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Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST - PCIEERD)

PCIEERD POLICY BRIEF

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GREEN MINING TECHNOLOGY FOR THE SMALL-SCALE MINING INDUSTRY



- ❖ The Philippines is fifth of the most mineral-rich countries in gold, copper, nickel, and chromite and ranks 22nd in the world's gold producing countries in 2017.
- ❖ Mining industry in the Philippines generated and contributed billions of pesos to the national economy in terms of local taxes, fees and royalties.
- ❖ Small-scale mining industry comprises of 75% of the country's gold production. However, it has been dubbed as heavy user of mercury and cyanide substances known to be highly lethal to living creatures especially when exposed with high dosage.
- ❖ The government must initiate policies, programs and appropriate technologies to promote responsible small-scale mining and aid small-scale mining communities.

The Philippines is endowed with rich mineral resources. It is considered the home to one of the largest copper-gold deposits in the world. According to the Mines and Geosciences Bureau (MGB), the Philippines is fifth on the most mineral rich country in gold, copper, nickel, and chromite. The country is also ranked as the 22nd in the World's Largest Gold Producing Countries in 2017 released by GFMS Gold Survey. These abounding mineral resources escalated and developed the mining industry over the years.

"High levels of mercury and cyanide concentrations were found in the hair and blood samples of the small-scale miners and other affected people in Diwalwal, Compostela Valley and Itogon, Benguet"

The mining industry in the Philippines provides producing livelihood in the countryside and contributes to attaining further economic growth. In 2017, the gross value added to mining and quarrying improved by 5.4% (PSA, 2018). The amount of national and local taxes, fees and royalties that the minerals industry generated and contributed to the Philippine economy in 2017 amounts to 25.54 billion pesos. It generated an estimated 204,000 jobs in 2017. It is conservatively estimated that for every job in the industry, about four (4) indirect jobs are generated in the upstream and downstream sectors (MGB, 2017).

The mining industry is classified into two categories- small scale and large scale. Large-scale mining involves the use of heavy and highly mechanized equipment. On the other hand, small-scale mining uses low-end technology or minimal machinery often relying on basic indigenous techniques and heavy physical labor.

Governed by R.A. 7076 also known as People's Small-scale Mining Act of 1991, it rationalizes viable small-scale mining activities in order to generate more employment opportunities and provide an equitable sharing of the nation's wealth and natural resources.

The small-scale mining industry comprises of thousands of workers and their families which contribute a sizable share to the economy, especially on the local front. This industry contributes up to 75% of the country's gold production according to the data released by the MGB (2017). Owing to its significant contribution to gold production and to the economy, different policies and regulatory mechanisms have been created to alleviate its negative impacts.

The mining industry has been dubbed as heavy users of mercury and cyanide substances known to be highly lethal to living creatures, especially when exposed with high dosage. Citing from the environmental and health studies released by the Artisanal Gold Council and Libertas Academica, it proved that if these chemicals are spilled into the oceans, it could cause poisoning to the land and water resources, as well as, to the people or those affected areas.

Exposure to mercury and cyanide can bring imminent danger to the nervous, respiratory, digestive and immune system of a person. Direct exposure to mercury can cause severe damage to kidney and lungs while indirect exposure causes significant neurological disorders and reduced immunity. Globally, 14-19 million workers are employed as Artisanal Small-scale Gold Mining (ASGM) and based on human biomonitoring data, between 25% and 33% of these miners or about 3.3-6.5 million globally suffer from moderate chronic metallic mercury vapor intoxication (CMMVI). Mercury, according to the study of World Health Organization (WHO), is considered as one of the top 10 chemicals or groups of chemicals of major public health concern.

A result of the study conducted in Diwalwal, Compostela Valley and Itogon, Benguet showed that high levels of mercury and cyanide concentrations were found in the hair and blood samples of the small-scale miners and other affected people (Leung, A., 2016).



This environmental battle and health issues prompted the government to impose stricter regulations. The Department of Environment and Natural Resources (DENR) issued the Department Administrative Order (DAO) No. 2015-03, which completely banned the use of mercury, hydraulicking, or compressor mining, and limited the extraction of small-scale mining to just three minerals namely: gold, silver, and chromite. This is also to transform the small-scale mining operations to a more responsible sector. However, the capability of the regulatory agencies must be strengthened with adequate manpower to monitor the implementation of related policies in order to mitigate the adverse impacts of small-scale mining. Appropriate technologies for small scale mining operation must also be introduced to the industry.

Various techniques developed from Research and Development (R&D) can be used to move the small-scale mining from environmentally and socially exploitative industry to one that uses environment-friendly technologies without compromising productivity and safety.

The Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) provides support for R&D programs/projects, transfer and commercialization of technologies to improve productivity of priority industries which includes the mining industry.

Integrated Gold-Copper Mineral Processing Plant: The Case of Itogon, Benguet

One of the projects supported by the Council is the development of eco-friendly technology for gold-copper extraction. It is being implemented by the Department of Science and Technology – Cordillera Autonomous Region (DOST-CAR) in collaboration with the University of the Philippines, Diliman (UPD).



Fig. 2. Flotation cells and gravity concentrators

To demonstrate effectiveness of this technology, several Integrated Gold-Copper Mineral Processing Pilot Plant were put up. This is the first-ever project in the Philippines that aims to solve the long-time problem on the use of cyanide and mercury in mining that leads to poisoning of the environment. These plants are eco-friendly and do not use typically-used chemicals in mining extraction process such as mercury and cyanide. Instead, it uses an “enhanced gravity concentration-flotation-extraction” process. This process ensures that waste materials from these plants are safe and non-pollutant.

However, there were several challenges encountered by the project team as well as the beneficiaries in the implementation of the project which need the attention of all stakeholders.

Issues and Challenges

Among the problems were:

1. Difficulty in Securing Necessary Permits

Before a Small-Scale Mining Contract can be issued, the mining site should be declared as “Minahang Bayan” in accordance with R.A. 7076 otherwise, the operation will be deemed illegal. The Benguet Mining Federation had difficulty in securing the required permits due to different mineral land classifications in Benguet and other technical requirements such as the Pre-prior Informed Consent (PPIC) which is mandated by the Infra Law or R.A. 8371.

2. Opposition from Big Mining Companies

Publishing of the application for the declaration of “Minahang Bayan” permit is required by providing all stakeholders and affected sectors of the notices for operation. With this, the Regional MGB received protests from big mining companies since most of the areas in Itogon, Benguet are covered by them. These protests cause delays in the processing and issuance of permits.

3. Acceptance of the local miners to use the Technology

The small-scale miners were hesitant to use the technology and opted to go back to the traditional method due to poor recovery of gold from ore using the technology. The flotation process can only be used for high grade ore but for lower grade ore, the traditional process is more appropriate to use as manifested in the parallel testing conducted by the Federation and UP Diliman of which 25.11% gold recovered through cyanidation as compared to 7.39% using flotation.

4. Lack of trained personnel to operate the Pilot Plant

The Implementing Agency trained personnel to operate the plant. However, most of the trained personnel now work with other small-scale mining operators.

Policy Recommendations

The intention of the project is to address the detrimental effects of cyanide and mercury to the health of the small-scale miners and the mining community and to minimize the harmful environmental impacts of cyanidation and amalgamation. The introduction of innovative processes could be the best option to provide means of livelihood in a safe and legitimate way.

However, these noble objectives cannot be achieved without the support of the government and the different sectors and stakeholders. Given the result of this study, the following are recommended:

- ❖ **Proactive stance of the regulatory agencies such as the Provincial Mining Regulatory Board (PMRB) in the issuance of the required permits for application for the declaration of the “Minahang Bayan” to legalize the operation of the small-scale mining.**
- ❖ **Involvement of the Local Government Units particularly in regulating small-scale mining operations, and in monitoring and addressing environmental degradation and conflicting land uses.**
- ❖ **Harmonize related provisions of the mining laws and regulations and allocate resources/funds for monitoring and evaluating implementation of the laws/regulations. Part of the revenue generated from mining should be used to clean up the environment around the mining sites.**
- ❖ **Conduct of Information, Education and Communication campaigns and capacity building efforts among stakeholders.**
- ❖ **Encouragement to engage stakeholders in the promotion of economically-sustainable and technology viable small-scale mining industry through participatory approach in project implementation.**

- ❖ **Strengthen community-NGO-Government Agencies collaboration to ensure monitoring of the small-scale mining activities and measure the technology’s effectiveness.**



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POLICY BRIEF highlights PCIEERD’s stance on policy issues related to industry, energy and emerging technology sectors through the coordination of the Policy Unit and the PCIEERD Technical Working Group for Policy Review and Development

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