

Artisanal and small-scale mining: the paradox of extraction

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Figures on artisanal miners are often lumped with small-scale operators. Yet, understanding what motivates such miners or stops them from becoming formal small-scale miners is a step towards addressing the adverse consequences of artisanal mining.

There are an estimated 9 million artisanal and small-scale mining (ASM) operators and about 54 million dependants of the activity in Africa. ASM is the second largest employer after agriculture and employs 10 times more miners than the large-scale mining sector, producing [18% of Africa's gold](#) and almost all gemstones except diamonds. ASM has gained more prominence as a source of livelihood over time, with the number of miners quadrupling between 1999 and 2014. In Eritrea and the Central African Republic, for example, more than half the [population is dependent on ASM](#). ASM affords higher income than agriculture, often provides employment in depressed agricultural areas, and slows down rural-urban migration.

Why it is important to separate artisanal mining from small-scale mining

The paragraph above is a typical introduction to ASM literature but as gripping as the figures may be, lumping together artisanal and small-scale mining presents a challenge to policy prescription and implementation. It is a foregone conclusion, going by most literature from global mining authorities and international institutions such as the World Bank, that the two components of ASM should be addressed as one. The 9 million miners and 54 million dependants or the 18% of gold produced are not disaggregated to identify which group plays what role. This [challenge is pointed out by the World Health Organization](#), calling to attention the inconsistency in definitions of ASM provided by the World Bank, the International Labour Organisation (ILO), the United Nations Environment Programme (UNEP) and eminent scholars. The [nuances in ASM](#) are critical for formulating actionable

policies and without proper recognition of these nuances, any blanket policies targeting ASM will be ineffective. Policy makers have to target artisanal mining or small-scale mining each on its own merit.

One reason why they are lumped together may be due to the lack of credible or adequate data on artisanal mining as a result of its informality. However, informality notwithstanding, the significance of artisanal miners should not be overlooked by considering them as merely part of small-scale mining. There are significant differences in motivation and ability between individual gold-panners rummaging in open mine pits or river beds and incorporated groups that own mechanized processing capacity. As it stands, it is hard to tell how much impact artisanal miners have on the mining sector and how much any policy adjustments targeting them specifically would affect the mining industry, even when it is known that artisans make up the majority of the mining workforce. A critical starting point in this debate is to define the boundary beyond which an artisanal miner becomes a small-scale miner.

[In Ghana](#), for example, to get a five-year licence, small-scale miners have to pay the Minerals Commission US\$200 and also acquire an environmental permit from the Environmental Protection Agency for US\$1,435, which expires every two years. This would then give them access to at most 25 acres of demarcated mining areas where they can work formally, under government supervision. However, the bureaucracy and costs involved inhibit many miners from acquiring the required permits. These are the unregulated miners practising what is commonly referred to as *galamsey* (illegal artisanal mining). These miners are mostly local individual entrepreneurs and micro-enterprises using crude and basic technology such as pick-axes and shovels, requiring low capital

input, and often highly itinerant. On the other hand, small-scale mining often involves some labour substitution with capital due to the use of more sophisticated technology such as excavators, dredgers, metal detectors, sifters and crushers. This relatively capital-intensive exercise increasingly attracts foreign ownership, pushing local miners into the periphery.

While it is common to view the [distinction through the lens of formality](#), making the case that artisans are informal while small-scale miners are formal, it is difficult to agree on what constitutes formality in this context. Depending on the jurisdiction, it may imply government regulation, legal provisions for the activities, or organized record keeping. Although small-scale mining is legally recognized by most jurisdictions and often regulated through licensing, this is often not the case for artisanal mining. In [Ghana, artisanal miners lack both legal recognition and government regulation](#). While small-scale mining is legal and supposedly regulated, there are many small-scale miners operating without licences, which further confounds the distinction between the two mining practices. In Tanzania, artisans – referred to as Wavamizi (invaders) – are legally recognized by [the 2010 Mining Act](#). Legal recognition notwithstanding, the artisans attract negative sentiments as the government of Tanzania does not adequately regulate their mining activities, resulting in the perceived ‘invasions’. In Ethiopia, artisanal miners are both legally recognized and relatively well regulated. Given the variations in governance in different countries, the Ethiopian example may be hard to replicate elsewhere but provides a good case study on how artisanal mining could be conducted.

[Mining in general is considered unsustainable](#) due to the non-renewable nature of the commodities and the extractive nature of the industry. It is especially the case for artisanal mining due to the itinerant nature of the artisans who move around, leaving behind innumerable gaping holes, a manifestation of the limited geoscientific information available to them. Ultimately, the goal should be to pivot all miners into more sustainable sources of livelihood, but first it is critical to curb the negative impact of artisanal mining. Understanding the artisans and their motivations and what prevents them from becoming small-scale miners where they would benefit from government resources and regulations is a step towards taming the adverse consequences of artisanal mining.

Critical differences across regions and minerals

In Mali, Burkina Faso, Guinea, Ghana, Sierra Leone and most of tropical West Africa, gold and diamond mining is mostly done on arable agricultural land. As a result, the presence of artisanal mining becomes a threat to the agricultural sector and specifically threatens crop cultivation. In arid and semi-arid areas like sections of eastern Ethiopia and the Sahel, ASM has marginal impact on agriculture but still has environmental, social and health implications similar to those in arable areas. Even within a regional context, artisanal gold mining, which dominates ASM discussions, poses a set of challenges different from those posed by diamond and other gemstone mining.

Artisanal gold mining is a critical component of ASM as it results in displacement of farmlands, diversion and conversion of streams into mine sites for panning, and contamination of soil and water due to the use of mercury and cyanide in the gold amalgamation process. According to the [Minamata Convention on Mercury](#), the use of mercury and cyanide in mining is unique to the gold mining process and occurs mainly among artisanal miners. Small-scale miners often have more advanced sifting and amalgamation techniques such as the use of sluices, centrifuges and vibrating tables. When well regulated, mine tailings and mercury-gold alloy burning can release minimal mercury particles to the environment. Other minerals often do not require the use of chemicals in the extraction process but still have other detrimental side effects, such as noise pollution in the case of quarrying. However, all these minerals result in lowering the groundwater table through dewatering of mine pits, hazardous abandoned sites close to communities that become fertile breeding grounds for mosquitoes, societal challenges such as child labour and gender inequality, and diversion of a critical labour force that is vital for other sectors of the economy such as smallholder agriculture.

In spite of the obvious negative side effects of both artisanal and small-scale mining, the size of the populace that is dependent on the sector can be very significant in some countries, making an outright ban of the practice politically unpopular and socially untenable. There is urgent need for a practical and sustainable solution but for that to happen, the changing nature of ASM must be recognized, as the sector has seen a significant shift from artisanal work into small-scale mining as a result of the entry of foreigners with access to capital. This increased labour-capital substitution reduces employment opportunities for the local communities while still churning out the same negative externalities. At the

same time, earnings from the sector are increasingly financing investments and expenditure abroad and in regional hubs, with only a small portion of these earnings trickling down to local communities. This not only makes the detrimental aspects of ASM more apparent but also weakens its justification as a source of low skill employment *en masse*.

The ASM-agriculture nexus

The nature of the relationship between agriculture and artisanal mining is intricate, dynamic, and often confrontational. Both practices can occupy the same geographic space and share and/or compete for the same factor inputs i.e. land, labour, water and capital. The two activities tend to be mutually exclusive in such regions, with increased mining resulting in destruction of farmlands, pollution of waterways, reduction in arable land, reduction in agricultural productivity, decline in food security, and commandeering of the critical agrarian labour force. Given the unsustainability of artisanal mining and the ballooning global demand for food production, it is only prudent to rethink how to adjudicate this relationship.

There are rare instances of symbiosis between agriculture and mining [observed across Africa](#). In Mozambique, for example, 30% of those engaged in ASM in the townships of Niassa and Manica use those earnings to supplement their seasonal farming income in the dry season. In the township of Chazuka, farmers buy fertilizer and crucial farm inputs using their earnings from artisanal mining. The seasonal alternation between farming and mining is also common in Sierra Leone, Kenema (see Box), Komana West in Mali, and East Akim in Ghana. Similarly, in Geita, one of the oldest gold mining districts in Tanzania, villagers invest their profits from gold mining in agriculture, viewing it as their primary economic activity even though gold mining provides a higher income. In Liberia, rural inhabitants use rice grown on their fields to attract artisanal miners who explore the same fields for diamonds and get paid with rice pending any diamond finds, which can then be split between the owners of the farms and the artisans. These cases are rare and although their benefits pale in comparison to the adverse consequences of ASM, they point to possible areas of consensus between the two sectors.

Countries can create a more amicable relationship between the two sectors by formalizing and legalizing artisanal mining to allow for monitoring and government regulation in order to lower the health and environmental damage caused, and also by actively incentivizing and nudging artisans towards other sustainable activities such as agriculture.

Farmer-miners of Sierra Leone

Sierra Leone's alluvial diamond mining (often referred to as 'blood diamonds' because of their alleged role in the country's prolonged civil war) is critical to the economy. Diamonds have been a major source of revenue since their discovery in the 1930s, [ranking third](#) in exports after iron ore and crustaceans in 2016. In 2014, artisanal mining contributed [36% of diamond mineral exports](#).

Unlike in many diamond-producing countries such as South Africa and Botswana where diamonds are mined deep in the earth's crust, Sierra Leone's diamonds are found on the surface, making them easily accessible to artisans. Two river systems – the Sewa, which flows through Kenema, Bo and Bonthe districts; and the Moa, which flows through Kenema and Pujehun districts – have over time deposited diamonds over large areas in the south and east of the country. It is especially easy to find diamonds during the dry season when the rivers subside.

Since these rivers flow through agricultural areas rich in farmlands and swamps, mining and farming activities dovetail smoothly. Using the volume of mining licences issued as a proxy, the labour allocation cycle is as follows:

- ▶ The peak period for mining licence issuance is between January and March, which corresponds with the dry season when farms are prepared for cultivation by clearing of undergrowth, felling of trees and the burning of debris. While the vegetation is drying, farmers can afford time to undertake diamond mining, both licensed and illicit.
- ▶ In April, licence issuance declines as farmers shift labour towards preparing farms and sowing seeds. Farming activities increase in intensity in anticipation of the rains in July and August. Farmer-miners spend this period attending to their farms, growing subsistence food crops and selling surpluses to the mining population in towns such as Koidu.
- ▶ From late September to November, the rice crop is harvested and this requires intensive labour. Once harvesting is completed, labour then shifts back to mining and there is a spike in the number of licences issued.

Ethiopia's handling of this conundrum can help inform policy making in other countries. Ethiopia's strategy is laudable but implementation is the core challenge. How does a government effectively enforce the two-year contracts? How does it ensure that artisans have sustainable livelihoods elsewhere after exiting the mines? The problem here is that if artisans cannot support themselves sustainably, they are likely to return to illegal artisanal mining since they are no longer eligible for licences. Given that mining communities in Ethiopia save less than 5% of their income to invest in other activities, this programme likely rarely achieves its objectives. Some tweaking of the programme could improve the outcome. The government could implement a savings scheme e.g. matching the artisans' savings to encourage more saving, or withhold some of the income and release the funds upon termination of mining contract. This would provide a substantial lump sum which can be used as initial capital in a new venture.

The problems associated with ASM are manifested in different ways across countries. However, Ethiopia's fundamental policy changes can inform how other countries go about harmonizing ASM and agriculture in order to achieve sustainable growth. The key takeaways here are that there is need to:

- ▶ Formalize the ASM sector to allow for monitoring and government regulation in order to lower the health risks and environmental damage that result from ASM activities.
- ▶ Strengthen institutional capacity to plug regulation loopholes. This requires comprehensive geological mapping and land use planning, identifying areas with mineral reserve potential and guiding the utilization of such land resources. In addition, the use of heavy earth-moving and dredging equipment in artisanal mining sites should be restricted.
- ▶ Strictly enforce existing policies and regulations. The challenges to such enforcement are brought about by regulatory capture by vested interests, weak institutional capacity and weak coordination among development partners and government entities that are in the ASM/agriculture space.
- ▶ Address the longstanding challenges confronting smallholder agriculture such as financing, logistics and technical support. Making agriculture attractive again will reverse the attrition of its labour force.

The Ethiopia case

In Ethiopia, mining contributes about **10% of the country's** foreign exchange earnings. Two-thirds (65%) of mining is ASM, employing at least 1.26 million people and supporting the livelihood of over 7.5 million. Of this mining labour force, 43.2% is also involved in subsistence farming. While these numbers are critical in benchmarking the size and importance of ASM activities, they are likely to undervalue the earnings, given Ethiopia's thriving local gold market and likely black market. Nevertheless, of note is the strong encouragement by the government for artisans to use their income as seed money for other ventures.

Policy interventions:

- ▶ Legalize artisanal mining through two-year non-renewable licenses; upon their expiry, artisans have to leave the areas that have been zoned and demarcated for ASM activities.
- ▶ Conduct geological mapping and demarcation of land to halt encroachment on arable land and suppress itinerancy.
- ▶ Offer extension services and training to miners to ensure safe and environmentally sound practices that meet prescribed health standards.
- ▶ Strengthen the legal market system to reduce smuggling by **guaranteeing a market and prices** to artisans through the National Bank of Ethiopia (NBE) and its designated regional banks which are obliged to buy any minerals (mainly gold) tendered.

Outcomes:

- ▶ Gold purchased by NBE increased from 500 kg in 2008/2009, to 8,200 kg in 2011/2012 generating about US\$300 million.
- ▶ Gemstone harvesting increased from 3,000 kg to 16,500 kg for the same period.
- ▶ Foreign exchange earnings from gemstones rose from less than US\$500,000 to about US\$6 million.
- ▶ At the same time Ethiopia has seen substantial growth in crop production, mostly **driven by area expansion, increased yield, and enhanced productivity**. A causal relationship cannot be claimed as it is not clear whether the expansion is in new unexplored areas or land reclaimed from ASM activities.

Concluding observations

Unregulated ASM activities are irrefutably detrimental to the environment and threaten agriculture and food security. However, the fact that millions of people are employed in or depend on the sector cannot be ignored, but it offers few options that can provide large-scale employment with relatively high income. This means careful consideration of regulation, transition and exit from the sector is necessary. Regions where ASM activities are carried out on arable agricultural land, such as in tropical West Africa, can use crop farming as a means for these communities to pivot sustainably out of artisanal mining. Where the soil profile and climate favour farming activities, conscious efforts should be made to help miners shift into farming and this would entail changing some fundamental aspects of agriculture in order to make it as appealing as mining. Shifting to agriculture is not a panacea as many areas of ASM activity are not agriculturally viable, but farming can be a crucial alternative in areas that are viable. Agriculture provides a clean and sustainable way out and with a growing African population and accelerating rural-urban migration, food production promises to remain a critical and resilient sector. Africa's tropics can be the world's food basket and encouraging artisanal miners to gradually trade their shovels for hoes is a step towards global food sustainability.

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