Economics of Philippine Mining:
Rents, Price Cycles, Externalities, and Uncompensated Damages

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Among the many goods, resources and assets in the natural environment, the Arroyo administration has identified metallic minerals as a strategic commodity for its economic growth plan. It argues that because metallic mineral resources within the national patrimony remain untapped, they must be extracted, exploited and exported, like the country's overseas workers to bring maximum economic benefit. Mineral commodity production has thus become a priority economic activity in the government's medium-term development plan. If in the 1960s and 1970s Marcos wagered partly on a natural resource-based development strategy with timber as the strategic commodity, Arroyo repeats the same strategy with metallic minerals.

The Arroyo government asserts that mineral resource development will bring "maximum and sustainable economic, social and environmental benefits." Its expectation is that of "(a) minerals industry that is not only prosperous but also socially, economically, and environmentally sustainable with broad community base and political support while positively and progressively assisting in the government's poverty alleviation program and contributing to the general economic well-being of the nation." Thus, in pursuit of this objective, the government has proclaimed the availability of public lands with rich mineral reserves, and offered more incentive policies to local and foreign mining investors.

I. Research questions and basic economic concepts

This paper discusses the constraints and determinants of investment flows into the metallic mineral sector, the price cycles that characterize metallic mineral markets, the components of negative externalities mitigated by government programs and investors' expenditures, the implications of mineral production for growth and sustainable development, and proposed policy actions at the national and local level. The following research questions are raised.

What is the effect of incentive policies, global demand and price cycles of metallic minerals, and investors' assessment on investment flows to the Philippines? In particular, the effect of price cycles, production and policies on revenue shares and incomes, specifically rent? Also, what are the negative externalities of mineral production, i.e. its resource and environmental impacts and the adverse economic and social consequences, as well as the distribution of these costs? To what extent are these potential externalities addressed by government policies, programs or mitigated and internalized by mining companies? What are the implications of both the use of rents and

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the unmitigated negative mining impacts and uncompensated costs for sustainable development? A discussion of these questions implicitly provides an assessment of government's role as investment promoter and private investors' partner vis-à-vis the community, environment, and future generation.

At least five basic economic concepts are necessary in clarifying and discussing the above research questions. As building blocks of an economics of mining, these concepts consist of the following: economic rent, value of the marginal product, net present value and sustainability, externalities, and private and social opportunity costs. While economic rent, value of the marginal product, are net present value are different related notions of economic benefit, these are to be evaluated by the reality of externalities, private and social opportunity costs. An appreciation of these concepts will provide enlightened policy action at both the local and national level.

1.1 Economic rents

Economic rent is the net income (surplus) or receipt over and above the costs. At a particular production period ***t***, rent is operationally defined as $(p_l - c_l)\ H(t)$ for a biologically renewable product, like timber, or $(p_m - c_m)\ Q_t / (1 + r)^t$ for a non-renewable product, like metallic minerals where p_l and p_m is the respective price of timber and mineral, and c_l and c_m their respective unit cost of production. $H(t)$ is the sustainable harvest while Q_t is the periodic volume of minerals taken from a given reserve stock. Economic rent is the more appropriate term for economic benefits in the natural resource sector, rather than total sales revenues, labor employment or wage incomes. Sales revenue is a gross income value while wage receipt is merely a compensation for labor services.

In timber or metallic mineral extraction, economic rents are realized through the market and the property rights over a natural/ non-labour resource. While the market through its price and cost signals confers a monetary value on the natural resource output, the rents from logging or mining respectively originate from the natural yield of a renewable resource or the naturally (geologically) given stock of non-renewable deposits. Without the natural yield of biological resources or nature's geological mineral stock, there would be no economic rent payments to natural resource property holders.

It is from this rent that both private investor and government draw their income share. Specifically, a government administration's receipt of resource-based taxes and royalties comes from this surplus. The respective share of government or the investor in the economic rent is defined by national laws, policies, and incentive measures of a mineral-producing country, together with the position of global investors and other competing nation-suppliers vis-à-vis the government. Both the legal policy framework and the investors' relation to government also determine the respective use of investor's and government's share of rents. The amount of government's share, however, that would go to current budgetary allocation for environmental protection or public community welfare is dependent on programs it would enunciate. Whether government's collection and use of tax revenues from the natural resource assets is carried out

justifiably in behalf of the nation's equity holders, both present and future citizens is subject to empirical verification.

In order to maximize private economic benefits or rents, a competitive supplier may implement efficiency improvement measures or undertake rent-seeking industry association lobbying activities for subsidies and tax credits. With prices set by the global market, a competitive supplier can only maximize rents by increasing extraction rates. Given the rising rent prospects in a price upswing phase, there are strong incentives for a short-term miner to maximize extraction rates, increase work duration and shifts, and forgo future incomes. By forgoing a greater proportion of future rents at present or succeeding periods, depending on its time preference, a mining company gives up the opportunity to equalize discounted periodic rents across the long term. However, in a downswing period or recession, there is pressure on a mining company to slow down production, if not close down operations as rents decline or losses incurred. The higher economic rents significantly generated during upswings may contribute to economic growth depending on their productive or investment use. No growth is thus generated if all these rents are simply remitted or merely used for unproductive spending.

1.2 Value of the marginal product of forestlands, net present value, and sustainability

While rent is the economic benefit from the production of a natural resource-based commodity, the economic benefit in the use of a particular resource to a commodity producer is called the value of the marginal product (VMP) of the resource. Whether it is land, water, or an environmental service, a resource generates a VMP, i.e. the additional revenue earned by a commodity producer from employing an additional unit of the resource. If the VMP of the resource is greater than its price or unit cost payment to the provider, then this net receipt contributes to rent income of the producer.

Different commodities may be produced with a particular natural resource. With alternative resource uses generating their own respective VMP, each alternative resource use entails an opportunity cost or foregone benefits (revenues). If the VMP of land in the production of one commodity (C1) is greater than the VMP of land in the production of another commodity (C2), then relatively more land would be employed in the production of C1. Similarly, the production of different commodities with the use of the same resource may also be evaluated through the so-called net present value (NPV) rule, with the resource being allocated to the production activity yielding the higher NPV.

The NPV of a particular natural resource-based commodity is the sum of the present and future discounted economic rents over a finite number of production cycles. The stream of current and discounted future economic rents from timberland or mineral land, for instance, underlies their respective value. The value of a given mineral stock is thus defined over the life-of-the mine.

The value of a mineral land or timberland, however, is not sustainable. Because the fixed stock of metallic minerals cannot be reproduced through labor-capital

investments, a unit of ore extracted today means less is available tomorrow for future extraction. Even for a reproducible resource, like timber, the value of timberland is not sustainable. Even if harvesting proceeds at a sustainable rate and is accompanied by replanting investments, it cannot be sustained over time in an economy where the opportunity costs of timber and the land exceed the value of the timber yield. In other words, because a mineral or timberland is appraised and treated as a potentially liquid stock or a de facto financial asset that can be compared with alternative interest-bearing assets, its value is relative, contingent on market conditions or is not sustainable.

The conventional practice among business decision makers, as well as some economists is to compare asset yields and values. It is improper, however, to compare forest timberlands or mineralized forestlands vis-à-vis financial assets for at least two reasons. One, the comparison fails to reflect the fact that the creation and sale of financial instruments does not entail a negative externality on the physical natural environment and community, while the extraction of timber or metallic mineral involves potentially adverse resource and environmental impacts, as well as social and economic risks. Two, there are other resources in the so-called timber or mineral forestlands, consisting of non-marketed, non-marketable or unvalued products and services that provide a stream of present and future benefits that significantly constitute the land's alternative asset value. In particular, the benefits it provides are in the form of use values and economic and environmental services, such as the subsistence food and materials of local/ indigenous people, non-timber and agro-forestry products, future rents from forest species, ecotourism, carbon sequestration, watershed services, etc., as well as nonuse values. While commercial mining and other extractive activities threaten and cause the loss of these values, there are less intrusive agro-forestry and other economic activities that complement or build on these values.

Resource sustainability requires a number of conditions. With regards to the sustainability of a biological, renewable resource, the following conditions are necessary: 1) harvesting at the natural yield level; 2) investment in resource regeneration; and 3) the protection and maintenance of the habitat or environment. With regards to a non-reproducible/ exhaustible resource, like metallic minerals, on the other hand, sustainability requires the generation of substitute non-depletive resources for the exhaustible one by requiring the investment of rents in reproducible capital and the development of renewable (natural and human) resources (Hartwick, 1977).

Moreover, natural resource-based production, whether with use of renewable or exhaustible resources must not compromise the global environmental service provided by natural ecosystems. Thus, in the extractive process and re-investment of rents, it is imperative to ensure that there are minimum levels of stocks of different types of capital that are essential for economic and environmental sustainability (Ehrlick, 1981; Perrings, 1991).

1.3 Negative externalities, and private opportunity cost and social costs

Negative externalities are the adverse effects or costs of production/ consumption that are not borne (or internalized) by the direct producers and consumers but are passed on to the environment and people who are not involved in the particular production or consumption activity. These adverse effects include the costs of a depleted resource, the damage or loss of environmental services and natural habitats, the effects of waste or pollutants on land, air, water, people's health and well being, and the decline or loss of productivity and income. These potential external costs are partially or fully mitigated and compensated. If not, the external costs are borne by the environment and community who in effect subsidize the externality producer.

The notion of opportunity cost (as the foregone benefit or revenue from an alternative production or resource use) is conventionally viewed from the perspective of an individual (private or public) economic agent, whether as producer or resource user. It may ordinarily be applied to private or public resources, but not to environmental or public goods because the latter is assumed to be free, without price and not subject to alternative use.

Opportunity cost, however, may also be defined from the perspective of a group, community or larger society, especially with regards to the use of public resources. To these public resources, including those that are privately-held, such as public forestlands under existing tenure instruments, the notion may be applied in terms of the foregone stream of benefits or lost opportunities to alternative users, local community, present generation or future beneficiaries. Similarly, the notion can be applied to environmental or public goods which when subjected to particular alternative uses, lose their value, and cease to provide benefits to the community or larger society. Instead, they become the tragedy of our denuded forests, polluted waters, air or the global commons.

If economic activity with the use of public resources results in community displacement, exclusion to resource access, loss of livelihood or income source, natural resource depletion, degraded or damaged environmental resources, sickness, or future income losses affecting a large group of people, then the foregone economic benefits of the affected, deprived or excluded sectors from these public resources comprise the social opportunity cost.

If unsustainable activities in the use of public resources results in the degradation or loss of environmental benefits and more sustainable alternative livelihoods are foregone, then the social opportunity costs are great. Given the high social opportunity costs, there is necessarily a demand for alternative resource-environment uses and alternative property rights arrangements that restore the environmental benefits and provide greater economic and social benefits.

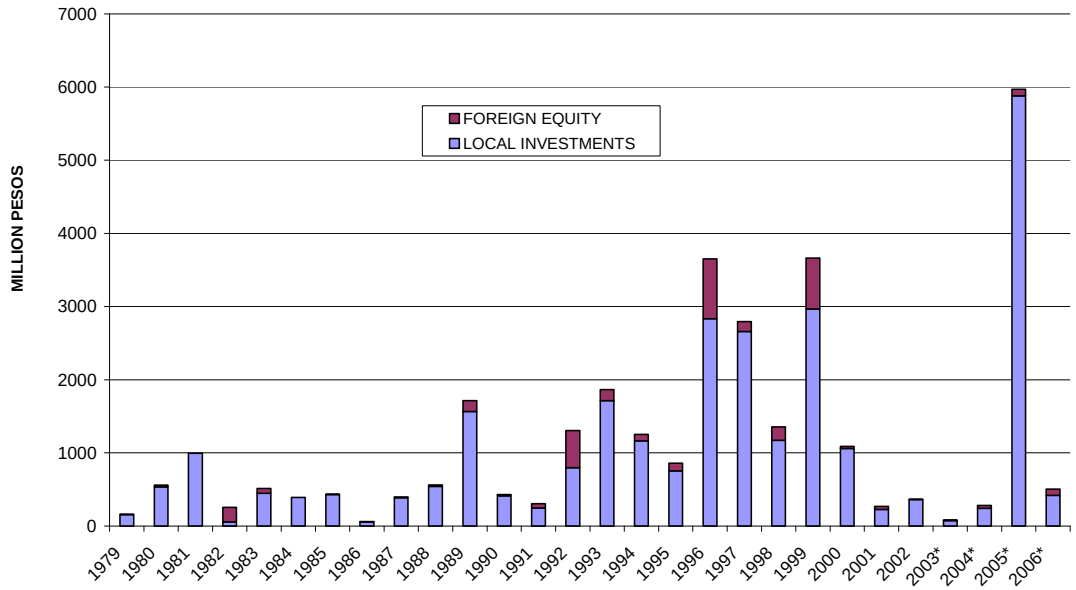
II. Determinants of investments

Figure 1 shows the paid-up investment flows to the mining and quarrying sector from 1979 to 2006. The declining and low investment levels in much of the 1980s reflected both the slump in world demand in the 1980s and early 1990s, which must have

accounted for the decline in the number of mining companies or their short life span[2]. Thus, the industry's high contribution of about 1.5 percent to GNP in the 1970s could not be replicated in the coming decades. Except for gold, the decline of mineral industry continued unabated.

There were short periods, however, when investments increased in spurts, such as in 1989, 1992-1993, 1996 and 1999 and 2005. These movements may partly be related to particular policies, the incentive provisions of the 1987 Omnibus Investment Code, the 1995 Mining Act, Executive Order 270 of January 2004, and the December 1, 2004 Supreme Court decision on the constitutionality of foreign investment participation in the mining industry, and the development of a Mineral Action Plan (MAP). These policies either increased or reinforced existing privileges and incentives[3].

Figure 1. PAID-UP INVESTMENTS IN THE MINING AND QUARRYING SECTOR WITH TOTAL FOREIGN AND LOCAL EQUITY, 1979-2006



Source: MGB-DENR, 2007

[2] While there were 371 mining companies in 1980-89, the number declined to about 202 in 1990-99, and further down to only 43 in 2000-3. The initial decline in number involved about 45% of the companies, which only had a life span of about 10 years. The latter period involved the exit of almost 80% of the remaining companies.

[3] The mining industry had historically received incentives in the form of free use of the water and timber resources within the area, easement rights, zero export taxes and premium duties, price support subsidies, stabilization funds, tax amnesty for distressed industries, government infrastructural support and military protection, apart from the lifting of mining restrictions in some forest reserve areas.

Apart from these incentive policies, investors' assessment of the country policy and mineral potential, together with the effect of metallic mineral prices have also influenced the flow of investments into the country.

2.1 Incentive policies

The Omnibus Investment Code of 1987 provides a number of incentives: income tax holiday for 4 years for non-pioneer and 6 years for pioneer projects; tax and duty free importation of capital equipment and pollution control devices; carry over of net operating loss incurred in the first 10 years as a deduction from taxable income for the next 5 years; income tax - accelerated depreciation (at most twice as fast as normal rate of depreciation); and deduction of accumulated exploration and development expenditures not exceeding 25% of the net income from taxable income. By reducing the cost of production and tax payments, these incentives increase the investor's share of the economic rent.

The Philippine Mining Act of 1995 (RA 7942) in particular sought to revitalize the industry and attract foreign investors by providing new production agreements, such as the mineral production sharing agreement (MPSA), co-production agreement or joint venture agreement with government, exploration permit (EP) or the Financial and Technical Agreement (FTAA).

These new agreements provide tenure and foreign equity participation. While the first three allows only for 40 percent foreign ownership, the FTAA enables 100% foreign-owned corporations to explore, develop, exploit and use country's mineral resources. The Supreme Court decision on the constitutionality of this agreement made it legal for foreign investors to engage in mineral exploitation. It argued that capital is a constraint, and is needed to provide financial and technical assistance. With this justification, FTAA contractors receive secure investment-tenure rights and investment guarantees, such as full remittance of profits, foreign loan payments (interest and principal), and other foreign obligations arising from the FTAA and other contracts, repatriation of investment, freedom from expropriation or requisition of investment, and confidentiality.

Another attractive incentive to foreign investors is the exploration right over a large area. With the provision of as much as 81,000 hectares for exploration within a period of 8 years, there is an implicit incentive - the probability of finding a deposit is greater with a large area. The Mines and Geosciences Bureau does not seem to accept this assessment with its assumption of a low probability of finding a deposit fixed at 0.002.

Apart from this implicit incentive, the FTAA contractors are allowed to recover their pre-operating expenses, eliminate taxes for at most the first 5 years of operation. Based on the MGB's determination and upon negotiation with the FTAA Negotiating Panel, a longer period is granted to projects requiring large investments with high production rates and extensive mine life. With this incentive, a contractor does not have to specifically pay corporate income tax, custom duties and fees on imported capital

equipment, value added tax on imported goods & services, withholding tax on interest payments on foreign loans and dividends to foreign stockholders, other national taxes, except excise tax on minerals up to the end of the recovery period. Also, the FTAA allows foreign investors to directly export all of their mineral output, and obtain lower excise duties.

Government's provision of security of investment, attractive exploration rights, tax holidays and other incentives in crucial periods of mining operations demonstrates its strong support and participation with the investor in the exploration and production phases. With the provision of tax holidays, the government in particular gives up a portion of the economic rent payable in taxes. By increasing the investor's share of rent, it in effect bears some of the risks and becomes a partner in the arrangement.

Apart from these incentives and rent sharing grants, the government has also addressed the concerns of investors, specifically the impediments and constraints to investment, and has developed a Mineral Action Plan (MAP), in partnership with the Chamber of Mines. The objectives of the MAP are: to promote a clear, stable or predictable policy environment; provide support mechanisms in exploration, research, and labor quality development; form a productive relation with the small-scale mining (SSM) sector; and provide a better public image of the industry. Thus, apart from addressing issues with respect to environmental protection, sustainability and social acceptability, it has also taken measures to remove various identified impediments and constraints to investments.

In addressing investors' concerns, the MAP has recommended the following actions: the streamlining or reduction of the processing time of mining applications from 3 years to 7 months; the processing of the environmental impact assessment (EIA); the decentralization and facilitation in number of days required for the granting of NCIP certification precondition or the free, prior, and informed consent (FPIC) form; facilitation of requirement in the non-IP areas; and automatic approval of applications if they exceed the reduced processing timeframe. Also, the MAP has established a one-stop-shop for area clearance, provided security of tenure of mining tenements and investments, and has ensured due process in the cancellation, termination, and suspension of mining tenements and activities, as well adequate consultations with the mining industry and other stakeholders in the establishment of protected areas. Moreover, it has encouraged local government units (LGUs) to incorporate mining in their Comprehensive Land Use Plans.

At the core of all the incentives government has provided to local and foreign investors is its proclamation through the Mines and Geo-science Bureau (MGB) of the availability of mineral-rich lands within the public domain. Specifically, about 9.45 million hectares of geologically prospective areas for metallic minerals are said to be available and remain untapped. Also, the Bureau has released updated information on the estimated reserves of different metallic minerals in the 14 regions of the country.

Table 1 presents the approved area under different mining tenements by regions as of 2007. A total of 448,403 hectares under different tenements has already been approved while some 42,091.5 hectares under the Mineral Production Sharing Agreement (MPSA) are not yet registered. The new tenement areas are additions to the mineral lands under existing permits (patented mining claims, lease contracts, and the tenements on mineral reservations) that cover an area of 557,065 hectares (Table 2). Together, the existing permits and new tenements occupy 1.005 million hectares.

The MGB proclaims that in the near future there will be an additional 660,000 hectares under mining applications (EP, MPSA, FTAA). The total projected area under mineral permits/ tenements will then be 1,386,065 hectares.

2.2 Global economic conditions and mineral price cycles

Together with incentive policies, an upswing in metallic mineral prices with global economic growth raises expected rents and draws more investment inflows. In the case of the Philippines mining industry, mineral price increases directly correlate with investment flows in particular periods. Historically, the increase in investments in 1979-81, 1987-89, 1992-93, 1995-96, 1998-99, and 2005 coincided with rising prices of gold, copper and nickel, in 1992-93 for silver and nickel, in 1995-96 and 1999 for copper and nickel. The direct relationship between mineral prices and investments, however, cannot be fully validated because of data limitations, i.e. Philippine data on investments by mineral product is not available.

Because of fluctuations in global growth, world mineral prices have not moved continuously upward. Price cycles characterize the world mineral markets. So during downswing phases, the increasing rate of price decreases discourages investment inflows. Figures 2 A-G present the price cycles of different minerals over a period of 33 years from 1973 to 2006. The following observations may be made.

Though metallic minerals are said to be exhaustible, a continuous secular increase in prices seems not to hold for now. Short-term cycles persist. Particular metallic minerals differ partly in the number of short-term cycles, the duration of such cycles, the price growth rates and the stability of prices. These differences in cycle pattern suggest that minerals with a longer span or upswing phase afford more predictability and security in investment returns than minerals with a shorter cycle span and more erratic price movements. Minerals with greater price fluctuations and frequency of negative price growth rates may be seen as risky investment projects, if not financially unattractive within such periods. Such market conditions may thus result in periodic production stoppages, if not firm closures.

Since 1973 to 2006/7, gold has had at least 6 U-cycle with the 6^{th} cycle starting 2003 still to be completed. With a cycle span ranging from 5 to 9 years, gold is the most

stable in the set. It only had 7 years of negative price growth rates[4]. Like gold, nickel also has 6 cycles, but with a shorter range span of 3 to 6 years or shorter upswing phases. Compared to gold, nickel is less stable with more years (13) having negative price growth rates. Nickel's upward trend since 1980s reflects the very strong demand for stainless steel and the disruptions and production delays of new investment projects[5].

Compared to gold and nickel, copper has had more cycles (7) cycles, with a span ranging from 5 to 10 years. It was more erratic though, and had a greater number (14) of negative price growth rates. Like copper, silver has the same number of cycles (7) but more unstable. It has a shorter span duration of 4 to 7 years and more years (16) of negative price growth rates. Having the same number of cycles as silver, bauxite has a shorter span duration of 2 to 5 years[6]. Table 3 provides a summary profile of the price cycle of the different metallic minerals.

Zinc and lead seem to be the most unstable minerals. They have the most number of cycles (8), and the span duration is short (2 to 5 years), with erratic price movements, with respectively 13 and 14 years of negative price growth rates. With regards to their year end projection, the price of zinc, together with copper while rising markedly in recent years fell sharply in late 2006 and early 2007, as demand weakened and stocks increased.

The price upswing for gold and nickel since 2002 to 2005, copper since 2003 to 2005, and silver, bauxite, lead in 2004 and the latter part of the period, however, did not induce greater investment flows to the Philippines. During the past five years, mining companies have been increasing investments elsewhere, with exploration companies in particular increasing their spending worldwide in 2006.

The lackluster flows of investment in the country may be due to the slump in US housing and auto sector, slower global growth, the expected decline in metal prices, and investors' assessments of the country's policy and mineral potential[7].

[4] Negative growth rates may result in seasonal slowdown, if not shut downs or closure. Because of negative price rate (-15%) in 1999 and no subsequent positive price improvement in the next two years, Philex Gold had to stop operations in 2002.

[5] Nickel prices are not projected to ease, because no significant new supply is expected in the immediate term. There is also no substitute at the moment.

[6] The rising role of China may also be seen in the behavior of aluminum prices, which, unlike those of zinc and copper, rose by much less, despite rapid growth in demand, principally because China has been steadily expanding its exports. Stocks of other products, such as aluminum and copper, have increased, suggesting an easing of their prices going forward.

[7] There is uncertainty with the speed at which metals prices will decline. While global growth is projected to remain relatively rapid, the supply problems that have challenged the industry over the past few years may still persist.

Figure 2A. YEARLY GROWTH RATES AND PRICE CYCLES OF GOLD PRICES, 1973-2006

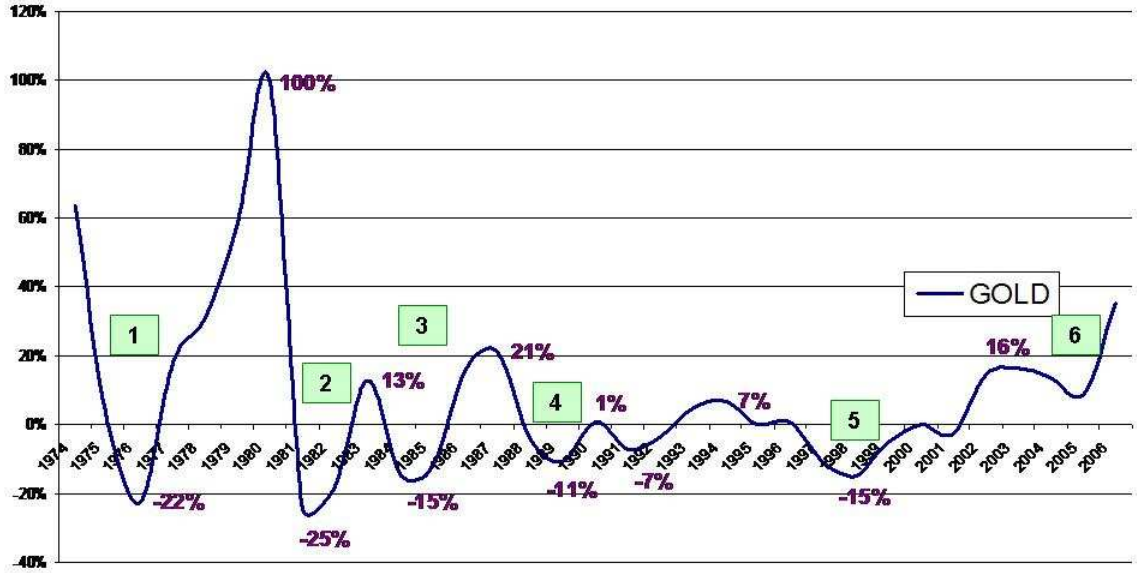


Figure 2B. YEARLY GROWTH RATES AND PRICE CYCLES OF NICKEL PRICES, 1973-2006

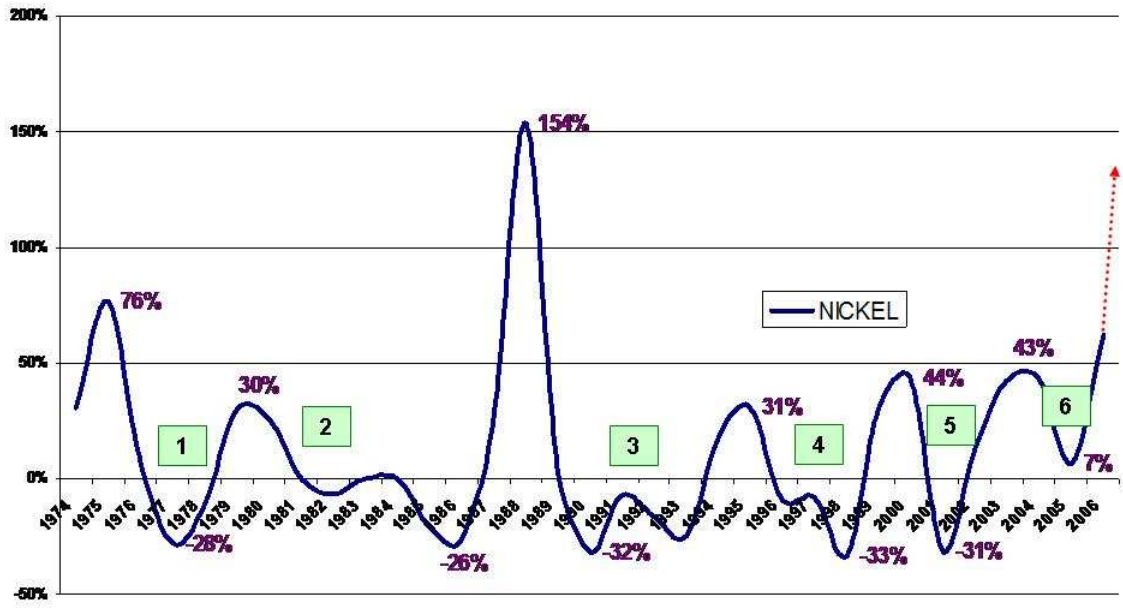


Figure 2C. YEARLY GROWTH RATES AND PRICE CYCLES OF BAUXITE PRICES, 1973-2006

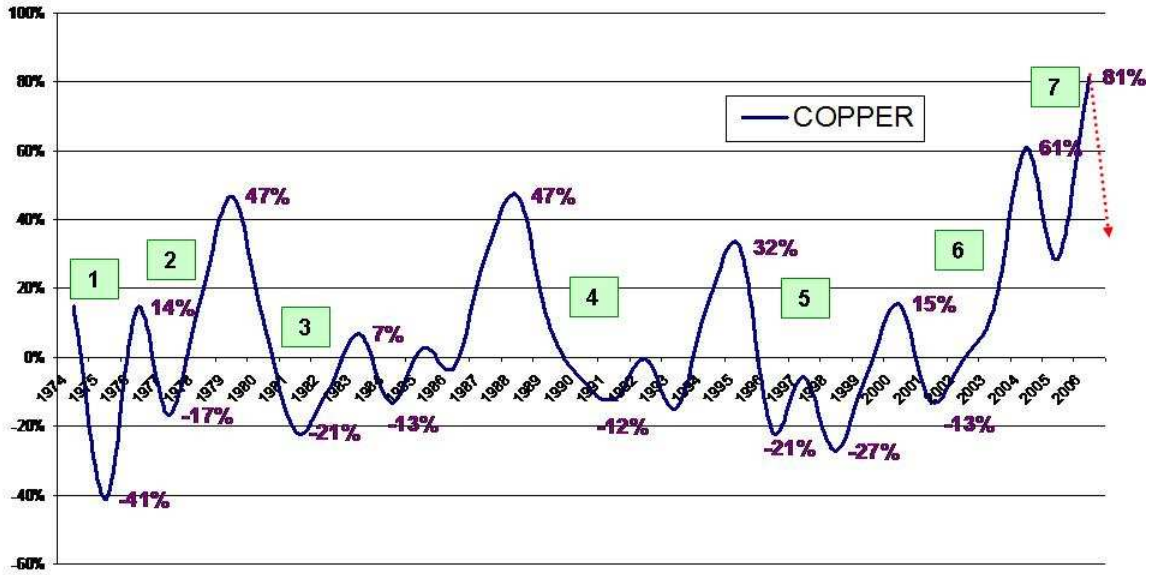


Figure 2D. YEARLY GROWTH RATES AND PRICE CYCLES OF SILVER PRICES, 1973-2006

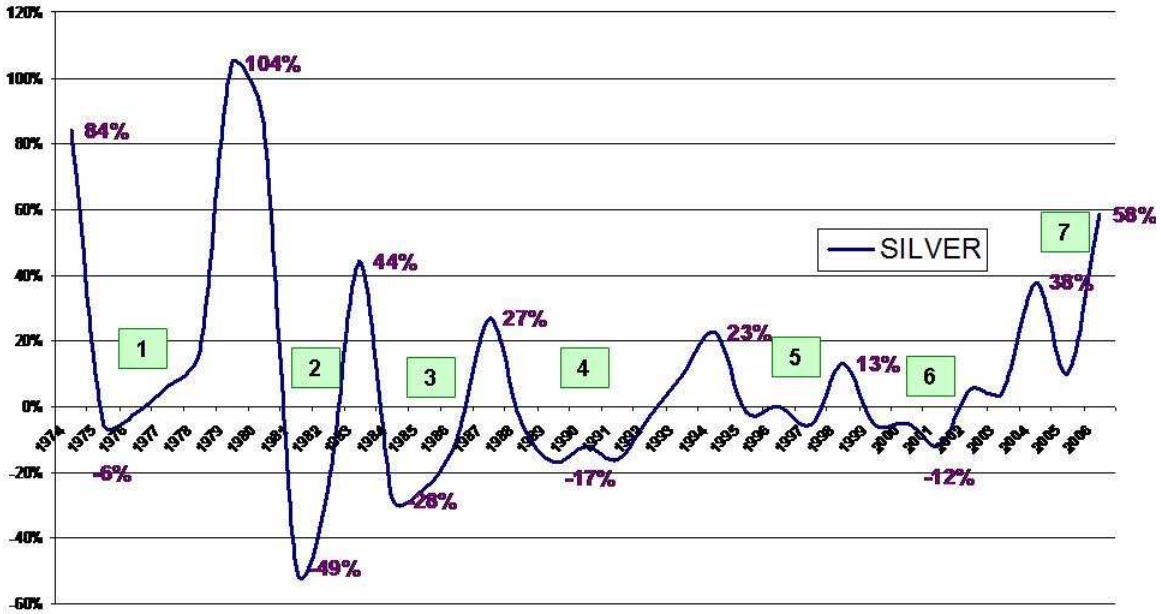


Figure 2E. YEARLY GROWTH RATES AND PRICE CYCLES OF BAUXITE PRICES, 1973-2006

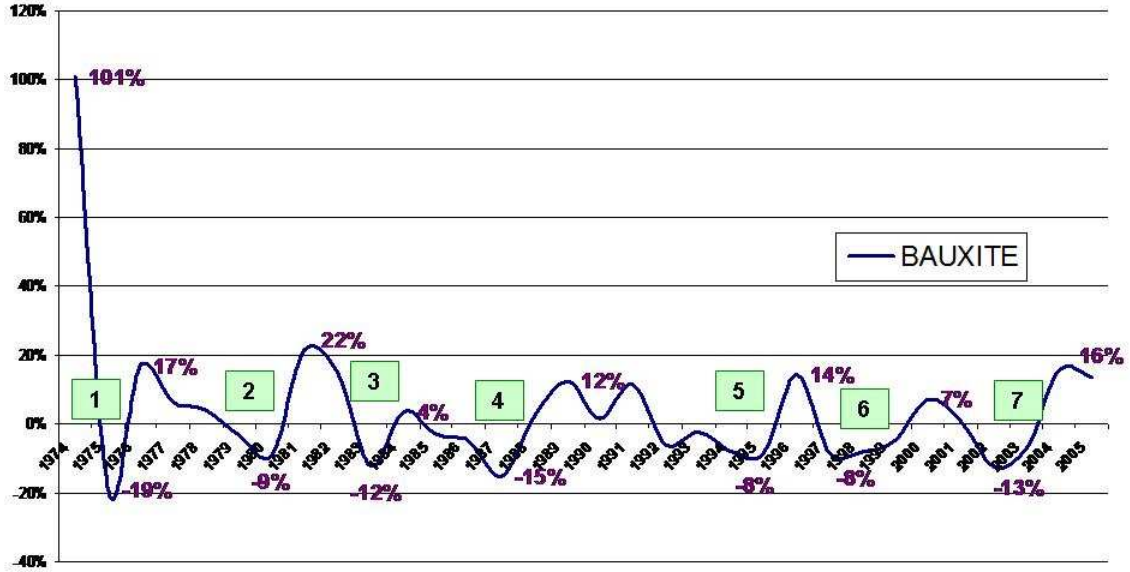


Figure 2F. YEARLY GROWTH RATES AND PRICE CYCLES OF ZINC PRICES, 1973-2006

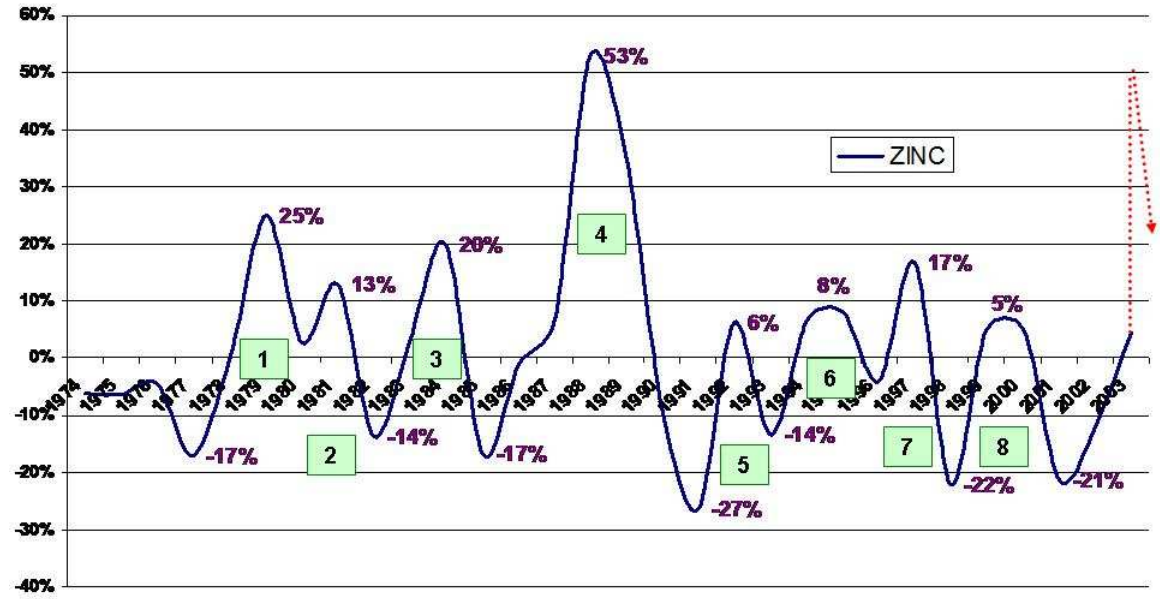
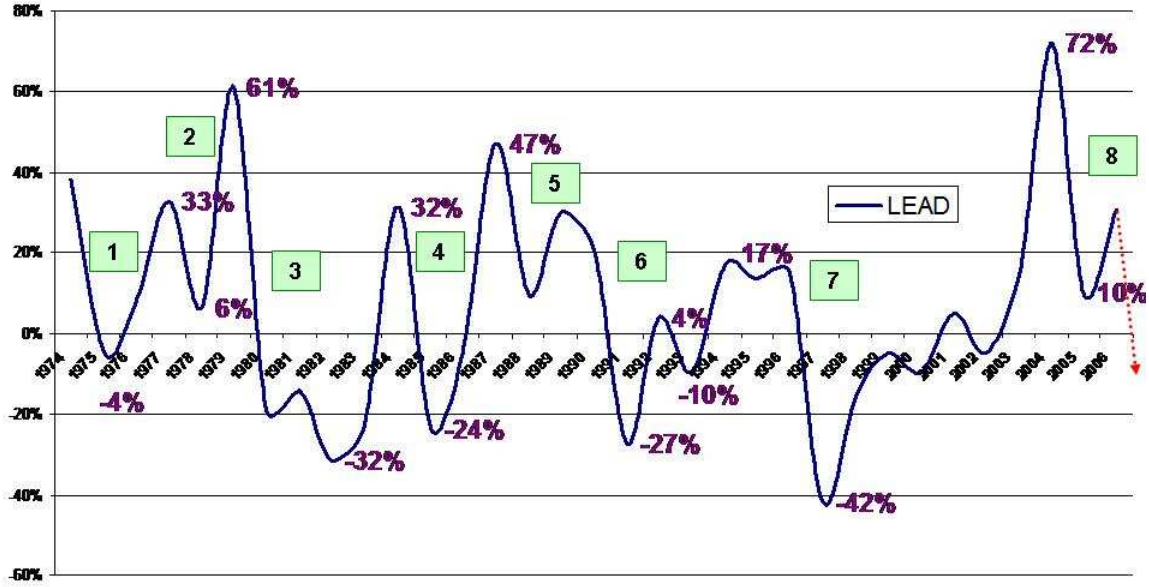


Figure 2G. YEARLY GROWTH RATES AND PRICE CYCLES OF LEAD PRICES, 1973-2006



Source: MGB-DENR, 2007

2.3 Foreign investors' assessment of the investment climate

Since 1997 the Fraser Institute has undertaken an annual survey of company executives and exploration managers in mining and mining consulting companies operating around the world to determine their assessment of the investment policy environment and mineral potential of 65 jurisdictions. The Philippine was included in the survey beginning year 2000.

The Policy Potential Index is a composite index that measures the effects on exploration of government policies, including uncertainty concerning the administration, interpretation, and enforcement of existing regulations; environmental regulations; regulatory duplication and inconsistencies; taxation; uncertainty concerning native land claims and protected areas; infrastructure; socioeconomic agreements; political stability; labour issues; geological database; and security. The index serves as a report card to governments on how attractive their policies are from the point of view of an exploration manager or investor. On the other hand, the Current Mineral Potential Index shows whether a jurisdiction's mineral potential under its current policy environment encourages or discourages exploration.

The Fraser survey results for 2002-2007 (Table 4) shows the ranking of the Philippines along various indicators. While it ranked relatively better in terms of mineral potential, its policy potential rank has been poor. Out of 65 jurisdictions, the Philippines

ranked 5th to the lowest in 2006/7, a slight improvement from the 2003/4 ranking when it was 3rd to the lowest.

With regards to the investors' assessment of particular country conditions and policy area for 2006/7, the country specifically ranked low in political stability (at the bottom 62 position out of 65 jurisdiction), certainty concerning native land claims (61/65), security (60/65), geological database (57/65), certainty on which areas will be protected as wilderness or parks and regulatory duplications & inconsistencies (56/65); and certainty concerning the administration, enforcement of existing regulations (54/65). Compared to earlier survey results, the country's ranking in these particular items deteriorated overtime. For instance, there has been greater uncertainty concerning native land titles after 2002, as well as the coverage of protected areas, wilderness or park after 2004. Also, the survey reports a perceived decline in political stability after 2003, and in infrastructure after 2004.

Has the low ranking of the Philippines in policy potential by potential investor-respondents influenced the slow inflow or decline of foreign investments in time? And does the low assessment in policy potential reflect objective conditions? The views of the Chamber of Mines president in the latter part of 2006 seem to resonate with the assessment of mining company executives in the Fraser Survey. He complained that "changes in policies have led mining companies to believe and confirm their early suspicions that investment policies in the Philippines are not stable and are heightened by high political risks."[8] In an earlier interview, the former Supreme Court Chief Justice inadvertently specified particular provisions in the Philippines constitution and laws which posed as risks to investors in the mining industry[9].

Moreover, the uncertainty or risks investors face with regards to the policy environment, for instance, on native land claims and the coverage of protected areas may also objectively be related to the actual condition of the so-called mineralized forestlands. Table 5 gives the distribution of public forestlands, by tenure and category. The existing public forestland uses and category, such as established timberland with tenure (7.2M

[8] The Chamber of Mines President Romualdez had complaints over a number of issues: 1) the bills in the Senate repealing the Mining Act or classifying mining as a "resource seeking" that is not entitled to incentives; 2) the resolution of some provinces to ban mining despite the opinion of the Justice Department; 3) the moratorium on new mining tenements outside of the 24 priority projects; and 4) the failure to establish the "one-stop-shop" and reduce the processing of tenements.

[9] In an interview with an external fact-finding mission (July 28, 2006), the SC Justice Artemio V. Panganiban expressed the stringent conditions governing minerals. One, minerals would always be subject to the full control and supervision of the state. The state retains the "power to direct overall strategy and to set aside, reverse or modify plans and actions of the contractor". The court in fact can nullify specific provisions of FTAA that are contrary to law or are grossly disadvantageous to nation. Two, while the President has the prerogative to determine the net mining revenues between the contractor and the state, there must be no grave abuse of discretion. The President must take appropriate steps to secure the best terms and conditions. If in the execution of this prerogative, the court has cautioned that: 'if it should later be found that the share (of the profit agreed upon is grossly disadvantageous to the government, the officials responsible for entering into such contract on its behalf will have to answer to the court for their malfeasance and the contract provisions voided.'

ha), the approved mining tenements and the still unregistered MPSA (0.49M ha), national parks, GRBS/WA, and established forest reserve (4.56M ha), already account for a total of 13.01M ha (82.4%) of the total 15.8M ha public forestlands. So where will the prospective mineralized areas identified by the MGB amounting to about 8M hectares come from? Are they within the 2.4M ha under CADC, the national parks and forest reserves, or the other timberland areas? In other words, with overlapping and competing uses or categories of forestlands as a source of uncertainty to potential investors, there will be pressures from the investors and actions on the part of the Arroyo administration to provide secure land rights.

III. Mining revenue shares, rents and externalities

Despite the constraints posed by the country's policy environment and global price cycles, investments have flowed into particular areas. Table 1 shows the number and area of approved tenements. Most are under the MPSA with an average area of 1,547 hectares while the EP and FTAA respectively have larger average sizes (3,273 hectares and 24,687 hectares).

An accurate assessment of the reserve volume and recoverable ore of the mineral area is necessary to determine the plant capacity and rate of production that yields the desired rate of return on the contractor's investment. From the volume of recoverable ore and the production rate, the life-of-mine period is derived or the depletion time of the reserve.

Table 6 illustrates the relationship of reserve, recoverable ore, production rate and life of the mine. Based on the mineral reserve assessment conducted by Engineer Herman Mendoza in Samar Island, the Table presents the estimated reserve volume and recoverable ore (in metric tons) of bauxite, copper-pyrite, and lateritic nickel in particular locations in Eastern and Western Samar.

A constant production rate over the mine life period assumes a given utilization of the existing plant capacity and a homogeneous mineral reserve that has a fixed grade-to-tonnage relationship. If the mining grade (or quality) is lowered in order to increase the production rate, the cost per unit product increases. Also, given the price cycle, the upswing phase may be characterized with longer work periods or more labor shifts while a downswing would have shorter work periods or stoppages.

Figures 3A and 3B show the positive correlation between mineral production and prices. Given the positive relationship of production to higher prices, higher economic rents are realized in the upswing. Rents of course decline in the downswing. However, in particular years where prices decrease and production is unable to adjust directly but instead continues to increase, less rent is earned or losses are incurred.

Figure 3A. MINERAL PRODUCTION AND PRICES: GOLD, 1979-2005

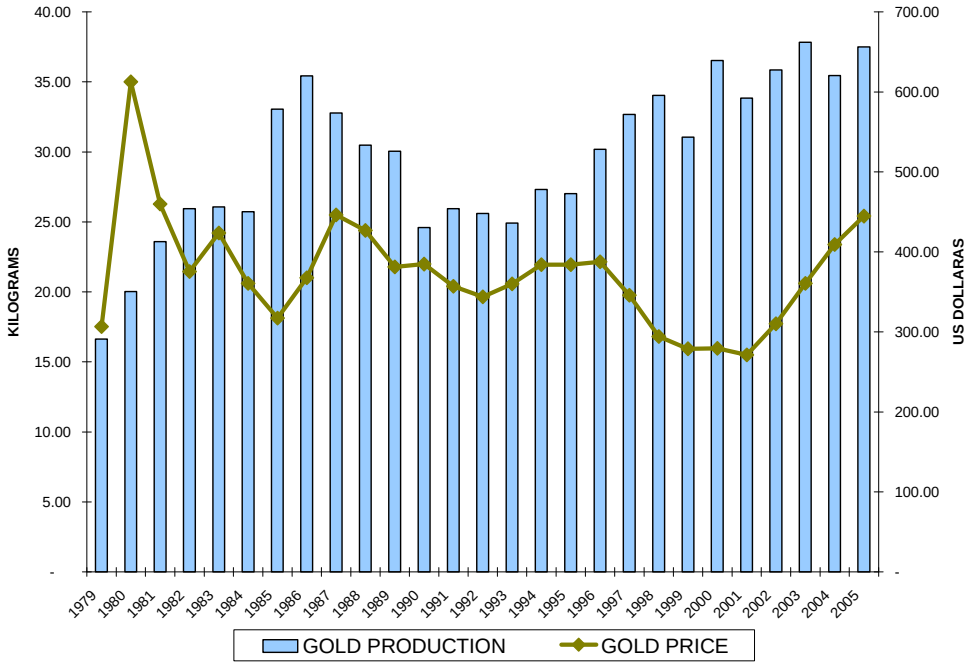


Figure 3B. MINERAL PRODUCTION AND PRICES: COPPER, 1979-2005

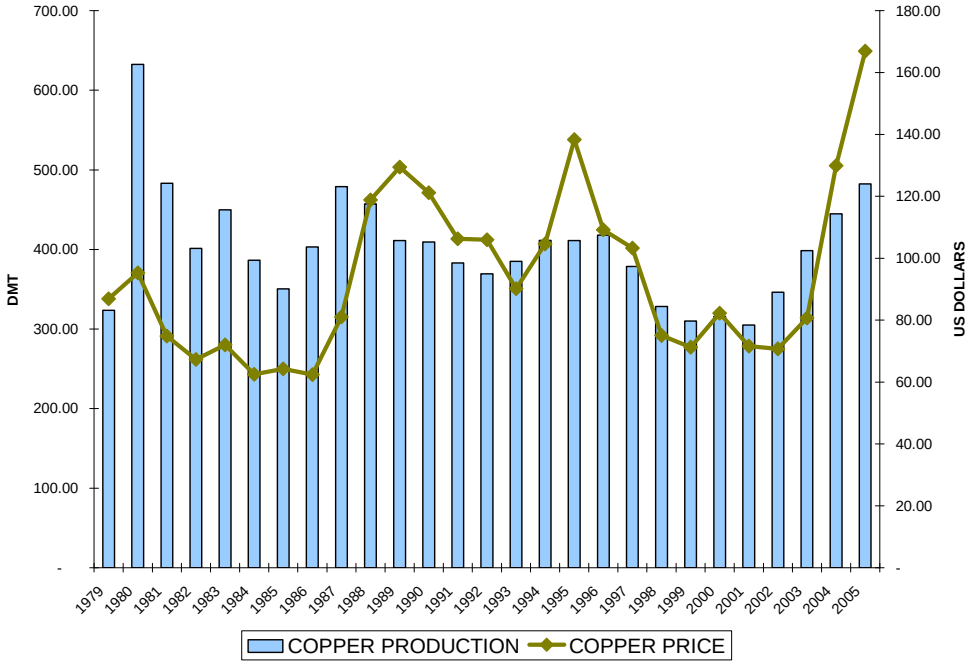


Figure 3C. MINERAL PRODUCTION AND PRICES: SILVER, 1979-2005

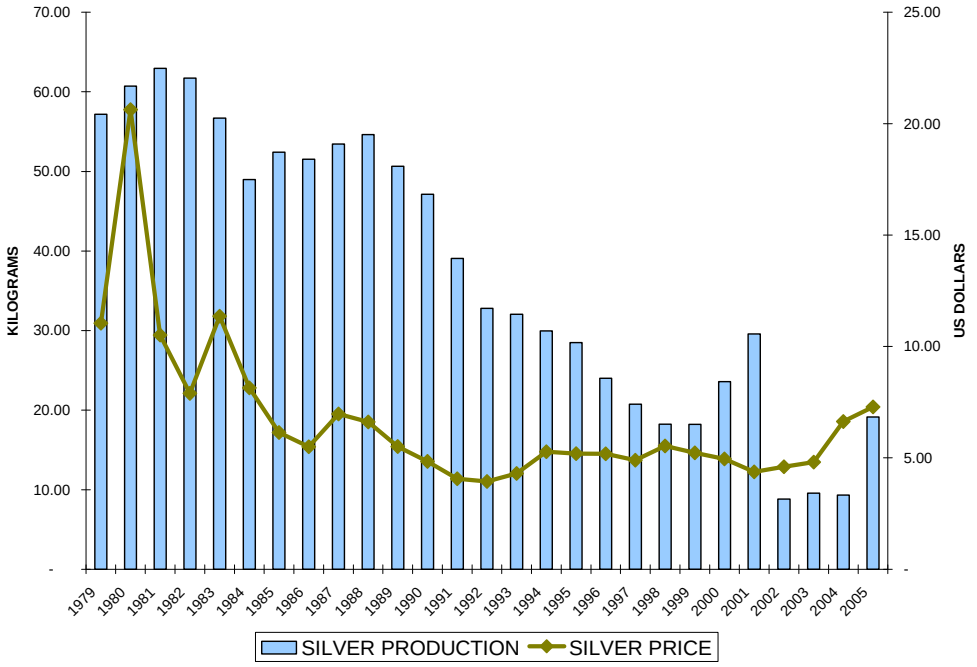
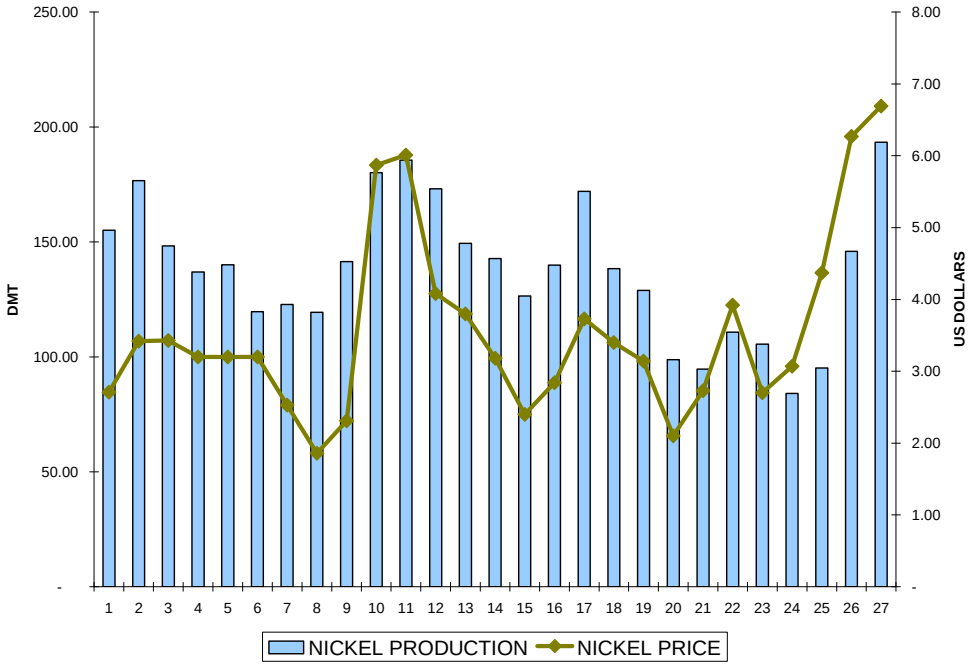


Figure 3D. MINERAL PRODUCTION AND PRICES: NICKEL, 1979-2005



Source: MGB-DENR, 2007

Revenue shares of labor-community, environment-related, non-labor expenditure, government, and mining company

Given the annual production rate at a given world mineral price and average plant operating costs, it is possible to estimate the net incomes before tax or the economic rents. Table 7 gives the sales revenues, various cost outlays, and the net incomes of 4 types of mineral-producing company, as well as the proportion of revenue going to labor and management, environment-related expenditure, non-labor current and capital costs, tax payments to national and local governments, and the net income of the mining company[10]. Implicitly part of the company's net income is the opportunity cost of capital or the foregone income from the incurred non-labor current and capital costs. Deducting this gives a more precise measure of rent. Given these figures, the following observations may be made.

One, the revenue shares of labor and management, the indigenous people and community development, and the environment-related expenditure are small. Specifically, labor and management's share of revenue ranges only from 3.7 to 8.5%, with the portion going to rank-and-file accounting only for less than half of this cost. After it has given its free, prior informed consent (FPIC) to the mining company, the indigenous peoples receive a royalty share amounting to 1% gross revenue net of a remittance tax. There is concern over how the NCIP will manage the royalty fund, free of corruption and conflict.

The allocation for community development (0.23%) refers to the contractor's required contribution of 90% of the 1% of direct mining and milling costs which would be used to promote livelihood development and welfare projects in the barangay(s) within the immediate environ of the mining company. The small contribution for labor and the community, coupled with the technology-intensive nature of large-scale mining and the immediate exportation of minerals with limited local processing, suggests the limited employment-generating capacity of the mining contractors.

With regards to the environment-related annual expenditure, it accounts only for 1 to 2.4 percent of revenue. In the gold-copper case, the environment share (1.57%) consists of the initial expenditures for environment-related infrastructures under the Environmental Work program, which is equivalent to at least 10% of capital expenditures over the life-of-mine, plus a 5 million peso contribution (0.03%) to the Rehabilitation Cash Fund. It is not clear to what extent the funding for environment-related infrastructure will help prevent soil erosion, tailings dam collapse, acid drainage, or water pollution.

Two, current non-labor operating and capital costs constitute a significant revenue share amounting to 17 to 46% of revenue. It is inversely related to the company's net income - the smaller the non-labor mining costs, the higher the share of net income. At a

[10] The bauxite, copper, and nickel revenue and cost data are drawn from Mendoza's study (Mendoza, 2001) while the copper-gold data was obtained from the MGB.

given price, the net income after tax is from 26% to 47.5%. Net income share decreases with a decrease in price.

At the given copper- gold price ($15.6/ mt), the break-even price is $7.07/ mt. A decline from the given price by at least 55% will generate losses for the company. Hence, during the expected upswing phase in a 5-10 year cycle, there is pressure to increase extraction rates.

Three, the share of taxes in the bauxite-copper-nickel mines is higher compared to the copper-gold mine because these mines operating in a government reservation provide a national government royalty of 5% of actual market value. The tax share is, moreover, slightly understated because certain tax payments, like customs duties and real property tax and tax on dividends have not been deducted from the current costs or net income share.

Four, the economic benefits of mining accrue mainly to the mining company and the national government. Because government tax receipts are drawn from the economic rent, a reduction in government's share gives a greater portion of the economic rent to the mining company. Under an FTAA incentive scheme where a contractor enjoys a cost recovery period or no obligation to pay custom duties, taxes on dividends, and corporate income taxes, for instance, the contractor's net income share increases from 34% to about 51% while the government's share of revenue in the gold-copper case decreases from 19.6% to only about 2%. With this incentive, the FTAA scheme fares equally, if not surpassing the benefits provided by the other agreements.

Among the four types of mineral producer, net income share after tax accounts for about 26% to 47% of revenue. This amount includes both the opportunity cost of capital and the mining company's share of the rent. Given its capital and current expenditure outlays and a 12% interest rate, the opportunity cost of capital amounts to about 2% to 5.5% of revenue while company's share of rent is 20% to 45% of revenue.

Five, while the above income distribution partly illustrates the integration of mining in the local or national economy, there are other costs, however, that are not accounted. At least two types of costs are not included: 1) actual payments that have been made but have not been deducted from net income, and 2) costs that are not paid, but may justifiably be demanded now or increasingly in the future because of negative externalities on the environment and community.

There are two examples of the first type: i) the mine waste and tailings fee payments, and ii) the payoffs to military, political figures, insurgent or rebel groups. These annual cost outlays reduce the company's net income share.

Enunciated in 1974, the mine waste and tailings fee policy require the payment of a PhP0.05 and PhP 0.10 fee per metric ton, respectively of mine waste and mill tailings wastes. There is no estimate at the moment of the annual volume of mine waste and tailings (a multiple of mineral ore output) net of allowable wastes deduction that is levied

at the above given fee rates. It is apparent, however, that because no fee adjustment has been made in real terms since 1974, unit waste payments have effectively been deflated over time. Based on the consumer price index, the cost of food in 2006 is 12.4 times more expensive than its 1978 (base) price.

Payment deductions from net income also include payoffs to political or armed groups. Based on the report of the company manager of KingKing Mines Inc., about $2M was paid off to terror/ insurgent groups as part of the "cost of doing business" in the area. As a proportion of revenue, this informal tax reduces the contractor's net income share.

Six, the present cost category for "environment" and "community" does not include the cost of externalities that may have materialized now or will be apparent in the future. The internalization of such costs would necessarily reduce economic rent or the share of the contractor and government. Given this negative effect on rents, actions to account and effect payments for external costs would be subject to policy debate, if not strongly resisted. If there is successful resistance, then revenue shares would not be affected; there would neither be an increase in the share of the environment or community, nor a decrease in the share of the contractor and government. If external costs, however, are not covered, then someone within or outside the community or some specie in the environment would absorb the cost.

Once government recognizes such external costs, and begins negotiations with affected parties, it may either enforce compliance on the part of externality generator to existing rules and regulations, or improve existing programs and policies. If government succeeds either in effecting compliance with existing programs, standards, and compensation requirements or in raising environmental commitments and fund payments, then these payments and financial commitments reflect the company's willingness to pay for externalities, as well as government's willingness to accept the commitment of the other party.

3.2 Mining externalities: resource-environmental impacts and the economic and social costs

What are the externalities of mining? And how is government and industry addressing the environmental impacts and external costs of the different mining phases and activities? Do government-contractor's remedial, mitigating measures, and programs, specifically the Environmental Compliance Certificate measures, Environmental Protection and Enhancement Program (EPEP), Social Development and Management Program (SDMP) livelihood financing, Environmental Work Program (EnWP), Rehabilitation Cash Fund (RCF), Mine Waste and Tailings Fee Reserve Fund cover fully the external costs of mining?

Table 9 lists the various mitigating measures and funding programs. According to DENR guidelines, the Environmental Protection and Enhancement Program (EPEP) requires a listing of the foreseen impacts and affected areas in each mining phase and activity, together with the mitigating measures to be undertaken and their estimated

budget[11]. The EPEP draws the list of foreseen environmental impacts from the assessment results of the environmental impact study (EIS) while the mitigating measures consist of the commitments that are specified in the investor's environmental compliance certificate (ECC). The estimated budget for mitigating measures will be sourced mainly from the above funds.

Table 8 represents the EPEP guidelines in matrix form. The list of foreseen impacts and mitigating measures reflects the government and contractor's perspective and approach to mining externalities. Several assumptions are implicitly made with regards to the program. Because the adverse environmental impacts are foreseen and the necessary mitigating measures have been identified, four assumptions are made. One, these measures would be fully and properly implemented. Two, their full and proper implementation would prevent or directly eliminate the environmental risks. Three, the existing funding programs and standards can adequately support the necessary mitigation measures. Finally, because adverse environmental changes are successfully prevented or mitigated, there would not be any adverse off-site environmental impacts or significant economic, social risks and costs.

One existing funding source is the Environmental Work Program (EnWP). The program requires that given a mining company's environmental protection and enhancement strategies in the exploration phase, 10% of the estimated exploration cost or project development investment would be set aside to fund the required environmental infrastructures. While the company would expectedly allocate its limited funds on priority projects that address strategic environmental problems, two issues are not apparent: what would the company identify as the strategic environmental problems and how much of the available funds are actually allocated for a properly designed tailings dam, reforestation, soil erosion control or water quality protection.

Another company budget source for financing a company's commitments and mitigation measures that are stipulated in the annual EPEP is the Mine Rehabilitation Fund (MRF). With the MRF consisting of the Monitoring Trust Fund (MTF) and the Rehabilitation Cash Fund (RCF), the MTF provides a replenishable amount of PhP150,000 for the work of the Multipartite Monitoring Team (MMT). Established either at 3 to 5% of annual direct mining and milling costs or at PhP5 million, whichever is lower, and deposited as a trust fund in a government depository bank, the RCF finances progressive rehabilitation activities, repair works or mitigating measures identified in the EPEP. Specifically, it may be used to cover the costs of reforestation or re-vegetation or the rehabilitation or repair work of the tailings dam.

There are, however, only two fund sources which solely provide compensation for damages, namely the Mine Wastes and Tailings Fees Reserve Fund (MWTFRF) and the Environmental Trust Fund (ETF). Both funds are under the National Treasury and deposited in a government depository bank. While the MWTFRF, in particular, provides

[11] The four general phases of mining consist of exploration and ore extraction, mineral production, waste management, rehabilitation and closure, together with their respective activities, such as land clearing, road building, construction of dam, tailings storage, and other infrastructures.

funds for compensation of damages caused by mining operations, the ETF has a replenishable fund of PhP50,000 to compensate damages outside of those caused by mine waste and tailings.

In assessing damages, the MMT and investigative team determine the amount of compensation that would be charged to the fund. Not all types of damages, however, are covered by the fund. Specifically, the MWTFRF provides only for the cost of repair of damaged privately-held property, i.e. the "cost of rehabilitating damaged industrial, commercial, residential, agricultural and forest lands, and marine and aquatic resources." The fixed/ unadjusted fee payment since 1974 under the MWTFRF (PhP0.05 and PhP 0.10 peso fee respectively per metric ton of mine waste and mill tailings waste) suggests either that the available funds for such property damages have continuously declined in real terms over time, or that the effective damages subject to compensation have shrunk.

Table 9 presents the different program fund sources for rehabilitation or damage reparation. The fund status suggests the need for an assessment study to determine in particular the sufficiency of both the MWTFRF and the ETF, and the types of damages that have actually been compensated. Does the ETF, for instance, cover livelihood income losses, immediate and future health impacts, restoration of damaged natural habitats and other public resources, and their accompanying productivity losses?

In general, do these government programs and funding sources for mitigation action and environmental rehabilitation address all the potential resource and environmental impacts and economic and social risks and costs? Specifically, are there potential resource and environmental damages that should be included among the foreseen impacts in the EPEP? Given the above program objectives and their prescribed fund uses, are there unmitigated resource and environmental damages, and is there willingness to pay or compensate for their accompanying economic and social costs? And given the contradiction between the (rent) benefits of mining and the cost of environment and community welfare protection and restoration, is there a process to identify and reach a socially acceptable trade-off?

Unmitigated Resource and Environmental Impacts and Uncompensated Damages

Table 10 lists the potential adverse resource or environmental changes in each mining phase, as well as the economic and social impacts of such changes or particular mining activities. In general, these impacts, risks and damages consist of the following: 1) community displacement; 2) reduced access or availability of domestic or local water sources for onsite and offsite communities; 3) decrease in production yields (agriculture, fish, others) and other livelihood-income losses; 4) property damages; and 5) health illness and/ or deaths. As noted earlier, some of these are not included in the list of foreseen impacts because all the negative resource-environmental impacts are assumedly foreseen and mitigated. And as a result of effective mitigation and enforcement of other policies, there are no adverse economic and social consequences.

Below are the specific potential unmitigated resource and environmental impacts and the extent of economic-social risks and damages. Because the following unmitigated impacts and uncompensated damages are location-specific, local government units, communities and nongovernmental organizations in potential and operating mining areas must anticipate, identify, monitor, document and value these for possible compensation demands.

One, household and community displacement in a mining tenement area from their subsistence or livelihood activities is possible, if not inevitable not only because households in such areas have no tenure rights, but also because enclosure of an area for mining results in the disruption, if not loss of the natural habitat for subsistence-livelihood activities[12]. The possibly affected subsistence activities may include gathering or culture of non-timber forest products, hunting, and swidden agriculture.

The Social Development and Management Program (SDMP), together with the social acceptability condition of the EIA seem to be the only program dealing with community impacts. In the list of livelihood projects submitted in the annual SDMP by a mining contractor, there is a need to verify the involvement and extent of participation of displaced onsite or offsite households. Amounting only 0.9 of 1% of annual direct mining and milling costs, this fund source for community development may be limited because it is specifically established to provide alternative livelihood for employees, dependents, neighboring communities during the life-of the-mine. In other words, it may not directly address community displacement.

Two, the water demands of a mining company may entail the diversion of surface or groundwater supply. While piped water that is metered is a cost included in the mining and milling cost, the water drawn directly from local surface, spring or aquifer sources is free without any user charge. Moreover, a mining company's consumption of surface, spring or groundwater poses a potential externality, resulting in the disruption or decline, if not loss of the local water supply sources for local household residents, including both onsite and offsite, downstream communities[13].

The following considerations must be noted in measuring the impacts of water diversion and use for mining operations. One, restriction in access or reduced availability of potable water for both onsite and offsite communities would entail greater cost in travel time, if not actual payments. Two, water diversion may also reduce its availability for other uses, such as farm irrigation, domestic chores, or recreation, thereby lowering yields, incomes and household welfare. Three, the effect of reduced stream flows for hydroelectric power generation, downstream irrigation, coastal water resources, or fish

[12] Mining is a land-intensive activity. Only a small portion of the concession is developed, consisting mainly of the mineral extraction site, tailing ponds and road network. A large area may be unused, and even if superfluous to the mining activity, it does not get reclassified nor reverted to the public domain.

[13] The volume required is significantly dependent on the extent of mineral processing activity. The modern mineral processing plant requires water in weight quantities in a ratio to the weight of the mineral processed, which ranges from 0.4 to 20.

habitats would be reflected in lower farm and fish yield, and marine habitat productivity which in turn would affect household food sources, income, and nutrition.

Three, groundwater abstraction for mine operations, in particular, may be excessive and hence a cause of the eventual depletion of the aquifer in the area. The country's limited water policy framework and enforcement capacity reinforces this condition. It assumes an adequate groundwater supply for all off-stream uses and a zero valuation of raw water, and there are no effective regulations and monitoring of groundwater use. Because of free, excessive and unregulated use, it is expected that groundwater abstraction and consumption will entail greater future cost, and cause its depletion.

Future water supply shortages will particularly be apparent in the so-called "environmentally sensitive" watersheds that have medium or high vulnerability or watershed stress. Threat to water supply is apparently greater in areas where mining agreements overlap with vulnerable watersheds. It is reported that 8 percent of approved mining contracts and exploration areas overlap with proclaimed watersheds while 14 percent of mining and exploratory concessions in particular overlap with areas of high stress.

Four, the pollution of mountain streams, drainage channels, rivers and other bodies of water because of acid rock discharge, release of wastewater, toxic metals and effluents, and tailings results not only in the loss of water for direct consumption, bathing/ cleaning, and recreation[14]. It also affects livelihoods, fish specie population, and both present and future health conditions. The release of toxic metal, mercury, cyanide and their eventual absorption into the food chain can also cause serious future health damages. Despite the passage of the 2002 Clean Water Act, these problems however are not mitigated partly because of the non-implementation of a water pollution charge system.

In order to account for the impact of water pollution, the loss of water quality may be valued either in terms of the cost of illness and the loss of human capital (present and future labor productivity and income) or the cost of water treatment, damage reparation, or the expenditure for pollution abatement or prevention of further resource degradation.

Five, the overflows and leakages from tailings impoundments or dams or their collapse constitute a major source of unmitigated environmental damages and economic and social costs, contributing to the other uncompensated costs mentioned above. They pollute and reduce access to local water sources, pose health hazards, and result in the displacement of communities and livelihood opportunities[15].

[14] Atlas Consolidated Mining Co., for instance, discharged an estimated 5.7 million cubic meter of acidic water into a river and then the open sea, resulting in fish kills, and it was fined for $210,000.

[15] The tailings dam overflows of Philex Gold between 1997 to 2002 affected immediate, surrounding and downstream communities. It caused mudslides which destroyed rice fields and reduced production by half, and silted the bay and mangroves which resulted in massive fish kills.

Since 1982 to 2005, at least 18 serious tailings dam failures have happened. These tailings dam spillage and collapse have resulted in adverse environmental impacts affecting a number of villages, towns, and displacing a significant population, and have wrought massive economic and social costs. Specifically, dam spillages and collapse have caused siltation, cyanide tailings pollution of water streams, rivers, or bodies of water, inundation of rice lands, property damages, loss of livestock, fish kills and damage to local fish industry, disruption if not loss of livelihood, skin irritation, injuries, mortality risks, if not actual deaths, and the entry of toxic chemicals into the food chain, with disastrous long term health effects.

The immediate causes of tailings dam spillage, overflows, collapse and massive discharge of acidic water and toxic tailings on land and bodies of water are specifically related to any of the following factors: limited tailings dam capacity, increased pressure buildup causing a leak, break in dam embankment, clogged drainage tunnels, damaged concrete pipes, heavy rains, weak dam foundation or facility structure further weakened by land subsidence or earthquake. A number of tailings dam failures have also occurred in mines which had been operating for a number of years and in high seismic risk areas.

The underlying causes of these damages can further be traced to improper site location, inadequate dam design, company cost-cutting practices, below standards engineering work, inadequate mitigation measures, as well as government's limited standards and lack of monitoring or close supervision resulting in the use of inferior materials, low quality engineering work, absence of erosion controls, etc. In other words, these "accidents" are the liability of both the investor and the government.

IV. Policy Implications

Table 11 provides an evaluative framework for identifying and valuating mining externalities that may be applied at the local level. It enumerates the five potential unmitigated impacts and uncompensated damages, together with the valuation techniques for estimating such impacts and damages. It also identifies the affected stakeholders who absorb the damages or those physically displaced. Among those permanently displaced by mining are households who lose livelihood opportunities due to land/ habitat conversion, pollution of farm lands and water sources, and the collapse of tailings dams. The displaced include indigenous communities, as well as the farm and fisher folk households living alongside polluted streams, rivers or coastal areas.

As an environmental, economic-social assessment framework, the Table also serves as a guide for action at both the local and national level. The above unmitigated impacts and uncompensated damages bear the following policy implications.

One, the limited assumptions and provisions of the country's Water Code and related water policies must be addressed. In particular, there must a water supply and quality assessment; its sustainability must be ensured; the watershed must be the unit of management; in-stream water must be conserved and protected for its environmental

services; groundwater withdrawals must be limited to the recharge rate; a resource and environmental user fee system must be established and implemented in order to regulate resource use and maintain environmental quality; specifically, a raw surface water and groundwater charge must be levied, together with pollution charge, payments for environmental services, and the provision of incentives for pollution abatement technologies.

Two, geologic risk or land vulnerability assessment studies must be undertaken in prospective mineral areas, especially those with high seismic risks or prone to landslides and disasters, in order to determine the potential extent of environmental damages and the economic and social risks. These disaster-prone areas with high seismic risks may be included in the protected area system, and hence closed to mining. Since more than half of active concessions are said to be already located in such areas of high seismic risk, it is imperative to assess their mining design plans, particularly the adequacy and strength of mitigation and pollution control measures, and tailings impoundment structures.

Three, an environmental insurance system must be established to address the unmitigated impacts and potential uncompensated costs. Without this compensation source, these costs would be absorbed by the environment and affected local communities, households, and members of future generation in terms of present and future productivity, income–livelihood and health losses.

If undoubtedly substantial, the costs of damages particularly from a company's tailings dam overflow or collapse would very likely exceed the economic rents net of remittances either in a disaster year or downswing period. There must therefore be an environmental insurance fund established industry-wide and drawn from current and future rents in order to sufficiently cover the expected maximum annual value of uncompensated environmental, economic and social costs of the entire industry. Moreover, because the damages are the liability of both the mining company and the government, the share of both in compensation payments must be determined[16].

While there is presently no such environmental insurance system in place, the issuance of DENR-DAO 2005-06 in April 6, 2005 on the "Guidelines for the Institution of a System of Mandatory Environmental Insurance Coverage (MEIC) seems to have been an answer to the need. According to the guidelines objective, because the present administrative regime fails to "guarantee full environmental responsibility …, (t)he MEIC shall encompass payment of damages to health and property, environmental

[16] A prospective environmental insurance system may also consider or cover the damages emanating and forthcoming from abandoned mines. Specifically, how such damages would be compensated, the liability of the companies who had abandoned the mine, and the responsibility of the government would have to be resolved. At present, there are said to be 857 abandoned mines; some if not all pose hazards, have structurally weak or damaged tailings dam, are discharging at present or in the future pollutants and toxic materials into streams and bodies of water, and may collapse and cause flash floods, landslides, siltation of drainage system, and other downstream damages. The clean costs which have been estimated in billions of dollars had not been included in the companies' annual costs, much less the irreversible damages (Calumpita, Manila Times October 11, 2005).

rehabilitation, remediation and/ or clean-up costs and expenses (for the affected communities, areas and stakeholders), and provide a facility for the alleviation and recompense for any kind of environmental impairment or damage by reason of the project." Specifically, all current project proponents and applicants for an Environmental Compliance Certificate (ECC) and/ or Certificate of Non-coverage (CNC) must obtain insurance coverage in the form of both an environmental performance bond (EPB) to "answer for all environmental damages, penalties, and legal obligations which may arise from the failure of the project proponent to comply with its undertakings" and an Environmental Pollution, Impairment and Clean-up Liability Insurance (EPICLI) to "answer for all claims arising from damages to the environment, bodily injury, property damage arising from a pollution event including environmental rehabilitation, clean up and/ or remediation costs and expenses for contamination and/ or impairment of the environment."

The proposed MEIC unfortunately was not able to progress beyond the April 2005 DAO issuance. On 21 February 2006 it was indefinitely suspended partly because of valid reasons, as well as the resistance of industry associations. The DENR, for instance, had drawn up general guidelines that were perceived to apply indiscriminately to all project proponents and ECC applicants; it also failed to immediately and comprehensively establish the necessary mechanism for liability insurance, as well as delineate a cost-sharing arrangement among enterprises and government. While these policy limitations partly served as the basis for the resistance of different industry groups, particularistic interests also motivated industry position against an environmental insurance system.

In its critique of the DAO on MEIC, the Foreign Chambers of Commerce asserted that "the MEIC is a redundancy which complicates existing legal framework" because from their perspective "the existing mechanisms to insure environmental conservation," like the implementation of RA 6969 and PD1586 are enough. And the "concerns and issues of environmental management are being well dealt with under Multipartite Monitoring Team (MMT) as a monitoring mechanism and Environment Guaranty Fund (EGF) as a protective mechanism." Moreover, in their view, MEIC is merely a "new system of tax" or an "environment registration fee" posing in the name of an insurance coverage – it "is nothing but an added cost of doing business in the country."

The position of local and foreign mining companies or the Chamber seemed not to have been explicitly articulated in this issue. If the foreign mining company-members of the foreign chambers are then only willing to shoulder the current prescribed obligations and not make additional environmental outlays that further impinge on rent incomes, the government must have both the technical grounds and the political will and moral capacity to promote and establish an environmental insurance system.

Four, there must be a critical evaluation of the legal policy on public forestlands with prospective metallic mineral reserves which classifies and solely restricts their use as mineral production areas. Concomitantly, there must be a multiple use valuation of

public forestlands, as recommended in the Mineral Action Plan, in order to weigh and determine the alternative options for public forestland use. Historically, prospective mineralized public forestlands since the American colonial period have been assumed to have no alternative function or economic use other than as a source of metallic minerals. The rationing of public forestlands for fixed land use categories has thus opened mineral lands to the above unaccounted, uncompensated costs while closing them to positive land market developments. In other words, society has borne the social opportunity costs or foregone benefits from other land categories and uses that may be more efficient, income generating, equitable or environmentally sustainable.

In the absence of a land market or a flexible public land use policy, mining investors determine the amount of land demanded (***Dm***), based on the additional revenues it can generate or the value of its marginal product ***VMP(m)*** for mineral ***m*** production[17]. Figure 4 shows that if at a given metallic mineral price, only $\boldsymbol{OML_1}$ out of the total $\boldsymbol{OML_2}$ mineral lands are placed under mining operations, the residual area $\boldsymbol{(OML_2 - OML_1)}$ remains idle or unavailable for other uses even if the value of marginal product of land ***VMP(nm)*** for non-minerals ***nm,*** like agro-forestry or processed agricultural production is greater than the ***VMP(m)***. It is only when metallic ore prices increase and raise the demand for mineral lands to ***DDm*** that the available mineral lands is fully used. In other words, under a fixed public forestland rationing system, mineral lands are simply reserved for mining investors; they are only effectively exploited under robust mineral market conditions, and are not opened or released for other uses even if the market and environmental conditions of ***nm*** production are more favorable than ***m*** ore extraction.

With the liberalization of public land use, the relative values of ***VMP*** in mineral ***m*** and non-mineral ***nm*** production would determine the allocation of public forestlands. Given the demand for land ***Dnm***, a portion of former mineral lands would be used for ***nm*** production when its ***VMP(nm)*** exceeds the ***VMP(m)***[18]. Apart from growing demand for other higher-valued non-mineral ***nm*** products, demand for land ***Dnm*** can further shift upwards to ***DDnm*** as a result of the valuation of the costs of unsustainable activities on public forestlands and water resources or the increasing appreciation of the community and public for the economic benefits and environmental services of the watershed (see Figure 5). Both reasons thus translate into demand for alternative resource-environment uses and alternative property rights arrangements.

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[17] Even in the absence of a land market, the ***VMP*** concept or the net present value (***NPV***) rule may be used to evaluate public forestland use options. Both are useful to a private investor or a public decision-maker in assessing alternative investment/ production or land classification options. While the ***VMP*** does not consider costs unlike the ***NPV,*** it is useful in assessing options with the same marginal costs. The ***NPV*** rule, however, may be a more superior tool if one wants to incorporate non-market costs, externality and benefits considerations. For instance, it allows for the evaluation of mining's net benefits vis-à-vis the NPV of sustainable agro-forestry cropping regimes plus the non-market benefits, like the indirect uses of forestlands for soil conservation, provision of water supply, flood protection, and carbon sequestration.

[18] Under the present fixed public forestland policy, demanders or holders of mineralized public forestlands who have obtained their mining permits before the enactment of the Indigenous People Rights Act (IPRA) do not have to compensate present usufruct holders or cultivators who have no formal property rights nor do they have to grant FPIC rights to the IPs in the area.

Five, information and capacity building on environmental laws, programs, the EIA process and their requirements and limitations must be provided to local governments, rural and indigenous communities, specifically upstream and downstream farm and fisher folk households living in vulnerable or hazardous areas, alongside streams, rivers, irrigation facilities or coastal areas, in order to enable them to monitor and evaluate compliance with company commitments and mitigation measure, as well as document and value the potential unmitigated impacts and uncompensated damages of mining. Specifically, there must be capacity building in legal rights; valuation of environmental services, livelihood and health impacts, and other damages in the short- and long term, and their distribution; stakeholder analysis, organizing for community mobilization, negotiation and conflict resolution.

FIGURE 4. MARKET LAND ALLOCATION FOR TIMBER-MINERAL AND AGRICULTURAL PRODUCTION

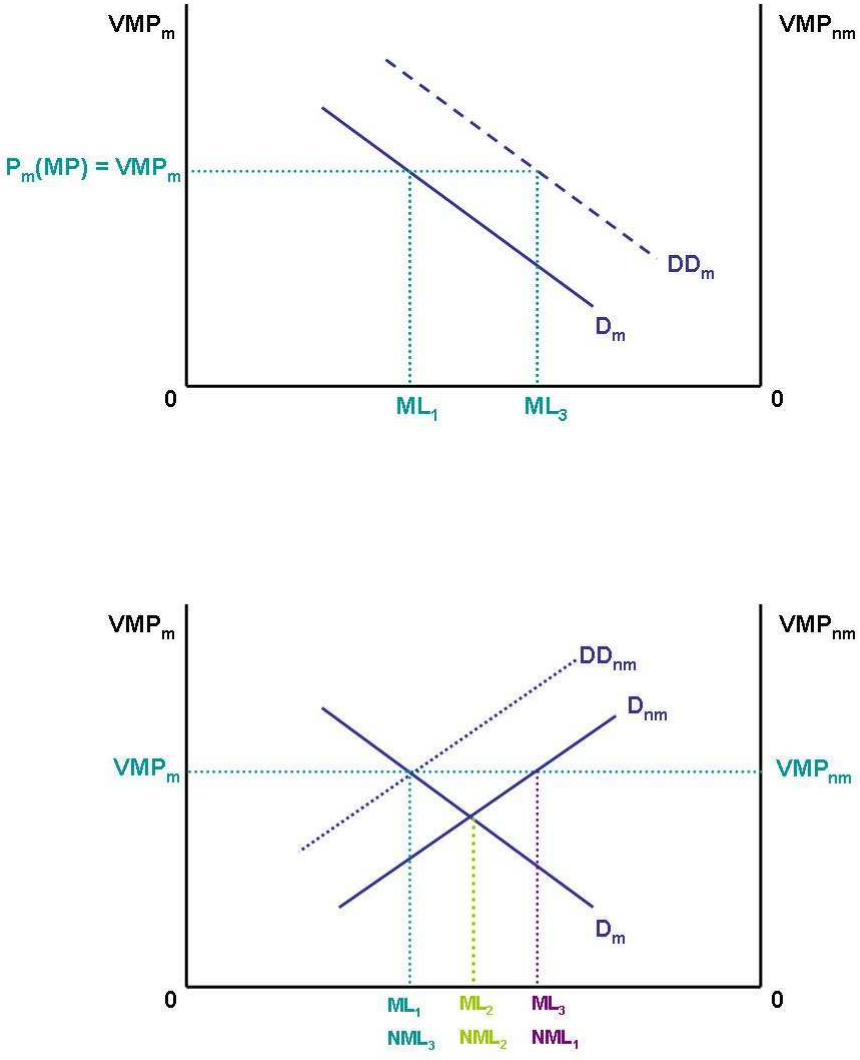

Table 1. SUMMARY OF MINING TENEMENTS PER REGION, 2007 (in hectares)

Region	MPSA						EP/TEP		FTAA		TOTAL AREA OF TENEMENTS	
	#	Cancelled/ With Appeal	#	To be Registered	#	Approved	#	Area	#	Area	To be Registered	Approved
1	1	4,360.71	3	752.04	11	14,577.82	3	8,878.32			4,360.71	23,456.14
2	1	1,692.84	1	2,391.80	1	2,835.00	2	14,792.58	1	21,428.7600	1,692.84	39,056.34
3	1	26.50	5	3,281.58	24	20,841.84					26.50	20,841.84
4	2	121.02	4	2,794.19	39	33,824.29	3	11,109.21			121.02	44,933.50
5			3	589.06	16	23,363.52	1	5,393.57				28,757.09
6	1	2,673.00	2	1,187.55	11	28,469.54					2,673.00	28,469.54
7	8	12,203.78	1	2,013.76	22	13,142.82	1	4,787.24			12,203.78	17,930.05
8	3	9186.00	3	14,239.54	10	26,676.18	2	7,949.12			9186.00	34,625.30
9	4	17,253.00	2	5,884.31	7	15,186.34					17,253.00	15,186.34
10			1	482.10	3	8,201.70	2	1,971.68				10,173.38
11	1	371.19	2	8,475.62	19	37,203.95	1	3,542.03	1	27,945.00	371.19	68,690.08
12					5	7,061.61						7,061.61
13	2	1,539.00	9	14,076.54	28	71,172.48	7	13,263.99			1,539.00	84,426.46
CAR					9	14,652.74	3	10,132.60				24,785.34
Total	**24**	**49,427.04**	**36**	**56,168.09**	**205**	**317,208.83**	**25**	**81,820.34**	**2**	**49,373.76**	**49,427.04**	**448,393.01**
Average Area		*2,059.46*		*1,560.22*		*1,547.37*		*3,272.81*		*24,686.88*	*2,059.46*	

Source: http://www.mgb.gov.ph

Table 2. CURRENT AND PROJECTED NUMBER AND AREA UNDER MINERAL PATENTS AND TENEMENTS, 2006/7

Type of Mineral Permit/ Tenement	# of Current Permits/ Tenements	Area of Current Permits/ Tenements (hectares)	Average Area of Current Permits	Projected Number of Permits/ Tenements	Projected Area of Permits/ Tenements (hectares)
Patented Mining Claims	206	1,571	7.63		
Lease Contracts*	2,146	138,594	64.58		
Mineral Reservations	7	416,900	59,557.14		
Mineral Production Sharing Agreement	205	317,209	1,550.29	145	485,000
Exploration Permit	25	81,820	3,272.80	26	115,000
Financial or Technical Assistance Agreement	2	49,374	24,687.00	12	60,000
Total	**2,591**	**1,005,468**		**183**	**660,000**

* Some of the lease contracts may have been converted into MPSA after 2003

Sources: MGB-DENR, *A Response to the Issues Raised Against Mining*, 2003
MGB-DENR, List of Approved Tenements, 2007

Table 3. PROFILE OF MINERAL CYCLES, 1973-2006

Mineral	Number of Cycles	Duration of Cycle (Years)	Number of Negative Price Growth	Maximum Negative Growth Rate
Gold	6	5-9	7	-25%
Nickel	6	3-6	13	-33%
Copper	7	5-10	14	-41%
Silver	7	4-7	16	-49%
Bauxite	7	2-5	16	-19%
Zinc	8	2-5	13	-27%
Lead	8	2-5	14	-42%

Source: MGB-DENR, 2007.

Table 4. FRASER SURVEY, 2001-2007

Index	2001/ 2002	2002 /2003	2003/ 2004	2004/ 2005	2005 /2006	2006/ 2007
Policy Potential Index	33/45	37/47	51/53	58/64	60/64	61/65
Current Mineral Potential Index	37/45	32/47	44/53	54/64	40/64	47/65
Uncertainty Concerning the Administration, Interpretation and Enforcement of Existing Regulations	33/45	39/47	45/53	59/64	58/64	54/65
Uncertainty Concerning Native Land Claims	33/45	45/47	52/53	62/64	58/64	61/65
Uncertainty Concerning which Areas will be Protected as Wilderness or Parks	27/45	24/47	22/53	56/64	55/64	56/65
Infrastructure	32/45	35/47	44/53	59/64	56/64	58/65
Political Stability	39/45	40/47	49/53	60/64	57/64	62/65

Source: http://www.fraserinstitute.org/

Table 5. FOREST LAND USES AND CHANGE, BY TYPE OF ACCESS, Area in Hectares, 2002, 2005/07

	2002	2005/2007*
Timber License Agreement[1]	740,680	778,943
Pulpwood Timber License	46,399	46,399
Industrial Forest Management Agreement	696,740	713,000
CSC[2]	666,775	666,775
CBFMA/CFMA	1,623,568	1,622,129
CADC	2,407,352	3,001,496[3]
FLMA	14,103	14,103
CFSA	67,034	67,034
MSA/REFO/MOA/On-going	31,746	31,746
Community-based Forest Management	4,810,578	5,403,283
Socialized Industrial Forest Management	29,593	40,265
Forestland Grazing	115,460	109,000
Tree Farm	20,099	17,000
Agroforestry Farm Leases	90,707	89,000
Established Timberland with Tenure[4]	**6,550,256**	**7,196,890**
Approved Mining Tenements[5]		448,393
Approved Mining Tenements to be Registered		49,427
National Parks, GRBS/WA	893,221	1,342,579
Established Forest Reserve	3,272,912	3,222,360
Unclassified Forest Land	1,089,118	753,427
Total Area	**11,805,507**	**13,013,076**

[1] From 1951 to 1985, there were 10,125,389 hectares under TLA. Hence, 4,035,389 hectares of TLA areas were cancelled or not renewed by 1985.
[2] Certificate of stewardship contract (CSC); Community-based forest management agreement (CBFMA); Community forest management agreement (CFMA); Certificate of ancestral domain claim (CADC); Forest land management agreement (FLMA); (CFSA); (MSA); Reforestation (REFO); Memorandum of Agreement (MOA)
[3] This figure includes 604,144 of CADT approved from July 2002 to December 2004
[4] Does not include the forestland areas under Mineral Production Sharing (MPSA) and, Financial and Technical Assistance Agreements (FTAA, and Exploration Permits (EP/TEP).
[5] Most of the mineral reservation are (446,721 has) are with permits/tenements.
Sources: FMB, *Philippine Forestry Statistics (*2003, 2005).

Table 1.2. Estimates of Different Forest Land Types and Non-forest Lands, Coverage of the Public Domain, and Extent of Loss or Expansion (In million hectares)

Public and Private Land Type	1934	1969	1988	1997	2003/2005
Forest Type					
Old growth	11.1	5.22	1.17	0.81	
Other forest/mossy	2.33		0.292	1.04	
Pine	0.5	0.22	0.25	0.28	
Closed					2.481
Residual	2.5	3.27	3.48	2.73	
Plantation					0.282
Unproductive/ Reproductive brush lands and submarginals	0.7	1.79 5.44	1.46	 2.23 0.48	
Mangrove	0.3	0.14	0.139	0.112	0.153
Forest Area in Forestland	**17.43**	**16.08**	**6.79**	**5.39**	**2.916**
Non-Forest Lands					
Open, brush and grasslands	3.6	1.12	9.09	10.49	3.516
Public forestland without forest cover					9.423
Public Forestland					
Public forestland, classified & unclassified	21.03	17.20	15.88	15.88	15.79’
Alienable & disposable	≈8.6	12.57	14.11	14.14	14.21’
With forest cover					0.737’
Without forest cover					13.408
Total Country Area	≈29.63	29.77	30.0	30.0	30.0

Sources: Revilla (1985); Bonita and Revilla (1978); Philippine German Forest Resources Inventory Project (1990); and FMB, *Philippine Forestry Statistics (*1997, 2003).

Table 6. Mineral Reserve Assessment of Samar Island.

	Bauxite	Copper-Pyrite	Lateritic Nickel
Area (ha)	3,972	648	648
Reserve (MT)	137,859,997 MT 42.99% Al203	1,424,973 MT 2.4% Cu 8,062,000 MT 35.46% S	13, 278,310 MT 0.58% Ni
Recoverable Ore	90,411,373 MT	1,252,476 MT 2.4% Cu 7,255,800 MT 35.46% S	11,950,479 MT
Life of Mine & implicit Areal Mining Rate	21 years 189 ha/year	11 years 58.9 ha/year	12 years 54 ha/year
Implicit Annual Output Production Rate (per ha)	209,412 MT 1,108 MT/ha	70,303.04 MT 1,193.6 MT/ha	82,987.2 MT 1,536.8 MT/ha

Source: Mendoza, Herman 2001

Table 7. REVENUES, COSTS, AND RENTS IN DIFFERENT MINERAL CASES

	BAUXITE	% of Revenue	COPPER and PYRITE	% of Revenue	NICKEL	% of Revenue	COPPER-GOLD	% of Revenue
Price/mt	$210		$300 (Copper Concentrate); $55 (Pyrite Concentrate)		$5,537		$15.6	
Production (MT)	4,305,303		5,016,809		995,873		25,000,000	
Revenue/Sale (PhP)	14,251,544,773	100.00%	750,840,441	100.00%	1,266,521,997	100.00%	390,000,000	100.00%
Labor and Management Cost	682,048,853	4.79%	63,725,042	8.49%	75,218,303	5.94%	14,300,000	3.67%
Royalty to IPs							3,900,000	1.00%
Community Development	16,016,115	0.11%	906,350	0.12%	3,354,186	0.26%	900,000	0.23%
Environmental Costs	146,576,220	1.03%	8,148,890	1.09%	30,208,092	2.39%	6,010,000	1.54%
Environmental Trust Fund	50,000	0.0004%	50,000	0.01%	50,000	0.004%	50,000	0.01%
Rehabilitation Cash Fund	5,000,000	0.04%	3,021,166	0.40%	5,000,000	0.39%	111,111	0.03%
Mine Waste and Tailings Fee Cash Fund								
Capital Expenditure or Depreciation/Depletion	664,176,145	4.66%	53,836,074	7.17%	222,208,014	17.54%	37,000,000	9.49%
Exploration Costs	(47,619,048)	-0.33%	(14,727,273)	-1.96%	(13,500,000)	-1.07%		
Mining (and Milling) Costs	478,916,746	3.36%	31,490,259	4.19%	110,860,663	8.75%	120,000,000	30.77%
Processing Costs	986,845,457	6.92%	49,998,639	6.66%	191,220,258	15.10%		
Power	289,667,216	2.03%	17,738,422	2.36%	65,175,124	5.15%		
General Supplies	24,138,935	0.17%	1,478,202	0.20%	5,431,260	0.43%		
Excise Tax	285,030,895	2.00%	15,016,809	2.00%	25,330,440	2.00%	6,250,000	1.60%
Custom Duties							150,000	0.04%

	BAUXITE	% of Revenue	COPPER and PYRITE	% of Revenue	NICKEL	% of Revenue	COPPER-GOLD	% of Revenue
Real Property Tax							3,500,000	0.90%
Local Business Tax	53,443,293	0.38%	2,815,652	0.38%	4,749,457	0.38%	750,000	0.19%
Development of Geosciences and Mining Technology	1,779,568	0.01%	100,706	0.01%	372,687	0.03%	300,000	0.08%
Occupation Fees							50,000	0.01%
National Government Royalty (5% actual market value)	712,577,239	5.00%	37,542,022	5.00%	63,326,100	5.00%		
Tax on Dividends							2,500,000	0.64%
Corporate Income Tax	3,184,927,084	22.35%	153,503,834	20.44%	152,805,572	12.06%	62,953,244	16.14%
Net Income Before Corporate Income Tax	9,952,897,139	69.84%	479,699,482	63.89%	477,517,413	37.70%	196,728,889	52.39%
Opportunity Cost of Capital	*287,535,054*	*2.02%*	*16,777,719*	*2.23%*	*69,767,438*	*5.51%*	*18,840,000*	*4.83%*
Company's Share of Rent	**6,480,435,000**	**45%**	**309,417,929**	**41%**	**254,944,403**	**20%**	**112,435,644**	**29%**
Break-even Price	PhP993.15				PhP466.53		$7.07	
Negative Growth of Price	90.54%				63.30%		54.70%	

Source: Mendoza, Herman D. *Mineral Resource Assessment (MRA) of Samar Island,* REECS, Samar Island Biodiversity Study, 2001

Notes:
Community Development - 0.9% of the 1% of mining (and milling) costs, processing costs, power and general supplies
Rehabilitation – PhP5,000,000 or 3% or 5% of mining (and milling) costs, processing costs, power and general supplies, whichever is lower
Development of Geosciences and Mining Technology - 0.1% of the 1% of mining (and milling) costs, processing costs, power and general supplies
National Government Royalty – 5% of the actual market value of the mineral
Corporate Income Tax – 32% of net income
Opportunity Cost of Capital – capital expenditures and mining (and milling) costs, processing costs, power and general supplies
Company's Share of Rent – net income after corporate income tax
Break-even Price – Total Costs / Total Volume of Production
Negative Growth of Price – [(Break-even Price – Given Price) / Given Price]*100

Table 8. Environmental Protection and Enhancement Program (EPEP) Guidelines

Mining Phase & Activities	Affected Area or Resource	Foreseen Impacts	Mitigating Measures	Estimated Budget
I. Construction and Development				
• Removal of plant and animal communities • Haulroads and access roads and other infrastructure • Final void (pit) and high wall • Buildings, and other structures • Plant, including derelict equipment • Residential, recreation and/ or community facilities • Stockpiles and dumps and overburden spoil piles	• Land Resource • General	• Loss of vegetation, change of topography • Loss of important plant species • Soil transport, erosion, siltation, soil compaction • Change in surface water runoff • Effect on soil fertility • Slope stability problem and potential wall collapse • Soil/water contamination • Suspended dissolved solids • Leakage of materials on the pipeline, pipe failure • Potential acid rock generation	• Separation of contiguous area for wildlife and watershed management protection • Slope stabilization to prevent soil erosion • Construction of fresh water dams	
II. Mining Operations and Mineral Processing				
• Stockpiles' (waste/spoils and ore) drainage • Mine dewatering or pit drainage	• Water resources • Air	• Degradation of water quality • Change in drainage pattern • Change in water run off • Erosion, siltation • Acid rock drainage • Slope failure • Dust from mining activities, plant processing area, vehicle movement, and exploration activities • Fumes from flotation and concentrate storage and CIL areas • Gases from underground mine shafts		
III. Waste Management				
• Infrastructures for storage, settling and treatment ponds, wastewater treatment, power and drainage control • Watercourse crossings and diversion banks • Solid waste disposal • Product waste and consumable use, storage and disposal	• General • Water resources	• Siltation and sedimentation • Soil erosion/deposition • Water contamination and heavy metals • Structure stability failure, seepage , spillway failure • Change in drainage pattern • Loss of vegetation, flora and fauna • Decrease in water source • Potential acid generation	• Tailings impoundment • Tailings dam seepage collector • Treatment of residual voids • Construction of sediment control dam • Treatment of groundwater quality	

Mining Phase & Activities	Affected Area or Resource	Foreseen Impacts	Mitigating Measures	Estimated Budget
IV. Rehabilitation				
• Pre-mining preparation • Final landform design • Land surface preparation for revegetation o Slope stabilization o Backfilling o Nursery establishment o Treatment • Maintenance	• Land resources			

Table 9. MITIGATING MEASURES AND FUNDING PROGRAMS

Mitigating Measure	Actual Fund Source	Purpose
Environmental Work Program	10% of estimated exploration cost or capital investment	Construction of environment-related infrastructure
Mine Rehabilitation Fund • Monitoring Trust Fund • Rehabilitation Cash Fund	PhP150,000 PhP0.5million or 3-5% of annual direct mining and milling costs	Finance the work of the Multipartite Monitoring Team Finance environmental or facility rehabilitation activities and repair works
Mine Wastes and Tailings Fee Reserve Fund	(PhP0.05/mt of mine waste)*(assessed volume) (PhP0.10/mt of tailings waste)*(assessed volume)	Cover the property damages of industrial, commercial, residential, agricultural, forestlands, and marine/ aquatic resources
Environmental Trust Fund	PhP50,000	Compensate damages outside of those caused my mine waste and tailings

Table 10. FRAMEWORK FOR VALUATION OF EXTERNALITY

Mining Phase/Activities	Unmitigated Potential Resource and Environmental Damages	Uncompensated Economic/Social Risks & Costs	Present Remedial/ Mitigating Measures	Estimation of Damages/Costs
I. Mining Exploration, Operation & Ore Extraction				
• Land clearing • Road building • Excavation for assessing ore reserve • Construction of open pit, under-ground mine & waste dumps • Removal of surface vegetation (loss of forest area) & topsoil • Accumulation of waste piles of rock, soil & earth • Release of hazardous materials from rock wastes	• Disruption, if not loss of natural habitat • Forestland conversion/ loss • Decline in carbon sequestration capacity • Erosion, sedimentation • Reduced slope stability or higher risk of landslides • Diversion of surface or groundwater • Reduced or erratic stream flows • Clogged stream channels • Potential acid rock generation • Contamination of surface waterways	• Restricted entry to hunters, food gatherers, shifting cultivators • Loss of forest-based livelihoods (e.g. non-timber forest products) • Displacement of indigenous and migrant households/ community • Reduced water availability for domestic consumption & irrigation • Higher cost of potable water • Income losses due to landslide, farm productivity decline	• Environmental Work Program (EnWP) for Exploration • Environmental Protection and Enhancement Program (EPEP) • Social Development and Management Program (SDMP) • Monitoring Trust Fund and the Rehabilitation Cash Fund (RCF)	
II. Mineral Production				
• Crushing, concentration • Separation of ore with the use of chemicals (mercury, cyanide, sulphuric acid) • Increased use of local water sources • Increase energy consumption (hydro electric or fossil fuel)	• Threat to particular species or biodiversity loss • Diversion of surface & groundwater • Reduced stream flow or groundwater depletion • Acid rock drainage and contamination of soil and water • Surface, groundwater pollution	• Reduced local water supply • Higher cost or greater inavailability of potable water • On-site and off-site decline in farm yield, fish harvest (subsistence or income sources) • Less recreational opportunities • Entry of mercury, other toxic material into the food chain	• Implementation of Annual EPEP & rehabilitation measures • Implementation of SDMP community development & livelihood projects • Monitoring Trust Fund and the	

Mining Phase/Activities	Unmitigated Potential Resource and Environmental Damages	Uncompensated Economic/Social Risks & Costs	Present Remedial/ Mitigating Measures	Estimation of Damages/Costs
	• Reduced fish spawning area • Damage to aquatic life • Air pollution (increased dust, PM, metal gases, sulphuric acid)	• Health damages from poor water quality • Respiratory illnesses and long term loss of life • Decline in productivity, income	Rehabilitation Cash Fund (RCF) • Guidelines for mine waste and tailings management	
III. Mine Waste and Tailings Management				
• Accumulation & storage of sulphide minerals, toxic metallic elements • Storage of waste rock piles • Construction of tailings dams/ ponds • Greater release of hazardous materials from rock wastes • Acid rock drainage • Discharge of acidic water or release of tailings, toxic metals into bodies of water	• Contamination of streams, rivers, other water bodies from tailings release • Destruction of habitats (rivers, mangroves, sea grass, coral reefs) • Fish kills • Groundwater contamination from tailings dam seepages • Air pollution from dried tailings • Loss of particular species	• Immediate illnesses and long-term health damages from contaminated water and food intake • On-site and off-site/ downstream property damages, and livelihood or income losses from tailings release • Off-site/ downstream community displacements	• Mine Waste and Tailings Fees Reserve Fund • Guidelines for mine waste and tailings management	
IV. Mine Rehabilitation, Closure or Abandonment				
	Same as above	Same as above	• Final Mine Rehabilitation and Decommissioning Plan (FMRDP)	

Table 11. UNMITIGATED RESOURCE-ENVIRONMENTAL IMPACTS AND UNCOMPENSATED DAMAGE

Unmitigated Impacts and Uncompensated Damages	Valuation Technique	Proposed Policy Actions	Affected Stakeholder
1. Household, community displacement	• Subsistence income losses • Resettlement cost		Indigenous people Upland migrant settlers
2. Reduced access or availability of local water supply for in-site and off-site areas	• Cost of potable water • Productivity (income) loss of agriculture, fishery, hydroelectric, recreation, services • In stream habitat damage	• User fee policy • Environmental charge • In-stream water reserve	Onsite community Neighboring & downstream communities
3. Unpaid use and depletion of groundwater	• Raw groundwater value • Depletion cost of groundwater	• Groundwater fee • Regulation of groundwater use	Onsite and offsite well owners
4. Pollution of surface water and aquifer	• Restoration cost of polluted bodies • Habitat productivity loss, e.g. fish yield • Cost of potable water source, water for other uses • Health cost (e.g. cost of illness, human capital or productivity loss) • Wastewater treatment, cost of abatement and technology	• Raw surface water charge • In-stream water reserve • Payment for environmental services • Pollution charge • Incentives for pollution abatement technologies	Affected farm households, fisherfolks Spring and potable water users, esp. children
5. Leakages, overflowing or collapse of tailings dam	• Subsistence income losses • Resettlement cost • Cost of potable water • Productivity (income) loss of agriculture, fishery, hydroelectric, recreation, services • In stream habitat damage • Restoration cost of polluted bodies • Habitat productivity loss, e.g. fish yield • Cost of potable water source, water for other uses • Health cost (e.g. cost of illness, human capital or productivity loss) • Wastewater treatment, cost of abatement and technology	• Geologic risk or land vulnerability assessment study • Damage or loss compensation • Incorporation of disaster-prone areas into the Protected Area system • Environmental insurance system	Affected onsite and downstream communities Affected farm households, fisherfolks, recreationists, enterprises

Appendix
MGB's Estimated Benefits per Mine in Million $ (25M mt/year)
Copper-gold mine; Area: 50,000 hectares: years of production: 20

Foreign Exchange Revenue: 25M mt($15.6/mt) = $390M; $7,800M over life-of-mine
Investment inflow: $740M (implies a capital expenditure/ year $37M)
Direct mining & milling cost: $120M/year; (**Non-labor cost: 36.6%)**
Payroll (may be included in direct mining cost): $14.3M/year; 286M/lom **(Labor: 3.7%)**
Annual production cost: $157M/25M mt = $6.28M/ mt
Royalty to IP: $3.9M/ year **(IP & community: 1.2%)** less government withholding
Community development (.9 of 1% of direct mining, milling cost): $0.9M/year
Government taxes **(about 16%)**
Excise tax: $6.25M/year
Custom duties: $0.15M/year
Real property tax: $3.5M/year
Local business tax (2% of sales VS 37.5 of 1% of gross sales): $0.75M/year
Development of geosciences and mining technology: 0.1 of 1% of mining, milling cost): $0.30M/year
Occupation fees: 0.05M/year
Corporate income tax $51.4M/year
Tax on dividends $2.50M/year
National government royalty (5% actual market value)
Corporate income including dividends tax, net of corporate tax: 159.79M/year **(about 41%)**
Environmental Work Program (10% of investment for the entire lom) $6.01M/year **(1.5%)**
Rehabilitation Cash Fund (3-5% of mining, milling costs or P5M, whichever is lower)
Mine waste and tailings fee: volume of waste and tailings, given the production level – fee would be drawn from corporate income – fee rates have not been adjusted since 197 -
Water consumption – is the cost included in the mining and milling cost – if not, because there is no user charge for groundwater use -