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Implications of Lifting the Open-Pit Mining Ban in the Philippines

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Abstract

An order "Banning the Open-pit Method of Mining for Copper, Gold, Silver, and Complex Ores in the Country" was issued by the Department of Environment and Natural Resources (DENR) on April 27, 2017. Justifications to the order included the past environmental disasters caused by mining operations, which were then employing the open-pit mining method and indicated that such mining method poses risks to host communities and to the environment. The order affects prospective mining projects that would employ the open-pit mining method. On December 23, 2021, the ban was lifted on the premise that the "Revitalization of the Mineral Resource Industry as One Measure to Achieve Economic Growth Amidst the Crisis Caused by the COVID-19 Pandemic." The rationale behind opposing development perspectives/sentiments on open-pit mining was reviewed and the ecological integrity implications related to open-pit mining was discussed. Facts were cited and challenges or high-level opportunities for improvement on various aspects of regulating mining activities, in general, were flagged. The method of mining (i.e. surface/open pit or underground) and type of commodity extracted (i.e. metallics, non-metallics were emphasized as not the only major factors to cause unacceptable outcomes from mining, such as potentials for environmental disasters or negative impact to social welfare. Two major directions to take were provided and options moving forward in order to optimize benefits from approved mining projects were enumerated.

Keywords: open-pit mining, tailings management, governance, benefit cost analysis, environmental valuation, social impact, equitable distribution, fair share, fiscal regime

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1. Introduction

1.1 *Context and relevance of the study*

On April 27, 2017, former Department of Environment and Natural Resources (DENR) Secretary Regina Lopez signed the Department Administrative Order (DAO) No. 2017-10, "Banning the Open-pit Method of Mining for Copper, Gold, Silver, and Complex Ores in the Country." [2] Lopez cited the destructive nature and the potential of open-pit mining methods for a disaster and being a risk to host communities and to the environment as the main reasons for imposing the ban,[3] further adding how the ban was meant to protect the country's unique biodiversity and to prevent environmental degradation in forms such as mine tailings spills which contaminate waterways.[4]

Just like any DAOs, the order starts by attempting to enumerate the legal basis for the order. It then provided a "rough" characterization of the open-pit method of mining and cited as fact that "the history of mining in the country shows that most, if not all, open pits have ended up as perpetual liabilities, causing adverse impacts to the environment…" (DAO 2017-10, par. 6).

DAO No. 2017-10 also cited as fact that notwithstanding the provisions of Philippine Mining Act of 1995, "the rehabilitation of mined-out open pits shall invariably require perpetual maintenance works … and, thereby, leave to the unknown the fate of the environment" (DAO 2017-10 par. 8).

The ban was to be enforced on all prospective open-pit mining projects.

The open-pit mining ban lasted until December 2021, when it was lifted by succeeding DENR Secretary Roy Cimatu[5], through DENR DAO 2021-40, "Lifting of the Ban on Open-pit Method of Mining under DAO 2017-10, and Providing for Enhanced Parameters and Criteria for Surface Mining Methods." The DAO was signed on December 23, 202, and is premised on the "Revitalization of the Mineral Resource Industry as One Measure to Achieve Economic Growth Amidst the Crisis Caused by the COVID-19 Pandemic."

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[1] Research Associate. Senior Research Fellow, and Research Specialist respectively, Philippine Institute for Development Studies

[2] Regina Paz Lopez, "Banning the Open Pit Method of Mining for Copper, Gold, Silver, and Complex Ores in the Country," DAO No. 2017-10 § (2017), http://databaseportal.mgb.gov.ph/mgb-public/api/attachments/download?key=2tMHU3ni4UYaIUwOvRN-WUmMcsq68cYJyYZLp2mgZO3h5c4UNoITGhZ8NrN5D0Ibp.

[3] Mariclaire Miguel, "LOPEZ BANS PROSPECTIVE OPEN-PIT MINES," Denr.gov.ph (Department of Environment and Natural Resources (DENR) Region 6, 2019), https://r6.denr.gov.ph/index.php/86-region-news-items/595-3-tribute-to-trees-8nd-flowers.

[4] Bong Sarmiento, "Philippine Groups Slam 'Cruel Christmas Gift' as Open-Pit Mining Ban Is Lifted," Mongabay Environmental News, January 11, 2022, https://news.mongabay.com/2022/01/philippine-groups-slam-cruel-christmas-gift-as-open-pit-mining-ban-is-lifted/.

[5] Roy Cimatu, "Lifting of the Ban on the Open Pit Method of Mining for Copper, Gold, Silver and Complex Ores in the Country under DENR Administrative Order No. 2017-10, and Providing for Additional Enhanced Parameters and Criteria for Surface Mining Methods," DAO No. 2021-40 § (2021), http://databaseportal.mgb.gov.ph/mgb-public/api/attachments/down-load?key=7gwAW5kDiL05aa57FQVHMiAOHGw5eCKiFrRocWw7WAupci1k5OXQoSddz7Vdxyap.

The DAO 2021-40 cites the need for stalled and new mining projects to attract investments that will help stimulate the Philippine economy after the COVID-19 pandemic hit.[6] The order to lift the ban comes after then President Rodrigo Duterte lifted a moratorium imposed in 2012 on new mineral agreements, allowing new mining deals and reviews of existing contracts for possible renegotiation, as well as directing the environment sector of the government to formulate and implement rules and conditions on mine safety and environmental policies.[7]

Debates have ensued on whether lifting the open-pit mining ban on the Philippines would bring forth the claimed results of economic growth of the Philippines, following its recent decline due to the COVID-19 pandemic, or if it would, as claimed by environmental activists, bring further harm to the environment that would later on result in the further decline of the country's economy due to loss of environmental functions and services.

This study aims to determine and enumerate the implications of lifting the open-pit mining ban in the Philippines in terms of socioeconomic as well as ecological factors, as well as to determine the rationale behind varying insights on open-pit mining operations and provide ways forward on simultaneously optimizing open-pit mining benefits and ensuring ecological integrity.

For the completion of this paper, the team conducted a series of interviews to relevant, concerned stakeholders - mining companies involved in open-pit methods, mining communities, government agencies such as the Mines and Geosciences Bureau, and other organizations such as the Chamber of Mines of the Philippines (COMP), and the Extractive Industries Transparency Initiative (EITI). Questions raised in the interviews were kept neutral to keep the rapport of the team in being impartial to the issue. Interviews were done through online conference calls, and sessions were recorded with the permission of the participants present. Related literature pertaining to the past ban on open-pit mining methods, as well as to the recent lifting of the ban were also reviewed to incorporate studies on potential advantages and disadvantages of the ban lift to the host communities, as well as to the local and national settings.

1.2 *Policy issue(s) and evaluation questions of interest*

Apparently, the banning of open-pit mining was premised solely on the negative impacts of open-pit mining to the environment without mention that the order is temporary, pending establishment of mitigating measures to justify chances of the order being lifted. The DAO 2017-10 mentioned adverse impacts to the environment caused particularly by:

- Acidic and/or heavy metal-laden water
- Erosion of mine waste dumps
- Vulnerability of tailings dams to geological hazards

[6] Enrico Dela Cruz, "Philippines Ends Open Pit Mining Ban to Reinvigorate Industry," ed. Ed Davies, Reuters, December 28, 2021, sec. Environment, https://www.reuters.com/business/environment/philippines-lifts-four-year-old-ban-open-pit-mining-2021-12-28/.

[7] Enrico Dela Cruz, "Philippines Lifts Nine-Year Ban on New Mines to Boost Revenues," ed. Ed Davies (Reuters, April 15, 2021), https://www.reuters.com/business/energy/philippines-lifts-nine-year-old-ban-new-mines-boost-revenues-2021-04-15/.

Eventually, however, the lifting of the ban as stated on DAO 2021-40, was justified by both economic opportunities and the existence of best practices that can mitigate environmental risks. Specifically, enhanced technical, social, and environmental practices were mentioned as conditionalities and requirements in order for mining tenement holders to be allowed to employ open-pit mining methods.

In assessing and expounding on the implications of lifting the ban on open-pit mining, the following has been identified as policy issues and questions of interest:

- What is the rationale behind opposing development perspectives/sentiments on opening-pit mining operations in the country?
- What are the development and ecological integrity implications related to re-allowing opening of open-pit mining projects? What are the socio-economic and environmental costs and benefits?
- How can the country optimize benefits from open pit mines, while addressing ecological integrity concerns?

1.3 *Objectives*

The study shall examine the economic, social, and environmental implications of the DAO No. 2021-40, or the lifting of the open-pit mining ban.

Specifically, this study will:

- Determine the rationale behind varying insights on open pit or surface mining operations.
- Evaluate the social and environmental welfare costs in allowing open mining projects affected by the ban to proceed to operations stage; and
- Provide ways forward on simultaneously optimizing open pit mining benefits and ensuring ecological integrity.

2. Development perspectives on open-pit mining

2.1 *Policy tools and instruments*

The pros and cons of the open-pit method of mining are almost exactly the same for any mining operation, regardless of the mining method used. We have economic benefits as against environmental and social welfare cost.

Protecting the country's unique biodiversity and to prevent environmental degradation in forms such as mine tailings spills which contaminate waterways were the intentions of the ban, but so as the Mining Act of 1995 and all other environmental and mining-related laws. Justifying mining projects, regardless of mining methods employed, will always meet opposing views that include subjective opinions.

The opposing perspectives are, however, described using incomparable metrics. While we can compute exact monetary values to compare acceptable financial metrics or government mandated commitments, there are no such environmental and social cost indicators, monetary or otherwise, against which to assess mining projects.

Valuing or computing economic benefits can be a straightforward and scientific exercise using universal or standard accounting procedures or well-defined regulations. These may consist of firm-level or government revenues/profits, national accounts as GDPs, GVAs, GRDPs, or benefits accruing to or received by host and impacted communities as SDMPs, IP royalties, etc. On the other hand, there are no standard valuation method(s) for current and future environmental and social cost items, i.e. biodiversity, anthropogenic activities, human health and safety, detailed future foregone livelihood, etc. that are mandated to be used to indicate acceptability or non-acceptability of a mining project.

To exemplify, while it can be said that an eventual depleted or closed-down open-pit mines can be perpetual liability for the government, establishing a value acceptable to all stakeholders to such liabilities as basis to counter or mitigate its impact, or justifiably compensate for eventual or future losses of a stakeholder is not required by law in order for government to approve or disapprove mining projects.

This presents major reasons why it seems very difficult to establish indicator(s) that can be used to directly compare economic benefits and environmental or social welfare costs of mining projects with the intention of finding out which is greater/lesser.

Ideally, describing the ill-effects of mining operations to justify similar mining bans (or even suspensions and permit cancellations) must not just be non-quantitative, i.e. that the open-pit mining method is destructive in nature, of exemplifying the potential of employing such methods for a disaster, being a risk to host communities, being perpetual liabilities, and causing adverse impacts to the environment. To the least, data must be presented and compared against quantitative thresholds and benchmarks using acceptable metrics.

Unfortunately, many thresholds are not quantified and can only be described subjectively. Non-monetary sustainability metrics and indicators, therefore still have to be established. In contrast, the economic benefits can be objectively defined.

2.1.1 Sufficiency of laws and consistency of policies

The existence of appropriate laws and the drive to successfully implement such laws reflects the policy directions and priorities of government. And the support of key stakeholders is critical to attain the objectives leading to such directions.

The decision of the DENR to lift the ban on open-pit mining was supported by the Department of Finance (DOF), with the then Finance Secretary Carlos Dominguez III emphasizing that the lifting of the ban on open-pit mining will help revitalize the country's economy as it starts to recover from the COVID-19 pandemic (PNA 2021). Mineral resources play an essential role in urbanization, infrastructure construction, and national security, thus being an extremely important aspect of economic development. In 2020, the Philippine mining industry exported around US$5 billion worth of mineral products and contributed over ₱25 billion in taxes, fees, and royalties.

Mining industry players are convinced that the existing laws and regulations are sufficient to assure a balance of economic and environmental interest to the satisfaction of all stakeholders.[8] The Philippines Mining and Exploration Association (PMEA) stated that sufficient safeguards will be imposed to ensure that mining methods including open-pit are safely done, and that the environment and host communities are considered (Jocson 2022).

One extremely important requirement bundle that can be basis towards assuring continued compliance by proponents of proposed critical projects (as mining) to all relevant codes, and environmental laws is the development and completion of the project's comprehensive Mining Project Feasibility and detailed Environmental and Social Impact Assessment/Study. These documents or a compilation of documents establishes tecno-economic requirements, environmental and socio-economic baselines, and recommends interventions to mitigate and improve impacts as a result of the mining project. This requirement is imposed to all mining project permit applications, not only for open-pit mining projects.

A list of laws relevant to open-pit mining are listed below. The list does not include ordinances and regulations issued by individual local government units. As with all laws, regulations, and ordinances are written with room for flexibility, and as such are open for augmentation otr improvement.

Table 1. Laws relevant to open-pit mining

Law	Title/Description
A. Environmental Regulations	
Republic Act (RA) No. 7942	"Philippine Mining Act of 1995"
DAO 2010-21	Revised Implementing Rules and Regulations of RA 7942
RA No. 7076	"People's Small-scale Mining Act of 1991"
RA No. 9147	"Wildlife Resources Conservation and Protection Act"
RA No. 7586, as amended by RA No. 11038	"The National Integrated Protected Areas System Act of 1992"

[8] https://www.bworldonline.com/special-features/2021/07/09/383342/sustaining-the-philippine-mining-industry-under-balanced-interests/

RA No. 11038	“Expanded National Integrated Protected Areas System Act of 2018”
RA No. 83716	“The Indigenous People’s Rights Act of 1997”
RA No. 9072	‘” National Caves and Cave Resource Management and Protection Act”
RA No. 9003	“Ecological solid Waste Management Act of 2000” ‘
RA No. 9275	“Philippine Clean Water Act of 2004”
RA No. 8749	“Philippine Clean Air Act of 1999”
RA No. 6969	“Toxic Substances and Hazardous and Nuclear Waste Control Act”
RA No. 7160	“Local Government Code of 1991”
RA No. 8550	“Philippine Fisheries Code of 1998”
RA No. 10654	“An Act to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing, Amending Republic Act No. 8550”
Presidential Decree (PD) No. 1586	“Establishing an Environmental Impact Statement System including other Environmental Management Related Measures and for Other Purposes”
DENR DAO 2003-30	Implementing Rules and Regulations of PD 1586
PD No. 705, as amended	“Revised Forestry Code of the Philippines”.
Executive Order (EO) No. 578 s. 2006	“Establishing the National Policy on Biodiversity”
EO No. 533 s. 2006	“Adopting Integrated Coastal Management as a National Strategy”
EO No. 79 s. 2012	“Institutionalizing and Implementing Reforms in the Philippine Mining Sector to Ensure Environmental Protection and Responsible Mining, particularly on the Full Enforcement of Environmental Standards in Mining
EO 270 s. 2004	“National Policy Agenda on Revitalizing Mining in the Philippines”
EO No. 130 s. 2021	“Amending Section 4 of Executive Order No. 79 S. 2012”
DENR DAO No. 2016-12	“Adopting the Philippine Biodiversity Strategy and Action Plan (PBSAP) 2015-2028”
DENR Memorandum Circular (DMC) No. 2016-745,	“Integration of Biodiversity in the Planning, Implementation and Monitoring of Development Projects and Tenurial Instruments Issued by the DENR”
24 Article 2, Section 16 of the 1987 Constitution of the Republic of the Philippines	It is the policy of the State to protect and advance the rights

	of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature
DENR DAO 2017-15	Guidelines on Public Participation Under the Philippine Environmental Impact Statement (EIS) System
DENR DAO 2017-10	Banning the open-pit method of mining on prospective projects
DENR DAO 2021-40	Lifting of the ban of the open-pit mining method…
DENR DAO 2022-04	Enhancing Biodiversity Conservation and
DENR DAO 2018-19	Guidelines for Additional Environmental Measures for Operating Surface Metallic Mines.
B. **Social safeguard policies**	
RA 8371	Indigenous Peoples Rights Act of 1997
PD 442 as amended	Labor Code of the Philippines
RA 9710	Magna Carta of Women
DENR DAO No. 2000-98	Mine Safety and Health Standards

Source: Authors' compilation

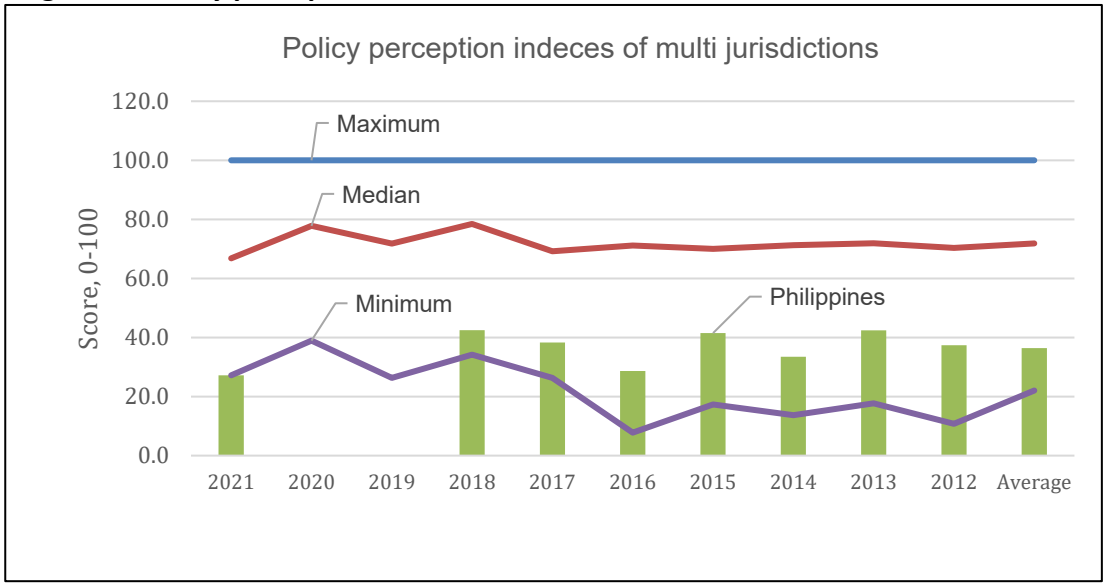
Despite these laws, however, there certainly are opportunities for improvement. Results of well-designed surveys are excellent starting points to identify such opportunities and help justify interventions. One particular annual study is the Policy Perception Index (PPI) based on the Fraser Institute Annual Survey of Mining Companies. The index can serve as a scoreboard that keeps track and compares how attractive governments' policies are to mining industry stakeholders' players.

"The Policy Perception Index is a composite index that captures the opinions of managers and executives on the effects of policies in jurisdictions with which they are familiar. All survey policy questions (i.e., uncertainty concerning the administration, interpretation, and enforcement of existing regulations; environmental regulations; regulatory duplication and inconsistencies; taxation; uncertainty concerning disputed land claims and protected areas; infrastructure; socioeconomic agreements; political stability; labor issues; geological database; and security) are included in its calculation." (Fraser Institute 2017, p. 13) [9] In other words, it is a measure of the jurisdictions or the country's attractiveness of its mining policies.

While there can be debate on the acceptability of such scores, the existence and importance of such scorecards on a global scale cannot be underestimated. To the least, similar studies should be part of standard benchmarking activities by agencies mandated to develop, promote and/or regulate the mining industries, regardless of scale of operations and mining methods employed.

[9] https://www.fraserinstitute.org/categories/mining

Figure 1. Policy perception index



Data source: The Fraser Institute Annual Survey of Mining Companies

Since 2012, the Philippine's Policy Perception index has always been below the median of the consolidated scores of all jurisdictions being compared each year. And in 2021 (2020 survey), the country had the least score among 84 jurisdictions being compared (Figure 1). The report highlighted the ban on open-pit mining as one reason for the low score.[10]

2.1.2 Capacity to enforce mining laws and environmental regulations

The government is confident in being able to enforce mining laws.

In November 2021, the former Finance Secretary, who also co-chairs the Mining Industry Coordinating Council with the Secretary of the Department of Environment and Natural Resources, stressed its full confidence that the Philippine government is capable of strictly regulating mining operations to address and minimize the risks and impacts posed by such extractive activities. Moreover, the Secretary has assured the public that government "will strictly enforce the "non-negotiable condition" on the mining industry for it to adopt environmentally sustainable and responsible extractive practices to guarantee the sustainability of this potential economic growth driver and the vibrant future of its host-communities." [11]

In December 23, 2021, the DENR Administrative Order No. 2021-40 was released ordering the lifting of the nationwide open-pit mining ban. In South Cotabato, the lifting of the nationwide ban makes the separate 12-year old provincial open-pit mining ban of the province the remaining obstacle to the proposed $5.9 billion Tampakan copper-gold mine. The Tampakan project is said to be one of the largest untapped copper-gold mines in the world. On its first ten years of operations, government revenues from the project alone will reach over ₱72 billion.

[10] Surprisingly, there were no respondents commenting on the Philippines' policies were received during the 2019 and 2020 surveys.

[11] https://www.dof.gov.ph/dominguez-assures-public-on-strict-adherence-to-sustainable-responsible-mining-practices/?utm_source=rss&utm_medium=rss&utm_campaign=dominguez-assures-public-on-strict-adherence-to-sustainable-responsible-mining-practices

The open-pit ban by the provincial government has a legal basis from the Local Government Code of 1991 and was pitted against the Mining Act of 1995, a national policy allowing open-pit mining should all conditions for such projects be complied with.

On May 16, 2022, the provincial board of South Cotabato approved the lifting of the provincial ban[12], but only to be vetoed by the governor of the province barely a month on June 3, 2022.[13]

So far, the proponents of the Tampakan Copper-Gold Project have complied with all the requirements imposed by law to be able to start operations. If the government has the capability to regulate the mining industry, then it seems that the government itself is not consistent in following the very law it should be enforcing.

2.1.3 Justifying suspensions, cancelations, or bans

In February 2017, the late DENR Secretary Lopez ordered the cancellation of the Mineral Production Sharing Agreements (MPSAs) of several surface mining operations "subject to compliance with the provisions of Republic Act No. 7942 on the final mine rehabilitation of disturbed areas and other applicable laws and rules and regulations." The order therefore specifies that these companies proceed to the final mine rehabilitation stage. The orders were issued upon "review of the DENR of the audit report (done in August 2016) per DENR Special Order No. 2016-746, and the explanations and/or comments of the company (submitted in October 2016). These cancellation orders, however, contradicts the recommendations of the audits done in August 2016, and of the Technical Review Committee report submitted to the Secretary in January 2017, which recommended ECC suspension, non-issuance of Ore Transport Permits (OTPs) and/or Mineral Ore Export Permits (MOEPs), fines corresponding to violations, etc., pending implementation of corrective measures as recommended by the committee.

The contradiction of decisions between regulator-agencies, local government units, and even of offices within the same agency does not help boosting investor confidence but is frustratingly happening. The laws were written to allow a wide range of leeway as such. Take for example Chapter XXIV, Section 230 of the DENR DAO No. 2010-21 that indicates the grounds for cancellation, revocation, and termination of a mining permit, mineral agreement, or FTAA, as:

a. Falsehood or omission of facts in the application for Exploration Permit, Mineral Agreement, FTAA or other permits which may alter, change or affect substantially the facts set forth in said statements
b. Non-payment of taxes and fees due the Government for two (2) consecutive years; and
c. Failure to perform all other obligations, including abandonment, under the permits or agreements.
d. Violation of any of the terms and conditions of the Permits or Agreements; and/or
e. Violation of existing laws, policies, and rules and regulations.

The distinction of the grounds to justify either cancellation or suspension is not specifically established.

[12] https://news.mongabay.com/2022/05/open-pit-mining-ban-lifted-in-philippine-province-clearing-way-for-copper-project/

[13] https://www.bworldonline.com/the-nation/2022/06/05/452845/south-cotabato-governor-acknowledges-veto-on-open-pit-mining-wont-stop-tampakan-project/

In the same logic, a ban by a local government unit that can contradict a national law can find justification from the absence of such distinction.

2.1.4 Transparency

The lack of transparency, to some extent, can breed non-compliance or non-adherence to codes, laws, and acceptable standards. For the government, the lack of transparency can promote double standards, incompleteness in justifications, and unnecessary bias in the crafting of such laws. While the intentions may be noble, the means to achieve long term goals may be far from efficient and effective. It may seem that there are more constructive options. or a better version of the law could have been possible should the objectives and resolutions be discussed with key stakeholders in a more transparent way.

A specific case is the DENR Department Administrative Order (DAO) 2017-10, "Banning the Open-pit Method of Mining for Copper, Gold, Silver, and Complex Ores in the Country."

The order loosely defined the open-pit mining method, only targeted prospective projects, provided no scientific basis as justifications or the ban, and excluded operations producing specific commodities, despite also being open-pit mines.

2.1.4.1 Open-pit mining definition

DAO 2017-10 roughly defines the opeon-pit method of mining as "… characterized by the extraction of metallic ores from a surface excavation resembling roughly an inverted cone with benches along its walls…. mainly for the extraction and disposition of copper, gold, silver and complex ores" (DAO 2017-10, par. 5) This is the only definition presented and is not very specific on including all open-pit mining methods since other surface contour mining projects may be considered open-pit mines, albeit not resembling an inverted cone as in **Error! Reference source not found.**.

Figure 2. Inverted cone pit

Cowal open pit mine, New South Wales, Australia[14]

[14] https://im-mining.com/2021/03/31/evolution-mining-studying-open-pit-underground-expansion-options-cowal/

The Runruno molybdenum-gold mine in Nueva Vizcaya by FCF Minerals is described as a "conventional drill and blast open pit mine," with mostly surface contour techniques or benching employed (**Figure 3Error! Reference source not found.**).

Figure 3. Runruno mine, Nueva Vizcaya

FCF Minerals operations in Nueva Vizcaya[15]

Figure 4. Other open pit mines in Philippines

Carmen Copper open pit, Cebu

Source: Atlas Mining

Siana Gold Project open pit, Surigao del Norte

Source: TVI resource Development Corp.

The pits of the Carmen Copper project in Cebu and the Siana Gold Project in Surigao del Norte are large open pit mines resembling an inverted cone. (**Figure 4Error! Reference source not found.**).

The use of non-explicit definitions therefore allows for exemptions at the discretion of the regulators.

[15] https://metalsexploration.com/wp-content/uploads/2021/03/Corporate-Update-%E2%80%93-January-2019-16-01-2019.pdf

Moreover, the DAO also directed the order (ban) to "Mining contractors who have not yet commenced commercial operation but have approved Declarationsof Mining Project Feasibility for open pit mining…" who "…are given a period of six (6) months to review their planned mining methods accordingly…" (par. 9). The ban therefore applies to prospective projects only, and not those already in operation.

2.1.4.2 Similarities with other surface mines.

As a surface mine, open-pit mining operations bring nearly (and in many cases exactly) the same environmental and social impacts to the host and neighboring communities as other surface mining projects. To name a few:

- Need to resettle surface owners/settlers
- Drastic changes in sources of livelihood for the surface settlers/owners
- Loss of topsoil and vegetation / Surface erosion
- Air pollution
- Rehabilitation
- Surface/ground water quality and use
- Issues regarding final land use

With the impact on the environment as the main justification for the open-pit mining ban, it should be noted other surface mining methods pose similar threats. The former DENR Secretary Lopez ordered the suspension of several laterite mines in 2016 due to the same reasons. But as per the experience of the MGB and the MICC, environmental risks can be mitigated, and issues resolved without the need for a national ban. Examples of mineral ores being mined by other surface mining methods are the Philippine nickeliferous laterites soils, which are considered as both nickel and iron ores. As weathered rocks, laterites occupy vast land areas, but the ore deposit is typically less than a 30-meter bed from the surface. For a single laterite mine within a maximum contract area of 5,000 hectares, the cumulative disturbed areas during production stages can reach hundreds of hectares.

In 2018 the DENR issued DAO 2018-29, setting guidelines and imposing limits on the maximum disturbed area depending on allowed throughputs of the mining project. [16]

[16] Guidelines for Additional Environmental Measures for Operating Surface Metallic Mines. https://bit.ly/3Cft4fc

Figure 5. Laterite surface mines prior to release of DAO 2018-29

(a) Approximatey 700 hectares (multiple and spread pits).

(b) Approximately 300 hectares (compact area).

2.1.4.3 Non-metallic mines

The order did not cover non-metallic mining projects[17]. Several non-metallic minerals, especially those industrial minerals required by the construction industries, ie. limestone, silica, marble, feldspar, etc. are mined by employing open-pit mining methods, be it of large or small-scale operations as quarries (Figure 6). The order also does not cover open-pit coal mining (Figure 7).

[17] As mining of minerals needed by the construction industry, cement manufacturing

Figure 6. Limestone quarry in Bohol

Source: Philippine Mining Service Corporation

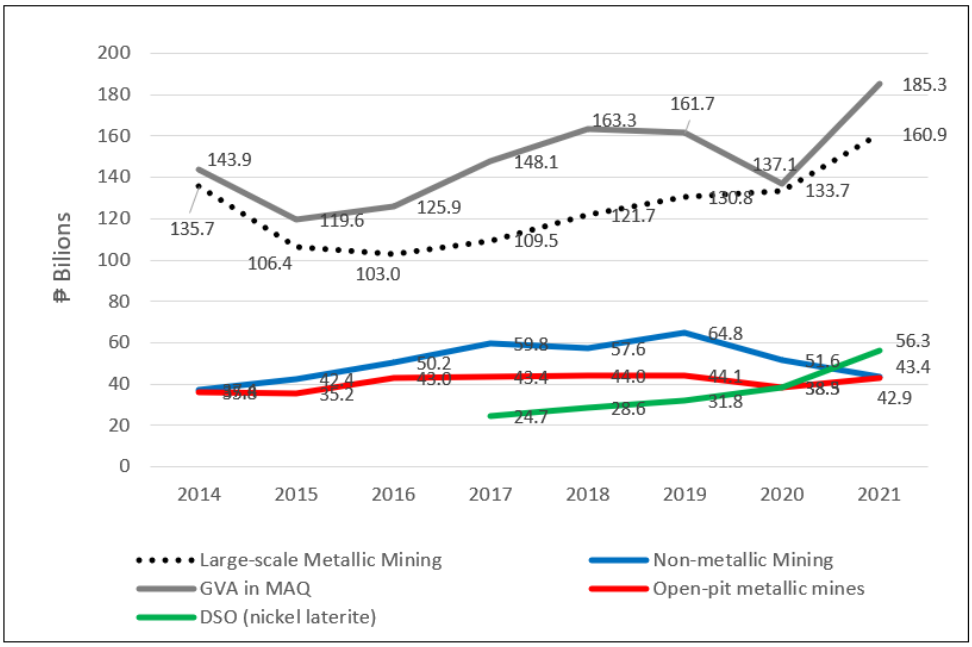
In 2021, the combined product values of both coal and non-metallic mining operations reached over 75% of the product values of all large-scale metallic mines in the country. Semirara Coal Mining and Power Corporation alone reported production volume of 13.7 million MT, with a value of around ₱71 billion in 2021 for the first nine months of 2022.[18] (**Error! Reference source not found.**Figure 8)

Figure 7. Semirara open-pit coal mine

Source: Semirara Mining & Power Corporation company profile 2016

[18] Lagare, J. November 2022. Semirara Jan-Sept Profits Soared on Higher Coal Prices, Energy Sales (https://business.inquirer.net/370957/semirara-jan-sept-profits-soared-on-higher-coal-prices-energy-sales, accessed November 22, 2022.

Figure 8. GVA and Product Values of select industries and sectors



Data source: MGB and PSA

While almost all non-metallic mines are technically open-pit mines, these operations, prospective or otherwise, were excluded from the ban for the prime reason that they support the much larger construction industry, which is critical to the economic growth of the entire country. Note that large scale metallic mining on the average is 2.4x the GDP contribution of non-metallic mining. This sector, in turn, supports the growth of the construction industry, which is nearly 10x the size of the large-scale metallic mines.[19]

Production volume and product values of commercial small-scale and Institutional Sand and Gravel activities being regulated directly by their corresponding LGUs are included in Mining and Quarrying (MAQ) and non-metallic mining statistics.

2.1.4.4 The decision to employ open-pit mining methods

The Mining Act of 1995 and its Revised Implementing Rules and Regulations, the DENR AO 2010-21, do not mention prohibition on mining activities by mining method to be employed, for as long as the activity is consistent with the environmental protection policies as specified under Chapter XVI of DAO 2010-21.

Although open-pit mining has advantages over underground mining methods, the decision on which mining method to employ that can most economically mine targeted ore reserves depends on the physical structure, location, resource size, other geology profiles or characteristics of the orebody, and of course, local regulations. This is regardless of commodity or whether ore is metallic or non-metallic.

For logical reasons, it would be more cost-efficient if the entire orebody is highly accessible and extracting target valuables would require relatively less complex infrastructure and equipment, as with surface mining methods, such as stripping, open-pit mining, etc. Surface mining methods are currently the most common mining methods globally.

[19] In terms of GDP, from 2014 to 2020.

Table 2. Advantages of open-pit mining method

Advantages	Disadvantages
High productivity, i.e., highly mechanized and labor conserving (around 100–400 tons per employee-shift including both ore and waste)	Limited by depth _500 m; technological limit imposed by equipment; and deposit beyond pit limits must be mined underground or left in place
High production rate (essentially unlimited, although small surface mines also possible)	Limited by stripping ratio
Lowest cost along with open cast mining	High capital investment associated with large equipment
Early production, development can be programmed to permit early start-up	Surface damaged may require reclamation; a bond has to be added to the production cost
Low labor requirement; can be unskilled except key operators (e.g., drill, shovel)	Requires large deposit to realize lowest cost, unless very high grade
Relatively flexible; can vary output if demand hanges	Weather can be detrimental; it can impede operations.
Suitable for large equipment; permit high productivity	Slope stability must be maintained; proper design and maintenance of benches plus good drainage are essential
Fairly low rock-breakage cost (drilling and blasting); superior to underground mining where bench faces are less easily maintained	Requires provision of large waste disposal/dump area
Simple development and access; minimal openings required although advanced stripping may be considerable	
Little if any bank support required; proper design and maintenance of benches can provide stability	
Good recovery; good health and safety; no underground hazards	

Source: Lifted in full from Open Pit Mining (DOI: http://dx.doi.org/10.5772/intechopen.92208)

In contrast, an orebody located deep from the surface will require employing underground mining options. Infrastructure and equipment needed to access the orebody and handle or convey eventual bulk materials mined are more sophisticated, thus mine planning and production is more complex and restricted. Labor requirements for underground work are tougher to meet than those required in surface mining operations as a higher level of mechanization is required. Timely communications are also typically difficult to attain in underground mining environments. Global statistics show that it is less safe to work in an underground mine than a surface mine. Combined, the complexities of underground mining would reflect in higher capital requirements than those required on surface mines with the same throughputs.

While environmental risks and social disturbances that need to be mitigated exist in any of the mining technique options, project proponents will eventually weigh final decisions to proceed with a mining project against overall life-of-mine economics. This is regardless of mining methods being compared selected.

Having said this, the sequence in narrowing down mining method options starts with the geology profile of the orebody.

2.2 *Economic contributions*

2.2.1 Expected government revenues from mining

The government's economic justifications for large-scale (open pit) mining projects mainly rest on the potential government's revenue from the mining projects. As defined in the DENR Department Administrative Order No. 2010-21, with the subject "Consolidated Department of Environment and Natural Resources Administrative Order for the Implementing Rules and Regulations of Republic Act No. 7942, Otherwise Known as the "Philippine Mining Act Of 1995." The Philippine government's share are in the form of taxes, fees, and royalties collected by relevant agencies, either at the national or local levels.

The enhanced economic activity from employment opportunities and its multiplier effects are both operational necessities for the proponents and corollary to any business venture. These do not directly convert to government revenues from mining projects. The performance metrics for compliance are straight-forward and will be against the items listed in Table 3.[20]

Table 3. Government revenue sources from mining

Revenue type	Collecting agency
Royalty	MGB
Excise Tax	BIR
Corporate Income Tax	BIR
Additional Government Share (for mines under FTAA)[21]	MGB
Mining Fees and Charges	MGB
Customs Duties (for imported inputs)	BOC
VAT	BIR
Withholding Taxes	BIR
Business Tax	LGU
Real Property Tax	LGU
Registration Fee	LGU
Occupation Fee	LGU

Source: Mendoza and Canare 2013.

From transaction records, each of the concerned government agencies can certainly track and monitor collections. But due to non-existence of a common database that allows inter-agency access, a compilation that suits industry performance and related study objectives has to be performed manually by the study proponents themselves. In many cases, even the central and regional offices of these agencies also still do not have a central and accessible database that contains data collected by each regional office. Compilation has to be done at the central offices. The process requires approaching each concerned collecting agency and submitting formal requests for collation of specific information.

While the MGB, being the main regulator of the mining industry, does compile key data from

[20] Ronald U. Mendoza and Tristan A. Canare, "Revenue Sharing in Mining: Insights from the Philippine Case," Modern Economy 04, no. 08 (2013): 520–34, https://doi.org/10.4236/me.2013.48056.

[21] FTAA and MPSA definition basis: R.A 7942 , Philippine Mining Act & its IRR A .O. No. 2010- 21, https://leap.unep.org/countries/ph/national-legislation/denr-administrative-order-no-2010-21-revised-implementing-rules

the submissions of select monthly, quarterly, and annual reportorial documents by each mining company, the availability and accessibility of such data critical to timely industry analysis, government planning, and eventual community development.

Aside from MGB, other frontline mining industry regulators as the EMB and host local government units also track a variety of technical, environmental, financial/economics-related information from mining activities. The PSA then categorizes select data reports under the main account of Mining and Quarrying. From the source, these can be broken down as:

- Metallics
  - by commodity, i.e. copper, gold silver, chromite, iron ore
  - by region
  - by province
  - employment
  - economic contribution
  - environmental

- Non-metallic Mining
  - As above, but commodities as: Limestone, for industrial use; Limestone, for cement; Pozzolan; Waste material, sand and gravel

Government revenues from mining projects must not, however, be equated to government's fair share of profits from mining projects considering that minerals are finite resources and are not renewable. There are contradicting opinions on whether the share of government is indeed a fair one. [22]

2.2.2 Government revenues from open-pit metallic mining projects

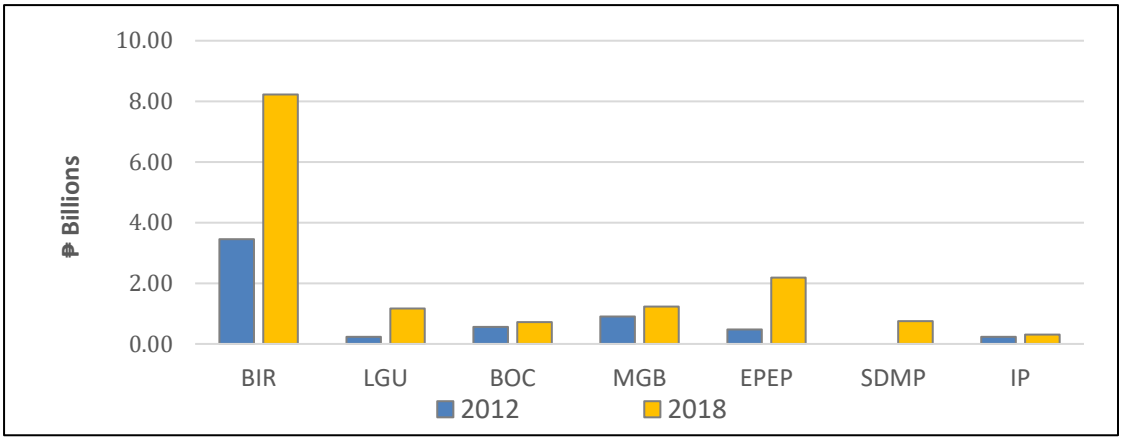
Based on the 2018 report of the Extractives Industries Initiative (EITI),[23] government revenues from metallic mining projects reached approximately ₱11.3 billion.[24] These were in the form of national (corporate income taxes, VAT, excise taxes, etc. paid to the BIR)) and local government taxes (business taxes, property taxes, etc. paid to LGUs), export/import duties (paid to the BOC), and royalties paid to the MGB. Expenses related to environmental protection, social development, and indigenous peoples' concerns reached ₱3.2 billion. (Figure 9)

[22] Solita Collas-Monsod, "'Zero' Share from Mining Wealth?," INQUIRER.net, October 21, 2011, https://opinion.inquirer.net/15761/%E2%80%98zero%E2%80%99-share-from-mining-wealth.

[23] Records are from responding participants may not reflect exact overall industry data at that time. For FY 2018, on the EITI 6th Report, there was a 79% participation rate from metallic mining projects and 100% from non-metallic mines.

[24] BIR, LGU, BOC, MGB

Figure 9. Select expenditures of metallic mines



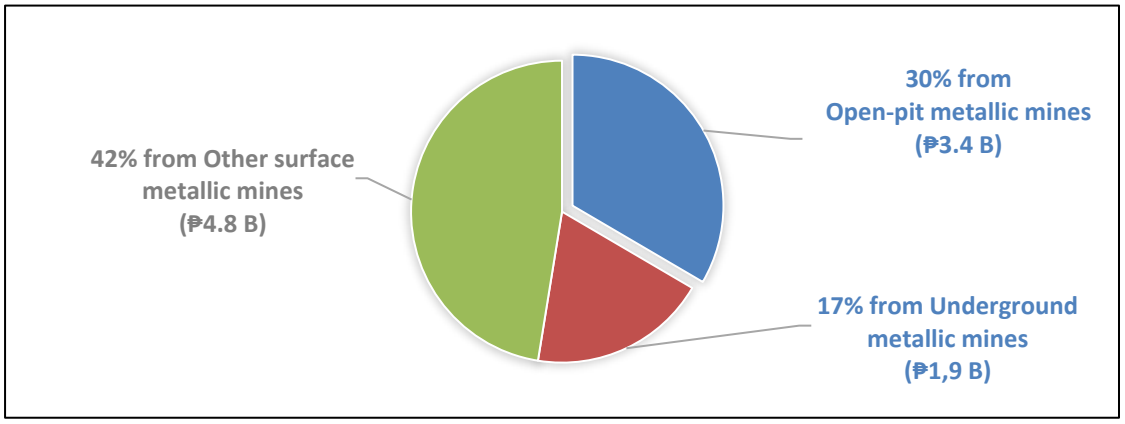
Note: BIR-Bureau of Internal Revenue; LGU-Local Government Unit; BOC-Bureau of Customs; MGB-Mines and Geosciences Bureau; EPEP-Environmental Protection and Enhancement Program; SDMP-Social Development and Management Program; IP-Indigenous Peoples
Data Source: EITI

From the same report, out of 86 metallic and non-metallic mining operations that operated between 2012-2018, only seven (or 8% of total) employs underground mining methods. And of the 92% that are surface mines, only five operations (or 6% of metallic mining projects) were open-pit metallic mining operations:[25]

- Carmen Copper Corp. (Cebu)
- FCF Minerals (Nueva Vizcaya)
- Oceanagold (Nueva Vizcaya)
- TVI Resources (Zamboanga)
- Filminera Resources (Masbate)

These open pit mines extract either copper, gold, silver, and complex ores but were not covered by the 2017 ban as the mines were already in operations prior to the order. Out of this ₱11.3 billion government revenues from metallic mining activities in 2018, ₱3.4 billion or 30% were contributed by open-pit mining operations. (Figure 10)

Figure 10. Contribution of open-pit metallic mines to government revenues



Data source: EITI

[25] By 2020, only six open-pit metallic mining operations remain. Whereas between 2000 and 2021, a total of 14 mining companies operated open-pit mines in the Philippines.

2.2.3 Contributions to gross regional domestic product

Economic growth as reflected in GDP figures has risen from ₱6.98 trillion in 2000 to ₱185.4 trillion in 2021 (Figure 11). Share of Mining and Quarrying (MAQ) industries followed suit rising from ₱56.45 B in 2000 to ₱144.43 B in 2021 (Figure 12).[26] However, the share of MAQ industries remained below 1.5% since 2000, and below 1% since 2014 (Figure 12, Figure 13).

Figure 11. Total Gross Regional Domestic Product

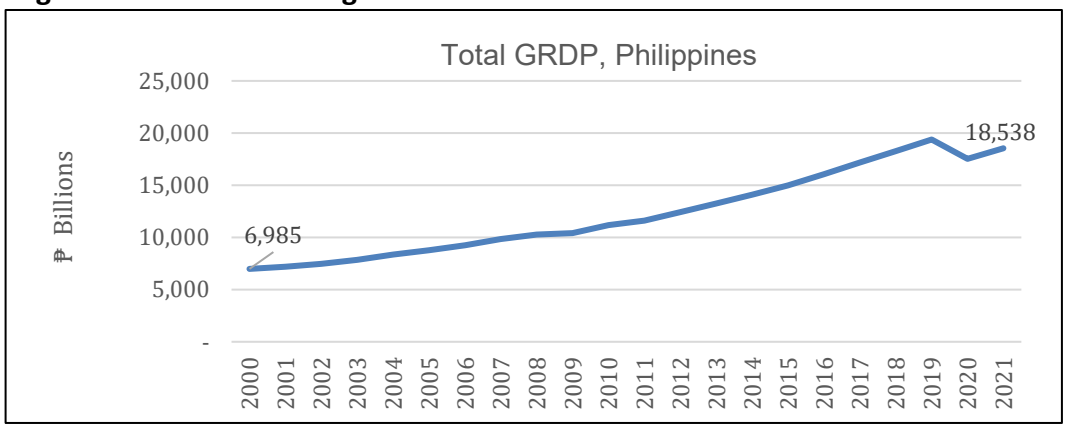


Figure 12. Gross Value Added in Mining and Quarrying

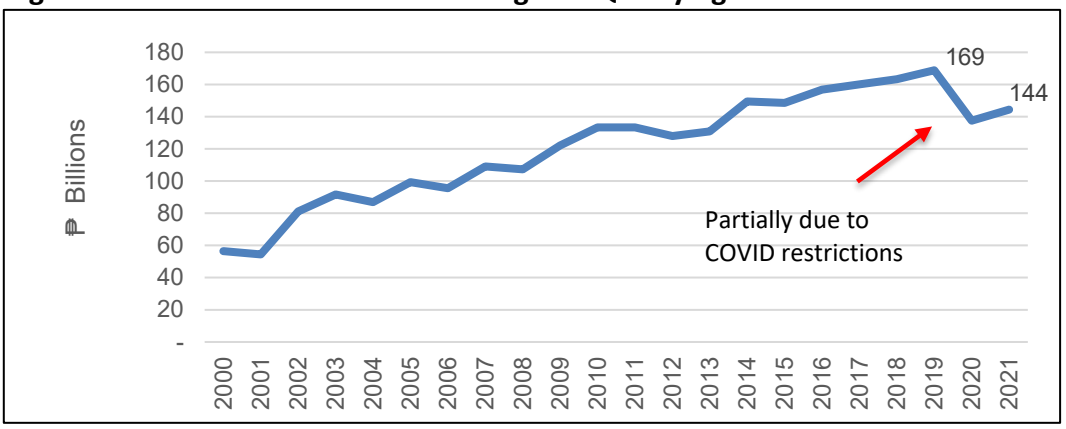
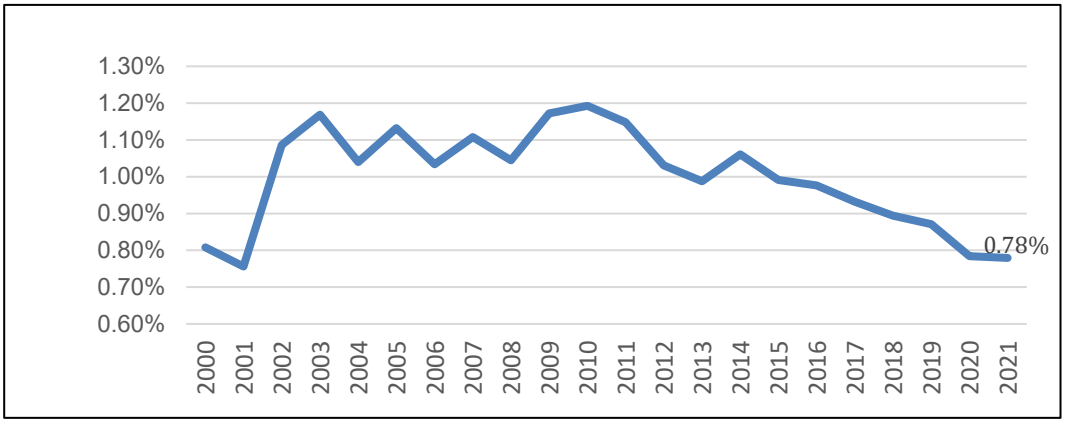


Figure 13. GVA in MAQ as % of total GRDP



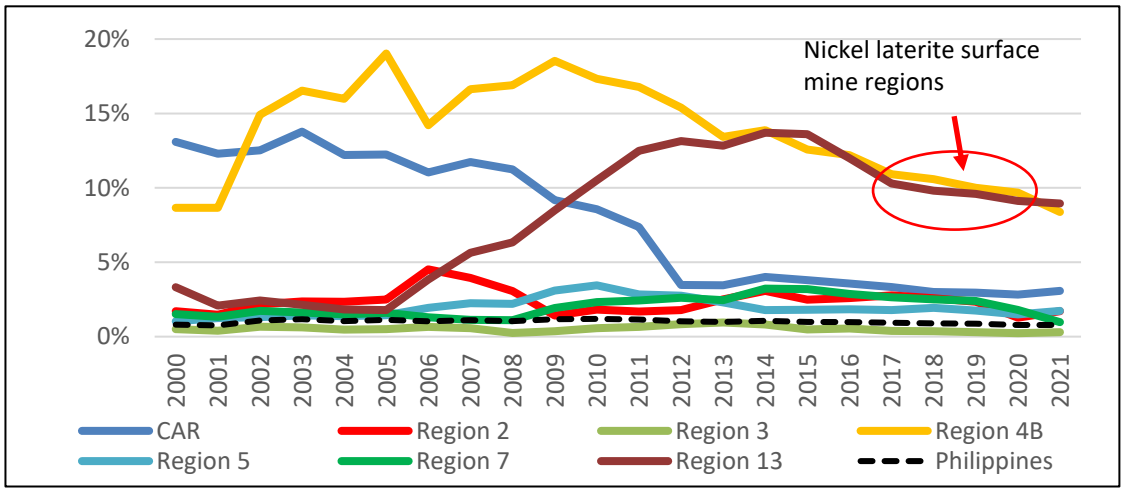
Source of data: PSA

[26] Constant 2018 pieces.

But while on a national level, total contribution of MAQ industries to total / national GRDP is one of the lowest, in some individual regions MAQ activities are major contributors to the region's GRDP.

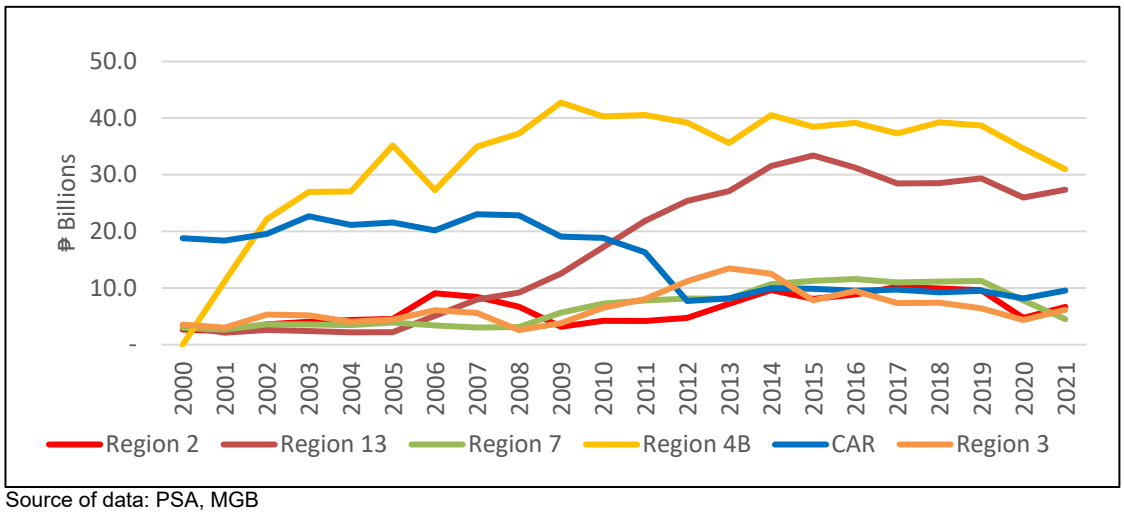
Taking the major mining regions of Regions II, IVB, VII, XIII, and CAR, the regional MAQ contributions to GRDP reaches an average of 14% of Region IVB, around 8% for Regions XIII and CAR, and 1% for Philippines average (). Mining operations in Region II employs open-pit mining methods[27], surface contour mining in Region XIII and IVB[28], Region VII are open-pit operations (both metallics and non-metallics)[29]. (Figure 14)

Figure 14. GVA In MAQ as % of GRDP



Source of data: PSA, MGB

Figure 15. GVA in MAQ per region



Source of data: PSA, MGB

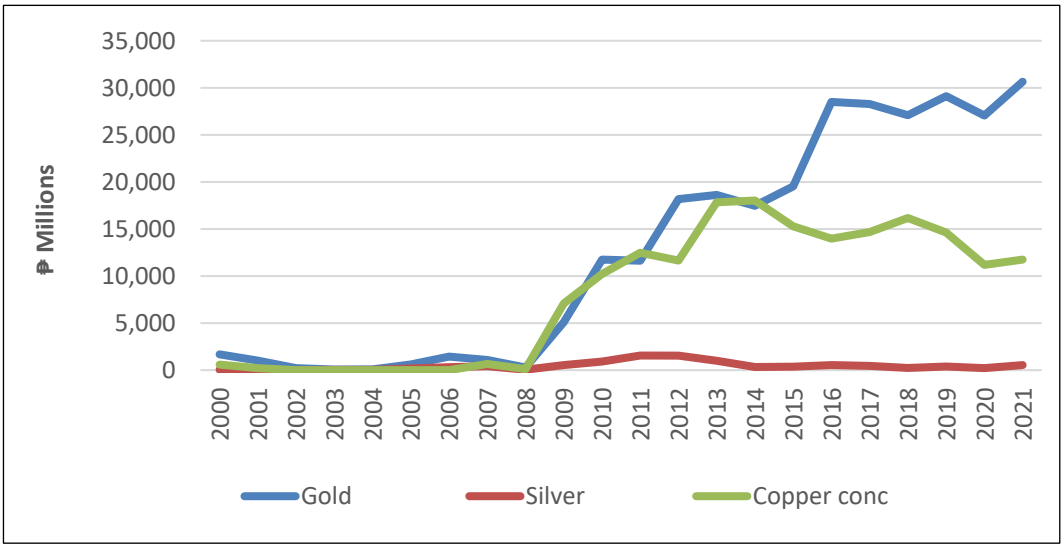
Gross Value Added in Mining and Quarrying as percentages of total GRDPs may be fraction of a percent, but in absolute terms for specific regions, but these figures equate to considerable government revenues (Figure 15).

[27] Oceanagold and FCF Minerals.

[28] Nickel laterite mining companies.

[29] Carmen Copper Corp and limestone quarries.

Figure 16. Open-pit mining product values



Source data: MGB

For the ten-year period 2012-2021, MAQ GRDP totaled ₱1,488 billion and 26% of this figure (₱380 billion) is the value of products from large-scale open pit metallic mines. Between 2000 to 2021, there were eleven companies operating open-pit metallic mines and this number was down to five in 2021. Total product values from these mines in 2021 was ₱40.4 billion. (Figure 16)

2.2.4 Prospective benefits: operating and stalled projects

Select projects are decribed below with summary of government revenues presented in Table 4.

Oceanagold Didipio Gold-Copper Project. The Didipio Mine is the first recipient of the Financial or Technical Assistance Agreement (FTAA)[30] in the country since 1994. It covers Barangay Didipio and neighboring communities traversing Nueva Vizcaya and Quirino which would develop later into conflicts on jurisdiction and benefit distribution. From 2013 to 2018, OceanaGold's Didipio operations contributed approximately ₱2 billion in excise taxes.

In 2018, while the company's application for mining license renewal is being processed, the MGB then reiterated the company's clearance to continue mine operations even when license is under review (Burton, Dela Cruz, & Hogue 2019). However, in 2019, the mining company suspended its operations citing dispute with the provincial government. Only in 2021 did the Philippine government finally renewed the FTAA retroactively from June 2019 to 2044 under several additional conditions (Rivas 2021) with the absence of LGUs' consent in the FTAA renewal still a point of contention, i.e.:

- To go public within the next 10 years and offer 10 percent shares of its subsidiary, OceanaGold Philippines Incorporated (OGPI/)
- Additional 1.5 percent of gross revenue for community development
- Reclassification of net smelter return; shared 60%-40% rather than full inclusion in government share

[30] Granting title, exploration, and mining rights to the company within a fixed fiscal regime

- Transfer of OGPI's principal office to the host province within the next two years
- OGPI's offer for purchase should not be less than 25 percent of its annual gold doré production at fair market price

Eramen Minerals Inc. (EMI). Eramen's "Nickel Silicate and Associated Metal Ore Open Mining Project" is located within the municipalities of Sta. Cruz and Candelaria, in the province of Zambales, with the tenement covering an area of 4,619 hectares under MPSA No. 209-2005-III, signed on April 2005. All permit-related and reportorial documents submitted to the DENR and other concerned agencies that are accessible forms part of the references for this study.

While the mining project is not an open-pit mine following the definition of the DENR DAO No. 2017-10, being a surface mine disturbing hundreds of hectares of land area, and with economic, social and environmental impacts well documented during operating and non-operating times, the EMI project was selected to be part of this study.

In February 2017, EMI's Zambales nickel laterite mine was one of the several mines whose MPSA was ordered cancelled by the DENR's former secretary, the late Gina Lopez, referencing results of an audit conducted by the DENR on August 8-20, 2016 "… that the company has committed violations of the mining and environmental laws…."

In 2018, an MICC review of mining operations recommended that major reforms be undertaken by EMI. Noteworthy is that the company's overall performance was best compared to the other three nickel laterite mining operations in Zambales. In 2019, EMI was able to fulfill all recommended reforms, and the MGB eventually allowed the company to continue operations.

In November 2022, in a turnaround proving its renewed commitment to consistently employ best practices in environmental management, EMI was one of 12 companies conferred with the Presidential Mineral Industry Environment Award (PMIEA) by the Philippine Mines Safety and Environment Association. The Presidential Mineral Industry Environment Award is conferred annually to deserving groups or companies engaged in mining activities in the country under the categories of Mineral Exploration, Quarry Operation, Surface Mining Operation, Underground Mining Operation, Mineral Processing, and Research and Development.

Runruno Gold Project. The Runruno Gold Project[31] is an operating conventional drill and blast open-pit mining operation, currently owned 100% by Metals Exploration Plc.[32] Operations in the Philippines is under the corporate name of FCF Minerals Corporation and is also owned 100% by Metals Exploration. The Financial and Technical Assistance Agreement (FTAA) with FCF was signed by Order of the President in October 2009, the Environmental Compliance Certificate (ECC) issued March 2010, and the Feasibility Study announced in May 2010. The tenement covers an area approximately 3,000 hectares.

The Runruno Gold-Molybdenum Project is located within Baragay Runruno, Municipality of Quezon and the Province of Nueva Vizcaya. It is a distance of 320km by road north of Manila. The area has been known to be prospective in gold and other precious metals since the early 1960s. The project lies immediately downstream from the village of Runruno.

[31] Initially the Runruno Gold-Molybdenum Project

[32] Registered in England and is listed in the Alternative Investment Market (AIM). AIM is a specialized unit of the London Stock Exchange.

The mine has been in production since 2016 and is currently the fourth largest operating gold mine in the Philippines with the last few years seeing a significant turnaround in the operational performance of the plant and the mine overall. Runruno contains gold reserves of 9.94Mt with an average gold grade of 1.35 grams per ton and forecast gold production for 2022 between 67,000-71,000 ounces per year.[33]

Tampakan Copper-Gold Project. The lifting of the ban on open-pit mining has paved ways for the continued development of certain projects that were seen to boost economic activity in their host regions. One such project is the US$5.6 billion Tampakan Coper-Gold project in Mindanao. Sagittarius Mines, Inc's (SMI) proposed Tampakan Copper-Gold Project involves one of the world's largest undeveloped copper-gold deposits.34 The min will be the largest in the Philippines, with a contract area of around 10,000 hectares and covering the boundaries of South Cotabato, Sarangani, Davao del Sur and Sultan Kuldarat. [35]

The project has the potential to yield an average of 375,000 tons of copper and 360,000 ounces of gold per annum over 17 years.[36] According to COMP Chairman Toledo, for the first 10 years of the Tampakan operations, national taxes are estimated to reach ₱ 68 billion; local taxes, ₱4 billion, royalty for indigenous peoples, ₱ 4.8 billion; and Social Development and Management Program, ₱2.6 billion (18). The project has since faced opposition since copper and gold reserves were confirmed in the 1990s. The Indigenous B'laan are most affected by the conflict as the planned project spans across five tribal councils and would have to involve the eviction of around 5,000 people.[37]

The Tampakan project, while not yet in operations stage, has already influenced people's livelihoods in forms of potential and actual economic gains, employment opportunities, food and water, land and resettlement as well as infrastructure. Being the most directly affected community by the project, some of the B'laan people interviewed stated that SMI had widened their opportunities for employment through scholarships for secondary education and job training (Hamm, Schax, and Scheper 2013).

In terms of ecological implications, residents emphasize their fear of water shortages and water pollution if the Tampakan project becomes operational. Assessing and identifying potential negative consequences to the environment, SMI is introducing mitigation measures to prevent environmental risks and damages (Hamm, Schax and Scheper 2013).

As of writing, despite the lifting of the (national) ban on the open-pit mining method, the project still remains subject to resolution of the (local) open-pit mining ban contained in the South Cotabato Provincial Environment Code. The Provincial Board of the province has already approved the lifting of the local ordinance in May 2022, but only vetoed by the provincial Governor less than a month later.

[33] Metals Exploration PLC, corporate website, https://metalsexploration.com/, accessed September 2022.
[34] Sagittarius Mines Inc., 2011. Tampakan Copper-Gold Project, Environmental Impact Statement: Overview Document.
[35] The Tampakan Forum 2014. The Tampakan Copper-Gold Project and human rights violations in the South Cotabato, Philippines. https://franciscansinternational.org/fileadmin/media/Business_and_HR/Statements/philippines_report_tampakancopy-revised_may2014.pdf
[36] Sagittarius Mines Inc. Tampakan Project Description. https://franciscansinternational.org/fileadmin/media/Business_and_HR/Statements/philippines_report_tampakancopyrevised_may2014.pdf (accessed August 2022).
[37] https://news.mongabay.com/2022/02/i-am-pro-mining-indigenous-opposition-to-philippine-mine-project-falters/ (accessed August 2022).

Kingking Copper-Gold Project. The Kingking Copper-Gold Project of St. Agustine Gold & Copper Ltd.[38] is located in the Municipality of Pantukan, Compostela Valley, near Davao City. The proposed open pit copper-gold mining project shall have an average throughput of 73,000 tons per day (mill and heap leach).

As per the project proponents, multi-volume documents needed to perfect the permit requirements of the MPSA have already been submitted to the DENR. The draft Environmental Impact Statement (EIS) was submitted to the Environmental Management Bureau (EMB) in February 2012, while the the Declaration of Mining Project Feasibility (DMPF), which includes the relocation plan for the project's affected people, was submitted to the MGB in May 2012). Moreover, endorsements required by the DMPF have already been obtained from the corresponding Local Government Units (LGU). (St. Agustine Copper-Gold Ltd., 2013)[39]

Silangan Copper-Gold project. The Silangan copper-gold mine project of Philex Mining Corp. is located in the province of Surigao del Norte. At a cost of development cost of $224 million and with total investments reaching $1.7 billion, the project is one of the biggest investments in Mindanao.

The project would create job opportunities for around 8,000 workers and generate ₱38 billion in government revenues throughout its 28-year mine life..[40]

Table 4. National Government/ LGU /Community share and revenue sources from mining projects

Operating			
OceanaGold	$320 million	₱2.7 billion Based on 2016 payments	₱2.3 billion Based on 2016 payments
Carmen Copper	$88 million (without mine development)	₱2.2 billion Based on 2016 payments	₱700 million Based on 2016 LGU payments
FCF Minerals	$149 million	₱1.3 billion Based on 2018 payments	₱340 million Based on 2018 LGU payments
Eramen Minerals	₱113 million	₱350 million Based on 2018 payments	₱5 million Based on 2018 payments
Prospective			
Tampakan	$5.9 billion	₱80 billion	
Kingking	$2 billion	₱18 billion	
Silangan	$1.7 billion	₱7.2 billion	

Source: EITI, MGB, author's computation

[38] The company is listed in the Toronto Stock Exchange (TSX)

[39] https://www.sagcmining.com/wp-content/uploads/2013/12/NI-43-101_King-king_Rev.0-10-28-13_final.pdf

[40] Philex's $224-m Silangan copper-gold project in Surigao gets support of LGUs (https://manilastandard.net/business/csr-mining/314214217/philexs-224-m-silangan-copper-gold-project-in-surigao-gets-support-of-lgus.html), accessed October 2022.

Socioeconomic and environmental implications

2.3 *Ecological integrity*

Development of minerals employing surface mining methods (paricularly open-pit mining) involve both landscape and ecological violations. Such ecological violations changes the living conditions on the territories of and adjactent the mining tenement, including drop in biological productivity and sharp decrease in environmental quality, affecting the flora, fauna, and human health of the community (Koščová, Hellmer, Anyona, and Gvozdkova. 2018). High demand for extracted minerals has led to unwarranted activities, which includes extraction beyond allowable amounts (Wang, et. al 2020), as well as operations in unauthorized or supposedly protected areas. Lifting the ban on open-pit mining in the country mandates companies to take initiatives for environmental protection; but on the other hand, perpetual risks to damages to the environment that negatively impacts sustainable development can still exist.

Mining activities pose various environmental risks depending on the scale of exploitation and this is magnified with the operations of mineral processing facilities. Environmental impacts of such activities include land subsidence, resource pollution, acid mine drainage, tailings spills, ang destruction of natural a landscape and ecosystems (Asr, et. al. 2019). Negative environmental effects of mining projects and processes range from destruction of forests to loss of biodiversity. It is mandatory for mining projects to adopt appropriate management practices to prevent long-term complications. Negative impacts of large-scale mining industries on resources of water, soil, air, and living organisms should not be neglected (Carvalho, 2017).

Large-scale mining, in general, affects most negatively the hydrosphere - not only to the water spaces in the vicinity of the tenement, but also to a distance of several tens of kilometers. Most impact on the atmosphere occur during the development stages involving blasting, excavating, and moving traffic. If proper remediation works in the area is done poorly or not done at all after completion of work, events such as blowing of dust and occurrence of stagnant aerodynamic zones will occur (Koščová 2018).

Cognizant of the need to assure that risk mitigation measures are in place, the Philippine Mining Act (RA 7942) ensured social and environmental safeguards prior, during, and after mining operations. It required companies to undergo environmental impact assessment (EIA) as precursor to the environmental compliance certificate (ECC). It mandated the formulation of the Annual Environmental Protection and Enhancement Program (EPEP), Final Mine Rehabilitation/Decommissioning Plan (FMR/DP), and Social Development and Management Plan (SDMP), and established the following funds: environmental trust fund, mine wastes and tailing fees, monitoring trust fund, rehabilitation cash fund, and safety and health programs, on top of other mandatory tax contributions at various government levels and across agencies.

However, there are still scenarios were implementation and grounding realities fall short of the ideal provisions and regulatory layers. Mining companies suffer from bureaucratic delays while stakeholders report workarounds and noncompliance.

Examples of ecological integrity concerns that still require mitigation or poses opportunities for resolutions are as follows:

- Disaster risks
- Natural resource depletion
- Watershed degradation leading to shortage of water supply

- Pollution, chemical toxicity, erosion
- Illegal use of explosives
- Contamination of water bodies
- Displacement of families
- Inequitable distribution of benefits, host vs adjacent and affected LGUs
- Illegal activities – mining operations, logging, peace and order concerns, leakages, compromised adjudication processes, risk to environmental officers and enforcers
- Safety and health, labor and work arrangements

And based on DENR audits of 2016, the following violations, which breeds such ecological concerns, still persist:

- Non submission of revised EPEP/FMRDP as required by amended ECC
- Evidence of soil erosion and lack of slope stabilization measures
- Run off not captured, discharges to nearby water bodies, causing siltation
- Partial compliance on water quality (groundwater and spring water quality)
- No accredited pollution control officer
- Poorly designed and located siltation ponds may not capture silt-laden run off during heavy rains
- Cut and uprooted trees without tree cutting permit
- Improper delineation contributes to weak attribution for mine impacts

DENR Department Administrative Order (DAO) No. 2017-10, the moratorium order against open-pit mining, seems a reaction of government to such realities feared to rehappen. The order cited "adverse impacts to the environment", "disasters…due to tailings spills associated with open pit mining", and "perpetual maintenance works that shall outlive the existence of mining companies."[41] Similar, DENR DAO 2021-40, the decision to lift the ban in December 2021, to revamp the economy following pandemic downturns is also another justifiable move reflecting the needs of the times. The order also needs to indicate that it specifically aims to revitalize the mining industry and establish environmental and safety parameters and criteria for surface mining methods.

To further augment DAO 2021-40 and other environmental laws related to the regulation of mining activities, in March 2022, then DENR Acting Secretary Jim Sampulna ordered the strengthening of measures to preserve terrestrial and marine biodiversity in mining operations, thru DENR DAO 2022-04, "Enhancing Biodiversity Conservation and Protection in Mining Operations." [42]

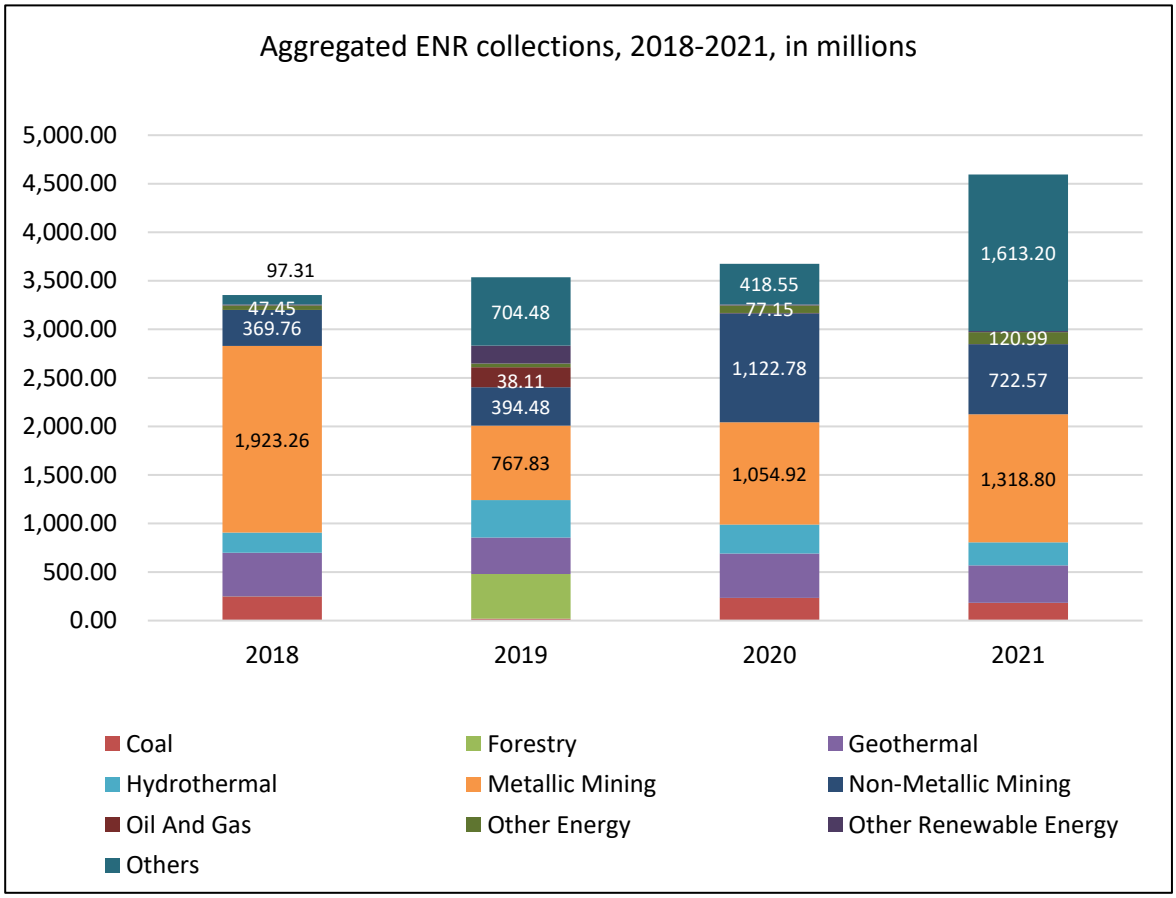
[41] DENR DAO 2017-10. Banning the open pit method of mining for copper, gold, silver, and complex ores in the country, page 2.

[42] DENR Issues Order To Ensure Biodiversity Protection In Mining Operations, (https://tinyurl.com/4xdxcsat), accessed September 2022.

2.4 *LGU revenue*

Department of Finance – Bureau of Local Government Finance (DOF-BLGF) collects environmental and natural resources data which reflects the payments of extractive industries to local governments and detailed accounts of shares from national wealth in compliance with PH-EITI annual reports.

Figure 17. Aggregated ENR collections, 2018-2021, in ₱ millions

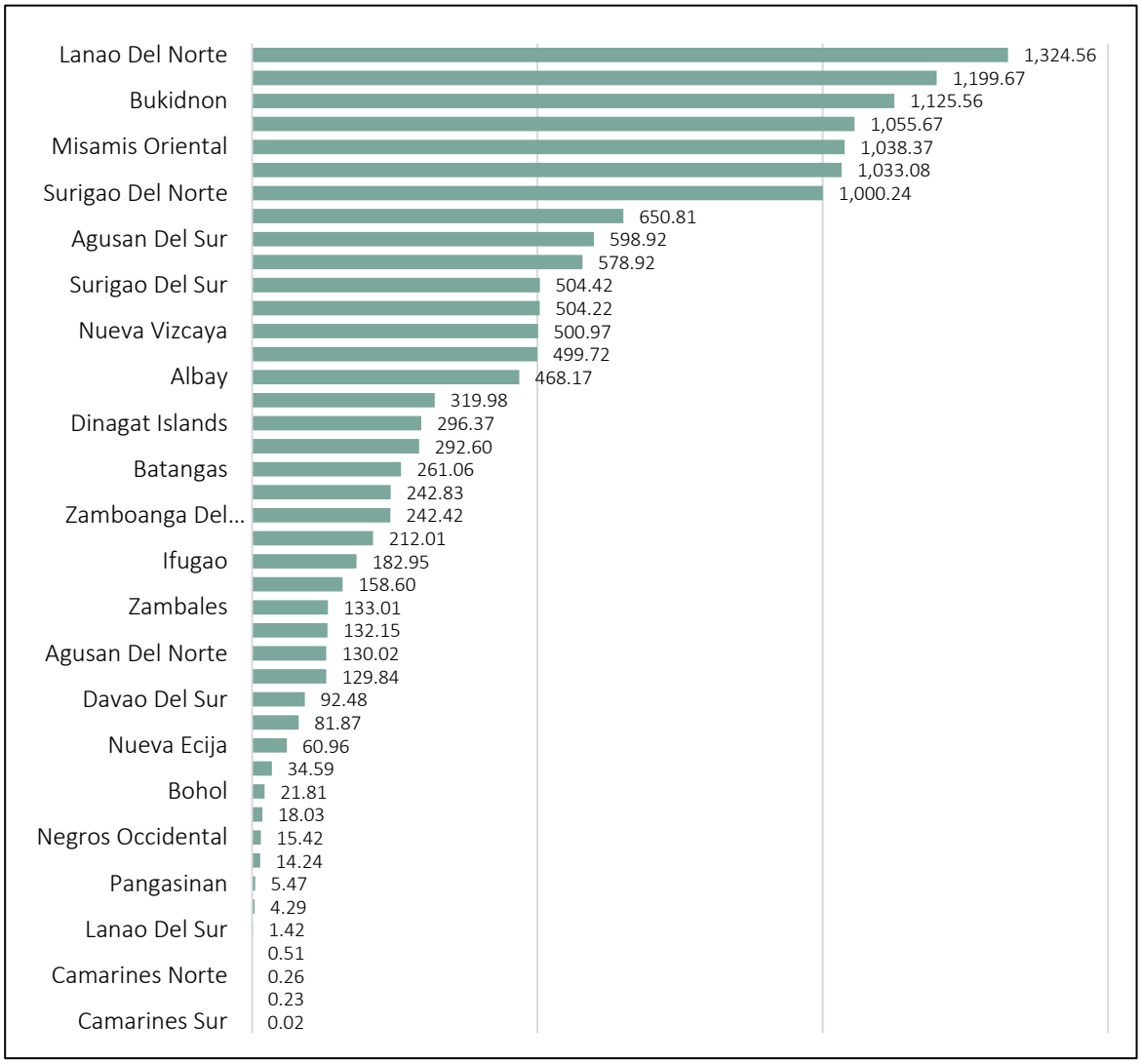


Source of basic data: DOF-BLGF

Metallic mining dominated in shares, but 2019 saw a significant dip in payments from the sector. The steep decline was not entirely attributable to the pandemic since it was the same year that prices went down. Non-metallic mining sees a threefold increase in 2020 and overtakes metallic mining by a margin, but the trend for the latter has started to pick up again. The lifting of the moratorium on new mineral agreements, and of the ban on the open-pit mining method is expected to generate more sales, profits, and government revenue. Shares should reflect the policy moves in 2022. (Figure 17)

Among the provinces, Lanao del Norte posted the highest ENR collections from 2018 to 2021 with an aggregate amount of PHP 1,324.56. Trailing after it are the provinces of Bukidnon, Misamis Oriental, and Surigao Del Norte. Region 5 poses the lowest figures despite being prime areas for small-scale mining. This adds indicative evidence of how much the government, both national and subnational, finds it difficult to capture the benefits of small-scale mining.

Figure 18. Total ENR collections, 2018-2021 in ₱ millions



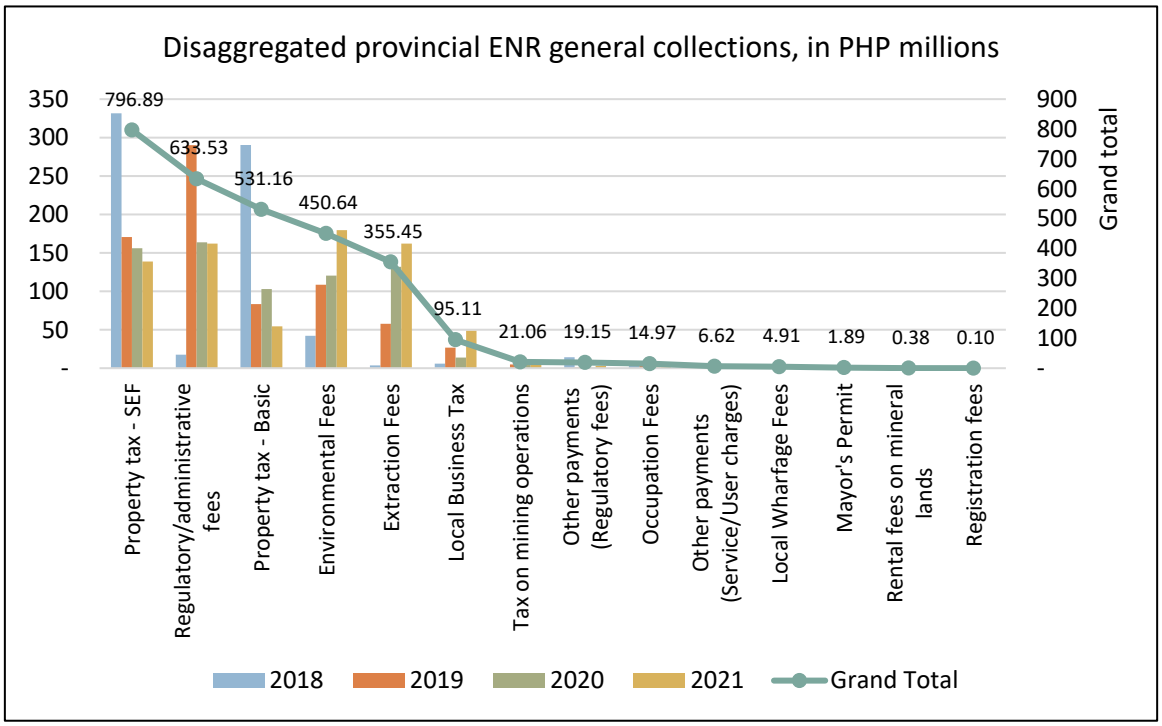
Source of basic data: DOF-BLGF

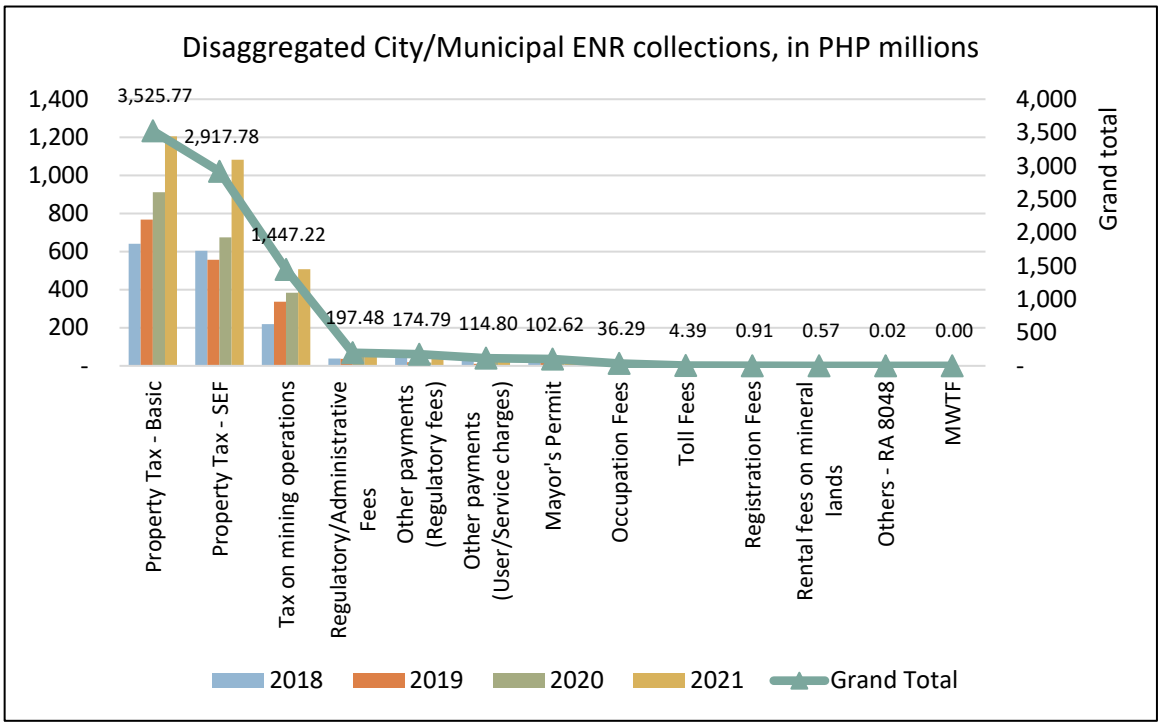
A comparison of provincial versus municipal/city breakdown in terms of fund source gives a picture of proportioned shares to each level. For instance, while both levels have property tax the highest, PLGUs charge more for environmental fees whereas this expenditure type does not appear in the graph for city/LGUs. High above on the chart is tax on mining operations which eventually becomes a source of conflict for multiple host communities (i.e. Kasibu and OceanaGold case). (Figure 19)

However, the ENR collections provided above merely reflect shares and payments from various sectors of extractive industries, and do not capture most mining outputs, particularly production and sales. Hence, it will not equal the gross value added (GVA)[43] figures under mining and quarrying reported by the MGB.

[43] GVA is an econometric measuring the contribution of a particular sector to the total value of all goods and services produced domestically (GDP). The PSA defines gross value added (GVA) as the value of output less the value of intermediate consumption (https://psa.gov.ph/statistics/technical-notes/node/167198). The GVA figures on Mining and Quarrying (MAQ) as reported by the MGB do not include crude oil and coal.

Figure 19. Comparison of disaggregated collections, 2018-2021, in ₱ millions

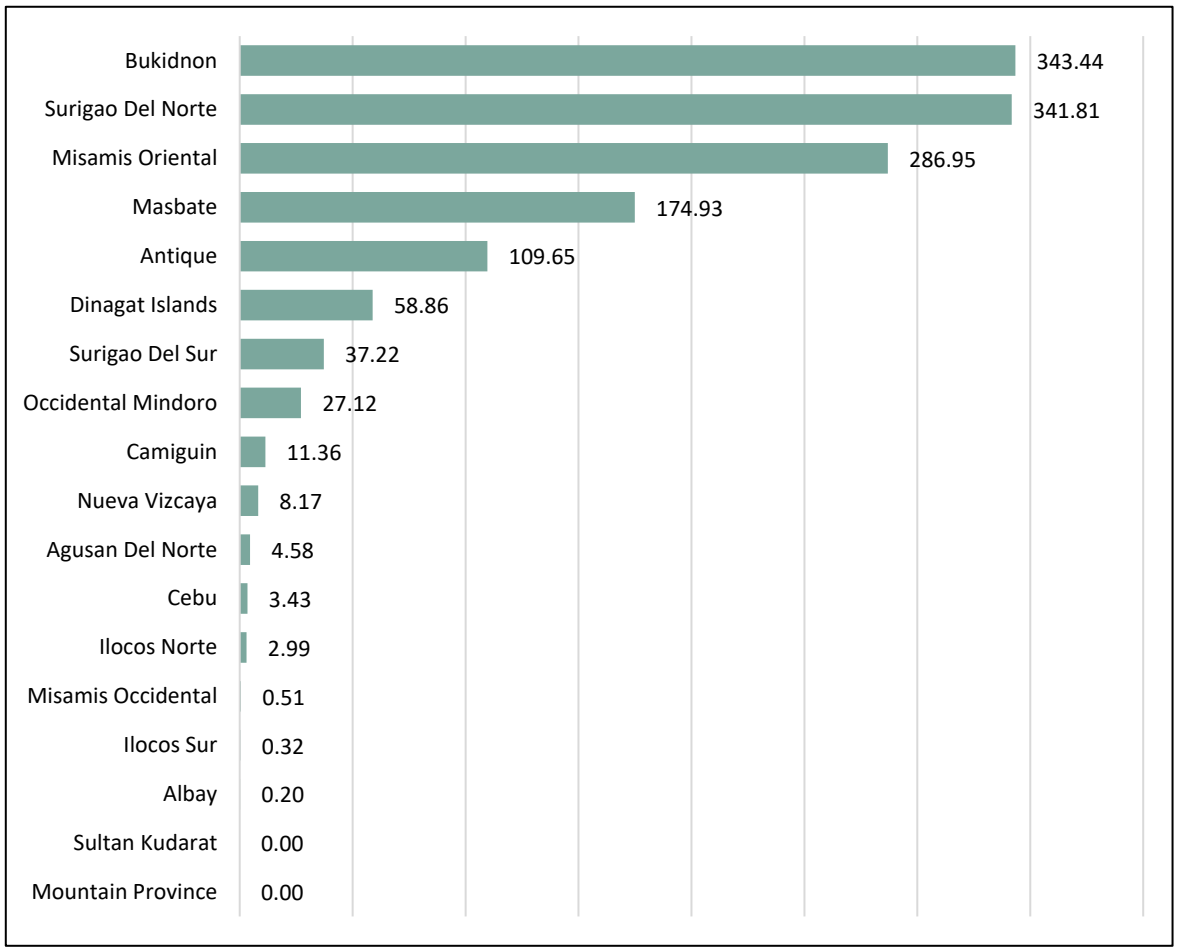




Source of basic data: DOF-BLGF

Interestingly, utilization reports do not tally with the aggregate collection. The dataset relies on the compliance of local treasurers to DOF requirements hence non-submission from LGUs reflect missing data. Bukidnon tops utilization in the next figure, followed by Surigao del Norte and Misamis Oriental. However, the figures are smaller compared to its allocation. (Figure 20)

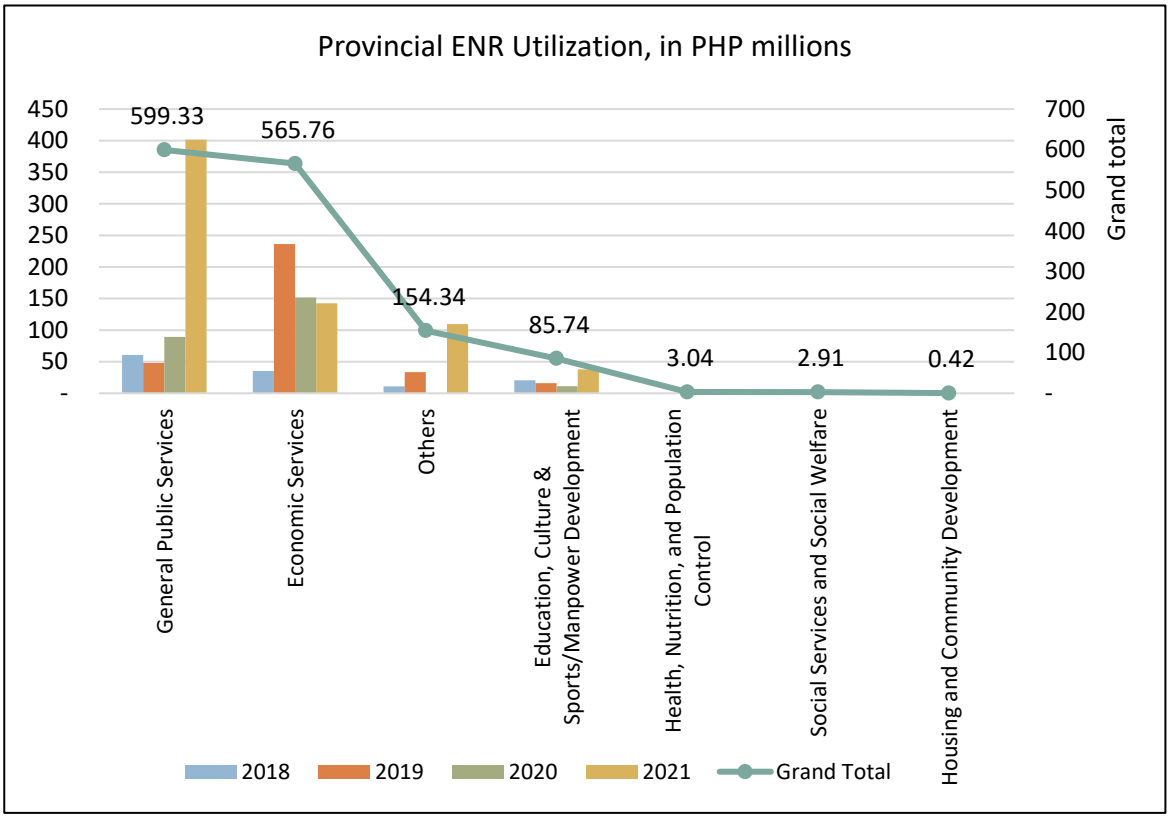
Figure 20. Total Provincial ENR Utilization, in ₱ millions

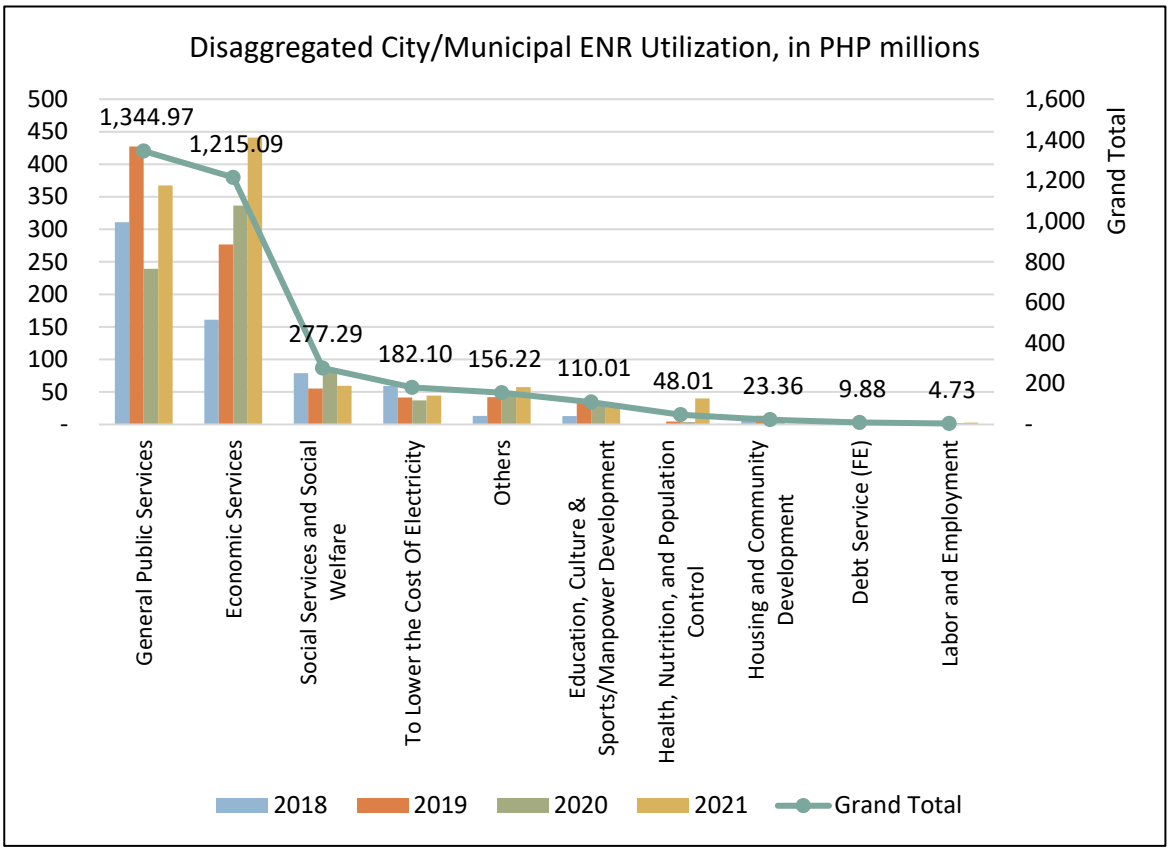


Source of basic data: DOF-BLGF

General public services and economic services dominate both provincial and municipal disaggregation. The latter tends to give more value to social services and social welfare whereas provincial LGUs have it below the line. Environmental rehabilitation is not shown in the typology given, but this opens up opportunities for streamlining. For instance, the funds collected could also be shared or redistributed to disaster risk reduction and management functions to mitigate the compounded risks and hazards from mining operations. (Figure 21)

Figure 21. Comparison of disaggregated utilization, 2018-2021, in ₱ millions





Source of basic data: DOF-BLGF

Moreover, several other sources capture environmental payments of mining operations. DOF-Bureau of Local Government Finance (BLGF) aggregates direct payments of extractives to LGUs. The reporting only started in 2018. While the cumulative total increased over the years, fluctuations abound LGUs with open pit mines, some receiving half of previous amount in 2019, while some increased tenfold.

Figure 22. ENR General Collections to LGUs with open pit mines, in PHP millions, 2018-2020

REGION	PROVINCE	LGU NAME	LGU TYPE	INCOME CLASS	2018	2019	2020
Region VII	Cebu	Toledo City	City	3rd		68.01	27.20
Region II	Nueva Vizcaya	Kasibu	Municipality	3rd	108.88	111.28	82.65
Region II	Nueva Vizcaya	Quezon	Municipality	4th	67.03	32.50	83.02
Region III	Zambales	Santa Cruz	Municipality	1st	2.00	2.17	3.29
Region V	Masbate	Aroroy	Municipality	1st	18.06	135.69	134.18
			Cumulative Total With Other LGUs		**2,555.26**	**2,646.13**	**2,971.81**

Source of basic data: DOF-BLGF, 2018-2020

PH-EITI also keeps track of all reports submitted by mining companies, albeit voluntarily, and received by government agencies. Reconciliation compares the two sources of figures and checks for differences. On the table below, mining company and government reports show different figures. It indicates non-alignment and non-harmonization of submissions and exposes the systemic weakness of traceability and accountability.

Improvements in the environmental landscape are small but instrumental in facilitating bigger, more concrete changes. So far, these include delegation of tree cutting permits to PENROs instead of regional DENR offices, thereby cutting the lengthy process into three months, and emerging best practices from companies which range from progressive rehabilitation[44], foraging for native seeds[45], and tissue culture and cloning for rehabilitation.

However, challenges on conflicting policy recommendations, arbitrary fund utilization,[46] fragmented permitting, absent benchmarking metrics, and noncentralized requests leave much to be desired in the industry, particularly when there are no regulatory changes or additions upon lifting of the ban. These lead to possibilities of exploring programmatic EIA for more comprehensive baseline assessments and integrated resource accounting, programmatic monitoring, and elevating the funds into a sovereign wealth fund to cover health, education, and social security of current and future generations to come.

[44] Relies on succession process, use of grass and pioneer species before proceeding to secondary/primary species.

[45] This process allows the companies to work through bureaucratic delays in procurement.

[46] EPEP utilization and environmental programs are arbitrary, depending on companies.

Table 5. Comparison of social and environmental expenditures between company and government, in millions, 2018

Company	Actual social and environmental expenditures	Project	Government	Variance
Carmen Copper Corporation	Environmental Trust Fund	0.00	0.00	0.00
	Annual EPEP	193.56	193.34	-0.22
	Final Mine Rehabilitation and/or Decommissioning Fund	0.00	0.00	0.00
	Mine wastes & Tailing fees	2.61	1.36	-1.25
	Monitoring Trust Fund	0.00	0.00	0.00
	Rehabilitation Cash Fund	0.00	0.00	0.00
	Safety and Health Programs	0.00	0.00	0.00
	Annual SDMP	***168.58***	***196.02***	***27.45***
	DHNC	131.21	147.02	15.81
	DMTG	13.73	19.60	5.88
	IEC	23.64	29.40	5.76
		364.75	**390.73**	**25.98**
FCF Minerals Corporation	Environmental Trust Fund	0.00	0.00	0.00
	Annual EPEP	406.65	406.34	-0.31
	Final Mine Rehabilitation and/or Decommissioning Fund	0.00	0.00	0.00
	Mine wastes & Tailing fees	0.00	0.09	0.09
	Monitoring Trust Fund	0.00	0.00	0.00
	Rehabilitation Cash Fund	0.00	0.00	0.00
	Safety and Health Programs	16.96	0.00	-16.96
	Annual SDMP	***14.68***	***33.18***	18.50
	DHNC	7.70	24.89	17.19
	DMTG	2.76	3.32	0.55
	IEC	4.22	4.98	0.76
		438.30	**439.61**	**1.32**
OceanaGold (Philippines), Inc.	Environmental Trust Fund	0.00	0.00	0.00
	Annual EPEP	1,143.21	208.51	-934.69
	Final Mine Rehabilitation and/or Decommissioning Fund	0.00	0.00	0.00
	Mine wastes & Tailing fees	0.33	0.19	-0.15
	Monitoring Trust Fund	2.24	2.73	0.48
	Rehabilitation Cash Fund	0.00	0.00	0.00
	Safety and Health Programs	54.10	0.00	-54.10
	Annual SDMP	***144.49***	***137.99***	-6.51
	DHNC	109.92	107.61	-2.31
	DMTG	16.39	12.15	-4.24

Table 5. Comparison of social and environmental expenditures between company and government, in millions, 2018

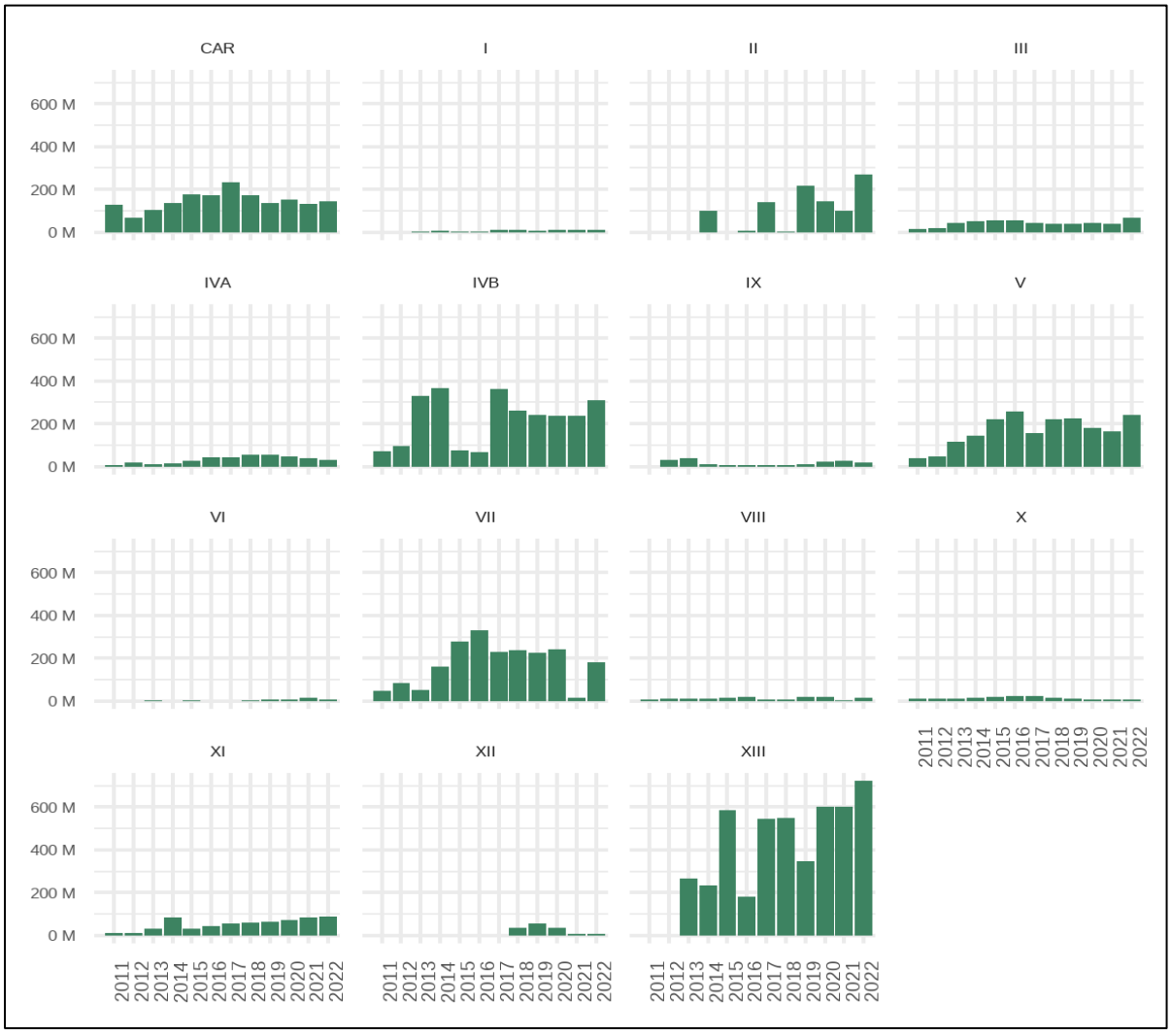
Company	Actual social and environmental expenditures	Project	Government	Variance
	IEC	18.19	18.22	0.04
		1,344.38	**349.41**	**-994.96**
Filminera Resources Corporation	Environmental Trust Fund	0.00	0.00	0.00
	Annual EPEP	97.15	97.15	0.00
	Final Mine Rehabilitation and/or Decommissioning Fund	0.00	0.00	0.00
	Mine wastes & Tailing fees	0.00	0.00	0.00
	Monitoring Trust Fund	0.00	0.00	0.00
	Rehabilitation Cash Fund	0.00	0.00	0.00
	Safety and Health Programs	26.92	0.00	-26.92
	Annual SDMP	***35.64***	***0.00***	***-35.64***
	DHNC	25.43	0.00	-25.43
	DMTG	5.29	0.00	-5.29
	IEC	4.93	0.00	-4.93
		159.72	**97.15**	**-62.57**
Eramen Minerals, Inc.	Environmental Trust Fund	0.00	0.00	0.00
	Annual EPEP	0.00	49.46	49.46
	Final Mine Rehabilitation and/or Decommissioning Fund	0.00	0.00	0.00
	Mine wastes & Tailing fees	0.00	0.00	0.00
	Monitoring Trust Fund	0.00	0.00	0.00
	Rehabilitation Cash Fund	0.00	0.00	0.00
	Safety and Health Programs	0.00	3.71	3.71
	Annual SDMP	***2.11***	***2.11***	0.00
	DHNC	1.38	1.38	0.00
	DMTG	0.34	0.34	0.00
	IEC	0.39	0.39	0.00
		2.11	**55.29**	**53.18**

Note: **Project amount** = amount reported by companies on PH-EITI; **Government agency data** = aggregate amount recorded/received by agencies from the specific company. These amounts include revenue streams and other taxes (paid of collected), mandatory expenditures, and funds; **EPEP** = Environmental Protection and Enhancement Program; **SDMP** = Social Development and Management Programs; **DHNC** = Development of Host and Neighboring Communities; **DMTG** = Development of Mining Technology and Geosciences; **IEC** = Information and Education Campaigns
Source: PH-EITI 2018

2.5 *Socioeconomic considerations*

The Philippine Mining Act of RA 7942 is the legal basis for mineral exploitation in the country, and it enshrines mandated social responsibilities towards host and neighboring communities and indigenous peoples. Conflicts can arise between companies and host communities when the interest of the latter is endangered due to the former's goals. Such are the cases of Tampakan, and two other copper-gold projects in Mindanao — Silangan and KingKing. Chamber of Mines project a vibrant regional economy from their operations, but environmental groups caution against pollution and degradation of major watersheds (IUCN 2022).

Table 6. Annual SDMP by region, 2011-2022



Source of basic data: DENR-MGB 2022

The mining policy also runs against other issuances like the Indigenous Peoples Rights Act (IPRA) of 1997. IPRA states that indigenous communities have priority rights within their ancestral domains; on the other hand, the Mining Act grants the state prerogative to also exploit natural resources on indigenous lands. IPRA also mandates that indigenous communities have to give their free, prior and informed consent (FPIC) when prospect projects have the potential to significantly affect their territory, which is the basis of their livelihoods and culture, and consequently lead to displacement and resettlement (Hamm et. al. 2013). Differences in both

acts yield to arising issues and concerns when projects involving indigenous people following their own development paths.

According to the DENR, the lifting of the ban is projected to lead to the continued development of 11 stalled projects, which are expected to increase annual mineral exports by ₱36 billion, contribute about ₱11 billion yearly in government revenue, and employ an estimated 22,880 workers, mostly living in impacted municipalities (PNA 2021). However, unfair benefit distribution, improper management of wealth, and corruption pervades local economy stimulus and income opportunities (Mancini and Sala 2018).

Companies are mandated by law to prepare social development and management programs (SDMP) for hosts and neighboring communities which are fixed for a period of five years. SDMP is delivered in-kind instead of monetary royalties and business taxes channeled to LGUs with the aim to provide employment and generate livelihood opportunities for residents in the area.

Region 13 hosts the most mining operations in the country thus it garners the highest SDMP values among regions, reaching as much as ₱600M in a year. Regions IVB, V, VII, and CAR trail behind Caraga while the rest are dwarfed in comparison.

Aggregate SDMP contribution comes up to ₱1,597.79 million between 2011 and 2022. Development of Host and Neighboring Communities (DHNC) take up the most funds, followed by Development of Mining Technology and Geosciences (DMTG), and Information and education campaigns (IEC). Recently however, DENR-MGB has released a memorandum on a National Unifying IEC in partnership with the Chamber of Mines to which companies are enjoined to set aside certain percentage for contributions. Both data and output remain to be reflected in such platforms.

Table 7. Aggregate SDMP contribute by region, in ₱ millions, 2011-2022

REGION	TOTAL (2011-2022)	DHNC	IEC	DMTG
CAR	1,758.10	1,315.35	233.71	209.04
I	71.24	51.21	13.38	6.65
II	978.41	724.37	144.42	109.62
III	507.70	387.59	70.86	49.25
IVA	391.87	289.73	56.29	45.85
IVB	2,663.39	2,106.70	341.58	215.11
V	2,005.30	1,473.59	318.21	213.50
VI	49.54	38.13	6.85	4.56
VII	2,078.93	1,662.22	229.35	187.36
VIII	147.05	113.61	19.19	14.25
IX	186.93	121.88	28.56	36.48
X	161.91	130.53	17.64	13.73
XI	634.85	491.58	85.82	57.45
XII	142.62	110.78	18.76	13.08
XIII	4,632.34	3,630.31	580.18	421.84
Total	**16,410.16**	**12,647.57**	**2,164.80**	**1,597.79**

Source: DENR-MGB 2022

IP royalties remain a murky discussion. Shares given to IPs are no longer monitored once given due to their right to self-govern. EITI figures show Region 13 as the highest receiver of IP royalties of ₱, followed by CAR and Region 4B, consistent with the SDMP grants.

However, it is noted that royalty shares are arbitrary over the years, with some regions receiving only once. While this can be attributed to the platform's self-reporting mechanism, it elevates the discussion of transparency, particularly for benefits geared towards the most vulnerable and marginalized of society. Further to this, only two out of five open pit mines gave IP shares in 2012 and 2013 with a cumulative amount of ₱ 86.35 million.

Table 8. IP royalty shares across region, in ₱ millions, 2012-2018

Region	2012	2013	2014	2015	2016	2017	2018	Grand Total
CAR	67.76	84.72	45.53				8.00	**206.01**
Region 2		29.00						**29.00**
Region 3								
Region 4B		31.90	69.27	12.62	1.72		54.38	**169.88**
Region 5								
Region 7								
Region 8		84.72						**84.72**
Region 9								
Region 10								
Region 11	25.77							**25.77**
Region 12								
Region 13	107.72	229.04	188.81	136.12	155.28		246.48	**1,063.45**
(blank)	57.35							**57.35**
Grand Total	**258.60**	**459.38**	**303.61**	**148.74**	**157.00**		**308.87**	**1,636.19**

Source: PH-EITI 2018

Small area estimates indicate a general reduction in poverty incidence of host LGUs with slight fluctuations over the years. While this is good, the relationship of mining operations and communities brings to light discussions on survival and sustainability of the area post-closure. Narratives on the ground describe high dependency on the operations, but capacity building, livelihood, and employment separate to the mine existence remain scarce. This results to the consequential ghost towns, defined as "collapsed communities" after mine closures (Keeling & Sandios 2017). (Table 9)

Table 9. Small area estimates of host LGUs with open pit mining operations

Company	LGU	Province	2006	2009	2012	2015	2018
FCF Minerals	Quezon	Nueva Vizcaya	18.5	16.6	21.0	13.3	14.8
Oceanagold	Kasibu	Nueva Vizcaya	15.8	13.6	22.8	17.8	21.7
Eramen Minerals	Santa Cruz	Zambales	18.2	18.7	18.9	23.7	9.6
Filminera	Aroroy	Masbate	49.0	45.5	43.3	41.8	37.3
Carmen Copper	Toledo	Cebu	34.3	31.5	18.9	21.9	17.2
TVI Resources	Bayog	Zamboanga del Sur	29.2	43.6	44.5	47.8	37.9

Source: PSA, various years

The low sustainability also gleans into weaknesses of alignment. Social programs and livelihood projects do not tap into local development plans despite SDMP's capacity to address a locality's urgent needs. The absent anchoring disconnects the flow of in-kind benefits and makes the intervention superficial. Some best practices on the ground exhibit strong lateral and vertical integration. Partnerships with national levels to piggyback on services and programs is a most notable effort.

The contribution of mining that reflects into the improvement and maintenance of a municipality's or city's competitiveness is another metric that must be monitored to assess the impact of mining activities in a given locality. The Cities and Municipalities Competitiveness Index program of the Department of Trade and Industry ranks cities and municipalities in their performance across five pillars: Economic Dynamism, Government Efficiency, Infrastructure, Resiliency, and Innovation.[47]

Table 10 presents select municipalities with active large-scale surface mining operations. Rankings may not be as critical as monitoring one's index over the years.

Table 10. Contribution to Local Economy: Evidence From DTI-CMC Index

LGU	PROVINCE	2019	2020	2021	2022
Aroroy	Masbate	31.99	35.34	30.98	27.62
Bataraza	Palawan	33.52	37.59	33.03	27.65
Bayog	Zamboanga del Sur	36.47	39.02	27.77	31.27
Kasibu	Nueva Vizcaya	39.13	40.62	34.65	33.16
Quezon	Nueva Vizcaya	35.17	36.14	29.96	29.87
Santa Cruz	Zambales	35.22	35.01	28.04	22.91
Toledo	Cebu	36.59	34.84	31.03	29.11

Source: DTI-CMCI 2022

While data and information exist to quantify and assess the contribution of mining activities to social welfare within the host and impacted communities, there still is no single repository or database that compiles all relevant information used for timely and sounder decision making, i.e. complete accounting and fair distribution of wealth.

Other critical information missing is closure guidelines and appropriate metrics to better measure and compare the conditions of host communities over the years.

2.6 *Indigenous Peoples*

RA 7942 requires proposed mining operations within ancestral lands of indigenous peoples and cultural communities (IPs/ICCs) to undergo free, prior, and informed consent (FPIC). This critical process is an addition to other processes and permits like environmental compliance certificate (ECC). The same law also mandates royalty payment to consenting IPs/ICCs.

However, leakages and conflicts arise in the processes despite the provision of legal basis and guidelines. Consent varies between majority of the community and the indigenous political structure (i.e. council of elders). Institutional realities on the ground particularly limit the level of advocacy towards, and capacities and leverage of indigenous groups against extractive companies (Domingo & Manejar 2020).

[47] Yearly rankings can be viewed here https://cmci.dti.gov.ph/

IPs/ICCs have persisted resistance against some major mining operations, most notably OceanaGold, citing dire pollution consequences to their water sources. Some 4,000 IPs reportedly live in Didipio, Kasibu, Nueva Vizcaya, but their CADT applications were ultimately not approved, owing to their migrant status.

On the other hand, untraceable royalty shares become a cause for concern. While the law states that these will be placed in a "trust fund for the socioeconomic well-being of the indigenous cultural community", government is not the repository for such. Rather, it recognizes the IPs rights to self-determination as enshrined in IPRA. What current datasets reflect instead are voluntary submissions of mining corporations to EITI with aggregate transfer figures. It could be inferred that bigger amounts are given to indigenous peoples, but benefit distribution is skewed.

Lifting the moratorium facilitates higher benefits, but it also elevates the need to ensure the same tenets of accountability, traceability, and welfare in the IP/ICC sector.

2.7 *Sustainable development*

Sustainable development defines that it is necessary to integrate environmental policies and development strategies to sustain current and future human needs, improve quality of life, and protect the environment (Asr et al., 2019). Considering possible impacts of large-scale mining methods on local communities, the decision to lift the ban on open-pit mining in the Philippines might not be right from the view of sustainable development, according to political scientist Ruth R. Lusterio-Rico, adding that the economic benefits that could be gained now would not outweigh the consequences on the environment for the future generations, and that resumption of open-pit mining leads to greater environmental destruction for indigenous peoples and local residents of host communities (Jocoson 2022).

Without the contribution of minerals and metals which fuel the manufacturing sector and create jobs and value added along the supply chains of products, many of the Sustainable Development Goals (SDGs) set by the United Nations for 2030 could not be reached; however at the same time, production of mineral raw materials can yield to negative environmental and social impacts, restricting the achievement of other SDGs such as climate action, good health, and clean water (Mancini and Sala 2018).

2.8 *Value addition*

For the base metal nickel, the Philippines ranks 5th globally in terms of reserves. Nickeliferous minerals occur in Philippine laterite ores, together with cobalt, aluminum, manganese, and even rare earths. These are the same values that are considered as critical metals primarily due to their applications as important elements to energy storage components as batteries.

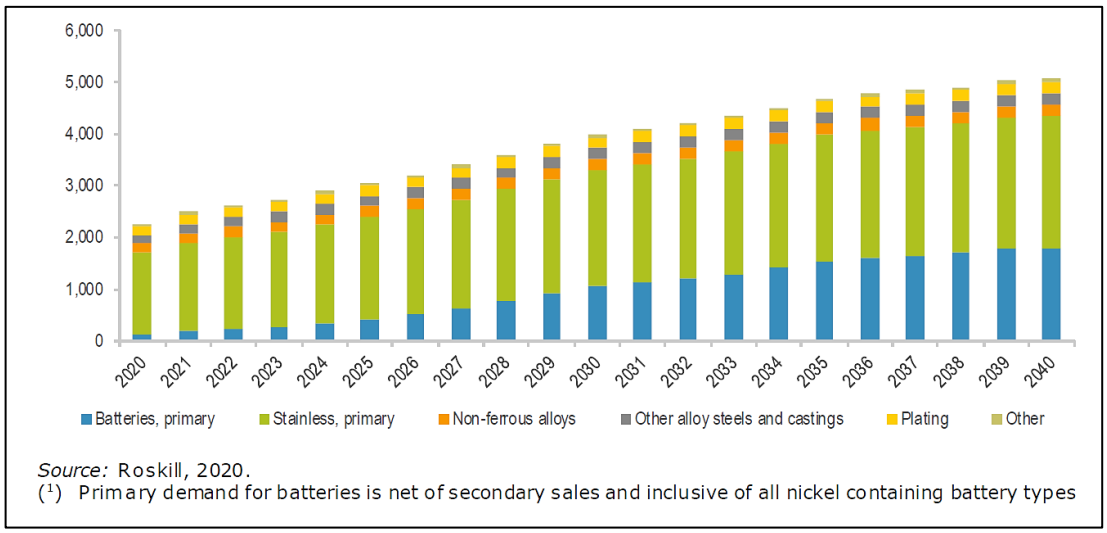
As the world transitions to cleaner energy options, it is expected that demand for these critical minerals will continue to be on the rise. Current global nickel production is at around 2.5 million tons, and 0.125 million is to satisfy demand for battery production applications. By 2040, nickel demand for battery production alone is estimated to reach over 1.8 million MT. (Figure 23)

In 2021, the Philippines exported 0.37 million MT of nickel, of which 80% is in the form of direct shipping ore (DSO) or unprocessed ore, mostly to China. At that production level, the Philippines is the second largest supplier of nickel (

Figure **24**). Current price range of our nickeliferous ore with typical assays of 1% nickel, 30% iron, 0.1% cobalt, 40ppm scandium, and other extractable values, is being priced within $40-$65 per MT, FOB Philippine port. While as processed concentrate, ore value can reach over $400 per MT. The opportunity to produce higher value products from nickel ore is obvious.

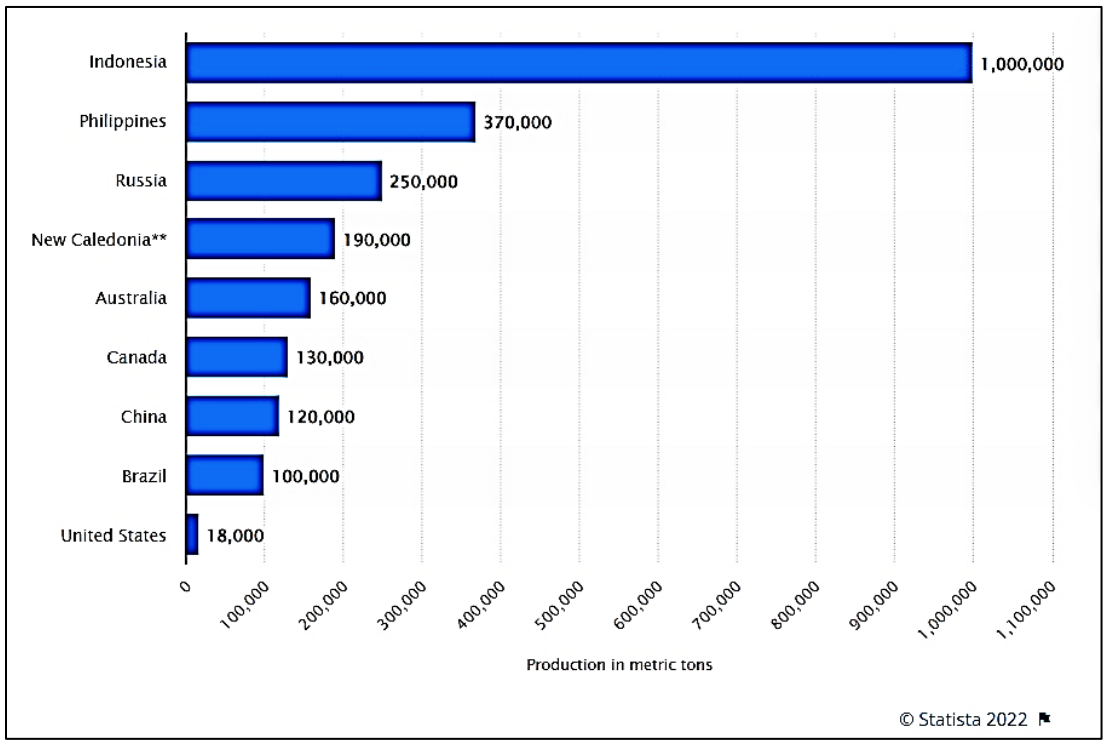
Nickeliferous laterite is mined using surface mining methods.

Figure 23. Nickel demand forecast to 2040, in kiloTons



Source: Roskill, 2020.
(1) Primary demand for batteries is net of secondary sales and inclusive of all nickel containing battery types

Figure 24. Global nickel supply, 2021 in metric tons



3. Ways forward

Two general directions:

- Establish sustainability indicators and monitoring and evaluation platforms
- Optimize benefits from open pit mines, while addressing ecological integrity concerns

3.1 *Establish sustainability indicators and monitoring and evaluation platforms*

Sustainability indicators are more like performance targets or "scores" that stakeholders can aim at accomplishing within pre-identified milestones or audit/review periods. In the same manner that we have safety targets of zero lost time incidents, acceptable mill/metal recoveries, effluent quality targets, mine/mill/tailings storage facility design codes and standards, etc., more has to be established following global best practices for sustainability metrics and indicator establishment. These metrics need to be clearly defined, acceptable to all, and measurable.

Specifically, we need metrics and performance indicators for:

- Ecological integrity, i.e. watershed management, forest cover, water resource thresholds, water bodies, biodiversity, mineral wealth
- Public health and safety, i.e. disaster risk, heavy metal toxicity, worker safety, women and child laborer
- Abandoned mines or post mining rehabilitation requirements, i.e., bonds, penalties, responsibility limits by government vs mining company
- Post-mining community level indicators, i.e., local economy competitiveness, resiliency, public health
- Baseline and endline monitoring for in-course and post-mining impact assessments
- Periodic monitoring, reporting and public disclosure of mining firm operations
- Benefits-Cost Analysis or alternatively, as evaluation criteria to assess public reactions to mining projects
- Prioritizing activities, studies, projects, based on capacities of regulators to assess such projects.
- Full benchmarking

Correspondingly, monitoring procedures of performance metrics that are mutually acceptable to all stakeholders as basis for compliance/non-compliance has to be standardized.

Mining companies relay the longstanding problem of comparing biodiversity metrics to mining impacts since there is no existing baseline. DENR's recent DAO 2022-04 addresses this problem in the context of biodiversity protection. The issuance essentially mandates mining companies to conduct baseline assessment with defined metrics at all stages of the mining cycle, from exploration to development to operations and to decommissioning. Companies are further required to monitor and manage the area ten years after mine closure in observance of delayed environmental impacts. The study lauds this policy direction and suggests evaluation of gaps after an implementation period. The same efforts should be spilled over to socioeconomic aspects and civic engagement since these components are not necessarily fiscal in nature.

Monitoring leaves much to be desired. The review of practices and impacts should be done systematically and continuously. MICC reviews should be sustained and complemented with DENR's audit process. Findings, however, should be validated on the ground with host, neighboring, and outside communities where impacts still traverse.

Mining monitoring teams fail to capture effects of mining at the most critical times (natural disasters) due to limitations in access and weather. Cases in points are water quality and progressive rehab status monitoring. Functionality of sedimentation pond designs are put to test during rainy days and not during the dry season. Progressive rehab should also be monitored more frequently than the usual MMT quarterly reporting times. Thus, possibilities for remote monitoring emerge that can fill gaps in timeliness of data acquisition; monitoring stations can be placed in strategic locations, can withstand hazards, and can act as early warning systems. This goes to say that if government regulators do not have capacity to validate what proponents are saying, or monitor the impact of such projects to the environmental and social welfare od the communities, then such projects may be less prioritized than projects that government can fully regulate.

Moreover, the conduct of complete benefit-cost analyses per mining project or programmatically per industry, nationally or regionally, must be required prior to approving/disapproving mining projects. E.O. 79[48] signed by the late President Benigno Aquino III in July 2012 also mandated the DENR to conduct Full-Cost Benefit Analysis Studies of the mining industry.

In some countries, an alternative to the BCA is the Multiple Criteria Analyses (MCA), where instead of trying to quantify environmental and social impact in monetary figures, a set of evaluation criteria or performance indicators are established to assess public reactions to a project.

Examples of BCAs or MCAs done in other countries:

- A Multiple Account Benefit-Cost Analysis of Coal Mining in Alberta. https://papers.ssrn.com/sol3/papers.cfm?-abstract_id=3924693
- Costs and Benefits of a mining project in Rönnbäck – A CBA on the social and environmental impacts of mining. https://tinyurl.com/36j4ht6e
- Cost Benefit Analysis of the Mining Sector in Karamoja, Uganda. https://tinyurl.com/bdd4m589

Furthermore, we need to include the conduct of full-benchmarking activities as part of mining performance reviews. This means we do not just establish sustainability performance indicators then track and identify best performers per specific aspects of mining operations, but we need to know what enables or motivates these operations to perform well. Full benchmarking with the objective of improving mining performance must also not just include mining industry players as inspirations can be found from across several industries, i.e. human resource management from the service industries, community relations and environmental performance from the energy industries, etc.

[48] Executive Order No. 79. 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. Signed by President Benigno Aquino III on July 6, 2012.

3.2 *Optimize benefits from open pit mines, while addressing ecological integrity concerns*

In parallel, in order to optimize benefits reaped from mining activities, not only from surface or open-pit mines, we also need to:

- **Develop and maintain digital monitoring and evaluation platforms for the above for easy access and analysis**
- **Strengthen transparency platforms including monitoring and evaluation standards and metrics**

  In parallel to the establishment of appropriate performance metrics and indicators, we need to be able to store, access, and monitor performance data in a most timely and transparent manner. A common digital platform is ideal, to be populated and accessed by all relevant agencies. EITI's strategic position for transparency and monitoring platforms can be used as a template. EITI, working within the DOF, can even be appointed part of the agencies managing such platforms. Opportunities to improve governance in areas such as appropriate allocation and utilization of revenues from mining activities can be decided on for optimal impact, be it for national, regional, provincial, or municipal applications.

- **Augment government oversight for non-metallics:**
  In 2021, in terms of production value, the non-metallics mining sector surpasses those produced by open-pit metallic mining operations (Figure 8). As surface mines, non-metallic mining poses similar issues to the environmental and social welfare of host communities. Non-metallic mining activities include gravel and sand activities, of which the licenses to operate are issued directly by LGUs and considerable revenue is paid directly to the LGUs. This is a very fragmented sector with small-scale players that are not as visible, in terms of economic, environmental, and social impact as how large-scale metallic mining is being regulated.

- **Institute more appropriate plans that includes assurance of perpetual rehab and maintenance fund resources for decommissioned or closed / foreclosed mines.**
- **Improve cost accountability arrangement including expense coverage for proposal assessment or validation, monitoring and evaluation, and post-mining rehabilitation.**

  One can only assume and project the time it would take to rehabilitate abandoned or decommissioned mines and bring it to a state that is expected and needed by host communities. But the law specifies only a 10-year duration to estimate the cost of implementing a project's Final Mine Rehabilitation/Decommissioning Plan (FMR/DP) and does not include strategies that can assure that the post-mining use of the site is truly beneficial and sustainable in the long term. Neither the local communities nor the government should be burdened during any stage of the mining project.

- **Institute programmatic review of adjacent / clustered mining projects**

  A programmatic review of mining projects that considers adjacent or clustered projects allows for a more complete benefit-cost or multiple criteria analyses to base sounder decisions in justifying or disapproving projects.

- **Strengthen institutional capacity to validate project Environmental Impact Studies (EIS), i.e., expert hydrogeologists, TSF engineers, socio-economists, etc.**

  There are several studies and assessment documents that regulators must be able to validate prior to its acceptance as the impact of mining projects can be felt over a very wide area, i.e. baselines related to water resource (surface and groundwater), erosion rates and corresponding sediment settling pond designs, TSF designs per global best practices or acceptable standards, etc.

- **Augment mining fiscal regime for appropriate benefit sharing (fair share of State, LGUs, communities).**
- **Reinvestment and programming of mining revenues towards human capital and ecological integrity PAPs.**

  While contract areas reach a maximum of 5,000 hectares, the actual active mine and disturbed areas are just a fraction of this total. In many cases, the contract area sits at the boundaries of multiple provinces of municipalities/cities and the criteria for government sharing (factoring percentages of total area and population where the contract area is located) does not reflect where development funds are impacted or needed most. Take for example the case of communities where the mine and administrative offices are located at muncipalty(ies)/province(s) different from the mill and tailings storage facilities, and that the latter operations are mere cost centers of the project. More revenue goes to the LGUs with communities carrying less risk.

- **Shorten adjudication process and increase penalties and community compensation for damages.**

  The $7 billion compensation for the 2019 tailings dam collapse in Brazil was decided in just over 25 months, while less than $1 million compensation decision for Marcopper tailings dam breach in Marinduque that happened in 1991 was just decided on last May 2022.

- **Adapt more accurate policy definitions for open-pit mining, large/small-scale mining, covering both metallic and non-metallic mineral extraction**
- **Study the feasibility of deferring certain projects in anticipation of emerging technologies that can hurdle environmental challenges.**

  In scenarios where government has revenue options for certain regions, provinces, or communities that can counter development opportunities or whatever environmental and social welfare benefits of proposed mining projects, deferring approval of a mining project can be an option while:

  - Allowing technology to improve to better mitigate environmental and social risks
  - Enabling government to attain the level of capability and capacity required to better understand, quantify, or validate the environmental and social risks involved and proper governance platforms are in place.

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