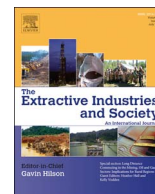




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## Viewpoint

## Teaching artisanal miners about mercury pollution using songs

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## ABSTRACT

This article argues that poor policies are heavily responsible for the mercury pollution problem in the artisanal and small-scale gold mining sector. It condemns governments and the futile regulations in place to ban mercury in the sector. The emphasis should rather be on implementing educational initiatives capable of highlighting a better way forward for miners and other community members. In addition, permanent technical assistance is crucially needed to foster sustainable implementation of clean processing techniques. Humor is an effective way to engage miners, including parodies stressing the health impacts of mercury. The article shares some of these parodies.

### 1. Introduction: education versus regulations

Mercury pollution has become a major area of focus for the United Nations. The organization's most recent undertaking in this area is the Minamata Convention, a global treaty endorsed by 128 countries in October, 2013. It was conceived by officials at the United Nations Environment Programme (UNEP) and seeks to eliminate the production and trade of mercury products, with a view to reducing anthropogenic emissions and releases of mercury to the environment (UNEP, 2017). The accord, which has been ratified by 69 countries to date, including Canada, entered into force on August 16, 2017. Some countries that use and consume large amounts of mercury, due particularly to the existence of numerous artisanal gold mining operations, such as Colombia, Kenya and Zimbabwe, have not yet ratified the Convention. However, in other countries that have already signed and ratified the accord, such as Peru and Ecuador, a lack of coherent policies for tackling this imminent problem undermines the potential for real change.

The Convention has established sound objectives to control the imports and exports of mercury, as well as implementing a more transparent mercury trading process to curb mercury use by artisanal and small-scale gold mining, the world's largest consumer of the metal. It has been estimated that artisanal gold mining operations release more than 1400 t of mercury/a into the environment, through both the discharge of mercury-contaminated tailings and the emissions generated from the burning of gold amalgams (Veiga et al., 2014a). Although the Convention is a well-intentioned document, there are many loopholes that can be exploited by signatory countries. It begins with the ambiguity of the Convention's language, in particular its use of the words

*wherever feasible* in the specification of certain Articles. For example, Article 7, which outlines the objectives regarding Artisanal and Small-scale Gold Mining (ASGM), states that "Each Party that has artisanal and small-scale gold mining and processing subject to this Article within its territory shall take steps to reduce, and *where feasible* eliminate, the use of mercury and mercury compounds in, and the emissions and releases to the environment of mercury from, such mining and processing". Another example is the fact that Canada, which had already signed the Convention in 2013 (only ratifying it on April 7, 2017), was somehow able to import 175 t of metallic mercury in 2014 from Malaysia and then export it to Cuba, where it was likely passed on to other developing countries in Central and South America, principally for use in the ASGM sector (Veiga and Marshall, 2016).

But what are the real implications for reducing mercury pollution upon implementation of the Minamata Convention? Are developing countries prepared (or even proposing solutions) to deal with thousands of artisanal gold miners working in rural areas, who have few if any economic alternatives? Some countries such as Brazil, Indonesia, Colombia and Ecuador have established laws prohibiting the use of mercury at artisanal mine sites. In Ecuador, the Organic Law (Article 17), implemented on June 13, 2013, prohibits the use of mercury in any mining operation. However, in 2015, processing centers in Portovelo, Ecuador were producing approximately 7–8 t/annum of gold and using 5.08 t of mercury/a, from which there were combined losses of 691 kg/a with the tailings and 945 kg/a to the atmosphere via evaporation from the burning of amalgams (Gonçalves et al., 2017). In May 2017, the Ecuadorian police arrested 21 "illegal" miners in Portovelo (La Republica, 2017) and there have been reports that many miners continue to be arrested, due to allegations they are using mercury in their

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operations (A. Kiefer, Mercer University – personal communication). As a result, an increasing trend has been observed in both Ecuador and Colombia of miners burning amalgams at their home behind closed doors, which poses a threat to families and neighbors.

It is clear that the authorities, before establishing laws to promote a transition from mercury to other cleaner methods, have not yet exploited the best argument to convince miners to change their practices: that amalgamation only achieves relatively poor gold recovery (from 30 to 50%). Rather than focusing on environmental and health issues, the promise of improved gold production would appear to be the most practical way of convincing them to adopt more efficient processing methods, such as gravity or flotation concentration. Moreover, while individual miners are being penalized for using mercury in these countries, mercury traders and the owners of gold processing centers continue to be allowed to operate freely, often under the protection of permits (Veiga et al., 2014b).

Authorities in developing countries where artisanal mining is widespread generally have very little knowledge of mercury chemistry, toxicity, or relevant environmental and health impacts, let alone alternative techniques. Subsequently, artisanal miners are typically demonized for the inadequacies of the resident Ministry of Mines, large-scale mining companies and the rest of society. International agencies play a supporting role by providing assistance to governments, through the implementation of short-term “band-aid” solutions. But despite their involvement, no sustainable solution, neither technical, economic, social nor environmental, has ever been successfully implemented on a large scale. The only way to foster real, sustainable change is through educating both artisanal miners and government authorities. Large-scale mining companies could also be a part of this equation by helping to foster coexistence with artisanal miners working on their concessions.

As most artisanal gold miners are unlicensed, a legalization platform will be needed in order to ensure that efforts to combat mercury pollution are indeed effective. However, the formalization of artisanal miners, which is widely promoted by governments around the world, has been and will continue to be a colossal failure, due to excessive bureaucracy associated with registration, no training, inadequate technical assistance, shortage of financial capital, and a lack of available mineral titles for prospective licensees (Hilson et al., 2017; Veiga et al., 2017). In the case of mercury pollution, many training projects focus on micro-miners who produce insignificant amounts of gold per day, as the larger polluters are generally more difficult to approach and convince to change their practices. It is apparent that donor agencies, together with regulatory bodies in developing countries, lack the resources to tackle this problem effectively. The most important lesson learned from these failures is that formalization cannot exist without education (Marshall and Veiga, 2017). Even if formalization processes in developing countries around the world were simple enough for any artisanal miner to navigate, most mining areas are now in the hands of large mining companies or other local entrepreneurs (Hilson and Hilson, 2015; Nyame and Blocher, 2010). Therefore, unless government agencies, artisanal miners and companies all sit down together at the same table to begin negotiations for a fair solution, the problem will not be easy to resolve. However, *a priori*, all of these actors must have a basic understanding of the needs, motivations and skills of the artisanal mine operator, as sustainable solutions cannot be decided upon without a long period of consultation, dialogue and education.

Educating artisanal miners about the impacts of mercury can be challenging. However, it is possible to simplify messages and make them more accessible using street theater, shows, pamphlets, posters and radio interviews (McDaniels et al., 2010), or any other popular communication method that is easy to understand. For example, the use of music for training purposes provides the instructor with an alternative vehicle to convey complex information and put students at ease (Veiga et al., 2015). Kulkarni (2011) has suggested that the use of music in educating people about technical issues has a calming effect that

facilitates comprehension and improves student performance.

This article shares examples of two songs that have already been used to teach artisanal miners, students, authorities and trainers in developing countries about the impacts of mercury pollution. The songs are parodies of known songs, whereby the lyrics are modified to direct a simple message about mercury in a humorous fashion as a way to engage the audience. When translating to another language, it is important to use colloquialisms that are appropriate for the setting. By using informal language doused with humor, these songs are effective at putting artisanal miners and their trainers at ease, while at the same time highlighting the dangers of mercury pollution.

## 2. “I Just Called to Say Don’t Mine it”

The song below is a parody of Stevie Wonder’s massive hit, “I Just Called to Say I Love You”, released in 1984. In this parody, a trainer is disappointed with an artisanal gold miner, due to his lack of concern about land degradation and environmental pollution, non-existent site remediation and the indiscriminate dumping of mercury into drainage systems. In fact, residual mercury associated with tailings discharged into streams is the main vehicle by which mercury becomes mobilized in fluvial environments. Adsorbed on to particulate matter, mercury can be deposited far downstream. In Ecuador, mercury from mining effluents has reportedly been detected 160 km downstream from gold processing centers (Gonçalves et al., 2017). This parody also explores the allusion of many artisanal gold miners that they will become rich quickly, while at the same time showing a complete disregard for any regulatory compliance or environmental ethics. When performed to Colombian, Peruvian and Ecuadorian artisanal miners, the lyrics were translated and modified to incorporate local context. The English lyrics are as follows:

*One day you said, you found some gold  
Up in the North and the site was far and cold  
You said you’ll be.... a millionaire  
In this remote site no inspector will be there  
You’ll make a pit, holes everywhere  
Waste in the river and you said nobody cares  
You’ll be so rich.... so will be your family  
And nobody will see where you’ll dump your mercury  
You just called to say you’ll mine it  
You just called to say that you don’t care  
You just called to say you’ll mine the gold  
And you said that with nobody you’re gonna share  
I didn’t celebrate, I was quite surprised  
A little later you will pay a higher price  
I don’t believe.... you’re gonna tell  
Environmentalists they all should go to hell  
Mining is not a game, or a bordello  
Mining must change, I have learned this with Marcello  
I can help you with technology  
And mercury-free one day your plant is gonna be  
I just called to say don’t mine it  
I just called to say how much I care  
If you mine and don’t reclaim it*

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