

Scientists keeping an eye on mining



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Small-scale mining plays an important economic role in rural areas of the Philippines. This type of mining does not make use of large industrial machinery, does not mine too deep into the earth, and produces fewer than 50,000 metric tons of ore annually. In provincial areas, small-scale mining is essential to providing locals with jobs and a source of income, which helps develop smaller towns and drives economic growth. It also helps us make use of the country's rich natural resources in a manner that is less destructive than industrial mining operations.

However, even small-scale mining can be dangerous not only to the miners but also to the environment and to people living in nearby areas. This is why there are—while still pushing for the development of small-scale mining operations—policies in place to protect the environment, the miners, and any other people who may be affected.

Republic Act No. 7076, also known as the People's Small-Scale Mining Act, is the central policy that governs small-scale mining. The law promotes small-scale mining by helping miners secure the land they need, registering small-scale miners and mining operations, and giving them avenues to sell their products.

This law also dictates that the Department of Environment and Natural Resources (DENR) should oversee and regulate the environmental effects of

small-scale mining. One important aspect of this supervision is the regulation of the use of toxic substances in mining operations and placing legal limits on the mineral contents of wastewater produced by such operations. Under the law, the use of mercury is completely prohibited in these operations.

Science gives us a way to help monitor these mining operations and ensure that they are staying within legal limits. Two scientists, Jessie O. Samaniego (of the Philippine Nuclear Research Institute Department of Science and Technology and the University of the Philippines Diliman College of Engineering) and Maria Antonia N. Tanchuling (of the University of the Philippines Diliman College of Engineering), are contributing to efforts to monitor small-scale mining operations to make sure they are not causing undue harm to the environment, their workers, or other people. Their work was recently published in the [Philippine Journal of Science](#).

The scientists examined a small-scale gold mining operation in Paracale, Camarines Norte, and took water samples from several of the operation's facilities while operations were ongoing, as well as from nearby bodies of water including a creek and the Luklukan River. The researchers tested the water samples for several heavy metals—arsenic, barium, cadmium, lead, and mercury—all of which can cause harm to people, plants, and animals exposed to them.



The ball mill facility of the mining operation, where mercury is used to process gold ore
One of the sites from where the scientists collected water

Alarming, the scientists found that the wastewater sample showed increased levels of every heavy metal that was tested for, except for barium. The levels of these metals found in the water samples are above the legal limits defined by the DENR, meaning the operation must legally treat this wastewater. The scientists also found extremely high levels of mercury in the water, and this proves that the mining operation has been illegally using mercury.

While their methodology may be simple, the scientists' work is an important example of how science and policy can work together to protect the well-being of the environment and people. Policy can help set goals and boundaries that help drive economic growth, cultural development, or the creation of new technologies, and science can help give us ways to meet these goals.

The scientists' work has brought attention to environmental and health issues. The small-scale mining operation's use of mercury and the increased levels of heavy metals in its wastewater pose a serious threat to its surroundings.

Mercury contaminating bodies of water such as the creek near the mining facilities and the nearby Luklukan river can affect fishes and other inhabitants. Fishes that ingest mercury not only can die but also can poison animals such as birds or even humans eating them. Humans who drink river water

laced with mercury or eat fishes living in these waters can develop kidney, lung, and neurological problems. If pregnant women are exposed, exposure can result in developmental problems for the child. And while there are many risks for people near the mining facilities, there are even more for the people who actually work in those facilities.

Striking a balance between providing livelihood opportunities and economic growth for local communities and protecting people's health and the environment can be tricky. Luckily the scientists' work gives us a lot to go on. For example, many environmental issues can be addressed in an appropriate wastewater treatment plan. The use of mercury can also be eliminated by newer, safer methods of mining.

REFERENCE

Samaniego JO, Tanchuling MN. Physico-chemical characteristics of wastewater from a ball mill facility in small-scale gold mining area of Paracale, Camarines Norte, Philippines. *Philipp J Sci* 2018; 147:343–56.

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