Journal of Environmental Science and Management 24-2: 75- 88 (December 2021) ISSN 0119-1144

Geological Exploration, Responsible Mining and Ecological Restoration in the Philippines: Expectations and Possibilities

REVIEW PAPER

ABSTRACT

The 2012 passage of Executive Order 79 in the Philippines literally stopped the granting of new mineral agreements by the Government to private companies. It put a stop to the full implementation of the 1995 Mining Act that resulted into the drying up of investment in the Mining Industry. This is bound to change with the 2021 signing of Executive Order 130 which allows the Government to enter into new mineral agreements with mining companies. With this development, old issues against the Mining Industry are being re-hashed. Environmental degradation, loss of ecological systems, suppression of the communities' voices in charting their future and fair share from the mining revenue for the country are some of these issues. This paper intends to show that exploration and mining can be done responsibly and ethically that do not run counter to the protection of the environment and respect of the rights of the communities. Given the chance, the Mining Industry can be a positive factor in the country's development drive.

Graciano P. Yumul, Jr.[1,3]
Carla B. Dimalanta[2]
Decibel V. Faustino-Eslava[3*]
Ferdinand T. Jumawan[1]

[1] Cordillera Exploration Company Incorporated, Bonifacio Global City, Taguig City, Philippines
[2] National Institute of Geological Sciences, College of Science, University of the Philippines-Diliman, Quezon City, Philippines
[3] School of Environmental Science and Management, University of the Philippines, Los Baños, College, Laguna, Philippines

[*] corresponding author: dfeslava@up.edu.ph

Keywords: *exploration, responsible mining, ecological restoration, mining laws, Philippines*

INTRODUCTION

The need for minerals and metals in the global economy and the development of a nation is a reality. With the aspiration of the different countries to pursue development, with the changing climate which needs to be addressed, and the necessity for safe havens during times of uncertainties, precious and base metals are desired commodities now and in the near future (*Meinert et al. 2016; Fraser et al. 2021; Mining Journal 2021*). Infrastructures to be built need steel. Energy transition metals (ETMs) are important components in manufacturing batteries for hybrid and electric vehicles, to mitigate the negative impact of a globally-warming world, and establish a low-carbon society (*Vidal et al. 2013; Koning et al. 2018; Lèbre et al. 2020*). Developed economies' currencies and digital currencies sometimes are no match to precious metals, specifically gold, as a safe haven during times of crisis (*Aftab et al. 2019; Salisu et al. 2021; Yousaf et al. 2021*). Almost anything that we use, at this point in time, would have a component that has been mined (*Herrington 2013; Tilton et al. 2018*). However, problems exist in the development and production activities associated with the mining industry. Resources and minerals from conflict zones, use and exploitation of women and child labor in small-scale operation settings, desecration of indigenous peoples' lands, willful destruction of the environment and absence of social license to operate are some of the issues hurled against the industry (*Conde 2017; Cesar 2019; World Bank 2019*). These are realities worldwide which give the Mining Industry a very bad image of being irresponsible, exploitative and selfish.

The Philippines is not exempt from the problems that beset the global mining industry. The problems in the Philippines are as complicated when it comes to the issue of balancing geological exploration, development and ultimate extraction of minerals, preservation of the ecology and social acceptability (*Doyle et al. 2007; Chaloping-March 2014*). With the recent developments in the country now, specifically revolving around the promulgation of Executive Order 130, a lot of sectors have insisted that granting of new mineral agreements will lead to further degradation of the environment. Is this a correct and valid perception? Dealing with

the metallic sector in the Philippines, for purposes of discussion in this study, the realities of geological exploration, and responsible mining are presented. It will be shown that given the laws, rules and regulations in place in the Philippines, the environment can be taken cared of during exploration and operations, and at the very least, rehabilitated to a new level of health or even improved post-mining as part of the whole development cycle in a mining operation. Hopefully, this can clear up some of the misconceptions and can lead to a better understanding and appreciation of the industry.

Geological Setting of the Phillipines

The geology of the Philippines is the product of the interactions of different tectonic blocks of varying origins (**Figure 1**). Oceanic, continental, oceanic plateaus and island volcanic arc terranes have accreted and amalgamated together to form the Philippine archipelago (*Dimalanta et al. 2020*). Oceanic crusts (e.g. South China Sea, Sulu Sea, Celebes, Philippine Sea) are subducting along trenches beneath the archipelago resulting into faulting, magmatism and volcanism with associated hydrothermal activities and mineralization (*Yumul et al. 2020*). With the right combination of pressure, temperature, fluid chemistry, and metal contents as a function of space and time, mineral ore deposits, from epithermal gold-silver, carbonate rock-hosted skarn to porphyry copper deposits, are formed (*Gabo-Ratio et al. 2020*). Collisions involving oceanic plateaus, arc reversals, subduction roll-backs and resulting crustal extensional regimes are associated with alkaline rock-related mineralization. The onland emplacement of oceanic lithospheric fragments exposes ultramafic rock-hosted chromitite and nickel-sulfide deposits (*Jumawan et al. 1998; Zhang et al. 2020*). The weathering of the mafic and ultramafic rocks form bauxite and nickeliferous laterite, which aside from nickel, may contain cobalt, iron, and scandium (*Tupaz et al. 2020*). It is correct to say that the Philippines is richly endowed in mineral resources as a result of its geological setting and tectonic evolution.

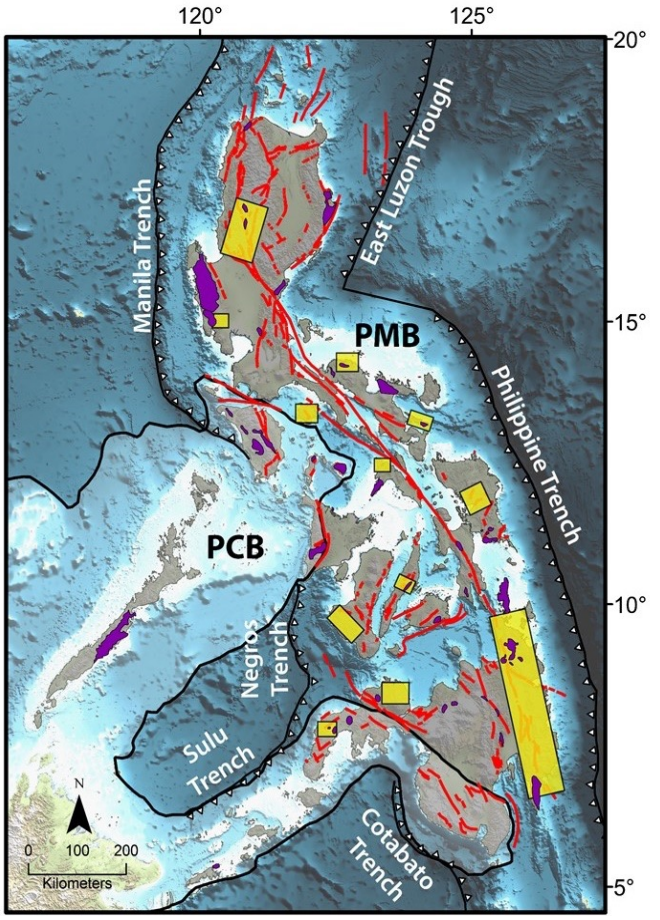

Figure 1. General tectonic map of the Philippines. Metallic deposits can be found associated with ancient volcanic centers or emplaced oceanic lithospheric blocks. PMB – Philippine Mobile Block; PCB – Palawan Continental Block. Black with hachures correspond to trenches. Red lines are faults. Yellow box indicates mining districts and areas where precious (e.g. Au) and base (e.g. Cu-Pb-Zn) are present. Violet- colored areas indicate location of ophiolites where nickel, chromitite and related mineral deposits can be found (*Sillitoe & Gappe 1984; Mitchell & Leach 1991*).

Nonetheless, discovering and delineating the location and tonnage of the target mineral deposit is one thing. For it to have significance, it must be developed and mined. Unfortunately, in spite of finding economically-viable deposits in the Philippines, some of which are classifiable as giant deposits [i.e. contain at least 100 MT (3.2 Moz) gold, 2,400 MT (77 Moz) silver, 2 million metric tons copper, 1.7 million MT zinc or 1 million MT lead (*Singer 1995*)], most of these deposits remain idle at the moment. Technical, environmental, social, financial and legal issues, individually or in combination, have constrained these deposits into being developed. In their present undeveloped state, these mineral deposits will not be able to contribute to the country's progress. To degrade the significance to the country of these possible future mines is a big mistake.

Mining Regulatory Regimes in the Philippines

Mining activities have been recorded in the Philippines even before the arrival of the Spaniards. Several mining regimes and laws have been promulgated to regulate the mining industry in the Philippines. In

this paper, three laws and two executive orders are highlighted as they are (will) presently impacting the exploration, mining activities and rehabilitation efforts within the mining industry. Republic Act No. 7942 (Philippine Mining Act of 1995) laid down the rules and regulations on how mining rights can be secured by companies and the different mineral agreements available. The 1995 Mining Act followed the signing into law of Republic Act No. 7076 (Small Scale Mining Act of 1991). The 1991 Small Scale Mining Act defines how small-scale mining contractors can mine, extract and sell their mined ores for commercial purposes which should be complementary with existing rules and regulations especially on safety, health and environment. To ensure that the rights of the indigenous people and cultural communities are recognized, promoted and protected, Republic Act No. 8371 (The Indigenous People's Rights Act (IPRA) of 1997) was promulgated. These three laws are important in the conduct of the mining industry in the Philippines.

Small-scale mining activities, where a lot of environmental degradations and mining accidents occur, are supposed to be registered and monitored by the government (*Verbrugge and Besmanos 2016; Domingo and Manejar 2020*). For small scale quarry operations, permitting requirements are managed by local government units, while mining for metals is covered by the R.A. 7076 or the "People's Small-scale Mining Act of 1991", supposedly being implemented by the DENR. These are supposed to be pick and shovel operations wherein the use of explosives, chemicals and equipment are not allowed (**Figure 2**). The 1995 Mining Act addresses various facets of the the mining industry. The law clearly lays down the responsibilities and accountabilities of mining companies in the conduct of their operations. No mining accident in the Philippines, after the 1995 Mining Act promulgation, has been allowed to be swept under the rug. Investigations determine accountabilities, come up with measures that prevent or mitigate the repeat of these events and impose sanctions and penalties on the erring company. With the 1997 IPRA law, based on our experience, it was difficult to have an exploration and mining-related activity done without the participation and consent of the concerned community, especially the indigenous peoples (**Figure 3**). However, the same strict implementation of the laws cannot be said of small-scale operations where the mere reporting of accidents very rarely happens.

However, the Benigno Aquino III Administration saw the need to increase the share of the Government in the mining industry revenue. This is one of the major reasons why Executive Order 79 series of 2012 (Institutionalizing and Implementing Reforms in the Philippine Mining Sector Providing Policies and Guidelines to Ensure Environmental Protection and Responsible Mining in the Utilization of Mineral Resources) was signed. The E.O. 79, which was signed on July 6, 2012, enumerate among others the following provisions: A new revenue sharing scheme must be implemented before any new mining agreement is entered by the Government with a mining company; No Go Zones, where exploration and mining cannot be done, were expanded which included tourist areas, strategic agricultural lands and island ecosystems; Small-scale mining operations can only be done in Government-approved "Minahang Bayan" (Communal Mining) areas; The Mining Industry Coordinating Council (MICC) was established. Together with this, several measures were also implemented that included a One-Stop Shop, Resource Accounting to value the natural resources, implementation of a ProgrammaticEnvironmental Impact Assessment, installation of a Central Database System and membership of mining companies to the Extractive Industries Transparency Initiative; and Local ordinances must be

Figure 2. Artisanal and small-scale miners in the Philippines basically work with picks, shovels and jute sacks without the use of explosives, equipment or chemicals. (Photo credits: G.P. Yumul,Jr.).

Figure 3. In applying for exploration and mining permits, presentations and discussion with the communities, indigenous peoples, and local government unit officials are always done. The National Commission on Indigenous Peoples and Mines and Geosciences Bureau resource persons participate in some of these meetings. a. Presentation to combined IP elders and local government officials on the different facet of exploration and mining (Photo credit: Glenn Ababao); b. Presentation to a joint Municipal Council – League of Barangay Captains (Photo credit: Heather Kim Pomeg-as); c. A pre-Field Based Investigation meeting with the NCIP, IP elders and the company concerned (Photo credit: Joven Brett Pacyaya).

consistent with national laws. During the implementation of E.O. 79, those with existing mining permits continued, small-scale mining carried on unabated mostly outside of the very few areas declared as "Minahang Bayan" (that only totaled 39 as of May 2021), and the mining industry, as a whole, was in limbo (**Figures 4a-4c**). This has an extremely negative impact in the country's mining industry. In the 2017 and 2018 Fraser Institute Annual Survey of Mining Companies, the Philippines was part of the least attractive jurisdictions in terms of investment (Stedman & Green 2018; 2019). In 2019 and 2020, the Philippines has been dropped from the survey, which can be attributed to its unattractiveness globally (Stedman et al. 2020; Yunis and Aliakbari 2021). The same is true in the international exploration scene. The Philippines was not attractive enough so no new global company, whether major or junior, has engaged in exploration in the country. Changes in the mineral regime, difficulty in getting permits, allegations of corruption, among others, led to foreign entities shying away from the Philippines. From 2012 up to 2021, several measures were introduced in relation to E.O. 79. In 2018 and 2019, 43 large-scale metallic mining companies were reviewed for legal, social, environmental, and technical matters through the MICC, something that up to this time has not been done with small-scale mining operators. Mining companies were ordered to implement ISO 14001 to ensure effective environmental management system. An open pit mining ban was also instituted. The excise tax collected by the Government from the Industry increased from 2% to 4% on gross revenues as result of the TRAIN 1 package of tax reforms passed in 2018. This increase has led the mining industry to clamor for the revocation of E.O. 79 as the revenue sharing requirement, as stated in E.O. 79, has been addressed. Then came the COVID-19 pandemic and the resulting major economic downturn.

The Government sees the mining industry as a low-hanging fruit which can provide much needed financial resources. With this in mind, Executive Order 130 Series of 2021 (Amending Section 4 of E.O. 79, S. 2012) was signed. Take note that Section 4 of E.O. 79 "prohibits the grant of mineral agreements until a new legislation rationalizing existing revenue sharing schemes and mechanisms shall have taken effect". With E.O. 130, new mining agreements can now be entered into with the Government. The Implementing Rules and Regulations of E.O. 130 through DAO 2021-25 hopes to achieve the following: Review the terms and conditions of new mineral agreements and re-negotiate existing mining contracts and agreements; Determine which among the areas covered by mineral agreements can be declared into mineral reservations; Ensure the compliance of companies with existing mine safety, health, environment, and social development (SHES) policies; Engage local governments and communities as mandated by the Philippine Environmental Impact Assessment System; and Promote best mining practices and technologies, and formulate policies on mineral resources development and SHES management. It is expected that the results of the mine review will be announced by the MICC, and that the open pit mining ban will be lifted. With the signing of E.O. 130, some sectors of society complained that the destruction of the environment will be aggravated. According to these sectors, social problems, associated with mining, will further be heightened and communities will even have less voice in charting their future. These generalizations are not necessarily correct as will be shown later.

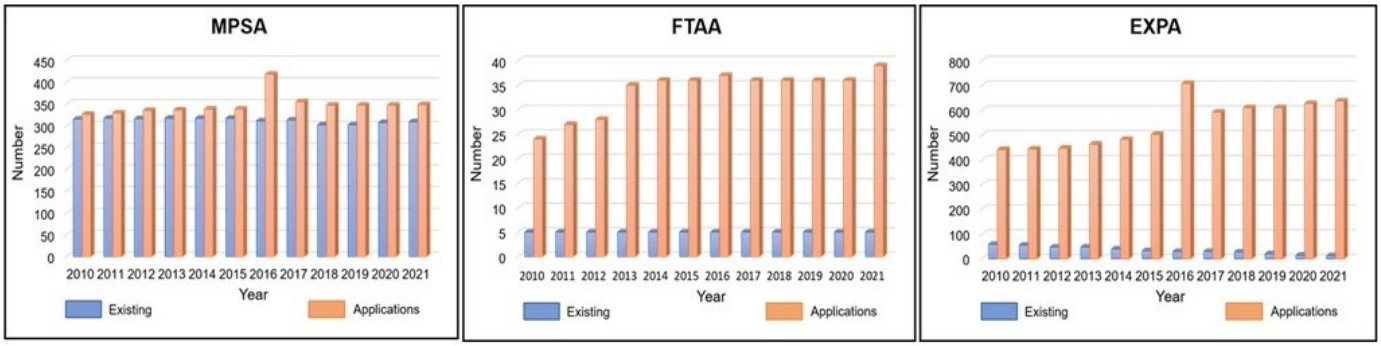

Figure 4. From 2012 to 2021, there was almost no increase in the Mineral Production Sharing Agreement (MPSA) and Financial or Technical Assistance Agreement (FTAA) applications under E.O. 79. Only the Exploration Permit Application (EXPA), which was allowed, had increased in number. (Mines and Geosciences Bureau 2021).

Issues That Continuously Hound the Philippine Mining Industry

Global mining concerns can actually be summarized into: resource sustainability issues (e.g. resource to reserve conversion; increasing production costs); Technology upgrade (e.g. Smart Mining involving artificial intelligence and autonomous vehicles and the accompanying culture shift); Safety and health (e.g. COVID-19 pandemic and its impact in the operations and global supply chain); Social license to operate (e.g. resource curse, resource nationalism, generational equity, community and geopolitics) and Environmental concerns (e.g. ecosystem changes, decarbonization and green technology) (C*arlson 2019; Mining Magazine 2019; ICMM 2019; Humphreys 2019; Bell and Yacoub 2021*). Most of these issues hound the industry in the Philippines (*Clemente et al. 2018*). Security issues, involving non-state actors, some of which are also armed, are realities in the country. The destructions brought about by legacy mines that operated in the 1970's and 1980's remain in the minds of the people (*Samaniego et al. 2020*). Mining accidents related to extreme weather events occur (*Holden 2015*). Heavy siltation of rivers and coastal waters are reported and documented. Tailings dam-related incidents, water pollution and deforestation have occurred in the past (*David 2002*). With these problems and the perceived very limited contribution of the mining industry to the country's Gross Domestic Product (0.6%), the acceptance of the industry as a viable partner in the country's development is put into question (*Mines and Geosciences Bureau 2020*). Nonetheless, there are a lot of evidence that shows that the mining industry, especially at the local level, actually makes a positive difference to the community and that the environment can indeed be taken cared of. This will be expounded later.

DISCUSSION

Exploration is not Mining

All the data, at present, point to the fact that there will be increased need of critical metals (e.g. Cu, Ni, Ta, Zn, PGMs among others) in the future (N*ieto et al. 2013; Schipper et al. 2018; Olafsdottir and Sverdrup 2021*) (**Figure 5**). This is particularly true in the development of green technologies where rare earth elements are crucial inputs. Most of these critical metals have to be mined while the circular economy is not fully in place (*Ali et al. 2017; International Energy Agency 2021*). These are brought about by the realization that: Countries and economies would want to further develop wherein metals and minerals are critical components; The drive towards the attainment of a low-carbon society; and Substitutes and recycling will not be enough, in the near future, to fully address the global need for metals and minerals. To address this reality of demand exceeding supply, massive exploration efforts must be exerted to find new mineral deposits (*Arndt et al. 2017; Valenta et al. 2019; Herrington 2021*).

In spite of repeated explanations, a lot of the communities where an exploration activity is to be done, would always have the notion that exploration is almost always equivalent to mining. Even when the activities are elucidated, wherein most of the work are non-destructive and would have very small footprints, people would still argue that exploration would ultimately lead to mining (**Figures 6a – 6d**). Comments, queries and opinions related to these have been voiced out during several National Commission on Indigenous Peoples-led Field-Based Investigation and Free and Prior Informed Consent consultations (**Figure 3**). Presentations to the local government units also elicit the same kind

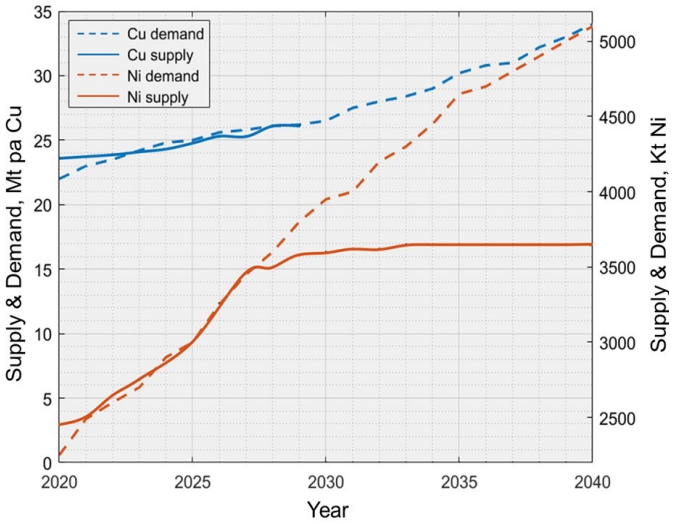

Figure 5. Global demand for certain minerals will exceed the available supply in the next 20 to 30 years. Nickel and copper demand will exceed available supply (*Schodde 2017; Woodall 2020*).

of questions and perceptions. Exploration involves mapping, collection of fist-sized rock samples or a kilo of soil samples for chemical analyses. There is no massive extraction of rocks or soil from the ground. Geochemical and geophysical surveys and drilling operations leave very small footprints and are rehabilitated before the work area is left (**Figures 6a-6d**). Exploration is not equivalent to a mining operation. Exploration is the first among the many risks involved in the search for mineral deposits. Exploration, however, does not always result into a mining operation. Once the exploration survey is finished and no mineral deposit is found, in spite of the expenditures, the exploration company walks away. If a mineral deposit is found but would not be of enough tonnage or of sufficiently high ore grade to be economically-viable, exploration would also be abandoned. A deposit, which maybe sizeable and economical in terms of ore grade and tonnage, can be discovered but would not also be mined if there are inherent unsurmountable problems (i.e. technical, social, environmental, legal, financial)

Figure 6. Exploration leaves small footprints. a. Sampling in mineralized areas; b. Coastal mapping; c.) Geophysical survey; d.) Drilling. (Photo credits: RWG; G.P. Yumul,Jr.).

surrounding the development and extraction of the deposit. The exploration company may also walk away. It is in the interplay of enough tonnage, acceptable ore grade, good mineral recovery, high metal price, absence of any insurmountable problem and community acceptance, among others, can a deposit discovery proceed into being developed into a mining project.

Responsible Mining is Feasible and is Happening

The process of getting a permit to explore and ultimately have an agreement with the Government to develop, exploit, process or export metal ores involves a lot of investment in terms of people, time, finances and materials (**Figure 7**). In so doing, any serious mining company would ensure that the permits and agreements they get are secured and maintained. All regulatory requirements are observed to guarantee that no sanction or penalty is bestowed on a company. This is done considering the investment poured into a project and the challenges a company has to hurdle in securing permits.

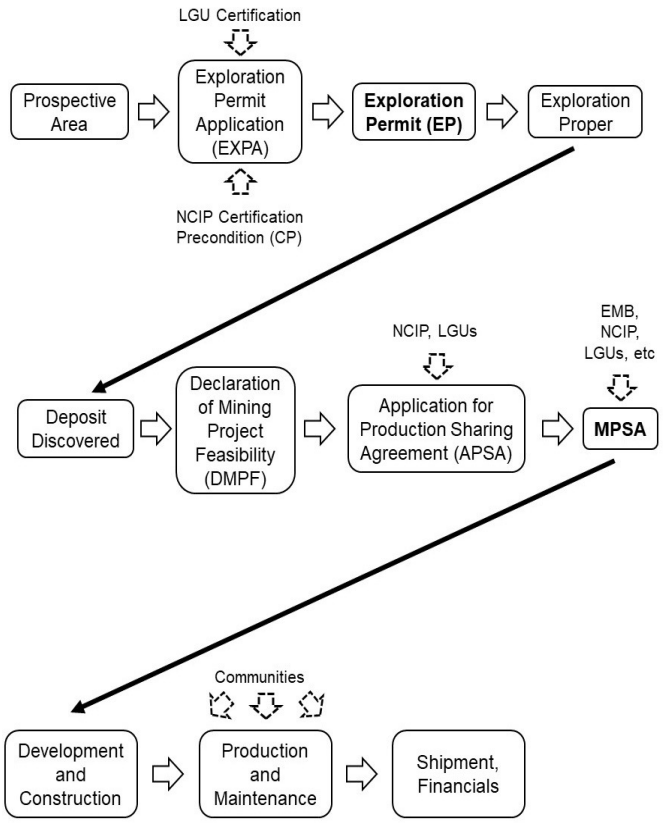

Figure 7. Generalized application framework from exploration through mining and milling all the way to ore shipment. The participation of several government regulatory agencies, the communities and indigenous peoples are highlighted).

Unfortunately, the issue of legacy mines is always brought up by some sectors. Mines operated during the 1970's and 1980's, were abandoned and were not rehabilitated as there was no law obliging the companies to do so. It is the present generation that is left with the responsibility of rehabilitating these mined-out areas. But these sins of the past, which cannot happen now with the prevailing 1995 Mining Act, should not be used against the present mining industry. Additionally, the National Government, through the Mines and Geosciences Bureau (MGB) of the DENR, implements the Mine Rehabilitation Program (MRP). Under this program, the government has taken upon itself the preparation of risk assessments and the formulation and implementation of the corresponding Environmental Management Plan (EMP) for legacy mines. The MGB's MRP has been a priority program of the current and the immediate past two administrations of the country, and clearly states that it is so in their respective Philippine Development Plans. The records show that the mining industry is one of the most regulated industry in the Philippines. The 1995 Mining Act and subsequent Department of Environment and Natural Resources Administrative Orders clearly spell out the accountability of mining companies should mining accidents occur. As examples, penalties and sanctions were imposed on concerned mining companies that were involved in mining disasters/ accidents post-Mining Act 1995 promulgation [e.g. 1996 Marcopper tailings spill (Marcopper and Placer Dome), 2005 Rapu-Rapu mine spills (Lafayette); 2012 Padcal tailings spill (Philex); 2016 Antamok mine tailings leak (Benguet Corporation)]. This shows that the 1995 Mining Act works and that the Government is serious and would indeed run after the responsible entities.

Another aspect that people tend to ignore is small-scale mining and its obvious negative effect to the ecology. It is surprising that large-scale mining operations are made to account for almost everything including those done by the small-scale miners. Small-scale mining, no doubt, is an integral part of the industry and have to be helped and monitored. However, the things happening in this sector reflect bad on the mining industry, as a whole. More often than not, small-scale mining operations are not registered and, thus, are not monitored by the Government. Most of them would not be paying taxes. But these operations are actually producing substantial amounts of ores, especially those involved in small-scale gold mining operations. Having almost no monitoring and regulations to follow, blatant environmental degradation and unsafe mining-related practices are prevalent in small-scale mining operations. Mine tailings, together with mercury or cyanide, are disposed in rivers, temporary tailings dams

are built within dried river channels or banks, unsafe underground mining work areas are more of the norm and mine accidents, when they occur, almost always lead to serious injuries and fatalities (**Figures 8a-8d**). This is not what responsible mining is all about. Although some groups would insist that marginal miners are involved in small-scale operations, the reality on the ground is that small-scale miners remain poor, but the financiers are the ones making money. This has to change somehow.

Reforestation, maintenance of nurseries, water and air monitoring, preservation of slope stability and observing underground safety practices are some of the things that responsible, large-scale mining companies observe (**Figures 9a-9d**). Based on the online report of the MGB-DENR (Mines and Geosciences Bureau 2021), collectively and as of November 2021, a total of PhP415 billion (USD 1 = PhP 50.73 as of 4 November 2021), have been allocated for environmental protection and enhancement programs, 36.87 million seedlings have been planted in about 28,717 hectares of mined-out and other rehabilitation areas, and about PhP 9.6 billion allocated for the implementation of Final Mine Rehabilitation and/or Decommissioning Plans. Progressive rehabilitation, per MGB directive, is implemented. Accidents, should they occur, are reported immediately. Responsible large-scale mining companies work hand-in-hand with the communities to ensure that the operation is acceptable to all stakeholders. Several global best practices [e.g. Environmental, Social and corporate Governance (ESG); Towards Sustainable Mining (TSM); Equator Principle] are adopted by large-scale, responsible miners on a voluntary basis under the concept of going beyond mere compliance with laws, rules and regulations. It should be noted that every large-scale metallic mining operation is required to obtain an ISO certification for Environmental

Figure 8. Small-scale mining operations in some parts of the Philippines. a. A vertical shaft (sink) used by small-scale miners to reach their mineral target; b. A temporary siltation cum tailings pond put up along a river bank; c. A makeshift mill where ores are processed; d. A typical small-scale mining portal (tunnel opening). (Photo credits: G.P. Yumul,Jr.).

Figure 9. Responsible large-scale exploration and mining companies ensure that they protect the environment, the ecological system and communities. a. Provisions of nurseries and forest plantations are normal features of responsible large-scale exploration and mining companies; b. Underground mines are well-structured and built. Steel sets, wire mesh and shotcretes are normal features; c. Responsible large-scale mining companies invest a substantial amount of money on safe and stable tailings storage facilities; d. With nearby mining operations, clean, flowing river water that passes environmental standards are observed in large-scale mining areas. (Photo credits: G.P. Yumul,Jr.).

Management. The acceptability of the community, together with the taxes and royalties paid to the Government, and communities especially the Indigenous Peoples all form part of the company's Social License to Operate. This is best exemplified during the COVID-19 pandemic wherein PhP 380 million of the Social Development and Management Plan funds of the mining companies were utilized for host communities, together with their neighboring communities, through continuous employment, food subsidies and medical assistance, to name a few (**Figure 10**). Although the contribution of the mining industry to the national GDP is low, the industry's contribution to the provincial GDP of those hosting mining operations is expectedly high (e.g. 16.8% of the total Gross Regional Domestic Product of Region XIII, Caraga in 2019; 7.3% in CAR in 2018) (MGB-XIII 2020; MGB-CAR 2019)!

Ecological Restoration and Mining

The common notion that there will be blatant, enhanced destruction of the environment and ecological system if additional mining projects materialize is not correct. Mining is a temporary land-use and the area that has been mined can be rehabilitated and built back better as shown by works in the country and other parts of the world (*ICMM 2020; Boldy et al. 2021*). Enough regulations exist that protect the social fabric of the community and the environmental features of the area where mining will be done. This is, over and above, the common initiatives of companies in ensuring that their reputations are preserved and protected. Three questions are asked in determining the possible relationship of mining with the ecological system of the area to be worked on: What is the time frame involved in the

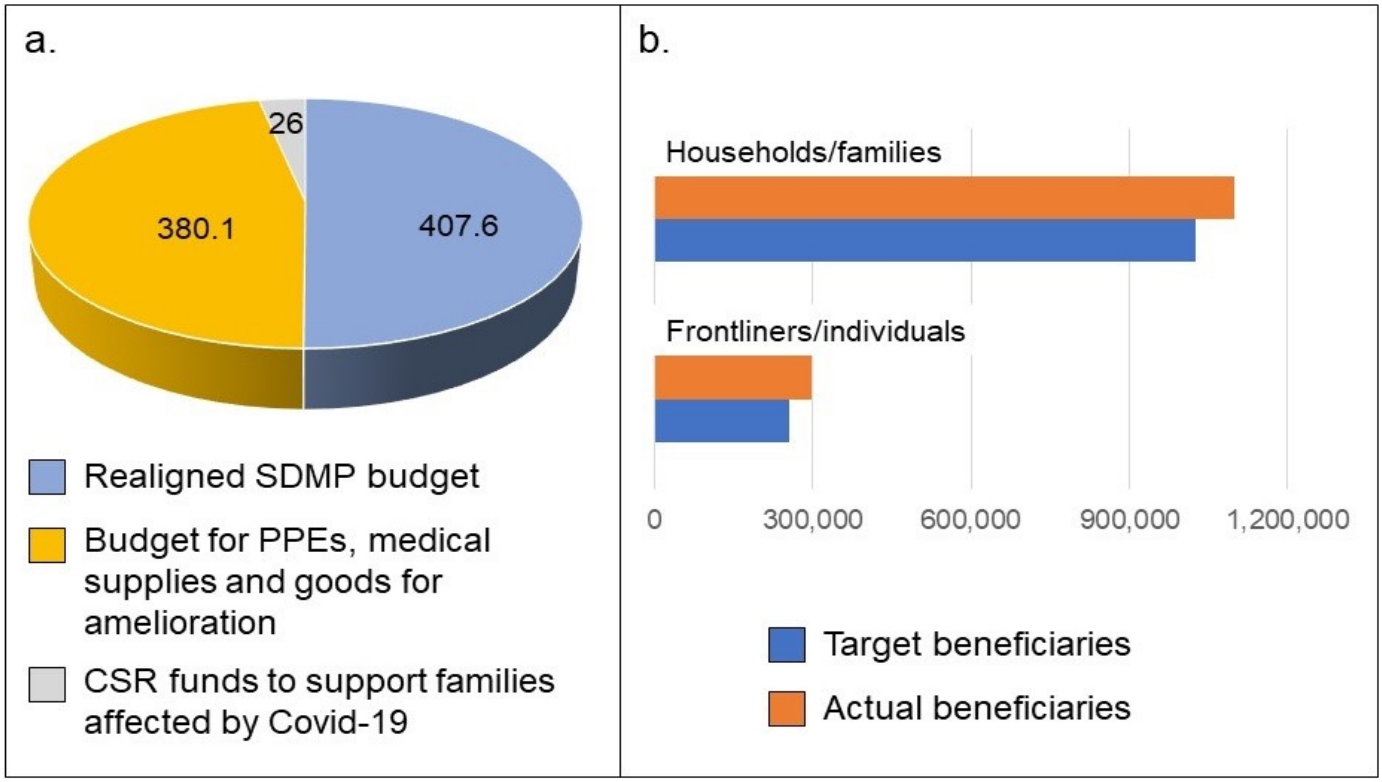

Figure 10. A substantial amount from the different mining companies' Social Development and Management Program funds were utilized to help host and neighboring communities affected by the Covid-19 pandemic (Source: *Mines and Geosciences Bureau 2020*). A. Allocation of funds in million Pesos; B. Beneficiaries of realignment..

temporary usage of the land and mining activities of the company? What is the assurance that abandonment will be done right and correct rehabilitation measures will be applied? What is the guarantee that mineral wealth is shared and wealth creation for the host community is sustainable?; and What measures should be undertaken to ensure that ecosystems can reach a certain level of health to be able to deliver beneficial services to the community at present and in the future?

A responsible large-scale mining company obliges itself to address the environmental and social concerns of the community where an operation is located. With the substantial capital investment poured into a project and the reputational damage that may result should an infraction be carried out, responsible mining companies are committed to doing things right. The 1995 Mining Act has spelled out clearly the duration that mining operations can be done. In the case of a Mineral Production Sharing Agreement (MPSA), development and mineral ore extraction can be done in twenty five years. This can be renewed for another twenty five years. Once approved, the Implementing Rules and Regulations of E.O. 130 state that the exploration phase cannot be subsumed anymore under an MPSA, but will have to undergo an Exploration Permit Application (EXPA). An EXPA is good for two years and renewable for two two-year periods. During development and operations, from the 1995 Mining Act through E.O. 79 to E.O. 130, all emphasize the importance of preserving the environment. Some measures promulgated by the Government, which responsible large-scale mining companies execute, involve a) Progressive Mining, b) Implementation of the Environmental Work Program (EnWP) and Environmental Protection and Enhancement Program (EPEP), and c) Compliance with the conditions set in the approval of the Environmental Compliance Certificate (ECC), to name a few. The operations of mining companies are monitored and inspected, not only by the Mines and Geosciences Bureau (both Central and Regional Offices) but also by the Multipartite Monitoring Team which is composed of government, academe, indigenous peoples, Church, civil society organizations and non-government organizations. The Final Mine Rehabilitation and/or Decommissioning Plan (FMR/DP), agreed upon by all the concerned stakeholders, ensures that the mined-out area is not only rehabilitated but is something that can be used by the host community once mining operations cease.

In terms of economic benefit and wealth creation

for the host communities, the provisions laid down in the 1995 Mining Act is unique in that it prescribes for a share in production revenue and mandated social expenditures as a percentage of operating costs. In most other mining countries, such payments are voluntary and subject to negotiations. During exploration, the mandated Community Development Program (CDP) fund, given to the host communities, is 10% of the exploration budget of the company. While in operations, the mandated Social Development and Management Program (SDMP) Fund requires annual expenditures of 1.5% of the operating costs for the host and neighboring communities and annual royalties (1% of the gross output) to the concerned Indigenous Cultural Communities (ICCs). These mandated expenditures have been used to put up infrastructures, community-based industries and scholarships. In 2020, a substantial amount from the SDMP of mining companies has been used to help fund the relief efforts for the host and neighboring communities to address the COVID-19 pandemic (**Figure 10**). Most of the responsible large-scale miners would also initiate programs and community-based industries that are not tied down to the mining operation under their Corporate Social Responsibility (CSR) programs that go beyond the mandated SDMP. This is to ensure that there would be life after mining, a better one for that matter, when operation ceases. Taxes (corporate, business, local, income among others) are paid, both to the national and local government. Any accident that may occur during the life of the mine is covered by the law-mandated Contingent Liability and Rehabilitation Fund (CLRF). With respect to ecological restoration, programs involving Development and Utilization Work Program, Safety, Health and Environmental (SHE) Program together with other existing programs and supports (EnWP, EPEP, SDMP) ensure that the communities are able to build back better. The academic communities are also pitching in, particularly through the support of the Department of Science and Technology, through various researches that target to improve extraction and processing methods, and to increase rehabilitation success. Clearly, there are enough measures to ensure that the ecology is taken care of. All of these things are observed and sustained by responsible large-scale mining companies. In the unfortunate event that an accident happens, the concerned responsible large-scale mining company would never shrink from the responsibility of addressing it.

Continuing Challenges on the Philippine Mining Industry

There are specific issues that need to be highlighted when it comes to the varying concerns and challenges impacting the Philippine mining industry. People are finding it difficult to discern the difference between responsible and irresponsible mining. Most of the negative concerns and impacts related to small-scale mining operations are all lumped as reflective of the whole industry. The existence of legacy mines, which were left behind by previous companies during a different time period, is still actively associated with the present mining industry. With all the regulations imposed by the Government, there is a sentiment in some sectors that the public sector personnel are not well-trained enough to implement these rules. Assuming but not granting that this is correct, this can easily be addressed considering the preponderance of expertise in the local sector, especially in the academe, who can offer trainings. Tapping bilateral or multilateral programs to address this concern of perceived lack of expertise among government personnel is also possible. The inconsistency in the implementation of provisions related to exploration and mining between the local and national government is an ongoing concern. Undoubtedly, there are still a lot of things that the mining industry has to do if it wants the public to view it in a positive light. There is no alternative but to address these various concerns considering the important contributions the mining industry can give to the country in the short, medium to the long-term period. All of these activities can and will be done by the large-scale mining companies responsibly and ethically, as guided by regional implementing agencies, notwithstanding conflicts between regions in the interpretation of the same law.

CONCLUSIONS

The mining industry in the Philippines faces the same set of challenges besetting the industry globally. With the perceived difficulty of doing business in the country, the Philippines is not in the global exploration radar and foreign direct investment in the mining industry has dried up in recent years. This can change with the introduction of E.O. 130 which allows the granting of new mineral agreements to mining companies. Admittedly, the concerns about environmental destruction related to mineral extraction are valid. However, most of these are associated with irresponsible miners and small-scale mining operations. Responsible large-scale miners ensure that mining operations, environmental protection and ecological restoration are done hand in hand correctly. As it is, people, in general, will have to decide on the dilemma they have wherein some dislike mining but would not part with materials, technologies and gadgets that would not be feasible without mining.

Responsible large-scale mining companies, collectively, have to act more decisively to show that most of the problems perceived by Society are not related to the responsible development and extraction of mineral deposits. The Government, aside from the immediate need for additional financial resources from the mining industry, ought to clearly share its vision on how it sees the industry meaningfully contributing to the country's development. With the expected increase in the demand for metals in the next twenty to thirty years, and with a dwindling global supply, our Government must situate our country to play a pivotal role in addressing this global need. Lastly, individuals must apply more science, than generalizations, in understanding the importance of mining to one's personal need and to the Society, in general.

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ACKNOWLEDGMENT

This paper is an offshoot of the presentation, "From E.O. 79 to E.O. 130: Exploration to mining realities, and restoration possibilities in the Philippines" delivered by GP Yumul, Jr., during a plenary session of the 9th Annual International Conference on Environmental Science, co-organized by the University of the Philippines Los Baños–School of Environmental Science and Management and the Pampanga State Agricultural University, held online from 3 to 4 May 2021. The data, figures and information culled by our colleagues and students at the UP-NIGS Rushurgent Working Group are acknowledged with thanks. We would like to acknowledge, too, the data shared by the Department of Natural Resources, Mines and Geosciences Bureau and the Chamber of Mines of the Philippines. Gerard Brimo is acknowledged with thanks for his suggestions in an early version of this manuscript. Things written here represent the collective experience we have had through several decades of work in exploration and mining. The views presented here are our personal views and do not in any way represent the stand of our respective institutions.