Journal of Cleaner Production 90 (2015) 244–252

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Artisanal gold mining in Antioquia, Colombia: a successful case of mercury reduction

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ARTICLE INFO

Article history:
Received 27 May 2014
Received in revised form
6 November 2014
Accepted 9 November 2014
Available online 15 November 2014

Keywords:
Mercury pollution
Artisanal mining
Gold
Colombia
Antioquia

ABSTRACT

Five municipalities in Antioquia, Colombia, with population of 162,000 inhabitants, were the world's largest mercury polluter from artisanal gold mining in 2010, releasing and emitting an average of 92 (73–110) tonnes/a of mercury. UNIDO – United Nations Industrial Development Organization joined forces with the Government of Antioquia, National University of Colombia and University of British Columbia to start The Colombia Mercury Project to reduce mercury use and losses.[1] The actions consisted of assessment of mercury losses, health monitoring and awareness campaign. This was supported by technical demonstrations of methods to reduce the amount of mercury used in the processing centres ("entables"). Enhanced enforcement of existing local and federal regulations accompanied these activities. Demonstrations of cleaner methods to miners and owners of "entables" generated 39 new mercury-free processing plants. The presence of the company Gran Colombia Gold buying ore from the miners at a fair price also contributed considerably to observed reductions in mercury use. Mercury entering in the whole ore amalgamation in the 323 "entables" was reduced on average 43% from 2010 levels. In 2013, mercury losses were reduced by 63%, resulting in **46 to 70 tonnes/a**, less mercury entering the environment than in 2010.

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1. Artisanal gold mining and mercury

Artisanal mining is characterized by rudimentary extraction methods (Veiga, 1997). In more than 70 developing countries, there are 30 million individuals extracting more than 30 different minerals artisanally (Veiga et al., 2014a). As the price of gold tripled in the last 10 years, the number of artisanal gold miners increased substantially in the rural areas all over the world. Around 16 million people are directly involved in this activity, producing 380–450 tonnes of gold annually (Seccatore et al., 2014), and releasing and emitting 1400 tonnes/a of mercury to land, water, and air (UNEP, 2013a). According to UNEP (2013b), artisanal gold mining is the largest source of anthropogenic mercury emissions (727 tonnes/a).

Jønsson et al. (2013) suggest possible explanations for the fact that artisanal miners continue to use mercury haphazardly and underrate its health impacts, and discuss possible ways to facilitate mercury reduction. While Clifford (2014) acknowledges that there are some positive signs that academics and policymakers are reaching a new consensus on how to tackle the issue more effectively, he advocates more 'humanistic' reconceptualisations of approaches to mercury pollution in the sector. Spiegel et al. (2014) outline possible ways to address intertwined technological, political and socio-economic challenges facing marginalized populations in mining communities. They stress the need for international donors and national policymakers proactively engage—rather than vilify—artisanal miners, and for gender-sensitive grassroots empowerment initiatives. These analyses all underscore the need for fundamentally reforming national mining policy priorities, recognizing marginalized mining communities' resource rights and tackling livelihood insecurity. Formalization of artisanal miners is not enough to guarantee cleaner procedures. Demonstration of simple techniques can obtain extraordinary results if the miners are engaged in all steps of the educational process (Veiga et al., 2014b).

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[1] Mercury loss = emission (to air) + release (to water and land).

http://dx.doi.org/10.1016/j.jclepro.2014.11.032
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2. Artisanal gold miners in Antioquia

Despite the regulations on artisanal mining in Colombia, the sector has a large number of informal and illegal miners due to poor law enforcement in rural areas. According to Guiza and Aristizabal (2013), 87% of 4134 Colombian gold mining operations are illegal and 95% of all the gold mines have no environmental permit. In 2013, Colombia officially produced 55.74 tonnes of gold (America Economia, 2014). The artisanal and small-scale sector produced 72% of the country's gold or around 40 tonnes/a of gold in which 66% were illegal (Guiza, 2013). According to the Ministry of Energy and Mines there are 1526 gold mines in the Department of Antioquia, of which 186 have legal mineral titles (12.2%) which is much higher than the national formalization (legalization of informal and illegal miners) level. The Colombian Government's efforts to formalize artisanal miners resulted in a modest 1% of formalization by 2008 in the whole country, though formality rates are also low in other productive industries in the Colombian economy. About 60% of the population, not including those involved in agricultural activities, is employed in the informal sector (ILO, 2012). About 37.2% (Index Mundi, 2012) of Colombia's 47 million residents live below the national poverty line and 25.5% of Colombians live in rural areas, (Trading Economics, 2012), where poverty is most prevalent. In 2009, 64% of the rural population or more than 7.7 million people were poor, and 2 million lived in extreme poverty (IFAD, 2012).

Guiza and Aristizabal (2013) highlighted the discrepancy between the official numbers of artisanal gold miners in Colombia and the field observations. From 2009 to 2011, the Government of Colombia conducted a Mining Census in twenty-three Departments (Colombian Provinces) and concluded that there are approximately 50,000 artisanal gold miners in the country whereas Cordy et al. (2011) estimated around 200,000 miners, based on data from neighbouring countries and the gold production observed in the field. The higher estimate was corroborated by the Secretary of Mines of Antioquia (Veiga et al., 2014a).

In the Department of Antioquia (Fig. 1), it is estimated that there are 15,000 to 30,000 artisanal gold miners, most of them are located in the Lower Cauca River and in the Northeast region of Antioquia where gold has been mined since pre-colonial times (Veiga, 2010). The majority of Antioquia's gold production comes from 5 municipalities: Segovia, Remedios, Zaragoza, El Bagre and Nechi with population of 162,000 inhabitants. In 1852, the company, Frontino Gold Mine was established in the town of Segovia and in the 19th century, Colombia became the largest gold producer in the world (Kline, 2012). Today, Segovia (population: 37,000) is still the largest gold-producing town in the country due to the presence of Gran Colombia Gold (GCG), a Canadian-based company, which began operations in 2011. Gran Colombia owns the largest underground gold mine in Colombia and has 21,400 ha of mineral titles in the region. The company estimated a reserve of 5 million troy ounces (oz) of gold at an average production grade of 9.3 g/t in which around 110,000 oz (3.42 tonnes) of Au were produced in 2013, with plans to increase production, in a near future, to 200,000 oz (6.22 tonnes). Since 2005, the company works in

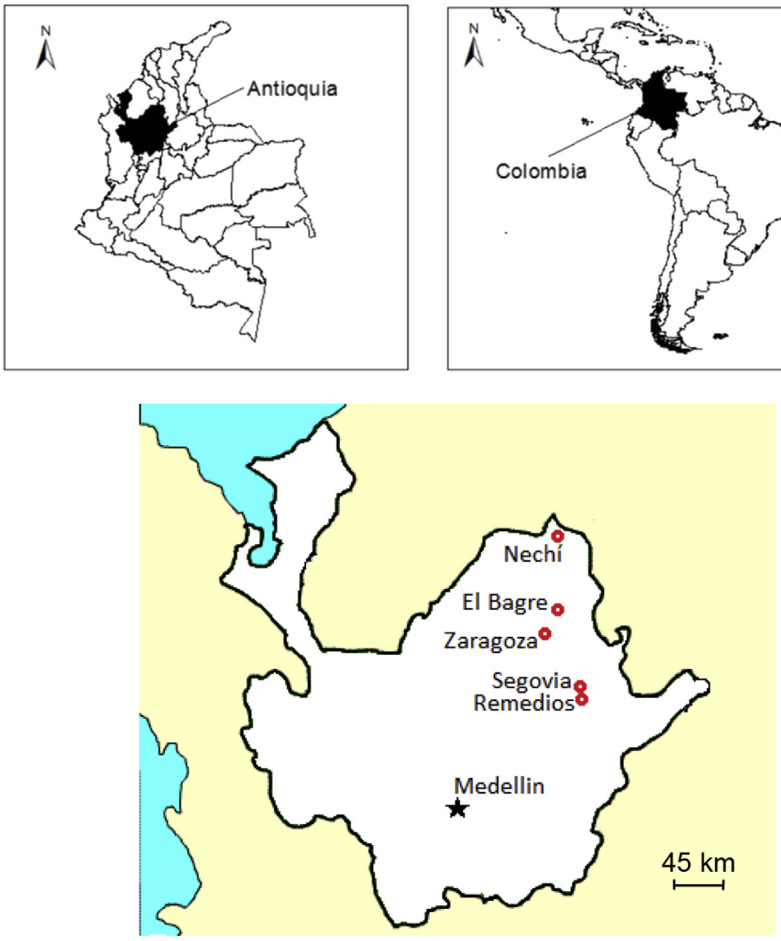

Fig. 1. Map of the Department of Antioquia indicating the 5 municipalities considered in this study.

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