

REVIEW OF PHILIPPINE LARGE-SCALE METALLIC MINES

Synthesis of the MICC Review of Large-Scale Metallic Mining
Operations in the Philippines, 2018 – 2020



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Foreword

The mining industry plays a huge role in stimulating the national economy and contributing to the country's socio-economic development. With the opportunities and risks it poses to the people and the environment in the medium and long term, the industry needs to be scrutinized, reviewed, and monitored. In 2012, the Philippine government issued Executive Order No. 79 (EO 79) to institutionalize and implement reforms in the mining sector. The Mining Industry Coordinating Council (MICC), an inter-agency body, was created to carry out the order. The MICC is mandated to assess and review all mining operations concerning their compliance with existing laws and regulations. It also reviews mining-related laws, rules, and regulations, and provides corresponding policy recommendations to improve their effectiveness and relevance.

Pursuant to Section 3 of EO 79, the MICC has implemented a multi-stakeholder review on the performance of existing mining operations from February 2018 to December 2020. The Review was conducted in two phases and covered a total of 45 large-scale metallic mining operations. A total of 29 local experts were engaged to undertake the review, ensuring that it is objective and based on facts and science.

This paper is designed to present the technical perspective of mining based on the results of the MICC review, particularly on the legal, technical, social, economic, and environmental aspects. The paper also highlights the good mining industry practices and those that need improvement. Its intended audience includes the academe, legislature, judiciary, and the business sector.

With this paper, the MICC aims to guide mining companies in improving their mining operations and business practices. For the government, the paper offers valuable and relevant insights to better inform policies and decisions towards improving the regulation of the mining sector and ensuring its contribution to the country's sustainable development agenda.

Executive Summary

The Mining Industry Coordinating Council (MICC), through the Development Academy of the Philippines (DAP), has engaged a multidisciplinary team composed of legal, technical, environmental, social, and economic experts to conduct a review of mining operations across the country starting with large-scale metallic mining. The Mining Review aimed to (a) identify gaps, issues, and concerns that limit the industry's contribution to national and regional development; (b) ensure a more responsible mining sector considering the commonly held perception of the destructive effects of mining operations; and (c) recommend effective interventions and policy measures toward contributing to the sustainable development goals. In meeting these objectives, the frame of the Review combined substantive regulatory compliance, technical and economic efficiency, environmental quality management, local economic growth, and community welfare improvement.

The legal Review was done in two stages. The first stage examined mining companies' procedural compliance with regulatory and corresponding documentary requirements. The second stage looked into actual implementation activities and substantive compliance beyond mere documentary review. On the other hand, the technical review framework was jointly developed by mining engineers, metallurgical engineers, and geologists. It covers the review of production, mineral resources, comparison with global standards of mining operation, infrastructure support for mining, auxiliary facilities, mine management, capitalization, safety, and working environment. The environmental management review considers mining activity as environmental perturbation or disturbance of the natural pattern that affects ecosystem functions and flow of ecosystem services. The review carries the premise that laws and regulations are designed to minimize mining's impacts on the environment and to ensure the sustainable management of other natural capital—renewable or non-renewable. With that frame, a mining company is obliged to put in place preventive and mitigation measures, and restore damaged ecosystems. The social aspect of the review, meanwhile, takes on the perspective of social development, which means improving the well-being of every individual in society to attain their full potential. Therefore, the social development review is focused on the attainment of improved quality of life or well-being of people and communities in mining sites. The economic aspect of the Review is anchored on the concept of sustainable economic growth and development. This concept includes the notion that future generations should have at least the same level of stock of resources or capital, regardless of kind, so that the level of assets available is non-declining over time to support basic needs of the present and the future. In addressing the key tasks prescribed by the MICC, each expert followed the standards of their respective discipline. Each expert has specific terms of reference and key questions to answer that was agreed upon by the entire panel of experts identified by NEDA, the agency acting as Secretariat of MICC, the Department of Environment and Natural Resources (DENR), and the Department of Finance (DOF). The results of the Review were discussed and presented in a series of meetings and workshops led by the over-all team leader. The summaries of the Review begin with legal compliance followed by technical, environment, social and economic findings, and recommendations, respectively. Chapter 3 details the legal compliance review, including summary recommendations for each mining company and future direction related to mining policy. Chapter 4, 5, 6, and 7 provide details of

the Technical, Environment, Social, and Economic review. Chapters 8 and 9 summarize the results and recommendations by experts.

The Review covered 43 large-scale metallic mining companies. There are 45 mining sites or operations, but two nickel mine sites operated by one company in Dinagat Island were considered as one operation. Of the 43 companies, 11 produce gold, 5 copper, 9 silver, 4 chromite, 2 magnetite, and 27 nickel (see Table 4). These are located in 17 provinces in 10 Regions (see Figure 6). Of those reviewed, 19 were under the Care and Maintenance Program (CMP), either voluntarily due to the sudden drop in mineral ore prices worldwide or involuntarily due to suspension following a DENR Audit. Thirteen of these are nickel mining operations, while the rest are magnetite and chromite. Ten gold mining operations were operating at the time of the review, while one is under CMP. Owing to the lack of a national policy on care and maintenance program at the time, companies employed different methods of maintaining their mining area. Some companies could not keep up with the required activities, notably social development and management. Nevertheless, several companies were able to sustain their social management programs and even drive innovation to address specific social issues they have encountered.

Four mining operations showed excellent benchmarks for future mining entrants whether open-pit or underground mining. One gold mining operation has a state-of-the-art, fully mechanized underground system that yields higher ore production. Three nickel mining demonstrated several innovations in mining operations and environment management, leading to recognition and awards at local and international levels. However, 14 companies must address some regulatory issues as reported by the DENR audit reports in 2016. In the two phases of review, these are the mining operations that had about 2.0 average overall score. All gold mining operations located in Luzon have varying levels of performance. One had the potential for sustaining development where it performs significantly in the five aspects of sustainability, namely technical, environmental, social, legal, and economic aspects. Except for the old gold mining in Benguet, the other mining operations have a steady production.

Other mining operations, particularly those engaged in nickel mining in Zambales and Loreto, Dinagat Islands, need to further examine their technical and environmental aspects and consider increasing environmental protection expenditures. These nickel companies must carefully balance investments for socio-economic development with community development. It must consider building up other forms of capital e.g., renewable natural or manufactured capital that can be sustained beyond the mine life. This type of metallic mineral mining is spread across a wider area. Extraction is limited to only a few months in a year, and highly dependent on global demand and market cycles. Volatility in the global market and activities are price fluctuation encourage perverse incentives towards intensifying production during peak demand and disregarding the environmental damage.

Four nickel laterite mines in Zambales are concentrated in a mountain range and are adjacent or with shared boundaries in the upper sections of the major river systems in the area. These four mines employ the same mining method, which involves the complete removal of vegetation and strip-excavation of wide and extensive step-like benches to remove the soft nickel-bearing weathered rock and the overlying clayey material that are directly exported to foreign buyers as unprocessed material known as Direct Shipping Ore (DSO). On the other hand, nine mining companies have Mineral Production Sharing Agreement (MPSA) in the municipalities of Basilisa, Libjo, Tubahon, Loreto, and Cagdianao in the Dinagat Island Province. These are the AAM-Phil Natural Resources Exploration and Development Corp., Wellex Mining

Corp. Mine, Krominco, Inc., Libjo Mining Corp., Oriental Synergy Mining Corp., Oriental Vision Mining Phil. Corp., Sinosteel Phil, N.Y. Mining Corp., Cagdianao Mining Corp., Century Peak Corp. - Rapid City. Of the 11 mining sites, only Cagdianao Mining Corporation and Century Peak Corporation are operating. The rest are on CMP. Compared to some gold mining with a century of history, most nickel laterite mining companies are relatively recent. The government offices directly dealing with the permitting, regulation, and monitoring of the nickel laterite mining operations need substantial improvement and modification of its implementing rules and regulation to better address this type of mining's inherent impact on the environment and affected communities.

For some mining operations, there are sufficient grounds to justify the closure orders issued by the DENR. Some of these mining companies are performing poorly, and others need interventions for key reforms. Such performance required a detailed review. Table 16 on page 63 presents a summary of the ratings of large-scale metallic mining operations included in Phase 1 and 2 of the Review. Started in 2018 and completed in May 2019, the Phase 1 covered mining operations that failed the 2016 DENR audit. Phase 2 was started in 2019 and was completed in May 2020, involving those that passed the 2016 DENR audit.

On the social and economic aspects, Social Development and Management Program (SDMP) evaluation, social impact assessment, and stakeholder satisfaction surveys are recommended at a specified period of its implementation. Also proposed are process evaluation, project-specific impact evaluation, institutional and governance assessment, and sustained funding for social development even while under CMP. On the environment aspect, regular accounting of dependencies and impacts of mining operations on the overall environment and within and adjacent ecosystems impacted by the mining operations are needed. The use of remote sensing, artificial intelligence tools, and Internet of Things (IoT) technologies can help accomplish these tasks. On the legal aspect, a review of policy, standards, and regulatory mechanisms for CMP are needed to improve the welfare of the host and neighbor communities. In addition, in the same manner as SDMP evaluation, the Environmental Protection and Enhancement Program (EPEP) and Final Mine Rehabilitation and/or Decommissioning Plan (FMR/DP) require evaluation at specified intervals emphasizing measurable targets. The goals of these two programs must match and ensure specific and appropriate indicators of success that can be measured during and after the end of mine life in view of sustaining development in the host and neighbor communities. Combinations of nature-based and infrastructure solutions to control sedimentation and major environmental threat in mining operations, must be sufficiently funded. Solutions include climate-proofing, such measures, acknowledging that mine sites are at significant risk of damage from typhoons and related hazards.

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Acronyms

ADSDPP	Ancestral Domain Sustainable Development and Protection Plan	DOF	Department of Finance
AEPEP	Annual Environmental Protection and Enhancement Program	DOLE	Department of Labor and Employment
ASDMP	Annual Social Development and Management Program	DSO	Direct Shipping Ore
ATL	Atmospheric Tank Leach	EA	Environmental assessment
BCA	Benefit-Cost Analysis	ECAN	Environmentally Critical Areas Network
BCR	Benefit-Cost Ratio	ECC	Environmental Compliance Certificate
BIR	Bureau of Internal Revenue	EIA	Environmental Impact Assessment
BNMI	Benguet Nickel Mining Inc.	EIRR	Economic Internal Rate of Return
CAPEX	Capital expenditures	EIS	Environmental Impact Study
CAR	Cordillera Administrative Region	EITI	Extractive Industries Transparency Initiative
CBMS	Community-based Monitoring Survey	EMB	Environmental Management Bureau
CES	Corporate Exploration Strategies	EO	Executive Order
CMP	Care and Maintenance Program	EPEP	Environmental Protection and Enhancement Program
COG	Cut-off grade	ESRI	Environmental Systems Research Institute
CRMP	Community Royalty Management Program	FDI	foreign direct investment
CSR	Corporate Social Responsibility	FGD	focus group discussion
DAO	Department Administrative Order	FIRR	financial internal rate of return
DAP	Development Academy of the Philippines	FMRDP	Final Mine Rehabilitation and/or decommissioning plan
DCF	Discounted Cash Flow	FPIC	Free, Prior and Informed Consent
DENR	Department of Environment and Natural Resources	FS	Feasibility study
DFS	Detailed/definite feasibility study	FTAA	Financial or Technical Assistance Agreement
DHNC	Development of Host and Neighboring Communities	GIS	Geographic Information System
DMPF	Declaration of Mining Project Feasibility	GRC	Greenstone Resources Corporation
DMTG	Development of Mining Technology and Geosciences	HSS	Health, Safety, Security
		ICC	Indigenous Cultural Community

IEA	International Energy Agency	NPVR	net present value of revenue
IEC	Information, Education and Communication	OAMDC	Ore Asia Mining and Development Corporation
ILO	International Labor Organization	OHSAS	Occupational Health and Safety Assessment Series
IP	Indigenous People	OP	Office of the President
IPRA	Indigenous People's Rights Act of 1997	PHP	Philippine peso
ISO	International Organization for Standardization	PMC	Philsaga Mining Corporation
KII	Key informant interview	PPAEMTG	Promotion of Public Awareness and Education on Mining Technology and Geosciences
LGU	local government unit	PRA	participatory rapid appraisal
LPAL	Low Pressure Acid Leach	PSA	Philippine Statistics Authority
MGB	Mines and Geosciences Bureau	RA	Republic Act
MICC	Mining Industry Coordinating Council	RHNC	Representatives of the Host and Neighboring Communities
MMT	Multipartite Monitoring Team	RTNMC	Rio Tuba Nickel Mining Corporation
MOA	Memorandum of Agreement	SDMP	Social Development and Management Program
MPSA	Mineral Production Sharing Agreement	SEP	Strategic Environmental Plan
MRE	mineral resource estimate	SIA	Social Impact Assessment
NCIP	National Commission on Indigenous Peoples	SRMI	SR Metals Inc.
NDVI	Normalized Difference Vegetation Index	TESDA	Technical Education and Skills Development Authority
NEDA	National Economic and Development Authority	TRT	Technical Review Team
NGO	non-governmental organization	TSP	Total Suspended Particulates
NIGS	National Institute of Geological Sciences	USD	United States dollars
NPVB	net present value of benefits	USLE	universal soil loss equation
		ZDMC	Zambales Diversified Metals Corporation

CHAPTER 1:

Overview of the Mining Industry

Global Mining Trend

The global mineral industry is largely influenced by economies’ gradual shift towards low carbon and the increasing cost of access to resources. The rise of artificial intelligence, diversifying financing and investment options available, mining workforce competition, geopolitics, and demand for creating sustained benefits to communities are affecting the industry’s evolution, which can be seen in the rapid expansion of mining operations in the country between 2006 and 2016. This growth was boosted by the increase in global demand for steel and the rise in nickel price (See Figure 1). A shift towards low carbon will increase demand for other non-common metals, such as graphite, lithium, indium, and cobalt, may increase with several highly advanced countries shifting to renewable energy (IBRD/World Bank 2020). These market trends, the direction of global investments, production in other countries, demand by highly influential markets, such as China and the United States, and climate actions will greatly influence investment and mineral extraction, and indirectly impact on local communities’ welfare, and the environment.

Shifts to renewable energy require the modernization of local mining operations. Based on commodities production, gold, silver, and copper are among the

high-priced metal commodities in the world market. Gold prices increase amid crises because gold is regarded as an investment haven from risks. Gold is also considered the most stable currency in the long term. However, the country is globally ranked 27th in reserves of gold and 30th in gold production. In recent years, local production has dropped significantly from 197 tons in 2019 to 156 tons in 2021 (Trading Economics 2021). Such a trend is likely an indication of slow modernization and restricting regulatory mechanisms.

Dominating nickel, which is largely dictated by the construction and steel industries, are Australia, Russia, New Caledonia, and Brazil. In 2020, the Philippines ranked sixth in nickel reserves, following Indonesia, Australia, Brazil, Russia, and Cuba (Statista 2021). Figure 1 shows a highly volatile market for nickel. The local response is to rapidly extract in order to meet the demand. Thus, environmental protection, which is one of the subjects of the MICC review, is afforded less attention. It is worthy to note that the Philippines produces Direct Shipping Ore, which is exported without local processing. Processed nickel is a tiny proportion of the total extraction. The small window of favorable weather dictates the rapid extraction or production of nickel.

Figure 1. Historical Trend of Nickel Prices
Source: Federal Reserve Bank of St. Louis (2021)



Kesler (2007) assembled some historical data on steel consumption starting in the 1700s. Data showed a rapid rise in steel consumption from the early 1900s to the 2000s, matching the rapid increase in population in the same period (see Figure 2). Apart from the effects of population growth, the transition to renewable energy and the dramatic change in the living standards put upward pressure on the demand and supply of metals in the world market (Kesler 2007). This is consistent with the upward swing in nickel prices between 2006 and 2007, as shown in Figure 1 above. It was notable from published data that China has a large influence on prices of

metals, so fluctuations such as those caused by the COVID-19 pandemic influence trade and have an impact on markets and production.

According to the S&P Global Market Intelligence’s World Exploration Trends 2021, the global exploration budget for nonferrous metals decreased by 11 percent to an estimated USD8.7 billion in 2020 from \$9.8 billion in 2019 (S&P Global Market Intelligence 2021 and Manalo 2021). The post-pandemic recovery efforts is projected to have a positive effect on the global mining industry. In addition to the surge in demand from China, emerging economies, such as Thailand, South Korea, Taiwan, and India, have increased their per capita consumption of copper. The promotion of the circular economy likewise ushers in changes in the metal industry. The circular economy promotes a move from linear business models, in which products are manufactured from raw materials and then discarded, to circular business models where products or parts are repaired, reused, returned, and recycled. Analysts believe that this shift must be considered in making investment decisions in the industry (World Economic Forum 2014).

In the last five years, the industry’s investment or capital expenditure declined consistent with global market trends (see Figure 3). The American Chamber of Commerce of the Philippines reported that the

Figure 2. Upward Swing in Steel Production at the Beginning of the 1900s

Source: Kesler (2007).

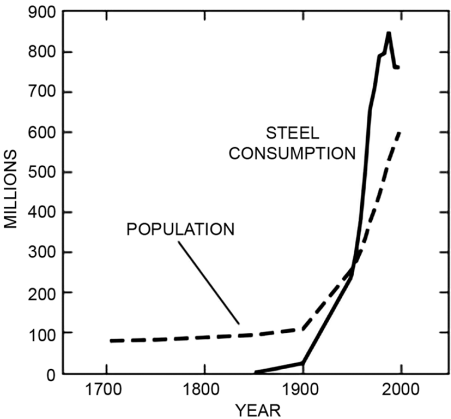
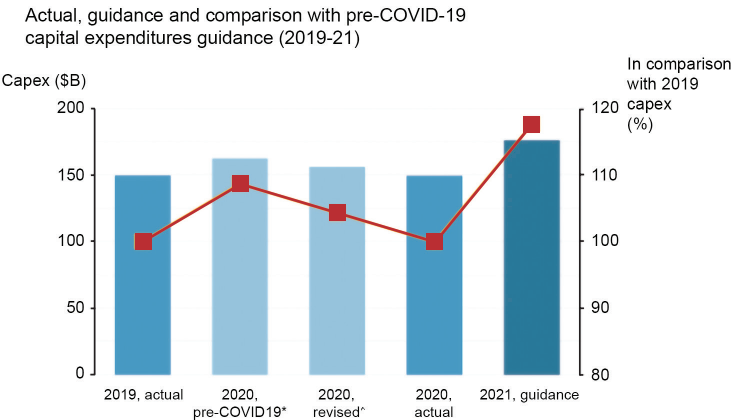


Figure 3. Actual Guide and Comparison with 2019 Capital Expenditure in the Mining Industry as Reported by S&P Global Market

Source: Manalo (2021).



Data as of April 5, 2021.
* Capex guidance on or before February 2020.
^ Capex guidance on or before May 2020.
Sources: S&P Global Market Intelligence: Capital IQ

pending foreign direct investments (FDI) for mining in the Philippines amounted to USD23 billion in 2016. These investments are higher than the 2017 FDI of USD10.26 billion, 2018 FDI of USD9.95 billion, and 2019 FDI of USD7.65 billion. These figures indicate that access to capital is becoming increasingly challenging for metal companies considering the emphasis on financing institutions on Environment, Social, and Governance (ESG). Consequently, modernization and shift to local nickel processing remain a challenge for local companies.

The COVID-19 pandemic caused work stoppages, disrupting the global mining industry's supply chains in 2020. According to the International Energy Agency, as stated by Manalo (2021), government action is needed to ensure adequate supplies of nickel, cobalt, and rare earth elements given the “looming mismatch” between expected demand from energy and planned mining investments. In this scenario given other constraints and the scale of operation and source of raw materials, investment in post-mining processing in the country will take time to progress.

Domestic (Metallic) Mining Industry and Trends¹

The local mining industry includes both metallic and non-metallic minerals that can either be large-scale or small-scale. The 2018 Census of Philippine Business and Industry shows that Sector B, or mining and quarrying industries, has 15 subsectors, five of which are metallic minerals and employ 56 percent of 37,630 paid employees (Table 1). This metallic mineral group accounts for only 45 percent of the PHP189 billion

revenue for that year. Of this group, 57 percent is contributed by nickel ore mining companies that largely export direct shipping ore (DSO) without further processing. Among the group, nickel ore has the largest footprint in terms of area in hectares. Mining of hard coal and “support activities for other mining and quarrying” are significant contributors to revenue in the mining and quarrying industry.

Table 1. Summary Statistics for Mining and Quarrying Establishments by Industry Sub-Class: 2018 CPBI

Industry Description	Number ¹	Employment as of 15 November 2018		Workers ²	Total Revenue (in Thousand PhP)	Expense (in Thousand PhP)		
		Total	Paid Employees			Total	Compensation	Other Expense
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mining and Quarrying	278	37,721	37,630	16,625	189,755,087	148,241,226	20,604,182	127,637,044
Mining of hard coal	6	3,281	3,265	728	33,393,056	21,654,736	1,676,321	19,978,415
Extraction of crude petroleum	3	37	37	4	2,985,114	2,337,399	73,831	2,263,568
Extraction of natural gas	s	s	s	s	s	s	s	s
Mining of iron ores	s	s	s	s	s	s	s	s
Gold ore mining	18	11,210	11,197	5377	37,017,790	39,038,212	8,046,799	30,991,413
Copper ore mining	s	s	s	s	s	s	s	s
Chromite ore mining	s	s	s	s	s	s	s	s
Nickel ore mining	27	9,905	9,902	9,902	48,909,567	36,882,399	5,731,017	31,151,381
Marble quarrying	s	s	s	s	s	s	s	s
Limestone quarrying	23	726	718	140	3,004,645	2,772,710	160,716	2,611,994
Stone quarrying, except limestone and marble	14	428	426	24	563,409	496,421	49,080	447,341
Sand and gravel quarrying	139	2,878	2,833	124	5,751,684	4,909,514	497,246	4,412,269
Silica sand and silica stone quarrying	s	s	s	s	s	s	s	s
Stone quarrying, clay and sand pits, n.e.c.	5	101	101	241	1,353,134	992,890	54,367	938,523
Extraction of salt	18	237	233	74	64,366	48,900	12,924	35,976
Support activities for other mining and quarrying	16	3,959	3,959	10	10,092,296	8,557,804	2,063,659	6,494,145

¹Number of Establishments; ²Workers on Sub-Contract Agreement or Under Manpower Agencies as of 15 November 2018

¹ This paper focused on large-scale metallic mining which was the scope of the review. This group of mining operations has the largest revenue of the three major industry groups.

Figure 4. Trend of Mining Operations in the Country Between 1930 and 2020

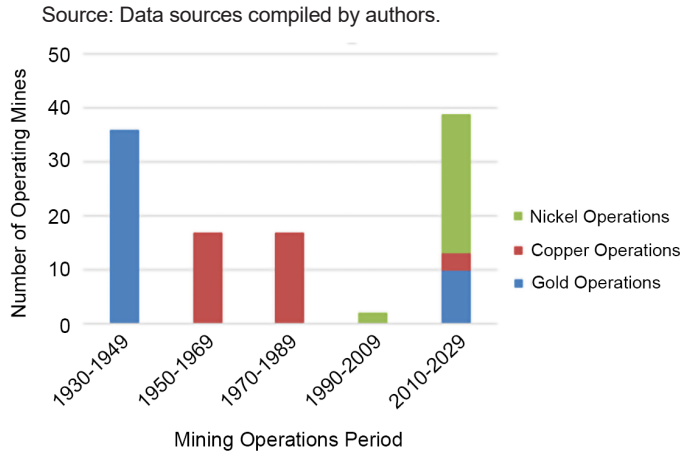
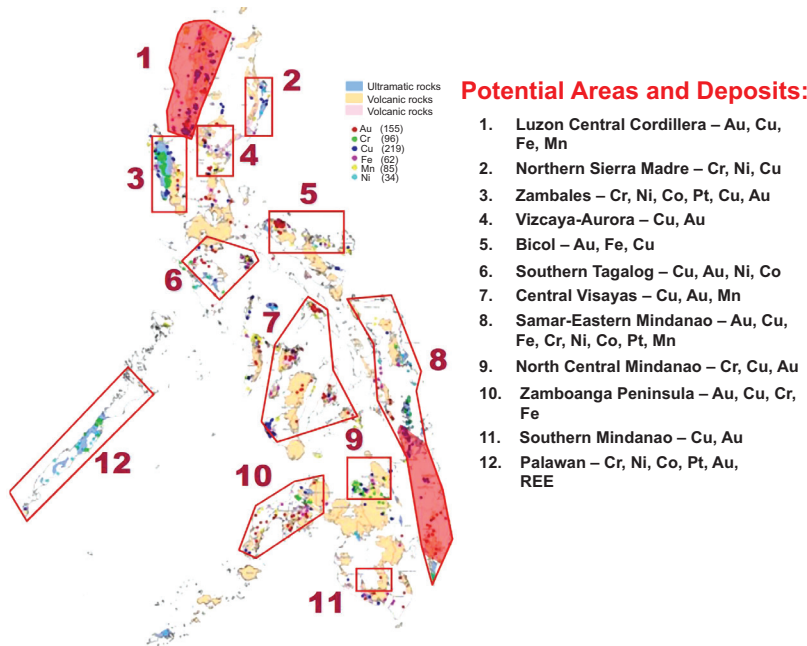


Figure 4 shows a summary of mining operations by major commodities and their projected growth drawn from historical data from 1930 up to 2029. More than 30 mining operations existed between 1930 and 1950. The number declined and settled at about ten mines between 1950 and 1970. The number

of mine operations between 1990 and 2010 cannot be ascertained, but a recent report indicates there were likely 20 to 50 mining operations. A more recent report from the Mines and Geosciences Bureau (MGB) indicated 50 sites in operation as of May 2021.

Figure 5. Overview of Mining Tenements



Data provided by MGB as of December 2020 (See Figure 5) show extensive areas in the country considered as mining tenements. The spatial extent of mining tenements is 769,900 hectares, 3,970 small-scale mining operations, 55 non-metallic operations,

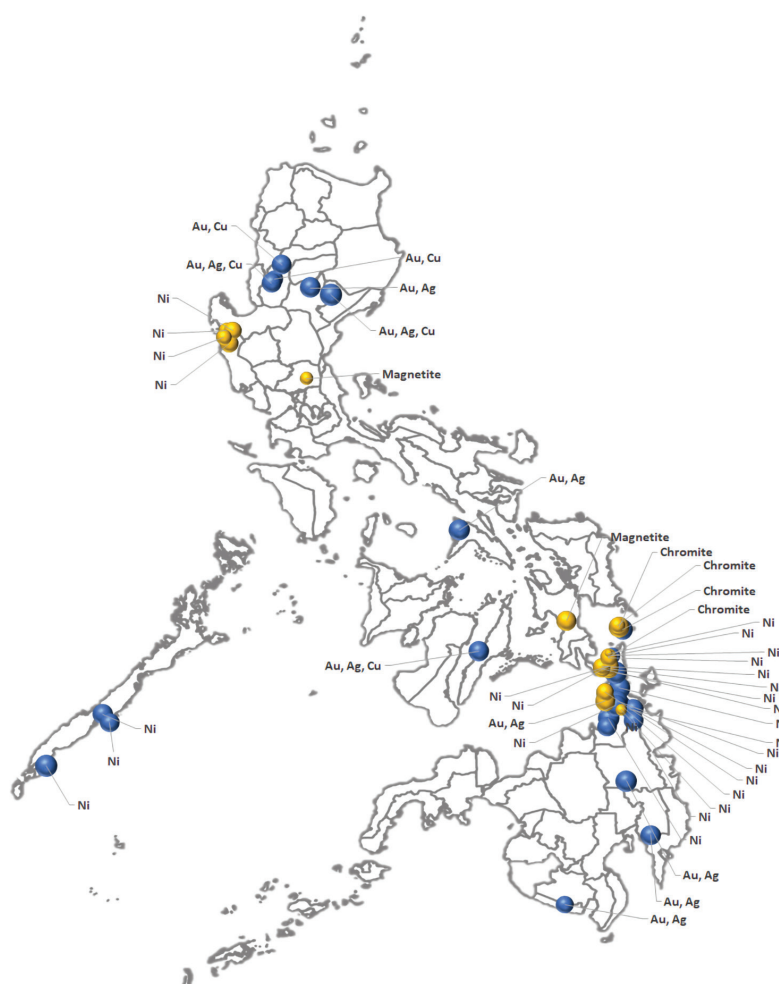
and 50 operating metallic mines that are mostly nickel mines. Data from the first and second phases of the MICC Review indicated that more than a third of those supposedly operating mines are presently under CMP, which implies that they are not actively producing.

Figure 6 shows the large-scale metallic mining operation distribution under review by MICC. The largest concentrations are in Surigao del Norte, Surigao del Sur, and Dinagat Islands in Northeastern Mindanao, where transportation is less developed. These sites are mostly nickel mining operations. Rio Tuba Nickel Mining Corp., Adnama Mining Resources, Inc., SR Metals, Inc., Agata Mining Ventures, Inc., Carrascal Mining Corp., and Marcventures Mining and Development Corp. are

among the major nickel producers showing consistent performance in production and trade. Geographically, Palawan leads all nickel-producing provinces with consistently high production, followed by Agusan del Norte, Surigao del Norte, Surigao del Sur, Dinagat Island, and Zambales. Mining operations in Dinagat Island are persistently affected by weather interruptions. During good weather, mining operations are rapid in some cases, and environmental protection is given less attention.

Figure 6. Spread of Current Mining Operations (Operating and Under Care and Maintenance in the Country)

Source: Mining Industry Coordinating Council.

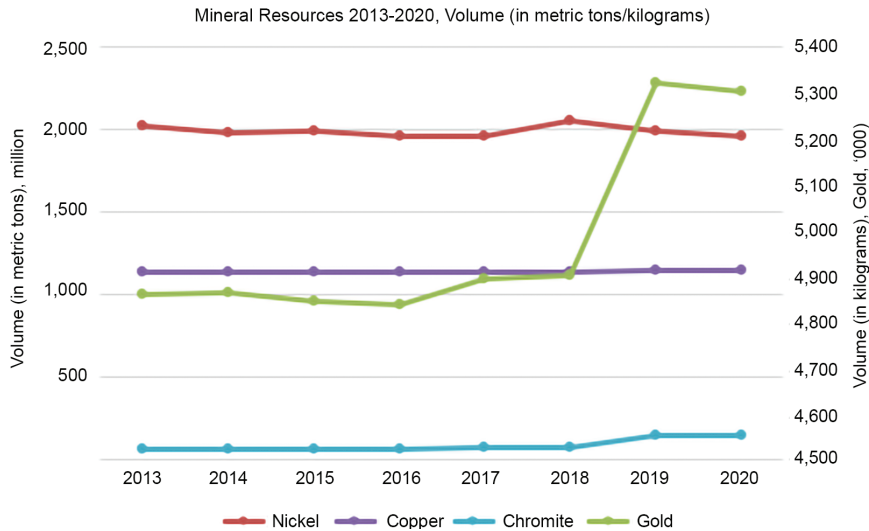


A final note by Brimo (2021), current chair of the Chamber of Mines in the Philippines, in his recent “Mining Outlook” presentation to the MICC, argues that policy roadblocks, principally the moratorium

on new mining permits in place since 2012 under Executive Order 79 and the ban on open pit mining, stymie the industry’s growth and its ability to further contribute to the economy.

Figure 7. Physical Asset Account from 2021

Source: Philippine Statistical Authority.

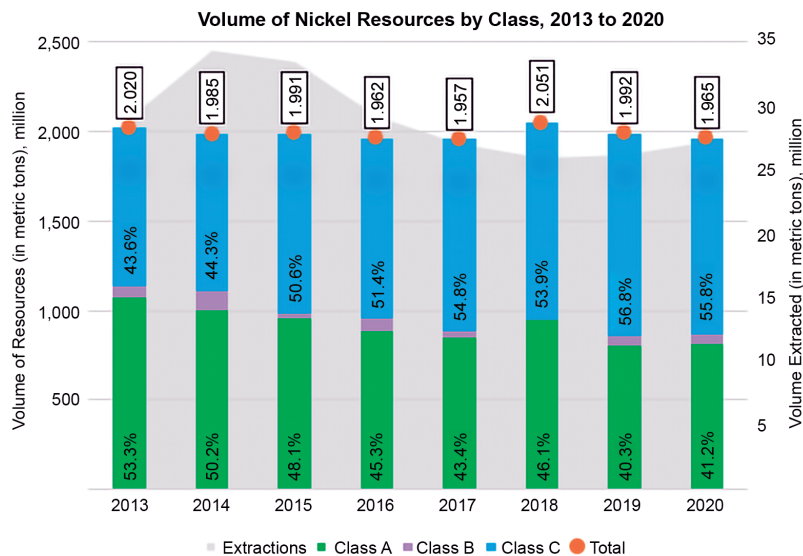


Mineral Resources

The Philippine Statistics Authority (PSA) regularly reports information on mineral resources in the country, including, more recently, estimates on resources, production, export, and resource rent. The key minerals are nickel, gold, copper, and chromite. The rest, such as iron, silver, and magnetite, are of insignificant quantities. In the past, iron was among the top export of the country. With the opening of new mines in other countries, the foreign market for

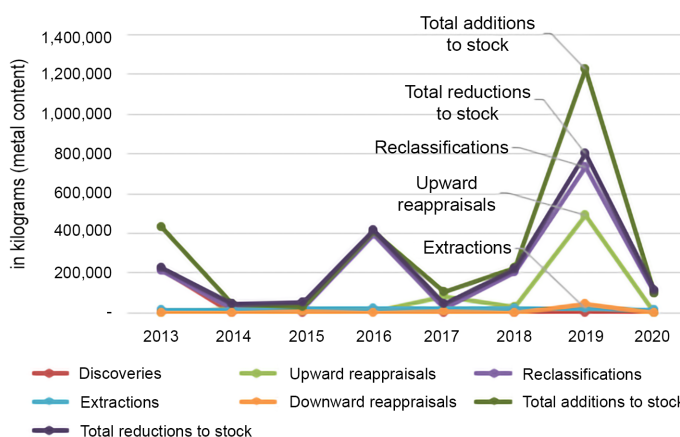
Philippine produce has gradually declined. Figure 7, on the other hand, shows the physical account trend indicating that gold resources increased significantly starting in 2018, which could be brought about by the opening of the mining operation in Nueva Vizcaya and other new explorations.

The PSA recently released the mineral accounts of the country for the period 2013-2020. Figure 8 shows a steady trend of discovered nickel resources and

Figure 8. Trend of Nickel Resources and Extraction, 2013-2020

extraction in the period, also reflects the rapid expansion of nickel mining sites in various parts of the country. Peaking in 2014, the high extraction rate indicated high global demand and rising commodity prices. What is not reflected in the present account is another nickel price increase in 2008, where nickel mining operations started but not as extensive as those in 2014.

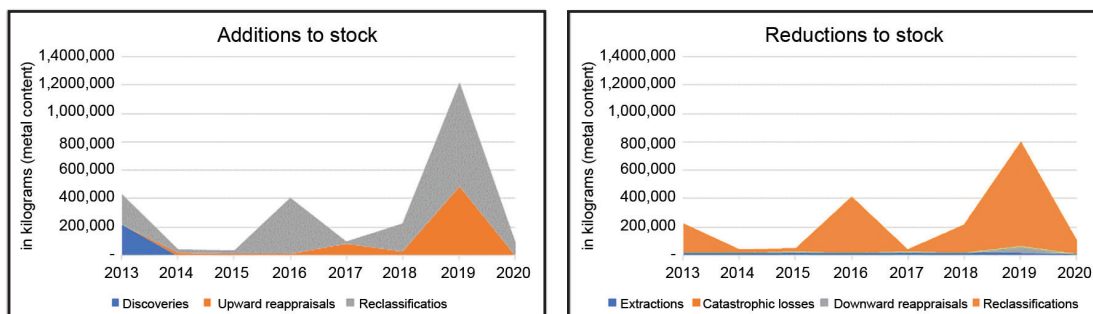
Physical Asset Account: Total Gold Resources, 2013 to 2020



Specific information on gold resources showed a steady flow between 2013 and 2020. Figure 9 indicates a good outlook for such resources. However, it is notable that, as indicated in the previous section, it is simply a sustaining value, as dictated by limited production capacity. The total gold resources would even increase if the existing ten operating gold mines ramp up their production with the upswing of total additions to the stock of gold resources in 2019. Furthermore, the lifting of the moratorium on new permits implies increased production of other metallic minerals.

A nickel export ban in Indonesia introduced in 2020 was expected to boost the Philippines' prospects of becoming the world's top producer, a title the latter has previously held. However, despite being the world's second-largest nickel producer, the Philippines has significantly limited its capacity to participate in establishing a global supply for the shift to renewable energy due to the lack of facilities. Further, while the Philippines is a top nickel ore producer, it only has two existing nickel and cobalt processing plants that produce nickel and cobalt sulfide concentrates (intermediate products further processed to make electric vehicle batteries).

Figure 10. Additions and Reductions in Stock of Gold Resources, 2013-2020



It was noted that the upswing in the Total Additions was mainly due to the reclassification. The volume of extraction is relatively flat, implying no dramatic

changes in the flow of gold to the economy despite the huge resources shown in Figure 10.

Markets for Philippine Minerals

The Philippines’ trading partners of metallic minerals are China, Japan, Korea, Australia, Hong Kong, India, Switzerland, and Singapore. China is the main buyer capturing 44 percent of the total export

value, followed by Japan at 34 percent. In terms of commodity export value, copper and nickel are the highest, with China mostly sourcing from Philippine producers.

Table 2. Summary of export data, per commodity and destination, 2017, PhP ‘000²

Destination	Chromite	Copper	Gold	Nickel	Total	% of Total
China	254,977	6,637,454	2,764,323	24,433,768	34,090,521	44
Japan		21,055,188		5,756,318	26,811,506	34
Korea		3,694,877			3,694,877	5
Australia			3,137,082		3,137,082	4
Hong Kong			7,034,751	180,430	7,215,181	9
India			1,996,704		1,996,704	3
Switzerland			1,151,729		1,151,729	1
Singapore				180,430	180,430	0.2
Total	254,977	31,387,519	16,084,590	30,550,946	78,278,031	
% of Commodity	0.3	40	21	39		

The demand for major metals, such as iron, aluminum, copper, zinc, lead, and nickel will increase six-fold until 2030 (Watari, Nansai, & Nakajima 2021), and that supply-side constraint is physical availability. The top five constraints are energy requirements, greenhouse gas emissions, aquatic toxicity, land-use and abiotic resource depletion. In 2020, metallic mineral production fell to 14.4 percent by value because of disruption caused by the COVID-19 pandemic. As expected in periods of crises, the global market price of gold rose by 26 percent from USD 1,307 in 2019 to USD1,647 in the first half of 2020. The country’s mineral product receipts totaled USD 4.22 billion in 2020 – about 5.3 percent higher than the USD4.01 billion these exports generated in 2019 (Philippine Statistics Authority, 2020).

Contribution to the economy

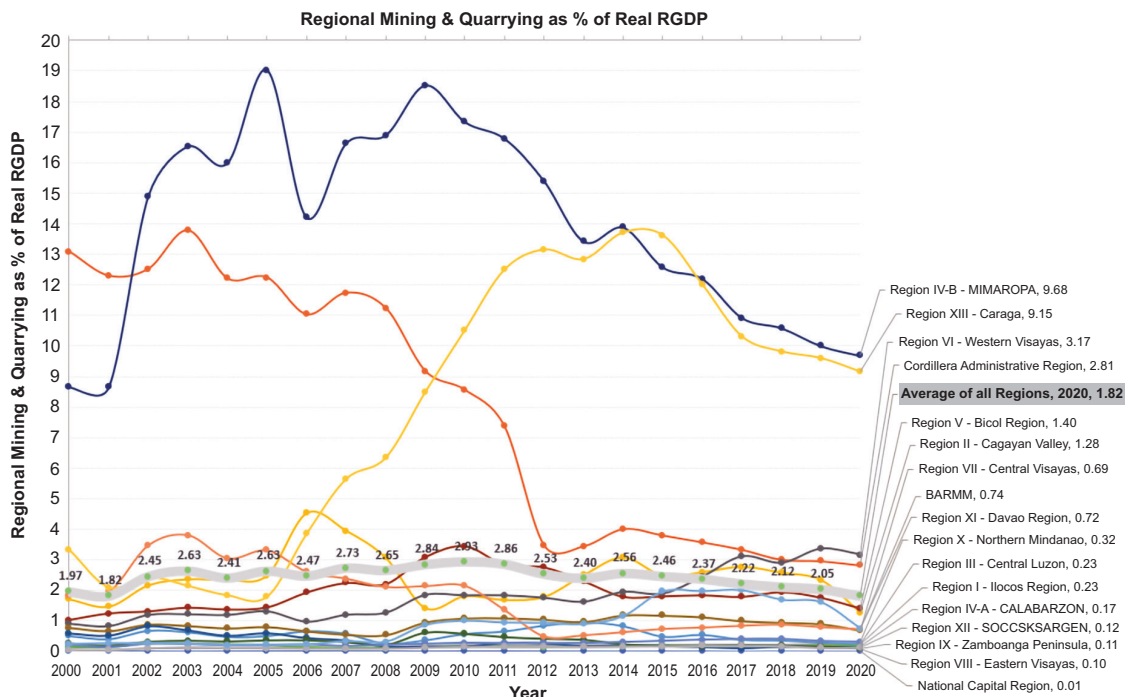
Gross Value Added and GDP from Mining

Figure 11 shows a 20-year trend of real regional GDP contribution of mining and quarrying industry from 2000 to 2021. The range of regional contribution is from 1.8 percent to 2.9 percent, and the overall contribution to the national GDP is less than 1 percent. It is likely that in those regions where the contribution exceeds 2 percent of the regional GDP, metallic mining is the dominant industry that provides a greater contribution to employment.

² The values per country were approximated from an aggregated data report in the 2017 EITI report.

Figure 11. Twenty-year Trend from Years 2000 to 2020 of Real Regional GDP by Political Region

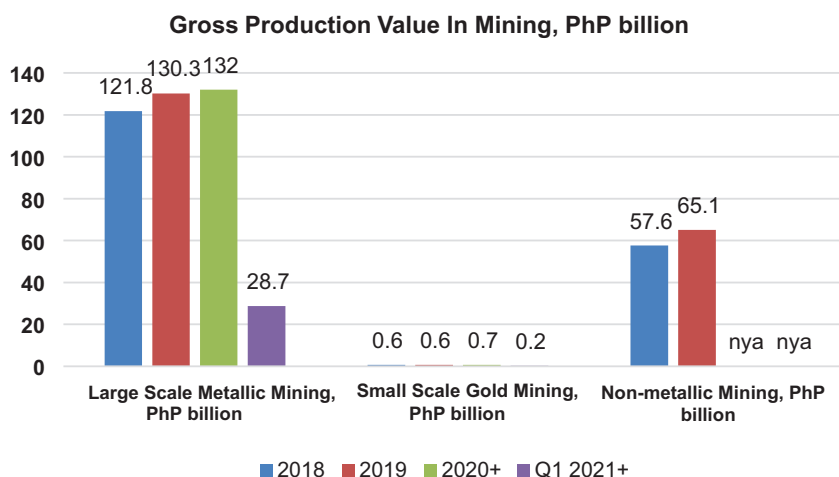
Source: Philippine Statistics Authority, 2021.



As shown in Figure 12, statistics provided by the PSA indicated that more than two-thirds of the gross production value in the mineral industry comes from large-scale metallic minerals, and about a third comes from non-metallic minerals. Small-scale gold mining operation contributes less than 1 percent.

The country's most productive region is Surigao del Norte in Caraga, while key nickel mining operations are in Taganito, Rio Tuba, Cagdianao, Carrascal, and Adlay Cagdianao Tandawa mines. Mining companies, such as Nickel Asia and Global Ferronickel, operate extensively throughout the country (NS Energy 2021).

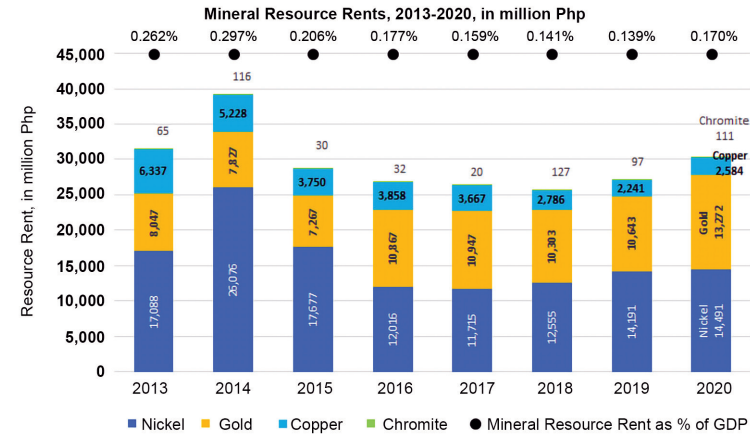
Figure 12. Gross production value in mining, 2017 to 3rd Q 2020.



In the same mineral account reported by the PSA in 2020, the resource rent trend (see Figure 13) shows that among all metallic minerals, the largest resource rent contribution comes from nickel mining operations, followed by gold. Chromite has the least contribution. The total resource rent from these four metals ranges from 0.139 percent to 0.297 percent, which is almost insignificant. Resource rent from gold appears steady before 2015, increasing in 2016 and remaining steady thereafter. The trend for copper is the opposite: from as high as PHP6.3 billion, it went down to PHP 2.5 billion in 2020. The contribution of chromite is

relatively small, at the mercy of world market demand, local capacity, and extraction sources. Data on silver, iron, and magnetite, which are among the products of mining companies reviewed, are not covered by the statistics. Iron, a significant export of the country during the last century, appears to have not contributed significantly to the resource rent in recent years. However, the PSA’s data from 2018-2020 do not include figures on iron’s contribution to resource rent. Estimates on the state of production of this commodity can only be obtained from reports of mining companies. Still, these are not sufficient to draw conclusions on the sustainability of production.

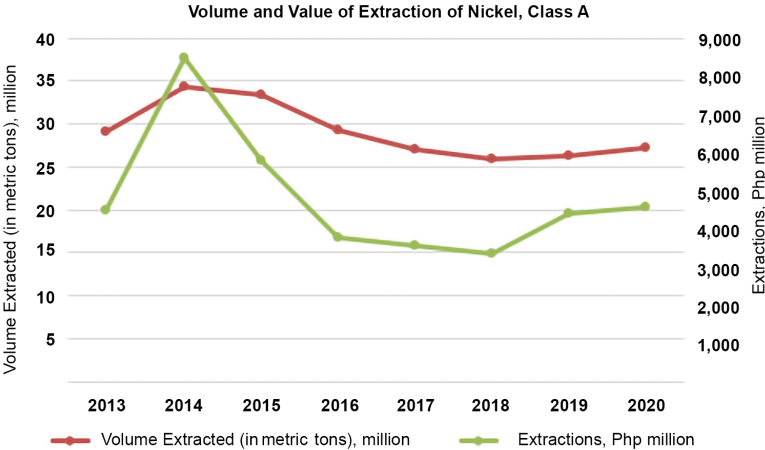
Figure 13. Trend of mineral resource rent for period 2013 - 2020, PSA report July 2021



Despite the large contribution of nickel to resource rent, and the GDP, its production is largely hinged on global market prices. Figure 14 provides a glimpse of the trend in revenue from nickel. The nickel production, mostly DSO, tracks the trend of global

market prices, but its value drops more rapidly than the production volume. This price volatility should prompt greater attention to incentives for local processing to capture more value-adding processes that will further increase the value of nickel exports.

Figure 14. Volume and value of extraction of Class A nickel between 2013-2020.



Government Share from Mining Sector

Based on the available data for 2018, payments by metallic mining companies to the government amounted to PHP 11.09 billion. Seventy-four percent of the payments went to the Bureau of Internal

Revenue in the form of excise and other taxes, 10.7 percent to the MGB, and 6.9 percent to the Bureau of Customs (BOC).

Table 3. Disaggregation of Payments Paid by the Metallic Mining Sector Per Government Agency, 2018

Agency	Reconciled Metallic mineral	% of Total	Reconciled Non-metallic Mineral	% of Total
BIR	8,216,004,549	74.05	8,572,403,076	82.20
BOC	768,267,384	6.92	1,537,942,020	14.75
DOE	NA	0.00	NA	0.00
LGU	645,337,734	5.82	317,968,879	3.05
MGB	1,187,312,323	10.70	-	0.00
PPA	219,837,318	1.98	-	0.00
NCIP	58,010,632	0.52	-	0.00
Total	11,094,769,940	100.00	10,428,313,975	100.00

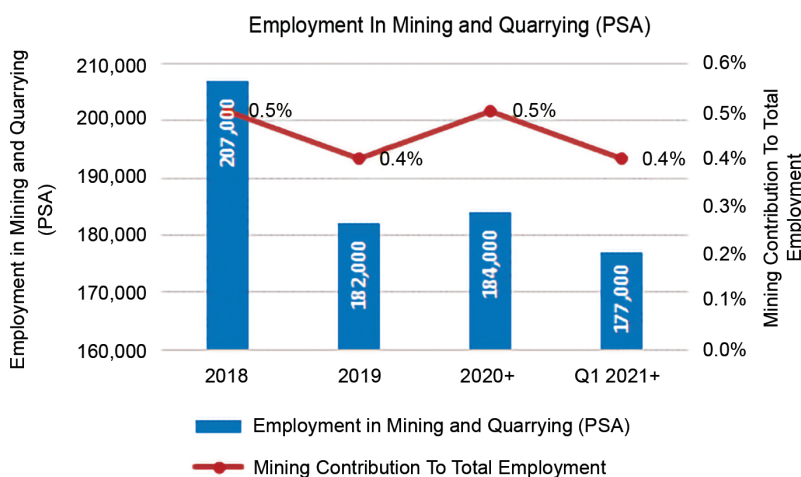
BIR = Bureau of Internal Revenue, BOC = Bureau of Customs, DOE = Department of Energy, LGU = local government unit, Mines and Geosciences Bureau, PPA = Philippine Ports Authority, NCIP = National Commission on Indigenous Peoples.

The main taxes levied on the mining sector are corporate income tax, excise tax on minerals, and royalties on mineral reservations. The major oil and gas levies are the government's share in oil and gas revenues, apart from corporate income tax and withholding tax on profit remittance to the principal. The Bureau of Internal Revenue (BIR) is

the main body responsible for collecting taxes paid to the national government, while the MGB and the Department of Energy collect sector levies for mining and coal, oil, and gas. Local government units (LGUs) are responsible for collecting subnational payments (Extractive Industry Transparency Initiative 2021).

Figure 15. Combined Contribution of Mining and Quarrying to Total Employment 2018-2021 Q1

Source: Philippine Statistics Authority (2021).



Mining Employment

Like its value to the country's GDP, the contribution of mining and quarrying to total employment is less than 1 percent. Based on the March 2021 Labor Force Survey (LFS) estimates released by the PSA, the full-year mining and quarrying employment levels in 2019 and 2020 are 177,000 and 184,000, respectively. Its share in the total employment in 2019 and 2020 is 0.42 percent and 0.47 percent, respectively. Notably, the aggregate employment of mining and quarrying includes metallic and non-metallic minerals.

Contribution to Local Communities

Mining contributes to the local economy through increased economic activities and additional employment from new businesses. Implementing the Social Development and Management Program is mandatory; it obliges a mining company to develop programs to promote the development of human and social capital in mining sites. These include human resources development through scholarships, livelihood and enterprise development, health services and other public services, such as roads and other infrastructures, and fostering cultural development. An impact evaluation is needed to ascertain the improvement of the communities' welfare.

CHAPTER 2:

Overview of the MICC Mining Review

Rationale of Mining Operations Review

Executive Order No. 79, which was issued in 2012, granted the MICC the mandate to conduct an assessment and review of all mining operations in the country and determine their compliance with and continued efficacy of existing mining laws, rules, and regulations. In particular, the Review seeks to (a) know whether the mining companies are compliant with the provisions/conditions of their contracts, particularly those related to environmental safety and quality, payment of taxes, duties and fees, guidelines for operation, corporate social responsibility (CSR), and other obligations to the State and host/neighboring communities; (b) assess whether the compliance with the terms and conditions of the mining contracts has caused disadvantage to any stakeholder (e.g., mine workers, communities, and indigenous cultural communities and indigenous peoples) or resulted in conflict in land use (i.e., encroachment in ancestral domains, protected areas and ancestral lands); (c) know if there is a need to revise the existing *pro-forma* mining contracts, including provisions on mining fees, penalties, and sanctions; (d) know the gaps and weaknesses in existing mining and environmental laws, including contradictory provisions; and (e) strengthen or make such laws more effective.

The cancellation or suspension of the MPSAs of 26 mines by then Environment Secretary Regina Lopez on 2 February 2017 prompted the concerned companies to file an Appeal or Motion for Reconsideration to the Office of the President (OP) and the DENR, respectively. The President ordered the MICC to conduct a thorough review of the mines to guide the OP and the DENR in responding and deciding on the companies’ petitions. Following this directive, MICC, through NEDA and DAP, organized a team of 25

experts consisting of legal, technical (Mining/Geology/Metallurgy), environmental, social and economic, and mining experts to conduct an “Objective Fact-Finding and Science-Based Review of the Performance of 26 Mine Operations.” This was the Phase 1 of the Review, while the Phase 2 of the Review covered 17 large-scale metallic mining operations.

Scope and Coverage

Table 4 summarizes the number of mining companies covered by the two phases of the Review, covering large-scale metallic mining operations. In Phase 1, experts were grouped into five Technical Review Teams (TRTs), each consisting of five experts in the disciplines mentioned and a designated Team Leader (TL) to coordinate the TRT activities, strategies, meetings, field visits, and report writing. The 26 mines were then distributed among these five TRTs. NEDA also acquired the services of an Overall Team Leader (OTL) to coordinate the general flow of work and

Table 4. Summary of mining companies covered by the review

Commodity Group	MICC Review Phase		Grand Total
	Phase 1	Phase 2	
CMP	16	2	18
Au, Ag		1	1
Chromite	3		3
Magnetite	2		2
Ni	11	1	12
Operating	10	15	25
Au, Ag		5	5
Au, Ag, Cu	1	2	3
Au, Cu	2		2
Chromite		1	1
Ni	7	7	14
Grand Total	26	17	43

CMP = Care and Maintenance Program.

integrate all the reports coming from individual experts and each TRT's consolidated report. The original duration of the Review was three months, from March to May 2018. However, the economic experts sought to conduct household surveys in communities of selected mine operations, requiring an additional three months in Phase 1. This phase of the Review was completed in June 2018. Included in Phase 2 were 17 large-scale metallic mining companies that were not subject to suspension or termination. Completed in September 2020, Phase 2 engaged 20 of the experts from the Phase 1 Review.

Table 5 shows the distribution of mining operations by region and type of mineral product. The Review did not cover mineral processing operations that were not integral to the existing extractive operation. The teams of experts recommended that another review must cover them. Overall, the Review covered only 43 mining companies or 45 mining operations. It should be noted that Wellex 1, Wellex 2, Century Peak Casiguran, and Century Peak Rapid City operations were scored separately. The MGB recently reported ongoing 50 mining operations as of May 2021.

Table 5. Distribution of the 45 Mining Operations (43 mining companies), Operating or Under Care and Maintenance Program by Region and Province as of November 2020

Region/Province	Commodity						Grand Total
	Au, Ag	Au, Ag, Cu	Au, Cu	Chromite	Magnetite	Ni	
CAR		1	2				3
Benguet		1	2				3
Region II	1	1					2
Nueva Vizcaya	1	1					2
Region III					1	4	5
Bulacan					1		1
Zambales						4	4
Region IVB						3	3
Palawan						3	3
Region V	1						1
Masbate	1						1
Region VII		1					1
Cebu		1					1
Region VIII				3	1		4
Eastern Samar				3			3
Leyte					1		1
Region XI	2					1	3
Agusan del Norte						1	1
Agusan del Sur	1						1
Davao de Oro	1						1
Region XII	1						1
South Cotabato	1						1
Region XIII	1			1		20	22
Agusan del Norte						1	1
Dinagat Islands				1		10	11
Surigao del Norte	1					6	7
Surigao del Sur						3	3
Grand Total	6	3	2	4	2	28	45

*Wellex 1, Wellex 2, Century Peak-Casiguran and Century Peak-Rapid City operations were scored separately in the two phases of the Review.

Goals and Objectives

The Review was conducted in accordance with the legal mandate in the Philippine Mining Act of 1995 or RA 7942. Chapter X: Development of Mining Communities, Science and Mining Technology of the law states that each mining company must “help create responsible, self-reliant, and resource-based communities capable of developing, implementing, and managing community development programs, projects, and activities in a manner consistent with the principles of people empowerment and sustainable development.”

Further, Section 134, Chapter XIV of DENR AO No. 2010-21, requires the contractor, permit holder, and lessee to assist in the development of the host and neighboring communities and promote the general welfare of the inhabitants living therein.

The overall objective of the Review is to identify the gaps and issues that limit the mining sector from contributing effectively to national and regional development; and recommend interventions and policy measures that will ensure a more responsible mining sector.

General Framework and Methodology

The framework for the two phases of the Review applies the key principles of sustaining development from exhaustible resources. Five aspects, covering both performance and impacts, were examined at the firm, local economy, and landscape levels — whichever is relevant. Each aspect was described in terms of the principles and the corresponding indicators operationalizing these principles.

Averting financial risk and strategy against uncertainty

Among the various types of risk, the most relevant for this section, is the financial risk that mining companies face because of fluctuations in metal prices. The firm needs to be sufficiently capitalized to withstand periods of low prices that

are normal for metal market cycles. It also needs to exercise financial responsibility by setting aside part of the windfall gains during periods of high prices to finance activities, such as rehabilitation, maintenance of equipment, and keeping the mining complex safe during downswings. On the governance side, local government authorities and the host communities need to set measures to avoid such problems.

Substantive compliance with regulations designed to benefit society

Regulation through rules and imposition of incentives and disincentives maximize the net benefits that go to society over and beyond the investment period. Regulation is implemented through a combination of rules on meeting technical standards, undertaking environmental measures and engaging responsibly with society, and through penalty for faulty actions and reward for good practices. Adherence to standards is expected to minimize costs from the negative impacts incurred not only during mining activities but also after the decommissioning of the mines. These standards include measures on pollution mitigation and land rehabilitation to restore the landscape’s ecosystem services that were impaired during mining.

Beneficiaries invest earning from mining to assure future incomes.

Mining beneficiaries invest their returns in assets to increase productivity and generate continuing incomes. Income from mining should eventually be replaced by income from other sources once the mines have been depleted. Even when mining is no longer physically sustainable, income from mining can still be sustained. It is important that all beneficiary entities who receive income from mining in various forms prepare for the inevitability of an exhausted mine.

Maintaining level of assets for sustaining economic growth

Economic growth is sustainable when minimum levels of all assets in various forms — human, social, institutional, man-made, natural, and financial — are secured assuming that the services these assets

generate are not fully substitutable even in the long-term.³ Thus, attaining economic growth necessitates utmost efficiency when continuing to draw down minerals, which are depletable natural resources.

Sustaining environmental assets

Different types of mining pose varying levels of risks to the environment. Considering the size of the mining area relative to the surrounding landscapes, the duration of mining, and the available technologies for extraction, beneficiation, transport, and processing, measures to minimize negative impacts are warranted. These measures must abide by the following principles for environmental sustainability:

Pollution is mitigated and residual damage is managed. Specific practices in managing the anticipated air, water, and land pollution to levels according to environmental standards were identified during the Environmental Impact Study (EIS). The study is a requirement in obtaining the Environmental Compliance Certificate (ECC) and serves as an accompanying formulation of the Environmental Protection and Enhancement Program (EPEP). An annual EPEP allows for adjustments based on the results of regular environmental monitoring.

Scarce inputs, water, and soil (silt) are recycled. Recycling scarce inputs, such as water and soil, usually saves costs and generates internal benefits for the mining company. Thus, the systems for managing pollution and recycling scarce inputs become part of “good housekeeping.” These practices are usually reported when a mining company applies for accreditation for ISO 14001. But while these are necessary for sound environmental management, continuous monitoring of environmental performance, quality of air and water, and land through the inspection of facilities and regular audits remains essential.

The landscape is rehabilitated appropriately. Rehabilitation activities during the mining and the decommissioning processes are expected to restore the affected ecosystem so that the landscape

remains useful and continues to provide ecosystem services in the post-mining phase. Among the key practices are restoring the vegetation, minimizing damages from dust and erosion, and putting appropriate covers for the transported ore and stockpile.

Risks from disasters and climate change are adequately addressed. When risks and uncertainties are present due to knowledge gaps and climate change, actions need to be undertaken to prevent serious, irreversible damage, following the Precautionary Principle. This principle rules in precautionary measures when scientific evidence about an environmental or human health hazard is uncertain and the stakes are high. These may include avoiding precarious locations of siltation ponds, such as near the coast or at the edge of a cliff, and the required payments to the Contingent Liability and Rehabilitation Fund and Final Mine Rehabilitation Fund.

Economic Efficiency

The economic efficiency framework’s application is often limited to a mining firm maximizing the net present value of financial returns over the investment period subject to technical standards, environmental, and social safeguards. While mining provides profits to its investors and incomes to the firms’ employees, it may, inadvertently or not, cause externalities. On the one hand, negative externalities, such as impacts of environmental damage by exposure to dust, decreased productivity of irrigated farms from silt, and lower fish catch from damaged coral reefs, result in costs to certain economic sectors. On the other hand, positive externalities, such as indirect employment and road infrastructure, can benefit other sectors. The scope and methods of economic efficiency review of mining operations are as follows:

Societal Concerns on Efficiency and Equity. Equity concerns include the incidence of benefits and costs among various mining stakeholders within the same generation (intragenerational equity); and how gains are earned, and costs

³ Weak sustainability depicts the situation where some assets are used up because of the belief that they can be fully substituted by the other assets; strong sustainability is achieved when a minimum level of all assets is maintained because of imperfect or even zero substitutability.

are shared across generations (intergenerational equity). Intragenerational equity in mining means equitable sharing of benefits among the current stakeholders when it raises the incomes of its beneficiaries without unduly hurting the welfare of others. Intergenerational equity in mining means mineral resource extraction and depletion for the benefit of the present generation do not compromise the welfare of future generations.

Social Benefit Cost Analysis (SBCA). SBCA is a modification of economic analysis. It involves two steps: (a) financial analysis, which is first conducted to examine the viability of the mining company under business-as-usual conditions. This analysis is important for mining companies in which investments are privately sourced and public funds do not directly underwrite them; (b) economic analysis, following the financial analysis, examines the benefits and costs of options of mining operations from the perspective of external stakeholders who are not employed by the company nor located within its premises. A key principle of benefit-cost analysis is its stepwise nature. An account of the status quo or no improvements (without intervention) in practices is first conducted, followed by the analysis of the alternative technology or management option (with intervention). The values derived for each efficiency criterion are then compared, i.e. “with” versus “without” option. Alternative technology or management option is always compared with the business-as-usual scenario.

Scoring Procedure and Overall Rating Index

A scoring system was introduced to provide a tool for making decisions on the status of mining operations. Each expert provided a score for each criteria by discipline. The scores were aggregated by simple average for each discipline with the underlying assumption of equal weight for each criterion. An overall score for each mining operation was then presented and labeled Sustainable Development (SD) Scorecard for Mining. The SD Scorecard for

Mining may be improved as a rating system for each mining company in the future. The scoring procedure was developed in Phase 1 and adopted in Phase 2 with some changes given the differences in the status of mining operations. Those in Phase 1 were subject to suspension or termination, while those in Phase 2 were continuing operations except for two under CMP that were not subject to suspension or termination. The following are summaries of scoring: (a) each mining operation was rated by the specialists based on their findings with respect to the MICC guide questions for each of the five aspects; (b) the simple averages for that aspect of the operation were computed; (c) indicators without basis for rating are not included in computing the simple average; and (4) the legal rating is used in order to proceed to the next process of analyzing the other four aspects’ rating.

Table 6. Scoring Index Applied to Each Mining Operations

Description	Index Level	Range
Acceptable/Good	3	≥2.8
Minor Corrections	2	2-2.8
Major Reforms	1	Bet 1 to 2
Not Acceptable	0	<1

In classifying the mining operations by its indexes, the experts applied a range of average scores to represent those indexes e.g., good, needing minor corrections, major reforms, or poor. A score level greater than 2.8 means good or acceptable performance; those between 2 and 2.8 need only minor correction; those with scores between 1 and 2 require major reforms in operations; and those obtaining a score less than 1 are considered performing poorly or demonstrating a not acceptable performance. (See Table 6).

Table 7 lists the criteria and indicators used for evaluating and scoring mining operations. At the start of the Phase 2 review, the legal and technical experts decided to modify the criteria for scoring bearing in mind that the next set of mining operations are considered good performing based on the DENR audit.

Table 7. Evaluation Criteria or Indicators per Aspect of the Review Used in Calculating the Score of a Mining Operation

Phase 1	Phase 2
Legal	
1. Completeness and compliance with contract	1. Mining tenement
2. Compliance with ECC	2. Safety and health management
3. Compliance with other NR and environmental laws	3. Environmental management
4. Compliance with CLRF and FMR/DP	4. Social development and management
5. Compliance with taxes, fees, royalties	
Technical	
1. Design and appropriateness to site conditions	1. Production rate
2. FS and DMPF	2. Reserves (Life of Mine)
3. Production	3. Parity with global standards of mining
4. Transport and stockpile	4. Mining support infrastructure
5. Management and capitalization	5. Auxiliary activities and other infrastructure
6. At par with global standards	6. Management and capitalization
7. Occupational health and safety practices	7. Standard safety factors
	8. Working environment
Environmental	
1. Pollution and mitigation practices	1. Pollution mitigation practices
2. Reuse of water and soil	2. Reuse of water and soil
3. Rehabilitation of landscape	3. Rehabilitation of landscape
4. Toxic and hazardous waste management	4. Toxic and hazardous waste management
5. Impacts	5. Impacts
6. Risk managed	6. Risk managed
Social	
1. Intra-generational equity: target beneficiaries identified and reached	1. Intra-generational equity: target beneficiaries identified and reached
2. Inter-generational equity services provided: SDMP, CSR	2. Inter-generational equity services provided: SDMP; CSR
3. Reduction of poverty/inequity; improved access to basic services	3. Reduction of poverty/ inequity; improved access to basic services
4. Perception of local community and community relations	4. Perception of local community and community relations
5. Conflict present	5. Conflict present

Phase 1	Phase 2
Economic	
1. Direct benefits to the company	1. Direct benefits to the company
2. Sufficiency of capital in slump years to meet environmental and social safeguards	2. Apparent sufficiency of capital during slump years to meet environmental and social safeguards
3. Direct and indirect employment and income	3. Direct and indirect employment and income
4. Revenue from taxes, fees, royalties	4. Revenue from taxes, fees, royalties
5. Use of revenues by recipients to sustain income after closure	5. Use of revenues by recipients to sustain income after closure

The next sections provide details of the Review. The sequence begins with the legal review, followed by technical, environmental, social, and economic reviews. Each aspect reports on the component

framework applied, method of data collection, analytical approach, results or findings, and summary recommendations.

CHAPTER 3:

Legal Aspect of the Review

This aspect of the MICC Review was aimed at determining whether the mining operations have complied with all the applicable laws and rules. In case of violations, reference was made to the applicable legal provision. Another purpose of the Review was to determine the adequacy of government regulatory provisions to recommend policy or institutional reforms.

Framework and Methodology

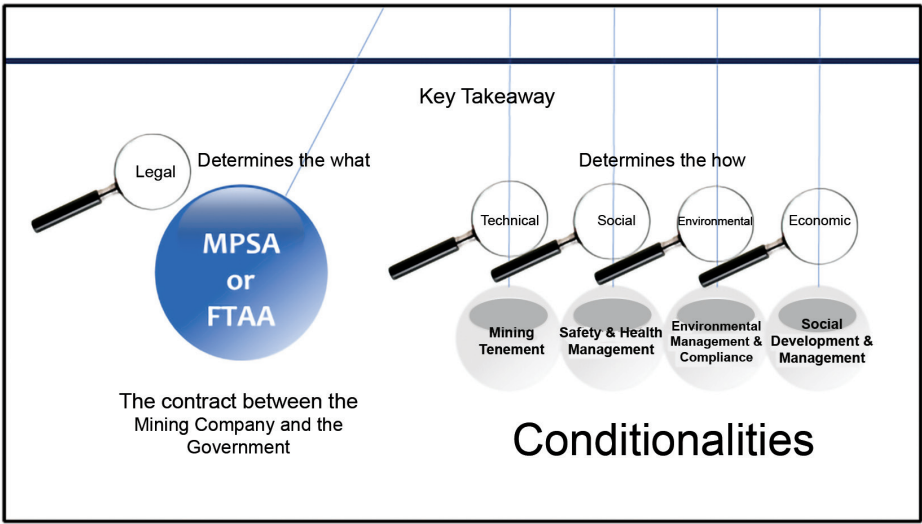
The key question is, “What would be a picture of a mining company meeting the legal aspects of its operation?” Each mining operation must comply with minimum requirements to begin and continue their operations. These requirements were met by performing recommended standards, which were proven through submission of reports or securing permits, registrations, or licenses. The standards were divided into four major groups: Mining Tenement, Safety and Health Management, Social Development and Management, and Environmental Management and Compliance. Each group was further divided into subgroups governed by different laws, rules, or administrative orders. These requirements are administered by different governmental agencies, mostly bureaus within the Department of Environment and Natural Resources (DENR). This is the benchmark for which the Mining Review proceeds.

Consistent with the state policy on ownership of natural resources, the extraction of valuable minerals is subject to regulation. Certain requirements must be complied with before, during, and after the actual mining operation. While the primary law governing large-scale mining is RA 7942 and overseen by the MGB, several other agencies and bureaus play pivotal roles in the legal operation of mines. These agencies include the Environmental Management Bureau (EMB), the National Commission on

Indigenous Peoples (NCIP), the Protected Area Management Board (PAMB), the Biodiversity Management Bureau (BMB), formerly the Protected Areas and Wildlife Bureau (PAWB), the National Water Resources Bureau (NWRB), the Department of Interior and Local Government (DILG), and the local government units (LGU), among others. For monitoring mines operating in Palawan, a specialized agency called the Palawan Council for Sustainable Development (PCSD) is in charge. Each agency or instrumentality has a set of requirements with which a mining company has to comply. These requirements may or may not arise from the same law or statute and may be the subject of a specific administrative order or implementing rules and regulations. The legal review will attempt to evaluate the procedural and substantive compliance made by the companies to determine their sufficiency or insufficiency.

The second key question is, “What is the legal review in relation to other reviews?” Consider this Newton’s cradle (see Figure 16). A mining company will not be able to operate without a mineral agreement, typically an MPSA, as prescribed under RA 7942. The MPSA is an agreement where the government grants the contractor exclusive right to conduct mining operations within a contract area and shares in the gross output. The contractor shall provide the financing, technology, management, and personnel necessary to implement the agreement. If a company is not qualified to apply for an MPSA, they may opt to apply for Financial Technical Assistance Agreement (FTAA). A contractor and the government may enter into an FTAA for large-scale explorations, development, and utilization of gold, copper, nickel, chromite, lead, zinc, and other minerals except for cement raw materials, marble, granite, sand, and gravel, and construction aggregates.

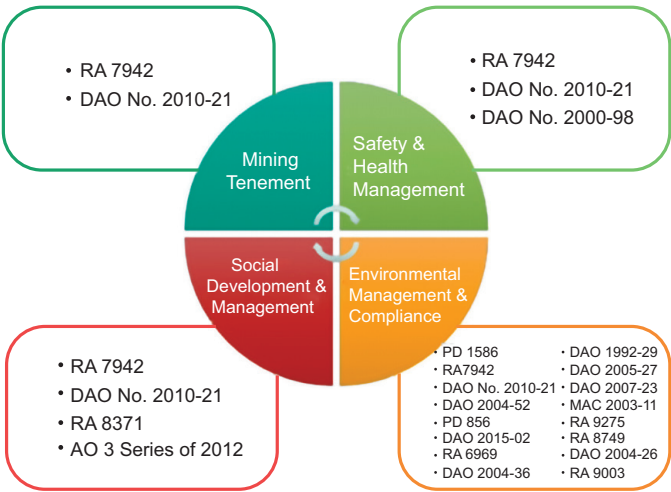
Figure 16. Process Flow of the Legal Aspect of the Review: Newton’s Cradle



These main documents (MPSA or FTAA), which serve as contracts between the mining company and the government, contain conditionalities on mining tenement, safety and health management, environmental management, and social development and management. These conditionalities would also translate to the review’s different aspects: technical, social, environmental, and economic. Figure 17 shows

the four groups of conditionalities. Each group is further divided into subgroups governed by different laws, rules, or administrative orders. Table 8 shows the minimum laws and rules relevant to the legal compliance review of large-scale mines. There are several other requirements, but these are deemed more important in determining legal compliance.

Figure 17. Minimum Requirements for Large Scale Mines



The legal review determined compliance with laws, rules, or regulations, as identified in Table 8. It pinpoints violations of particular law, rule, or regulation. On the

other hand, the technical, social, environmental, and economic experts would show how those rules were violated.

Table 8. Titles of Laws and Rules on Mining in the Philippines

Law or Rule	Title
RA No. 79-42	Philippine Mining Act of 1995
DAO No. 201021	Revised Implementing Rules and Regulations of RA 7942, Otherwise Known As The Philippine Mining Act Of 1995.
DAO No. 2000-98	Mine Safety and Health Standards
RA No. 8371	The Indigenous Peoples' Rights Act of 1997
AO 3 Series of 2012	The Revised Guidelines on Free Prior, Informed Consent (FPIC) and Related Processes of 2012
PD No. 1586	Establishing an Environmental Impact Statement System, Including other Environmental Management Related Measures and for Other Purposes
DAO No. 2004-52	The Revised Guidelines in the Issuance of Cutting/Harvesting Permits in Private Titled Lands
PD No. 856	Code on Sanitation of the Philippines
DAO No. 2015-02	Harmonization of the Implementation of the Philippine Environmental Impact Statement System and the Philippine Mining Act of 1995 in Relation to Mining Projects
RA No. 6969	Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990
DAO No. 2004-36	Revising DENR Administrative Order No. 29, Series of 1992, to further strengthen the implementation of Republic Act of 6969 (Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990) and Prescribing the Use of the Procedural Manual
DAO No. 1992-29	Implementing Rules and Regulations of Republic Act No. 6969
DAO No. 2005-27	Revised Priority Chemical List
DAO No. 2007-23	Prescribing Additional Requirements for the Issuance of the Priority Chemical List (PCL) Compliance Certificate
MC No. 2003-11	Clarifying the 1997 Rules for the Administrative Adjudication of Illegal Forest Products Under DENR Administrative Order No. 97-32
RA No. 9275	Philippine Clean Water Act of 2004
RA No. 8749	Philippine Clean Air Act of 1999
DAO No. 2004-26	Amending Rule XIX of DENR Administrative Order No. 2000-81 (Implementing Rules and Regulations of RA 8749)
RA No. 9003	Ecological Solid Waste Management Act of 2000

Method of Data Collection

Legal experts conducted a preliminary research on recent policies of the DENR, MGB, EMB, and other relevant government agencies, followed by a review of documentary submissions by mining companies. Company records were reviewed with particular attention to submitted reports as required under RA 7942, DAO 2010-21 (Implementing Rules and Regulations of RA 7942), DAO 2000-98 (Safety, Health and Sanitation Standards), and other related agency administrative orders and circulars, as well as environmental and other special laws. Achievements and good practices connected to legal compliance were also noted.

Secondary data were also secured, such as results of the latest audits, including ISO 14001, MGB, Multipartite Monitoring Team (MMT), and other third-party audits conducted. The audits by the

DENR through MGB were based on a Memorandum Circular No. 2016-01 dated July 1, 2016, issued by former Secretary-designate Regina Paz L. Lopez. The audits were carried out until September 27, 2016. The results were released on February 2, 2017.

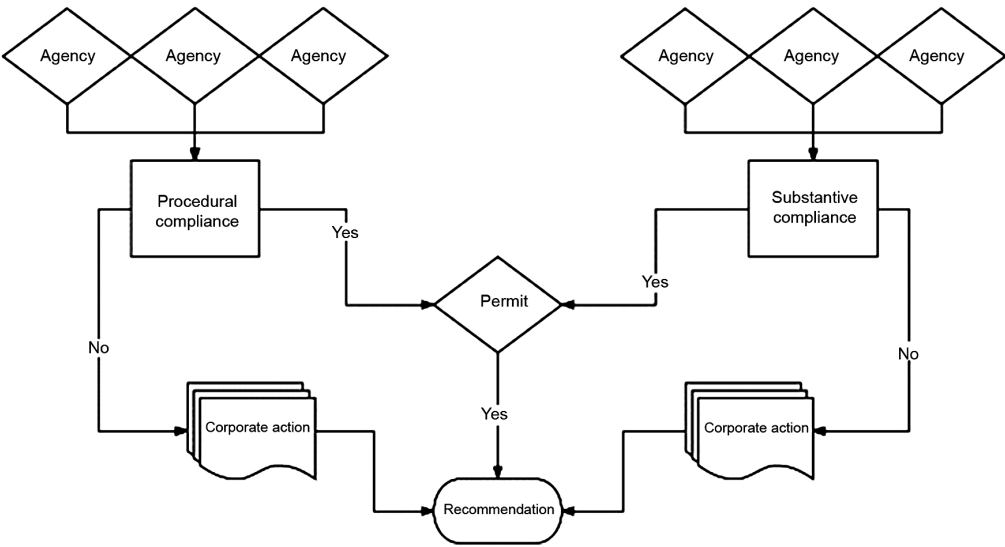
The legal team supplemented the Review with searches of online resources and government data portals, such as the EITI and the PSA, respectively, along with maps contributed by independent providers and interactions with colleagues. Details from the suspension order of some of the mining companies were also scrutinized. Experts visited sites to see firsthand the actual operations of the companies to validate key observations from the audit reports. It also allowed face-to-face interviews and dialogue with respective compliance personnel and company officials.

Analytical Approach

Figure 18 shows a summary of the analytical guide used to determine compliance. A checklist for the procedural compliance was developed. Mining companies were asked to accomplish the checklist and provide supporting documents to prove compliance. Permits and licenses were verified to check the completeness of documents. Experts also took note if they were secured within the time allowed. A fact-based or document-supported explanation for non-compliance was secured. While the legal experts usually look into violations and non-submission of reports, they also try to rationalize why certain practices, contrary to the law or warranting a penalty, have been approved or tolerated. Substantial compliance was determined by looking into the performance quality and achievements of the mining companies. The legal experts validated the absence or presence of contractual/ permit/ license violations. They also

compared contract content with the stakeholders’ views and experiences. Indicators beyond what was required of the mining companies were also documented. As a guide in scoring the mining companies, parameters were set by which the mines were evaluated. The scoring criteria used for Phase 1 are different from Phase 2. For Phase 1, five major groupings were handpicked for being the most recurring issues. Table 7 on page 18 shows the legal scoring parameters used. Document completeness and compliance were based on several important reportorial and documentation requirements prescribed by RA 7942 and DAO 2010-21. The legal experts narrowed the requirements based on what applies to the mines reviewed. They have set a minimum number of common indicators across all review teams. Some TRTs used more depending on the details found with their respective mines reviewed.

Figure 18. Analytical Guide to Determine Compliance



Key Results/Findings

Scoring for each mining operation was done in agreement with the legal experts from the other technical review teams. Each legal expert from the technical review teams may assign weights to each requirement to affect the overall score. Table 9

presents the number of mining operations reviewed in Phase 1 and 2 classified according to performance levels. A score level greater than 2.8 suggests good performance; those between 2 and 2.8 need only minor corrections; those with scores between 1 and

2 require major reforms in their operations; and those scoring less than 1 are considered companies performing poorly. In Phase 1 of the Review, the key measures scored were (a) completeness and compliance with the contract, (b) compliance with ECC, (c) compliance with other natural resources and environmental laws, (d) compliance with Contingent Liability Rehabilitation Fund (CLRF) and Final Mine Rehabilitation and Decommissioning Program (FMRDP), and (e) compliance with taxes, fees, royalties. In Phase 2, the key measures, also associated with documentary and substantial compliance, were: (a) mining tenement, (b) safety and health management, (c) environmental management, (d) social development

and management. Some 15 mining operations were reviewed in Phase 1, and one in Phase 2 needs major reforms in terms of legal performance; 13 of which are under CMP, and three were operating at the time of review. Shown in Annex Table 1 are mining companies that obtained a rating between 1 and 2 on the legal aspect of the review. Two — Mt. Sinai Mining Exploration and Development Corporation in Guiuan, Eastern Samar, and Claver Mineral Development Corporation in Claver, Surigao del Norte — received failing marks (“Not acceptable or poor”), which means companies may be subject to further scrutiny if not suspended.

Table 9. Summary of A Average Scores on the Legal Aspects by Status of Mining Operations

Score Levels/Index	CMP					Operating					Grand Total	
	Au, Ag	Chromite	Magnetite	Ni	CMP Total	Au, Ag	Au, Ag, Cu	Au, Cu	Chromite	Ni		Operating Total
Phase 1		3	2	12	17		1	2		7	10	27
Acceptable or Good												
Needs minor correction		1		1	2		1	1		6	8	10
Needs major reforms		1	2	10	13			1		1	2	15
Not acceptable or poor		1		1	2							2
Not scored												
Phase 2	1			2	3	5	2		1	7	15	18
Acceptable or Good				1	1	2				5	7	8
Needs minor correction	1				1	2	2		1	2	7	8
Needs major reforms						1					1	1
Not acceptable or poor												
Not scored				1	1							1
Grand Total	1	3	2	14	20	5	3	2	1	14	25	45

CMP = Care and Maintenance Program.

Note:

>2.8 = Acceptable or Good

>2 and <=2.8 = Need minor correction

>1 and <=2 = Needs major reforms >0

<=1 = Not acceptable or poor

Ease of Access and Availability of Information

For mining companies scoring high in legal compliance, TRT experts found it easy to access documents and other information needed for the review. This can be attributed to some factors, such as the creation of compliance teams. In several mining companies, competent compliance teams have been formed and trained to timely secure the necessary requirements. This helped them successfully manage the permitting and licensing processes for the company. With these teams, in cooperation with the department heads and staff, they created systems that enabled them to comply with the requirements and follow the regulations set by the government.

Another commendable practice cited was the record-keeping and documentation protocols, that brought transparency and receptivity to audits, not to mention efficiency in the processing of necessary permits. Companies were willing to open their books for further scrutiny, as indicated in the report of the 2016 audit team. Furthermore, the presence of the top management down to unit heads and staff who have become sources assisting the team enhanced information accessibility.

Report Delivery, Compliance Team and General Compliance

Apart from verification of documentary requirements, another determinant of compliance is the companies' preparedness to execute, manage, and sustain these requirements.

Most operational mining companies were found to have been legally compliant or highly compliant, as evidenced by complete documentation on-site. Aside from the major requirements, such as acquiring an MPSA/FTAA and ECC, compliant mining firms also ensured that they are ISO 14001 and OHSAS 18001 certified, showing their commitment to adhering to environmental, health, and safety regulations of the government. This can be attributed to a good and dedicated legal compliance team, who keeps track of submission deadlines and completes documents for submission. They have submitted most, if not all, of

required applications, plans, and programs; secured all required permits and licenses; paid all taxes, duties, and fees; and promptly submitted all required reports. Deficiencies pointed out in the first DENR audit were also quickly addressed.

Substantial Compliance

Mining companies also need to translate documentary compliance into concrete actions based on standards set by law, rules, and regulations. Mechanisms like establishing legal compliance teams are also set up to help attain tangible accomplishments. With the important documents secured and in place, the appropriate processes can be facilitated to ensure continuous operations of the mining firms. In addition, problems or issues that may arise can be addressed or dealt with accordingly.

Substantial compliance means having clear and definite goals or targets. Without such, strategies are mere approaches and purposes are vague. Therefore, there is the likelihood that the evaluation is confined to mere compliance. In this regard, submitted requirements need to have the approval of the governing bodies to ensure that targets and goals are checked and validated. This means government agencies have a role to play in contributing to the substantial compliance of the mining firms. For the mines reviewed, many have complied in terms of document submission. However, upon closer inspection, they were found to have pending approvals. For instance, all the gold mining companies passed the Review in Phase 1. But there was a common observation that while the companies submitted a Final Mine Rehabilitation and Decommissioning Program, they were not approved seasonably. The companies attribute this to the delayed response of the Mine Rehabilitation Fund Committee (MRFC), which is composed of representatives from the MGB, DENR, EMB, the Provincial Environment and Natural Resources Office (PENRO) of the local government unit, non-government organization (NGO), and the mining permit holders themselves. The delays may have arisen because of the difficulty to convene all the MRFC members. For most mines, the submitted requirements have yet to be approved by the MRFC.

On the other hand, some mines have passed the legal review but have violations cited against them. Once more, upon closer scrutiny, many factors contribute to the score given to them. In the case of the gold mining companies reviewed in Phase 2, the legal experts noted violations of the Mining Act itself. They noted that the area indicated in the MPSA or FTAA overlapped with proclaimed reservations or watersheds. Section 19 of RA 7942 prohibits mining inside proclaimed watersheds and other reservations. However, most of the old mines acquired vested rights before the proclamation that established the reservations. These mines may have gotten mineral patents over portions of the reservations. By law, mineral patents are superior tenurial instruments as they were issued before the enactment of the Philippine Constitution.

Another issue affecting the substantial compliance of mining companies, particularly with nickel mines in Phase 1, is the lack of a Special-Tree Cutting and Earth-balling permit. Ideally, no mining can proceed without this permit, given that the first stage of the operation is to clear the vegetation. Unfortunately, it was observed that some nickel mines still proceeded with the clearing of trees despite not having a permit to do so. It may have been difficult for the regulators to enforce this requirement due to the delays in the issuance of permits attributed to them. Nickel companies in Phase 2 fared better, with their average scores higher than those in the first review. However, the experts agree that this translates to mere paper compliance because of major violations noted in their reviews. There seems to be a flaw in the usual evaluation processes being made by regulatory agencies. The current system focuses on quantity or the number of check marks on the list versus quality, which is actual compliance. Policy recommendations were made to revisit the evaluation tools so that companies may go beyond paper compliance.

Proper adherence to requirements leading to the crafting of the environmental impact statement was the challenge faced by the chromite mines. The legal review noted that several companies used *Pro forma*

Environment Impact Statements, which inevitably led to faulty environmental programs. These programs do not stand a chance to comply with the conditions in the resultant ECC. A good environmental study would consider the peculiar qualities of the area where the mining activities are conducted. Any generic plan would result in a hit-or-miss situation, often to the detriment of the environment and to the people in and out of the mines.

On the other hand, different indicators and mechanisms are in place for mining companies to achieve substantial compliance. The development and submission of the FMRDP, and the provision of funds to cover mine closure costs at an early stage considered a best practice, as exhibited by Adnama Mining Resources Inc. Filminera has complied substantially with all its documentary requirements following several changes it underwent after the 2016 DENR audit. Its ECC and permits are in order, and all audits are properly managed, an exemplary achievement as the company answered and rectified deficiencies based on the audit findings. Several mining companies also achieved substantial compliance by striving for and maintaining good relations, specifically with the IPs. For one, Taganito Mining Corporation has acknowledged the presence of Manobos in their mining tenement area and complied with the obligation to provide them royalty equivalent to 1 percent of its gross sales. Platinum Group Metals Inc. has also faithfully complied with its obligation to provide royalties to Manobos and Mamanwas and assisted them in plans on utilizing the said royalties.

Another good practice is establishing a good community relations team, that will help prevent legal problems. This team will be able to address community concerns even before these ripen into legal disputes. It can de-escalate complaints, a win-win approach for both the community and the mining operation.

In terms of dealing with illegal small-scale miners, Apex Mining Corporation does a “big brother-small brother” approach, which absorbs illegal miners into the company operation to give them a legitimate source of livelihood.

Beyond Compliance

Model companies go beyond legal compliance. They suggest improvements on Free, Prior and Informed Consent (FPIC), taxes, LGU support, and law enforcement. They are competent partners and are concerned about the industry as a whole.

Awards

A good practice that can be considered beyond compliance is the participation of mines in international competitions and going global in their operations. Going global means compliance with international standards, such as ISO principles. In the Review, awards achieved by some of the mining companies, both local and international, were recognized and commended. These mining companies that are multi-awarded locally and internationally also have very high to perfect numerical scores for compliance with the minimum legal requirements. For example, Rio Tuba Nickel Mining Corporation (RTNMC) won the first ASEAN Mineral Awards for “*Best Practice in Minerals Mining*” in 2017. The ASEAN Mineral Awards was established to honor ASEAN mining companies, that have contributed to promoting sustainable minerals development in the ASEAN region. Cagdianao Mining Corporation bagged the 2019 Presidential Mineral Industry Environmental Award (PMIEA), specifically the *Presidential Achievement Award for Surface Mining*. Under EO No. 399, series of 1997, the PMIEA is given to “recognize the exemplary efforts of the mining groups and companies in the country in achieving environmentally and socially responsible mining operations.” Moreover, Agata Mining Ventures Inc. bagged the 2018 and 2019 PMIEA *Safest Surface Mine* awards for implementing a Legal Obligations and other Requirements Procedure and assisting indigenous peoples in investing royalties received for sustainable projects. OceanaGold Phil Inc. also won the First ASEAN Mineral Awards by bagging the *Best Practices in Sustainable Mineral Development* under the Mineral Processing Category. The mine is also PMIEA awardee for consecutive years from 2015 to 2017. Other awards were bestowed by the Pollution Control Association of the Philippines Inc. (PCAPI) and the Philippine Chamber of Commerce and Industry (PCCI).

Internationalization

Participation and cooperation of several companies in the Extractive Industries Transparency Initiative (EITI) are regarded as good legal practices. The EITI is an international standard promoting open and accountable management of oil, gas, and mineral resources. According to the EITI website, “the EITI Standard requires the disclosure of information along the extractive industry value chain from the point of extraction, to how revenues make their way through the government, and how they benefit the public.” Therefore, cooperation and participation in the EITI are regarded as good legal practices. They are indicators that the company operates with the highest standard as it is willing to subject itself to public scrutiny. They also indicate that a company is at par with national and international standards. Other companies also participate actively in Sustainability Reporting Initiative (SRI) by ECC International and Global Reporting Initiative (GRI). Aside from the international awards earned by RTNMC, it also participates actively in the EITI and the SRI by ECC International.

Sharing of Best Practices by Good Performing Companies

Numerous science and technology information could be generated in the development of mining technology and geosciences (DMTG) activities. If shared, this information will contribute greatly to the mining industry. Knowledge products from these activities, particularly from the research works, are important. While companies are already accommodating visits from other companies, the sharing of best practices may be further refined and made more targeted. In addition, benchmarking the environmental performance of RTNMC with international standards is a prudent way towards a more sustainable mining industry.

Summary and Recommendations

The main advantage of highly compliant mining companies was setting up a dedicated legal

compliance team to check if the firm adheres to all the requirements under Philippine law. Access to information and reports about the mining company did not become a challenge, with the legal compliance team tasked to respond accordingly. The team completes the documents for submission and keeps track of the deadlines. Also, they closely coordinate with the organization structure in keeping up with the requirements of the different aspects of the mining company.

Fast response and action on the deficiencies pointed out by the different audits, primarily by the MGB led to the substantial compliance of mining companies. Another good practice under substantial compliance is having a good community relations team. The team helps prevent legal problems since they can address community concerns before they escalate into legal disputes. Limiting the achievement of substantial compliance are the delays in the approval of submitted documents, lack of some permits, and challenges in complying with proper adherence to crafting of studies and documents, such as the environmental impact statement. Policy recommendations were made to revisit the evaluation tools, so they transcend paper compliance.

The participation of mines in international competitions can be considered a good practice that goes beyond compliance. By going global, mining operations are compelled to comply with international standards, such as ISO principles with minimum requirements prescribed by international standards. Mining companies that got high to perfect numerical scores for compliance with the minimum legal requirements were also the ones who have reaped different kinds of awards. Cooperation and participation in the EITI are also regarded as good legal practices that go beyond compliance and are good indicators that the company operates with the highest standard and is willing to subject itself to public scrutiny.

An audit should go beyond the checklist. Any regular or special audit conducted by government regulators must go beyond checking permits, licenses, or documents. Quantitative data should only be a preliminary evaluation of the compliance of mining companies. After determining the presence of the permit, license, or document, earnest efforts must

be made to ascertain compliance with the specific requirements. For example, a company can have the requisite ECC but could be violating the terms and conditions embodied therein.

Restrict audit within current operations. The issues surrounding the planned expansion of RTNMC marred the 2016 DENR audit on the company. The parallel report given by an NGO member delved heavily on the pending Application for Mineral Agreement, which was not related to the operations being audited. This created confusion and vilified the otherwise compliant operations. This may create instability in the mineral industry because legitimate operations may be disrupted by speculative findings made available to the public.

Conduct a separate review of mineral processing plants. The presence of a mineral processing plant (MPP), which is owned by a separate entity, creates a problematic situation, as in the case of RTNMC. First, the MPSA provides that the MPSA holder should exclusively undertake the mining activities in the tenement area. Second, the MPP is a stand-alone plant that could source its ore from other mine sites. Finally, the responsibilities assumed by the MPSA holder may not have also been assumed by the MPP. In the case of RTNMC, the MPP is also using a tailings pond that the former is using. A separate review should be conducted to check if the MPP complies with its obligations under pertinent laws and if its presence is legally permissible in the tenement area.

Harmonize the Mining Act, the IPRA, and the SEP Law. Mineral Agreements have been issued even prior to the passage of the IPRA (1997) and the SEP Law (1992). Under the Mining Act, a contractor will be given an area open for extraction. However, the PCSD can have a different classification based on the Environmentally Critical Areas Network Environmentally Critical Areas Network (ECAN) Map and may restrict mining within certain areas or elevation.

The IPRA requires the conduct of FPIC and has mandated it as a requisite before the issuance of a license or permit within an ancestral domain. There was a concern about whether FPIC should be

required as an additional condition even if the MPSA, which was issued prior to the passage of the IPRA, explicitly provides that renewal shall be under the same terms and conditions as in the original agreement.

Delineate no-go zones: The government must identify and strictly enforce no-go zones to avoid

unnecessary conflict and deter proponents from applying or seeking exemptions.

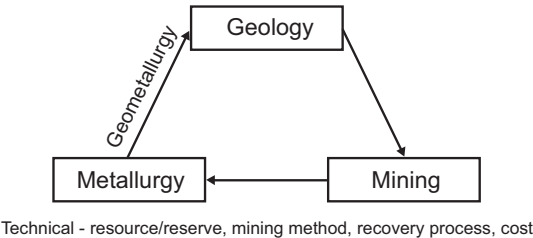
Include NCIP as a member of the MMT. For mines operating within ancestral domains, a representative from the NCIP should be made a member of the MMT to determine if the FPIC MOA provisions are being followed.

CHAPTER 4:

Technical Aspect of the Review

In this Review, the experts’ group synergized the expertise of mining engineers, metallurgists, and geologists, in collaboration with legal, social, and economic experts to devise the processes and tools of evaluation that can be used at a broader scale in the mining industry. The technical review teams used slightly different methods for those under the care and maintenance phase and those currently operating. For mines under CMP, the focus is on assessing housekeeping and maintaining the physical assets as good measures of responsible mining. This is followed by assessing the perception of mining stakeholders, more importantly, the residents of the host and neighbor communities, on how they are affected by the shift to CMP. For continuing operation, much of the review focused on the local practice compared with the accepted and world-class standards.

Figure 19. Simplified Framework of the Technical Review of Mining Operations



Framework and Methodology

Mining’s objective is to maximize the gains of metallic and non-metallic values on the ground. The bottomline framework is centered on three principles: (a) efficiency and economic growth, in which disposition and use of minerals are adequately managed to attain economic development; (b) equity or the assurance that mining results in poverty alleviation and improving the quality of life in host communities; and (c) environmental protection and

sustainability, in which the highest standards of mining and environmental protection are employed. These three principles are translated into the six technical aspects of the mining operation. These are: (a) general knowledge of the ore deposit or economic geology; (b) using benchmarks of the mining operation in determining mining operation; (c) implementation of the mine plan, diagrams, and mine surveys; (d) assessment of the production history; (e) assessment of the resource reserve; (f) and consistency of the operation with reports to government agencies, such as the MGB and other DENR entities. The three mining areas, namely geology, mining, and processing, are evaluated. Their relationship to each other is shown in Figure 19.

Technical experts reviewed documents, such as mining plans, maps, and production history, and conducted field visits and interviews with professionals working on site. The technical experts believed that experimentation and actual verification measurements of, for instance, the volume of ore deposits, are not needed since most of the relevant data and information are certified by professionals and competent persons. In production, the rate or the mill throughput as indicated in the DMP and ECC serves to set the limits and prevent runaway production. The mineral reserve to annual production ratio serves as the upper limit.

For continuing operation, much of the Review focused on the local practice compared with the accepted and world standards. The experts covered the following: (a) general knowledge of the ore deposit being mined, also known as economic geology; (b) technical design and appropriateness to site conditions; (c) management and capitalization; (d) at par with global standards; (e) occupational health and safety practices; and (f) Certified Management Systems as best practices; ISO 2015 Integrated Management Systems, ISO 14001 Environmental

Management Systems, ISO 9001 Quality Management Systems series, ISO 45001 Occupational Health and Safety (replacing BS OSHAS 18001, Occupational Health and Safety Assessment Series).

Benchmarking: Evaluating the technical performance of the mining operations under review would require industry-acknowledged criteria, standards, or existing benchmarks. The current regulatory requirements during mining operations are not performance-enhancing. These are reportorial obligations and there are no standards or guidelines against which the mining activity or performance level can be assessed (e.g., Land Use Reports, Annual Mineral Ore Reserve Reports, and even Self-Monitoring Reports that include Water Quality Standards, Safety and Health, standards for water quality coming out of a sediment settling pond discharges; Erosion and Siltation Control, Progressive Rehabilitation; mining production efficiency, labor productivity, energy efficiency, land use efficiency, sediment transport control, and progressive rehabilitation).

The key questions: (a) Are the specifications, design, methods, and regulations on company infrastructure, facilities, equipment, and human resources, at different phases of mining compliant with the national standards and suitable to the area's physical conditions? (b) Are these comparable with the current global benchmark of mining technologies? The Efficiency Comparison Indicators are production cost, labor efficiency, safety, energy, land productivity, and land-use efficiency.

General knowledge of the ore deposit being mined, also known as economic geology. This includes mineral resources and mineral reserve management. The key question is: How well are mining companies managing the mineral resources in their mining tenement. Are decisions on extraction dictated by the foreign demand? Other aspects include: (a) adequacy of mine plans, mine diagrams, and mine surveys; (b) continuing assessment by experts of ore resource and reserves; (c) mining operation efficiency and safety; (d) mining operation productivity; and (e) innovation and technological advancement in mining operation.

For mines under CMP, the focus is on assessing housekeeping and maintaining the physical assets as good measures of responsible mining. This is followed by an assessment of the perception of mining stakeholders, more importantly the residents of the host and neighbor communities on how they are affected by the shift to CMP.

Method of Data Collection

The process started with reviewing company documents and government reports. All these provided a background for the experts prior to the field visits. The important documents reviewed were the Mine Feasibility Study, Mine Technical Reports, Life-of-Mine Plan, production history, FMRDP, and financial documents.

Onsite interviews of field personnel supplemented the field visits. The exploration visits and field observations were conducted to compare company reports with actual field implementation. Field visits were complemented with photo documentation provided by mining companies. At the end of the field visit, the team conferred with the different field units in charge of production, geology, bioassay, engineering, safety and security, including a conference with the site manager and mining engineers. These conferences sought to assess the competency of personnel and their level of adherence to mining protocols and standards. When necessary, the technical expert assists the environment expert in the sampling in different mining operations, such as ore feed, mill tails, waste rock, river discharges, mine water and other mining activities that are dependent on and have an impact on different environment media, such as air, water, and earth.

Analytical Approach and Scoring Method

The technical experts agreed on three stages in reviewing mining operations applied to those under CMP and operating during the review. Figure 20 summarizes the three stages of the analytical approach. These are explained in the succeeding paragraphs.

Figure 20. Summary of Analytical Approach in Reviewing Mining Operations



The first stage is an analysis of ore resources and reserves, which includes (a) production rate and mill throughput, which is approved based on Declaration of Mining Project Feasibility (DMPF) and EEC; (b) mineral reserves to annual production ratio, which includes declared mineral reserves (proved and probable), and mineral resource (measured, indicated or inferred), required review of a mining operation to see where the controllable factors are; and (c) determination of break-even price, mining cost, and production capacity.

The second stage is an analysis of the mining system applied. In this evaluation process, the expert group refers to a global standard of mining operations. Being at par with global standards is a measure of the appropriateness of mining (and milling) technology in developing and producing mineral deposits. This includes equipment application, human resources, and methods to produce at the designed tonnage or grade. In implementing modern mining processes, the company is expected to have reviewed and adopted the best practices in mining.

The third stage is an analysis of production operating parameters, which include (a) infrastructure support of mining (and milling), such as amenities of modern living, residential, religious, cultural, sports, recreational and modern facilities, schools, and markets; (b) auxiliary facilities and infrastructure, which includes office, storage, training facilities, depots for fuel, motor pools, bodegas, stockyards, scrap yards, timber yards, explosives plants, and magazines; (c) management and capitalization, which includes analysis of the organization, financial resources of the company, and mineral resources; (d) safety performance, where a mine operating continuously and profitably must have an HSES

(health, environmental, security, and safety) system in place. Two metrics measure safety performance: frequency rate defined as the number of incidents per million person-hours rendered and severity rate defined as the number of days lost per million person-hours worked. Safety performance is an immediate symptom of the effectiveness of the HSES system. Apart from health and safety performance, a conducive working environment ensures that workers are motivated and productive even if seldom supervised; hence, good housekeeping is a necessary condition for efficient mining operations.

Key Results/Findings

Table 10 presents the number of mining companies reviewed in Phases 1 and 2 and their classification according to their performance levels. Of the 20 mining operations under CMP, only three received a good performance score; four needed minor corrections; six were for further re-evaluation considering that these will need major reforms; and one received a failing score on the technical aspect of mining. The company receiving the failing score is Oriental Synergy Mining Corporation, which operates in Loreto, Dinagat Island province. Having such performance on the technical aspect are indications of similar performances in all other aspects, including the legal aspect. Six of those currently operating mining companies scored below the desired level or were marked as companies that need major reforms.

Annex Table 1 column H shows the companies scored between 2 and 1. These are Benguet Corporation gold operation in Itogon, Benguet, Lepanto Consolidated Mining Corp in Mankayan, Adnama Mining Resources Inc. in Claver, Surigao del Norte, Century Peak Corp Rapid City operation in Loreto, Dinagat

Islands, SR Metal in Tubay, Agusan del Norte, and Tribal Mining Corp in T'Boli, South Cotabato. The six operations should be subjected to a thorough review

to determine the continuance of mining operations. Nonetheless, ten need minor corrections on the technical aspect of operations.

Table 10. Summary of the Scoring on the Technical Aspect of Mining Operations by Companies Reviewed in Phase 1 and 2

Score Levels	CMP					Operating						Grand Total
	Au, Ag	Chromite	Magnetite	Ni	CMP Total	Au, Ag	Au, Ag, Cu	Au, Cu	Chromite	Ni	Operating Total	
Phase 1		3	2	12	17		1	2		7	10	27
Acceptable or Good			1	1	2		1				1	3
Needs minor correction		1		3	4					6	6	10
Needs major reforms		1	1	4	6			2		1	3	9
Not acceptable or poor				1	1							1
Not Scored		1		3	4							4
Phase 2	1			2	3	5	2		1	7	15	18
Acceptable or Good				1	1	2	2			4	8	9
Needs minor correction	1				1	2			1	1	4	5
Needs major reforms				1	1	1				2	3	4
Not acceptable or poor												
Not Scored												
Grand Total	1	3	2	14	20	5	3	2	1	14	25	45

CMP = Care and Maintenance Program.

Note:

>2.8 = Acceptable or Good

>1 and <=2 = Needs major reforms

>2 and <=2.8 = Need minor correction

>0 and <=1 = Not acceptable or poor

Four gold mining companies, namely Oceana Gold Philippines (OGPI), FCF Minerals, and Filminera, received an average score of 3.0 on the technical aspect. Getting a perfect score in terms of the global standard of mining operation means excellent infrastructure support, auxiliary infrastructure and management and capitalization, design, appropriateness of production system, and occupational health and safety. These mining operations serve as a benchmark in setting new entrants to gold mining in the country. However, gold mining operations located in Luzon reflect varied performance. The gold mine operation of OGPI in Barangay Didipio in Kasibu, Nueva Vizcaya has the potential for sustaining development

as it performs significantly in the five aspects of sustainability, namely technical, environmental, social, legal, and economic. Thus, except for the old gold mining in Benguet, the other mining operations have steady production. The productivity of Benguet Corp.'s mining operation in Itogon had declined over the years, thus requiring re-configuration of its contractual arrangement. A proposed alternative is to increase corporate-level production instead of the greater proportion allotted to the contractual arrangements with small-scale miners applying low-level technology. Lepanto's mining operation, the other older generation gold operation, may also improve its productivity by automating its

production and improving its underground safety measures, such as providing breathing apparatus to underground miners.

The mineral resource endowment, mining technology, investment, especially for nickel mining, are keys to the longevity and profitability of mining operations. This was exhibited in the performance of RTNMC in Palawan. All told, RTNMC should be classified as the “model” for all nickel mines in the country, including its township building that helps sustain the company in the long run.

It is further recommended that RTNMC, in coordination with the MGB and the academic community, undertake comprehensive documentation of the company’s overall mining evolution from its inception up to its status in the present. From this documentation, a “mining operations audit” system or methodology can emanate, which the MGB may find useful in future work on monitoring surface nickel laterite mines.

Human resources capability, complementation, and organizational structuring were proven worldwide to improve the efficiency of mining operations. The Cagdianao Mining Company, having a well-structured organization for a mine of this size, a pool of human resources of more than 1,000, and a senior staff with a wealth of combined working experience, was rated as one of the best-managed open-cast mining operations in the country today. Their mine operations alone boast a team of 30 seasoned mining engineers and geologists.

Nonetheless, experts found key issues on the technical aspect, especially for those mine operations that are under CMP. These key issues include exploration, underperformance in production targets and site rehabilitation, poor mine engineering, and inadequate waste disposal system and technical capability. For instance, mining operations in Zambales have inadequate measures on controlling sedimentation and siltation, thereby aggravating the condition of streams. Such lack of measures has impacted downstream economic activities in the lowlands and coastal ecosystems.

Maintaining adequate and full personnel safety complement is essential during the CMP phase.

Maintaining health, safety, and security is necessary for ensuring productive but safe mining. Personal protective equipment (PPE), personnel trained in mine rescue and firefighting, and disaster preparedness are required in this phase.

Accessibility for regular monitoring must be ensured during the entire CMP phase. Experts found that the use of drones proved to have a lot of applications, especially in periodic monitoring of progressive rehabilitation. It saves resources and is an economical way to gather information. A significant and common observation among experts during field visits was the need for all mining operations to give equal importance to the FMRDP to ensure the sustainability of any mining community beyond the mine life.

Mechanization, especially for nickel mining operations, deserves to be given attention and investment. The goal is the integration of mining and processing operations, thereby adding value towards maximizing the benefit from extracting non-renewable mineral resources. The recent declaration of scandium being recovered in the nickel laterite processing in a local mine signals the need to determine if other valuable elements like Platinum Group Elements could be recovered and their presence confirmed in the nickeliferous laterite profile.

Summary and Recommendations

Geology is a critical and primary consideration in mine development and operation. Ore deposits and various geologic factors, such as topography, mineral inventory, soil characteristics, structural geology, and hydrology, are vital inputs in extracting the ore (mining) and processing it (metallurgy) and rehabilitation.

DSO should be discouraged, and processing of nickel or iron ore locally should be required.

Processing nickel/iron ore requires larger investments but may have greater economic benefits in the long term and more so with the retrieval of other high-valued metals. This is recommended so that the timing and phasing of mineral extraction and processing will ensure that rehabilitation efforts can keep up.

Restoration of ecological functions and reestablishment of biodiversity is a protracted process. Since the mined-out areas will take a long time to recover their ecological balance due to massive earth movements, mining operations and rehabilitation efforts should be properly timed. Efforts should not only focus on revegetation but also on holistic restoration of the natural land and water landscapes or configuration that maximizes restoration of flora and fauna biodiversity. These efforts are recreating corridors and areas conducive for connectivity, spawning, growth, and refuge of species.

Collaborative effort of government regulators and other stakeholders in planning and project implementation. Government regulators, together with other stakeholders, including academic institutions, should play an active role in conducting research and monitoring. They should employ adaptive planning with local planners to harmonize large-scale mining, agriculture, and fishery, and settlement planning with other land- and marine-based economic activities.

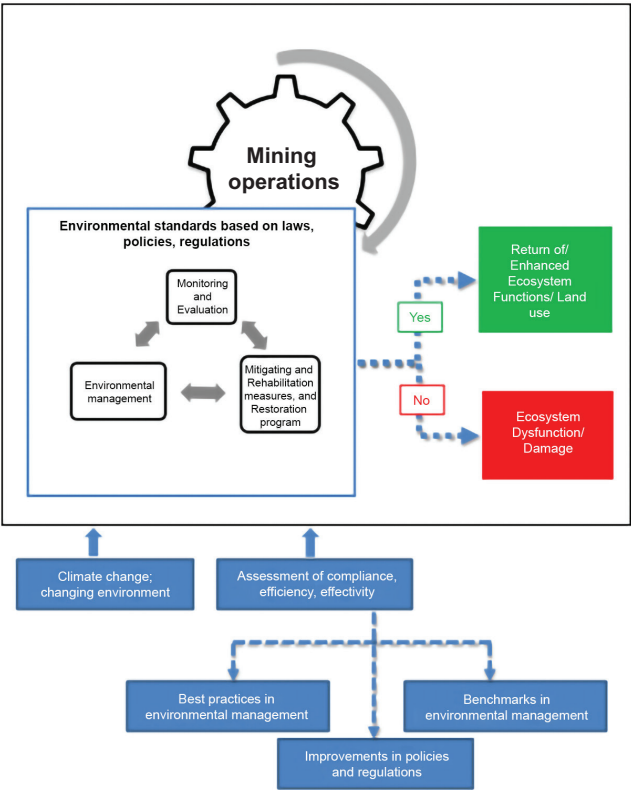
CHAPTER 5:

Environmental Aspect of the Review

Sustainable development is the DENR’s governing principle for the enforcement of RA 7942, as stated in Section 3 of its Implementing Rules and Regulations (IRR). This means realizing the needs of current generation without sacrificing the ability of the future generations to meet their own needs. Its trajectory is to improve the total quality of life of both present and future generations. One of the pillars of sustainable development is environmental sustainability, which as Thomsen (2013) stated, is achieved “when governments, corporations, and other organizations adopt sustainable development initiatives to address concerns about climate change and the depletion of natural resources. Consumers and activists are pushing for large corporations to be part of these

initiatives. The environmental experts based its review on the stipulation of Section 167 of the IRR of RA 7942, which states that for mining activities to be sustainable, it must protect the environment by: (a) maintaining sustainable environmental conditions at every stage of the mining operations; (b) establishing functional post-disturbance land use; (c) preserving the downstream freshwater quality; (d) preserving seawater quality and natural habitats for marine life; (e) Preventing air and noise pollution; and (f) respecting the traditional and sustainable management strategies concerning natural resources of Indigenous Cultural Communities (ICCs) and other communities. The following review framework and methodology attempts to capture these requirements.

Figure 21. Consolidated Framework of Environment Experts



Framework and Methodology

Figure 21 brings together different approaches adopted by environmental experts in their respective reviews of the mining firms in Phase 2. These mining operations are evaluated against the standards on environment management, mitigation and rehabilitation measures, and environmental monitoring and evaluation. The baselines are defined in laws, policies, and regulations that are put in place to achieve certain goals and safeguard the welfare of various stakeholders. These environmental standards in management, mitigation, rehabilitation, and monitoring must address climate change scenarios and increase effectiveness and efficiency. In turn, efficiency and effectiveness are assessed in view of established best practices, environment management benchmarks, and consistent with policies and regulations. Mining operations are evaluated against key environmental management indicators and biophysical indicators of efficiency and effectiveness.

Method of Data Collection

A checklist of data and document requirements was sent to mining companies prior to site visits. The environmental reports examined were EIA report, annual EPEP, FMRDP, minutes of MRFC meetings, and CMVR, to name a few. The consolidated information was organized and analyzed to determine compliance with existing local environmental standards and compared with global standards. Mining companies were requested to provide drone shots of sites where visits were not possible. These drone shots helped visualize the extent of mining operations in relation to the watershed and off-site conditions affected by mining operations. Historical data from Google Earth were also obtained for assessing vegetation changes in the last 20 years. The Normalized Difference Vegetation Index (NDVI) was generated.

Visits to mining sites, offices, yards, storage facilities, nurseries, and rehabilitation sites were done, along with off-site areas, such as water sources, reforestation sites, NGP sites, streams, rivers, deltas, ports, especially outlets of streams originating from a mining operation. Environment assessments include

evaluation of erosion control, water and sediment management, waste management, rehabilitation efforts, nursery management, climate-proofing, and environmental projects and programs implemented. Towards the end of site visits, all experts conducted exit conferences to provide the company with a “preliminary assessment of the findings.” The experts maintained constant communication with the company’s focal person on environmental concerns for the required data and other needed clarifications. The field visits include meetings with concerned government agencies, mainly from MGB and LGUs. Such visits helped validate and get feedback from stakeholders on issues and challenges related to mining operations.

Analytical Approach

The environmental conditions of the subject mine site were assessed and documented, starting with the available documents from the MGB and the mining company. The pre-mining operations, such as documentation of flora, fauna, soil, water, and air, among others, were also examined to have baseline information on the pre-existing ecosystems goods and services prior to mine development and commercial operation. The environmental impacts of mining operation were likewise evaluated against these baselines, which the EIS report presumably described.

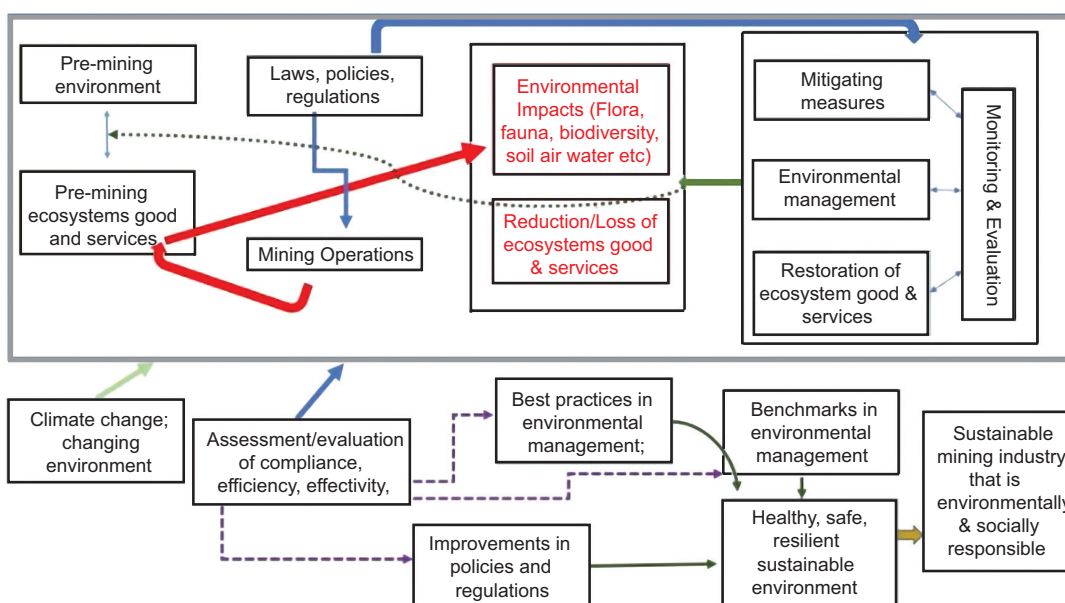
Similarly, the corresponding mitigating measures as stipulated in the EIS, EPEP, and AEPEP reports are compared with observed conditions in the field. It was presupposed that the measures had been sufficiently addressed, and the predicted environmental impacts adequately mitigated. Prior to the field visit, a compliance checklist on the relevant environmental safeguards was sent for the company to fill out together with the appropriate documentary evidence to establish compliance. The checklist includes monitoring and evaluation reports, biodiversity monitoring, and aquatic, or marine assessments after the start of the mining operations. The environmental impacts attributed to the mining operations, such as soil erosion and sedimentation, were spatially examined in the context of a watershed and its drainage system starting at the source until the discharge outlet. However, a complicating scenario in

assessing the impacts on a watershed is the presence of two or more mining operations, which creates a dilemma in the attribution of the impacts. Such cases would require a more detailed data collection and analysis.

The environmental review was likewise framed in the context of climate change, which drives changes that complicate the attribution of damage brought about by mining operations. It is expected that mining companies have accounted for the impacts of climate change on rehabilitating and restoring disturbed ecosystems. Thus, the Review looks for

climate-proofing of practices and facilities or design of environmental protection measures. The assessment outcome includes identifying best practices, gaps in environment management, and needed improvements in policies and operations. The key criteria for determining benchmark practices are innovations above and beyond mere compliance, healthy and sustainable ecosystems based on pre-identified indicators. Figure 21 summarizes the analytical approach in assessing the environmental management of mining operations.

Figure 22. Analytical Approach in the Assessment of Environment Management of Mining Operations



Key Results/Findings

Table 11 presents the number of mining companies reviewed in Phases 1 and 2, and their classification according to performance levels. Like in the other aspects of the Review, a score level greater than 2.8 implied good performance, while those between 2 and 2.8 needed only minor correction. Those with a score between 1 and 2 required major reforms in their operations, and those scoring less than 1 are considered to be performing poorly. In the environmental aspect of the review, of the 20 mining operations under CMP, seven required major corrections (Benguet Corp. Nickel Mines, Inc.,

Eramen Minerals, LNL Archipelago Minerals, Inc., Zambales Diversified Metals Corp., AAMPFIL Nat. Res. Exploration 2B, Mt. Sinai Mining Exploration and Dev't., and WELLEX Mining Corp. Mine 1), and eight (8) were given poor performance scores (Ore Asia Mining & Dev't. Corp., Krominco, Inc., Libjo Mining Corp., Oriental Synergy Mining Corp., Oriental Vision Mining Phil. Corp., Sinosteel Phil, N.Y. Mining Corp., Claver Mineral Development Corp., and Century Peak Corp. - Casiguran). Annex Table 1, column (I) shows largely nickel mining operations in Regions III and XIII evaluated in Phase

1 and were among the mining operations subject to suspension or termination resulting from the DENR Audit in 2016. Of the 25 continuing mining operations another twelve (12) mining operations needed major reforms; seven (7) were reviewed in Phase 1 (Benguet Corp, Berong Nickel Corp, Citinickel Mines and Development, Lepanto Consolidated Mining Corp., and five (5) in Phase 2 (Adnama Mining Resources Inc, Carrascal Nickel Corporation, Marcventures Mining and Dev. Corp.), Century Peak Corp. - Rapid City, TechIron Resources Inc., Tribal Mining Corp., Carmen

Copper/ Atlas CMDC, and Philex Padcal). These are five (5) gold, one chromite and six (6) nickel mining operations, reviewed in Phase 1 and 2, respectively. Eight (8) mining operations which performed poorly on the environmental aspect are Ore Asia Mining & Dev't. Corp., Krominco, Inc., Libjo Mining Corp., Oriental Synergy Mining Corp., Oriental Vision Mining Phil. Corp., Sinosteel Phil, N.Y. Mining Corp., Claver Mineral Development Corp., and Century Peak Corp. – Casiguran.

Table 11. Summary of the scoring on the environmental aspect of mining operations by companies reviewed in Phase 1 and 2.

Score Levels	CMP					Operating						Grand Total
	Au, Ag	Chromite	Magnetite	Ni	CMP Total	Au, Ag	Au, Ag, Cu	Au, Cu	Chromite	Ni	Operating Total	
Phase 1		3	2	12	17		1	2		7	10	27
Good			1		1		1				1	2
Needs minor reforms		1		1	2					2	2	4
Needs major reforms		1		6	7			2		5	7	14
Poor		1	1	5	7							7
Not Scored												
Phase 2	1			2	3	5	2		1	7	15	18
Good												
Needs minor reform	1			1	2	4				6	10	12
Needs major reform						1	2		1	1	5	5
Poor												
Not Scored				1	1							1
Grand Total	1	3	2	14	20	5	3	2	1	14	25	45

CMP = Care and Maintenance Program.

Note:

>2.8 = Acceptable or Good

>1 and <=2 = Needs major reforms

>2 and <=2.8 = Need minor correction

>0 and <=1 = Not acceptable or poor

The more common issues were improper hazardous waste storage, inadequate sedimentation, or siltation control (see Figure 23), poor environmental monitoring system, steep mining bench slopes, and lack of tree cutting permits. Several sites also fell short in annual targets in rehabilitation, thus requiring closer scrutiny of the incentive or regulatory mechanism that would ensure that mining operations accomplish their programs. Nonetheless, two mining operations have

shown exemplary performance. One was the gold mine operation of Oceana Gold Phil Inc, and the other was magnetite mining by Strongbuilt Mining Development Corp.

Nickel mining companies are particular interest in this Review. More than half, or 27 of mine operations reviewed, are nickel mining operations spread out in different parts of the country. Region XIII in the

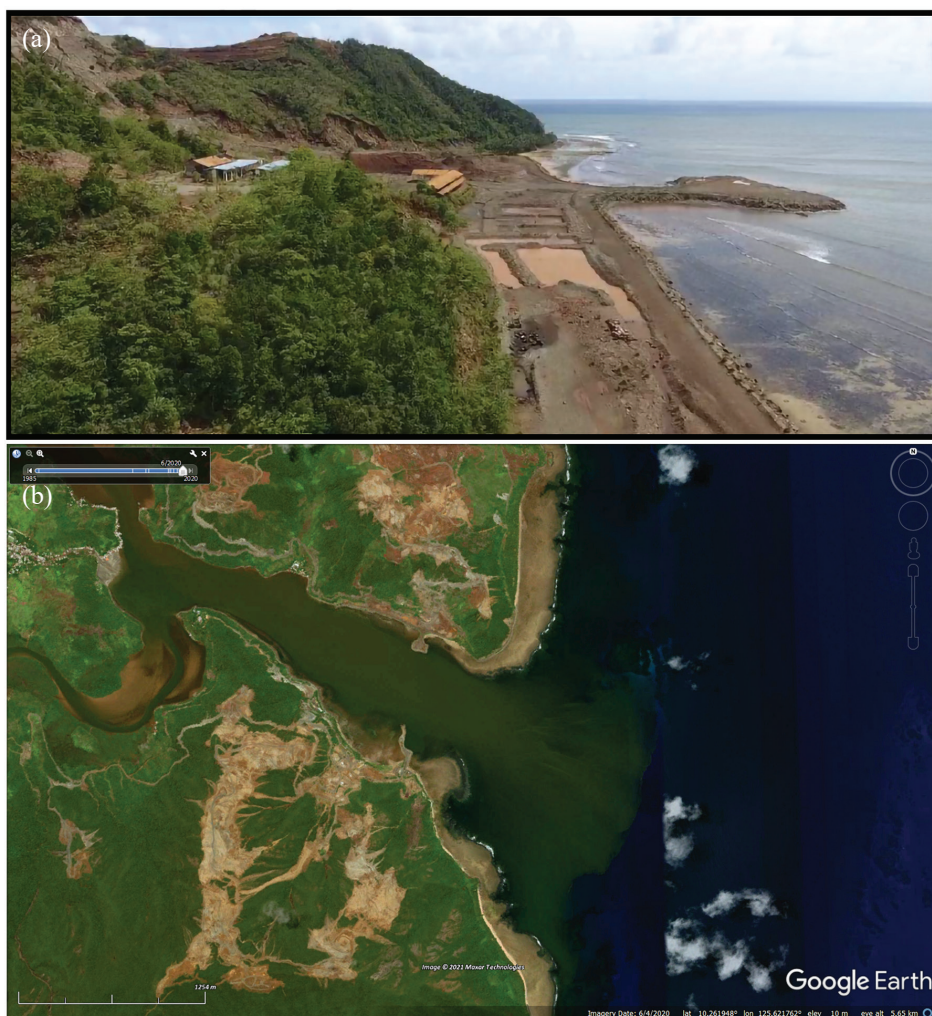
Surigao provinces, Dinagat Island, and Agusan del Norte has the most number of nickel mine sites. During the review, 14 are continuing operation, and the same number are under CMP. The performance of these mining operations ranged from extremely poor to exemplary in terms of environmental management; and from almost zero innovations in mined-out area rehabilitation to model sites with complementary research and development.

Mined Out Areas Rehabilitation

Once digging has reached the bottom of the saprolite layer and the grades go back to the original values of the parent rock, mine sites are considered ready for

immediate rehabilitation. These are typically one or two orders of magnitude lower than those of the earth layers. These depths are iron-rich hardpan, red, and yellow laterite (limonite and saprolite). In low-lying areas rehabilitation may include re-contouring (flattening) of the land surface, which can be very irregular, especially if the saprolite layer material was dug out to “peel off” the garnierite-rich boulders. In steep areas, benches are left for stability and siltation control.

Figure 23. Mine sites images (a) upper photo, from drone (b) visible flumes of likely pollutants into coastal waters of Dinagat Islands.



Revegetation of mined-out areas requires returning the flora that can thrive in the lateritic material. However, clayey and iron-rich material will enable the growth of only a limited number of plant species. The conventional way of revegetation is by introducing fast-growing species, such as *Acacia mangium*, *A. auriculaeformis* and *Casuarina species*. Driven by demand for improving biodiversity and promoting endemic and indigenous species, rehabilitation is increasingly shifting towards planting native species which have a higher chance of survival, thus improving biodiversity. On the Dinagat and Homonhon Islands, the native mangkono (*Xanthostemon verdugonianus*) was used to rehabilitate mined-out areas. However, this species is slow-growing and will require large quantities of saplings that are not readily available. These types of species can be supplemental planting material.

Figure 24. Vitiver grass used for slope stabilization is likely unstable and has limited economic value



Rehabilitation with Food Production Objectives

In some sites, with livelihood taken into account, agroforestry areas and crops production, such as paddy and corn, were established. While it is desirable to use perennials, the ecological restoration expert recommends taking advantage of natural ecological succession, such as the use of grasses and shrubs (Figure 24). However, such scheme shows inconsistency in different site conditions. Planting bananas, papaya, coffee, camote, and cucumber is commendable because it supports the food needs of local communities.

Still, caution is given, considering its impact on the habitats of unique species at the site. Further, judging by its growth rate, *mangkono*, though native at the site, may not be a suitable species for rehabilitation. Soil-enriching plants like the *mani mani* (*Arachis sp.*) will hasten the productivity of the land. There are areas where acidity and salinity are not tolerable for most species unless the soil is treated using lime.

Good Environmental Practices and Progressive Rehabilitation

Several good practices were observed in the Phase 2 of the Review. Firstly, some companies' robust rehabilitation practices included high rehabilitation investments running up to more than PHP 1 million per hectare, wide use of native species, mangrove reforestation, and a good pit rehabilitation program. Complementing the rehabilitation programs were biodiversity conservation initiatives like the establishment of an ecological park. There were also observations on the continuous pit monitoring systems using radar and good waste rock dump management with acid mine drainage encapsulation program. Soil erosion in some areas was reduced significantly through an extensive network of settling or sediment ponds. Lastly, various technologies were adopted to reduce water pollution.

Water recycling is practiced by conserving surface water resource. Some companies have endeavored to employ third-party audits to manifest their company's transparency to the public. Noteworthy environmental management practices were given recognition, nationally and internationally, for conducting the following activities: (a) intensive rehabilitation practices; (b) water recycling; and (c) third-party audits. Some of these companies have also obtained ISO certifications.

Summary and Recommendations

The low rehabilitated-to-disturbed-area ratio plus the altered ecosystem in operations areas certainly have impacts on the capacity of ecosystems to provide services, including sediment transport control

(or sediment control), soil erosion control, water flow regulation, water quality regulation, air filtration, climate regulation (e.g., carbon storage and sequestration). Hence, the restoration of lost renewable capital shall be the target of the FMRDP. Any related research should be fed into enhancing the FMRDP and shall guide the AEPEP.

Develop specific quantified outcome targets for annual (EPEP). Operationalizing the annual EPEP requires specific quantitative outcome targets to measure the success of environmental protection and ecosystem restoration efforts, along with investments. A specific recommendation to guide rehabilitation efforts is to define post-mining land use rather than pronounce motherhood statements such as "...land is suitable for agreed post-mining land use..." Likewise, the Annual EPEP shall be the instrument for measuring the quantified targets and standards set in the EIA. Based on those, the FMRDP shall be evaluated based on specific targets i.e., desired rehabilitation or restoration outcomes. Such targets shall be the bases for measuring success during the relinquishment period.

Conduct regular accounting of ecosystem services. A regular accounting of ecosystem services directly or indirectly affected by mining operations shall be component activities of the environment unit of the mining company. This includes accounting of provisioning services (i.e., food and fiber), regulating services (i.e., amount of carbon sequestration, sediment retention, soil erosion, carbon sequestration), and cultural services (recreational sites, cultural sites maintained or develop). The accounting needs to consider vegetation cover information before developing the site. This reference forest shall be the baseline of the rehabilitation efforts to restore

important ecosystem functions and provision of ecosystem services. Having these accounts and prior information on vegetation will avoid the practice of planting and growing exotic or non-indigenous species in mined-out areas. Mining companies are advised to reconsider using exotic species as planting material in declared mined-out areas. This accounting work can be funded using the allocation for DMTG, which is appropriately used for research related to the development of mining technology and geosciences.

Control sediment flows in water bodies. Controlling sediment flow in water bodies is an important obligation not to be ignored during mining operations. The mining operation leaves many open, disturbed, and easily eroded areas during rainy periods. The situation in most mine sites is aggravated during monsoon and heavy rain brought about by tropical depressions or cyclones. Although chemically inert, the clayey material remains in suspension for an extended period and joins the main drainages, thereby covering the riverbed, banks, and likely damaging infrastructure located on the floodplains. The location, the density per unit area, and the design of silt dams, impounding dams, ponds, traps, and canals are critical in maintaining the water regulating functions of such bodies.

Despite this, several mining operations were found to have fallen short of the standard, reducing streams' water regulation capacity. Thus, assessing the watershed sediment yields that will help determine appropriate vegetative measures, infrastructure, and other sediment control measures, with or without mining operations, is advised. The capacity and capability of the silt traps and siltation ponds system need to be studied in-depth, particularly during heavy rainfall and typhoons. (See Figure 25)

Figure 25. Siltation of Riverbeds Resulting from Insufficient Control Measures

Enhance dust and sediment control. Dust is among the prominent concerns of communities. It intensifies during extraction periods, typically in dry months. Thus, it is suggested that mining companies explore conducting suppression studies to enhance dust control. Though driven by financial objectives, mining operations must consider environmental and health impacts. Apart from sediment control and dust mitigation, a bigger challenge is harmonizing large-scale mining, agriculture and aquaculture, progressive and active community, and urban living with coastal and marine activities. In Zambales, mines have negatively impacted lowland fishponds, rice production, and marine ecology through stream discharge. This aspect is addressed mostly by the country's gold mining operations but hardly undertaken in nickel mining operations except as part of the SDMP and CSR.

Conduct and incorporate scientific research about nickel laterite material. Incorporating more scientific research on the nature of nickel laterite material is encouraged to establish a metal inventory and identify nickel-bearing mineral species. The result of this research is vital in the design of any future on-site processing of this commodity. The challenge is to design a structure or system that will address the clayey water run-off. The current design of impounding dams and ponds cannot control the clayey water from joining the river tributaries causing siltation along the way. Employing scientific tools in examining and addressing several environmental management concerns is a formidable advantage for a mine company. RTNMC and the DENR can continue a partnership in research towards better environmental management of the mining site.

CHAPTER 6:

Social Aspect of the Review

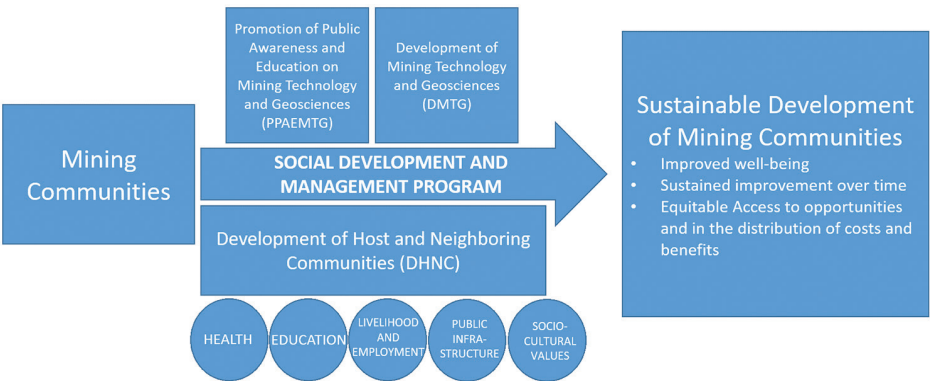
The social aspect of the review is focused on the impact of mining activities on their hosts and neighboring communities. Social development is about improving the well-being of individuals, so they can attain their full potential to enhance the quality of their lives and their communities.

Framework and Methodology

The diagram in Figure 26 shows a representation of the social aspect of the MICC Review. The primary target of the review is the implementation of the SDMP. The SDMP refers to the comprehensive five-year plan of the contractor or permit holder for the sustained improvement in the living standards of the host and neighboring communities by creating responsible,

self-reliant, and resource-based communities capable of developing, implementing, and managing community development programs, projects, and activities in a manner consistent with the principle of people empowerment (DENR 2010). The objectives of the SDMP are anchored on the principles of sustainable development, alternatively expressed as: “improvement of the human being over time, and equity in access to the opportunities and the distribution of costs and benefits” (DENR-MGB). Investing in renewable natural capital and man-made capital, developing human assets, and enhancing social capital effectively ensures future income for the beneficiaries. The desirable condition is that communities will not only experience improvement in welfare during the mining operation but even beyond.

Figure 26. Framework for Social Aspect



SDMP has three major components, which receive 1.5 percent of the operating cost. Development of Host and Neighboring Communities (DHNC), DMTG, and Promotion of Public Awareness and Education on Mining Technology and Geosciences (PPAEMTG) are allocated 75 percent, 15 percent and 10 percent of this share, respectively.

Communities and representatives from the mining firm decide on projects, including their funding, through

DHNC’s six mandatory components. These are: (a) human resource development and institution building; (b) enterprise development and networking; (c) assistance to infrastructure development and support services; (d) access to education and educational support programs; (e) protection; and (f) respect of Socio-cultural values and use of facilities/services within the mining camp or plant site. The DMTG funds aim to advance technology and geosciences, and

resources and mineral discoveries; operational efficiency; resource recovery; and enhance environmental protection and mining safety. On the other hand, PPAEMTG supports information, education, and communication for greater public awareness and understanding of responsible mining and geosciences (MGB 2018). The participatory approaches of engagement with the community, LGUs, mining companies, and other stakeholders have complemented the integrated process of the SDMP, which is envisioned to sustain the improvement of welfare and community stakeholders' equitable access.

Method of Data Collection

During the review process, data collection activities were done to capture evidence of mining operations' social and cultural impacts and companies' development interventions for the affected communities. Primary information was collected from host municipalities and impact communities, including IP and non-IP communities, neighboring communities, LGUs, and the mining companies through focus group discussions (FGDs), consultation meetings, and key informant interviews (KIIs) with the assistance of the Community Relations (ComRel) Officers. FGDs and KIIs were done with significant stakeholders, including representatives of local government units, community and peoples' organizations, cooperatives, and other sectoral groups in the impact communities such as the farmers, fisherfolk, women, youth, and the elderly. A questionnaire focused on the companies' knowledge of and experiences with SDMP implementation was formulated for the focus group discussions (FGD) and the key informant interviews (KII). These served to validate and verify the information indicated in secondary materials. Subsequently, community visits and observations were likewise done to validate and support the information gathered from FGDs and interviews.

The reviewed secondary materials included official reports of the mining companies, MGB, LGUs, and related national agencies. Key sources of data are Community-based Monitoring Systems (CBMS) report, census of population, socio-economic and ecological profile of the municipalities, municipal and barangay development plans, Municipal Comprehensive Land Use Plan, Ancestral Domain Sustainable

Development and Protection Plan (ADSDPP), SDMP Reports, Community Royalty Development Plan (CRDP), and CSR Reports. Data sources to determine changes used in the analysis of the impact of mining activities are as follows: demographic and education profile, health sector profile, livelihood and employment, access to other basic services (water, power, food housing, transportation, communication, and other facilities and services), access to safety; peace and order, cultural heritage; preservation of cultural values, important heritage sites, ancestral domains.

Analytical Approach

The Review identified and examined the implementation of SDMP projects and related activities and assessed their sustainability and contribution to the welfare of the communities. Qualitative data from the FGDs and the KIIs were analyzed against reports of compliance and adherence to the SDMP framework. In addition, desk review and analysis of existing documents were performed. The technical review team counted the emoticons used by FGD participants to assess identified programs during the consultation meeting. Impact was evaluated by whether target beneficiaries were appropriately identified and engaged: the SDMP and CSR are in place; communities have improved access to basic services; local communities have a positive perception of the companies; and companies have good community relations. A social performance assessment score was used to measure the contribution of the mine to sustainable development vis-à-vis other aspects of a mine. A five-point criteria were set for the social review. The criteria covered intergenerational equity, intragenerational equity, poverty reduction, community perceptions, and the presence or absence of conflict. The highest possible score was 3, which denoted acceptable practices; a score of 2 was given for mines for minor corrections had to be done; 1 for mines where major reforms were necessary; and 0 for mines with unacceptable practices. The higher the score, the more acceptable the practice.

Key Results/Findings

Table 12 presents a summary of the ratings of mining companies in Phases 1 and 2, classified

according to levels of performance on the social aspect. A score level greater than 2.8 indicates good performance; those scoring between 2 and 2.8 needed only minor correction; those with scores between 1 and 2 required major reforms in their social accountability; and those getting scores less than 1 are considered to be performing poorly on the social aspect. In Annex Table 1, Column J, Claver Mineral Development Corp.'s nickel mining operation scored zero. Nonetheless, 19 or a third of the 45 mining operations needed major reforms; nine were under CMP (Benguet Corp. Nickel Mines, Inc., Eramen Minerals, LNL Archipelago Minerals, Inc., Zambales Diversified Metals Corp., Emir Minerals Corp., WELLEX Mining Corp. Mine 2, Century Peak Corp. - Casiguran, Greenstone Resources based on the social review. Pacific Nickel Philippines, Inc.) and ten were in operation (Adnama Mining Resources Inc, Carrascal Nickel Corporation, CTP Construction and Mining Corp., Marcventures Mining and Dev.

Corp., Century Peak Corp. - Rapid City, SR Metal, Tribal Mining Corp., Carmen Copper/ Atlas CMD, Masbate GP Filminera, and Apex Mining Company Inc.). Six mining companies performed poorly based on the social review. Three are nickel mining operations (AAMPIL Nat. Res. Exploration 2Bm, WELLEX Mining Corp. Mine 1, and Claver Mineral Development Corp.), two magnetite mining (Ore Asia Mining & Dev't. Corp. and Strongbuilt Mining Dev't. Corp.), and one chromite operation (Mt. Sinai Mining Exploration and Dev't.)

These indicate that several companies either had issues with the communities or did not have a significant impact on communities' welfare. Fourteen of those are nickel mining companies (or 16 mining operations), of which ten are under CMP. Five gold mining companies (Greenstone Resources, Tribal Mining Corp., Carmen Copper/ Atlas CMD, Masbate GP Filminera, and Apex Mining Company Inc.)

Table 12. Summary Scorings of the Social Aspect of Mining Operations by Companies Reviewed in Phases 1 and 2

Score Levels	CMP					Operating						Grand Total
	Au, Ag	Chromite	Magnetite	Ni	CMP Total	Au, Ag	Au, Ag, Cu	Au, Cu	Chromite	Ni	Operating Total	
Phase 1		3	2	12	17		1	2		7	10	27
Good				1	1				1	1		2
Needs minor reforms		1		3	4	1	2		2	5		9
Needs major reforms		1		5	6				4	4		10
Poor		1	2	3	6							6
Not Scored												
Phase 2	1			2	3	5	2		1	7	15	18
Good									3	3		3
Needs minor reform						2	1		1	2	6	6
Needs major reform	1			2	3	3	1		2	6		9
Poor												
Not Scored												1
Grand Total	1	3	2	14	20	5	3	2	1	14	25	45

CMP = Care and Maintenance Program.

Note:

Good or acceptable means <2.8

Needs major reforms means >1 and <=2 =

Needs minor corrections means >2 and <=2.8

Not acceptable or poor means >=0 and <=1

needed significant reforms in their social engagement and development, one of which was under CMP. A cursory review shows that those having an average score of less than two in the social aspect operate in Region XIII and Region III.

Out of the 45 mining operations reviewed, 25 were operational at the time of the review while 20 were under the CMP. Their operational status directly impacts SDMP because the budget is derived from the 1.5 percent of the operating cost. Nonetheless, the mining firms can glean best practices and learnings, whether they are in operational mode or under care and maintenance

Sustaining the SDMP during CMP

Mining companies reviewed had different methods of maintaining their mining areas during CMP mainly due to a lack of established standard. Some companies could not keep up with the required activities, especially social development and management. There was a concern that, unless regulated, CMP may be used as a subterfuge to terminate employees and reduce cost for the implementation of the SDMP. Hence, the lesser the operation, the lesser the operating costs, and the lesser the cost for SDMP. But there were several companies that despite their condition, continued their social management programs and innovative approaches to address emerging issues.

Among those are:

- **Providing Alternative Livelihood Programs during CMP.** Alternative livelihood programs, such as growing cash crops, skills training, and other activities that harness native products or even culture and traditions, were sustained. Most large-scale mining companies have adopted these livelihood programs as a strategy to sustain a post-mining economy, which will inevitably affect their employees.
- **Formation of Cooperatives for Displaced Workers.** To help its displaced employees, Wellex Mine 1 formed a cooperative called Dinagat Island Pure Organic Farmers Association (DIPOFA), which received a portion of the land

managed by Wellex. This arrangement enables members to plant vegetables, fruit trees, and other crops like coffee beans and cacao. Income and profit from selling the produce were considered as income of the cooperative. In Dinagat Island, Oriental Vision Mining Philippines Corporation helped organize a Women's Cooperative, now registered under DOLE.

- **Focus on Specific SDMP Component During CMP Phase.** Strong Built Mining Development Corp. continued implementing social development programs though limited to health and sanitation, education, and socio-cultural values. Oriental Vision Mining Philippines Corporation supported the distribution of farm inputs, provision of fishing boats, an ambulance, motor vehicle transportation services, and bridges. It provided scholarships and turned over water facilities to the community after construction. Mt. Sinai Mining Exploration and Development Corporation continued its scholarship support for selected community members. A public school teacher in one of the impact barangays was a product of the scholarships from the mines.

Formalized and Engaged Community Relations Office During Operations Phase

The Community Relations Office (CRO) facilitated the implementation of projects and activities when mining companies, such as Oceana Gold Phil, Rio Tuba Mining Operations, and Cagdianao Mining Corp., followed the hiring qualifications for a Community Relations Officer. Through a participatory approach, selecting the right partner-beneficiaries and identifying priority needs were ensured. The mining company and the community members also observed good community relations, owing to the community organizers' familiarity with local culture. Furthermore, regular conduct of quarterly meetings and consultations of CRO with community stakeholders allowed participation, good communication, and resolution of conflicts if there were any. Monthly internal and onsite monitoring is also conducted together with community representatives.

Key Stakeholders Participation in SDMP Organization

In ensuring the success of SDMP, key local stakeholders should be identified, along with their specific roles and functions. Mining firms approached stakeholder participants in SDMP differently, while some simply followed the minimum requirements as indicated in the mandate. In many nickel mining operations, the Representatives of the Host and Neighboring Communities (RHNC), a multi-sectoral body with broad stakeholder membership and working closely with the mining company on SDMP, is a common set-up in Mindanao mine sites. For instance, the RHNC includes community, civil society organizations, LGU, and NGA representatives in the CARAGA region.

In Nueva Vizcaya, OceanaGold Philippines Inc. had sustained coordination with the Barangay Development Council, BLGU, and the municipal LGU, in close engagement with the MGB. A Community Monitoring and Evaluation Team (CMET) was formed to check and assess if SDMP plans and projects are effectively implemented. Similarly, in Nueva Vizcaya, the FCF Mineral Corp., improved communication between the company and the community by assigning one liaison or focal person per host and neighboring barangay. The Barangay Focal Person served as their contact for any SDMP-related concerns. Another innovation by both FCF Mineral Corp. and OGPI was the institution of a Technical Working Group (TWG) composed of provincial and municipal government agencies and a CRO representative tasked with formulating and implementing policies and guidelines for the SDMP. Other mining companies such as RTNMC, TechIron, and Philsaga have not only reached the target beneficiaries but have also covered those not originally identified.

Use of Assessment Studies in SDMP Formulation

Apart from community immersion, some companies conducted assessment methods, such as the Participatory Rapid Appraisal (PRA) and Social Impact Assessment (SIA), as part of the SDMP formulation processes. PRA was conducted to learn from the

people and integrate their knowledge, experiences, and opinions in the planning and managing development programs and projects. On the other hand, SIA estimates the likely social consequences in advance of a planned change (Neuman 2014). With the knowledge generated from these processes, identifying appropriate programs, projects, and activities (PPAs) was more specific and responsive to the communities' needs. The budget allotted was targeted and well-spent. Furthermore, the mining companies enhanced their SDMP strategies and methods in addressing the local poverty situation. The RTNMC and the CNBC further improved the SIA by including poverty profiling, which provided important information in identifying appropriate PPAs and developing the five-year SDMP with partners-beneficiaries. With this perspective, all PPAs are considered essential elements that can help reduce poverty among community residents within the host and neighboring communities. An important element in this poverty reduction strategy is fostering active community participation in the planning and implementation of all PPAs.

Other Notable Special Practices and Projects

SDMP Monitoring and Evaluation. Project monitoring is typically done according to area, but Platinum Group Metals Inc. introduced an innovation by assigning a personnel per specialization (e.g., focal person for livelihood support services; social services; and networking and partnership). This structure aimed to better implement and monitor programs and projects in the communities.

Information, Education, and Communication (IEC). Beyond typical IEC projects promoting awareness on such issues on health and sanitation, capacity building seminars, part of the budget was also directed to maintaining satellite ComRel offices.

Scholarships and Employment Packages. Some good practices in terms of employment for many of the mining companies involved hiring locals and graduates of SDMP scholars and partnering and cooperating with government institutions such as TESDA and private institutions in capacity development. A notable example of a private partnership

was OGPI's collaboration with Site Skills Training (SST) Center for intensive work readiness training for miners in Nueva Vizcaya at the USD 2-million underground metalliferous mining simulator of SST Center in Clark Field, Pampanga.

Community Network and Social Capital Enhancement. Different organizations and cooperatives have been formed and organized, involving farmers, fisherfolk, women, and IPs, among others, for sustained livelihood projects. For instance, FCF Mineral Corp. supported IP women in using their skills in weaving textiles. This project ensured the continuation of this heritage craft among the women in the host communities. AAMPFIL Natural Resources Exploration and Development Corp. has assisted in establishing a community cooperative for elderly community members by providing initial capital for the members to use to purchase goods to be sold.

Continuing Corporate Social Responsibility (CSR) Programs. CSR is the continuing commitment by businesses to behave ethically and contribute to economic development (WBCSD Stakeholder Dialogue on CSR 1998). Aside from enacting the legally mandated SDMP, several companies have continued to carry through their CSR as a supplement for SDMP projects. Notable examples are Cagdianao Mining Corp.'s annual medical missions and Taganito Mining Corp.'s provision of assistance and scholarships to students is one of the high-impact programs, apart from hospital services, housing, drilling of water sources, and community relations assistance program.

IP Relations and Support Programs. While there were issues related to royalty payments and the uneven distribution of benefits among IP community members, there are notable successes, such as the IP programs of Philsaga Mining Corp., Berong Nickel Corp., RTNMC, and Agatha Mining. Philsaga Mining Corp. has forged a Memorandum of Agreement between the company and the Manobo tribes on the royalty payments for SDMP-like projects on health, education, livelihood, and small infrastructure. Berong Nickel Corp. assisted the IP communities in developing a Community Royalty Management Program (CRMP). Rio Tuba Mining Operations also helped strengthen the implementation of social development programs by making a Memorandum

of Agreement between ICCs/IPs, CBNC, RTNMC, Rio Tuba Nickel Foundation, Inc., and NCIP under SDMP. Agata Mining Ventures Inc. launched the Mabakas Techno-Demo Farm School, a TESDA-accredited organic farm school to assist the Mamanwa and Manobo tribes. AMVI also rolled out the Trainers' Training Program for Cacao farmers to invest their royalties in such crops to ensure sustainable development.

Contribution to COVID-19 response. In support of the government's COVID-19 pandemic response, mining companies realigned funds of SDMP to assist the host and neighboring communities, as well as the non-impact barangays in implementing enhanced community quarantine, provision of relief goods, support for transport of Locally Stranded Individuals (LSIs), provision of medical supplies and facilities, providing livelihood, and other activities, such as IEC campaign on pandemic awareness and prevention.

Summary and Recommendations

ComRel staff members who underwent training in Community Development possess the needed skills to engage with community members. It was also noted that having a good relationship with the community helped facilitate operations. Some of the mines had established good rapport through frequent consultations with the community members.

The conduct of a social impact assessment (SIA) helped identify relevant SDMP PPAs and assess their value in improving people's lives. When necessary, the SIA provided a basis for adjustments in the SDMP. The steady sources of income significantly benefitted the communities. The mining operations provided not only employment, but also an alternative livelihood for the agricultural communities and small-business enterprises. The augmenting role of CSR projects and the formation of community-based organizations and cooperatives greatly enhanced the SDMP implementation. Furthermore, strengthening IP relations is also crucial for greater ease of fulfilling the SDMP. The contribution of the mines to the COVID-19 efforts of the government was deemed helpful. This may be done

to respond to particularly damaging calamities brought about by natural hazards like typhoons or volcanic eruptions in the future.

Counter dependence of HNCs to SDMP. One challenge encountered regarding sustainability is the *barangay* residents's dependence on the mining company, especially its SDMP and different community projects. The regular provision of funds for projects in the communities through the SDMP should not make the municipality and the host *barangays* dependent on the assistance of the mining company. Local governments have the accountability to implement programs for the welfare of their constituents and must initiate and fund projects that can help develop their communities. In addition, preparing the host and neighboring communities in the event of mine closure should also be incorporated in the SDMP. Some of the recommended activities are the development of sustainable enterprises, values orientation or reorientation regarding financial management, and better management of personal and family finances.

Promote inclusive engagement of all stakeholders regarding benefit sharing. The conflict on benefits from the mining among various stakeholders remains a concern. Mining projects trigger conflict between impact areas versus non-impact areas, direct and indirect impact areas, IPs and non-IPs, and other stakeholders. Various groups want to enjoy benefits from these projects, and jealousy may arise between groups over who gets more benefits. Companies

are thus advised to promote inclusive engagement with all stakeholders, so no one feels excluded in the benefit sharing.

Provide funding for training on community organizing or hiring a community organizer. Given the success of innovative community engagement, it is recommended to include funding for hiring a community organizer or a similar arrangement with host and neighbor communities to help develop and implement their respective social development programs. The cost can be partially taken from the SDMP funds depending on the size of the mining firm. In like manner as the OGPI scheme, the BLGU may hire a coordinator to support and facilitate the SDMP projects. The SDMP Coordinator undergoes orientation and training with the CRO of the mining companies in various processes of SDMP implementation and participates in training activities on community organizing.

Conduct SDMP comprehensive impact evaluation. Finally, it is recommended that mining companies that have long implemented SDMP should conduct a comprehensive impact evaluation of their SDMP. It is vital to determine what interventions should be carried out to prepare the community beneficiaries to cope with the challenges of life after mine. Among the recommended indicators for inclusion in the evaluation are employment rates, enrolment, completion rates, the proportion of births attended by skilled health personnel, and other similar or related variables.

CHAPTER 7:

Economic Aspect of the Review

This chapter summarizes the economic experts' reports following the Review of the performance of 26 mine operations in Phase 1 and 17 mine operations in Phase 2. The Review is grounded on the concept of sustainable development, which means sustaining the well-being of the economy, affected communities, and households. One of the core concepts of sustained well-being is that future generations are bequeathed with at least the same level of stock of resources or capital level. Their level of capital, regardless of type, is non-declining over time to support future basic needs. This so-called weak sustainability concept assumes that it is possible to substitute one capital with another so long as the level of capital, measured using the same metric, is maintained. The socioeconomic literature has identified five different classes of capital, namely, financial, physical, human, social, and natural. Of the five classes, natural capital is the most negatively affected by mining operations.

Framework and Methodology

The goal of the review from the economics viewpoint, apart from its contribution to national economy, is sustained growth of local economy and that the welfare of the communities at present are improved and can be maintained when mining operation eventually ceases. In the context of mining, economic welfare can be evaluated in terms of four key goals. The first goal, **financial sustainability of mining operation**, as earlier defined in the technical aspect of review means sufficient capitalization, stable sales revenue, cost efficiency, and sufficiency of mineral resources. The second goal, **contribution to the economy**, includes revenue to national and local government in the form of excise and other taxes, fees, and royalties, and to local economy, which includes employment, local taxes, local expenditure of employment income, added business, enterprise and household income resulting from mining

operation. The contribution to the economy is anchored on financial sustainability of the company and its operations. The third goal, **improved welfare and human capital**, in this review, means apart from increased household income includes access to credits and basic services, reduction in poverty, enhanced human capital, such as literacy, school enrolment and change in income of host and neighbor communities of the mining operation. Fourth is **sustained level biophysical capital**, which means that the economic well-being of households and communities in host and neighbor communities of mining operations includes safe, clean, healthy, and sustainable environment that contributes to their economic and other human activities. Thus, mining companies must maintain the environment in host and neighboring communities of the mining operation. The fifth goal is **sustaining natural capital**, which includes abiotic and biotic capital, such as habitats, species, air, soil, water, oceans, minerals, and natural processes considered as stocks from which ecosystem services flow as inputs to economic and human activities. In this review, the experts assessed the extent and quality of these stocks and the changes in its capacity to deliver ecosystem services as affected by mining operations. The aim was to ensure that natural capital is sustained even beyond the mining operation. Extraction of minerals, which are non-renewable type of resources, affects other forms of natural capital, such as soil, surface ecosystems — forests, inland waters, coastal and marine ecosystems. Of interest from a weak sustainability standpoint is the *substitutability* of natural capital with other forms of capital if these are diminished, lost, or damaged because of the mining operation.

Method of Data Collection

Assessing financial sustainability and contribution to the economy of mining operations required

review of company outputs, financial reports, markets, and mineral resources. Many of these reports are submitted in compliance with government regulatory requirements. At the minimum, key documents needed for this review are audited or unaudited financial reports, Annual EPEP, SDMP Expenditures, Final Mine Rehabilitation Plan, Mineral Production Reports submitted to MGB, Contingent Liability Rehabilitation Fund (CLRF), Sustainability Reports, the Mineral Production Sharing Agreement document, EIS, and the DMPF. Other reports, such as the five-year SDMP Impact Assessments, carbon audit and greenhouse gas inventories, and other related studies were also examined.

To estimate a mining operation's contribution to the local economy, reports on the payments of local taxes, royalties, allocation, and expenditures on Social Development and Management Program and Corporate Social Responsibilities are assessed. Employment data that detail the origins of employees (i.e., local or outside the host and neighbor communities) and financial statements provide an estimate of the mining operation's share in the employment income. Municipalities' poverty statistics provided by PSA, and the Community-based Monitoring System (CBMS) of the DILG, LGU data on local revenues from taxes, and other mining-related activities are reliable sources of information. Other sources included national statistics, such as gross domestic product, regional domestic product from PSA, and income and expenditure data of LGUs from the Bureau of Local Government Finance of the Department of Finance, and share of national wealth. The Ancestral Domain Sustainable Development and Protection Plan and Community Royalty Development Plan of IPs were also reviewed in some mine operations.

The review of improvement in household and community welfare required the conduct of FGDs among host and neighbor communities. FGDs are intended to elicit information from local stakeholders on the contribution of the mining operation to sustaining local economic growth and sustaining livelihood of households. Representatives from local government, trade and business sector, farmers, fishers, health workers, women, senior

citizens, peace and order, non-government or civil society organizations, schools, credit and finance, and other key representatives participate in these on-site discussions and dialogue. For detailed information, a sample of households and mine employees were interviewed using a computer- or an android-aided survey. The computer-aided or android-based employee survey was intended to elicit information on the following: (a) comparison of income of non-mining and mining employment; (b) distribution of expenditures on mining income that will help determine local capture of income; (c) indirect contribution to improving local enterprises; (d) comparison of assets of mining and non-mining households; and (e) analysis of employment by vulnerable groups. Key informant interviews with fishers, farmers, barangay health workers, barangay nutrition scholars, teachers, and youth sought to elicit information on the mining operations' qualitative and quantitative impacts.

Spatial data analysis using GIS and remote sensing data accessed through Google Earth Pro and Google Earth Engine for site of mine operation and supplemented by GIS information provided by the company. These data are used as proxy measure of the impact of mining operation on ecosystems its resources mostly plant resources, and other abiotic resources such as surface and ground water. Overlay of the mining tenement, boundary of the existing MPSA and proposed expansion would show which resources were and will be affected by past, present and mining operations.

Analytical Approach

Three evaluation frameworks commonly used in evaluating the economic contribution of mining operations are benefit-cost analysis (BCA), economic impact assessment, and impact evaluation. Economic efficiency suggests that given current constraints, all capital or resources are employed to maximize the returns to society. These are briefly described below.

Economic Impact Assessment. Economic impact analysis traces direct, indirect, and induced impact of an investment in one industry on other industries through its backward and forward linkages. In this review the focus is on review of contribution to the

local and national economy in the form of taxes, royalties, fees, and share from natural wealth, and review of geographic/spatial distribution of employees and their pattern of expenditures or use of mining income. In some areas this was supplemented with a review of regional input-output estimates on the direct, indirect, and induced effects on other industries with link to the mining industry.

Impact Evaluation. Impact evaluation, in the case of mining operation, this includes assessing the welfare of host and neighboring communities compared with either a baseline or a counterfactual. This uses the information from household and employee survey. The aim is to measure the change in welfare of the community and household brought about by mining operation in the area. Ideally, baseline indicators on household welfare before and after the mining operation are compared. A significant positive difference implies contribution of the operation in improving welfare. In the absence of baseline information before the mining operation a counterfactual site is compared with the host and neighbor communities in terms of pre-identified indicators of welfare. If both baseline before the mining operation and the counterfactual information are not available, the results of the FGD serve as proxy, which imply that the result of the analysis are just indicative figures that can be verified with more detailed data collection. In the present case, this evaluation uses indicative results of FGDs, KIIs and relevant data form both employee and household surveys.

Benefit Cost Analysis. BCA evaluates the net economic change or improvement in the welfare of society when an intervention, investment, program, or project is undertaken. Using the BCA framework, economic benefits and costs of a mining operation are estimated. It was asserted that mining and mineral processing provides the following benefits: (a) providing livelihood to local communities; (b) generating income for the local government, thereby directly contributing to its economy; (c) promoting a more efficient use of energy, saving people money; and (d) promoting environmental awareness through rehabilitation programs resulting in more renewable sources than ever. Apart from private investment and direct operations costs, the BCA framework

covers other types of costs from the perspective of the economy. These costs include: (a) direct mining – personnel, mobile equipment, processing, camp and travel, labor, services, supplies; (b) indirect mining; (c) externalities; and (d) damages. For analysis purposes, the direct mining costs are categorized into (a) unit-based costs, which include fuel, lube, gas and power, services and supplies, labor and salary; and (b) activity-based costs, which include drilling, engineering, truck haulage, and general administration, — technical overhead, management.

Local economic growth analysis. Analysis of secondary data from LGU, PSA, BIR, DOF and BLGF to include taxes from mining operations, fees and charges, land-use maps, poverty statistics, income, and expenditures of host municipality or city.

Accounting of Ecosystems and Natural Capital. This includes accounting of ecosystems extent, condition and ecosystem assets, and the provision of ecosystem services. The two major steps are physical accounting using various accounting tools and modeling techniques. The outputs are matrices graphs, and tables.

Key Results/Findings

Table 13 presents the number of mining companies reviewed in Phases 1 and 2, classified according to performance levels on the economic aspect. A score level greater than 2.8 implied good performance; those between 2 and 2.8 needed only minor corrections; those with scores between 1 and 2 required major reforms in their operations; and those scoring less than 1 were considered to be performing poorly. The results of the social and economics reviews have similarities in mining operations that were deficient in performance. In Annex Table 1, of the 20 mining operations under CMP, eight needed major reforms on the economic aspect. These were Benguet Corp. Nickel Mines, Inc., Eramen Minerals, Mt. Sinai Mining Exploration and Development., Krominco, Inc., Libjo Mining Corp., Oriental Vision Mining Phil. Corp., Sinosteel Phil, N.Y. Mining Corp., Claver Mineral Development Corp., and Century Peak Corp.– Casiguran. Three companies engaged in nickel mining, namely Ore Asia Mining

& Dev't. Corp., Zambales Diversified Metals Corp., and Oriental Synergy Mining Corporation were considered to be performing poorly on the economic aspect. Only four mining operations in Phase 2 Review were found to be showing good performance. These are Cagdianao Mining Corp., Rio Tuba Nickel Mining Corporation, Agata

Mining Ventures Inc., and Philsaga Mining Corp. One company, Pacific Nickel Philippines, Inc., was not given an overall score on the economic aspect despite scoring on sufficient capitalization and provision of employment income because its mine site is under re-exploration and presently, not in a production stage.

Table 13. Summary of Scoring of the Economic Aspect of Mining Operations by Companies Reviewed in Phase 1 and 2

Score Levels	CMP					Operating						Grand Total
	Au, Ag	Chromite	Magnetite	Ni	CMP Total	Au, Ag	Au, Ag, Cu	Au, Cu	Chromite	Ni	Operating Total	
Phase 1		3	2	12	17		1	2		7	10	27
Good		1		1	2		1			4	5	7
Needs minor reforms			1	3	4			1		3	4	8
Needs major reforms		2		6	8			1			1	9
Poor			1	2	3							3
Not Scored												
Phase 2	1			2	3	5	2		1	7	15	18
Good						1				3	4	4
Needs minor reforms	1				1	4	2		1	3	10	11
Needs major reforms				1	1					1	1	2
Poor												
Not Scored				1	1							1
Grand Total	1	3	2	14	20	5	3	2	1	14	25	45

CMP = Care and Maintenance Program.

Note:

"Good or acceptable means <2.8

"Needs major reforms means >1 and <=2 =

"Needs minor corrections means >2 and <=2.8

"Not acceptable or poor means >=0 and <=1

Four out of seven operating nickel mines in Phase 1 review were found to have good performance. These are Carrascal Nickel Corporation, CTP Construction and Mining Corp., Hinatuan Mining Corporation, and Marcventures Mining and Dev't. Corp. Half of

the nickel mines under CMP in Phase 1 needed major reforms while three of them were poor performers. In Phase 2 of the Review, one (Century Peak Corp. - Rapid City) out of seven operating nickel mines needed major reforms.

Financial Sustainability

The technical aspect of this Review listed sustainability indicators: sufficient capitalization, stable sales revenue, cost efficiency, and sufficiency of mineral resources. Undertaking this Review required detailed financial data from all mining operations. These data, however, are not complete for all the mining operations as some only had indicative information. Of those mining operations reviewed with available financial data, their level of financial sustainability is varied. A criterion adopted by the economics experts is “sufficiency of capitalization,” especially

during slump years and when the world markets are depressed. Table 14 summarizes the scoring by economics experts on capitalization of mining operations reviewed in Phases 1 and 2. A score of 2 and above means sufficient capitalization, while those scores below mean insufficient capitalization. Nine of those mine operations reviewed in Phases 1 and 2, have insufficient capitalization thereby can be considered having poor financial sustainability. All those are under CMP (six are nickel, one chromite, one magnetite, and one gold and silver mining operators).

Table 14. Number of Mining Operations Reviewed in Phase 1 and 2 by Type of Commodity and Status of Operation

Review Phase, Capital Sufficiency Rating Level	CMP					Operating						Grand Total
	Au, Ag	Chromite	Magnetite	Ni	Total	Au, Ag	Au, Ag, Cu	Au, Cu	Chromite	Ni	Total	
Phase 1		3	2	12	17		1	2		7	10	27
3		2	1	3	6		1	1		6	8	14
2				4	4					1	1	5
1				4	4			1			1	5
0			1	1	2							2
NA		1*			1							1
Phase 2	1			2	3	5	2		1	7	15	18
3						2				4	6	6
2.5						1			1	1	3	3
2				1	1	2	2			1	5	6
1.5				1	1					1	1	1
1	1				1							1
Grand Total	1	3	2	14	20	5	3	2	1	14	25	45

CMP = Care and Maintenance Program.

Note: *This is an exception since no score was provided on this criterion for Emir Minerals Corp.

It was observed that those with high production capacity ranked higher in terms of financial sustainability. Among those with high scores in financial sustainability in the nickel group were Cagdianao Mining Corporation, Hinatuan Mining Company, RTNMC (all four are part of the Nickel Asia Corporation group of companies), CTP Construction and Mining Corporation, and Carrascal Nickel Corporation. For gold, these were Philex

Mining Corporation, Filminera Mining, OceanaGold Philippine Inc., and Lepanto Mining. Figure 27 presents the top ten mining companies in terms of annual average revenue. These were based on available data provided to the MICC Review teams. Data on the financial sustainability of other gold operations were not available during the review period. Those ranked higher in financial sustainability were found to have sufficient ore reserves to sustain their operations.

Contribution to National and Local Economy

Reports of the contribution of mining and quarrying industries to the economy at the national level have been aggregated. At the municipal level, mining companies are contributing to the local economy from employment income (majority for locals), local taxes and fees, SDMP and environmental protection and enhancement program budget expenditures, and locally established backward and forward linkages. Backward and forward linkages include businesses and enterprises created to support direct mining activities. However, in many remote mining communities, only small proportions of employment income are locally captured, especially if a nearby

large urban center supplies most consumption goods. These urban centers get the most share of mining employment income. It is unclear if local revenues from mining are channeled back to providing essential services in the host and neighbor communities. Table 15 presents a summary scoring by economics experts on the contribution to local revenue, taxes, fees, and royalties. A score below 2 means that the mining operation has a less significant contribution to the local economy, implying that local revenues from mining are not adequately captured in the local economy. Nine mining operations received such poor ratings.

Figure 27. Estimate of Annual Average Revenue of Top 10 Mining Companies Reviewed by MICC

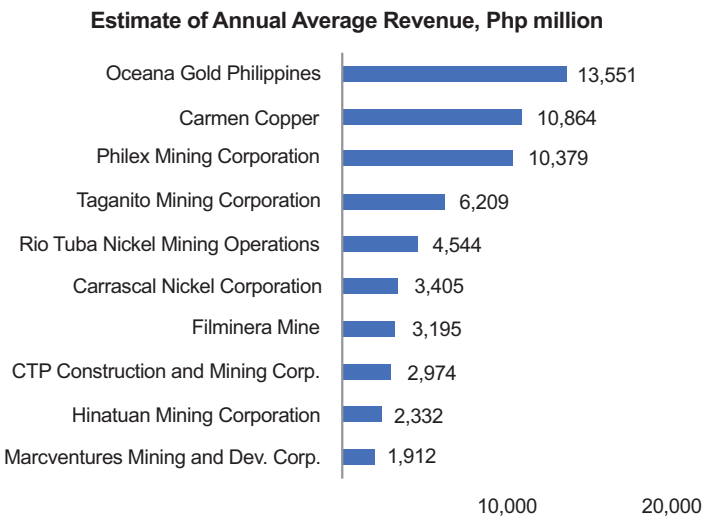


Table 15. Number of Mining Operations Reviewed in Phases 1 and 2 by Type of Commodity and Status of Operation with Corresponding Score on “Revenue from taxes, fees and royalties”

Review Phase, Rating Level	CMP					Operating						Grand Total
	Au, Ag	Chromite	Magnetite	Ni	Total	Au, Ag	Au, Ag, Cu	Au, Cu	Chromite	Ni	Total	
Phase 1		3	2	12	17		1	2		7	10	27
3		1		4	5		1			5	6	11
2		1	1	5	7			1		1	2	9
1		1	1	2	4			1		1	2	6
0				1	1							1
Phase 2	1			2	3	5	2		1	7	15	18
3	1				1	4	1			5	10	11
2.5									1	1	2	2
2							1				1	1
1.5				1	1					1	1	2
1						1					1	1
Not scored				1	1							
Grand Total	1	3	2	12	20	5	3	2	1	14	25	45

CMP = Care and Maintenance Program.

How the share of natural wealth is used requires further in-depth study. Long-running mining operations, such as Lepanto, Benguet Corporation, Filminera, RTNMC, have visible contributions to the development of infrastructures and support services facilities, particularly mining towns. Mine operations that have existed longer than those relatively new have shown to contribute more annually to local economic activity through its sustained payment of excise, real estate, and business taxes both to the national treasury and the local

government unit. The PSA data on real regional GDP showed the high contribution of mining and quarrying in areas with high capacity and high revenue mining operations (See Figure 11).

The economics experts recommended regular compiling and reporting of information on the capture and contribution of mining to the local economy. Further, a detailed study is crucial since the input-output analysis only captures industry-level information. The conduct of a survey of income of mine-related employment would be the starting point of research.

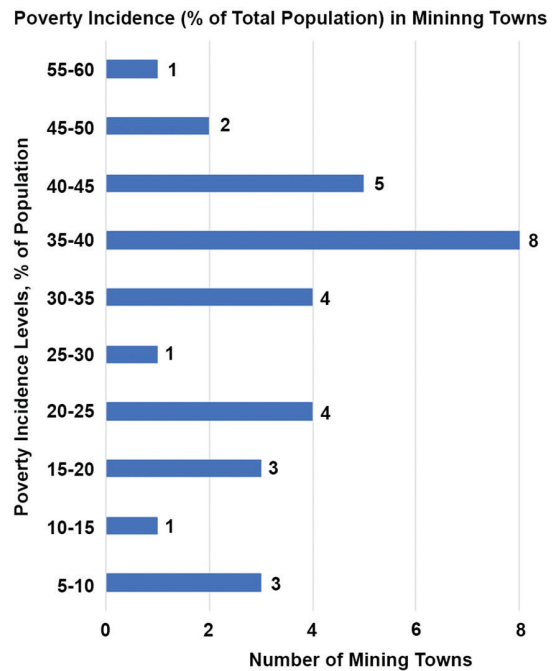
Economic impact on the community and household

In place of a rigorous method of impact evaluation, the process of discovering the impact of mining operations was done through structured FGDs, household surveys (including both mining and non-mining employees), and key informant interviews. These FGDs and surveys of households and employees, which social and economic experts jointly or separately conducted in host and neighboring communities, revealed varying impacts of mining operations. Some key evaluation variables in both the FGDs and household surveys, which were considered as measures of economic impact, are increased income, increased asset ownership (e.g., in both household and productive assets in agriculture and other livelihoods), improved access to basic household services (particularly health, sanitation, and pollution reduction), increased access to financing and credit facilities (micro credits and financing institutions), and improved human capacity (e.g., higher education, and skills training). On average, the income of host and neighbor communities increased, as well as the assets and access to credits for most mining companies. In some mining operations where household surveys were conducted, a test of significant difference between host and non-host communities in terms of assets and access to services revealed different results. The result showed significant differences for long-term mining operations, except those in Benguet Gold Operation. This likely outlier could be explained by the presence of small-scale miners in non-host *barangays* in the same municipality of Itogon.

Another macro indicator reviewed was the change in the poverty level using the poverty assessment data, particularly poverty incidence in years 2003, 2006, 2009, 2012, and 2015. Municipal level or small area estimates for 2018 are not yet published by the PSA. Overall, PSA's estimates of poverty incidence in nine towns with mining operations show consistent

downward trend from 2003 to 2015, namely Narra in Palawan, Doña Remedios Trinidad in Bulacan, Basilisa, Libjo, and Cagdianao in Dinagat Islands, Santiago in Agusan del Norte, Bunawan in Agusan del Sur, Aroroy in Masbate, and Maco in Davao de Oro (formerly Compostela Valley). The rest of the 32 towns with mining operations had increasing or fluctuating poverty incidence in one or two poverty assessment years, mostly 2012, which is rather peculiar. Poverty incidence in towns with active mining has a downward trend, indicating community welfare improvement. Figure 8 summarizes levels of poverty incidence in mining towns based on the 2015 PSA report, based on the 2015 PSA report. Of the 32 mining towns where large-scale metallic mining companies operate, 20 or more than half have above 30 percent poverty incidence in 2015.⁴ Of these 20 towns, poverty incidence decreased in five towns by more than ten percentage points between 2012 and 2015. These are Basilisa, Libjo (Albor), Tubajon, Loreto, and

Figure 28. Number of Mining Towns by poverty incidence levels in 2015 Poverty Incidence Levels



⁴ According to PSA (2019c), the official poverty incidence estimate of 21.6 percent in 2015 has been revised to 23.3 percent to reflect rebased prices from a base year of 2006 to 2012, and to incorporate counts from the 2015 Census of Population .(Albert, Abrigo, Quimba, & Vizmanos 2020).

Cagdianao in Dinagat Islands. Therefore, it is imperative to sustain this improvement in welfare and that mining beneficiaries invest their returns or income on assets that would increase productivity and generate continuing incomes. Income from mining should eventually be replaced by income from other sources once the mines have been depleted. On access to basic services, in mine areas where SDMP were found to have been effectively implemented and appropriately allocated, the number of community organizations and cooperatives has grown and access to basic services have improved. A review of literature, analysis of FGDs, and household interviews conducted on-site show that host communities of mining operations have higher cash and non-cash income relative to adjacent non-mining communities.

Natural Capital Sustainability

Before the enactment of the Mining Act of 1995, maintaining the level of natural capital was not the focus of mining operations, as shown in the minimal investment of companies to enhance vegetation. Except in those good performing mine operations, most on-site development activities were mere rehabilitation of mined-out areas. Only a few invested in estimating their carbon footprint and measuring carbon sequestration of existing vegetation. There is much less effort in improving ecosystem conditions and the provision of ecosystem services that should have been part of the AEPEP. Not one company had a complete estimate of the material balance, the number of residuals of mining operations, and the waste-to-product ratio of mining operations.

As mentioned in the report of environment review, some mining operations have impaired the capacity of the ecosystems to produce goods and services in their mining sites. With a low rehabilitated-to-disturbed area ratio, including an altered ecosystem, there is undoubtedly an impact on the capacity to provide ecosystems goods and services. Hence, restoration of lost renewable capital shall be the target of the FMRDP and a regular component of the AEPEP. Any related research should seriously be fed into the enhancement of the FMRDP and shall guide the AEPEP.

Summary and Recommendations

Mining revenues must be effectively used for improving community welfare. Mining provides significant gains for the national government, but the local government only receives up to 15 percent. In this regard, it is suggested that there should be an increase in the mining revenue share at the local level. Re-investing mining revenues received by the LGUs to enhance basic services and human capital, such as promoting the development of local businesses to increase local capture of mining employment expenditures, helps increase local economic activities and human resources development. Considering the findings by Albert et al. (2020), the major factor for non-participation in the labor market is the lack of schooling. Depositing a certain percentage of this revenue in a trust fund to serve as social safety nets and risk buffer, especially in calamities and emergencies, such as the COVID-19 pandemic, is likewise recommended.

Substantive use of funds for social and environmental programs to build up other forms of capital.

Most mining operations were found in communities with high poverty incidence because of limited productive assets, basic services, and human capital. In those settings, mining companies must allot budget from their SDMP, EPEP, FMRDP, Mine Rehabilitation Fund, Contingent Liability Rehabilitation Fund, and funds for the MMT to build productive and renewable capital that can substitute depletable minerals. Even part of the funds for their Corporate Social Responsibility projects can be aligned with this the thrust of increasing such capital. Further, using the previous year's operating cost as a basis for funding SDMP may be disadvantageous to host communities when mining operations are suspended. It is recommended that an annualized budget be prepared up to the abandonment phase of the mining operations.

Commerce or businesses must increase in communities to improve the local capture of mining employment expenditures. Mining companies must move beyond short-lived SDMP livelihood projects and instead promote long-term trades within and

expand towards managing local enterprises and private businesses. Activities under the SDMP and EPEP must ensure that local communities prioritize projects and provide incentives for establishing small- and medium-scale enterprises within mining communities.

Invest in substitutes of depletable or non-renewable natural capital (i.e., mineral ore) and renewing depreciated natural capital. Forests, coastal, and marine ecosystems are affected by mining operations to the extent that their original functions and ecosystem services to economic and other human activities cannot be restored or duplicated in-situ or through offsetting in different sites in a short period. The FMRDP must be planned and funded adequately to build this renewable and managed natural capital. Thus, “rehabilitation” and “restoration” must approximate the loss in value of these functions and ecosystem services that support local economic activities.

Consolidate the implementation of SDMP within a single LGU jurisdiction. Some negative externalities know no boundaries. In the context of integrated ecosystem framework, the benefits and costs (including externalities) are shared by all in the same watershed. Hence, it is suggested to review the selection process of SDMP beneficiaries to include all those within the affected watershed/s and not based solely on political boundaries. In municipalities or cities with multiple

mining operators, such as those in Bataraza, Palawan, where RTNMC and CBNC are located, the SDMP fund management through a single foundation appears to align effectively with LGU’s plans and programs, both at the *barangay* and municipal levels. Such a scheme minimizes budget splitting and focuses on priority projects with significant welfare contributions.

Account Local Natural Wealth, Natural Capital, and Ecosystem Services. A comprehensive wealth accounting, beginning with ecosystem accounting, may be undertaken to assess various assets’ current and future potentials, such as ecosystem, human, social, and manufactured assets. It is important to determine the depletion and depreciation of such capital. Further, mining companies must invest resources to improve their biodiversity and ecosystem accounting capacity within their mining tenements.

Improvement of Monitoring and Evaluation (M&E) and data management of mining companies. Mining companies must invest in new data management technologies and personnel to improve their operations, M&E, and reporting systems. For example, the integration of data generation and monitoring in the SDMP, which can be linked to the Community-based Monitoring System (CBMS) of the LGU, can help facilitate M&E. Mining companies should exercise due diligence in preparing the reports they submit to the MGB and other agencies to minimize data discrepancies.

CHAPTER 8:

Summary & Conclusion

This chapter summarizes the five aspects of large-scale metaling mining operations review. The ratings and performance indices were summarized according to the type of commodity and status of mine operation in Phases 1 and 2 of the Review.

Rating of Mining Operations and Performance Index

Table 16 summarizes the scoring results by commodity type of mining operations reviewed in Phases 1 and 2, which were disaggregated by the operational status and phase of the Review. Only four mining operations were considered to have good mining practices; one

was in Phase 1 and three mining operations were in Phase 2. More than half or 23 of those reviewed needed minor corrections (i.e., 12 in Phase 1 and 11 in Phase 2). 15 mining operations needed major reforms, 12 of which were reviewed in Phase 1. These were largely nickel mining operations, half of which were in Region XIII and the other half were spread in different regions. One nickel mining company (Century Peak Corporation - Casiguran) and a gold-silver mining operation, both currently operating and passed the DENR audit in 2016, got an index of “Needs Major Reform.” A cursory evaluation showed this largely scored poorly in the environmental, social, technical, or economic aspect.

Table 16. Summary of Mining Operation Rating Index in Phases 1 and 2 of the Mining Operations Review

Index by Commodity Group	Phase 1			Phase 2			Grand Total
	CMP	Operating	Total	CMP	Operating	Total	
Acceptable		1	1		3	3	4
Au, Ag, Cu		1	1				1
Ni					3	3	3
Needs Minor Corrections	4	8	12	1	10	11	23
Au, Ag				1	4	5	5
Au, Ag, Cu					2	2	2
Au, Cu		1	1				1
Chromite	1		1		1	1	2
Magnetite	1		1				1
Ni	2	7	9		3	3	12
Needs Major Reforms	11	1	12	1	2	3	15
Au, Ag					1	1	1
Au, Cu		1	1				1
Chromite	2		2				2
Ni	9		9	1	1	2	11

Index by Commodity Group	Phase 1			Phase 2			Grand Total
	CMP	Operating	Total	CMP	Operating	Total	
Not Acceptable	2		2	1		1	3
Magnetite	1		1				1
Ni	1		1	1		1	2
Grand Total	17	10	27	3	15	18	45

CMP = Care and Maintenance Program.

Note:

Good or acceptable means <2.8

Needs major reforms means >1 and <=2 =

Needs minor corrections means >2 and <=2.8

Not acceptable or poor means >=0 and <=1

The scoring summaries above were based on the consensus among expert groups to establish a set of criteria based on the scope provided by the MICC.

Table 17 summarizes the average rating of mining operations reviewed by commodity type. Nineteen nickel mining, three chromite mining operations, two magnetite mining operations, needed major reforms; all are under the Care and Maintenance Phase

during the Review. All of those needing major reforms were reviewed in Phase 1. It must be noted that this averaging method masked individual performance but indicated that nickel, chromite, and magnetite mining operations are the ones that needed major reforms. Hence, the regulatory agency should emphasize implementing these major reforms.

Table 17. Summary Rating of Mining Operations by Phase of the Review and by Commodity

Review Phase, Commodity	Number of Mining Operations	Average Rating by Status of Operations		Overall Average Rating
		Care and Maintenance Phase	Operational during the Review	
Phase 1	27	1.7	2.4	1.9
Au, Ag, Cu	1		2.9	2.9
Au, Cu	2		2.0	2.0
Chromite	3	1.8		1.8
Magnetite	2	1.7		1.7
Ni	19	1.7	2.4	1.9
Phase 2	18	1.6	2.5	2.3
Au, Ag	6	2.4	2.5	2.5
Au, Ag, Cu	2		2.3	2.3
Chromite	1		2.5	2.5
Ni	9	1.4	2.6	2.3
Grand Total	45	1.7	2.4	2.1

Table 18 shows the scores corresponding to the indexes in Chapter 2 on the scoring procedure (see Table 6). Good or acceptable mining operations have an overall average score greater than 2.8. Those with “Minor Corrections” have an overall average score between above 2.0 and 2.8. Those with “Major Reforms Needed” have an overall average

score between 1.0 and 2.0. Poor (Not Acceptable) performing mining operations have an average score of less than 1. These mining operations scored just above 1 and below in all the five aspects of the Review, which suggested significant legal issues, poor technical accomplishment, environmental challenges, limited community engagement at the site of mining

operations, and limited economic contribution. In Phase 1 review, one magnetite and one nickel mining operations are at that level. In Phase 2, one nickel

mining operation is in that category. The consensus among the experts is that these companies must be re-evaluated, if not suspended.

Table 18. Distribution of Mining Operations by Range of Overall Average Score Per Mining Operation

Score Levels (Index Level)	CMP					Operating						Grand Total
	Au, Ag	Chromite	Magnetite	Ni	CMP Total	Au, Ag	Au, Ag, Cu	Au, Cu	Chromite	Ni	Operating Total	
Phase 1		3	2	12	17		1	2		7	10	27
Good							1				1	1
Needs minor reforms		1	1	2	4			1		7	8	12
Needs major reforms		2		9	11			1			1	12
Poor			1	1	2							2
Not Scored												0
Phase 2	1			2	3	5	2		1	7	15	18
Good										3	3	3
Needs minor reforms	1				1	4	2		1	3	10	11
Needs major reforms				1	1	1				1	2	3
Poor				1	1							1
Not Scored												0
Grand Total	1	3	2	14	20	5	3	2	1	14	25	45

CMP = Care and Maintenance Program.

Note:

>2.8 = Good

<=2 and >1 = Required major reforms

<=2.8 and >2 = Needs minor correction

<=1 and >0 = Poor performance

Table 18 shows that 12 firms under the Care and Maintenance Program and three currently operating needed major reforms (overall score below 2); three are not acceptable (red-colored, all under CMP included in Phase 1); all the rest were considered to have acceptable operations or only needing minor corrections.

In addition to the current scoring, the technical review team in Phase 2 conducted an initial General Root Cause Analysis to determine the relative “weights of liabilities” of three key players, namely the government regulator, the mining company, and the local government unit, with regards to the issues related to the industry. These three specific key players were identified as the DENR-MGB, the mining company, and the LGU (which manages the host community). A simple scoring is given to these

key players: 2 – most liable; 1 – indirectly liable; and 0 – no influence.

The initial assessment results indicated that companies garnered 82 points (77 %) of the possible total score of 106 (2 points x 53 identified issues). Thus, the companies are viewed to be mostly the root cause of the violations. However, DENR-MGB’s score is not insignificant, as it garnered 63 points or 59 percent. Expectedly, the LGU has the lowest liability score, which was at 17-18 percent. The results reveal that, although mines are mainly the most liable among the three stakeholders, there are, nevertheless, issues regarding the performance of DENR-MGB’s regulatory functions.

These issues are confounded by the uneven distribution of regular positions across all regional offices. Each office is given about the same number

of technical positions, regardless of the number of regulated mines. Region XIII, which has the greatest number of active mines in the Philippines, is the most understaffed. To augment their technical staff, the MGB Region XIII office resorts to extended hiring of contractual personnel, which has implications to the performance of the agency's technical staff directly involved in actual regulation work.

Table 19 summarizes the number of mining operations according to Scoring Index by region. The summary

distribution indicates that 75 percent of mining operations in Region VIII (3 out of 4) needed minor correction; two out of three mining operations in CAR needed minor correction. Overall, 45 percent (10 of 22) of mining operations, 36 percent (8 of 22), and 9 percent (2 of 22) need minor correction, and major reform. These imply that 45 percent (10 of 22) needed and major correction or have poor rating. All the four mining operations in Region III need either major reforms or failed substantially in the scoring.

Table 19. Performance Index Based on Individual Mining Operations by Region

Index by Region	Phase 1			Phase 2			Grand Total	% of Operations in Region
	CMP	Operating	Total	CMP	Operating	Total		
Acceptable		1	1		3	3	4	
Region II		1	1				1	50
Region IVB					1	1	1	33
Region XIII					2	2	2	9
Needs Minor Correction	4	8	12	1	10	11	23	
CAR		1	1		1	1	2	67
Region II					1	1	1	50
Region IV-B		2	2				2	67
Region V					1	1	1	100
Region VII					1	1	1	100
Region VIII	2		2		1	1	3	75
Region XI					3	3	3	100
Region XIII	2	5	7	1	2	3	10	45
Needs Major Reforms	11	1	12	1	2	3	15	
CAR		1	1				1	33
Region III	4		4				4	80
Region VIII	1		1				1	25
Region XII					1	1	1	100
Region XIII	6		6	1	1	2	8	36
Not Acceptable	2		2	1		1	3	
Region III	1		1				1	20
Region XIII	1		1	1		1	2	9
Grand Total	17	10	27	3	15	18	45	

On the Legal Aspect

Overall, a general observation on the legal aspect was that while the paper compliance was deemed sufficient, except for a few, it was not matched by actual performance. There are cases when companies are compliant with operations or pollution requirements. Still, they do not use the most appropriate procedure or anti-pollution technology and facilities to protect the environment.

Some current procedural practices, such as temporary permits or care-and-maintenance program, have allowed companies to operate or hold on to their tenements even when global metal prices remain depressed. These arrangements, especially the CMP, have created a lot of idle mines where the economic and social aspects are negatively affected; only environmental maintenance remained as the main

activities. These are discussed further below in this section's social and economic parts.

Despite the time under operations, penalties were deemed not commensurate to the violations committed. Some violations, however, merit further review, whereas some penalties require suspension of the Environmental Compliance Certificate and non-issuance of Ore Transportation Permit and/or Mineral Export Permit until the ISO Certification is secured.

Contract with communities and IPs, where there are issues in the compliance or adherence to the current contract, must be further reviewed. The change the company operating within a tenement under the former owner usually complicates the issues. Such non-adherence to contractual arrangements creates conflicts with communities, negatively affecting the reputation and technical operations.

Mining operations create externalities that are factored in its cost, thereby transferring the burden to the affected communities. In dealing with dust pollution, a mining company conducts road watering. However, the frequency and coverage of road water are often insufficient to cover areas and communities affected.

On the Technical Aspect

Four gold mining operations in Luzon with operations spanning more than 100 hundred years employ different stages of technology. The newer gold operation of OGPI in Nueva Vizcaya is advanced and considered a global standard. With this as the benchmark, two gold mining operations in Benguet are relatively below this benchmark. The two nickel mining operations in Palawan included in Phase 1 Review, namely, Berong Nickel and CitiNickel Mining, should streamline their operations and increase their efficiency. Both will require further improvement in its pollution management and reduce environmental impact. As with other nickel mining operations, these companies can make use of its DMTG to (a) conduct research on how it can operate adequately during the rainy seasons; (b) fully characterize their ores for future metallurgical processing options - this can open a product stream and hence another income stream and possibly

solving the abundance of low-grade stockpiles; (c) do a cost-benefit analysis considering these two possibilities. Further, the company may want to earn other ISO Certifications like OSHAS 18001, and in addition, must update its 14001 certifications.

Water is used extensively for dust control and nursery operations in most mine operations. These two areas take up 80 percent of the water needs, while the balance is made up of human consumption, medical applications, and others. Mining companies are advised to explore supplemental measures to regulate water use and explore the development of a water account following United Nations System of Environmental Economic Accounting (UN SEEA) guidelines. Second, the persistent issue is the substantial volume of dust generated by the mining operation as well as by the roads and stockpiles. Runaway dust is a persistent issue, especially for sites with nearby communities dependent on mining operations. Clouds of dust affect daily activities and, most especially, the health of the communities.

The favorable nickel price in the world market potentially triggers sales and increases the production of mines to take advantage of the good market price. This condition leads to a ramp-up in production, not included in work plans, which leads to more areas being opened simultaneously, potentially affecting the population and the environment. The desire to sell more DSO resulted in the opening of extensive areas without any rehabilitation and re-vegetation. Overall, while providing quick revenues, DSO does not optimize the value of soil resources. Considering the ample nickel resource in the country, processing nickel/iron ore locally is value-adding and generating further backward and forward linkages, thus reducing the issue of timing and phasing of mineral extraction that largely depends on export demand. Nonetheless, processing locally nickel/iron ore requires larger investments but could be more profitable in the long-term, including retrieving other high valued metals without compromising environmental protection.

Current nickel operating mines are those with grades around 1.8 percent. During the "nickel fever" years between 2006 and 2008 and between 2011 and 2015, nickel grades went as low as 0.9 percent.

Depressed prices have led the companies to convert to CMP. Although this is a good business decision, their economic, social, and legal dimensions are not desirable. Experts' field visits proved that the CMP had become an easy way out during low metal prices. On the other hand, it has created socio-economic and legal problems. The opening of nickel mines in the Philippines from 2006 to 2008, and then again from 2011 to 2015, saw many marginal mines close when demand slumped after said surges. Many of these nickel mines produce around 1.8 percent nickel, which is almost marginal in the market. Most red and yellow laterites are below this grade, and companies are sometimes forced to sell the shallow material as iron ore (45-50% Fe) or saprolite (>1.8% Ni). MGB, through its Regional Office, should ensure that companies are strictly adhering to planned production. It should also strictly enforce the improvement of

environmental structures if the planned production is exceeded.

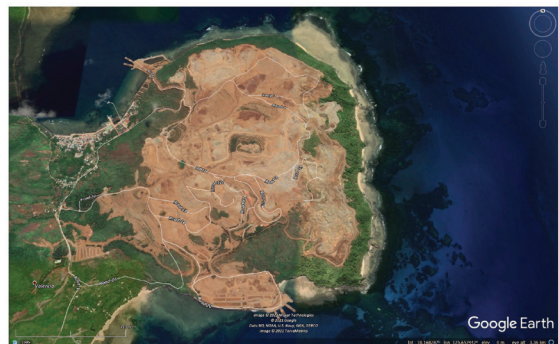
The type of nickeliferous laterite deposit determines the development and production and required rehabilitation activities. These nickel deposits are in mountainous areas where the deposit tends to be worked in many separate pits ("pockets") because the thick deposits are limited in extent⁵. The number of mine pits matters in achieving mining efficiency. It is normal to have at least two pits for tonnage and grade control purposes, but having more than a few producing pits will cause engineering challenges and subsequent rehabilitation. Truck deployments, haul roads, and other requirements will at least double, and siltation management will become a big cost item. Figure 29 shows a contrasting image of mining patterns.

Figure 29. Contrasting Configuration of Mining Operations in Dinagat Island Province

Source (Online): Google Earth Pro Imagery Date: 6/4/2020, Dinagat Island Province



(a) Approximately 700 hectares (multiple and spread pits)



(b) Approximately 300 hectares (compact area)

Without question, siltation is the leading environmental impact of nickel mining. Any digging of lateritic deposits loosens up the soil and underlying layers and immediately mobilizes silt, especially during rainy months. The traditional practice of leaving ore piles in mine sites rather than hauling to a designated mine stockpile area increases the readily eroded material transported to the river systems during heavy rains. It becomes imperative to collect silt as soon as it is mobilized.

Phase 1 of the Mining Review revealed that guidelines for mining operations under CMP are beset with issues. Through the CMP it is easier for mining companies to suspend their operations; force layoff skilled rank-and-file, highly trained staff, and professional employees; and stop funding the SDMP. The stockpiling of material, meanwhile, increased environmental hazards. Thus, stockpiles must be maintained to prevent siltation from forming.

⁵ Think of the weathering process in patches rather than area-wide

On the Environment Aspect

Mining operations impair the capacity of the ecosystem to continue providing ecosystem goods and services. The Review highlights the experts' findings on the low rehabilitated-to-disturbed-area ratio, the need for ecosystem services accounting, the urgency of sediment control or retention, dust management, and the harmonizing of the FMRDP with the local development plans.

Restoration of lost renewable capital shall not be taken for granted. Regulatory agencies and mining companies must ensure the development and implementation of specific, measurable targets and timelines for every annual Environmental Protection and Enhancement Plan and its implementation. Likewise, the FMRDP shall be evaluated based on the company's specific targets, which include the desired rehabilitation or restoration outcomes. These specific details are the bases for measuring the success of the EPEP and FMRDP implementation.

A regular accounting of ecosystem services directly or indirectly affected by mining operations should also be included and implemented under the EPEP and FMR/DP. Ecosystem services accounting must include provisioning services, such as food and fiber; regulating services like carbon sequestration, sediment retention, and soil erosion control; and cultural services, including valuation of recreational and cultural significance. This accounting work can be funded using the allocation for DMTG, and employing internationally established guidelines, such as the UN SEEA Ecosystem Accounting. This accounting process shall include reference vegetation or forest prior to the mining operation.

The mining operation leaves many open disturbed areas easily eroded during rainy periods. Hence, sediment flow in mining area, especially for nickel mining caused by monsoon rains and intense rain brought about by tropical depressions or cyclones must be controlled. Mining companies are advised to assess the watershed sediment yields with or without mining operations to determine appropriate vegetative measures, infrastructure, and other sediment control measures. The location, density per unit area, and design of silt dams, impounding dams, ponds, traps,

and canals are critical in controlling sediments. The capacity and capability of the silt traps and siltation ponds system must be studied in-depth, particularly during heavy rainfall and typhoons. Further, frequent storm hazards should prompt companies to undertake a more intensive climate modeling like in Dinagat Islands, where the weather exhibits wide fluctuations of wet and dry periods.

Though driven by economic objectives, the timing of mining operations must consider its environmental impacts and health effects. Anecdotal information derived from key informant interviews, focus group discussions and surveys indicated that mining dust is an important health concern raised by the communities. It is recommended that mining companies explore dust suppression studies.

Finally, the bigger challenge apart from ecosystem accounting, sediment control, and dust mitigation is harmonizing large-scale mining with agriculture and aquaculture, progressive and active community, and urban living with coastal and marine activities. In Zambales, mines have negatively impacted lowland fishponds and rice production, and the marine ecology due to the stream discharge. This aspect is addressed mostly by gold mining operations in the country but hardly undertaken in nickel mining operations, except as part of the SDMP and CSR.

On the social aspect

A critical regulatory instrument for ensuring compliance by mining operations on its social obligation to the host and neighbor communities is the SDMP. The implementation of SDMP differed from one region or company to another. The findings by experts on the implementation of this program range from extremely poor to near ideal. The set up that proved successful is (a) adequacy of Community Relations Office and human resources; (b) sustained engagement of CRO staff of the mining company with the community with complementation of focal person in the community; (c) sustained engagement of the CRO with key leaders at the municipal and barangay level; (d) formulation of operations manual +with the participation of communities

in its formulation; (e), consensus on determining the allocation of SDMP fund among host and neighbor communities; (f) multi-sector engagement in project implementation including progress monitoring and impact evaluation; (g) integrating the aspirations and plans of various sectors in identifying projects for funding; (h) sustained support to cooperatives and enterprises, and indigenous communities; and (i) SDMP annual evaluation and conduct of impact assessment. In some ways, as observed by experts during field visits, the identification of projects can be abused when there are uneven power relations in the community. The political engagement of each representative that decides on project implementation is a significant factor in the success of SDMP implementation. In some cases, a list of priority projects that passed through the review by the Barangay Development Council, which have wider sector representations, may change when subjected to review by the Sangguniang Barangay, composed of elected representatives.

Operational companies and those under CMP employ different approaches in implementing their respective SDMPs. Operational mining companies were able to showcase different approaches and strategies in the delivery of SDMP and their good practices. Most of them were reviewed in Phase 2 since Phase 1 involved suspended mining companies. Different aspects of mining with a highlight on good practices are expounded concerning the process and implementation of SDMP. On the other hand, those mining companies under CMP had a different method of maintaining their mining area. Some companies could not keep up with the required activities, especially on social development and management. But several companies were able to continue with their social management programs and have become innovative in addressing issues that were experienced despite their condition and corresponding implications.

One of the most articulated benefits of the communities from the operations of mining companies was employment, which has largely helped in solving unemployment problems in the community. Apart from employment, other manifested and perceived benefits are (a) social capital enhancement, such as the formation of community-based organizations

that involve farmers, fisherfolk, women, and IPs, among others, specifically for SDMP; (b) partnerships and agreements with IPs and the provision of assistance, such as formation of the Community Royalty Management Program, establishing techno-demo farm; (c) pandemic financial assistance was provided to the LGUs such transport of Locally Stranded Individuals (LSIs), food packages, and emergency responses.

Other key recommendations include: (a) Implementing a participatory process to design the SDMP and ensure representation of vulnerable and marginalized sectors (farmers, fisherfolks, women, and elderly, among others); (b) providing greater emphasis on capacity building for sustainable livelihoods and enterprise development; (c) anchoring SDMP and CSR programs to development plans or community needs assessment; and (d) establishing a baseline and regular social acceptability or stakeholder engagement study.

On the Economic Aspect

A simple input-output analysis done as part of the Phase 1 Review showed that mining and quarrying contributed significantly to the regional gross domestic product in regions where there are mining operations. There is no doubt that mining has contributed substantially to the local economy, as evidenced by the economic progress of communities relative to other non-mining communities in the same area. It brought employment, and the demand for labor helped increase the local population, which became the driver of the surge in economic activities. An increase in services comes with rapid population growth, promoting business growth, including the backward and forward linkages of the mining operation. However, growing consumption demand, theoretically, translates to additional pressure to exploit natural capital. This scenario brings a dilemma, which pits conserving biodiversity against land development. Otherwise, the communities will have to outsource their consumption demand.

While to some extent, mining contributes to regional GDP, experts saw initial indications of slow local economic growth because most of the

commercial transactions by residents or the use of their factor income are often done outside the host municipality. The expenditure of mining income is captured by highly urbanized cities or municipalities that provide for the consumption needs of nearby host community residents. Thus, mining companies are advised to invest part of their CSR in promoting enterprise development to promote local business development that will capture residents' mining income expenditures. Further, SDMP must also support local enterprises leading to sustained creation of local wealth or alternative manufactured capital to substitute the depletion of non-renewable and renewable capitals. Other non-traditional sources of production must be explored.

In Phase 1 of the Review, 17 out of 27 mining operations reviewed are under Care and Maintenance Phase. Two reasons to go under CMP are (a) depressed global metal prices forcing mining

companies to stop operation since the cost is higher relative to price, or (b) suspension by a regulatory agency for non-compliance with certain requirements. Under CMP, company employees suffer loss of income or livelihood, and backward and forward linkages of the mining operation are stopped. Meanwhile, during those periods, fund allocation for SDMP is significantly reduced or completely withheld, thus, slowing or stalling SDMP projects, local employment, and the growth of the local economy. It is recommended that an annualized budget be prepared up to the abandonment phase of the mining operations. Mining firms should continue to fund their SDMP or EPEP and sustain the progressive rehabilitation of mined-out areas with or without operations. Mined out areas that remain open, without rehabilitation, likewise pose a threat or risk of damage that will affect local livelihood.

CHAPTER 9:

Key Recommendations

This chapter synthesizes recommendations collated during the series of deliberation among experts, discussions in fora participated by members of the MICC and other stakeholders, and analysis of spatial and temporal data provided during the Review. These are brief summaries considered for disclosure over and above those specific recommendations for individual companies apart from summary recommendations per aspect of the review listed in previous chapters. Readers are advised to refer to summary recommendations by aspect in the previous chapters.

These recommendations were also organized so that targets are clear and aligned with the overarching goal

of making realizable changes in the mining industry. It was recognized that these recommendations would need steering by industry champions either in the mining industry, such as the Chamber of Mines or by regulatory agencies of the government, such as the MGB, Environment Management Bureau, and by staff bureaus such as the Forest Management Bureau and the Biodiversity Management Bureau of the DENR, and by the DOF.

From the list of recommendations summarized by experts, recommendations were grouped by actors and aspects of the Review to ensure the clear scope of each recommendation.

Enhance Monitoring and Substantive Legal Compliance

Recommended Actions by Mine Operators

- Apply innovations in technology, such as the GIS to improve self-monitoring and compliance with regulatory standards.
- Ensure that the undertaking of the care and maintenance program will not unduly disadvantage mine personnel and drastically reduce employment income of host and neighbor communities.
- will upgrade practices and restrict undertaking of activities or operations without the necessary permits.
- Institutions with regulatory mandate in the mining industry must provide incentives and mechanisms to improve transparency.
- Assessment of ownership of companies, especially related to the proportion of foreign ownership.

Needed Government Actions

- Future audits by the DENR that are done by a multi-stakeholder team can be improved by covering beyond mere documentary compliance and clear coverage i.e. covering only the current operations in the MPSA.
- Improvement in enforcement, sanctions, and judicial procedures are needed so that mining companies
- Review the mining operations adherence to boundaries within or beyond mining tenements, including mineral exploration.
- Partial operation without duly approved Declaration of Mining Project Feasibility (DMPF) must not be allowed as this Review revealed accompanying inappropriate practices in some mining operations.

Improve Technical Efficiency and Productivity

Recommended Actions by Mine Operators

- Considering the increasing global emphasis on environmental and social governance (ESG), mining companies must invest or finance innovations that improve productivity, including promotion of mineral processing and optimizing use of mineral resources through value-adding processing beyond just DSO.
- The mining operator must continually enhance its human resources capability and regularly update its DMPF considering the increasing environmental and social concerns in mining operations.

Needed Government Actions

- The MGB and the Chamber of Mines may establish a knowledge- and practice-sharing mechanism among mining companies and the public as an avenue to encourage modernization and efficiency in mining operations.
- The MGB and DOST with the participation of the Chamber of Mines must collaborate towards improving mining operations through industry benchmarking as a mechanism for improving productivity and using international standards, such as ISO 14001 and other related standards.
- Feasibility studies must be improved by setting up third-party review to include the 80-hectare limit of operations and integrating economic efficiency assessments in different stages of mining operations.
- The government and the mining industry stakeholders should expand investment in integrated mining and mineral processing to maximize the value-adding benefits.

Protect and Enhance the Environment and Natural Capital

Recommended Actions by Mine Operators

- Water quality remains a significant and sometimes contentious issue in areas even beyond the MPSA or FTAA boundaries; regardless of its veracity,

the EMB and other water authorities along with mining companies should actively and adequately engage with the communities in providing updated information of status of water quality and supply.

- Considering the significant impact of mining operations on the stock of assets and flow of ecosystem services within the MPSA or mining tenement, the MGB should include natural capital accounting as part of the environment report consistent with the global practices.
- Mining companies should undertake landscape and ecosystem function analysis and land suitability analysis, employ adaptive landscape restoration, incorporate nature-based solutions and factor in climate risk in improving the ecosystems of mined-out areas.
- Mining companies should enhance the capacity of environment management units in designing appropriate biodiversity-enhancing rehabilitation of mined-out areas with support from experts in the field.

Needed Government Actions

- The MGB and the EMB should institute a regular review of the EIA recognizing the importance of key components, such as soil erosion or sediment retention measurement, disposal of pollutants and explore the use of Strategic Environmental Assessment method.
- The EPEP and the FMR/DP standards must be updated to include conduct of land suitability analysis, using an acceptable reference forest as baseline, climate proofing, and clearly stating specific indicators of outcomes or success, and aligning rehabilitation plans with local zoning, land use and development plans.

Improve Community and Household Human and Social Capital

Recommended Actions by Mine Operators

- The mining company's community relation personnel must undergo continuing capacity building to promote creative, adaptive and innovative SDMP implementation.

Needed Government Actions

- The MGB must design a system of promoting and scaling up good and innovative practices on SDMP implementation with active engagement of mining companies.
- The NCIP or other appropriate institutions must help improve the capacity of indigenous peoples in the judicious use of royalties, financial accounting, benefit-sharing, and conflict resolution.
- Mining companies should enhance the consultation and partnership in SDMP implementation to maximize representation of stakeholders in host and impact communities, include those off-site communities affected by mining externalities, and increase the capacity of communities in project conceptualization, implementation and closure.
- MGB should review or update the 1.5 percent of operations cost ceiling for SDMP budget and consider an annualized budget even during care and maintenance programs when there are no mining operations.

Prioritize and Sustain Local Economic Growth Beyond the Mine Life

Recommended Actions by Mine Operators

- The company's budgeting for SDMP, FMRDP, and EPEP should consider increasing human and social capital of local communities that will increase household assets in view of the depletion of mineral resources and depreciation of renewable natural capital resulting from mining operations.

- In support of the above recommendation, the mine operators, CSR should move beyond development of small-scale livelihood and expand towards community-managed local enterprises and private business to increase local financial capital.

Needed Government Actions

- The national government should consider reviewing of the share of local communities from natural wealth revenue i.e, mining excise tax, in view of persistent poverty, inadequate household asset and limitations of the government transfers, such as Conditional Cash Transfer, Pantawid Pamilyang Pilipino Program Cash Assistance Program for COVID-19.
- The host LGU's receipts of mining-related revenues must be re-invested in enterprise-enhancing basic services, such as livelihood/enterprise assistance centers and in enhancing human capital, such as scholarships that promote development of local businesses to increase local capture of mining employment expenditures.
- Mine operators should consider the examples in Bataraza, Palawan where both RTNMC and CBNC operate, and of OGPI in Nueva Vizcaya which showed that establishing a local foundation or corporation to provide basic services and focused on priority projects significantly contributed to local welfare.
- The mine operator should invest in accounting of natural capital and biodiversity to assess current and future potentials of various assets in providing ecosystem services during and after mine operation.

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Annexes

Annex Table 1. List of 45 mining operations of 43 companies included in Phase 1 and 2 of MICC Mine Review with summary rating/scoring by aspect.

Review Phase	Company	Location	Province	Region	Status	Commodity	Rating ¹						Rating Index ²
							Legal	Technical	Environmental	Social	Economic	Average Score	
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
P1	Benguet Corp	Ilogon	Benguet	CAR	Operating	Au, Cu	1.60	1.60	1.50	2.4	1.6	1.74	Need Major Reforms
P1	Berong Nickel Corp	Quezon	Palawan	Region IVB	Operating	Ni	2.20	2.20	2.00	3	2.6	2.40	Needs Minor Reforms
P1	Citnickel Mines and Development	Narra, Sofronio Espanola	Palawan	RegionIVB	Operating	Ni	2.20	2.20	2.00	2.4	2.4	2.24	Needs Minor Reforms
P1	Lepanto Consolidated Mining Corp.	Mankayan	Benguet	CAR	Operating	Au, Cu	2.40	2.00	1.70	2.6	2.8	2.30	Needs Minor Reforms
P1	Oceana Gold Philippines	Kasibu	Nueva Vizcaya	Region II	Operating	Au, Ag, Cu	2.80	3.00	3.00	2.8	3.0	2.92	Good
P1	Benguet Corp. Nickel Mines, Inc.	Sta. Cruz	Zambales	Region III	CMP	Ni	1.60	NS	1.50	1.4	2.0	1.63	Need Major Reforms
P1	Eramen Minerals	Sta. Cruz, Candelaria	Zambales	Region III	CMP	Ni	1.80	2.30	2.00	1.4	2.0	1.90	Need Major Reforms
P1	LNL Archipelago Minerals, Inc.	Sta. Cruz	Zambales	Region III	CMP	Ni	1.80	2.00	1.50	1.4	2.2	1.78	Need Major Reforms
P1	Ore Asia Mining & Dev't. Corp.	Dona Remedios Trinidad	Bulacan	Region III	CMP	Magnetite	1.60	1.30	0.50	0.4	1.0	0.96	Poor
P1	Zambales Diversified Metals Corp.	Sta. Cruz, Candelaria	Zambales	Region III	CMP	Ni	1.40	NS	1.50	1.6	1.0	1.38	Need Major Reforms
P1	AAMPHIL Nat. Res. Exploration 2B	Basilisa, Libjo	Dinagat Islands	Region XIII	CMP	Ni	2.40	3.00	2.00	1.0	3.0	2.28	Needs Minor Reforms
P1	Emir Minerals Corp.	Guiuan	Eastern Samar	Region VIII	CMP	Chromite	2.40	2.80	2.70	1.3	3.0	2.44	Needs Minor Reforms
P1	Mt. Sinai Mining Exploration and Dev't.	Guiuan	Eastern Samar	Region VIII	CMP	Chromite	1.00	NS	1.70	1.0	2.0	1.43	Need Major Reforms
P1	Strongbuilt Mining Dev't. Corp.	MacArthur	Leyte	Region VIII	CMP	Magnetite	2.00	3.00	3.00	1.0	2.8	2.36	Needs Minor Reforms
P1	WELLEX Mining Corp. Mine 1	Libjo, Tubajon	Dinagat Islands	Region XIII	CMP	Ni	1.80	2.80	1.30	1.0	2.6	1.90	Need Major Reforms
P1	WELLEX Mining Corp. Mine 2	Tubajon, Loreto	Dinagat Islands	Region XIII	CMP	Ni	1.80	2.80	2.30	1.3	2.6	2.16	Needs Minor Reforms
P1	Krominco, Inc.	Loreto	Dinagat Islands	Region XIII	CMP	Chromite	1.80	1.50	0.70	2.4	1.8	1.64	Need Major Reforms
P1	Libjo Mining Corp.	Libjo, Tubajon	Dinagat Islands	Region XIII	CMP	Ni	1.70	2.00	1.00	2.6	2.0	1.86	Need Major Reforms
P1	Oriental Synergy Mining Corp.	Loreto	Dinagat Islands	Region XIII	CMP	Ni	1.40	0.50	0.20	2.4	0.8	1.06	Need Major Reforms
P1	Oriental Vision Mining Phil. Corp.	Tubajon, Libjo, Cagdianao	Dinagat Islands	Region XIII	CMP	Ni	1.60	1.50	0.50	2.6	2.0	1.64	Need Major Reforms
P1	Sinosteel Phil, N.Y. Mining Corp.	Loreto	Dinagat Islands	Region XIII	CMP	Ni	1.80	1.20	0.50	3.0	2.0	1.70	Need Major Reforms
P1	Adnama Mining Resources Inc	Claver	Surigao del Norte	Region XIII	Operating	Ni	2.80	1.80	1.80	2.0	2.8	2.24	Needs Minor Reforms
P1	Carrascal Nickel Corporation	Carrascal	Surigao del Sur	Region XIII	Operating	Ni	2.00	2.70	1.80	1.4	3.0	2.18	Needs Minor Reforms
P1	Claver Mineral Development Corp.	Claver	Surigao del Norte	Region XIII	CMP	Ni	0.40	NS	0.70	0.0	1.8	0.73	Poor
P1	CTP Construction and Mining Corp.	Carrascal	Surigao del Sur	Region XIII	Operating	Ni	2.60	2.70	2.20	2.0	3.0	2.50	Needs Minor Reforms

Review Phase	Company	Location	Province	Region	Status	Commodity	Rating ¹						Rating Index ²
							Legal	Technical	Environmental	Social	Economic	Average Score	
P1	Hinatuan Mining Corporation	Taganaan	Surigao del Norte	Region XIII	Operating	Ni	2.60	2.80	2.80	2.6	3.0	2.76	Needs Minor Reforms
P1	Marcventures Mining and Dev. Corp.	Carrascal	Surigao del Sur	Region XIII	Operating	Ni	2.40	2.30	1.80	2.0	3.0	2.30	Needs Minor Reforms
P2	Cagdianao Mining Corp.	Cagdianao	Dinagat Islands	Region XIII	Operating	Ni	3.00	2.93	2.80	3.0	3.0	2.95	Good
P2	Century Peak Corp. - Casiguran	Loreto	Dinagat Islands	Region XIII	CMP	Ni	1.50	1.71	1.00	1.55	1.4	1.42	Needs Major Reforms
P2	Century Peak Corp. - Rapid City	Loreto	Dinagat Islands	Region XIII	Operating	Ni	2.17	1.57	1.20	1.5	1.4	1.57	Need Major Reforms
P2	Rio Tuba Nickel Mining Corporation	Bataraza	Palawan	Region IVB	Operating	Ni	3.00	2.93	2.80	3.0	3.0	2.95	Good
P2	TechIron Resources Inc.	Guiuan	Eastern Samar	Region VIII	Operating	Chromite	2.78	2.32	2.00	2.8	2.5	2.48	Needs Minor Reforms
P2	Agata Mining Ventures Inc.	Tubay, Santiago	Agusan del Norte	Region XIII	Operating	Ni	3.00	2.71	2.80	2.7	3.0	2.84	Good
P2	Greenstone Resources	Mainit	Surigao del Norte	Region XIII	CMP	Au, Ag	2.80	2.14	2.80	1.8	2.4	2.39	Needs Minor Reforms
P2	Philsaga Mining Corp.	Bunawan	Agusan del Sur	Region XI	Operating	Au, Ag	2.92	2.71	2.50	2.8	3.0	2.79	Needs Minor Reforms
P2	SR Metal	Tubay	Agusan del Norte	Region XI	Operating	Ni	2.60	1.86	2.17	1.9	2.6	2.23	Needs Minor Reforms
P2	Tribal Mining Corp.	T'Boli	South Cotabato	Region XII	Operating	Au, Ag	2.00	1.93	1.30	1.7	2.4	1.87	Need Major Reforms
P2	Carmen Copper/ Atlas CMDC	Toledo City	Cebu	Region VII	Operating	Au, Ag, Cu	2.59	2.86	2.00	1.9	2.6	2.39	Needs Minor Reforms
P2	FCF Minerals Corp.	Quezon	Nueva Vizcaya	Region II	Operating	Au, Ag	2.22	3.00	2.80	2.2	2.8	2.60	Needs Minor Reforms
P2	Masbate GP Filminera	Aroroy	Masbate	Region V	Operating	Au, Ag	2.68	3.00	2.70	2.0	2.6	2.60	Needs Minor Reforms
P2	Philex Padcal	Tuba & Ilogon	Benguet	CAR	Operating	Au, Ag, Cu	2.43	2.93	1.70	2.2	2.2	2.29	Needs Minor Reforms
P2	Apex Mining Company Inc.	Maco	Davao de Oro	Region XI	Operating	Au, Ag	2.93	2.56	2.20	2.0	2.7	2.48	Needs Minor Reforms
P2	Pacific Nickel Philippines, Inc.	Surigao City	Surigao del Norte	Region XIII	CMP	Ni	2.96	2.53	2.08	1.25	NS	2.21	Needs Minor Reforms
P2	Platinum Group Metals Corp.	Claver	Surigao del Norte	Region XIII	Operating	Ni	2.93	2.90	2.10	2.6	2.6	2.63	Needs Minor Reforms
P2	Taganito Mining Corp.	Claver	Surigao del Norte	Region XIII	Operating	Ni	2.95	2.93	2.30	3.0	2.8	2.80	Needs Minor Reforms

¹NS = No overall score computed because the criterion does not apply to the mining operation at the time of the review.

²Good or acceptable," <2.8 | "Needs minor corrections," >2 and <=2.8 | "Needs major reforms," >1 and <=2 = | "Not acceptable or poor," >=0 and <=1.

