a rising price or the advent of new technology, but the proven reserves cannot exceed the total amount of minerals in place. In fact, proven reserves are always less than the total volume of mineral deposit, because a point of diminishing returns is always encountered in extracting the mineral.

b. Production Schedule.

The schedule of production is another data that has to be gathered by valuer, in order to forecast the future earnings of the company. The production schedule may be obtained from the company's forecast.

The production rate is another factor - besides the physical depletion - that determines economic life of the deposit. The production rate is determined by the market and the capital investment.

c. Revenues.

The major source of company revenue has to be first identified, what product/s that the company sells, and the quantity of product to be sold. It is evident that that gross income is the product of the production rate and the unit price.
If the product is sold internationally, then the analysis becomes more complex. The sale price is also analyzed, whether it includes a premium over the applicable international standard price.

Sales of by-products, if any, are also accounted for by means of calculated equivalent value per unit or volume of main product, based on the values achieved by the company in the past.

d. Competition.

Competition is another matter that has to be analyzed by valuer, as it is a multi-faceted in the mineral industries. In an upswing of the industrial cycle most mineral commodities may not suffer from competation, meaning it is possible to sell all ores produced. In a downswing, tough competition may set in.

Competition to minerals may also come from other products, the most notable being replacement of minerals by wood products such as plywood.

e. Operating Costs.

The operating costs are normally treated in the similar manner to those used in the company's forecast, with general headings covering :

direct production costs;
indirect production costs; and
general overhead costs.

f. Capital Costs.

The term development costs is used for mineral properties is a different sense than it is for commercial or residential properties. Mining development costs may be incurred variously by building roads, removing the overburden, and digging shafts and tunnels. These actions are taken prior to the time that any ore is produced and sold.

The company's forecast which contains a schedule of capital expenditure can be used in the valuation. If a mineral deposit is not worth more than its development costs, the company is in trouble.
The valuer has to examine in detail the major area of company's capital investment and give some comments on that matter.

g. Plant and Equipment.

The value of plant and equipment used in the production have also to be included in the valuation.

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Case Study : Tin Mineral Valuation in Indonesia.

a. Mineral Reserves.

The mineral reserves to be valued are located in the islands of Bangka, Belitung, Kundur and Karimun, in the west side of the Indonesian Archipelago.

Table 2. MINERAL RESERVES STATEMENT.

Location of Reserves	Proven reserves (in tonnes)	Probable reserves (in tonnes)	Total (in tonnes)
Bangka Island	237.500	135.000	372.500
Belitung Island	6.250	10.000	16.250
Karimun & Kundur Islands	51.250	50.000	101.250
Total	**295.000**	**195.000**	**490.000**

The above table showed the mineral reserves of the company as per June 30th, in the year of 1995, which was the cut-off date of the valuation.

b. Production Schedule.

The company's forecast as per June 30, 1995 has been used as a basis for a model.

In the year of 1994, the company produced approximately 34,000 tonnes of tin, of which inland mining and offshore mining each accounted for approximately 17,000 tonnes. In the first six months of 1995 it produced 17,600 tonnes.

The Table below shows the breakdown of the offshore and inland production in the last three years, and the six months ended June 30th, 1995.

Table 3. TIN PRODUCTION.

	1992 (in tonnes)	1993 (in tonnes)	1994 (in tonnes)	1995 (in tonnes)
Offshore mining	13.595	14.405	16.960	8.528
Inland mining	12.199	13.948	17.020	9.091
Total	**25.794**	**28.353**	**33.980**	**17.619**

Based on the above production schedule, all of the proven and probable reserves will be mined by the company within ten (10) years time, through both inland and offshore mining operations.

The offshore mining is carried out by a fleet of 21 bucket line dredges, the largest offshore dredge mining fleet in the world. In the year of 1994, dredge availability averaged 520 hours per month. This gave rise to a total of approximately 43.8 million cubic meters of tin ore body being mined.

All inland mining operations are carried out by local contractors. As of June 30th 1995, the company had 330 inland mines which operated by 205 local contractors. Contractors are considered to be more cost-effective than direct operation by the company.

The company pays the contractors a fixed fee for the recovery of tin concentrate based on the number of tonnes of tin concentrate recovered.
Most of the contractors are engaged on the one year contract, although the company is gradually replacing these with three to five year contracts.

c. Production Cost.

The company believes that it is currently one of the lowest cost tin producers in the world.

The following table shows the company's total operating cost and cash operating cost per tonne of tin for the three years ended 31 December 1994 and six months ended 30 June 1995.

Total operating cost comprises of cost of goods sold and operating expenses, while cash operating cost comprises total operating cost less depreciation.

Table 4. OPERATING COSTS.

		1992	1993	1994	1995
Total Operating Cost	Rp (million)	9.9	10.1	9.5	9.7
	US Dollar	4,421	4,493	4,223	4,310
Cash Operating Cost	Rp (million)	8.3	9.7	8.6	8.6
	US Dollar	3,714	4,302	3,816	3,823

d. Capital Expenditure.

The capital expenditure of the company for the past three and a half year amounted to Rp 200.2 billion or equivalent to US$ 89.1 million : Rp 17,155 million in 1992 ; Rp 36,417 million in 1993 ; Rp 99,694 million in 1994 and Rp 46,909 for six months of 1995.

e. Revenues.

The major source of revenues is the sale of the various grades of tin metal. The base metal price has been taken as US$ 6,500 per tonnes. This is assumed to include the average premium over the standard published tin price which is obtained for the two company's major brands of tin produced.

Sales of by-product minerals are accounted for by means of a calculated equivalent value per tonne of tin metal, based on the value achieved in 1994. This has been calculated to be US$ 50 per tonne of metal produced.

f. Operating and Capital Costs.

The operating and capital costs have been taken from the company's forecast. The operating cost was based on 1995 rates, the major capital investment was in the dredge reconstruction and reconditioning program.

g. Sensitivity Analysis.

Sensitivity analysis was carried out on the NPV with respect to changes in tin price, operating cost and capital cost. The result is as follows :

Variation from base	Tin value*)	Capital Cost*)	Operating Cost*)
-20%	268	567	687
-10%	406	555	615
0	543	543	543
10%	681	532	472
20%	819	520	400

*) *in million US Dollar*

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*) *in million US Dollar*

h. Value Conclusion.

At a tin price of US$ 6,500 per tonne, the value of the mineral calculated through the NPV on pre-tax basis with discount rate 15% is US$ 543 million.
If the discount rate is lowered to 10% the value will rise to US$ 669 million, and alternatively if the discount rate is raised to 20% the value falls to US$ 450 million.

The proven reserves support 68% of the total production schedule to the year 2004. However, as the proven reserves are mined predominantly in the early years, the income derived from the proven reserves represents 75% of the NPV and the income from the probable reserves represents 25% of the NPV.

The value of the mineral as per June 30th, 1995 is then US$ 543 million.

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