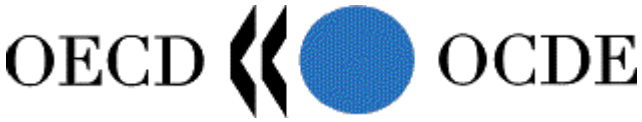

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THE INDONESIAN ENERGY AND MINERAL RESOURCES DEVELOPMENT AND ITS ENVIRONMENTAL MANAGEMENT TO SUPPORT SUTAINABLE NATIONAL ECONOMIC DEVELOPMENT

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ABSTRACT

Geologically, Indonesia is a potential region for the formation of various energy and mineral resources. Exploration activities that have been carried out since 1800's up to the present time, have successfully uncovered these resources in numerous areas. Among these various resources, oil, gas, coal, coal, tin, nickel, copper, and gold have so far given important contribution to the Indonesian economy. The majority of Indonesian territory has not been explored thoroughly, and therefore the chance to discover new economical energy and mineral deposit is likely to be substantial.

In the energy sector, oil is the primary source of energy since the last 30 years, and it may bring about quick depletion of this resource in the near future. Steps are being taken to sustain the benefit of this resource, by intensifying exploration to gain more oil reserve, accompanied by diversifying the use of different types of energy, and implementing conservation policy. Natural gas is the second most important energy source, and it will play important role in reducing the share of oil in the very near future. Coal and geothermal resources may become other important sources of energy, considering their widespread occurrences. Besides, there is also a number of potential renewable energy resources that can be developed in the future. The availability of divers energy resources in Indonesia may guaranty the security of national energy supply for a long period of time.

The contribution of mining industry to the national economy is needed now, more than ever, to help drive the economic recovery from the crisis, and in the longer term, to play a key role in national sustainable economic development. Whilst satisfying the demand to increase the role of the energy and mineral sectors to support the national economy, the government will also remain committed to protecting the environment through the passing and implementation of appropriate laws and regulations.

A number of environmental issues need to be seriously managed, and these include good mining practices, post mine land use, and regional and community developments. The community development program in particular, should be clearly defined by each operating company in cooperation with central and local governments and local community. It will play an important role in supporting the poverty alleviation program which currently is part of the government's national strategic agenda.

INTRODUCTION

The occurrence of energy and mineral deposits are determined by the geological characteristic of a region. Besides, these geo-resources are distributed unevenly across the earth, and consequently a region may fall into one of three categories; rich, partially rich, or poor. Moreover, there are only a few regions in the world which can be categorized as being rich in energy and mineral resources. Indonesia is quite fortunate because it can be regarded as a mineral-rich country, as its geologically prospective for the formation of various energy and mineral resources. Some of these deposits, particularly gold, silver, precious stones, and building stones, have been utilized, since the early centuries when the Hindu and Chinese cultures entered this region.

Scientific exploration in Indonesia was introduced by the European geologists, particularly the Dutch, starting in the 18th century, after the industrial revolution in Europe. Since then, numerous energy and mineral resources such as oil and gas, geothermal, coal, gold, copper, tin, nickel, iron, aluminum, diamond, and various non-metallic minerals and rocks, have been uncovered. In line with this important discovery, the geological characteristic of Indonesia was also starting to be understood. This early data seems to have encouraged further geological investigations that have been continuously conducted until now. Exploration activities were continuously carried through after Indonesian independence, particularly since the late 60's when an intensive National Development Program began, resulting in the discovery of many more energy and mineral deposits.

The occurrence of various energy and mineral resources in Indonesia constitute a competitive advantage, compared to many geologically-resource poor countries. Therefore, Indonesia is very fortunate in being able to make use of these resources to back up national economic development for the sake of the people's prosperity, as declared in the Country's Constitution of 1945. Although these resources have so far played an important role in supporting the country's development program, improvement of resource management is urgently required to achieve a better performance in the future.

The significance of energy and mineral resources is clearly demonstrated by their utilizations since the ancient time up until the present day. As an example, earth and mineral materials have been the basic elements in producing numerous items such as bricks, roofing materials, flooring , cooking tools, cement, jewelry, fertilizer, perfumes, ceramic, paint, medical, and pharmaceutical products, cars, trains, air craft, electric and electronics devices, etc. Similarly oil and gas are the most important energy sources and constitute principal components in producing diverse petrochemical products such as plastics, paints, asphalt, fertilizer, lubricants, insecticides etc .

The diverse energy and mineral resources in Indonesia should be able to act as the key driver for national economic recovery and just as importantly, give support to ongoing national development. With a few exceptions , most energy and mineral resources are non-renewable resources. Therefore, their development requires proper management, so they can be continuously advantageous not only for the present but also for the future generations. In addition, extractions of these resources potentially damage the environment, and accordingly careful handling and control are urgently needed to keep such damage to a minimum level.

ENERGY RESOURCES DEVELOPMENT

Over the past 30 years energy supply in Indonesia has grown at an average of 8% per annum, and energy demand has grown at a similar rate. Among the many natural energy resources that are available, oil is the most economical and widely used resource in Indonesia. The currently known Indonesian oil reserve represents about 1% of the total world reserves.

It has frequently been stated that with the rate of oil exploitation of 1.5 million barrels/day, Indonesia will soon become a net importer, unless new significant deposits are discovered. Fortunately, there have been 60 hydrocarbon basins discovered, of which thirty eight have been explored and fourteen are currently producing, and the other twenty two have not been explored thoroughly. This means that the chance of discovering new deposits is likely to be substantial. It is important to note, recently there have been significant discovery of oil deposits in old fields in East Java and South Sumatera, and in new fields in the deep water environment in the offshore areas of eastern Indonesia. It certainly demonstrates the high incidence of hydrocarbon occurrence in Indonesia, and gives rise to the real expectation that similar discoveries may be made in the other fields, both old and new.

Another important energy source in Indonesia is natural gas, which constitutes the second largest proven and potential reserves in Asia. The share of natural gas for primary national energy supply has grown significantly from 6% to 27% during the last 30 years, however over half the gas produced has been exported overseas. Gas is currently under-used in Indonesia when viewed in terms of the gas resources available, and there is plenty of scope for gas to replace oil in the future. At present oil meets 75% of energy demand in Indonesia while gas meets just 10%. The use of natural gas will provide consumers with a more environment friendly energy source. Together with oil, natural gas also represents the backbone of petrochemical industry, which is another prospective contributor to the Indonesian economy.

Fig. 1 shows oil and gas resources development that increase from 1996 to 2000. The production and investment performances tend to decline (Fig. 2 and Fig

3) during the last couples of years, due to unrest situation in several areas. The situation is now getting better, and oil and gas activities are expected to go back to normal soon.

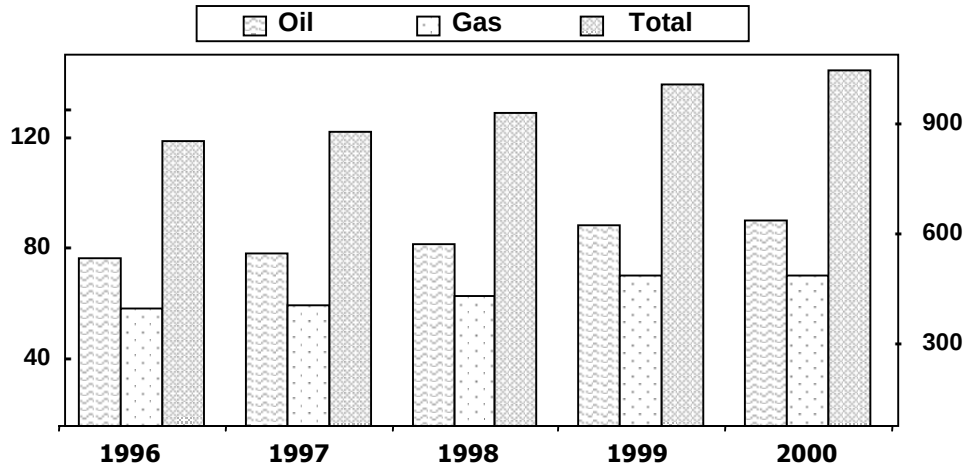

Fig 1. Oil and gas resources development
(Dept. Energy and Min. Res, 2001a)

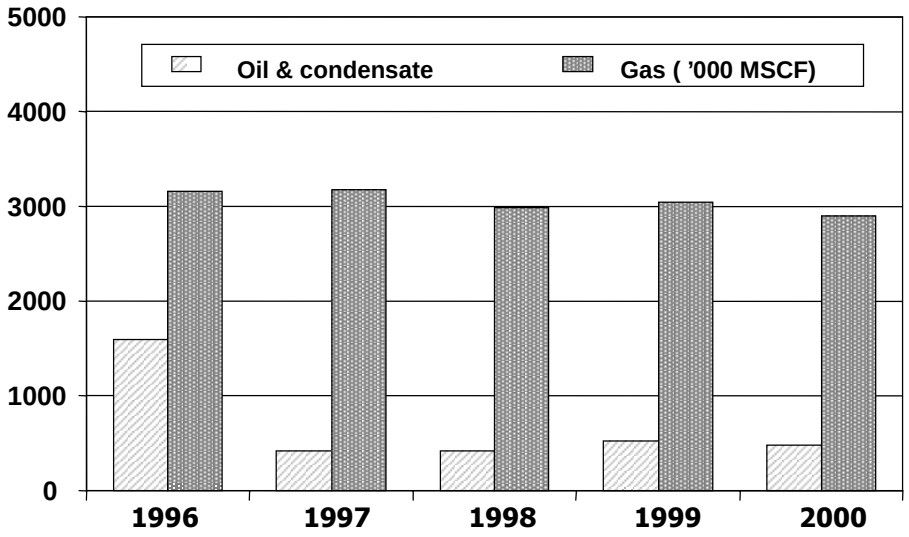

Fig 2. Oil and gas production (Dept. Energy and Min. Res, 2001a)

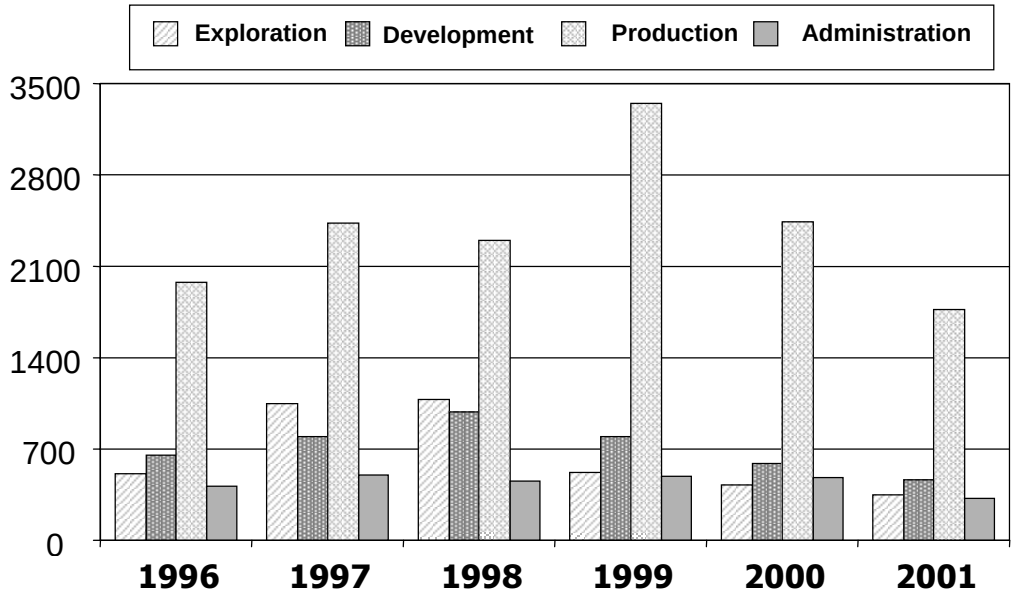

Fig 3. Investment figure - US$ millions (Dept. Energy and Min Res, 2001b)

Apart from oil and gas, Indonesia is also endowed with other geo-energy resources, particularly coal and geothermal. The coal resource is also relatively small compared to the global reserve, and much of these fall into low rank category. Nevertheless, with a total resource of some 39 billion tones, it will be very significant for national energy supply for several hundreds years to come. To date it is the higher quality coal resources that have been successfully developed which has enabled a significant new export industry to be developed for Indonesia, earning valuable foreign exchange for the country.

In terms of geothermal resource, Indonesia is known to have a major occurrence, with total resources of not less than 20.000 MW, which represents 40% of the total global resource. Again, it could contribute significantly to the security of energy supply for a long period of time. From the known and potential resources that could be developed, it can be anticipated that domestic supplies of energy sources can provide a strong foundation for the future of Indonesian economy in the long run.

During the last 30 years the contribution of oil has been very dominant in the Indonesian economy, accounting for close to 90% of primary energy supply in the 1970's. Since then it has decreased to the current level of 57% , being replaced largely by natural gas , whose share has grown from 6% to 27% during this time . However this "diversification" has largely taken place in the export market not in the domestic market. As just mentioned oil still remains very much the dominant energy source to meet domestic demand, supplying 75% of Indonesia's needs and there continues to be concern about the rapid depletion of oil reserves. Consequently, Indonesia continues to seek ways to reduce its dependency on oil. The most effective means to conserve all hydrocarbon resources is through conducting

conservation management in both the upstream and downstream side, to gain a sustainable benefit for the country. The new national oil and gas law that has been issued recently, should enable the government to carry out a more economical and sustainable development of the national oil and gas resources.

Whilst conservation is important, the main focus is on implementing an effective diversification strategy. Besides increasing the utilization of gas there is also considerable scope to increase coal utilization especially in the power sector , given the huge resources Indonesia has. From the economic point of view, the increase of coal utilization will result in enhancing national revenue from this commodity, and at the same time intensifying regional development. Another option is to increase utilization of geothermal energy, which currently accounts for less than 1% of energy supply. The advantage of using geothermal energy is that it is a renewable resource and is environmentally friendly, although it has a number of disadvantages, such as not being readily transportable, being remotely located from industry or settlement centers, and requiring high cost of development. A national energy policy is currently being prepared, to optimally use the different kinds of energy sources.

MINERAL RESOURCE DEVELOPMENT

The Indonesian mineral sector constitutes another potential contributor to the national economy. This sector comprises plentiful commodities, such as metallic minerals, numerous industrial minerals and rocks. Among these various minerals, tin, nickel, copper, gold, and coal, have been produced from world class deposits and they form important national commodities, either for export or in domestic markets. Today, mining projects in Indonesia use less than 0.1% of Indonesia's landmass, in contrast with 33% land mass owned by concession of timber industry. There are many other areas that have not been explored thoroughly either on land or seabed zones. The majority of sea territories have not yet been targeted for mineral exploration. Based on the geological circumstance, it is not being overly optimistic to speculate that many more discoveries will occur in the future.

The Indonesian mining sector performance has been increasing, particularly since the early 70's. This is as a result of the enactment of General Mining Law No 11 of 1967. Based on this law the Contract of Work (CoW) system for foreign investor was introduced long with the Coal Contract of Work (CCoW) system for both foreign and domestic investors, the Mining Authority (MA) system for domestic investors, and Letter of Regional Mining Permit (LRMP) for local / regional industrial mineral development. Since then the Indonesian mining sector has grown dramatically. The CoW and CCoW systems in particular, have successfully attracted foreign investors to explore and develop mineral resources in many parts of the country. In the early 90's Indonesia turned into one of the most attractive

countries in mining investment, and was ranked fourth in attractiveness out of 15 countries after Chile, Argentina and USA.

From 1967 to 2000, there have been 235 CoW's, 119 CcoW's, and 597 MA's issued. This constitutes a major development of the Indonesian mining industry, and as a matter of fact, the CoW and CCoW represent the key drivers for such development. From 235 CoW that have been issued, currently only 86 remain, as 132 have been terminated and the other 17 are expired. Table 1 summarizes the status of CoW, CCoW and MA.

Tabel 4. Status of Contract of Work, Coal Contract of Work and Mining Authorization until 2000

STATUS	CoW	CCoW	MA
Total number	235	119	597
Terminated	132	-	-
Expired	17	-	-
Remaining	86	119	597
General Survey	20	-	21
Exploration	39	-	293
Feasibility Study	6	-	-
Construction	6	-	-
Production	15	16	283

Dept. Energy and Min. Res, 2001a.

PRODUCTION, REVENUE AND PROFITABILITY

Tin, nickel, copper, gold and coal presently constitute the principal Indonesian mining commodities. Their productions tend to increase from 1996 to 2000 except for gold, as shown in Fig. 4. Total mining investment until 2000 was recorded as high as US$ 12 billion. The development of mineral resources is making a significant contribution to the economy, accounting for some 3.8% of GDO, while oil and gas production makes an even larger contribution, accounting for close to 9% of GDP. The government of Indonesia is continuously trying to increase its revenue from non oil and gas mineral development. The sales performance of the mining industry is shown in Fig 5, showing a sustained rise in net sales revenue, except in 1997 and 1998. Total government revenue from 1996 to 2000 is shown in Fig 6, which reflects an increase from 1996 to 1999, followed by a decrease in 2000.

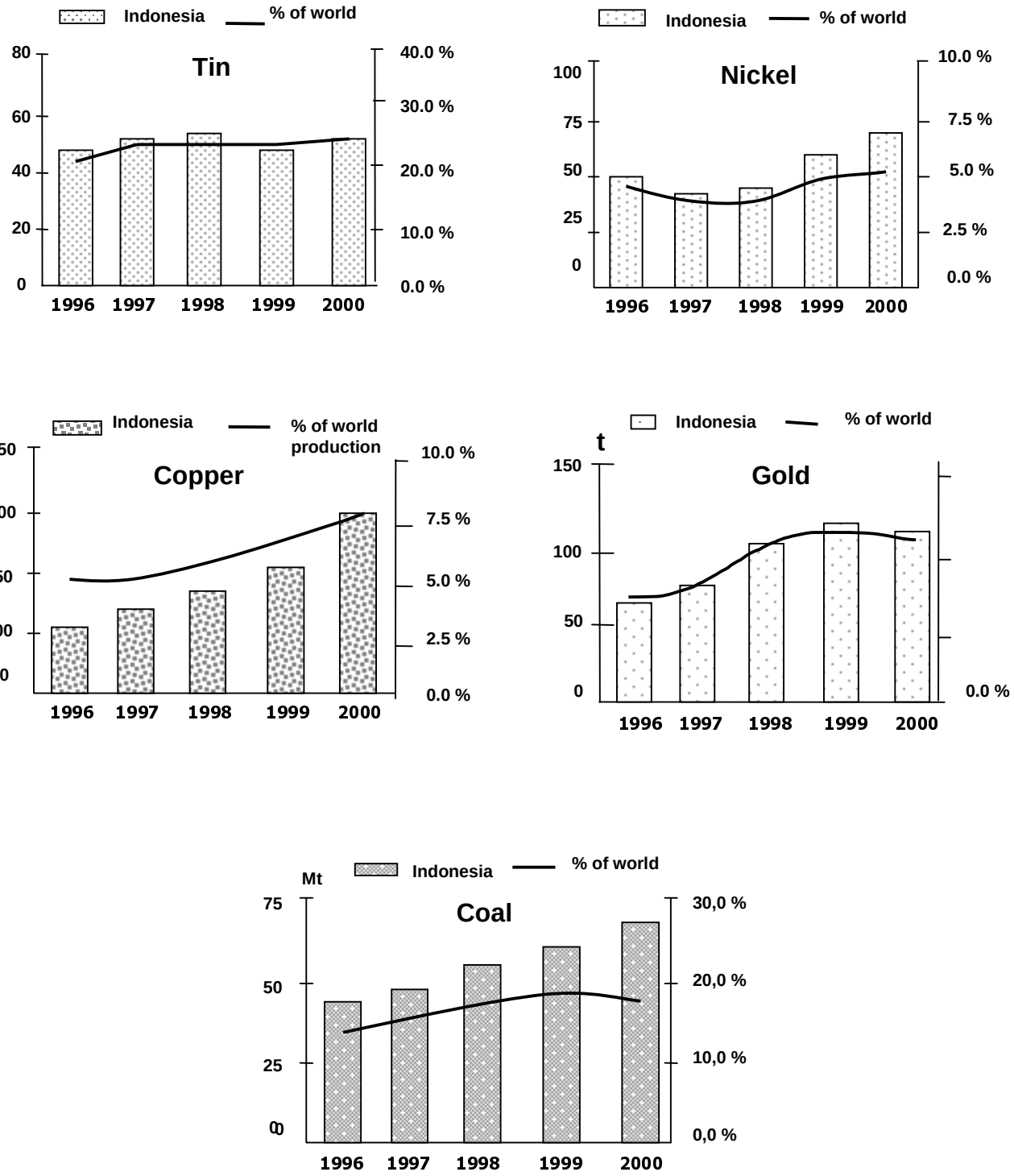

Fig 4. Productions of tin, nickel, copper, gold and coal
(Price Water House Coopers, 2001)

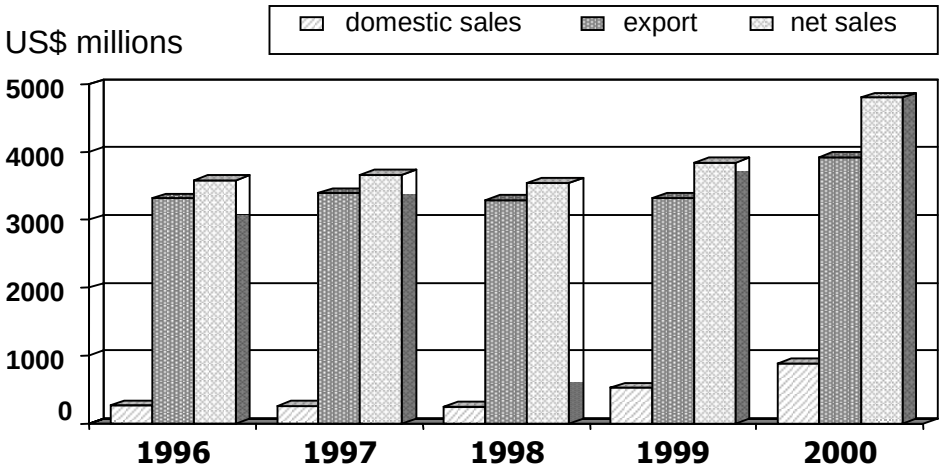

Fig 5. Sales performance (Price water House Coopers, 2001)

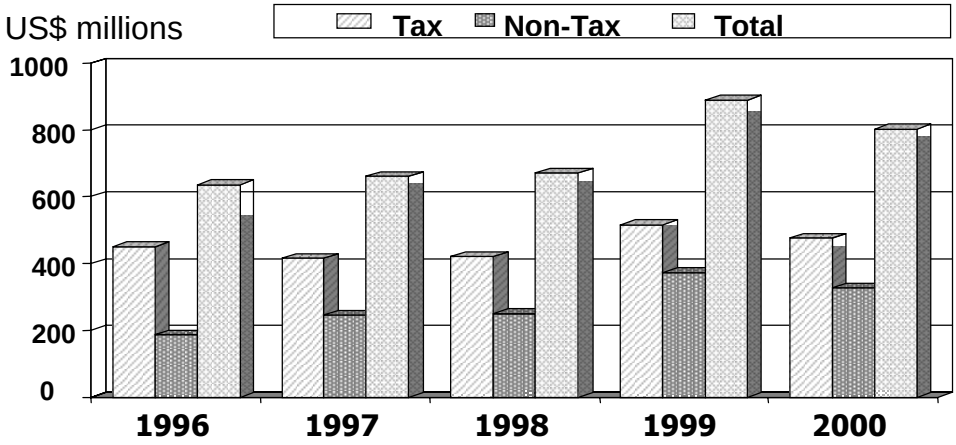

Fig 6. Government revenue from tax and non-tax
(Price Water House Coopers, 2001)

The aggregate profit and lost of Indonesian mining industry is presented in Fig 7. Whilst net sales revenue showed a healthy increase of some 26% in 2000 production expenses in particular increased by a greater amount (45%) resulting in a decrease in net profit . The increase in production expenses was largely driven by an increase in cost production as a result of increased in production volumes, spare parts, equipments and fuel prices. Apart from government revenue, a number of contributions are also given by the industry to the Indonesian economy. This includes employee compensation, purchase from domestic suppliers, dividends paid to Indonesian shareholders, contributions to GDP and to Indonesian export, etc.

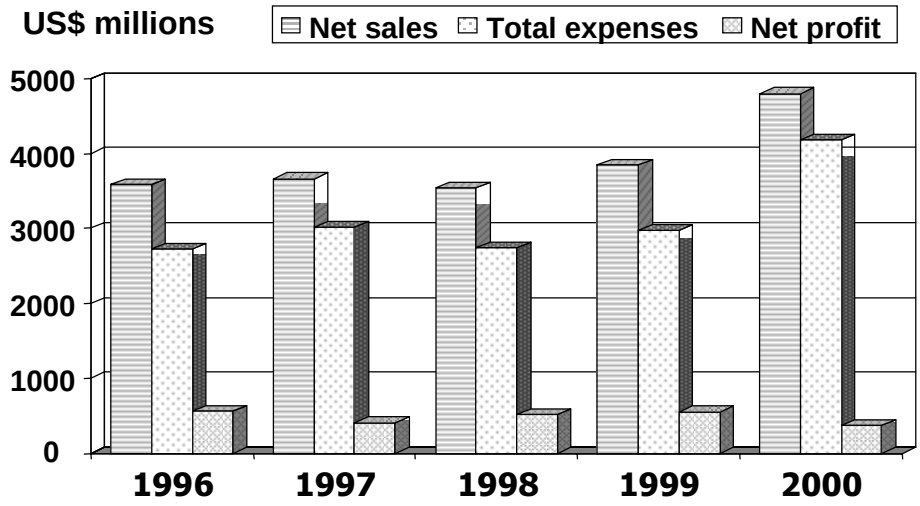

Fig 7. Aggregate profit and lost (Price Water House Coopers, 2001)

EMPLOYMENT AND CONTRIBUTION TO PUBLIC INTEREST

From 1996 to 2000 the Indonesian mining industry has provided not less than 30,000 direct jobs for Indonesians, such as shown in Fig 8. Besides, the industry has made other contributions to the public interest, including employee training, regional development, community development, charitable donations and contributions to non-profit foundations, reclamation, mine closure and environmental control.

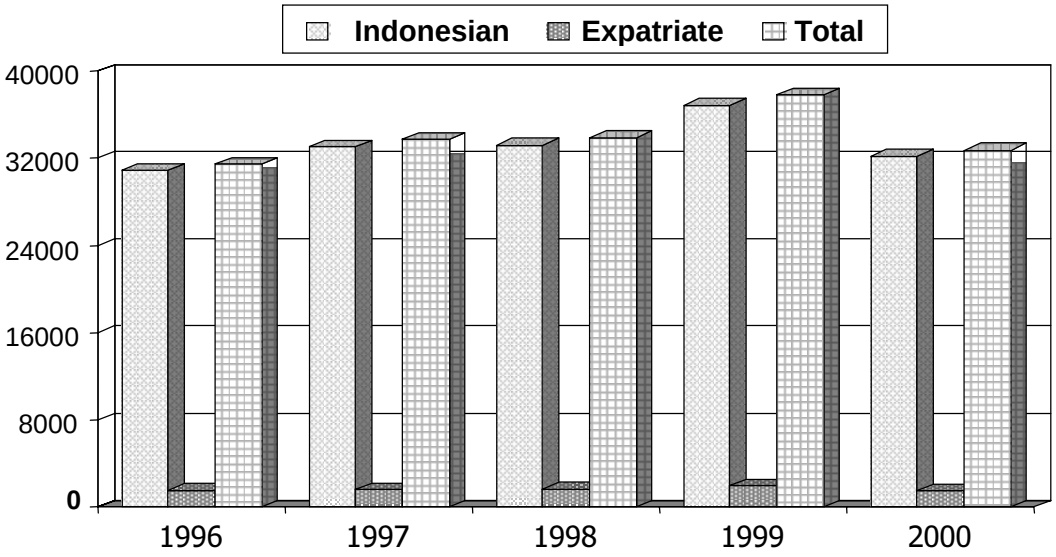

Fig 8. Direct employment (Price Water House Coopers, 2001)

ECONOMIC CRISIS AND INDONESIAN MINING INDUSTRY

In 1997 the economic crisis hit Indonesia and many other Asian countries, resulting in local currency depreciation particularly against US$. In Indonesia the depreciation was severe and had a negative impact on most of national industry performances including the mineral sector. However, the mining industry was less affected than most others as most of the production is exported earning foreign exchange while many production cost components are in local currency. Hence, the industry is actually not affected seriously by the crisis. However, the economic crisis in Indonesia has been followed by a political crisis, which has led to a deterioration in law and order. This has created situation of unrest in several regions, and a substantial increase illegal mining operations.

The above unpromising features have created a uncomfortable situation in the mining industry, causing in particular, a downturn in exploration activities, either due to delays or suspensions. As a result, during the last four years there has been no significant mineral discovery, and consequently, no new mine operations have started up. Performance on total investment, exploration and development expenditures is presented in Fig 9, which clearly shows investment increase from 1996 to 1998, and decrease since then. Exploration and feasibility expenditure tend to decrease, while development spending increases from 1996 to 1999 and continued by a decrease. The other factors that contribute to the decline of the Indonesian mining industry are the enactment of discouraging regulations, which include decentralization of the mining authority following the autonomy policy, and the restriction of mining operations following the Forestry Law No 41 of 1999 .

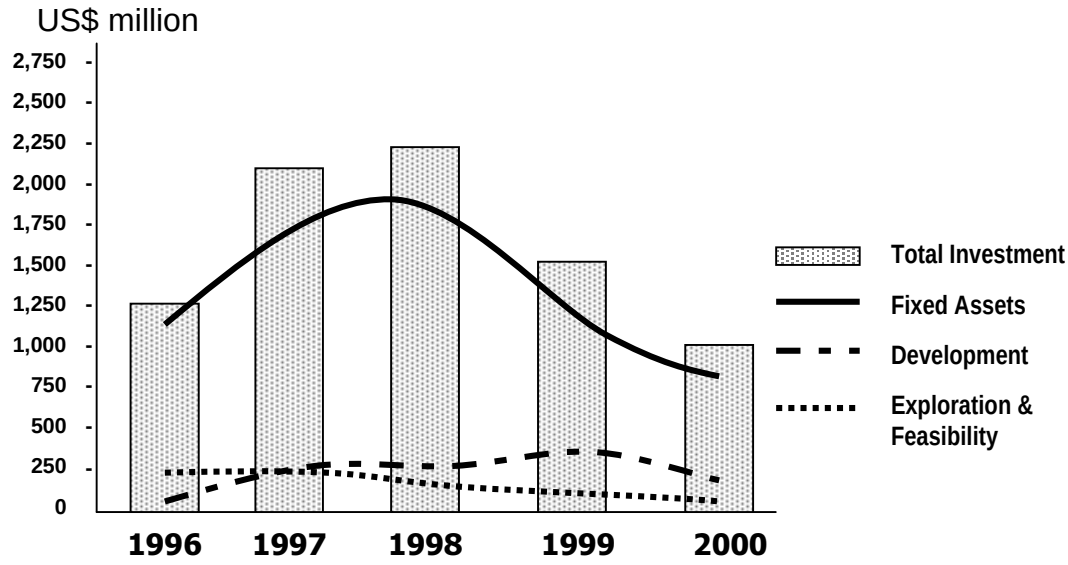

Fig 9. Investment, exploration and development
(Price Water House Coopers, 2001)

Therefore, although the mining industry was not affected directly by the economic crisis during the last four years, it does today face some major challenges. However steps are being taken to address this and to restore the mining industry to its former vibrancy. The government is well aware that the mineral sector provides Indonesia with one its major competitive advantages, in terms of geo-resource assets, second only to oil and gas. Allowing the mining industry to gradually decline is not an option. The contribution of the mining industry to the economy is needed now, more than ever, to help drive national economic recovery and in the longer term to play a key role in national sustainable economic development. With this in mind the government is implementing a number of programs, as follows:

1. Mineral sector restructuring by preparing a new mining law to replace the previous law no 11 of 1967. This new law is designed to accommodate the prevailing issues such as decentralization, the new investment policy, regional and community developments, small scale mining operations, land ownership, worker health and safety, and environmental management.

2. Efficiency Improvement of state owned mining companies, through privatization program.

3. Establishing close coordination with related institutions such as forestry and environment agencies, to create favorable regulations for the optimal benefit of national development.

4. Implementing swift and firm action to stop illegal mining operations.

5. Solving the problems related to regional autonomy implementation.

6. Optimizing ore process toward producing an end product to secure high added value to meet domestic downstream industry demand.

7. Expanding research and development programs toward the utilization of domestic mineral raw materials for intensifying domestic industry.

8. Establishing complete and accurate mineral resource data information system accessible worldwide, to attract mining investment.

ENVIRONMENTAL POLICY IN ENERGY AND MINERAL SECTORS IN INDONESIA

In Indonesia, environmental concerns emerged in early 1970's, and following this the Government enacted Law No 4 of 1982, regarding Basic Provisions for the Management of Living Environment. This Law was then improved and superceded by Law No 23 of 1997 concerning the Management of Environment. The other Law that is associated with environmental issues is Law No 24 pf 1992 regarding National Spatial Arrangement. To implement the Environmental Law, a Government Regulation (GR) was issued, namely Government Regulation No 29 of 1986 concerning Environmental Impact Assessment (EIA). This Regulation was further updated by GR No 51/1993 and recently by GR No 27/1999. The implementation of this regulation is described in the Environment Minister Decision No 17/2001, explaining the type of project or activities that requires an EIA. All these regulations are applicable to the energy and mineral sector.

ENERGY SECTOR

The development of the energy sector in the long term is directed towards guaranteeing self sufficiency in energy. The main goal of energy development is to enhance the welfare of society by fulfilling energy needs. As most are aware, the heavy dependency on oil will result in quick depletion of this resource. The most immediate task should be increasing the use of natural gas, which is available in substantial amount, and in addition, it provides consumers with a more environment friendly energy source. In line with this, steps will be taken to develop and maintain the reserves of energy; to diversify the use of energy; to use energy more efficiently and wisely, and to develop and promote the utilization of renewable resources such as biomass, city waste, solar power, wind power, small scale hydropower and geothermal. To date these energy sources have not been widely utilized as in most cases they have not been able to compete with conventional energy. In the future greater efforts will be made to harness their potential especially to meet energy needs in rural and remote areas in a sustainable manner.

As mentioned earlier, coal is another important energy source along with oil and gas. However, its development potentially harms the environment both during the process of mining and in its utilization. Consequently, a proper handling such as the application of good mining practice, combined with the application of clean coal technology, is urgently needed. The policy towards implementing good mining practice is described in the next chapter.

MINERAL SECTOR

As mentioned previously, the Law No 11 of 1967 concerning the Basic Provisions of Mining, has successfully attracted investors to develop the Indonesian mining industry. As a matter of fact this Law was solely dedicated to attracting investment, which was urgently needed to support intensive National Development Program, beginning in the late 1960's. This Law has in fact already regulated some environmental aspects far before enactment of the environmental law No 41 of 1982 mentioned earlier. This is found in article 30 of Law No 11/1967, where it is stated that mining operators are obliged to restore land which has been mined, after the completion of mining operations, to avoid any damage to the surrounding society.

Since then environmental policy in mining sector has been more fully developed, and changes are still underway. This includes the drafting and publication of guidelines for tailing impoundment, developing mine effluent standards, and providing technical advice concerning environmental conditions of specific mining operations. In line with the economic crisis and the programme to recover from it, there is a strong effort to boost national economic growth, and natural resources may become one of suitable targets for intensive exploitation. Accordingly, the government has to strike a balance between natural resource development and environmental sustainability. However, government must be vigilant and ensure that mining company does not cut cost by avoiding their environmental obligations.

The Department of Energy and Mineral Resources is making extra efforts to enforce and further develop mining environmental policy and regulation to deal with possible increasing environmental disturbance in the future. The objectives of this policy development are as follows:

1. To develop effective mining environmental regulations, guidelines and standard operating procedures.

2. Improvement of organization, jurisdiction, procedures and management of energy and mining environmental regulatory programs.

3. Development of institutional capability to identify and solve potential environmental problems from mining activities.

4. Improvement of mining practices with respect to environmental management

5. Application of national environmental policy to mining operations.

6. Improvement of procedures for reviewing environmental impact assessment (EIA) and environmental audit for mining operations.

7. Strengthening the relationship and coordination between permit and control processes.

8. Increasing the effectiveness of cooperation between related government agencies in the area of energy and mineral resources and environmental management. For example, the EIA is only required for activities that cause substantial environmental impact. Activities causing a lesser impact or an impact which is technologically straightforward to manage, only environmental monitoring and management is required.

PRINCIPLES OF SUSTAINABLE MINING

The Laws and Regulations mentioned above are the primary investment vehicle in the country's effort to revitalize the mining industry toward the principles of Sustainable Mining, which operates under the following principles :

1. Mining is a temporary use of land for the creation of wealth, leading to an optimum use of land in the post-mining stage as a consequence of progressive and engineered mine rehabilitation works, conducted in a series with mining operations.

2. Mining activities must always be guided by current best practice in environmental management committed to reducing the impact in mining while efficiently and effectively protecting the environment.

3. The wealth created as a result of mining accruing to the government and the community should lead to other wealth-generating opportunities for people in the communities and for other environment-responsible endeavors.

4. Mining activities shall be undertaken with due and equal regard for economic and environmental considerations, as well as for health, safety, social and cultural concerns.

5. Conservation of minerals is effected not only through technological efficiencies of mining operations but also through the recycling of mineral products, to effectively lengthen the usable life of mineral commodities.

CURRENT ISSUES RELATED TO ENVIRONMENTAL IMPACT

Mining has been well recognized to have both onsite and offsite effects such as degradation of water quality, flora and fauna habitats, erosion and sedimentation, topographic change, acid mine drainage, and increasing features of social impact. Some of the current issues of Indonesian mining industry in relation to environmental aspects include post mining land use, abandoned mining sites

community development, and illegal mining. Post mining land use should better be defined in advance to allow proper preparation of the land to be converted into the desired land use. It is closely related to mine closure plan that is currently stated in the Environmental Impact Assessment (EAI). Although EAI does not need to provide a detailed description on the mine closure plan, nevertheless it gives a clear framework to guide the mining operators to conduct appropriate action.

A community development program is one of the important measures to alleviate poverty. Currently it is regarded as being closely related to the environmental issue, and it constitutes a key factor in a successful sustainable mining development. Based on the Mining Law No 11/1967 and further described in CoW and CCoW schemes, a mining company is obliged to set up a community development program. However, to date such programs have failed to meet the real community needs, and therefore, substantial improvement is required. The new Mining Law is designed to accommodate this issue, by means of establishing cooperation between company, central and local government and local community. The community development issue may also be implemented through empowering small to medium enterprises, which currently is part of the government's national strategic agenda. Hence, it will play an important role in the national poverty alleviation program.

The other activity that potentially damages the environment is illegal mining as such activity ignores good mining practice procedures. To overcome this problem, the government is now taking serious steps to improve the law and to stop this illegal activity.

CONCLUSION

This paper has discussed the Indonesian energy and mineral sectors. In both these sectors Indonesia possesses rich resources, the development of which needs to be optimized so they can fully contribute to national economic development. Successful energy and mineral resource development must be carried out in a way that generates maximum economic benefit, and at the same time ensures that other objectives, such as those related to environmental protection and social developments, are also fully met. Based on the discussion in this paper, several conclusions can be drawn, as follows:

1. The occurrence of various energy and mineral resources gives Indonesia a distinct competitive advantage in terms of geo-resource assets. Therefore, they should be managed and developed appropriately, so that sustainable national economic development can be achieved for the sake of the people's prosperity.

2. Based on the known energy and mineral resources, it is clear that Indonesia is an attractive country for developing such resources. In both the energy and

mineral sectors, some new challenges have emerged during the last couple of years, particularly in the minerals sector. However the resilience of both these sectors has been amply demonstrated over many decades in Indonesia, and significant progress continues to be made up until today. The government recognizes the key role these sectors play in economic development and will take steps to ensure a conducive atmosphere for energy and mining investments is sustained through, for example, intensive energy deregulation programs.

3. Whilst satisfying the demand to increase the role of the energy and mining sectors to support the national economy, the government will also remain committed to protecting the environment through the passing and implementation of appropriate laws and regulations.

4. With regard to reducing the dominant role of oil in the national economy, the government will continue to implement energy diversification policies. The mineral sector can play an important role in meeting the non-oil diversification policy. Similarly, a number of alternative energy sources including renewable energy resources are becoming increasingly important in satisfying this energy diversification policy.

5. Three major environmental issues need to be seriously managed, namely , post mine land use, regional and community developments and poverty alleviation. The community development program in particular should be clearly defined by each operating company in cooperation with central and local governments and the local community.

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