



Formalization is just the beginning: Analyzing post-formalization successes and challenges in Peru's small-scale gold mining sector

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ABSTRACT

In recent years, the formalization of artisanal and small-scale gold mining (ASGM) activities has become a key strategy for governments to better govern and regulate the sector. While scholars have focused on examining the viability of formalization itself, little is known about the outcomes once ASGM operations become formal, or whether formalization efforts are sustainable. Peru has made great strides on simplifying the formalization process and has formalized over 9600 artisanal miners. Drawing on a case study from one of these formalized operations, this research examines postformalization outcomes. Findings from interviews with government officials and members of the ASGM community in one of the most important ASGM regions of Peru, Puno, demonstrate that formalization has yielded mixed results. Formal ASGM operations have improved health and safety practices and labor conditions, and miners believe their environmental awareness has increased. Despite these changes, miners who have become formalized feel even more pursued and scrutinized than they did when they operated informally, and they continue to face challenges obtaining technical support and accessing capital. We argue that although some progress has been made in formalization efforts, the problems and weaknesses within the approach may inadvertently push miners back into informality. We conclude that in order for formalization to be more fruitful for governments and miners, governments working on formalizing ASGM activities would greatly benefit from the creation of a solid postformalization strategy focused on educating and supporting formal ASGM operations.

1. Introduction

In recent years, the lucrative nature of artisanal and small-scale gold mining (ASGM) has attracted millions of people from rural and developing communities who are seeking economic opportunities. This has caused widespread expansion in ASGM operations globally. It is estimated that ASGM is a livelihood for about 16 million people in over 70 countries, who are responsible for between 12 and 15% of the world's total annual gold production (Seccatore et al., 2014; UNEP, 2017). Despite this rapid expansion, the majority of ASGM activities continue to take place in the informal sector.

There is an emerging consensus that ASGM formalization must be designed to protect and improve livelihoods and address the environmental impacts and social problems associated with the sector (Siegel and Veiga, 2009). Donor pressure (e.g., World Bank and United Nations) to prioritize the ASGM sector in development strategies (Fold et al., 2014; Hilson and Maconachie, 2017), governments' recognition of the potential economic benefits from ASGM activities, and increasing global

attention to ASGM's environmental and social impacts have resulted in efforts to draft and enforce legislation focused on ASGM formalization (Verbrugge and Besmanos, 2016; Hilson and Maconachie, 2017).

Unfortunately, formalization poses significant challenges for governments and artisanal small-scale gold miners alike, with estimates that 70–80% of the sector continues to operate informally (IGF, 2017). However, it is important to note that this is only an estimate and getting an exact number of formal versus informal miners is a difficult task. The complexity of the sector, including the differences between operations, mining districts, and mining communities (Fisher, 2007; Verbrugge, 2014; Verbrugge and Besmanos, 2016) and a general lack of government enforcement capacity have contributed to the relative lack of success of government led formalization efforts. Furthermore, legislation aimed at ASGM formalization has often been designed with large-scale, mechanized, foreign-financed operations as a model while neglecting the current practices and needs of artisanal and small-scale gold miners (Hilson and McQuilken, 2014). Complicated procedures and fluctuating policies and guidelines also make formalization difficult for miners.

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Often, artisanal and small-scale miners are discouraged from initiating the process of becoming formalized, as the challenges are perceived to outweigh the benefits (Salo et al., 2016; Veiga and Marshall, 2019).

With most research focusing on formalization itself, little is known about the outcomes once ASGM operations become formal or whether formalization efforts are sustainable. Despite the emerging consensus that formalization is the pathway to “fix” the ASGM sector, to our knowledge there are no studies that focus on formalized ASGM operations. Therefore, the objective of this research was to explore an underexamined sub-set of the ASGM sector: formalized ASGM operations. Here we draw on research we conducted in one of the most important ASGM regions of Peru, Puno, which boasts the largest number of formalized miners in the country, and ask, what are the outcomes in cases where formalization is achieved, and to what extent do the assumed benefits of formalization materialize?

Through an analysis of perspectives on formalization garnered from government officials and members of the ASGM community, we demonstrate that formalization has yielded mixed results. On one hand, there have been improvements in health, safety, and labor organization and practices at formal ASGM operations, as well as increased environmental awareness among miners. Despite these changes, miners who have become formalized feel even more pursued and scrutinized than they did when they operated informally, and they continue to face challenges obtaining technical support and accessing capital. We argue that although some strides have been made in formalization efforts, the problems and weaknesses within the approach may inadvertently push miners back into informality. A deeper understanding of the formalization process and its outcomes can yield important insights for governments and international organizations as they refine and tailor policies, regulations, and donor projects aimed at supporting miners in becoming formalized. Our research also underscores the fundamental importance of developing robust post-formalizations frameworks and plans to support miners in maintaining their formal status and fully realize the purported benefits of formalization.

2. ASGM formalization

Governments and policymakers often see formalization as a method to better govern and regulate the ASGM sector, which is commonly linked to social and environmental problems such as crime and conflict, child labor, health and safety concerns, deforestation, and mercury pollution (Verbrugge and Besmanos, 2016; Hilson and Maconachie, 2017; Caballero Espejo et al., 2018). Governments have often struggled with formalization, and often blame miners for its failures without considering their own capacity to enforce legislation or the problems inherent to the legislation itself (Van Bockstael, 2014). The majority of ASGM operations are located in remote areas with very little governmental presence, making enforcement a difficult task (Hilson, 2002; Hilson and Vieira, 2007). Furthermore, often formalization initiatives are not well suited to the ASGM sector and require informal and small-scale operators to comply with the same regulations as large-scale, mechanized, foreign-financed operations (Hilson and McQuilken, 2014).

Environmental concerns are a central focus of most discussions about ASGM formalization. Artisanal and small-scale gold mining is currently the largest source of mercury emissions into the environment, releasing over 2000 tonnes of mercury per year, approximately 35% of the global total (UNEP, 2020). Mercury pollution and other environmental problems stem from the ASGM sector's use of rudimentary mining and processing technologies, low levels of occupational health and safety practices, as well as the lack of long-term planning and control (Hinton et al., 2003; Fritz et al., 2018; Martinez et al., 2018). Stakeholders also often vilify the ASGM sector due to its susceptibility to social conflict and human rights and labor violations (World Gold Council, 2017). In addition, public perceptions of the sector are shaped by unfavorable media coverage focusing on the negative human and environmental

health impacts (e.g., New York Times, Nov. 2019; New York Times, Dec. 2019). In broad strokes then, the ASGM sector is marginalized and criminalized due to its informality and human and environmental problems, with most artisanal and small-scale miners lumped into the category of “illegal gold miners.”

The process to become formal relies heavily on mineral tenure and property rights (Siegel and Veiga, 2009). Because the majority of artisanal miners do not possess mineral rights or land titles, and the regulatory processes and policies tend to be rigid and inflexible, securing a license and operating in the formal sphere is exceedingly challenging (Hilson, 2020). These and other bottlenecks keep miners from becoming formalized (Fold et al., 2014). In addition, some have argued that formal titles and mineral tenure rights do not necessarily guarantee successful formalization (Bromley, 2009; Verbrugge and Besmanos, 2016).

Examples of failed, incomplete, or even counter-productive formalization efforts abound. In Zimbabwe, Spiegel (2009) found that government initiatives and policy frameworks to manage the ASGM sector have proved counterproductive, as illegal activities have increased and artisanal miners have continued to rely on shadow economies. In other countries, like Sierra Leone (Maconachie and Hilson, 2011a, 2011b, 2011b) and the Democratic Republic of Congo (Geenen and Radley, 2014), researchers observed that artisanal miners had limited incentives to comply with existing legislation, as the state was unable to provide them with tangible benefits in return. In Colombia, over a 15-year span (1993–2008), government efforts to formalize ASGM operations proved to be unsuccessful, as only 23 mines of the total 3631 applications were able to formalize – less than 1% (Veiga et al., 2014). In Bolivia, Salman et al. (2015) found that government agencies were aware of their limited capacity to monitor and enforce policy compliance. Researchers have concluded that, regardless of location, formalization of the ASGM sector is a difficult task, especially if there is a lack of political will (Hilson et al., 2019).

Globally, examples of successful ASGM formalization are rare. This is in part due to the fact that most of the efforts to formalize the ASGM sector have focused on the legalization of ASGM activities in order for governments to collect taxes, rather than educating miners on how to work with adequate techniques to improve gold recovery and reduce environmental and health impacts (Veiga and Fadina, 2020). Researchers have also highlighted that without proper education and training, formalization initiatives are not sustainable and do not translate to better practices (Veiga and Marshall, 2019).

2.1. ASGM formalization in Peru – “illegal” versus “informal”

Peru is Latin America's top gold producer and the eighth largest gold producer globally (USGS, 2020). Artisanal and small-scale gold mining is responsible for up to 20% of the total gold production in the country (IISD 2018). The exact number of artisanal and small-scale gold miners in Peru is not well-established, but estimates range from 100,000–500,000 miners (De Echave, 2016). Despite considerable efforts to formalize the sector, the majority of ASGM activities in Peru continue to operate informally.

Prior to 2002, artisanal and small-scale miners were not legally recognized in Peru, and the country's mining laws and regulations were designed to facilitate large-scale mining and multinational investments in the country (Hinton, 2005). The government treated ASGM as a nuisance to be eliminated, including using military force against miners (Damonte, 2016; Salo et al., 2016; Toledo Orozco and Veiga, 2018). However, in 2002, Peru passed the Law of Formalization and Promotion of Small-Scale Mining and Artisanal Mining (Law 27,651) which introduced a legal framework for formalizing ASGM. One of the principle goals of the law was to facilitate the formalization of miners, but it was mostly ineffective. In addition, despite finally recognizing artisanal and small-scale miners, the law did not define the difference between illegal and legal ASGM mining, creating tensions because eradication of *illegal* gold mining remained a central focus (Damonte, 2016, 2018, 2018).

In 2012, the government passed Legislative Decree 1100, which regulated interdictions of illegal mining and outlined the actions (e.g., confiscation/destruction of supplies and machinery) that could be taken by the Peruvian government throughout the entire republic. Legislative Decree 1099 approved interdiction actions that could be taken against illegal mining specifically in the department of Puno. During this period there were numerous military interdictions to destroy ASGM operations and camps and discourage the proliferation of the activity (Miroff, 2014). That same year, Legislative Decree 1105 was passed to define and differentiate between *informal* and *illegal* gold mining. According to this decree, illegal mining refers to activities that are conducted without complying with the laws and regulations (permits or titles) or in zones where mining activities are prohibited (rivers or protected areas). Informal mining are those activities that take place in areas that are legally allocated for mining activities, and where miners are in the process of obtaining the legal titles and permits and complying with the standards to become formalized.

From 2002 until 2016, only 112 artisanal and small-scale gold miners became formalized, just 0.2% of the 72,959 applicants who enrolled in the formalization process. A major cause of this failure was the requirement, at that time, for artisanal and small-scale miners to comply with the same requirements as large-scale mining companies, including obtaining the necessary mining and water permits, conducting geological and archaeological studies, and having an approved Environmental Impact Assessment (EIA). No mining activities could take place until they had completed all the requirements. Due to the little progress that was made, a new decree (Legislative Decree 1293) was passed in 2016 that declared the formalization of ASGM as a national interest and created an “exceptional” procedure aimed at advancing formalization efforts. The exceptional procedure simplified the formalization process for artisanal and small-scale miners. Instead of conducting a full EIA, miners were required to submit a document signed by an engineer that declared their corrective and preventive environmental measures, and the archaeological study was no longer necessary; instead, miners simply filled out a form as an oath declaring the absence of archaeological remains. The “exceptional” procedure also allowed miners to continue operating and not be subject to government interdictions while they fulfilled the formalization requirements, as long as they were not mining in restricted areas. This served as protection for miners who had registered in the formalization process; however, this “exceptional” procedure and the protection that comes with it has an end date of December 31st, 2021. This decree also decentralized the formalization process and gave regional governments the authority to lead the formalization process in their respective territories. The Ministry of Energy and Mines (MINEM) provided regional governments with workshops, trainings, and finances to carry out their formalization process.

In order to become formalized under the current Peruvian regulations (Decree 1105), artisanal and small-scale gold miners must complete five mandatory steps: (1) obtain a mining concession title or come to an agreement with title owner; (2) gain access to the land or land title; (3) have an approved simplified EIA; (4) declare the absence of archaeological remains; and (5) prepare a technical mine plan. In return for achieving these steps and becoming formalized, the government has promised miners professional support to help them improve their operations (Law 27,651, passed in 2002). Despite the simplification of the process, formalization for artisanal and small-scale gold miners continues to be challenging, especially for the majority of miners who lack the titles to mining concessions. This creates a bottleneck in the formalization process. No less, this simplified process has led to the highest number of formalized artisanal and small-scale miners in Peruvian history. Today, out of 88,736 applicants, 9647 (11%) are formalized. However, if we consider De Echave's (2016) upper end estimate of 500,000 artisanal miners in the country, then formal miners only account for less than 2% of all miners formalized in Peru. After years of failure, this first hint of any successful formalization makes it even more

important to diversify research on formalized ASGM operations to understand ways in which formalization policies and regulations can be more effective.

3. Methodology

This research draws on fieldwork conducted over a 14-month period from July 2018 to September 2019. We collected data through in-depth semi-structured interviews, focus group discussions, and participant observation with community members, a formal small-scale mining company's employees and *socios* (associates who invest as shareholders in the cooperative), and government officials. We individually interviewed thirty people, including twenty-two cooperative employees or socios and eight government officials. Of the cooperative representatives, twenty were men and two women, holding various positions at the mines including miners, supervisors, accountants, lawyers, engineers, consultants, warehouse keepers, board of directors' members, and security guards. In these interviews, to understand the impacts of formalization, we asked both open- and closed-ended questions about peoples' perspectives on formalization, what if any changes they had observed as a result of formalization, and the challenges they continued to face despite formalization. We conducted three initial focus groups with coop representatives to identify topics to explore in more depth during the individual interviews. In this article we have anonymized the cooperative we worked with, as well as the research participants, apart from indicating whether he or she was a member of the mining community or a government official.

4. The site – from alpaca herders to gold miners

This study examines a formal ASGM operation in the Andean highland region of Puno, in southeastern Peru, bordering Bolivia (Fig. 1). Puno is a key site because almost a third (2,893) of the 9647 artisanal and small-scale miners who have become officially formalized are located in this region. Although an examination of the potential reasons for these relatively high rates of formalization lie outside of the scope of this paper, there has been very little research to date on the characteristics and outcomes of ASGM formalization efforts in this region. Most studies on ASGM formalization in Peru have been limited to the Amazonian regions (i.e., Madre de Dios) (Damonte, 2016, 2018; Salo et al., 2016), leaving out some of the most important ASGM zones in the country. According to MINEM, Puno produces more ASGM gold than any other region of Peru (MINEM, 2019). Mining is a significant economic driver in Puno, and from January 2018–June 2019, it represented 98.5% of the region's exports (MINCETUR, 2019).

This study took place in the province of San Antonio de Putina, in the town of Ananea, one of the most important mining districts in the region. Located at 4800 m above sea level, Ananea, nationally known as *La Ciudad Dorada* (The Golden City), has very distinct attributes that set it apart from other mining towns, including thousands of hectares allocated for mineral extraction and approximately 30 formalized mining cooperativas, some of which export certified gold to international markets. Despite the high altitude and extremely cold temperatures, much of the landscape has been excavated and stripped by miners working in large open-pit operations to extract gold from alluvial deposits (Fig. 2).

Ananea has a long history of gold mining that has shaped the organizational structure that exists today (García Noblecilla, 2019). From 1924 to 1937, a Peruvian mining company operated in the principal area of Pampa Blanca (or White Plains). After a 23-year pause, in 1960, Natomas Company, a North American based corporation began working the area using dredges and abandoned its operations in 1972 due to threats of expropriation. At that time, the state-owned company Minero Peru, took over the mining titles of over 30,000 ha with the intent to develop a large-scale mine. However, according to Minero Peru's reports, a late 1980s feasibility study determined that the mine was not economically justified to continue operating (Minero Peru, 1996). In

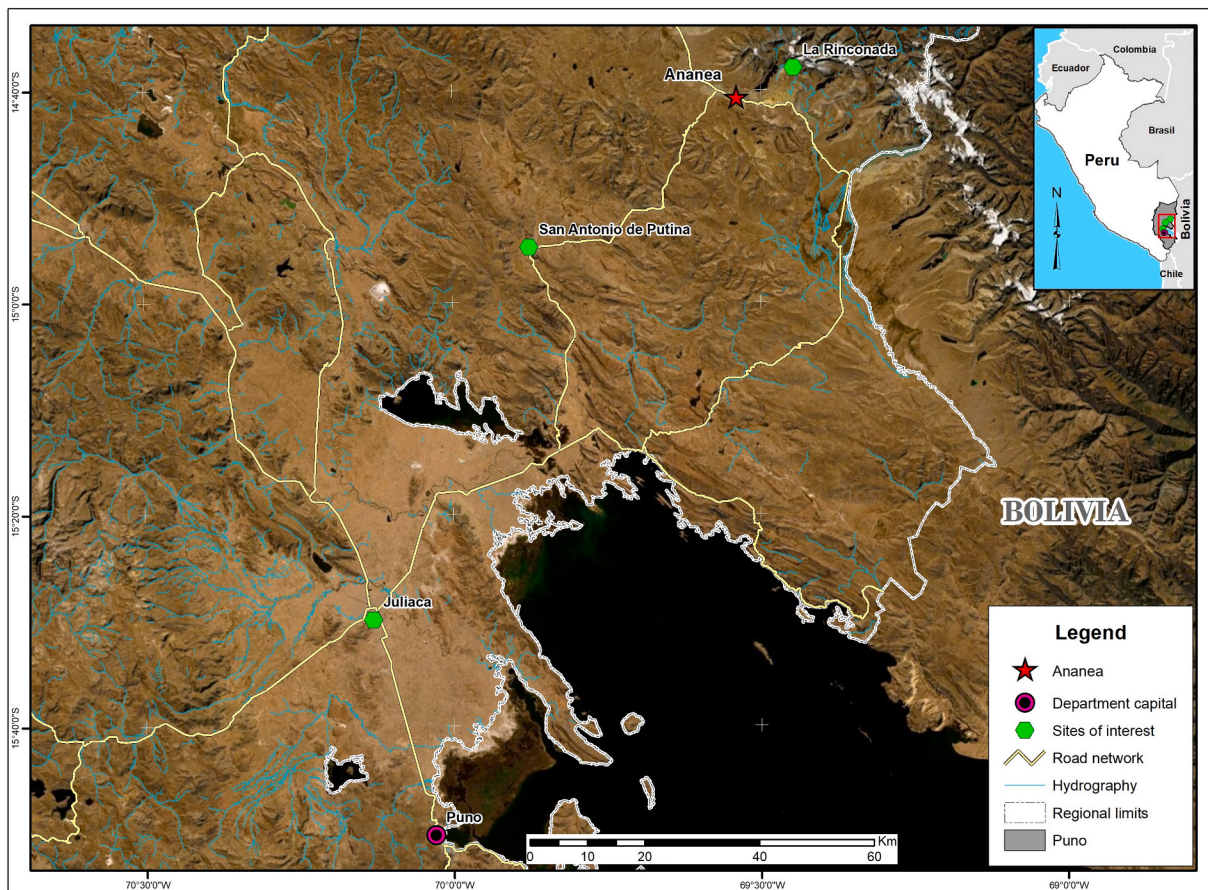


Fig. 1. Map of the study region. Sites of interest are shown in the hexagons (green). Ananea is shown with a star (red). Artisanal and small-scale gold mining operations take place in Ananea and La Rinconada. The nearest city to these sites is Juliaca, which is a 5-h car ride away. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

1992, Minero Peru began promoting privatization of the auriferous concessions in Ananea by holding two international public auctions, but they were not able to attract any investors (Minero Peru, 1996).

When Minero Peru took over in 1972, small areas of their concession were being mined artisanally by individuals and families from Ananea. However, the very first reports of artisanal mining in Ananea date back to 1878 by Italian geographer Antonio Raimondi (Raimondi, 1878). In Ananea, community members relied on mining during months with high precipitation (November–April), and they relied on alpaca herding, the traditional livelihood in this region, during the dry months (May–October) (Ferreira and Isbell, 2016). However, with the growing presence of larger scale mining companies in the 1960s and 1970s, the community realized the economic potential of mining in this area, and many people sold their alpacas to invest in mining activities, while others relocated their alpacas in order to mine the land.

Several interviewees stated that Minero Peru served as an example of how a formal, legal mining company worked and operated in their zone, and that they assimilated some of its processes and procedures. While they recognized the importance of organizing and working together, they ultimately saw that being formal allowed Minero Peru to continue to operate, while informal operations were subject to government interdictions. In 2013 in Ananea, national police and military raided, confiscated, and destroyed mining equipment and materials (Bnamericas, 2013). Community members confirmed that many of them were without jobs for months.

During interviews, we were also told that many young men left Ananea in the 1970s to pursue educational opportunities in urban areas such as Arequipa and Lima. In these cities, they were given greater exposure to the cooperative business model used in sectors, such as

agriculture, transportation, housing, and the closest comparison to them—alpaca husbandry. The cooperative business model is built upon solidarity in which members voluntarily come together to reach shared economic, social, and cultural goals. Decisions are made democratically, and each member has one vote; the goal is to equitably distribute costs and profits among all members. At the time, alpaca cooperatives existed in Ananea, but when these men returned to Ananea in the 1980s, they proposed starting a mining cooperative to unite miners from the region. Community members explained that it took a significant amount of time and effort to convince people to form mining cooperatives, as miners had always worked individually and for themselves. García Noblecilla (2019) also highlighted that the costs for miners in Ananea to operate individually increased over the years with the implementation of new technologies and heavy machinery, thus forming cooperatives and distributing the costs equally amongst members would allow for greater returns.

In the early 1980s, the community of Ananea formed the very first mining cooperative, *Cooperativa Santiago*, composed of 130 socios. *Cooperativa Santiago* paved the way for other cooperatives to form in the region—with their own visions, missions, values, and organizational structures. Eventually, all of these cooperatives created an umbrella organization called Mining Cooperatives of San Antonio de Ananea that is comprised of ten cooperatives. With this unifying organization, in the early 1990s, members traveled to Lima during public land auctions to advocate for the rights to obtain the titles to the mining concessions on which they had been working. Minero Peru's reports from the time highlighted that the community prohibited visits from Minero Peru's personnel in areas that artisanal miners occupied and blocked their ability to conduct any studies in neighboring zones (Minero Peru, 1996).

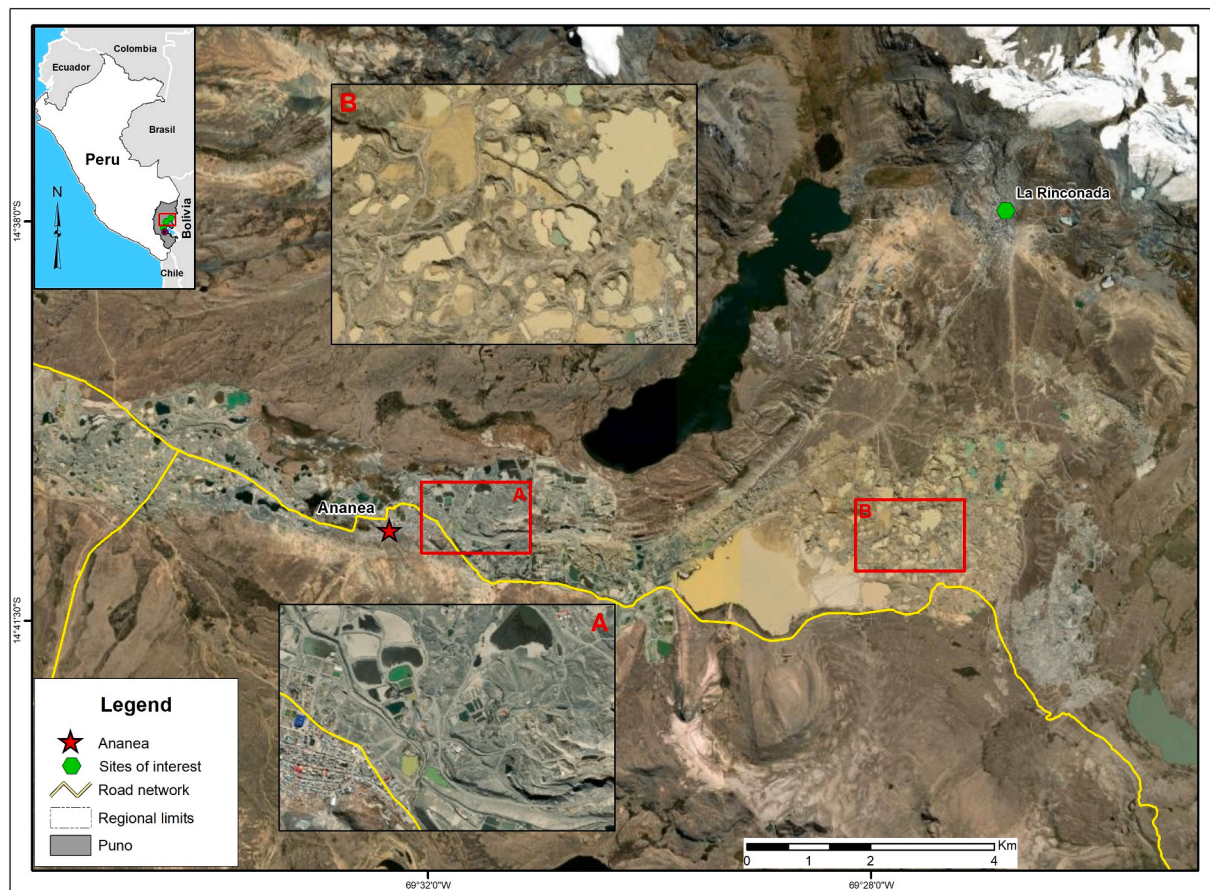


Fig. 2. Zoomed in map of the study region. Image (A) shows the town of Ananea, while image (B) shows the landscape which has been excavated and stripped by miners.

To avoid further conflicts with the community and after failing to find an international investor to purchase the concessions, in 1993, Minero Peru and the Mining Cooperatives of San Antonio de Ananea signed a contract transferring two large concessions (Maria and San Antonio de Poto) to the community. After returning to Ananea with the concession rights, the community divided them into 24 smaller concessions that were auctioned off to the cooperatives. Today, there are over 30 mining cooperatives in the region, of which 17 are formalized, the rest are in the process of becoming formalized (REINFO, 2020).

5. Results

5.1. Improvements in health, safety, and labor

Globally, the ASGM sector is generally associated with injuries and hazards due to a lack of health and safety practices and procedures (Hinton et al., 2003; Calys-Tagoe et al., 2015, 2017; Smith et al., 2016). However, the mining operations in the Ananea mining district presented an alternative image. Here, the large open pits resembled those of medium to large-scale operations (Fig. 3), with dozens of excavators, front-end loaders, and dump trucks. To start their shift, miners checked in at the security gate with their required personal protective equipment (PPE), and we observed miners being fed meals in the dining hall. Security gates were positioned at each entrance of the mine site and authorized visitors were met with signage throughout the entire site. Security guards patrolled the grounds, while supervisors inspected the operations to make sure workers were following proper protocols and the machinery and processes were running correctly.

Miners in Ananea stated that prior to formalization, health and safety were not prioritized, PPE was not required, accidents were more



Fig. 3. Photo of one of the open pit mines in Ananea with excavators and haul trucks in the distance.

prevalent, and it was common for miners to work long hours, resulting in fatigue and other health issues, as well as accidents. In interviews with miners, the second¹ most frequently mentioned benefit (91%) from formalization was improvements in health and safety (Fig. 4). Now, wearing PPE has become a norm. As one miner shared, “workers don’t second guess wearing PPE anymore, it is a daily habit, just like waking up and brushing your teeth.” Some government officials (50%) also acknowledged that formalization had improved health and safety practices and reduced accidents and fatalities.

Miners reflected that before formalization they worked “totally artisanally,” with simple tools such as shovels, pickaxes, and wheelbarrows. They lacked heavy machinery, a mine plan, PPE, supervision, or professional input and claimed that they worked long, strenuous hours. One miner stated, “Before formalization we would work in groups in a filthy manner (*a lo cochino*) without any organization or planning, every group on their own. And we would work as many hours as we could.” Another miner added, “There were more accidents because the bench was not controlled, the roads were not maintained, there was not any type of prevention. We all worked with whatever came out.” Due to formalization requirements, the mine has implemented new safety strategies, including slope stability monitoring and evaluation studies to create safer bench slopes and avoid collapses, slides, and other risks.

Miners also shared that prior to formalization they worked all day to produce a single concentrate which was then processed with mercury to recover the gold and sold weekly. They were generally paid once a week when the gold was sold, and their pay was based on the amount sold. The more hours they worked, the more ore they could process daily, which would lead to more gold recovered and higher pay. One miner, who currently holds a position in the municipal government, added that miners would leave for work before sunrise, sometimes without eating breakfast, and work in groups with their families or friends. He added that even after they organized into cooperatives, but had yet to become formalized, the goal was to work as many hours a day as their “bodies and water sources permitted”, sometimes working 16+ hour shifts.

Now miners in Ananea are compensated for their work regardless of the grade of the material or the amount of gold produced. They generally work two, 4-h shifts per day, separated by an hour break, and employees are on the cooperative’s payroll and receive insurance and paid time off. They have set schedules, working 15 days followed by 15 days off. During their daily shifts, they produce and process two concentrates. Gold is recovered from these concentrates by adding mercury to form an amalgam. The mercury is then volatilized by applying high heat, and the remaining *doré*, or gold alloy, is sold in bulk monthly. Prior to formalization, miners shared that they did not have a mechanism for capturing the mercury vapors and working in the amalgamation area for less than an hour gave them headaches. After becoming formalized, miners implemented a retort system to capture the mercury vapors, as well as other health and safety measures including requiring workers in the amalgamation areas to wear gas masks.

Miners commonly stated that although formalization was the catalyst for implementing these health, safety, and labor improvements, they were only possible by hiring professionals at the mine site, including mining engineers, environmental engineers, safety engineers, topographers, accountants, managers, nurses, and security guards. These professionals aided the cooperative in working in a safer and more organized manner and brought more legitimacy to ASGM operations with their focus on monitoring, supervising, improving operations, and reviewing and reporting data to the government. Some of the changes that were implemented included: (1) the optimization of haul truck usage to maximize production; (2) the installation of railings around the

sluices to prevent slipping or falling; and (3) the documentation of the entire production process to improve traceability. In addition to a Board of Directors and Administrative Council, each cooperative created an Occupational Health and Safety Committee.

Because the cooperative had to pay for these professionals, many of them were family and friends of the socios or recent college graduates who wanted experience. However, their expertise was respected and valued by the miners. One stated, “At first, everyone was accustomed to informality and doing things however they wanted ... But when the engineers are providing trainings and showing you examples of what can go wrong, then you listen to their explanation on how to avoid accidents and do things correctly.” The miners also mentioned that the formalization guidelines gave them the impression that the government would provide formal ASGM operations with technical support to improve production, environmental protections, and health and safety. All miners, except one (21/22, 95%), claimed that they had never received this type of assistance from the government. A previous cooperative president (2012–2016) stated:

Never, never, we have never received technical assistance. On the contrary, on behalf of the state we have received interventions and inspections with sanctions. We have never received any technical assistance, orientations, or trainings from the government, absolutely nothing. That is false. If there had been [support], we would have improved a long time ago. However, all this time we have had to sustain ourselves on our own projects.

Miners emphasized that they did not expect to receive money from the government, but they did expect to receive technical support to help them improve their operations.

The government officials interviewed confirmed the miners’ sentiments and highlighted that the government’s assistance has been focused on helping artisanal and small-scale miners fill out their EIA forms and Technical File in order to become formal. The government officials also pointed to a lack of field capacity. One official lamented, “there are miners working in zones of Peru that God does not even know about,” demonstrating the magnitude of the sector and the lack of governmental presence. In fact, there are currently just ten government employed engineers assigned to provide technical assistance across seven regions (Arequipa, Ayacucho, Apurimac, Cusco, La Libertad, Madre de Dios, and Puno). This means that in Puno, one government engineer is responsible for providing assistance to 6646 miners who are in the process of formalization. The practical result, as noted, is that no substantive technical assistance is available, even to formalized or formalizing miners.

5.2. Environmental awareness

In Peru, one goal of formalization was to address environmental concerns related to ASGM, and government officials often referred to the EIA as a “tool” to hold miners accountable for implementing better environmental practices. The miners we interviewed overwhelmingly (100%) felt that they were more environmentally aware now than prior to becoming formal, and the majority (82%) linked this awareness to the EIAs they were required to conduct as part of formalization. The EIA is composed of two parts, corrective and preventive. In the corrective section, miners must identify the corrective measures they are going to take to mitigate the environmental impacts that have already been caused in their mining concession. The preventive section outlines the measures they will take to minimize any future negative environmental impacts. The preventive section must be designed by an environmental engineer or an environmental scientist with prior experience in environmental management. Government officials base their annual inspections on the approved plan and give miners 40 days to rectify any issues. If they fail to comply, they are fined, and the government can revoke their formal status.

¹ The top response for both government officials and miners was the ability to work undisturbed by the government, reflecting how formalization represents a major shift from the government’s historically antagonistic relationship toward ASGM. This theme is further discussed in Section 5.3.

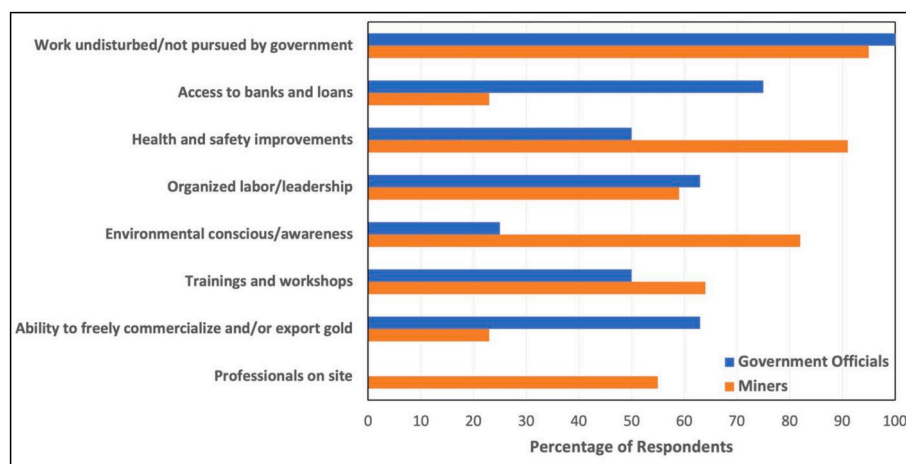


Fig. 4. Responses of miners (orange) and government officials (blue), when asked “What are the benefits of formalization?”. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Some miners stated that prior to formalization, ASGM operations released tailings, turbid waters, fuel/oil spills, and waste directly into the streams and onto the land. They stressed that they were working to comply with the formalization requirements and take care of the environment. For example, at this cooperative, they were no longer releasing tailings into the environment, they had built tailings ponds, and they were researching best practice examples of how to treat tailings. Some cooperatives had constructed settling ponds where suspended solids in wastewater from mineral processing settled out, and the water was then recirculated and reused. The environmental engineers also implemented a used oil disposal and recycling plan. Engineers shared that prior to this plan, miners would discard used oil anywhere—into streams, tailings ponds, or empty pits. Now there is a designated area where used oil is properly disposed of and is then sold to an oil recycling company every two-three months. The trainings, guidance, and support from engineers has resulted in a healthier and safer working environment, and in this case, a profit-generating activity for the cooperative.

Formal cooperatives are required to report on water use and quality and collect water samples three times per year from the catchment point (lagoon) and the point of recirculation (at the cooperative) and send them to an accredited lab for analyses of a variety of physicochemical water quality (e.g., pH, temperature, dissolved oxygen, nitrates) and inorganic (e.g., arsenic, copper, mercury, lead, zinc) parameters. Cooperatives had also implemented flowmeters to measure the daily volume of water being pumped into their operations, as they are required to abide by monthly maximum limits according to water permits. Regional water authorities analyzed the data to ensure that the mining operations remain in compliance.

Water quality monitoring has provided important data for the engineers working at the cooperative, as well as for the Regional Water Authority. Cooperative representatives never failed to highlight that the engineers they hired were spearheading the tasks of following the formalization requirements, especially those related to the environment. One miner stated, “Before we didn’t have a single professional. Today we have engineers and other professionals that show us how to take care of the environment.” Cooperative engineers provided monthly trainings and workshops to educate workers on environmental and health and safety issues. Miners stated that these workshops taught them about water management techniques, waste management, recycling, and the environmental risks from using mercury. The addition of new environmental management practices demonstrates that the process of formalization has raised miners’ environmental awareness. This type of awareness and knowledge, as well as the ability to act did not exist prior to formalization.

5.3. Making ASGM legible

As discussed earlier, over the last eighteen years, the Peruvian government has created new policies aimed at the ASGM sector. However, only over the last decade has the focus shifted from obstructing ASGM activities to moving them into a more legitimate, formalized space. For government and regulatory agencies, formalization appears to represent a way to benefit from, as well as surveil the sector.

The 2002 Law of Formalization and Promotion of Small-Scale Mining and Artisanal Mining outlined the potential benefits of formalization for miners (Law 27,651, Legislative Decree 1336), which included the ability to (1) freely commercialize and export gold; (2) operate in a secure, continuous, and peaceful manner; (3) receive technical support from government entities, (4) receive economic benefits, such as loans and financing; (5) avoid criminal proceedings for money laundering; and (6) access legal markets for production/mining supplies. Echoing number two in the list above, all of the government officials interviewed agreed that the most important benefit of formalization was that miners could “*trabajar tranquilamente*” or work peacefully and not be pursued by government (Fig. 4).

Miners (95%) overwhelmingly agreed with the government officials’ responses. This response was often followed by the explanation that the ability to work undisturbed allowed them to have a consistent income and operate in a secure, continuous manner without fearing that their machinery and equipment would be confiscated or destroyed. Various respondents recalled the government interdiction in 2012, when miners were left unemployed after their sluices were destroyed and they were not permitted to “move a single rock.”

However, working undisturbed did not necessarily translate to working unnoticed. Most government officials emphasized that formalization allowed government institutions such as MINEM, the Ministry of Environment (MINAM), and the Peruvian Customs and Tax Administration (SUNAT) to exert more regulatory oversight and control of the sector, as well as gain a better understanding of the sector so future policies and regulations could be more applicable to miner’s actual practices. Although this indicates that the government is working to align policy with reality, it also suggests that making ASGM legible allows the government to gain more control of the sector. Anthropologist James Scott (1998, p.78) argues that “an illegible state is a hindrance to any intervention,” whether the intervention is welcomed (i.e., technical support) or resented (i.e., taxation). As one government official stated, “You can’t improve, what you can’t measure. If you don’t know who it is, how many there are, and where they are, it is very difficult to design a solution for the problem.” Government officials also believed that formalizing miners would allow for better traceability of

gold and finances, provide MINAM with the capacity to regulate chemicals, such as mercury and cyanide, and allow SUNAT to collect taxes from the ASGM sector.

The current situation has left miners conflicted. While they generally felt that formalization allowed them to work peacefully, they also felt that formalization allowed for more government and regulatory scrutiny of their operations. One miner stated, “We are now under the government’s microscope and they are waiting for us to fail or make a mistake so they can fine us, sanction us, or shut down our operations.” Miners expressed that formalization provided the state with information on where and how they were operating. This coupled with the formalization requirements, including complying with environmental and labor laws and regulations, reporting gold production, providing receipts for every purchase, and filling out lengthy paperwork to commercialize and export their gold, as well as the risk of getting robbed while transporting their gold to legal markets made, in one miner’s words, “going back to informality inviting”.

Government officials also acknowledged the shortcomings of formalization. When we asked a government official about formalized miners feeling “under a microscope”, he stated, “That is true. Instead of one feeling protected by the state to do mining activities, you feel more, we can say, pursued because you have to fulfill a series of obligations. Simply because of a lack of knowledge, you are going to end up failing and having to pay fines or really high sanctions.” This government official not only echoes some of the miners’ sentiments, but he also indicates the importance of guidance, training, and assistance for newly formalized artisanal and small-scale miners.

In short, the government has not fulfilled the promise of providing technical support to formalized miners, as was outlined in the formalization policy of 2002. Miners shared that one reason why they became formal was so that they would not be considered “*contaminadores*” (contaminators) or “*ilegales*” (illegals), but after becoming formal they felt more pursued than miners who were not taking any steps to formalize or improve their methods. One miner stated, “All artisanal and small-scale miners, whether formal or informal, are all seen as informal miners. Government only shows our errors and accidents but does not help us fix them.” This problem, in part, may be rooted in the institutional culture of the government. After many years of oppositional relationships, it appears that government officials have not changed their mindsets to work with artisanal and small-scale miners. Rather, they continue to see ASGM as a problem, which affects how miners are treated and portrayed. A previous government official highlighted this point:

One key topic is the absence of a national policy that addresses and supports the ASGM sector...In general, I would say since 2012, if you look at it in only terms of budget, the emphasis has been put a lot more on the topic of interdictions against illegal gold mining than the topic of formalization. On average, the budget for ASGM formalization is 14–15 million soles (US\$ 3.9–4.1 million) per year, and the illegal gold mining (interdiction) budget has gotten to 60–80 million soles (US\$ 16.5–22.0 million). That’s 4 times the budget that formalization receives.

As the quote indicates, cultural change within the government has been an impediment to achieving the benefits of formalization. Oppositional perspectives continue to dominate while sufficient funds are not allocated to fulfill the promises of technical support.

In addition, although formalization makes ASGM more legible to the state in some respects, there remain large gaps in understanding. For example, access to bank loans was cited by the majority (75%) of government officials to be a significant benefit for formalized miners. Although some miners (23%) stated that formalized operations were able to access bank loans and freely commercialize and export their gold, many shared that when they attempted to open a bank account and obtain a loan, the banks denied their requests on the grounds that they did not want to get involved with the ASGM sector. During interviews with government officials, after they stated that miners could have access to banks and loans, we raised the common complaint from miners

that they had not been able to secure loans from banks. All of the government officials agreed that this was the case and that they were aware that obtaining bank loans was not really possible for ASGM operators. This highlights the disparities between the perceived benefits that the government purports that miners are able to capitalize on and the actual benefits that artisanal and small-scale miners are truly receiving from formalization. This type of misunderstanding and misalignment between the state and the ASGM sector inhibits the success of formalization efforts.

Government officials also believed that miners were reluctant to spend time and money to become formal when the incentives and benefits were not experienced immediately. An ex-government official illustrated this sentiment:

[In the long term] ... they will be able to request loans or acquire chemicals and machinery in a formal manner because they will be working in a formal supply chain. That in a sense will be cheaper, and you are not going to have to resort to the black market. The government also indicates that miners will be able to receive technical support to switch to clean technologies. But if you notice, all of it is in the long term, there is nothing immediate besides having a formal, decent job and operating peacefully without being pursued.

With the majority of benefits coming to fruition for ASGM operators after only several years of reporting all production and costs, paying taxes, legally commercializing their gold, and complying with environmental regulations, the lack of significant short-term gains contributes to a general reluctance among miners to become formalized, as well as a lack of perceived benefits once they do become formal.

6. Conclusion

The results from this study highlight that formalization has had mixed results in one of the most important mining regions of Peru. There were clear improvements in health and safety practices and labor conditions at the mine site and an enhanced environmental awareness among the miners. However, some of the purported benefits of formalization failed to materialize, most notably the absence of promised technical support, and in addition, formalized miners felt burdened by new responsibilities and increased scrutiny from the state.

Although, formalization laws in the country promise technical support to miners, in Puno, this has not been the case. Both government officials and miners emphasized that there is a lack of initial and ongoing support for miners. It is clear that ASGM organizations, in particular cooperatives, have been in part one key factor in the relative success of formalization efforts in Ananea. What technical and environmental improvements have been seen result from cooperative’s initiatives and their capacity to hire engineers and improve practices, without state support. Furthermore, even when miners invest the time, effort, and money to become formalized, they still perceive the government to be against them. Progress on formalization has not been enough to shift the government’s attitude away from interdiction and towards supporting the ASGM sector. As a result, instead of formal artisanal miners feeling more protected, accompanied, and supported by the state, they feel more persecuted and scrutinized.

Even in what could be considered an optimal case of formalization in Peru, in which miners were able to organize into cooperatives, obtain legal titles to the concessions and mining rights, and become formal, we see that persistent challenges may push them back, either partially or completely, toward the informal sector. Many more ASGM operations in Peru face larger obstacles, including the inability to obtain legal titles to concessions and mining rights. For these miners who struggle even more to become formalized, the realization at the end of the formalization process that government is not upholding its promises of support and instead still views them as a problem, is likely to provoke even greater disillusionment and resentment. Although behavioral and cultural change also needs to come from the miners themselves, there are substantial risks for formalization, as both miners and government officials

acknowledge that regressing to informal status might be seen as an inviting possibility.

Peru has made great strides to simplify the formalization process; however, it appears that the government's primary goal is to simply *legalize* the greatest number of artisanal miners possible. Reflecting the tendency for oversimplification that *Scott (1998)* critiques as part of the push for legibility, success is measured by the number of formalized miners and not the improvements that have been made in formal ASGM operations. To make formalization more fruitful for miners and government officials, it cannot simply be seen as a strategy to make ASGM more 'legible.' There needs to be an approach that takes miners' perspectives and needs into account and that views formalization as a step within a holistic improvement process, rather than an end unto itself. If miners are not supported to remain formal and comply with legal requirements without being sanctioned and fined, there is a high probability that they will revert to informality, especially considering that most benefits are delayed rather than immediate.

Ultimately, state-led formalization of ASGM activities in the Puno region continues to resemble legalization of ASGM operations rather than capacity building, which is necessary for adequate formalization. Moving forward, governments working on formalizing ASGM activities would greatly benefit from the creation of a solid post-formalization strategy with allocated budgets and personnel focused solely on educating and supporting formal ASGM operations. By truly prioritizing formal ASGM operations and providing technical support, this can serve as an incentive for miners to become formal and implement changes to retain their formal status. Formalization should not stop after artisanal miners receive a paper acknowledging their legal status. On the contrary, that is where the work to transform artisanal miners to responsible miners begins. Artisanal miners who have committed to becoming formal and operating in the legal sphere should be rewarded with support to enhance their operations and practices, not penalized by a bureaucracy unable to shed its oppositional mindset, unwilling to uphold its end of the bargain, or not committed to tailoring policies and incentives to the realities of ASGM.

Author statement

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