

Two industries at a crossroads

The formalization of artisanal and small-scale mining may be necessary to help meet global demand for critical minerals

By Kelsey Rolfe

The Kamilombe cobalt-copper artisanal mine in the DRC is situated between various industrial mining operations; an industrial copper mine operated by La Sino-Congolaise des Mines (Sicomines) is visible in the background.

Jean Martineau never really bought into the way junior mining companies financed their exploration—in his opinion, issuing rounds of shares on the public market to fund exploration work only diluted the value of management’s ownership stake over time. So when Dynacor Group, the company he was newly leading as president and chief executive officer, bought a small private company in Peru in 1996, Martineau saw an opportunity in its half-built gold processing plant. Dynacor finished building the 50 tonne-per-day (tpd) mill by 1998, intending to extract and process ore from the main vein on its mining concession and use it to finance continued exploration on the site.

The area was home to many artisanal miners who came looking to sell their ore. Artisanal miners are informal and largely work with rudimentary or unmechanized tools. “We thought, ‘this isn’t our business, but it could be helpful for them and we can earn some money.’ But it wasn’t a big [focus] for us,” said Martineau.

But the price of gold skyrocketed from roughly US\$290 per ounce in 1998 to US\$1,300 by the end of 2010, and the number of Peru’s artisanal miners grew along with it. Dynacor developed a progressively larger producer network of artisanal miners and kept boosting its plant’s production capacity. Processing the artisanally mined ore quickly became the company’s main business. In November 2022, Dynacor completed its latest mill throughput expansion, to 500 tpd. It now works

with approximately 1,000 artisanal mining collectives, representing between 5,000 and 6,000 miners.

However, its business model has not been without challenges, Martineau said. Dynacor had to set standards for the types of ore it can accept to ensure a consistent recovery rate, and set up offices around western Peru with 50 employees who develop relationships with miners and analyze the metallurgical properties of their ore. It had to adapt to the country’s changing legal framework around artisanal miners, and now works exclusively with those who are formalized or in the process of formalizing. It also provides health and safety training, support from geologists and help with filling out government paperwork.

Dynacor is one of a small but growing number of mining companies working directly with artisanal and small-scale miners (ASM). The ASM sector, which employs roughly 45 million people globally and economically supports millions more, includes operations ranging from small groups of miners, often digging on concessions owned by mining companies, to official cooperatives that employ workers but generally work with less sophisticated tools than big mining companies. There are around 20 million artisanal gold miners worldwide, with the remainder split between gemstones, diamonds and critical minerals like cobalt, copper and tantalum.

The ASM sector has long had a bad reputation for dangerous operating conditions, poor environmental practices and the



presence of child or forced labour, and mining companies and their downstream buyers have historically preferred not to engage with ASM miners to avoid legal and reputational risk. But experts say that co-existence models are key to helping formalize the sector and address some of its most entrenched issues, as is advocacy from buyers of critical minerals.

A mindset change among mining companies is “coming, but slowly,” said Marcello Veiga, professor emeritus at the University of British Columbia’s Norman B. Keevil Institute of Mining Engineering. Veiga, who works with multiple mining companies on engaging with artisanal miners, co-authored a 2022 paper for *The Extractive Industries and Society* journal on varying approaches to co-existence between gold mining companies and artisanal miners in Latin America. This ranges from companies that allow miners to operate on their concessions with minimal or no involvement to those that provide technical assistance and support, and companies like Dynacor that buy and process ASM ore. The paper highlighted arrangements with artisanal miners at sites such as Lundin Gold’s Fruta del Norte mine in Ecuador and AngloGold Ashanti and B2Gold’s Gramalote project in Colombia.

The voracious demand for critical minerals may create an imperative for more companies to help formalize the sector, said Rob Karpati, senior advisor at the Blended Capital Group, a corporate and investment advisory company. “The bottom line is

that there is either a win/win or a lose/lose approach: one where lack of engagement [with ASM] leads to conflict and value destruction, or one where earnest engagement leads to collaboration along with mutual value that extends to the community and down the value chain as productivity is enhanced,” he said.

“ASM is a legitimate sector that has existed for many centuries in different formats. Bringing stability [by] equipping, training and driving them towards best practices makes it fair and increases productivity while you’re at it. It means you can contribute [more] to the energy transition if there’s more copper and cobalt.”

Different approaches

Engagement with the ASM sector to date has been led by non-governmental organizations (NGOs) and intergovernmental organizations like the United Nations Environmental Programme (UNEP), many of which aim to provide health and safety training and address environmental issues.

These projects are well-intentioned but “cosmetic,” Veiga said. Take programs to eradicate mercury use in the processing of artisanally mined gold, for example. According to the UNEP, ASM gold mining operations are responsible for 37 per cent of global mercury pollution. But programs designed to teach artisanal miners about the health and environmental dangers of mercury ignore the financial realities of individuals or smaller operations. “You can teach them, but if they have no money it doesn’t matter,” Veiga said.

Additionally, many ASM gold miners are not processing the gold themselves, but taking their ore to middlemen with processing facilities, whom Veiga called “sharks.” After the miners hand over their ore, the processing facilities recover a poor percentage of the gold—typically 30 per cent or less—and pay miners a small sum. The facilities retain the tailings and use cyanide to extract the remaining gold for themselves. “When people say we need to find alternatives to replace mercury, [I just think] we need to stop the sharks,” he said. “The only solution is companies working together with artisanal miners.”

Ruby Stocklin-Weinberg, program manager of De Beers Group’s GemFair program, noted NGO-led programs are also generally unable to operate for long enough to introduce lasting changes. Her PhD research at UBC focused on developing successful training programs for artisanal miners. “Most projects I looked at lasted [between] three to five years, and that’s just not enough time,” she said.

GemFair, which launched in 2018 as a pilot program, buys diamonds from artisanal miners in Sierra Leone and sells them to the international market. A team of De Beers employees in the country’s Kono District evaluates ASM operations to ensure their labour, health and safety and environmental practices meet the company’s minimum standards for program participation. The company also does classroom and hands-on training with miners to improve their practices, and has procured safety equipment for them.

Stocklin-Weinberg said the program’s evolution demonstrates the value of working with artisanal miners over a longer timeframe. Since its initial pilot stage (which transitioned to a full program in 2021), the GemFair team has found more efficient ways to bring miners into the program and train them, allowing it to add roughly 50 ASM sites per year. She added that the company is revisiting its approach to mine site monitoring but has not seen evidence of child or forced



(Top) A worker at the Kamilombe mine in the DRC sorts artisanally mined cobalt ore; (left) staff from De Beers Group's GemFair program providing training at an artisanal diamond mine in Sierra Leone; (right) the Artisanal Gold Council's program in Burkina Faso trains artisanal miners on mercury-free gold processing technologies.

labour, conflict financing or human rights abuses at any of the operations it works with. De Beers is planning to evolve its standards to make it possible for miners to join the program earlier in their journey to meet the requirements, and is looking to introduce thematic-based training, including on topics such as site reclamation.

"There's still so much to learn, and it's been five years," she said. "Most other projects would've wrapped up by now."

The Victoria, B.C.-based Artisanal Gold Council (AGC) is working to provide training to ASM miners and develop responsible supply chains, with four active programs in Mongolia, the Philippines, Burkina Faso and Guyana. Its Burkina Faso program, which began in 2019 and is set to wrap up in 2025, is training 150 miners on mercury-free gold processing technologies and helping them organize into cooperatives, apply for licences to operate and receive business financing.

Saidou Kabre, the AGC's national project manager for Burkina Faso, said that with the AGC's help, the formalization process takes about a month. "The complexity is that most of the miners are illiterate, and don't possess the necessary documents," he said. To prepare for the ending of the program's support, he said the AGC has been fostering connections between relevant government agencies, existing cooperatives and other critical stakeholders, including financial institutions.

Kabre acknowledged that the mercury-free gold processing technologies miners were being trained on are expensive and only currently operated at one pilot site in the country. Scaling up to service Burkina Faso's roughly 800 artisanal mining sites would require greater support from donors and other collaborators, he said. One solution the AGC has pursued is to develop manufacturing capacity with local professionals so that equipment can be built locally instead of being imported.

Navigating the legal landscape

It is easy to say mining companies should pursue co-existent relationships with artisanal miners, but it is harder to execute them. One major hurdle is many countries' legal landscapes around the ASM sector.

“There are not many producer countries where artisanal mining has its own category in the mining code,” said Stocklin-Weinberg. Sierra Leone’s clear regulations regarding the ASM sector were a “very big motivation” for De Beers to begin working there.

Dynacor is considering building gold mills in two other countries, Martineau said. When approached by representatives of Latin American and African countries, the first thing Martineau asked is how or whether artisanal miners exist under the country’s mining laws. “If I have a legal mill, how would I buy ore legally from illegal miners?” he said. In Senegal, one of the countries Dynacor is considering, the government has reserved a particular area where artisanal miners can operate legally if they register with the mining department.

Even in countries with formalization processes, Veiga noted they tend to be overly bureaucratic and contain too many hoops for miners to jump through. This can be especially challenging for miners with low literacy levels and those who live far from government offices.

Peru’s ASM formalization approach required several revisions to address the realities of artisanal miners. An earlier version of the legislation required ASM operations to complete the same kind of environmental assessment as a major mining company, which has since been simplified. To date, the country has approximately 9,600 formalized ASM operations. While Martineau said the process is improving, Dynacor often has to help its suppliers navigate it.

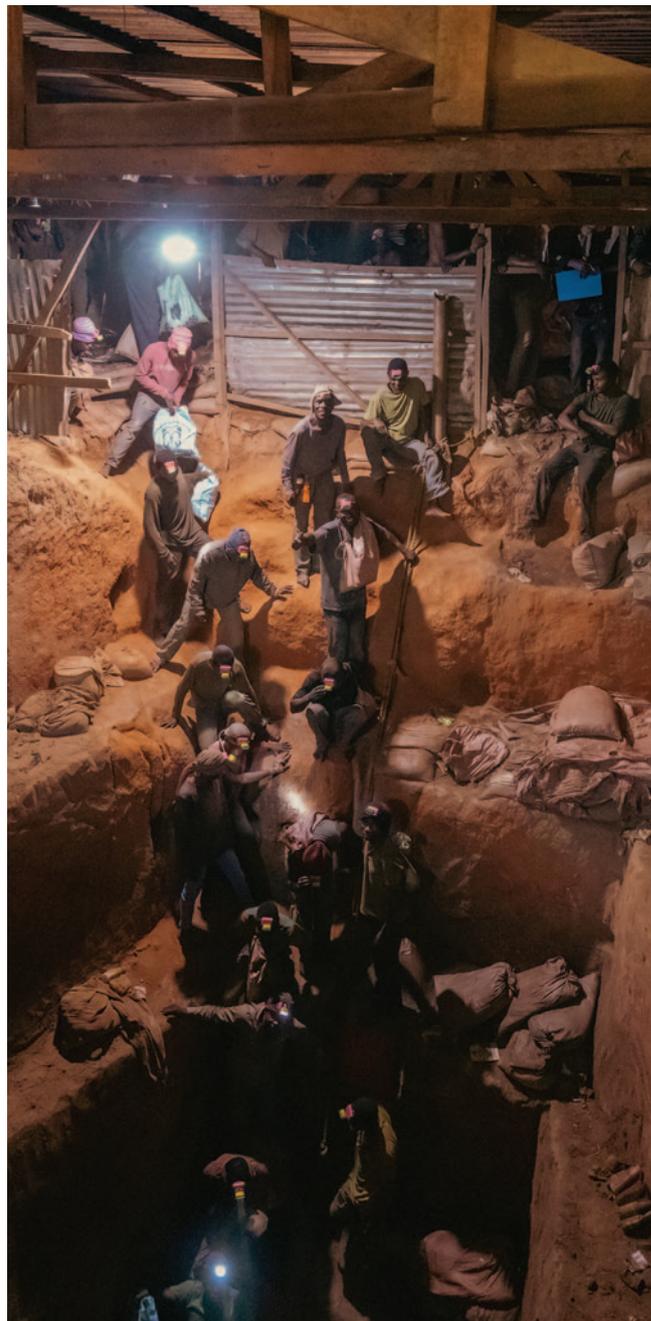
To comply with the law, the company has a stringent, 27-point verification process. When considering a new miner, it will verify their operations’ location, that they own or have a legal right to be on the concession and what stage they are at in the formalization process. Dynacor also sends a geologist to the property to confirm that the ore actually comes from there and to determine whether there are children working on site.

Formalizing DRC miners

The Democratic Republic of the Congo (DRC) has become a focal point of discussions around formalizing the ASM sector. According to Natural Resources Canada, as of 2021 the DRC hosted 46 per cent of the world’s known cobalt deposits and was responsible for 73 per cent of the world’s cobalt production. ASM-produced cobalt constitutes 15 to 30 per cent of the country’s annual cobalt output and 10 per cent of global cobalt production.

The country established a framework in 2018 to formalize ASM operations and transition artisanal miners to small-scale operations, requiring miners to become registered, receive permits and operate in a legally designated area. But according to Anne-Marie Fleury, Glencore’s responsible sourcing director: “There are not many ASM operations that meet all these requirements yet.”

One short-lived ASM formalization pilot project highlighted the operational and livelihood improvements to miners from legal ASM. The project, launched by Chemaf Resources and Trafigura Group in 2018 with the support of Congolese authorities, arranged for a cooperative of artisanal miners to work in small open pits on Chemaf’s Mutoshi concession. The companies



A group of artisanal miners (known as “creuseurs” in the DRC) using ropes to descend down one of the hundreds of tunnels at the Kamilombe mine at the beginning of their work day.

provided technical assistance, training, safety equipment and geological information. The project also brought women into the ASM workforce, which Dorothee Baumann-Pauly, director of the Geneva Centre for Business and Human Rights at the Geneva School for Economics and Management, noted in a February 2023 paper increased family incomes and allowed children to attend school, reducing child labour.

But the suspension of the project in March 2020 due to the COVID-19 pandemic undid those changes. During a site visit in December 2022, Baumann-Pauly learned that formalization standards were no longer observed. Miners were not wearing personal protective equipment, the open-pit mines had been



Dynacor works with a large network of artisanal miners in Peru, processing their ore at its Veta Dorada gold plant.

replaced by “about 150 poorly ventilated and unstable shafts that lead to deep vertical and long horizontal tunnels,” and more than 15,000 miners, including children, were working at the site—well up from the 5,000 adults working there during the formalization pilot project.

In an email to *CIM Magazine*, Trafigura’s head of media relations Victoria Dix said the company had opted not to restart operations due to changes in Congolese law in March 2021 to establish the *Entreprise Générale du Cobalt (EGC)*, an agency meant to oversee artisanal mining and purchasing of domestic ASM cobalt ore prior to the processing stage. The EGC’s rollout has been hampered by internal government controversies.

Those types of operating conditions are why many major electronics and automotive companies have tried to contractually exclude ASM-generated cobalt from their products.

But Baumann-Pauly’s paper called on cobalt end users to work with mining companies to encourage the proper formalization of ASM in the DRC. “Without ASM cobalt, buyers will not be able to meet a global demand that is projected to increase four-fold by 2030,” she said in a press release.

Michael Posner, director of the Center for Business and Human Rights at New York University’s Stern School of Business, said cobalt mining companies and buyers should work together to set standards for how to engage with artisanal miners. “There needs to be a collective effort,” he said.

Fleury agreed, noting that Glencore has evolved its approach to ASM operations over the past few years. “We recognize the importance of ASM producers in the cobalt supply chain and DRC communities. Industrial companies like us have a role to play, but partnership approaches are needed to address the issues.”

Glencore has no plans to buy or process ore from artisanal miners, which Fleury said is because its two DRC sites are large-scale, integrated operations that mine all their own cobalt and copper for processing and export with no need to purchase from any third parties.

Glencore’s approach to building partnerships has been to join the Fair Cobalt Alliance in 2020 to address the “bigger picture and root causes” of the country’s ASM sector. The organization, which also counts Tesla, Google and other civil society and human rights organizations among its members, works to help Congolese ASM cooperatives formalize their operations, address child labour in ASM and develop other economic opportunities in communities. “We realized that what we want to do we cannot do alone,” Fleury said. “We’re an industrial, commercial player and the issues associated to artisanal mining can’t be solved exclusively by a single actor, or by the large-scale mining industry or cobalt supply chain alone.”

Building trust

When a country’s legislation is on side, co-existence models can work well if there are specific conditions in place, Veiga said. Chief among them is a commitment to building trust with miners.

Martineau said Dynacor has built trust through being completely transparent about its pricing and ore analysis. When artisanal miners bring ore to Dynacor’s plant, they watch as it is weighed and crushed, as 60 kilograms is put through a small dry ball mill, and as four samples are prepared from 10 kilograms of the milled material.

The first sample is given to the miner, the second is analyzed immediately and two are set aside. Dynacor’s lab returns its results within 24 hours, and if the miner is happy with the assessed value of the ore, they can be paid upfront. The company pays between 70 to 80 per cent of the gold value in the ore it sells. If the grade of the ore seems unusually high, a third sample is analyzed to confirm it, and if the miner does not trust the company’s analysis, they can take their own sample to another lab. If there is a difference between the two samples, the fourth is sent to an international lab in Lima.

“The miners see all the preparation, it’s very transparent and it’s very appreciated by them,” he said. “They are human beings; we have to treat them with respect.” **CIM**