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RESEARCH ARTICLE OPEN ACCESS

Does Formalization Facilitate Environmental Improvements in the Artisanal and Small-Scale Mining Sector?

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ABSTRACT

This paper explores the link between formalization and environmental performance in the artisanal and small-scale mining (ASM) sector, focusing on the case of sub-Saharan Africa. The impression often conveyed by experts is that a commitment to formalizing ASM—that is, moves made to bring the sector's operations into the legal domain, where they can be regulated, monitored, and audited more closely by government officials—leads to environmental improvements at sites. In sub-Saharan Africa, however, the relationship between formalization of ASM and environmental performance of the sector's operations is more nuanced than is often portrayed. Findings from research carried out in Ghana and Liberia, the locations of two dynamic ASM economies in sub-Saharan Africa, are drawn upon to reinforce this point.

1 | Introduction

This paper explores the link between formalization and environmental performance in the artisanal and small-scale mining (ASM) sector,¹ focusing on the case of sub-Saharan Africa. The impression often conveyed by experts is that a commitment to formalizing ASM—that is, moves made to bring the sector's operations into the legal domain, where they can, in theory, be regulated, monitored, and audited effectively—leads to environmental improvements at sites. But in sub-Saharan Africa, where significant moves have been made in a number of countries over the past 30–40 years to formalize ASM, the link is far more nuanced than has been projected.

Most countries in the region that have attempted to address the environmental impacts of ASM have done so only recently and long after officially legalizing the sector. The regulations and policies they have ushered in for this purpose have typically been inserted into *entrenched* formalization apparatuses and

institutional structures that were conceived specifically to reduce the smuggling and illicit sales of minerals originating from ASM sites (Table 1). In sub-Saharan Africa, formalization of ASM has undoubtedly influenced environmental performance at sites but mostly in ways different from those commonly cited.

The paper begins, in Section 2, by revisiting the origins of the ASM formalization agenda in sub-Saharan Africa, providing a timely reminder of why it emerged in the first place. Section 3 proceeds to “locate” discussions about environmental protection in this debate. The main takeaways from this section are that, in sub-Saharan Africa and potentially elsewhere, the idea that formalization of ASM leads to environmental improvements at sites is *assumed*, and that despite analysis that may suggest otherwise, at no point in the region has the latter been the primary objective for pursuing the former. In Section 4, the paper shares findings from ongoing research in Liberia and Ghana, the locations of two dynamic ASM economies in sub-Saharan Africa in support of this position. The findings shared

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TABLE 1 | Formative small-scale mining legislation implemented in selected countries in sub-Saharan Africa.

Country	Main mineral(s) being mined on an artisanal and small-scale	Key legislation and year(s) implemented	Name of license(s) and/or permit(s)
DR Congo	Gold, diamonds, cobalt, and coltan	Law No. 007/2002 of July 11, 2002, Title IV Artisanal Mining (Art. 109 to Art. 113) Amended by the 2018 Law No. 18/001	ZEA/AEZ/Zone d'exploitation artisanale/Artisanal Exploitation Zones
Ghana	Gold and diamonds	Small-Scale Gold Mining Law, Precious Minerals and Marketing Corporation Law, Mercury Law, 1989 Subsumed by the Minerals and Mining Act (Act 703), 2006	Small-Scale Mining License
Liberia	Gold and diamonds	Minerals and Mining Law, 2000	Class B License Class C License
Sierra Leone	Gold and diamonds	Mines and Minerals Development Act 2022 and the Sierra Leone Mines and Minerals Development and Management Corporation Act 2023 which replaced the Mines and Minerals Development Act 2009	Artisanal Mining Licence Small Scale Mining License
Zimbabwe	Gold, diamonds, chromite, and colored gemstones	Statutory Instrument 275 (1991, Regulations on Alluvial Gold Panning in Public Streams) Now the Mines and Minerals Act (Chapter 21.05) and other laws that draw from this Act	Prospector's Licence and Certificate of Registration

Source: Information compiled by the authors.

are confirmation that the (modified) formalization structures now in place for ASM in sub-Saharan Africa fail to facilitate environmental improvements at sites in ways that are commonly believed. Section 5 reflects on the broader policy implications of the analysis and shares concluding remarks.

2 | Deconstructing Formalization Strategy in the Artisanal and Small-Scale Mining Sector

The origins of “formalization” in ASM policy dialogues can be traced back to the late-1980s and early-1990s. The main reason why it suddenly became a focal point of technical assistance and regulations implemented for the sector at the time was growing concern in donor and policymaking circles over the widespread smuggling of gold and precious stones at sites. Kambani (1995) was among the first scholars to comment on the scale of the phenomenon, explaining that “delays in payments, unresponsive exchange rates leading to overvaluation of local currencies, unfair pricing policies, inadequate marketing facilities and lack of formal financing sources have contributed to the widespread growth and uncontrollable rise in illegal trading activities of gemstones, diamonds and gold in many developing countries” (p. 110). The author used data available at the time to capture the “Dimension of the Problem”: how annually, more than 80% of Colombian emeralds and 50% of emeralds originating from Zambia, valued at US\$800 million and US\$200–\$300,

respectively, were being sold illegally; only one third of gold production in the Philippines was entering legal marketing channels; 50% of emeralds mined in Zimbabwe were being sold illicitly; and most of the US\$1 billion in gold being produced annually in Brazil originated from illegal mining operations scattered across the Amazon Basin.

Early champions of ASM formalization were in broad agreement that if the sector was “properly organized and supported,” mineral smuggling would reduce markedly and could “become a basis for related value-added economic activities” as well as “provide the raw material inputs for domestic manufacturing and fabricating industries” (Davidson 1993, 317). Momentum to formalize (ASM) began to build in policymaking and donor circles in the 1990s on the back of dialogue exchanged at two major gatherings: (1) the international seminar, *The Guidelines for Development of Small- and Medium-scale Mining*, held in Harare, February 1993; and (2) *The International Roundtable on Artisanal Mining*, which took place in Washington, D.C., May 1995. Experts from across the world attended both, exchanging ideas on how to legalize and support ASM effectively (Labonne 1994; Barry 1996).

Despite recent claims that may suggest otherwise, the position of donors and host government officials on formalization of the ASM sector has, from the beginning, aligned closely with the views of *Legalists* (De Soto 1989, 2001). Scholars who fall

into this camp see “the informal sector as comprised of ‘plucky’ micro-entrepreneurs who choose to operate informally in order to avoid the costs, time and effort of formal registration and who need property rights to convert their assets into legally recognized assets” (Chen 2012, 5). Although lacking details about sites and the operators who populate them, the material published on ASM in the 1980s and early-1990s did provide enough of a glimpse of the “plucky” microentrepreneur equivalents patrolling the sector who were ultimately responsible for a substantial share of mineral smuggling at the time. Wels (1983) was among the first to reflect critically on the scale of the task facing governments working toward formalizing ASM, claiming, over four decades ago, that “By nature, small-scale miners do not take kindly to government regulations and frequently escape the fiscal net” (p. A29). Carman (1987) subsequently elaborated on the challenge of facilitating what Davidson (1993) later described as the “transformation of artisanal or informal operations into commercially viable operations” (p. 323). The author expressed reservations about the ability of policymakers to engage “the small mine owner” who, it was argued, “as a producer, often sporadically, of limited amounts of minerals from deposits with few known ore reserves of a character not readily amenable to mass mining”, on the whole “pays little attention to laws” (p. 159).

Views such as these would shape many of the policy dialogues at, and the donor responses emerging from, the expert gatherings in Harare and Washington DC. The popular view among attendees was that “small-scale mining, particularly artisanal mining, had become a mainstay of many rural economies and that a legal framework that recognizes the characteristics of this type of mining is a prerequisite for formalizing the sub-sector” (UN 1996a, 215). A handful of countries, most notably Ghana, the Philippines and Zimbabwe, had already taken important steps toward establishing this “legal framework.” The governments of each had implemented fresh regulations and policies, with the goal of legalizing ASM, and had made a series of institutional and policy changes aimed at improving monitoring at sites and preventing illicit sales of minerals: in Ghana, the *Small-Scale Gold Mining Law, Mercury Law and Precious Minerals and Marketing Corporation Law* in 1989; in the Philippines, the *Small Scale Mining Act of 1991*; and in Zimbabwe, the *Mining (Alluvial Gold) Public Streams Regulations* (Statutory Instrument 275), also in 1991 (Maponga and Ngorima 2003; Hilson and Potter 2005; Verbrugge 2015). Officials at the United Nations credited moves such as these with reducing mineral smuggling, claiming that “The rise in the sector’s official contribution is mainly due to the steps taken for the formalization of the originally illegal miners” (UN 1996a, 217).

Today, formalization in the context of ASM—in particular, why it is pursued and what many believe it is capable of achieving—is perceived very differently, although it is unclear how discussion on this subject reached this point. It is now understood to be more of a *process* “that can include the introduction of legal and regulatory frameworks, providing legal access to minerals, information about geological data, organizing miners into flexible and dynamic organizations, and providing access to capital, equipment, and technical assistance” (Singo and Seguin 2018, 7). There is some concern among (ASM) experts, however, that it has “become a cliché to present formalisation as a silver bullet

for challenges faced within ASM, whether environmental, financial, social or technical” (AMDC 2017, 6). In support of this claim, it is *assumed* more often than not, that the policy, institutional and regulatory frameworks in place for the sector are equipped to support such a multipronged *process*. On the one hand, as Fritz et al. (2017) correctly point out, “Legal frameworks and programs are emerging across governments to formalize the ASM sector, since its potential to become more environmentally and socially responsible is increasingly recognized” (p. 27). A “well-designed formalization process [for ASM],” officials at the United Nations Environment Program point out, “generates the enabling conditions for accountability within the sector so that it can ultimately be integrated into the formal economy” (UNEP 2012, 2).

On the other hand, the earliest regulatory and policy frameworks implemented for, and technical assistance administered to, ASM were *not* designed with the idea that formalization of this sector should be viewed as a *process*. More specifically, while the broad consensus today may be that formalization in the context of ASM is “more than just legalizing and regulating economic activities” (Fritz et al. 2017, 27), the architects of the formative legislation implemented in the abovementioned cases of Ghana, the Philippines and Zimbabwe, as well as a number of other countries, such as Tanzania, Zambia, Brazil and Indonesia, did not conceive regulations with this idea in mind. Again, governments that had passed legislation and implemented licensing schemes for ASM in the late-1980s and throughout the 1990s had done so with the goal of reducing mineral smuggling and capturing *hitherto* lost revenue for the state. They carried out this work seeking to “raise the status of small-scale mining from that of an unorganized, undersupervised and underresourced industry to one that is organized, monitored, supported and modernized to meet specific national goals” (Kumar and Amaratunga 1994, 21).

Fritz et al. (2017, 27) have rightly acknowledged that overall “progress [toward formalizing ASM] is slow,” which they attributed to “both a lack of resources and by government strategies that do not always match the miners’ needs, priorities and capacities.” This, they maintain, is why “Many national policies fail because they do not consider the variety of ASM characteristics, and thus the specific needs of varied mining sites, or because they are too restrictive, consisting of too many or overly complicated administrative steps or requirements, among other reasons.” These are indeed valid points but what cannot be ignored is the growing expectation that the traditional approach taken to formalize ASM is capable of resolving a multitude of the sector’s problems while simultaneously positioning individual operators and groups to thrive economically. What proponents of formalization continue to overlook is how “Legal frameworks and programs” have simply been incorporated, with very little scrutiny, into *preexisting* ASM policy and regulatory architecture which, again, was designed and implemented with very different objectives in mind.

This is why the claim that formalization of ASM leads to “more environmentally and socially responsible” operations, therefore, is misleading; it is often *not* evidence-based but rather *assumed*. The discussion that follows unpacks this rather tenuous assertion further.

3 | Formalization and Environmental Performance in the ASM Sector: Articulating the Link

Where, then, does the “environment” fit into the ASM formalization debate? Proponents of (ASM) formalization hint that it “unlocks” individual operators: that they are not only forced to comply with regulations but, as licensees, also find themselves in a newfound position to access much-needed technological and financial support. It is furthermore maintained that, for host governments, formalized ASM operations are—at least in theory—far easier to monitor, regulate, and audit than their unlicensed counterparts. Collectively, the changes which formalization ushers in are seen to have a transformative impact at sites, including pushing operators down a path that is more sustainable, environmentally.

When articulating any link between the formalization of ASM and the state of operations, a deeper understanding of the sector's policy and regulatory focus is imperative. On the subject of environmental protection specifically, a rapid appraisal of the earliest literature on ASM reveals that this was rarely a motive behind inaugural efforts to legalize the sector, if at all. There was certainly acknowledgment at the time that formalization *could* lead to environmental improvements at ASM sites, but most of the explanations provided were abstract.

Discussions on this subject began to galvanize following the Harare seminar, the broad aim of which was to “provide a framework for encouraging development of small- and medium-scale mining as a legal, sustainable activity in order to optimize its contribution to social and economic development” (Labonne, 1994, 15). To achieve this, emphasis was placed on three themes, one of which was *Environmental and Social Aspects*. Under *Environmental* specifically, delegates stressed that making the sector's operators aware of the potential for activities to damage the environment and to assume responsibility for minimizing these impacts, ensuring effective local monitoring and encouraging the adoption of cleaner technology, should be prioritized moving forward. These ideas were further debated 2 years later at the *Roundtable*. Here, attendees expressed concern that “uncontrolled artisanal mining” has several negative effects, including “unacceptable environmental practices, poor social, health, and safety conditions”, which they attributed to the “technical and financial limitations” of operators (Barry 1996, 4).

It has since become clear that the argument made at the time about formalization being a key to “limiting its [i.e., ASM's] negative environmental impacts” (UN 1996b, 215) was a reference to how legalizing the sector puts regulators in an improved position to monitor and facilitate changes in practices at (ASM) sites. Although this view is largely-unfounded, it continues to resonate powerfully in government, private sector and donor circles: specifically, the idea that formalization, as a *process*, “brings miners into the orbit of the state, which provides protections, in the form of social and labour rights, but equally obligations, such as taxes and compliance with labour and environmental requirements”.² Perhaps nowhere has this been more evident than with the rhetoric surrounding policy treatment of mercury, which, for centuries, has been used in the ASM circuit to

amalgamate gold. As has been widely documented for decades, mercury, when released into the natural environment, methylates and bioaccumulates, posing a major health risk to humans. Today, ASM is the largest anthropogenic source of mercury emissions in the world; its activities are responsible for the release of over 20 tons of the metal into the natural environment annually. Formalization, however, “is [now] seen by many as a pre-condition for the effective reduction and control of mercury use, since it can facilitate organization, education, access to assistance, and the regulation of gold and mercury trade” (UNITAR and UN Environment 2018, 10). But this position is—and reinforcing claims already made—little more than an unfounded *assumption*. There is no evidence in support of the policy and legislative frameworks instituted specifically to address mineral smuggling, moves that have often been packaged as “formalization” (of ASM), leading to improved regulation of activities using mercury and monitoring at sites *directly*.

The argument that *formalization leads to improved environmental protection at ASM sites* is even more contentious when considering that there is no evidence that the formative regulatory, policy, and institutional architecture ushered in to “formalize” ASM was subsequently overhauled with environmental objectives in mind. Work carried out by Bugnosen (1998) offers a glimpse of *where* the thinking was on environmental issues during the design phases of the earliest ASM regulatory and formalization apparatuses. Among the 18 countries surveyed by the author, six required individuals applying for ASM rights to incorporate environmental protection plans that needed government approval before a license was issued; four had addressed specific environmental problems linked to the sector through dedicated legislative provisions; and two had in place a tax levied on mineral output, intended to generate money that would, in turn, be used in part to rehabilitate mined-out areas (Bugnosen et al. 1999).

It has since become clear, however, that in each of these 18 cases, policies and laws implemented purposively to address environmental concerns were simply “bolted” on to foundational formalization architecture. The shortsightedness of this approach was recognized early-on, sparking claims in Harare that “Small/medium-scale miners find it increasingly difficult to cope with environmental protection requirements” (Labonne, 1994, 14). This aligned closely with the donor position at the time: that “small-scale miners lack the knowledge and resources to use the best environmentally safe techniques,” and how “it will fall on government to monitor and encourage the use of such techniques,” most notably “efforts to raise environmental awareness, set minimum standards of compliance, and provide technical assistance in designing optimum mining systems” (Kumar and Amaratunga 1994, 21). Similar dynamics persist today, even in countries now regarded as being at the forefront of ASM governance. Two illustrative examples are Colombia and Guyana, where it has been shown that “a narrow focus on titling by no means guarantees that environmental regulations will be followed, as this requires money, training and incentives, and enforcement” (Prescott et al. 2022, 245).

These disparities bring sharply into focus claims made by Davidson (1993) shortly after the first wave of countries were hastily implementing policies and laws in a bid to reduce illicit

flows of minerals originating from ASM sites. The author was optimistic about how “It [i.e., ASM] can be rationalized and formalized; made more efficient, economic, safe and environmentally benign” on the grounds that “artisanal mining can be constructively transformed, and its character changed to increase its benefit potential and eliminate or at least minimize its disadvantages.” Yet, at the same time, the author very importantly cautioned that “the ‘constructive’ reconfiguration of artisanal mining may mean different things to the various parties concerned” (p. 317). For those who believe that “‘constructive’ reconfiguration of artisanal mining” through formalization leads to environmental improvements at sites, there are two very important points to consider. They are as follows: (1) that host governments are capable of facilitating change through regulation and monitoring and (2) that those engaged in the sector are willing and/or in a position to consider compliance with legislation and standards, and capable of modifying their operations accordingly. Both points will be discussed here.

Countries in sub-Saharan Africa, the location of the Ghana and Liberia cases profiled in the next section of the paper, have been pedestrian in overhauling regulatory and policy architecture for ASM. As indicated, from the late-1980s through to the mid-1990s, a wave of countries in the region implemented legislation that officially legalized/legitimized ASM. The main reason for doing so was to establish local (mineral) purchasing outlets, viewed as a key to curbing the smuggling of high-value minerals. The list included Guinea, where, following implementation of Law 92/004 on 1 April 1992, buying agencies were empowered to purchase diamonds and gemstones from artisanal miners, and mandated to record all bills of sales (Article 21); Ghana, where, in response to neighboring Togo exporting gold despite not having any (gold) mines, the government established the Precious Minerals and Marketing Corporation (PMMC)³ to purchase precious minerals from ASM groups; and Zimbabwe, which, in 1984, established Fidelity Printers and Refiners (Pvt) Ltd. to serve as the country's sole gold buyer and subsequently mandated all of the country's (ASM) operators to sell mined product to its agents (Davidson 1993; Coulibaly 1994; UN 1996a; Sanderson et al. 2021). These and complementary moves made elsewhere in sub-Saharan Africa helped position host governments to capture some of the gold and/or gemstones being mined on an artisanal and small scale in-country: records obtained from these countries reveal sizable increases in official mineral production/exports. But complacency rapidly set in, as many governments in the region, content with the revenue accrued from the sales of the gold and gemstones they were capturing, seemed disinterested in legalizing, let alone fully formalizing, the ASM operations producing them.

At this point, it is instructive to revisit Davidson's (1993) point about how “the ‘constructive’ reconfiguration of artisanal mining may mean different things to the various parties concerned” (p. 317). For the tens of millions of people dependent on ASM for their livelihoods worldwide, the key concern was—and will likely always be—security of tenure. In other words, does a license and/or permits awarded to small-scale miners afford opportunities denied to them in the informal economy, and can legalization of their operations be realized within a relatively short timeframe after they lodge applications (for licenses)? The broad consensus in donor circles in the early-1990s was that “To

facilitate formalization, it has been recognized that registration procedures and regulatory compliance can be simplified for subsistence miners in order for them to operate in a favourable institutional and legislative regime” (UN 1996b, 9). But few governments worldwide have taken on board these points when designing ASM licensing schemes and policies. This oversight was so glaring that officials at the International Labour Organization (ILO) would declare, toward the end of the decade, that “Small-scale mining is bedevilled with too many regulations that are mostly designed to constrain it and too few inspectors to ensure that they do” (ILO 1999, 87).

The situation in sub-Saharan Africa, however, was—and continues to be—particularly dire. Initially, it was a case of most of the inaugural ASM licensing schemes implemented in the region simply lacking appeal. Examples included Ghana's *Small-Scale Gold Mining License*, which, in the beginning, was granted for a period of three years but was not a transferable title and could only have been renewed “for such further period as the Secretary may determine”⁴; Zambia, where the passing of the *Mines and Minerals Act* of 1995 established, *inter alia*, Artisan Mining Rights, which granted title holders the right to work, on an artisanal scale, an area no larger than 50 km² but for a *non-renewable* lease period of only two years (Dreschler 2001); and Tanzania, where, following passage of the *Mining Act of 1998*, small-scale operators were required to follow the same laborious procedures as multinational mining companies by first applying for a Primary Prospecting License and subsequently, a Primary Mining License if they wanted to proceed with production (Mwanga 2022). A proliferation of licensing schemes that were not particularly aligned with the needs and capabilities of prospective applicants provided the foundation for, and fueled the development of, the dichotomous ASM sector now on display in sub-Saharan Africa: (1) a burgeoning informal segment that is eclectic in its composition, comprised mostly of individuals who enter the industry because of poverty; and (2) a small group of individuals who have defied the odds by securing the requisite permits and who are therefore seen as “legitimate” by the state.

African governments continued to overlook the importance of ASM legislation needing to be “user friendly” as far as the issuing of permits and the granting of licences are concerned – [specifically, designing] permits that provide clear security of tenure for a reasonable period so that small-scale mining can become established” (ILO 1999, 87). Many therefore proceeded, without adequately interrogating the strategies in place to formalize ASM, to add a layer of environmental requirements to already-burdensome licensing procedures (see Table 1). They “bolted” these on to a largely-unchanged policy and regulatory architecture which, again, was conceived specifically to curb mineral smuggling and not necessarily designed to facilitate the licensing of producers. Ghana and Zimbabwe were the first to do so, mandating prospective applicants to undertake costly and lengthy environmental assessments, which would further disincentivize small-scale miners' pursuit of licenses (Hilson and Potter 2005; Spiegel 2015). Today, sub-Saharan Africa has become what Davidson (1993) cautioned, over three decades ago, would materialize when licenses fail to empower operators or provide them with security of tenure: a region which illustrates how, “Without reasonable opportunities to mine, artisanal miners

will feel compelled to disregard the law and preexisting rights in order to secure their own livelihoods, even in countries where artisanal mining has been legalized” (p. 317).

These “add-ons” to licensing procedures have illuminated further the dichotomous ASM sector in sub-Saharan Africa. Its informal segment has mushroomed because fewer people are willing to invest the time and financial resources needed to secure permits and licenses. Only the very few who have managed to do so are realistically in a position to provide clues about how formalization influences environmental performance in the region’s ASM sector, if at all. Drawing on findings from ongoing research in Ghana and Liberia, the locations of two of the more dynamic ASM sectors in sub-Saharan Africa, the next section of the paper sheds further light on this subject.

4 | The Cases of Ghana and Liberia

4.1 | Context and Methodology

In both Ghana and Liberia, individuals have long struggled to secure licenses and permits to mine on a small scale. Ghana was the first country in sub-Saharan Africa to officially legalize small-scale mining (in 1989) which, as explained, was purposively pursued to curb gold smuggling. The small-scale mining licensing application system implemented, however, was *not* operator-friendly; it has become even *more* bureaucratic and exceptionally costly to navigate, despite criticisms voiced by miners over the years. Highlights include the additions of an Environmental Impact Statement and *Water Use Permit*, each of which has its own fee payment schedule and, due to separate applications that need to be lodged at government units that fall under different ministries, lengthen the licensing process considerably; continued and unprecedented increases in costs for the *Small-Scale Mining License* itself; and the separate laws designed and implemented for the sector being subsumed by the *Minerals and Mining Act 2006*, which has resulted in decision-making for mining becoming even more concentrated within a single government unit—namely, the Minerals Commission (Hilson and Potter 2005; Kumah 2022). Only a small group of miners have managed to navigate the complexities of the application procedures for a *Small-Scale Mining License* in Ghana, as well as mobilize the monies required to secure it. The discussion that follows draws upon findings from interviews conducted with 20 licensees operating in Ghana’s Eastern Region,⁵ which boasts one of the highest concentrations of artisanal and small-scale gold mining activity in the country.

In Liberia, the licensing procedure in place for ASM is markedly different. The main piece of legislation governing mining in the country, *A New Minerals and Mining Law*, was implemented by the Ministry of Foreign Affairs in 2000, during the country’s Second Civil War (1999–2003). It introduced different categories of mining licenses, namely, Class A, Class B, and Class C, a setup that continues to feature today. The Class B License and Class C License apply specifically to ASM and were instituted initially to stem the smuggling of alluvial diamonds, which played a major role in fueling civil violence in the country; they have since become the main licenses for those engaged in the extraction of gold on an artisanal and small scale. Research conducted in

Liberia has focused on holders of Class B Licenses operating in Bomi, Gbarpolu, and Sinoe, counties that have some of the highest concentrations of artisanal and small-scale gold mining activity in the country. Interviews were conducted with 20 of the 28 Class B License holders who, at the time of writing, were working across these three counties.⁶

The Liberia case must be viewed slightly differently to that of Ghana because of its range of licenses. Here, the barriers to ASM formalization are, therefore, the obstacles that prevent individuals from securing a Class B License. These include the need to pay a US\$10,000 (license) fee (and US\$10,000 annual renewal fee), have a minimum bank balance of US\$50,000 as working capital, and a requirement to present a work plan and undertake Environmental Impact Assessment (EIA) approved by the Environmental Protection Agency (EPA) (Van Bockstael 2014; Gräser 2024). There are tens of thousands of people in possession of Class C Licenses, a category that prohibits holders from using heavy machinery of any kind, who struggle to make the leap. They are unable to accumulate enough finance through their rudimentary mine production methods to secure a Class B License.

While the policy and regulatory architecture in place for ASM in Ghana and Liberia may be different, in both countries ASM is persistently *informal* or *quasi-formal* (ASM), populated heavily by transient operators and groups. Those in possession of *Small-Scale Mining Licenses* in the former and Class B Licenses in the latter are the only operators whose activities can be monitored and regulated straightforwardly by government officials. They are also the ASM operators who are most likely to comply with environmental legislation/standards and modify their practices accordingly. The data used in the analysis that follows, which were drawn from the combined 40 interviews conducted with holders of these license types in the study locations identified (Figure 1) between October 2022 and July 2023, shed important light on the link between formalization and the environment in ASM in sub-Saharan Africa, foremost how it should be articulated and communicated.

4.2 | Formalization: A Route to Improved Environmental Performance at Artisanal and Small-Scale Mine Sites?

Findings from interviews conducted with miners in Ghana and Liberia reinforce, to a large degree, what is now widely believed: that formalization puts host governments in an improved position to regulate, monitor, and audit the environmental performance of (ASM) operations. Drawing on experiences from the Brazilian Amazon, Alvarez-Berrios et al. (2021) identify the following “three general mechanisms” through which “In theory formalization answers the environmental problems of ASM” (p. 2). The first is zoning or confinement of the activity to designated spaces, the idea being that formalization strategies seek to ensure that ASM only takes place in areas where impacts from activities can be contained, such as downstream or outside of pristine forests. Security, or the idea that individuals with claims are less likely to exploit a site using the cheapest, most polluting methods, is the second. These people are more inclined to obtain loans to purchase cleaner technology. The

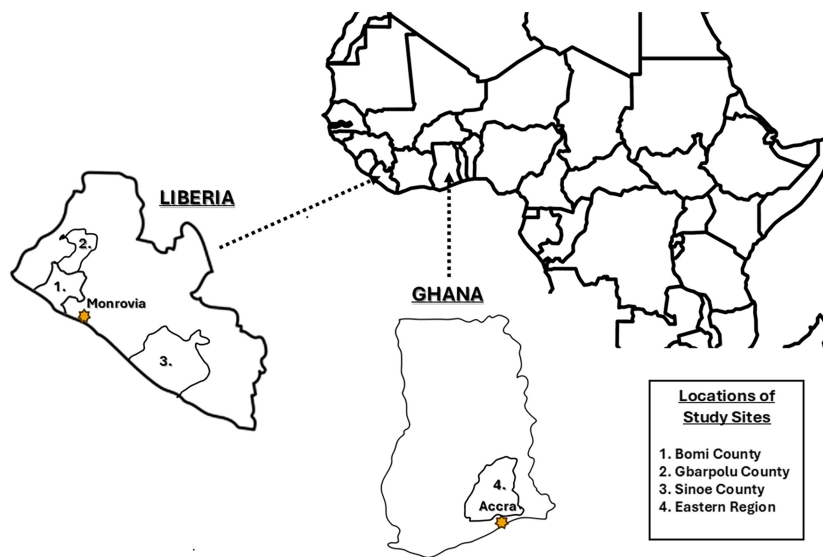


FIGURE 1 | Map of study locations.

third is legibility, specifically, the belief that legally-recognized and geologically mapped plots are more governable. Holders of these plots are likely to adhere to regulations and being wedded to these locations, can easily be held accountable for their environmental impacts.

The same argument could be made about *Small-Scale Mining Licenses* and Class B Licenses: that *in theory*, they confine holders to specific locations, a permanency that could lead them to think more dynamically about environmental protections, and which put regulatory bodies in the best position possible to inspect (ASM) operations more routinely and effectively. It is clear from the interview data that licensing increased miners' interactions with government officials. The miners interviewed claimed that officials visit sites periodically to monitor the environmental aspects of operations. Most appeared to understand why formalization has brought them into closer contact with the authorities, a fate which they seem to accept, as the following conversation with one Class B Licensee captures very clearly:

Government always monitor we the license holders at our mining sites to ensure we discharge our activities the right way, not as compared to those who do not own licenses, because they will always find means to escape whenever they hear government inspectors coming around. Yes, they can monitor us because they want us to do a proper job. They usually come around every two to three months. They always come around on the various mining sites to carry on inspections regarding the type of work we do. There are penalties attached to those who are found violating the regulations imposed on us miners.⁷

The significance of the constant threat of inspections, a point raised by a number of interviewees, cannot be overstated.

Their unpredictability means that licensees must always be “locked in,” ensuring that their operations are consistently in compliance with all environmental legislation and standards. One holder of a *Small-Scale Mining License* was particularly vocal about this, explaining in an interview that “The Mineral Commission, ... yeah, they are the ones who normally comes around and from time to time to check what our activities” but “Sometimes we know but we didn't know they'll be coming, yes we know that there's something, this is something that we need to take care of it and maybe we haven't so they come out of the blue and then they sees it then they complain and ask us to do”.⁸

In Ghana, explained another holder of a *Small-Scale Mining License* in an interview, it is not only officials from the Minerals Commission who visit legal sites but also officers based at the Ghana Environmental Protection Agency (EPA).⁹ It is much of the same in Liberia, where, as one Class B License holder stressed, “The government sends their agents time after time on the field, they send their investigators along with [Liberia] EPA and other environmental people, they come here and they inspect.” At the sites visited, it was further explained, “They make sure they check the water concentration and they make sure everything is in compliance with community and they know that I am not doing anything here that is not in compliance with the rules and regulations.”¹⁰ Perhaps for holders of Class B Licenses, it is, as one interviewee put it, due to fear of a tarnished reputation:

Government monitors our activities through their patrol men. When the time comes, these patrol men go on the field to see if you are doing any bad work on the field. They will go and observe and if they notice any bad work, they will make their reports to the Ministry of Land, Mines and Energy or to the mining agents. They will invite you and will stop your bad work and then put a fine on you.¹¹

This brings into focus what responsibilities for protecting the environment interviewees believe they have, if at all. From the data gathered, it would be a gross exaggeration to declare licensees “environmental stewards” or “eco warriors” but there are certainly signs that they are in *compliance mode*. Put simply, as one holder of a *Small-Scale Mining License* aptly put in an interview, “Legalization is why I mine responsibly and carefully, because not doing so will put me at a risk of losing my license.”¹²

But perhaps more importantly, licensees believe that they should be viewed differently from their counterparts who operate in the informal economy because of their environmental performance. Several licensees were quite vocal during interviews about needing to be recognized for this:

The approach to mining by an illegal miner, i.e. a miner who does not have a licensed concession, is that they abandon the area whether they find gold or not. As a licensed miner I cover up the pits whether I mine gold in commercial quantities or not because I can be traced. Legalization has informed how I mine to protect the environment because I as a licensed miner I do not wish to be prosecuted for noncompliance.¹³

As for us that have licenses, if you look at the back of it, they gave us the guidelines that we should not use those kind of things on our fields. Cutting of trees, the use of mercury, digging of holes. Whenever a hole is dug, you should cover it. These are the differences between us miners with licenses and those that do not have.¹⁴

“Legalization,” one *Small-Scale Mining License* holder explained, reflecting on the broader formalization process, “is why I mine responsibly and carefully, because not doing so will put me at a risk of losing my license.” The interviewee stressed further that “Illegal miners do not consider environmental issues in their operations but the legal miners are always conscious of that because the Minerals Commission and the EPA will always be around to check your work so you always have to make sure you reclaim [mine pits].”¹⁵ The willingness of licensees to comply with environmental legislation, whether due to fear of being prosecuted, the desire to be viewed differently to those operating in the informal economy or a combination of the two, bodes well for regulators in Ghana, Liberia and potentially elsewhere in sub-Saharan Africa.

This commitment, however, has failed to convince successive governments in either country of the importance of simplifying (ASM) and installing more operator-friendly formalization processes. In both, policymakers have rather inexplicably continued to endorse complicated ASM licensing procedures. This stance has fueled informality, which, ASM experts argue, “brings along damaging socioeconomic, health and environmental impacts, which trap the majority of miners and communities in cycles of poverty and exclude them from legal protection and support” (Fritz et al. 2017, v). Even miners themselves understand why confinement of their operations to the informal economy has

major repercussions environmentally and why more generally, imposing barriers to legalization of the sector—as both governments have done—is counterproductive. Many articulated the juxtaposition clearly during interviews, a case in point being the following:

Illegal miners ... are at liberty to mine haphazardly because nobody is going to monitor them and their whereabouts are also not documented but as a licensed miner, you know that you have your contract with the government so if you mine irresponsibly and you abandon the site. The monitoring agencies will come back for you so as a legal miner whenever I'm mining I try my possible best I reclaim the land and avoid causing damage to the river bodies.¹⁶

On the balance of the evidence shared, licensed miners in both Ghana and Liberia do comply with environmental regulations and seem willing to change their practices to meet demands if necessary. The findings, therefore, support suggestions (e.g., Fritz et al. 2017; UNITAR and UN Environment 2018) that formalization of ASM *does* lead to environmental improvements at sites, despite the regulatory and policy architecture in place being designed purposively to reduce smuggling linked to the sector and little more.

At the same time, however, the path to formalization of ASM is, in both countries, not clear; this path is obstructed by a number of barriers to securing licenses. It has long been known that to be effective, “Formalization has to be inclusive of miners' views and effective in monitoring and enforcing regulation.” This entails, *inter alia*, ensuring that (1) legal frameworks are supportive and accessible rather than punitive and (2) the processes followed to obtain licenses and permits are streamlined, cost-effective and worthwhile for applicants (Fritz et al. 2017, v). But neither Ghana nor Liberia has considered these blueprints, despite repeated calls made over the years for their governments to do so (see e.g., Hilson and Potter 2005; Van Bockstael 2014; Maconachie and Conteh 2020). In summary, while in both countries, it is clear that miners, when licensed, can be pressured into complying with regulations and adhering to particular operating standards, ironically, the regulatory and policy regimes in place *discourage* them from legalizing and ultimately, creating an environment that makes this possible.

4.3 | Miners' Perceptions of the Environment

Do small-scale miners who have formalized think proactively and dynamically about the need to protect the environment? In other words, with the security of tenure that a license affords, is there evidence that points to miners willing to take steps on their own to address environmental concerns at sites?

Based on feedback received from miners interviewed in both Ghana and Liberia, it would appear that, if given the opportunity, many would commit to protecting the environment. This does, of course, presuppose that there is a path available

to formalize throughout licensing, which, as has been established, does not exist in either country. From the data, however, there are three reasons for optimism should such a path be established. The first is that the level of environmental awareness within both cohorts of interviewees was extremely high. Claims such as “What I understand by the impact of mining on the environment, is more about the harm caused by mining on the environment ... for example, the use of mercury and also like the cutting of trees that causes storms to affect the community,”¹⁷ “There is a big difference between a miner’s hair and a regular person’s hair when samples are taken to the lab,”¹⁸ and “If I pollute the waterbodies, you know in the olden days when my mom and my grandparents are going to farm, these waterbodies were very clear than the pure water we have been buying nowadays,”¹⁹ suggest that small-scale miners are aware of the environmental impacts of their activities.

The second is that licensees are receptive to being educated on environmental issues; this was observable throughout interviews. Formalization, it could be argued fairly convincingly, creates viable routes for miners to access training and educational programs funded by host governments and/or donors and which are typically only made available to those operating legally. This is why, as one *Small-Scale Mining License* holder explained in an interview, there is broad agreement in the ASM sector that “when illegal miners are trained and educated on the negative impacts of mining they can also change.”²⁰ Another licensed miner provided a more elaborate explanation:

The difference between those who do not have licenses and us is that some of us go for workshops and they teach us how to treat the environment and how to protect it but for them they do not go to workshops, they are not taking licenses so when they go out there they do what they want but for us license holders we go to workshops. So we thought, how to do our mining so the environment can be safe for example, like if you dug a pit, you have to close it when you are through, plant trees to protect the community from storms. The thing is if they attend these workshops, things will be fine because they will have more understanding. But now they are doing illicit mining they just dig and they are not trained to safe mining and the differences between the license holder and the illicit miner is that we that have licenses...²¹

At no point did any licensee imply that those mining in the informal economy are unaware of the environmental impacts of their activities entirely. But many interviewees consulted in both Ghana and Liberia hinted at how, as licensees, they are the beneficiaries of additional training and information sharing, particularly on the health implications of overexposure to (methyl)mercury.²² According to one Class B License holder, this has proved helpful, explaining that “There have been several workshops held to educate us on the use of mercury, especially the harm it brings to our health and environment,” education

which he attributed to him now being “aware about the sickness that is caused from the use of mercury.”²³ Analysis of selected interview feedback suggests that many of these workshops are extremely dynamic and educational:

The government has been conducting trainings for us when it comes to the use of mercury, like advising us not to hold with our bare hands; avoiding it from our mouths; wearing of nose mask whenever we are using it. [This is] especially when burning the mercury off the gold because the heat from the gold is hazardous for our health.²⁴

We have been motivated by the workshops that we have attended between NGOs and the miners on how to take care of the environment. What one needs to do in this environment—in other words, for it to be safe—they guide you and sometimes when we go for workshops, they tell us about mercury and the impact that it has on the environment. It is very dangerous, especially for those that are mining using mercury. If you allow mercury to drop in the water, the fishes will swallow it, the people that will eat those fishes from that environment, will start to experience sicknesses and the kind of things are like problems in child birth or the child might be disable. Sometime it affect your finger and even cut them. That is why we go to workshops to learn some of these things so we can keep our environment safe.²⁵

This leads to a third reason, which is that formalization positions miners to address environmental problems comprehensively. Findings from interviews point to licensees performing quite admirably under the circumstances, with some even going as far as investing monies to protect the environment in the localities where they are based:

The thing is, as a licensed miner, you know that if you get diamonds or gold, you are obliged to give some amount to the town where you are mining. The money that we give goes to the town ... They used the money for the environment. Sometimes they use it to build toilets, guest houses, pump, these are some of the things they do with the money.²⁶

The difference in my approach is that I reclaim the land after mining, and I also plant trees and food crops like plantain. I sometimes go into negotiations with landowners on the type of food crops to plant. They normally prefer plantain and cassava so whiles covering up the pits they bring the crops to plant. For lands which will lie fallow after reclamation, we just plant trees because no one will cultivate the land.²⁷

Another key takeaway from interviews was that most licensees had assumed a role as their sites' environmental managers, sharing information with others and taking actions that deserve praise. Some licensees have taken it upon themselves to simply educate fellow workers, with the goal of spreading knowledge about the importance of protecting the environment. Examples include a holder of a Class B License and a holder of a *Small-Scale Mining License* who, during interviews, claimed, respectively, that "To protect the environment, I am always around my workers to advise them on how to go about mining and for them not to go contrary to what is on the license, to abide by the rules,"²⁸ and "anytime I go for environmental workshops, I choose one worker to go with so they themselves can learn and apply that knowledge when we come back to site."²⁹ There are even signs that licensees, if given the opportunity, would "think outside of the box" on environmental issues and respond to challenges innovatively. The following excerpts from selected interviews suggest this:

As a licensed operator, what I am doing different is, for me when I mine, I make sure that I put the land back to good use by reclaiming the land and planting trees, but with other places that I've seen, they mine and they'll leave the pit, and they do not reclaim. I make sure that by the end of my mining business I must make sure the land is back to its original state. It's not going to be 100% but the land will be good for use.³⁰

We do not pour mercury into the river. With the atmosphere I make sure I use a perforated *Milo* tin to cover the smoke and trap the mercury and this prevents the mercury from entering the environment.³¹

I do not mine irresponsibly because i have a licence. I put myself out there as a Ghanaian when mining, and as a Ghanaian the land belongs to me, it does not belong to anybody so whatever I do it will come back to me and the generation after me, hence it is better for me to do the right thing so my society and Ghana as a whole can benefit from it.³²

In summary, the evidence suggests that licensed small-scale miners operating in Ghana and Liberia are likely to think dynamically about environmental issues if given the opportunity to do so. The problem, however, is that the governments of both countries have failed to establish a viable path for miners to secure licenses and more broadly, to formalize their operations. This is a key to facilitating improved regulation and monitoring at sites, and ultimately putting individual miners in a position to take more responsibility in ensuring that the environmental impact of their operations are addressed comprehensively.

5 | Discussion and Conclusion

In sub-Saharan Africa, there is an articulatable link between the formalization of ASM and the environmental performance

of the sector's operations. In fact, a convincing case could be made, based on observations alone, that the formalization of ASM *does* facilitate environmental improvements at sites. Findings from research conducted in Ghana and Liberia reinforce this view: that the licensed operations which formalization yields can be regulated and monitored by government officials straightforwardly, and that legal miners—due to the security of tenure that their permits provide—are likely to tackle environmental problems more proactively than their unregistered counterparts.

At the same time, research findings from Ghana and Liberia serve as confirmation about how tenuous this claim is in sub-Saharan Africa and potentially elsewhere. Specifically, those who argue that formalization of ASM leads to improved environmental performance at sites do so *assuming*—rather naïvely it turns out—that the regulatory and institutional structures that govern the sector were designed with this goal in mind. An appraisal of ASM formalization strategies adopted in the region over the past four decades, however, reveals that this is not the case. As explained, formalization of ASM was initially pursued in sub-Saharan Africa in a bid to reduce the smuggling of minerals; the policies, regulations, and governance structures moves to do so would usher in, therefore, were installed explicitly for this reason. Few proponents of ASM formalization have attempted to articulate how the apparatuses purposively designed to curtail the smuggling of precious metals and stones originating from, and accompanying illicit financial flows linked to, the sector's operations in sub-Saharan Africa are capable of addressing, simultaneously, environmental challenges at sites. It has rather been *assumed* that it is possible, a position that promises to cause problems for host governments, particularly around expectations.

Moving forward, there are several points to consider; the first being the supposition that there *is* a route to ASM formalization in sub-Saharan Africa, which—and a point that has been belabored in this paper—most commonly is *not* the case. As indicated, the licensing and permitting processes now in place for ASM in most corners of the region are inappropriate, requiring individuals to make costly registration payments and navigate byzantine procedures to lodge their applications. These dynamics are on display in both Ghana and Liberia. In the former, costs with obtaining a *Small-Scale Mining License* from the Minerals Commission have long been prohibitive. Moreover, the application process for securing this license requires completion of many steps—including brokering dialogue with, and securing approvals from, local government officers and subsequently making frequent trips to the capital city of Accra for consultations with senior officials—and often, payment of bribes to several actors in order to expedite decisions (Hilson and Potter 2005; Teschner 2012; Kumah 2022). In the latter, the main problem for miners is their struggle to access the heavy machinery needed to increase yields. As explained, to do so legally, individuals must first secure a Class B License (as again, holders of Class C Licenses are prohibited from using equipment), which requires payment of a US\$10,000 registration fee (effective for 1 year), which must be renewed every year for US\$10,000. Prospective licensees must also complete a Technical Work Plan and complete an EIA approved by the EPA (LEITI 2016;

Government of Liberia 2022). The low level of ASM legalization in both countries is a testament to how difficult it is for operators to formalize: at the time of writing, for gold, there were only 497 *Small-Scale Mining Licenses* in Ghana and 88 active Class B Licenses in Liberia.³³

Reference made to Liberia's EIA leads to a second important point, which is the reinforcement of claims made earlier about the “bolting” of environmental provisions onto existing ASM regulatory and policy architecture. The standard approach in sub-Saharan Africa—and a point already made—has been to add a layer of environmental rules and regulations to *existing* formalization apparatuses for ASM designed explicitly to curb mineral smuggling at, and control illicit financial flows from, sites. When inaugural ASM formalization schemes were implemented in sub-Saharan Africa, few countries in the region had in place national environmental legislation, let alone dedicated government units responsible for its enforcement.

At the top of the list is Tanzania, where “small-scale mining” was officially recognized in the *Mining Act of 1998*, under which—and as indicated—individuals who wished to mine legally on a small scale were required to first secure a Primary Prospecting License and subsequently, a Primary Mining License (Mwanga 2022). Tanzania's National Environment Management Council (NEMC), however, did not acquire legitimate powers until 2004, following passage of the Environmental Management Act No. 20. It provides the NEMC with a mandate “to undertake enforcement, compliance, monitoring and review of environmental impacts assessments, research, facilitate public participation in environmental decision-making, raise environmental awareness, collect and disseminate environmental information” (Malisa 2007, 5). A similar situation has unfolded in Zimbabwe, where, as indicated, in 1991, the government promulgated Statutory Instrument 275 (*Regulations on Alluvial Gold Panning in Public Streams*), which established an institutional framework that empowered Rural District Councils (local government units) to issue licenses to riverbed gold panners and monitor their activities. The move was made in response to growing concerns over gold smuggling from, and the environmental risks associated with, ASM at the time (Spiegel 2015). But Zimbabwe's Environmental Management Agency was not established until 2002 (under Chapter 20:27) following passage of the *Environmental Management Act* and not fully operationalized until 17 March 2003 (SI 103 of 2003).³⁴

A similar pattern is observable in the two country case studies of Ghana and Liberia. In the former, as previously explained, small-scale mining was officially legalized in 1989, following passage of the *Small-Scale Gold Mining Law*, *Mercury Law* and *Precious Minerals and Marketing Corporation Law*. Similar to Zimbabwe and Tanzania, Ghana established its EPA much later—in 1994, following implementation of the *Environmental Protection Agency Act*. But it was not granted the authority to oversee EIAs until 2001, after the government passed the *Ghana Environmental Impact Assessment (EIA) Act* (Adu-Baffour et al. 2021). Following this, an Environmental Permit was enacted for ASM, administered by the EPA, *not* the Minerals Commission. Since this time, prospective licensees have been “required to obtain an environmental permit from the

Environmental Protection Agency (EPA) as a precondition to receiving a license to mine [on a small scale]” (Aryee et al. 2003, 137). In the latter, regulations for mining were also implemented *prior* to the passing of national environmental legislation. As was also explained, in 2000, the *New Minerals and Mining Law*, which contains provisions for different license types (including Class B and Class C), was passed.³⁵ According to Section 8.4 of the law, individuals who apply for a Class B Mining License must “submit as a condition precedent to the grant of the Mining License, an Environmental Impact Assessment Study Report prior to the grant of any such application.” Initially, this was made to the Minister of Mines and Energy, as the EPA was not established until 2003. On this responsibility having since been handed over to the EPA, officials at the unit insist that “The reform of the mineral sector meant that when the Mines and Minerals Act was passed in 2000 effort had been made to ensure that it was harmonised with environmental protection even before the EPA was established” and therefore, “Environmental considerations were included in the Act and it conforms to supplements certain environmental requirements of the EPA Act established later” (Liberia Environmental Protection Agency 2021, 2). The key takeaway here, however, is that in the absence of agencies and national legislation dedicated to protecting the environment during the design phases of the first ASM formalization schemes implemented in sub-Saharan Africa, it is very unlikely that (environmental) provisions for the sector were considered.

There is certainly an articulatable link between formalization of ASM and environmental performance at sites in sub-Saharan Africa. Findings from Ghana and Liberia suggest that the impact is positive, in large part because formalized activities are better-positioned to be regulated and monitored more closely by host governments, and that licensees are likely to be more responsive to environmental concerns. But *portraying* formalization as a panacea for facilitating environmental improvements at ASM sites, as many have done, is misleading. In sub-Saharan Africa specifically, doing so obfuscates the question “Is formalization of ASM working?” by implying that the policy architecture and regulations in place for the sector were implemented with

TABLE 2 | Declared gold production in Ghana, 1990–2000.

Year	Large scale producers (oz)	Small scale producers (oz)
1990	517,818	17,234
1991	825,114	15,601
1992	976,223	17,297
1993	1,222,344	35,145
1994	1,338,491	89,520
1995	1,581,506	127,025
1996	1,474,746	112,349
1997	1,677,911	107,097
1998	2,244,819	128,334
1999	2,358,423	130,833
2000	2,168,802	145,662

Source: Data obtained from the Minerals Commission.

environmental goals in mind, which, as has been explained, was *not* the case. As has been explained repeatedly, the initial motivation behind ASM formalization in sub-Saharan Africa was to control the smuggling of minerals being extracted at sites; the institutions, policies and regulations implemented under the banner of “ASM formalization,” therefore, were oriented toward achieving this goal.

Complications arise when officials at newly established national EPAs or their equivalent *add* a layer of regulations, permitting procedures and policies to *existing* formalization processes. In sub-Saharan Africa, officials appear to have approached this exercise *assuming* that these ASM formalization structures—which again, were designed purposively to curb smuggling at sites—are *entirely* legalized. If so, this would mean that state-sponsored and/or private buyers are only authorized to purchase minerals from *licensed* ASM operators or groups. This, however, is not the case, as experiences from Ghana reveal very clearly. Here, following legalization of small-scale mining (in 1989), which, *inter alia*, established the state-owned Precious Minerals and Marketing Corporation (PMMC),³⁶ the quantity of gold produced by ASM captured by the government increased significantly. Facilitated by the appointment of hundreds of licensed buyers working under PMMC, many of whom employ subagents to patrol sites on their behalf, state capture of gold increased nearly tenfold between 1990 and 2000 (Table 2); by 2018, the 1990 figure had

increased more than 1000fold to 1,987,298 oz. But crucially, most of this gold originated from *illegal* sites because buyers do not discriminate from *whom* they purchase. Referring, once again, to the question, “Is formalization of ASM working?”, therefore, in Ghana, it *has*: designed specifically to reduce smuggling of gold extracted at sites, the laws passed in 1989 and institutional framework conceived shortly after to facilitate legalization of the sector proved effective in preventing mineral output from exiting the country illegally.

In the context of environment protection, however, asking the same question in Ghana produces a very different answer. As explained, the ASM formalization structure implemented specifically in the country to reduce smuggling does *not* prioritize the establishment of paths to licensing, which are clearly a prerequisite to facilitating environmental improvements at sites. If anything, by adding a layer of environmental regulations, policies, and standards to the existing ASM architecture without interrogating its orientation, successive governments have made it even more difficult for individuals to secure *Small-Scale Mining Licenses*. In Ghana as well as Liberia, not only were dedicated environmental government bodies established long after ASM was legalized and are, consequently, out of their depth when it comes to regulating and monitoring sites, but each has also instituted its own permitting system that is *separate* from the main license. The Ghana EPA charges GHS6000 (US\$450) for an environmental permit, which miners already struggling to pay the

TABLE 3 | Environmental provisions attached to small-scale mining licensing processes in selected countries in sub-Saharan Africa.

Country	Year artisanal and small-scale mining legalized	Year national environmental body established	Added environmental permit/assessment and cost
Ghana	1989	EPA, 1994; Water Resources Commission, 1996	Since 2001, those applying for a <i>Small-Scale Mining License</i> from the Minerals Commission have had to complete Form SMM1, Application for Environmental Permit to Undertake Small/Medium Scale Mining. It costs GHC6000. A <i>Water Use Permit</i> must be obtained from the Water Resources Commission at a cost of GHC5000 (and additional processing fee of GHC600).
Liberia	2000	EPA, 2003	Since 2003, holders of a Class B License have had to secure permission from the EPA to mine. Producing the Environmental Impact Assessment Study Report can accumulate in excessive of US\$3500 in costs.
Sierra Leone	2009	While the EPA was established in 2008, it was not until 2022, following passage of the <i>Environmental Protection Agency Act No 15</i> , that it was given full authority and responsibility over environmental matters.	Completion of an environmental impact assessment is a part of the application process for a Small Scale Mining License. It falls on the EPA, however, to decide on what class of assessment is needed. There are accounts of the costs amounting to tens of thousands of US dollars.
Zimbabwe	1991	Environmental Management Agency, 2003	Licensees are required to complete an EIA which, by the late-2010s, cost in the range of US\$4000.

GHS850 (US\$65) registration fee to the Minerals Commission must also cover before their *Small-Scale Mining License* can be issued (Friends of the Nation 2019). Similarly, in Liberia, prospective Class B License holders find themselves having to pay, in addition to the US\$10,000 license fee and renewal fee, at least US\$3500 to complete an EIA Study Report for submission to the EPA.³⁷

What could prove problematic in Ghana and Liberia moving forward is that the way in which environmental regulations have been “layered” on to foundational ASM formalization architecture appears to be fostering rent-seeking behavior within their EPAs. Making environmental assessment procedures a precondition to being granted a *Small-Scale Mining License* (Ghana) and Class B License (Liberia) is a step that continues to be endorsed by both governments, despite criticisms made by applicants about the size of fee payments. The likely reason why is that it has proved to be an effective way for both EPAs to earn revenue. Other governments in sub-Saharan Africa appear to have taken a similar approach, electing to add costly environmental permits and assessments to already burdensome ASM licensing procedures (Table 3).

What is potentially of even greater concern moving forward is that empowering these government units to wield influence over ASM formalization processes has, in the eyes of multilateral organizations, NGOs and bilateral agencies, *legitimized* their participation as national partners in multimillion-dollar technical assistance projects designed specifically for supporting the sector. Specifically, within international projects such as planetGOLD, a number of multipronged technical support programs and the formative work commissioned to assist countries meet commitments linked to the *Minamata Convention on Mercury*, these organizations have partnered with national environmental agencies and tasked them with coordination work linked to supporting ASM. They have simply approached these exercises *assuming* that in host countries, there is a path for ASM operators to secure licenses; that the policy and legal architecture in place *encourages* formalization; and that national EPAs or their equivalents have been regulating the sector from the earliest phases of its legalization, and doing so objectively. But in sub-Saharan Africa, as illuminated by the Ghana and Liberia cases, neither of these points hold true. Ironically, the architects of this work only target and ultimately engage miners who are licensed and therefore recognized by lawmakers.³⁸

As a point of departure, it is instructive to recognize that in the context of ASM in sub-Saharan Africa, the link between formalization and environmental performance is tenuous at best. On the one hand, and as findings from interviews with holders of *Small-Scale Mining Licenses* (Ghana) and Class B Licenses (Liberia) confirmed, formalization of ASM *does* lead to environmental improvements at sites, as is often suggested. Sites that are formalized can arguably be monitored and regulated more easily than those that are unlicensed. Moreover, operators, with the knowledge of having security of tenure, find themselves in a position to think more constructively about how to improve operating conditions at sites. On the other hand, assuming that formalization of ASM leads to environmental improvements at sites in the region is highly misleading because it presupposes

that individuals have secure and straightforward routes to obtain licenses. Championing formalization as the “silver bullet” for solving all problems—including environmental impacts—in the ASM sector, as many have done, is therefore inaccurate. Doing so obfuscates why formalization was pursued in the region’s ASM sector in the first place.

Endnotes

- ¹ Defined here as low-tech, labor-intensive mineral extraction and processing.
- ² “Towards improved formalisation of artisanal and small-scale mining in Peru,” www.qeh.ox.ac.uk/blog/towards-improved-formalisation-artisanal-and-small-scale-mining-peru-0 (accessed December 4, 2024).
- ³ Now the Precious Minerals and Marketing Company.
- ⁴ Part 1, Section 4(1) of the *Small-Scale Gold Mining Law* (PNDCL 218), 1989.
- ⁵ At the time of writing, there were 82 holders of Small-Scale Mining Licenses mining for gold in the Eastern Region. Data retrieved from “Ghana Mining Repository,” <https://ghana.revenuedev.org/license> (accessed December 14, 2024).
- ⁶ There were, at the time of writing, 84 holders of Class B Licenses mining gold. See “Ministry of Mines and Energy, Liberia—Online Repository—All Workspaces,” <https://portal.mme.gov.lr/dashboard> (accessed December 13, 2024).
- ⁷ Interview, Class B License Holder #1.
- ⁸ Interview, Small-Scale Mining License Holder #1. The Minerals Commission is the main mining policy government unit in Ghana and is tasked with, *inter alia*, awarding licenses.
- ⁹ Interview, Small-Scale Mining License Holder #2.
- ¹⁰ Interview, Class B License Holder #2.
- ¹¹ Interview, Class B License Holder, #18.
- ¹² Interview, Small-Scale Mining License Holder #3.
- ¹³ Interview, Small-Scale Mining License Holder #7.
- ¹⁴ Interview, Class B License Holder #17.
- ¹⁵ Interview, Small-Scale Mining License Holder #13.
- ¹⁶ Interview, Small-Scale Mining License Holder #13.
- ¹⁷ Interview, Class B License Holder #20.
- ¹⁸ Interview, Small-Scale Mining License Holder #16.
- ¹⁹ Interview, Small-Scale Mining License Holder #18.
- ²⁰ Interview, Small-Scale Mining License Holder #13.
- ²¹ Interview, Class B License Holder #18.
- ²² Interview, Small-Scale Mining License Holder #11.
- ²³ Interview, Class B License Holder #1.
- ²⁴ Interview, Class B License Holder #9.
- ²⁵ Interview, Class B License Holder #18.
- ²⁶ Interview, Class B License Holder #2.
- ²⁷ Interview, Small-Scale Mining License Holder #10.
- ²⁸ Interview, Class B License Holder #2.
- ²⁹ Interview, Small-Scale Mining License Holder #11.
- ³⁰ Interview, Small-Scale Mining License Holder #16.
- ³¹ Interview, Small-Scale Mining License Holder #14.

³² Interview, Small-Scale Mining License Holder #19.

³³ "Ghana Mining Repository," <https://ghana.revenue.gov.gh/license>; "Ministry of Mines and Energy, Liberia—Online Repository," <https://portal.mme.gov.lr/license> (accessed April 28, 2025).

³⁴ "Environmental Management Agency (EMA)," www.uncced.int/resources/knowledge-sharing-system/environmental-management-agency-ema (accessed April 4, 2025).

³⁵ "AN ACT ADOPTING A NEW MINERALS AND MINING LAW PART 1, TITLE 23, LIBERIA CODE OF LAWS REVISED," <https://faolex.fao.org/docs/pdf/lbr146027.pdf> (Accessed April 4, 2025).

³⁶ Now the Precious Minerals and Marketing Company.

³⁷ Personal communication, Liberian government official, May 4, 2025.

³⁸ The Minamata Convention on Mercury, an international treaty that was agreed on in November 2013 and officially came into force in August 2017, seeks to "protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds and it sets out a range of measures to meet that objective" (UN Environment 2024, 2). Countries that have ratified the Convention are required to produce a National Action Plan (NAP), a comprehensive plan which lays out how anthropogenic emissions of mercury are going to be controlled and where possible, phased out. As it accounts for the largest share of the world's (anthropogenic) mercury emissions, ASM features heavily in several NAPs. planetGOLD is a US\$350 million project launched by the Global Environmental Facility to assist countries "eliminate mercury from the supply chain of gold produced by artisanal and small-scale miners by supporting improvements" through awareness raising, facilitating access to finance, assisting with formalization and fostering technological change. Two countries in sub-Saharan Africa (Kenya and Burkina Faso) featured in Phase I of the project, and in Phase II, an additional nine countries were selected from the region (Ghana, Côte d'Ivoire, Guinea, Nigeria, Mali, Sierra Leone, Madagascar, DR Congo, and Zambia). See "planetGOLD," www.planetgold.org/ (Accessed May 3, 2025).

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