Mercury Trade and Supply in Artisanal and Small-Scale Gold Mining in Colombia

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Table of Contents

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Preface

This report was written in June, July, and August, 2018 based on the review of literature, documentary research, interviews, and fieldwork. Its goal is to present an approach to the current situation of mercury trade and supply for a small team working in artisanal gold mining in a region of Colombia. This report identifies knowledge gaps and provides recommendations for both those charged with developing policies as well as stakeholders.

It is important to note that during the last five years, the Colombian State has invested approximately fifteen million US dollars in the process of eliminating mercury in small-scale mining. Nonetheless, there is still a lot to be done to reach the goals.

Colnodo team
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Mercury trade and supply in Artisanal and Small-scale Gold Mining sites in Colombia

1. Background

The history of gold extraction in Colombia can be traced to Colonial times. The areas of gold extraction today are the same as those under the Spanish rule. Forms of exploitation have varied very minimally.

> *Since the founding of Santa María la Antigua del Darién in the north of the territory of Chocó, the first Spanish colony on the mainland, expeditions were organized in order to "pacify the land and extract the large amount of gold existing in its mines," and "submit the indigenous people who had raised up and fled" to the mountains and Barbacoas: "….which since the first discovery of this mainland has been a famous province rich in gold and gem mines that the native people used as ornamentation as well as pearls from its coast. It is also famous for an important sanctuary called Dabaybe. This sanctuary is said to have a great quantity of gold jewels as offerings placed by the native inhabitants from the surrounded regions both in the sanctuary and in burials. At the risk of sounding fantastic, some of the ancient burials opened up by the Spaniards are said to have contained between ten and twelve thousand pesos worth of jewellery. For this reason, this population was coveted by many Spanish commanders" (Mendoza, 1605, pp. 85-86).*

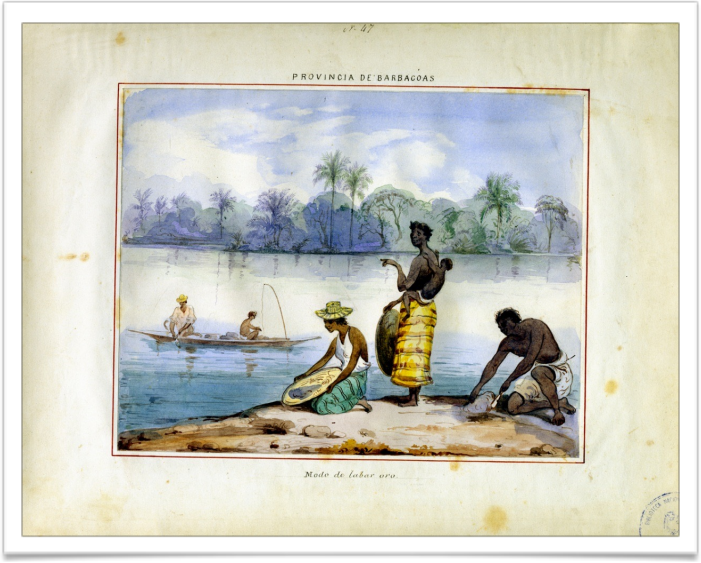


Figure 1. Gold panning in Choco recorded in painting circ.1605

Gold extraction in Colombia is linked to its history and triggered conflict even before the arrival of the Spaniards.

The problem of mercury contamination related to gold extraction in Colombia was recognized more than thirty years ago. Since then activities have been carried out to reduce its impact. For instance, in 1988 the Nariño Autonomous Regional Corporation (Corporación Autónoma Regional de Nariño) with support from the German Corporation for Technical Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit/GTZ GmbH) promoted the use of retorts to reduce mercury emissions caused by gold mining.

The experience was replicated in the Autonomous Corporations of Chocó, Amazonia, Cauca Valley, and Cauca. The use of retorts is still promoted in order to reduce mercury emissions in artisanal small-scale mining in Santander with resources from the Environmental Compensation Fund (Fondo de Compensación Ambiental). The first national inventory of mercury sources was created in 2009 (a joint effort between the Ministry of the Environment and the University of Antioquia).

In Colombia, more than 80 percent of the gold production comes from artisanal small-scale mining, and although it is not produced in legal mines, it becomes legalized through the Single-Window of Foreign Trade (Ventanilla Única de Comercio Exterior/ VUCE), administered by the Ministry of Foreign Trade.

Source: Banco de la República, Ministerio de Minas y Energía, Minercol, Ingeominas (2004-2011), ANM (2012-2016).
Note: Data updated until December, 2016.

Figure 2. Gold Production in Colombia 1996-2016 (in tons)

Even though Colombia has made efforts to reduce the contamination produced by mercury use in small-scale mining, the contamination persists.

When Colombia started the process to gain admission into the Organization for Economic Cooperation and Development (OECD), it was invited to evaluate and review its standards and foster the use of the best practices employed in the OECD, evaluate and review the standards applied in industrial processes in order to improve them, and implement the OECD's best practices in Colombia. Since then, a series of activities aimed at improving these aspects were set up and mercury contamination was considered a priority.

Political Constitution of Colombia

Article 332. *The State owns the subsoil and non-renewable natural resources, without prejudice to the rights acquired and perfected according to the pre-existing laws.*

In Colombia, the State owns the subsoil and non-renewable natural resources (Political Constitution, Article 332 of 1991). This means that minerals, metals, oil and other resources present in the subsoil are a public good. That is why the State is the only one that can grant permission to exploit these resources to individuals or companies that comply with the requirements established by law.

Act 1658 was passed on July 13, 2013. It states, *"This act establishes provisions for mercury trade and use in different industrial activities in the country. It sets the requirements and incentives to reduce and eliminate mercury trade and use. It also stipulates other provisions."* Its Article 3 stipulates that mercury use throughout the country, in industrial and productive processes shall be eliminated in no more than ten (10) years and in the case of mining within a maximum of five (5) years. The deadline for the elimination of mercury use in mining was July, 2018. Therefore, mercury use in gold mining is currently banned in Colombia.

In order for Act 1658 issued in 2013 to come into effect, its Article 4 stipulates the obligation for the Ministry of the Environment and Sustainable Development to regulate the Registration of Mercury Users. This obligation was established through resolution 565 issued in 2016 entitled "For the Establishment of Requirements and Procedures for the Registration of Mercury Users (Registro de Usuarios de Mercurio/ RUM) of the Mining Sector," issued by the Ministry of the Environment and Sustainable Development (MADS by its acronym in Spanish).[1]

[1] *See* http://www.ideam.gov.co/web/contaminacion-y-calidad-ambiental/registro-de-usuarios-de-mercurio

Registration is carried out gradually under the Environmental Information System (Sistema de Información Ambiental) administered by the Institute of Hydrology, Meteorology and Environmental Studies (Instituto de Hidrología, Meteorología y Estudios Ambientales/IDEAM). It started with the mining sector in Colombia and the system has registered 104,497 miners.[2] About **102,096 of the miners were reported as gold and gemstone miners.**

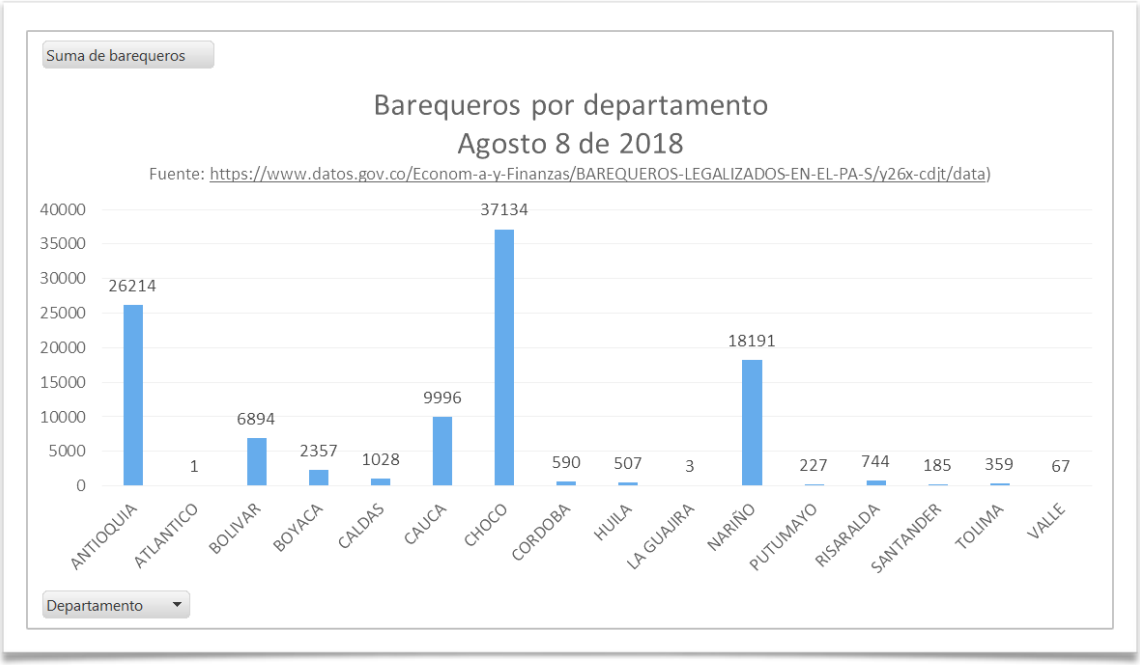


Figure 3. Distribution of artisanal miners in Colombia's regions as of 8 August 2018

With the passing of Resolution number 0130 issued in 2017, establishing the requirements and procedure for the Single National Registration of Authorized Importers and Traders (Registro Único Nacional de Importadores y Comercializadores Autorizados/RUNIC), the Ministry of Trade, Industry, and Tourism in coordination with the Ministry of the Environment and Sustainable Development, the Ministry of Health and Social Protection, and the Office of National Taxation and Customs (Dirección de Impuestos y Aduanas Nacionales) established control and restriction measures on importing and trading mercury and products containing mercury and will create a single national registration of authorized importers and traders.

[2] *See https://www.datos.gov.co/Econom-a-y-Finanzas/BAREQUEROS-LEGALIZADOS-EN-EL-PA-S/y26x-cdjt/data*

Article 3 of Decree 2133 issued in 2016 entitled "Mercury Import Quota and its Administration" was modified by Decree 1041, issued in 2018. Mercury will no longer be able to be used in mining and will be mostly used in the healthcare sector.

> *"From July 16, 2018 to July 15, 2020, an annual quota of mercury imports classified under tariff subentry 2805.40.00.00 of five (5) tons will be authorized to be used in different mining-related activities.*
>
> *The Ministry of Trade, Industry, and Tourism will administer 0.5 tons and the remaining quota, that is 4.5 tons, will be administered by the National Institute of Food and Drug Surveillance (Instituto Nacional de Vigilancia de Medicamentos y Alimentos/INVIMA) within the framework of its competencies in accordance with the regulation issued for that purpose."*

This decree also stipulates that the measure will be enter into force by July 16, 2020 and from then on imports will gradually decrease and will only be allocated to the health sector as follows:

- Until 2021, the quota will be 3.5 tons
- Until 2022, the quota will be 3 tons
- Until 2023, the quota will be 2.5 tons

With an interest in achieving the goals of Act 1658, the Single National Mercury Plan (Plan Único Nacional de Mercurio) was published in 2014. This plan seeks to gradually and definitely eliminate mercury use in the Colombian mining and industrial sectors. Efforts continued and a Strategic Sectoral Plan to Eliminate the Use of Mercury (Plan Estratégico Sectorial para la Eliminación del Uso del Mercurio) was published in June 2016 as a route toward sustainable gold benefits.

In August 2018, with support from seven ministries involved in the process and defined by Act 1658, adjustments were presented to the Single National Mercury Plan (Plan Único Nacional de Mercurio). These adjustments had been requested by the Colombian Office of the Comptroller General (Contraloría General de la Nación) and included evaluation and follow-up mechanisms as well as clearly defining the people in charge of each activity.

Months after Act 1658 had been formulated, in October 2013, Colombia signed a new environmental treaty known as the Minamata Convention on Mercury, the goal of which is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. Ratification of this instrument is pending. The Convention has been signed by 128 countries and, by the time this report written, already ratified by 94 countries.

"The objective of the Minamata Convention is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds and it sets out a range of measures to meet that objective. These include measures to control the supply and trade of mercury, including setting limitations on specific sources of mercury such as primary mining."[3]

The legislative process for Colombia to ratify its adherence to the Convention is constituted by four Congressional debates, which have already taken place, and the passing of Act 1892 issued on May 11, 2018. Today, the Act is being reviewed by the Constitutional Court. If the Court declares that the Convention is in compliance with the Constitution, it will be signed by the President and the Ministry of Foreign Affairs will prepare and deposit the instrument of ratification with the Secretary General of the United Nations in New York, who is the depositary of the Convention.

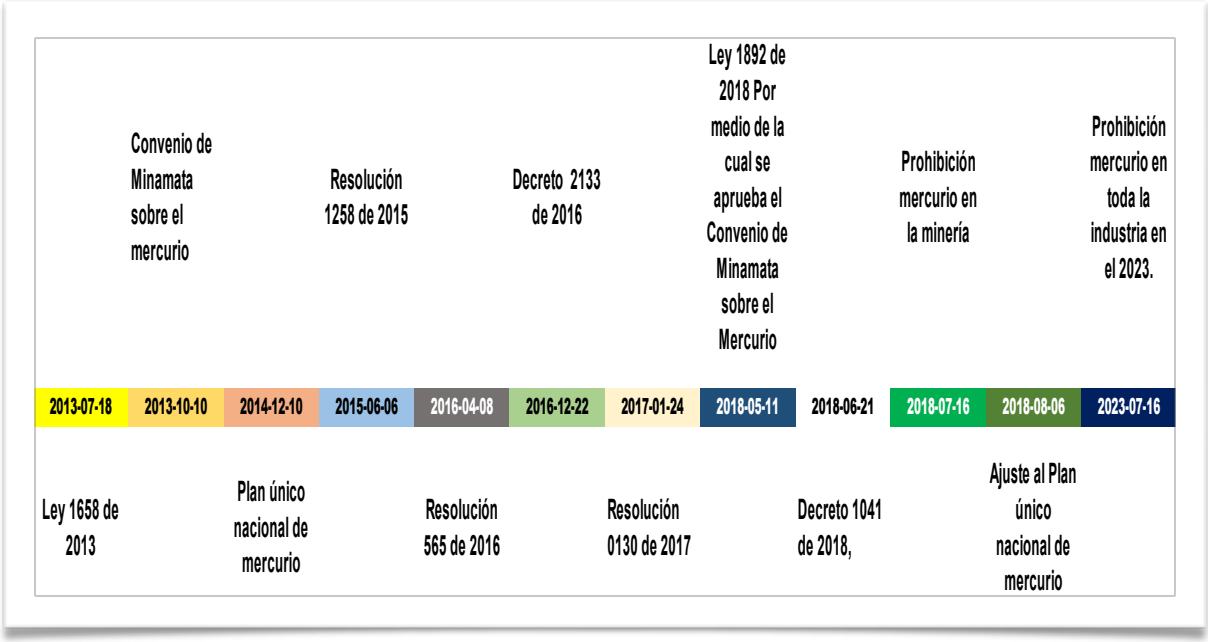


Figure 4. Timeline of mercury legislation in Colombia

For more details on the legislation, see Annex.

[3] *See http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP1%20version/Minamata-Convention-booklet-eng-full.pdf*

2. Goals

This project seeks to disseminate information about the risks of using mercury, as well as to identify the authorities' responsibility to comply with international commitments such as the Minamata Convention.

Specific Objectives:

- To identify a community involved in Artisanal and Small-Scale Gold Mining - ASGM.
- To describe the social structure, composition, and gender of ASGM miners (men, women, children) at the project site.
- To identify the methods used to estimate the scale of ASGM activity in Colombia and at the project site.
- To describe the ASGM's recent history in the project area.
- To identify the nature of the activities in the project area.
- To identify the factors promoting ASGM in the project area.
- To estimate the level of impact of mercury use on human health and the environment in ASGM in the project area.
- To describe how mercury is used in ASGM activities.

3. Methodology

In order to develop the project, official documentation and studies conducted by researchers from different bodies such as universities, as well as NGO projects were reviewed. El Tambo municipality, located in Cauca Department, was visited on July 13, 2018. A meeting called by the Municipal Town Hall through the Department of Agriculture, the Environment and Rural Development was held in El Tambo. The meeting's goal was to review mine safety besides projecting the reopening of the Fondas Environmental Mining Center (Centro Minero Ambiental de Fondas).

It was not possible to conduct the survey in view of the fact that Article 3 of Act 1658 issued in 2013 had already come into effect. Article 3 totally banned the use of mercury in Artisanal and Small-Scale Gold Mining (ASGM) as of July 16, 2018. In view of this juncture, none of the miners were willing to address the use of mercury. Available historical information was thus resorted to.

The information to estimate mercury use in mining came from a study on the mercury chain in Colombia with an emphasis on gold mining, Volume 3 (Estudio de la Cadena del Mercurio en Colombia con Énfasis en la Actividad Minera de Oro Tomo 3). This study was conducted in 2014 through inter-administrative agreement GGC 191 signed between the Colombian Ministry of Mines and Energy–Mining Planning Unit (Ministerio de Minas y Energía - Unidad de Planeación Minero Energético) and Córdoba University.

4. Dynamics of the Mercury Trading System

Mercury is not produced in Colombia (from cinnabar mining or as an extraction byproduct). Nonetheless, there is knowledge of the existence of some mercury mines in Caldas and Tolima Departments. Mercury is currently only extracted in China, Mexico, Indonesia and Kyrgyzstan.

Based on Legicomex statistics, the following countries were Colombia's main suppliers of mercury between 2004 and 2013 shown in Table 1.

Table 1. Mercury trade partners of Colombia 2004-2013

Country of Origin	Volume (in tons)
Mexico	233.80
Spain	184.60
The Netherlands	180.30
United States	152.10
Germany	82.10
Peru	21.70
Kyrgyzstan	16.90
Japan	13.20
Russia	11.90
China/Hong Kong	9.80
United Kingdom	2.30
France	0.40
Italy	0.01
Total	**909.11**

Source: Cadena_Mercurio_Tomo_I.pdf

According to the Colombian National Administrative Department of Statistics (Departamento Administrativo Nacional de Estadística), 71.4 tons of mercury were imported in 2007. Only 1.28 tons were reported to have been used in the manufacturing industry. This indicates that the greatest percentage is used in other activities such as gold mining.

By the end of 2017, the chlor-alkali plant located in Zipaquirá changed the technology it used to produce chlorine and ceased to use mercury cells. It has thus complied with the commitments stipulated in Act 1658 issued on July 13, 2013. This industrial activity will therefore no longer use mercury in the future.

> *Mercury comes into Colombia through five legal points of entry: Cartagena (83.4 percent), Buenaventura (12.8 percent), Medellín (3.1 percent), Bogotá (0.6 percent), and Barranquilla (0.1 percent). From these points of entry mercury is distributed to the cities where the importing companies are located and from there to the centers of use through pre-established routes, described below.* *Source: Cadena_Mercurio_Tomo_I.pdf*

Mining-oriented mercury trade is initially carried out by legal importers who sell it to regional businesses, usually companies devoted to chemicals and buyers of gold. These businesses in turn redistribute it to the miners, small businesses devoted to purchasing gold, and even pharmacies and stores.

Article 3 of Act 1658 issued on July 13, 2013, currently in effect stipulates that it seeks, "*to eliminate the use of mercury throughout the country in industrial and productive processes …… in mining within a maximum period of five (5) years,"* which already culminated on July 16, 2018.

An expert on a mission to Mexico in 2017 estimated that only in Queretaro State 1000 miners were involved in producing almost 300 tons of mercury a year (Spiegel et al., 2017). Bolivia, Colombia, and Peru are the main destination points. It is known that these three countries have extensive ASGM operations, although recent governmental controls in Peru have reduced the documented mercury imports for ASGM.

Source: UN Environment, 2017. Global mercury supply, trade and demand. United Nations Environment Programme, Chemicals and Health Branch. Geneva, Switzerland

From then on, mercury use in gold mining has been illegal in Colombia. None of those interviewed confirmed that they used mercury. Some stated that they had used mercury in the past for amalgamation. Off the record, it was confirmed that the

The illicit mercury market is linked to the gold business. In many regions, illicit mercury distributors are the same as the buyers of gold. To enter into the market, the mercury distributors begin by trading below their competitors' price. Having gained admission to the market and consolidated clients, the price is raised according to the business dynamic. The distributors finance transactions through a debt contracted by a miner, who is likewise obliged to deliver the product. This way the traders finally control the operation, coming in charge of trading inputs and gold. Illicit mercury enters Colombia crossing rivers along its borders with Ecuador, Peru and Brazil, areas in which there is an extensive trade network.

In May 2018, a confiscation of 272 kilos of illicit mercury was reported in the Department of Antioquia with an estimated value of $217,000,000 Colombian pesos ($75,165 USD), which confirms the extensive movement of mercury in the illicit market. Conversations with people in those regions who are aware of the trading mechanisms practiced in those areas hint at the existence of a possible smuggling route.

Decree 2133 issued on December 22, 2016 established measures to control the importation and trade of mercury and products containing mercury within the framework of Article 5 of Act 1658 issued in 2013. Article 2 of decree 2133 defines the duty of mercury traders to register in the Single National Registration of Authorized Importers and Traders (Registro Único Nacional de Importadores y Comercializadores Autorizados) and establishes a maximum import quota. The Ministry of Trade, Industry and Tourism, the National Institute of Food and Drug Surveillance (Instituto Nacional de Vigilancia de Medicamentos y Alimentos/INVIMA) as well as the National Mining Authority (Autoridad Minera Nacional) will be in charge of its administration.

5. Detailed Description of Activities

5.1. Identification of a Community Engaged in Artisanal Small-Scale Gold Mining (ASGM)

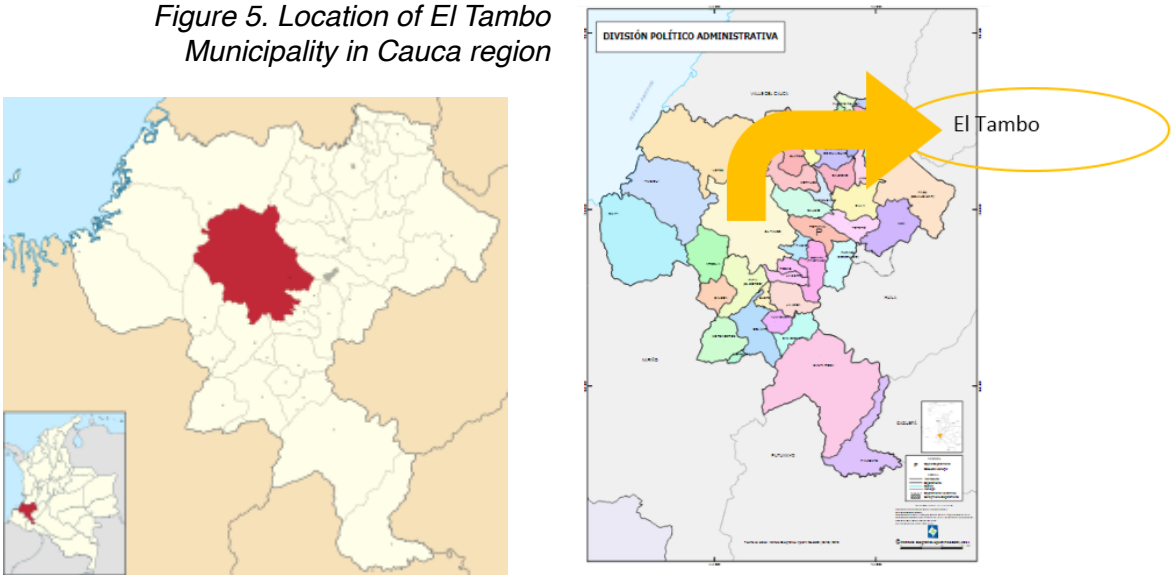
El Tambo municipality is located 33 kilometers from Popayán, the capital city of Cauca Department. It was founded in 1713 and became a municipality via Ordinance number 45 issued in 1914. It is bordered on the north by the López de Micay municipality, on the south by the Patía, la Sierra and Argelia municipalities, on the east by the Morales, Cajibío, Popayán, Timbio and Rosas municipalities, and on the west by the Timbiqui municipality. El Tambo is constituted by 19 villages that bring together 227 townships, a municipal seat with 14 duly registered neighbourhoods. El

Tambo is an eminently agricultural municipality. About 93 percent of its population is located in rural areas, whereas only 7 percent live in urban areas.

It was decided to visit El Tambo, a village located in Cauca Department in southwestern Colombia because it is an area in which mining activity is performed by Afrodescendant, indigenous and mestizo communities involved in the informal extraction of gold, which today is considered illicit in Colombia. There is information about mining accidents involving children. Women are also known to also participate in gold extraction.

Mining activity is carried out in the following municipalities in Cauca Department: Timbiquí, López de Micay, Guapi Santa Rosa, Bolívar, Almaguer San Sebastián, La Vega, Páez, La Sierra, Silvia, Jambaló, Inza, Suarez, Morales, El Tambo, Balboa, Argelia Rosas, Popayán, Piendamó, Buenos Aires, Santander de Quilichao, El Bordo, El Patía, and Piamonte.

Figure 5. Location of El Tambo Municipality in Cauca region



About 3.2 percent of the areas certified for gold extraction in Colombia (13) are found in Cauca region. Between 2013 and the third trimester of 2016, Cauca's participation in the Colombian gold production was 7.71 percent, representing a total of 3,742.81 kilos in 2016 out of the national total of 61,810 kilos.

Gold extraction is carried out in the following subregions: Fondas, Chicueña, Chapa, Chisquío, Limoncito, California, Mina Tapada, La Vega, Rellenos, and San Francisco (La Arada-Mina Flores).

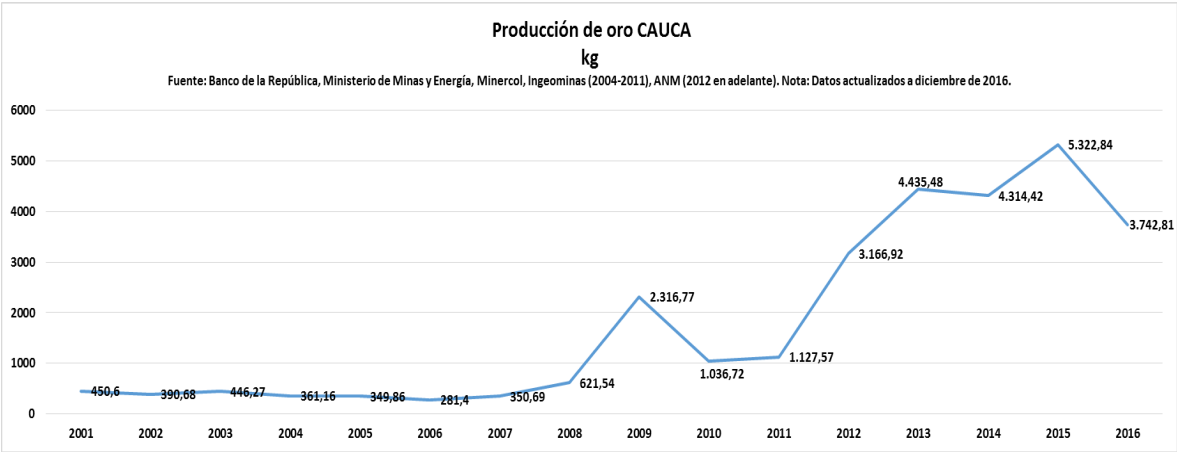


Figure 6. Gold production in Cauca region period of 2001-2016 (in kg)

5.2. Description of the Social Structure, Composition and Gender (Men, Women, and Children) of ASGM Miners in the Project Site

According to projections made by the National Administrative Department of Statistics (Departamento Administrativo Nacional de Estadística/DANE) for 2017, 10.4 percent of the population is indigenous, 23.3 percent are Afrodescendants of slaves brought from the west coast of Africa during the sixteenth and seventeenth centuries, and 66.1 percent is of mixed ancestry (mestizo). Approximately 87 percent of the population is rural.

Children, adolescents and youth, aged from 0 to 19, correspond to 37.2 percent of the total projected population, i.e., 17,788 inhabitants, of which 48.2 percent are women and 51.8 percent are men. No mention was made regarding the use of minors in mining activities due to an awareness that child labor is prohibited by Colombian labor law. There are, nonetheless, reports of minors working in mining.

Women have a place within artisanal mining. Because they are in charge of all family-related activities, they thus only expend a few hours a day in gold extraction. This situation confirms exposure to mercury contamination which they take home due to the fact that the amalgamation process is carried out by hand. A piece of cloth is used to squeeze the amalgam in order to draw the excess of mercury. In addition, the amalgam is later heated to obtain gold sponge containing a low percentage of mercury. This task is often carried out in the vicinity of their homes or even in their kitchens.

In a publication entitled **Small Scale Mining in Colombia: Not Such a Small Activity**, Professor Leonardo Güiza (PhD) states that 72 percent of women miners

performing operational tasks work in small uncertified mines. This indicates that a significant demand for female labor in the sector comes from illicit small-scale mining.

5.3. Identification of the Methods Used to Estimate the Scale of ASGM Activity in Colombia and at the Project Site

Public information available from the Colombian Ministries of the Environment and Sustainable Development, Mines and Energy, Health and Social Protection, as well as Trade, Industry and Tourism was used in addition to a study about the mercury chain in Colombia with an emphasis on gold mining, Volume 3 (Estudio de la Cadena del Mercurio en Colombia con Énfasis en la Actividad Minera de Oro Tomo 3) conducted in 2014 through inter-administrative agreement GGC 191 signed between the Colombian Ministry of Mines and Energy and the Mining Energy Planning Unit (Ministerio de Minas y Energía - Unidad de Planeación Minero Energético) as well as Córdoba University.

In his publication, Prof. Leonardo Güiza claims that mining in Colombia is not classified by size. Therefore, as far as the State requirements are concerned, artisanal small-scale gold mining is equivalent to a multinational corporation.

The study about the mercury chain in Colombia with an emphasis on gold mining was used to approach mercury use.

The Environmental Mining Center (Centro Minero Ambiental/CAM), a training center for miners operated for some years in the village of Fondas pertaining to El Tambo municipality. In a meeting promoted by the municipal Town Hall through the Department of Agriculture, the Environment and Rural Development, a committee was created to reopen the mining center in order to train the local population working in mining.

In El Tambo, the following ethnic communities engage in mining activities:

- 6 declared mining zones pertaining to Afrodescendant communities and 6 applications in process.
- 8 declared mining zones pertaining to indigenous communities, 3 applications in process, 2 suspended mining zones.

Average use of mercury in Cauca Department is 14.60 g Hg/g from gold recovered in gold reef mining (47 percent) and 13.50 g Hg/g from gold recovered in alluvial gold mining (53 percent). The gold production reported by the Bank of the Republic

(Banco de la Republica) from **El Tambo in 2016 was 16.18 kilos out of a national total of 61,805.29 kilos.**

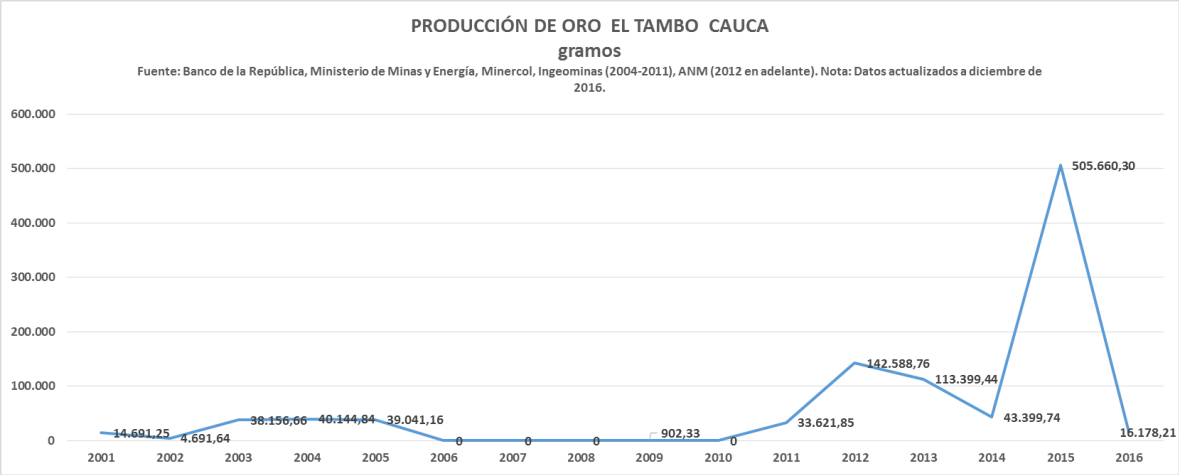


Figure 7. Gold Production in El Tambo, Cauca region period of 2001-2016 (in kg)

If all the gold production in El Tambo were carried out through amalgamation, mercury use would have been 226.80 kilos in 2016, without taking into account recovered mercury. It has been estimated that 74.7 percent of the mercury used in El Tambo, Cauca Department is recovered when amalgamation milling is used in reef mining. However, it was not possible to establish how extensive the use of milling is.

We think that it is possible to obtain the recovery data from some of the mines in which technological reconversion processes are being conducted in order to obtain certifications to improve gold trading. More detailed research must therefore be carried out in order to be able to extend this mercury recovery value to gold mining in the entire municipality.

With regard to processing gold ore, once the gold has been extracted, it is transported to leaching basins which are bathed with a cyanide solution (or an illicit use of mercury) in order to recover gold. As a result, a gold-charged solution is obtained that is then cleaned and filtered. Oxygen is later eliminated and finally zinc-dust is added in order to precipitate and solidify the gold. The gold goes through a drying process and is finally smelted.

Regarding small- and medium-scale mining, the trade chain starts with the sale of gold to an intermediary in a village close to the area of extraction. This is explained by the scale of the purchase that makes it possible to absorb the cost of transportation to

the foundries and its added value (smelting and refining costs, among others). The foundries export gold through international trading companies. Gold and its many alloys are widely used in jewelry, coin and ingot minting, as well as monetary standard in many countries and as an input for industry and technological devices. *Source: Sentencia T445 de 2016 Investigación científica y sociológica respecto a los impactos de la actividad minera en los ecosistemas del territorio colombiano.*

5.4. Description of ASGM's Recent History in Project Area

Informal mining exists virtually since pre-Hispanic times. It is not a current or recent phenomenon and has been linked to the lack of opportunities and income for the population.

The national registration of legalized artisanal miners in Colombia, consulted on August 6, 2018[4] reported 70 miners registered in the field of gold extraction in El Tambo municipality. Meetings with local municipal officials reported that approximately 450 miners work in all gold mining activities: extraction, pottery, charcoal and artisanal mining. It was also noted that a significant number of women who are in the process of legalization had not been included.

The most significant amount of gold extraction in El Tambo takes place in the village of Fondas, in which there are well identified mines such as:

- Mina Tapada
- Mina La Vega
- Mina La California.

5.5. Nature of ASGM Activity in Project Area, whether Legal, Illicit, Traditional, Basic or Developed, or a Combination of the Above

The mining carried out in the project area is subsistence mining and only a few miners work full-time in this activity. They partner up with relatives or acquaintances in order to extract gold and thus improve their income. Gold extraction is carried out close to waterways in order to use the rivers' energy to move mills or barrels. Simple techniques are used in open air mining. There are also underground mines at depths of up to 60 meters where deficient construction and drilling techniques put the miners' lives at risk.

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[4] *See https://www.datos.gov.co/Econom-a-y-Finanzas/BAREQUEROS-LEGALIZADOS-EN-EL-PA-S/y26x-cdjt/data*

There is a small private legalized mine that is in the process of becoming certified which aims to improve gold prices. It is called the CHEDE mine. A cooperative group from Fondas is also in the process of becoming certified by Fairmined.[5] This demonstrates that when there is willingness among the stakeholders, mercury use can be eliminated in mining.[6]

5.6. Factors Promoting ASGM in Project Area: Poverty, Conflict, Criminal Activity, Gold Fever, Large-Scale Gold Mining Activities

Gold extraction is mainly motivated by factors such as poverty due to low prices paid to farmers producing agricultural goods, the lack of infrastructure to give added value to crops harvested in the region, red tape in gaining access to loans for agricultural development, etcetera. All these factors contribute to having a population whose basic needs are unmet.

It was reported that 53.45 percent of the local population had unmet basic needs in 2012. In the rural areas, this percentage was 57.46. Under these conditions, it is extremely difficult to have the population understand the need to protect their health and the environment when not even their basic nutritional needs are being met.

The price of gold draws peasants searching for a better income to mining. Even though there are programs to legalize miners, they face significant difficulties and take on great responsibilities, such as registration with the National Tax and Tariff Office (Dirección de Impuestos y Aduanas Nacionales/DIAN), with the chamber of commerce, etcetera. The cost to become formalized may exceed its benefit.

5.7. Scale of the Impact of the Use of Mercury on the Environment and Human Health in ASGM in Project Area

In order to obtain gold sponge, the amalgam is squeezed and later heated in order for the mercury to evaporate. This separation is carried out in open spaces or kitchens. Mercury vapour is emitted into the atmosphere and part of it is inhaled by the miners. If this task is carried out inside the miners' homes, as is often the case, the whole family gets contaminated.

Colombia has an epidemiological surveillance system for chemical intoxication, which was regulated in 2006 through the creation of the Public Health Event Surveillance

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[5] *See http://www.fairmined.org/es/fairmined-for-miners/*

[6] *See https://www.bbc.com/mundo/noticias/2011/08/110812_oro_verde_colombia_aa*

System (Sivigila by its acronym in Spanish), which clearly defines the routine surveillance for acute intoxication with pesticides. This system seeks to identify the cause and effect of a disease. In many cases, due to circumstances related to technological capacity a lot of information is not reported, particularly when it refers to areas distant from the main urban centers.

The problem of mercury contamination is reflected in studies carried out by different organizations and individuals, like the study entitled “Evaluation of the Effects of Exposure to Mercury on the Respiratory and Neurological Health of a Mining Population from the North of Cauca Region in 2015.” This study surveyed men and women working in the area between the ages of 18 and 70 belonging to Afrodescendant ethnic groups. The study concluded that **the mining population of men and women exposed to the use of mercury is 2.46 times larger compared to men and women in other regions**. It also found that **mercury exposure was 2.53 times higher among Afrodescendant ethnic groups than among other ethnic groups such as indigenous and mixed ancestry populations.**

Approximately 49.06 percent of mercury users are women and 51.12 percent are indigenous and white populations. Because women are in charge of nourishing and caring for their children, they are a critical point through which mercury enters households directly.

This study identified the main health issues perceived by the gold miners in Cauca region who presented breathing and neurological disorders in a larger proportion than other exposed populations in the same region who are devoted to other activities such as agriculture.

5.8. Description of How Mercury is Used in ASGM Activities

The extraction of material from the mines, most of them underground, is sent to be milled and is then placed in barrels to which mercury is added for the amalgamation process, and for the concentration process through panning. It is squeezed with a fine cloth in order to reduce the excess of mercury. In order to produce gold sponge, it is later heated to generate the distillation or evaporation process.

The table below shows the maximum limits transgressed in each of the mines controlled in 2015. It is clear that mercury contamination is present in all of them as shown in Table 2 below.

Table 2. Heavy metals that exceed the Maximum Allowed Limits in each Mining Production Units at the municipality of Tambo

Metales pesados que superan los Limites Maximos Permitidos en cada una de las Unidades Productoras de Minería (UPM) del Municipio del Tambo							
Unidades Productoras de Minería (UPM)	Mercurio	Cobre	Hierro	Plomo	Zinc	Cadmio	Arsénico
19256O06	x	x		x			
19256O07	x		x				
19256O08	x		x	x			
19256O09	x		x	x	x		

Fuente: CONTRATO INTERADMINISTRATIVO GGC No 223 – 2015
INCIDENCIA REAL DE LA MINERÍA DEL CARBÓN, DEL ORO Y DEL USO DE MERCURIO EN LA CALIDAD AMBIENTAL CON ÉNFASIS ESPECIAL EN EL RECURSO HÍDRICO - DISEÑO DE HERRAMIENTAS PARA LA PLANEACIÓN SECTORIAL

5.9. Mercury Trading Routes, Cauca Region, Colombia

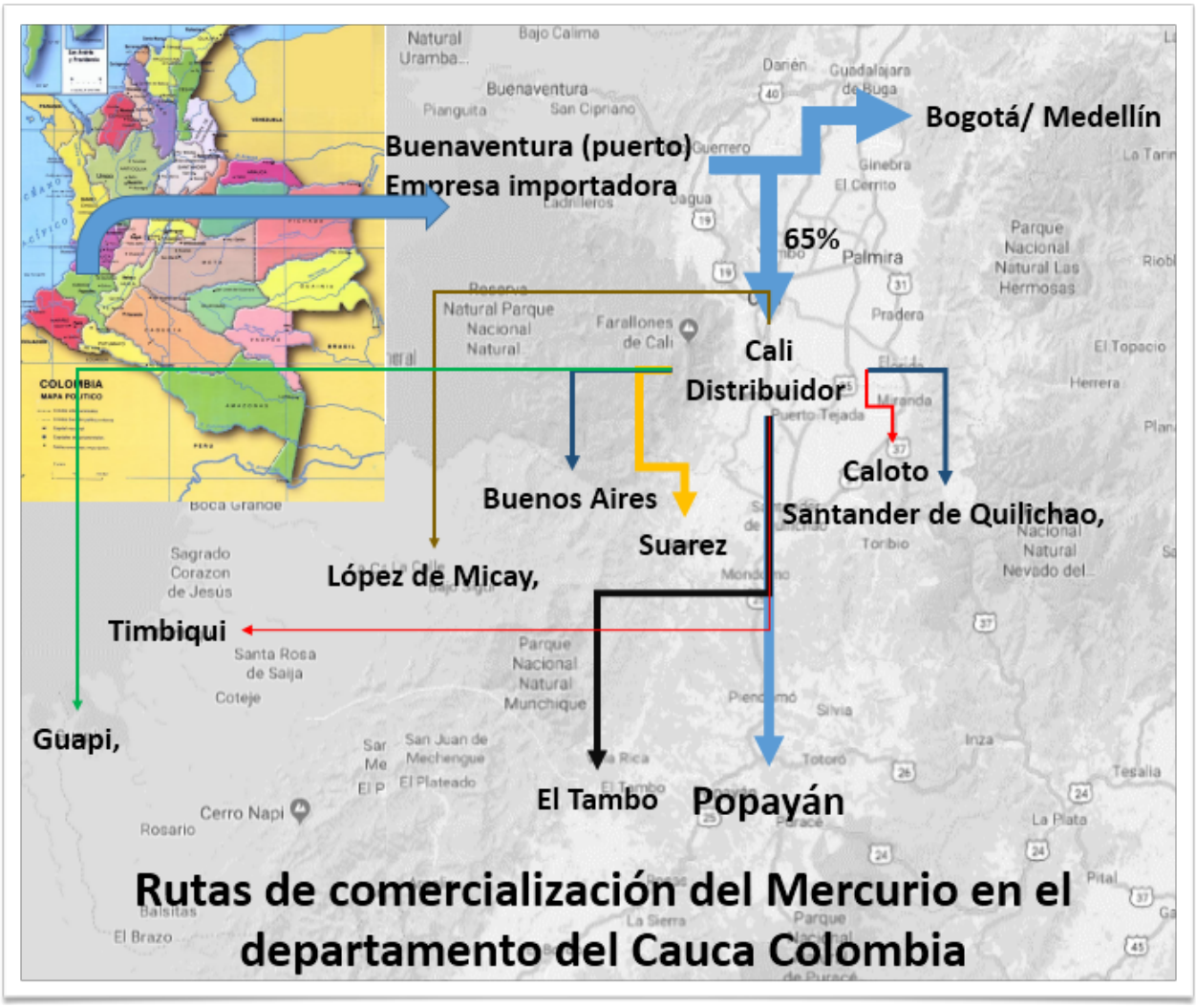


Figure 8. Mercury trade routes in Cauca region, Colombia

Before July 16, 2018, mercury was unloaded at the port and the importer would send it to its distributers in the city of Cali where it was apportioned throughout the gold mining populations with support from gold mining suppliers or gold traders. The distributer from the city of Cali did not assume any transportation risk, which was taken on by the trading company of each region. This risk made the mercury price increase. In this process, the quantities that are sold gradually decrease. It is thus necessary to manipulate the product in order to pack it into smaller containers.

The illicit mercury market is linked to the gold business. In many regions, the illicit mercury distributor is the very same buyer of gold. In order to enter the market, trading is initially done below the competition's price. Once they have gained admission to the market and have consolidated clients, the price increases according to the business dynamic. Illicit mercury is entering Colombia through the borders with Ecuador, Peru and Brazil, areas in which there is a large trading network.

The Mining-Energy Planning Unit (Unidad de Planeación Minero Energética/UPME) estimates that around 50 tons of mercury enter Colombia illicitly every year

Source: https://www.elespectador.com/noticias/medio-ambiente/tratado-internacional-sobre-mercurio-entro-en-vigencia-y-colombia-nada-que-ratifica-articulo-708404 Retrieved on August 16, 2017 - 1:24 PM

6. An Estimate of Mercury Used in Colombia

An estimate of mercury used in artisanal small-scale gold mining is presented below. It is an approximation because there is no actual updated information about the number of mines as shown in Table 3 below.

Table 3. Estimated mercury used in ASGM sites in Colombia

Department	Reef gold mining	Alluvial gold mining	Average Use of Mercury g Hg:g from Recovered Gold		
	(%)	(%)	Gold Reef	Alluvial gold	Mining districts
Antioquia (*)	27%	73%	25.00	9.70	Northeastern Antioquia
			27.70	0.00	Frontino
Bolívar	52%	48%	97.50	11.10	Lobas, Magdalena Medio Bolivarense, Mojana Bolivarense
Caldas(**)	98%	2%	17.20	0.00	Marmato
Cauca	47%	53%	14.60	13.50	El Tambo - Buenos Aires, Mercaderes
Chocó	0%	100%	0.00	7.00	Itsmina
Córdoba	0%	100%	5.70	6.40	Montelíbano
Huila	91%	9%	14.60	13.50	Tesalia - Aipe
Nariño	21%	79%	14.60	13.50	
Putumayo	21%	79%	14.60	13.50	
Risaralda	100%	0%	N/A	N/A	
Santander	100%	0%	3.30	0.00	Vetas - California
Tolima	72%	28%	14.60	13.50	Ataco
Valle del Cauca	63%	37%	14.60	13.50	South Pacific Coast, La Llanada, Cali-El Dovio, Payandé, Vetas, Putumayo

Source: Sinopsis Nacional de la Minería Aurífera Artesanal y de Pequeña Escala acuerdo No. MC/4030-09-04-2203 Programa de las Naciones Unidas para el Medio Ambiente – PNUMA Ministerio de Ambiente y Desarrollo Sostenible– MADS

Using gold production data corresponding to the first semester of 2017, mercury use was estimated based on the available data regarding the average use of mercury in each mining district and in each department, thus obtaining a value of **202,653 kilos of mercury for a production of 12,631 kilos of gold**. This gives an average of **16 grams of mercury per gram of gold**. This use of mercury is 3.2 times higher than

that global average amount reported in the document entitled *Global mercury supply, trade and demand,*[7] which is **5 grams of mercury per gram of recovered gold**.

Table 4. Hg to Au ratio in ASGM sites in Colombia

Region	The 1st Trimester of 2017	Reef gold mining		Alluvial gold mining		Mercury use (kg)	Average Use of Mercury g Hg / g from Recovered Gold	
		(%)	kg	(%)	kg		Reef gold	Alluvial
Antioquia	5,655.32	27%	1,526.94	73%	4,128.38	**78,218.70**	25.00	9.70
Bolívar	1,045.09	52%	543.45	48%	501.64	**58,554.51**	97.50	11.10
Caldas	801.99	98%	785.95	2%	16.04	**13,518.42**	17.20	0.00
Cauca	569.39	47%	267.61	53%	301.78	**7,981.13**	14.60	13.50
Chocó	2,551.45	0%	-	100%	2,551.45	**17,860.15**	0.00	7.00
Córdoba	131.15	0%	-	100%	131.15	**839.36**	5.70	6.40
Huila	15.25	91%	13.88	9%	1.00	**221.20**	14.60	13.50
Nariño	1,469.01	21%	308.49	79%	1,160.60	**20,170.92**	14.60	13.50
Putumayo	227.47	21%	47.77	79%	179.70	**3,123.32**	14.60	13.50
Risaralda	34.01	100%	34.01	0%	0.00	**496.49**	14.60	13.50
Santander	18.48	100%	18.48	0%	0.00	**60.98**	3.30	0.00
Tolima	97.82	72%	70.43	28%	27.39	**1,398.10**	14.60	13.50
Cauca Valley	14.78	63%	9.31	37%	5.47	**209.80**	14.60	13.50
Total	**12,631.22**		**3,626.32**		**9,004.60**	**202,653.08**	***16.04***	***kg Hg/kg Au***

Source: Sinopsis Nacional de la Minería Artesanal y a Pequeña Escala

The percentage of mercury recovery depend on many factors such as the methods used for gold mining and extraction methods.

[7] *United Nations Environment Programme, Chemicals and Health Branch. Geneva, Switzerland, 2017.*

Table 5. Type of gold mining and gold extraction methods				
TYPE OF ASGM	MINING METHOD	GOLD EXTRACTION METHOD	MERCURY RECOVERY (%)	AREA
Gold Reef Mining		Amalgamation Milling		El Tambo - Cauca
			33	Buenos Aires - Cauca
			65.6	Northeastern Antioquia
			50	Vetas - Santander
			40	California - Santander
Alluvial Mining	Backhoes	Amalgamation plates: Amalgamation of concentrates in small troughs or pans	65.3	Northeastern Antioquia
		Open flow amalgamation channels	77.5	Buenaventura - Valle
	Mini Dredges	Concentration in channels and/or amalgamation in small troughs or pans	63.6	Northeastern Antioquia
	Artisanal Mining	Use of pans		Northeastern Antioquia
	Lifts	Amalgamation plates and/or amalgamation of concentrates in small troughs, use of mineral lifts to feed a size-based classification system	65	Northeastern Antioquia
	Modified Dredges	Amalgamation plates and/or amalgamation of concentrates in small troughs, use of backhoe to feed mineral into a size-based classification system	23.5	Northeastern Antioquia

The use of mercury recovery factors is well intended, but the lack of actual research into gold mining inventories implies that it does not go beyond an academic exercise that is far from representing reality.

In 2015, a military division pertaining to the Colombian Air Force, the Brigade Against Illicit Mining (Brigada Contra la Minería Ilegal/BRCMI) started to operate in different regions of Colombia. **However, no information was found regarding confiscations of mercury.**

Figure 9. Infographic describing ASGM sites and its problems/impacts.

Source: Bol. Semana, Colombia, 2018 in https://www.semana.com/contenidos-editoriales/colombia-sin-mercurio/multimedia/aquiestaelproblemalolugaresdecolombiaendondeseliberamasmercurioyhaymasmineriailegal/576680

7. Data Discrepancies

The databases on legal mercury trade show marked differences in relation with data found on the internet for the period from 2007 to 2013. Clearly, the information is not consistent. There are great differences between UN-Comtrade and Legiscomex, but the cause was not identified through this study.

Table 6. Historical Comparison of Mercury Imports to Colombia between 2007 and 2013 (in tonnes)

Year	UN-Comtrade	Legiscomex	Discrepancies
2007	60.47	77.92	-17.45
2008	403.00	85.59	317.41
2009	2.36	150.40	-148.04
2010	3.45	110.90	-107.45
2011	2.18	106.63	-104.45
2012	5.09	102.23	-97.14
2013	202.00	104.05	97.95

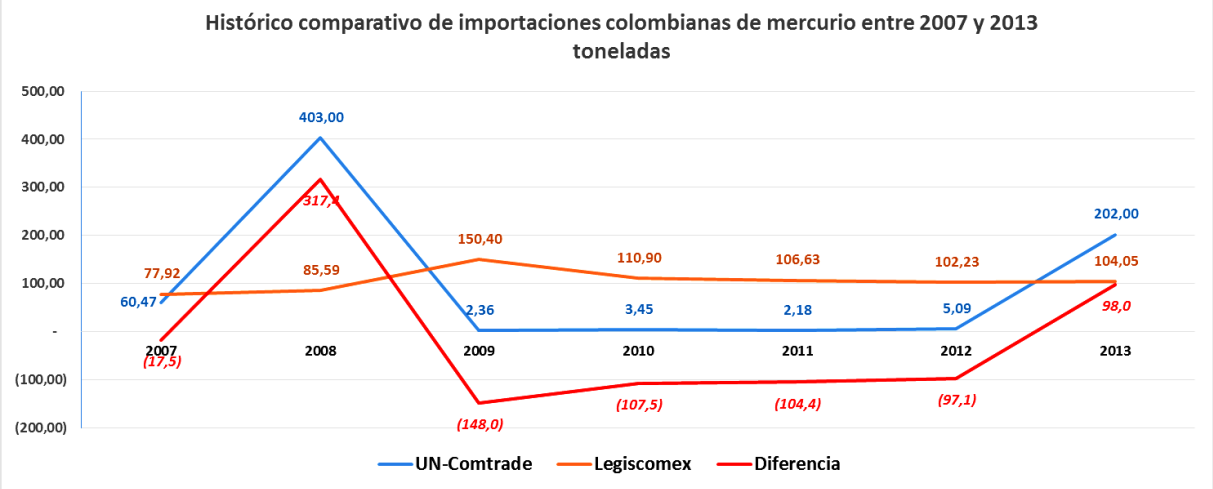


Figure 10. Historical Comparison of Mercury Imports to Colombia 2007-2013 (in tonnes)

8. Conclusions

- According to Act 1658, the use of mercury in gold mining in Colombia has been banned since July 16, 2018.
- It is important to motivate miners to voluntarily comply with the environmental requirements via technical assistance processes, environmental training, clean technology transfers and incentives through projects.
- It is necessary to train authorities to exercise the required controls.
- It is important to develop safety protocols to confiscate mercury and set up a chain of custody for its final disposal.
- Mercury trading will be harder to identify, particularly due to the difficulty of controlling waterways and the extensiveness of the Colombian borders.
- Illicit mercury trading through Central American countries is likely to increase. It might enter Colombia along the Pacific coast. Maritime controls must thus monitor the 339,200 km² corresponding to Colombia's maritime area on the Pacific coast.
- The use of amalgams must be eliminated in order to thus avoid exposure to mercury and its compounds and protect the most vulnerable populations: boys, girls, as well as pregnant and nursing women.
- It is important to identify the areas that have been contaminated with mercury in order to implement decontamination actions.

Annexes

Legislative Timeline

Date	Document	Entity	Document Description:
07-18-2013	Act 1658 issued in 2013	Congress of the Republic	This Act establishes provisions for mercury trading and use in different industrial activities in Colombia. It stipulates the requirements and incentives for the reduction and elimination of mercury. It also establishes other provisions.
10-10-2013	Minamata Convention on Mercury	United Nations	
12-10-2014	Single National Mercury Plan	Minambiente, Minminas, Minsalud, Mintrabajo, Mintransporte, Minagricultura, Mincomercio, Minrelaciones, ANM and UPME	This plan seeks to gradually and definitely eliminate the use of mercury in the mining and industrial sectors in Colombia.
06-06-2015	Resolution 1258 issued in 2015	Ministry of the Environment and Sustainable Development	Through this resolution, guidelines, an environmental guide, and terms of reference are adopted for the formalization activities of traditional mining referred to in Decree 933 issued in 2013. It includes other determinations.
04-08-2016	Resolution 565 issued in 2016	Ministry of the Environment and Sustainable Development	This resolution establishes the requirements and procedures for the Registration of Users of Mercury RUM of the mining sector.
12-22-2016	Decree 2133 issued in 2016	Ministry of Trade, Industry and Tourism	This decree establishes measures to control mercury imports and the trading of mercury and products containing mercury within the framework of Article 5 of Act 1658 issued in 2013.
01-24-2017	Resolution 0130 issued in 2017	Ministry of the Environment and Sustainable Development, Ministry of Health and Social Protection, and National Tax and Customs Office	This resolution stipulates the requirements and procedure for the Single National Registration of Authorized Importers and Traders (RUNIC by its acronym in Spanish)

Date	Document	Entity	Document Description:
05-11-2018	Act 1892 issued in 2018	Congress of the Republic	This act approved Colombia's adherence to the Minamata Convention on Mercury
06-21-2018	Decree 1041 issued in 2018	Ministry of Trade, Industry, and Tourism	This decree modified Article 3 of Decree 2133 issued in 2016
07-16-2018	Mercury ban in mining		Act 1658 issued in 2013
08-06-2018	Single National Mercury Plan	Minambiente, Minminas, Minsalud, Mintrabajo, Mintransporte, Minagricultura, Mincomercio, Minrelaciones, ANM and UPME	Adjustments requested by the Nation's General Comptroller's Office (Contraloría General de la Nación)
07-16-2023	Mercury ban throughout the entire industry by 2023		Act 1658 issued in 2013

List of Interviewees

- Jewellers - 4 people
- Miners - 20 people

Requirements for Mining Permit in Colombia

<table>
<tr><th></th><th>Small-Scale</th><th>Medium-Scale</th><th>Large-Scale **</th></tr>
<tr><td>Exploration area in hectares</td><td>Under 100</td><td>Over 100 and under 1,000</td><td>Over 1,000 and under 5,000</td></tr>
<tr><td>License duration</td><td>1 year</td><td>2 years</td><td>5 years</td></tr>
<tr><td>Time of extension</td><td>1 year</td><td>1 year</td><td>1 year</td></tr>
<tr><td rowspan="3">Requirements to Apply for a Mining Extraction License</td><td rowspan="3">Final Brief on Extraction and the Work and Investment Program (Programa de Trabajos e Inversiones/ PTI)</td><td colspan="2">Progress Reports about the Exploration Program</td></tr>
<tr><td colspan="2">Work and Investment Program</td></tr>
<tr><td colspan="2">Environmental Impact Study</td></tr>
<tr><td rowspan="2">Mining Extraction License (the permission that gives a person the exclusive right to explore mineral deposits in a determined area)</td><td colspan="3">The license has a 10-year duration as of the time of enrolment in the Mining Registration.</td></tr>
<tr><td colspan="3">Annual reports must be submitted, presenting a summary of the extraction program implemented, the investments made, and the results obtained.</td></tr>
<tr><td rowspan="3">Mining concession contracts (authorized by the Ministry of Mining and Energy that grant the concession holder the exclusive right to extract minerals and set up and develop gold extraction and transportation)</td><td colspan="3">The duration of the mining concession contracts is 30 years following enrolment to the Mine Registration.</td></tr>
<tr><td colspan="3">During the extraction, the contractor must return the areas that are not included within the mining plans and designs.</td></tr>
<tr><td colspan="3">When the large-scale mining concession contracts expire, the contractor must leave the mining equipment, facilities and works in working condition and return all the exclusive extraction property as part of a free-of-charge reversion.</td></tr>
</table>

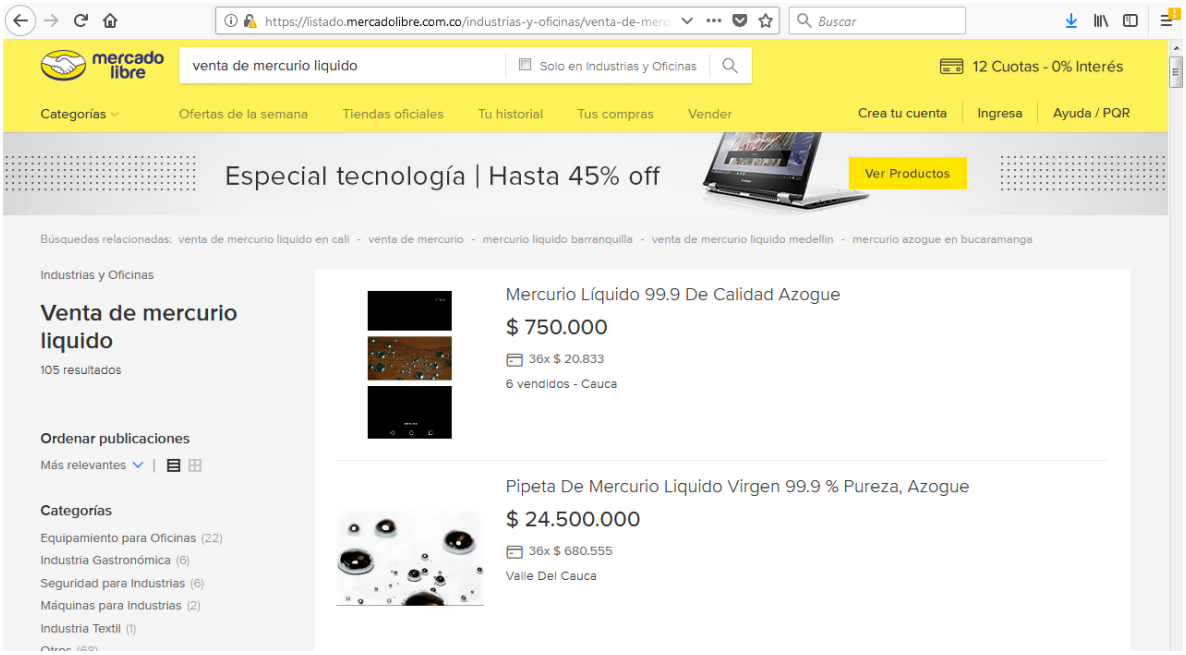
Source: Código de Minas (Act 685 issued in 2001)

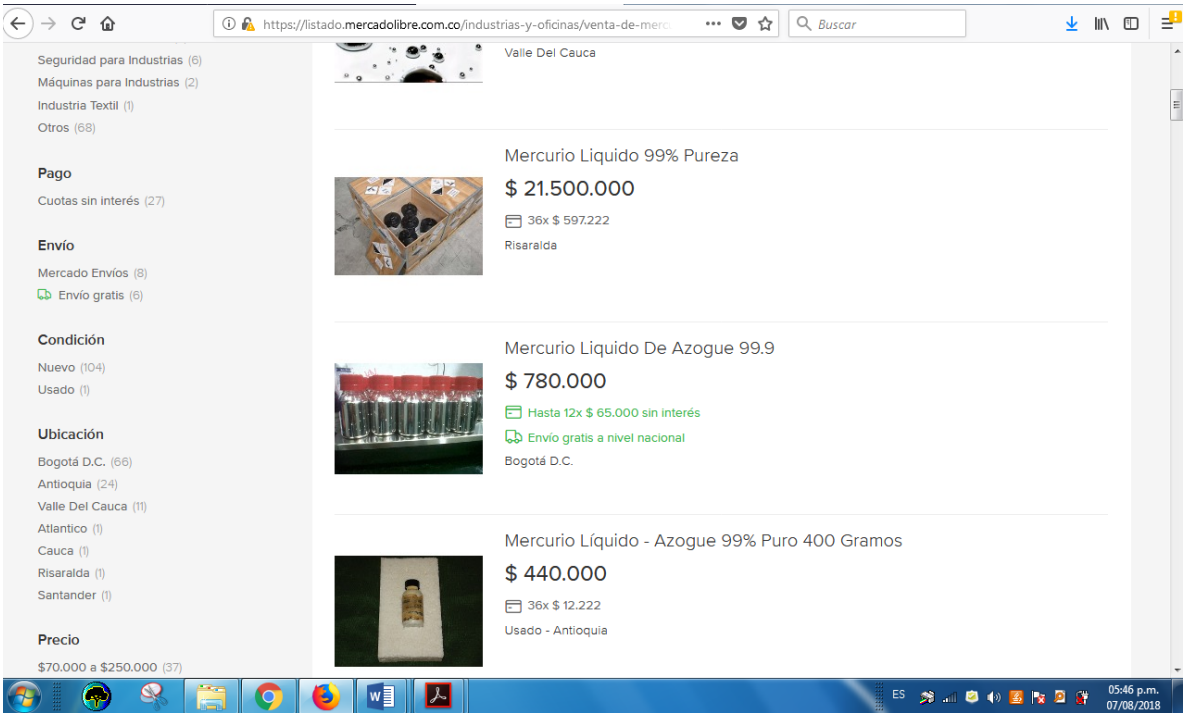
** Guía Minero-Ambiental de Explotación. Ministerio de Minas y Energía – Ministerio del Medio Ambiente. 2002*

***Large-Scale Mining: coal extraction is greater than 800,000 tons per year or removal of materials greater than 2 million tons per year for gold*

Sale of Mercury via Internet - mercadolibre.com.co

Information retrieved on August 7, 2018 at: https://listado.mercadolibre.com.co/industrias-y-oficinas/venta-de-mercurio-liquido





Mercury-Related Links of interest

- https://mejorsinmercurio.com/llega-un-aire-fresco. radio jingle entitled "A Fresh Breeze Arrives," Better Without Mercury advertising campaign.
- https://youtu.be/EXxQri2WiEs Choc Quib Town – Oro. Musical theme regarding gold extraction in El Choco (on the Colombian Pacific).

Banning the mercury market:

- https://es.mongabay.com/2018/07/colombia-prohibe-uso-de-mercurio-en-mineria/

Colombia's link to the Minamata Convention:

- http://www.wwf.org.co/?uNewsID=325172