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Rethinking state-led formalisation of artisanal and small-scale mining (ASM): Towards mining licence categorisation, women empowerment and environmental sustainability

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ABSTRACT

Securing a mining licence or permit is seen as the gateway for conducting artisanal and small-scale mining (ASM) operations. Yet, the policy and the academic discourse on the environmental impacts of ASM and formalisation policies inadequately capture the diverse perspectives of institutional and local stakeholders regarding the regulatory and legal framework for the heterogeneous nature of ASM operations. This paper, therefore, addresses this gap by providing critical, empirical evidence and interpretations of institutional and local stakeholders' perspectives of Ghana's state-led ASM formalisation framework and its impacts on mining licence acquisition. Drawing on findings from multiple qualitative studies in Ghana, we found that the one 'small-scale' mining licence regime was problematic and took no account of the diverse environmental impacts, the safety concerns, and the uneven economic returns from the various mining methods (alluvial, underground, and surface/open-pit mining) employed for ASM operations. The findings also showed that the one-size-fits-all mining licence hinders a) the development of appropriate environmental regulations and mine waste management practices for the various local ASM operations, b) the designing of context-specific land reclamation approaches, c) the provision of logistics, training, and technical assistance to address the divergent environmental impacts, and d) the economic empowerment of women who seek to have economic visibility in the sector. The findings further demonstrated that the current ASM formalisation framework needs to be reformed through categorisation of the mining licence to reflect the dimensions of ASM operations, such as the multi-tier licence classification we propose – *underground 'ghetto' licence, alluvial licence*, *surface/open-pit licence, medium-scale licence*, and *co-existence/partnership licence*. This classification could help the country's minerals regulatory body, the Minerals Commission, provide specific guidelines for mining operations, environmental management practices, and occupational health and safety protocols/practices for miners in the sector.

1. Introduction

The artisanal and small-scale mining (ASM) sector, serving as an engine of employment in many mineral-rich settings in the Global South (Arthur-Holmes et al., 2022a; Arthur-Holmes and Abrefa Busia, 2022b; IGF, 2017a; Banchirigah, 2006), continues to evolve from its subsistence, "hand-to-mouth" operations into a highly intertwined group of formal and informal actors operating with different degrees of mechanisation and sophistication (Ofosu and Sarpong, 2023; Martinez et al., 2021; Verbrugge, 2015). These significant structural and socio-economic changes in ASM operations, and the implications for the physical environment, continue to feature prominently in discussions on 'developments' in ASM. The sector's operational definition also continues to be debated in policy circles. According to Hentschel et al. (2003), definitions of small-scale mining vary from country to country depending on the macroeconomic situation, the geological framework, the mining history, and the legal conditions.

Broadly speaking, ASM operations are known to exploit marginal or small deposits, lack capital, be labour intensive, have poor access to markets and support services as well as low standards of health and

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safety, and to have a significant impact on the environment (Buxton, 2013; Hentschel et al., 2002, 2003). Elsewhere, ASM is often described as a complex and diversified sector that includes low income informal individual miners seeking to eke out or supplement a subsistence livelihood, to small-scale formal commercial mining activities that can produce minerals in a responsible way respecting local laws (IGF, 2017b).

Despite its low productivity due to the high rates of informality, the sector is known to be gradually taking over as an important off-farm activity, substituting small-holder agriculture, which is rapidly becoming unviable due to, for example, climate change (Arthur et al., 2016; Hilson, 2016; Banchirigah and Hilson, 2010; Bryceson, 1996, 2002). In Ghana, the sector is estimated to employ about 1 million direct dependants, providing indirect support to about 4.5 million people (McQuilken and Hilson, 2016).

Notwithstanding the socio-economic benefits derived from the ASM industry, the sector is known to present intractable environmental challenges (Arthur-Holmes et al., 2022b; Ofosu et al., 2020). Generally, findings have revealed that mining activities, on the one hand, contribute significantly to economic progress, but on the other hand, have negative impacts on the environment (Obodai et al., 2023; Ofosu et al., 2020; Schueler et al., 2011; Siaw et al., 2023; Weber-Fahr, 2002). Peck and Sinding (2003), for example, indicated that the discovery, extraction, and processing of mineral resources is widely regarded as one of the most environmentally and socially disruptive activities undertaken by humankind. As described by Weber-Fahr (2002), the mining industry leaves behind a 'footprint', that is, an environmental, social, and economic impact, and it is therefore fittingly described as a "footprint industry". Due to the rise in the negative impact of mineral extraction on the environment, many economists and environmentalists have tended to challenge economic models that base development on the extraction of non-renewable natural resources (Ross, 2001a, 2001b). Thus, many resource-rich countries face the continual challenge of making the difficult choice between environmental protection and economic development based on the highly informal ASM production.

For ASM, in particular, informality reigns. Although mineral and mining laws in resource-rich countries require small-scale mineral extractors to be licensed and their operations regulated, the majority of small-scale miners, worldwide, operate informally without the security of a licence (Veiga and Marshall, 2019; Afriyie et al., 2016; McQuilken and Hilson, 2016) due, in part, to the fragmented nature of the small-scale mining industry. In Ghana, illegal mining, prior to its ban in 2017, was shockingly widespread (Eduful et al., 2020; Ofosu et al., 2024b). Teschner (2012, p. 312) perceptively described the problem at hand, stating, "In fact illegal mining is so public that the casual observer may not believe it could possibly be illegal".

In this sense, the formalisation of operations has often been cited as the magic bullet in addressing informality with the associated environmental quagmire. For many mining operators, however, the costs of formalisation are generally known to be high: apart from their limited education, they also face bureaucratic inefficiency, long waiting periods and travelling distances to secure licences, high costs for obtaining different kinds of official documents, bribes, the limited availability of land on which they can legally work, and concerns about the ensuing high investment costs in a formal exploitation project (Geenen, 2012; Aryee et al., 2003). As such, they may have few incentives to join a formalised sector. This situation, which is found in many countries, was expressly captured by Banchirigah (2008, p. 29) who claimed that "although the government has long legalised ASM, requiring prospective applicants to follow a series of streamlined regulations to obtain a concession, ineffective policies and bureaucratic inefficiency have impeded formalisation, making illegal activity more appealing".

Despite these factors being responsible for the informality of ASM growth in Africa, less is known about grassroots perspectives of the regulatory framework of ASM and how it affects key stakeholders' understanding of ASM operations. Thus, understanding local stakeholders' perspectives of the ASM regulatory framework provides first-hand information of what the sector needs to do to address the various environmental and health challenges associated with ASM operations through re-classification of the ASM sector, especially in Ghana, where there has been a tremendous technological transformation of and changes in ASM operations over the last two decades.

This paper builds on works that have examined the varying environmental impacts of ASM operations and underscored the need for differentiated mining licensing systems due to the diversity of ASM (Arthur-Holmes et al., 2022b; Kumah, 2022a). For example, Arthur-Holmes et al's (2022b) work in Ghana explored the perceived impacts of the ASM methods on water bodies. In the same geographical setting, Kumah's (2022a) work examined formalisation from a grassroots perspective, where he argued for the multi-tier reclassification of the ASM sector due to the diverse environmental impacts of mining methods. This paper specifically examines the various reasons why institutional and local stakeholders' contest that Ghana's small-scale mining licence for the various dimensions of ASM operations is not effective in making the sector formal, thus hindering informal or prospective miners from operating within the legal ASM framework with the security of a mining permit or licence. Also, this paper explores why institutional and local stakeholders think different categories of mining licence or permits with differentiated application procedures, assessments, and costs are required to help address the illegality in Ghana's ASM sector and the diverse negative environmental impacts.

We contribute to the ASM formalisation literature in Ghana and Africa broadly by offering new perspectives on the 'one small-scale' mining licence or one-size-fits-all formalisation system as a problematic issue contributing to the illegality of ASM operations and the failure of government military interventions to halt illegal mining activities. Based on the findings, we argue for different categories of mining licences or permits in line with the artisanal, small- and medium-scale mining (ASMM) classification because of differential mining impacts on the environment, the health and safety of the miners, and the rural communities. While Kumah (2022a) highlighted that the one mining licence for all ASM operations is a concern for different miners due to the environmental impacts, we add to this by stating the following: 1) different economic outcomes and occupational hazards are associated with different mining methods, 2) the cost involved in land reclamation would vary depending on the environmental impacts that accompany the mining methods or practices employed, 3) the one-size-fits-all 'small-scale' mining licence hinders the economic empowerment of women who seek to have economic visibility in the sector, and 4) the one-size-fits-all formalisation system inhibits the development of different mining needs, innovations, and technical support from the government, donors, and non-governmental organisations for different ASM operations to promote environmental safety and reduce occupational health hazards in the sector.

Different to the discussions on the mechanisation of and innovation in the ASM sector, we argue that different categories of mining licence would not inhibit innovation in the sector, as some scholars, like Hilson and Maconachie (2020), have claimed using the case of Sierra Leone and Liberia, stating that "the restrictions imposed on holders of Artisanal Mining Licences and Class C Mining Licences are impeding innovation through mechanisation, and by extension, formalisation, of the sector" (p. 161). In relation to this, we highlight that ASM operators are not static with regard to their operations; instead, they are dynamic, adapting to their mining operations' socio-economic, technological, and environmental conditions, thus paving a way for innovation and the use of heavy machinery where necessary to increase their ore production. Unlike Kumah's (2022a) work, this article goes further to propose a multi-tier classification of mining licences for the ASMM sector in Ghana to guide the reforms in the formalisation framework.

The remainder of the paper is organised as follows. The next part, section 2, surveys the literature on the formalisation of ASM operations and the legislative framework and the associated weaknesses of Ghana's

ASM sector. Section 3 outlines our methodology and research context followed by section 4, which presents our research findings. Section 5 provides a discussion of our key findings, while Section 6 provides concluding remarks and directions for policy-makers and researchers.

2. Literature review

2.1. Characterising the formalisation of ASM operations: the perspectives

The formalisation of informal business operations has come to dominate the long-standing discussions on environmental governance and operational appropriateness in economic settings (De Soto, 2002; Siegel and Veiga, 2009). Often heralded as the panacea to curbing the environmental and social excesses of informal business operations, the calls for informal economic operations to be embedded in the formal economy continue unabated (see De Soto, 2002). According to Chen (2005), the formal economy comprises regulated economic units, and issues of the protection of workers, with the associated formal regulatory framework comprising government policies, laws, and regulations.

An essential component of the formal economy is the formalisation agenda, which encompasses the legalisation of a business entity and the observance of all enactments and requirements set forth in the code regarding business operations (Chen, 2005, 2012). Often conceptualised in theory and practice as a process of facilitating the movement of people from unregulated/illegal environments into more regulated/legal and supported existences, formalisation is meant to ensure that economic and entrepreneurial operations are undertaken within the legal and formal environment of the state. It is often seen as the process of registering and organising business activities, thus enabling and incentivising people to become legally acknowledged (Chen, 2005, 2012).

Anchored on the foundations established above, the fundamental view underpinning formalisation is closely aligned with the ideas of De Soto and the *legalist* school. According to this school, the primary condition for formalisation is 'property' or the fact that informal operators are given full legal and transferable titles to their claims (Hilson, 2020; Geenen, 2012). However, these formal property rights are not automatically programmed; they must be created through legal procedures. The official view concerning formalisation also regards the process that seeks to integrate ASM operations into the formal economy (Salo et al., 2016; Kinyondo and Huggins, 2020, 2021). A well-designed formalisation process, it is argued, would generate the enabling conditions for accountability within the ASM sector so that it can ultimately be integrated into the formal economy (Kumah, 2022a; Hilson, 2020).

The connection between formalisation and development in the ASM economy has, in recent years, been articulated more explicitly and very concretely (see, for example, Hilson, 2020; Siwale and Siwale, 2017). According to many scholars and policymakers, among other things, the basic condition for economic growth in the sector is to guarantee miners' access to mineralised lands and that such access should emanate from state law and the mining code (Hilson, 2017; Geenen, 2012). Formalised titles, coupled with access to the basic factor of operational production (in this case, mineral-rich lands) would create incentives for investments and development in the ASM sector (Hilson, 2017; Siegel and Veiga, 2009; Ribot and Peluso, 2003). As noted by Hilson and Ackah-Baidoo (2011), for example, many small-scale miners usually accumulate debts because they lack the financial means to acquire machinery and hire the labour required to improve their production. However, in an attempt to increase their yields, many operators negotiate deals with gold merchants and other middlemen, who tend to initiate a vicious cycle of borrowing and deeper indebtedness (Hilson and Ackah-Baidoo, 2011).

Legal titles and access to rich mineralised places would therefore allow miners to access credit from formal financial institutions for operational improvements and to access support from official mining agencies (Eniowo et al., 2022; Hinton, 2005). Equally importantly, formalisation in ASM would ensure conformity with labour regulations, i.e., formal contracts (covered by labour legislation), worker benefits, and social protection (Ofosu and Sarpong, 2022, 2023; Martinez et al., 2021). Further, formalised operations would ensure effective control of the ASM environment. First, mining authorities would be able to take hold of effective intervention strategies, specifically, those that initiate contact with mining operators, and enable the collection of microeconomic data to guide project development by international development agencies (Heemskerk, 2005). This supports the arguments of Walsh and Dewar (1987) that formalisation contributes to administrative efficiency by bestowing power and influence on the administrator (in this case, mining authorities). Second, rights and formalisation principles would also impose obligations to conform to environmental, employment, and human rights standards (Siegel and Veiga, 2009). This is very crucial considering the widespread environmental problems associated with the extractive industry, and ASM in particular, due to the deleterious effects on the physical environment and human health (Obodai et al., 2023; Arthur-Holmes and Abrefa Busia, 2022a; Ofosu et al., 2020; Kitula, 2006).

Notwithstanding the enormous benefits to be derived from a formalised ASM, however, many operators, as stated earlier, tend to bypass the system because the regulatory environment has been known to be too cumbersome and costly (Geenen, 2012; Hilson, 2017; Siwale and Siwale, 2017). As discussed extensively elsewhere, one of the problems associated with formalisation is the rigorous bureaucracy and costs associated with the process (Chen, 2012; Hilson, 2017; Buss et al., 2019; Yankson and Gough, 2019). The facilitation of formalisation costs money. Thus, although formalisation is largely considered the backbone of economic development, it is bound to achieve only limited success if individuals and business entities cannot afford the cost of joining the legal economy (Siegel and Veiga, 2009). This is particularly true for ASM, which is largely considered a poverty-driven activity (Barry, 1996; Hilson, 2017). However, such narratives have been contested due to the complex web of factors explaining why people join ASM (Arthur-Holmes et al., 2022a).

Many case-studies have demonstrated that, in practice, the costs of formalisation policies in ASM have often discouraged many miners from licensing their operations (Geenen, 2012; Banchirigah, 2006, 2008; Hilson and Potter, 2003; Siegel and Veiga, 2009; Siwale and Siwale, 2017). Thus, in some settings, informal, local, and customary land tenure arrangements have become more appealing and remain the easiest and most familiar system of land acquisition in relation to ASM operations (Nyame and Blocher, 2010; Mensah, 2021; Boafo et al., 2019). In sum, informality is largely a product of the high entry barriers and political obstacles that exclude the informal workforce in general, and ASM operators in particular, from the formal economic system.

2.2. Formalisation of ASM in Ghana: the legislative framework and associated weaknesses

For mining in Ghana, the Minerals and Mining Act, 2006 (Act 703) with its antecedents from the Minerals and Mining Law, 1986, PNDCL 153 (2), sets out the current legislative framework. Regarding small-scale mining, sections 81 to 99 of the Act are the relevant regulatory sections dedicated to the sector. Sections 1 to 80 are the regulatory sections for large-scale mining while sections 100–112 focus on administration and miscellaneous provisions. It is worth noting that despite the many institutions involved in the management of mineral resources, the president of Ghana has wide-ranging authority in all matters of mining sector governance. By law, all public lands in Ghana are vested in the President on behalf of, and in trust for, the people of Ghana (Article 257 (1) of the 1992 Constitution of Ghana). Further, the Constitution in Article 257 (6), and section (1) of the Minerals and Mining Act, 2006 (Act 703) makes provision for this and clarifies that:

> Every mineral in its natural state in, under or upon any land in Ghana, rivers, streams, water course throughout Ghana, the

> exclusive economic zone and any area covered by the territorial sea or continental shelf is the property of the Republic of Ghana and shall be vested in the President on behalf of, and in trust for the people of Ghana.

The Act is a comprehensively drafted law and covers virtually all aspects of mining, namely, ownership of minerals and the cadastral system; mineral rights; royalties, rentals, and fees; dispute resolution; reconnaissance licences; prospecting licences; and mining leases (Heipon, 2016; Ayee et al., 2011). The Act also covers other areas related to mining including the surrender, suspension, and cancellation of mineral rights; surface rights and compensation; industrial minerals; small-scale mining; and administration and miscellaneous provisions. Mining activities, under the Act, require a mineral right, and a person or entity must be granted a mineral right before they engage in any search, reconnaissance, prospecting, exploration, or mining activities. This right is to be granted by the Minister responsible for mining as stipulated in Section 82 (1):

> Despite a law to the contrary, a person shall not engage in or undertake a small-scale mining operation for a mineral unless there is in existence in respect of the mining operation a licence granted by the Minister for Mines or by an officer authorised by the Minister.

The mineral right then entitles a person to engage in mining activities. However, along with the right to grant comes the right to revoke. Thus, the Minister, on behalf of the President and on the recommendation of the Minerals Commission, may revoke or suspend mineral rights in accordance with the Act. Grantees of mineral rights have certain obligations. These include the appointment of a manager with the requisite qualifications and experience to oversee mining operations. Holders of mineral rights must also notify the Head of the Inspectorate Division of the Minerals Commission of the appointment of a manager and of each change of manager. Holders must also obtain the necessary approvals and permits required from the Forestry Commission and the Environmental Protection Agency for the protection of natural resources, public health, and the environment. To oversee the efficient and effective operations of the ASM sector in the mining districts, the Act has made provision for the establishment of Small-Scale Mining Committees. The Committees are made up of the following members: the District Chief Executive or his/her representative as the chairperson of the Committee, the District Officer of the Minerals Commission, one person nominated by the relevant District Assembly, one person nominated by the relevant Traditional Council, an officer from the Inspectorate Division of the Commission, and an officer from the Environmental Protection Agency (Minerals and Mining Act, Ghana, 2006).

A critical look at the current legislative framework, however, reveals some weaknesses which have significantly influenced and escalated illegal mining activities across the country (Bansah, 2023; Kumah, 2022a; Heipon, 2016; Hilson and Potter, 2003). As indicated earlier, one weakness that has been identified in the legislative framework is the long and cumbersome process of registration (Adu-Baffour et al., 2021; Hilson, 2017; Aryee et al., 2003). This, to a large extent, explains why so many years after the legalisation of small-scale mining, an overwhelming majority of Ghana's ASM miners continue to operate illegally, that is, without licences (Teschner, 2012; Banchirigah, 2008; Hilson and Potter, 2003). The law allows the provision of mining licences only to Ghanaian citizens who are 18 years or over and registered by the district centre in the designated area (Section 83). But this procedure by which individuals have to obtain small-scale mining licences has been described by most miners as tedious and expensive; hence, most small-scale miners operate illegally (Kumah, 2022a; Banchirigah, 2008). The following quotation from Hilson and Hilson (2015, p. 28) is indicative of the problems that small-scale miners endure in their attempt to licence their operations:

> Process is very cumbersome and long, and is encouraging illegal mining, and if it takes six months, they will start mining [illegally]… Starting from the district, spends too much time there…Minerals Commission sends to Ministry…I wish the Minerals Commission would make the decision. The CEO there should have the authority to make a decision on licences because it goes to the Ministry of Lands and Natural Resources, and it can sit there for months.

Also, the regulatory framework does not make any statements about how small-scale mining activities should be realised (Heipon, 2016). It has no specific regulations or measures for ensuring safety and the protection of health and the environment in the small scale mining sector (Arthur-Holmes and Abrefa Busia, 2022a; Aram et al., 2021; Armah et al., 2016; Bansah et al., 2016). The only comment concerning preferred methods could be found in Section 93, which states as follows:

> A person licensed under section 82 may win, mine, and produce minerals by an effective and efficient method and shall observe good mining practices, health and safety rules, and pay due regard to the protection of the environment during mining operations.

However, this provision is vague, as neither "effective and efficient method" nor "good mining practices" are defined, thus providing space for miners to operate in the manner they deem fit, and posing a challenge to monitoring officers in the effective discharge of their duties (Bansah et al., 2016).

Focusing on the growth of the sector, scholarship has long revealed that miners usually employ different mining methods and equipment depending on the location of ores (Arthur-Holmes et al., 2022b; Bansah et al., 2016; Ferring et al., 2016). These methods include alluvial mining ("dig and wash", dredging etc.), surface/open pit mining, and underground mining (Arthur-Holmes et al., 2022b; Bansah et al., 2016; Aryee et al., 2003). Regarding this, studies are beginning to show that the sector is significantly evolving from its rudimentary and "hand-to--mouth" operations into a highly intertwined group of formal and informal actors operating with different degrees of capitalisation (Ofosu and Sarpong, 2022; Kumah, 2022a; Crawford and Botchwey, 2017; Hilson et al., 2014). The injection of capital is leading to a growing differentiation among ASM operations especially in terms of their levels of mechanisation and sophistication (Ofosu and Sarpong, 2023; Bach, 2014). This is supported by recent reports indicating that hundreds of excavators were discovered in many ASM sites during the recent military-enforced crackdown on ASM operations (myjoyonline.com, 2020).

The legislative framework, however, does not cater for these different components of methods, mechanisation, and equipment employed in the sector. The framework, operating on a one-size-fits-all policy, does not cater for the varying aspects (Kumah, 2022a). Miners are required to obtain the same permit for their varying operations. Meanwhile, the different methods mean that incomes accruing to miners differ and environmental impacts also differ. In addition, there are varying effects on the health and safety of the operators involved in the sector. Further, the diverse and transient nature of operations requires different training, technical know-how, and financial and logistical support and assessment. In this sense, enacting policy-specific regulations for the diverse ASM operations can serve as the entry point for the effective control, monitoring, and management of the sector. We provide empirical evidence and a discussion regarding these aspects following the presentation of the section detailing the methodology.

3. Research contexts and methods

This paper is based on multiple qualitative research projects conducted from 2017 to 2022 in the Prestea-Huni Valley Municipal District in the Western Region of Ghana. Communities in which the research projects were carried out were Bogoso, Odumasi, Kwamenianpa, Prestea, Himann, Bondaye, Gambia, and Nsuta (see Fig. 1). Various ASM sites at these communities or near to them were visited prior to the research interviews, which were conducted face-to-face. The selected

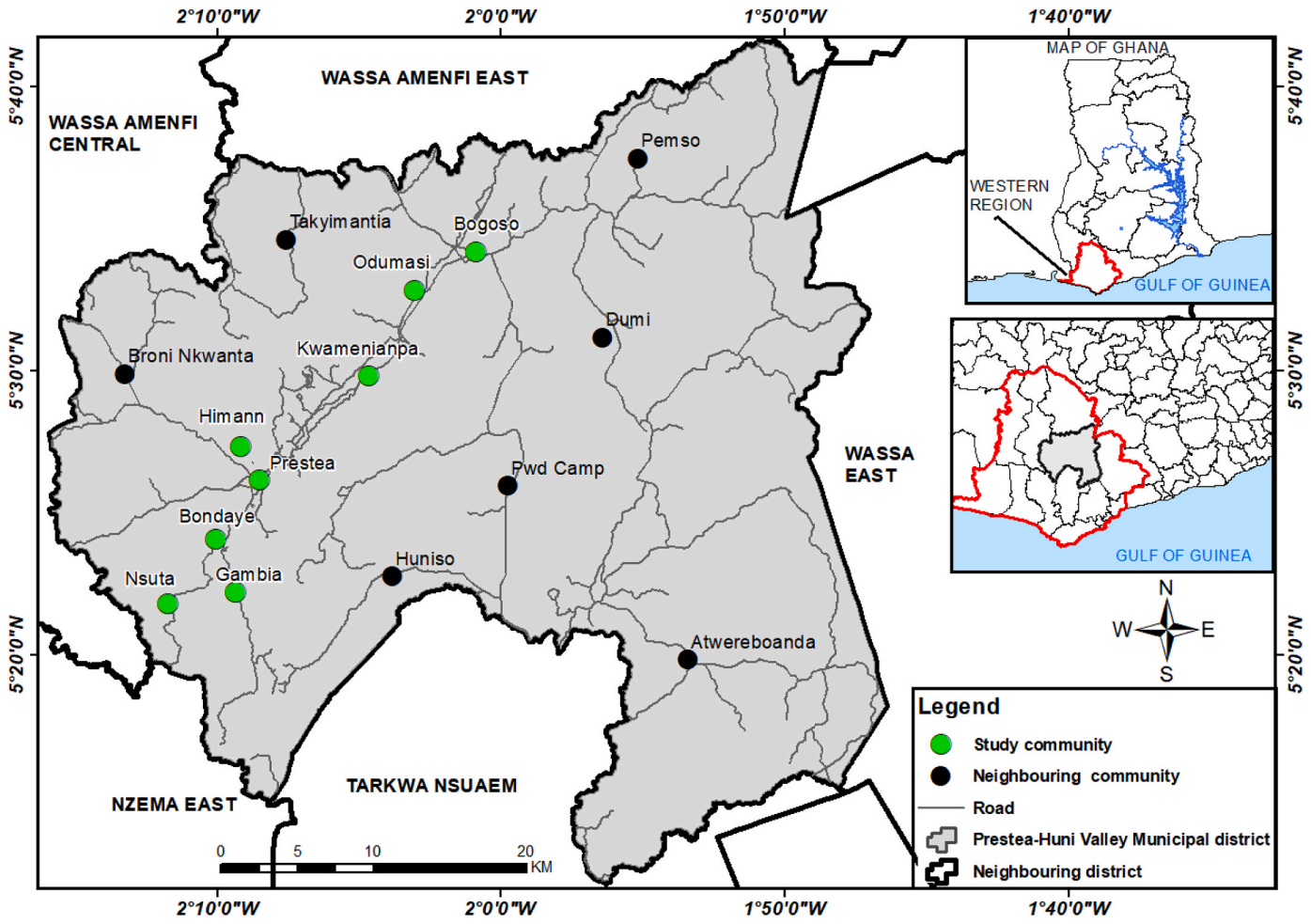

Fig. 1. Map of Ghana, regional map and the Prestea-Huni Valley Municipal District map showing the study communities.

communities for the research projects have a mining landscape with various dimensions of ASM activities but similar to the mining techniques employed to extract gold ore in the district. However, local miners in Prestea, Bondaye, and Himann mining areas sometimes have conflicts with large-scale mining (LSM) companies over access to mineralised lands to construct their livelihood.

Different forms of research instruments were used for the research projects. The research instruments were field notes from observations, interviews, and focus group discussions (FGDs). Some of the research projects, particularly those conducted in 2021 and 2022, employed digital interviewing methods through phone and WhatsApp calls. These methods were used because 1) many informal gold miners were being cautious of whom they talked to at the mine sites, 2) the first author used this social network in the selected mining communities to interview miners when he could not be physically present to conduct face-to-face interviews and engage in field observations, 3) the militarisation of ASM activities made it extremely difficult to conduct face-to-face interviews with miners at certain communities, and 4) the first author as the principal investigator was outside Ghana pursuing his doctoral studies. When the first author could not visit the mining communities for the research, he utilised his social networks through referrals from close contacts to interview ASM miners and community leaders. Some research assistants were also hired in these communities to enable the first author to recruit miners for interviews through digital means on the scheduled day and time.

Empirical analysis for this paper was generated from the questions on local stakeholders' perspectives on Ghana's ASM regulatory and policy framework. Overall, the empirical analysis focused on 149 face-to-face interviews, 50 phone/WhatsApp calls, and 9 focus groups with 5 ASM miners in each group (see Table 1). All the interviews, which were conducted in Akan (Fante and Wassa) after participants' informed consent had been obtained, used a semi-structured in-depth interview guide to capture first-hand information from the study participants. The interviews were transcribed verbatim in English.

The interviews, FGDs and notes from observations were analysed using thematic analysis with three themes: 1) Questioning the ASM regulatory and legal framework: One-size-fits-all 'small-scale' mining licence, 2) Justifications for the different mining licensing types for ASM operations, and 3) Proposed multi-tier mining licence classification for

Table 1
Research instruments and local stakeholders for the overall research projects.

Research Instruments	Local Stakeholders	Number of Interviews/Focus groups
Face-to-face interviews	Executive members of Small-Scale Mining Association-Prestea Branch	2–1 current, 1 former
	ASM miners	117
	Traditional leaders	5
	Community residents	19
	Community leaders	6
Digital Interviews (phone/WhatsApp Calls)	ASM miners	53
Focus groups	ASM miners	9 focus groups – 5 miners in each group

ASMM. Sub-themes were generated for the second theme based on various contesting propositions or justifications for the different mining licences in order to address the "galamsey menace" and ensure responsible and safe mining in Ghana. Some quotations were used to support each theme and sub-theme where necessary as presented in the subsequent section.

4. Research findings

We present our findings regarding the problematic nature of the one-size-fits-all 'small-scale' mining licence for ASM operations in Ghana. Second, we present the contesting arguments or propositions for different categories of mining licences or permits and explain why these new categories are crucial for the growth of the ASM sector and for ensuring environmental sustainability. Third, we present proposed institutional and local stakeholders' categorisation of the mining licence into different forms with differentiated costs and to enhance the understanding that stakeholders, including informal miners, have of the ASM and its various dimensions.

4.1. Questioning the ASM regulatory and legal framework: one-size-fits-all 'small-scale' mining licence

During the ban imposed on all ASM operations across the country from 2017 to 2019, ASM miners and the ASM Association executives showed dissatisfaction with and raised concerns about there being only the one 'small-scale' mining licence for all ASM operations and about the state-inclined ASM formalisation procedures and arrangements. Their concerns were related to six (6) factors.

First, the current mining licence does not encourage those ASM operators who prefer engaging in mining on a smaller scale, particularly underground 'ghetto' mining. Similarly, some alluvial miners who are involved in "dig and wash" operations shared their concerns that their mining technique does not yield higher gold production. However, it becomes unfair if they have to apply for the same licence as alluvial and surface open-pit miners, who employ greater levels of mechanisation and technologies, such as bulldozers, excavators, tractors, trucks, water pumps and washing plants, to achieve greater levels of gold ore extraction and processing. Not only the cumbersome and costly registration process but also the fact that it restricts miners who often use minimal technology to the one 'small-scale' mining licence for all ASM operations encourages them to bypass it. Besides, many licensed ASM operators choose to operate differently from what they stated in their licensing application forms; these operators think that having the licence allows them to employ any mining method for their operations.

Second, different miners cannot apply for the same mining licence or permit; going through a similar licence application procedure for different mining methods generates varying environmental impacts and economic outcomes. In relation to this, underground miners claimed that other miners, specifically alluvial and surface/open-pit miners, who used much more sophisticated mechanisation to increase their ore production, could have same licensing process but at a different cost and for different licensing types. This is explained on the grounds that their mining activities generate higher environmental impacts and higher returns. Thus, these miners further questioned why they should pay the same licensing fees for different ASM methods employed in gold extraction and processing which have different environmental impacts and economic outcomes. For example, as this 42-year-old surface/open-pit miner at Prestea declared:

> Just one mining licence for all artisanal or small-scale gold mining activities in the country does not make any sense…Various ASM methods impact economic outcomes and the environment differently…One small-scale mining licence impedes the development of resource governance and efforts to reduce the diverse environmental impacts caused by different mining methods. In this case, they are land degradation, soil pollution, destruction of water bodies, and water contamination and pollution.

Moreover, some ASM operators questioned the potency of the state-inclined mining formalisation procedures and arrangements because they fail to differentiate the levels of sophistication or mechanisation and the mining methods that affect operators' organisational structure, management activities, workplace safety, and environmental sustainability outcomes. However, some licence holders indicated that while the Minerals Commission and its district branches have adequate knowledge of licence holders' mining operations through their records, many licensed ASM operators have limited knowledge of what they need to do as part of their responsibilities in guaranteeing sustainable and safe mining and in addressing the potential negative environmental impacts. This situation, according to the findings, is because *many operators went for the mining permit because the government wanted informal gold miners to acquire it to make their mining activities legitimate and legal* (ASM Association Executive member, Prestea Branch).

Though this aspect of state-inclined ASM formalisation is a key to ensuring a sustainable, efficient, and environmentally-friendly approach to mineral extraction and mining environmental management, most ASM operators fail to recognise the responsibility that comes with their mining activities to safeguard the environment without damaging its essential elements, such as water bodies and forest resources. Thus, the Minerals Commission and other relevant state institutions have failed to provide (public) education on the general ASM licence and why it is required, the variations in the licence documents issued to operators, and the broader socio-economic and environmental impacts of not fulfilling the permit requirement. Premised on the lack of education for licence holders, the interviews conducted showed that many ASM operators, who were assisted by professional mining engineers or mining-related professions to secure mining permit, do not have adequate knowledge and understanding of "*the silent requirement for licence holders not (…) to use the licence for other forms of ASM operations, for example, for underground mining if a particular mining method (like open-pit mining) is indicated in the documents used to acquire the small-scale mining licence*" (A licence holder, Bogoso). On this basis, a single form of licence without any differentiation makes it difficult for ASM operators to adhere to the environmental management practices or any post-mining environmental management activities specified as a requirement for the title to mine.

Third, the same mining licence hinders some indigenes or communities from operating legitimately because they do not legally possess lands deemed suitable for mining activities, as those lands belong to large-scale multinational mining companies as a concession. As many interviewees contended, this situation prevents communities or locals – for example, those in the Prestea-Bondaye mining area (PBMA), where most concessions belong to the multinational mining companies – from operating within the formal domain of the sector. Due to this, informal miners and traditional authorities (i.e., local chiefs) recommended that (LSM-ASM) *co-existence/partnership licences* should be in place to offer some abandoned mine pits to these indigenes or communities in question. In doing so, this specific situation observed in different mining areas could be addressed to prevent the conflict between local people and LSM companies over access to land for ASM activities. For instance, a traditional leader in the PBMA made the following comment:

> How can the government deal with galamsey operators? See many people in Prestea do not have mineralised lands or registered concessions … How can they secure a small-scale mining licence? Government knows it, yet nothing has been done about it…How can people operate legally here? We traditional leaders sometimes talk to these large-scale mining companies, B/PGSL (Bogoso/Prestea Golden Star Limited) in particular, so that locals can work in abandoned open pits or shafts?...Gold mining in Prestea area is not just now; it started way back before independence, if I am correct, yeah! People can't get any personal licensed concession. Mining companies

need to work some form of partnership with the government to allow galamsey people to operate legally and avoid a military swoop in this area. We don't want that conflict between local miners and any big mining companies.

From the findings, the ASM formalisation arrangement and customary land administration system could be merged as a form of legal pluralist strategies to address land tenure issues and the conflict between LSM companies and local miners over access to land for ASM activities. In the PBMA and other mining regions where multinational mining companies possess a greater portion of the mineralised lands as concessions, the one 'small-scale' mining licence cannot help indigenous people or mining groups operate within the formal (or legal) sphere of the ASM sector in such a mining landscape. As a result, the traditional authorities should be involved in tackling the customary land tenure issues for ASM operations as well as the broader mineral extraction and governance for local development.

Fourth, a state-inclined ASM formalisation arrangement that focuses on one small-scale mining permit for all ASM operations does not provide specific land reclamation approaches for each mining method and appropriate environmentally sustainable mining practices that, in turn, address various environmental and occupational health issues for the adoption of mining techniques. As this 34-year-old alluvial miner at Gambia asserted:

A ban is unnecessary because the government and its institutions are to be blamed for burgeoning illegal mining activities destroying the environment … There are no specific land reclamation approaches and sustainable practices specified in the regulatory framework. But we are required to deal with environmental impacts, restore damaged lands, and fill mining pits after extraction. There must be distinct mining licensing procedures and types that provide precise and detailed information of restoring mined lands and damaged lands after mining operations. Post-mining activities differ because of the mining methods adopted by galamsey operators.

Fifth, having only the one mining permit implies that all the ASM operations are the same, with similar risk levels and chemical exposures. That is not the case, as different mining methods induce divergent occupational health hazards and safety concerns. According to our findings, health risks and occupational hazards in underground 'ghetto' mining are different from those of alluvial and surface/open-pit mining, which use higher levels of mechanisation, while underground mining involves the use of chisels, hammers, pick axes, shovels, and sacks etc. Moreover, some mining methods for ASM use different chemicals for processing. We found that some ASM operators utilise arsenic and cyanide for gold processing instead of using mercury for gold recovery. These highly toxic chemicals expose communities and miners to diverse toxic hazards and health risks. From the interviewees, we found that cyanide and arsenic usage is becoming common for some miners. However, based on the usage of these chemicals and the nature of ASM operations, they cannot be classified as small-scale miners but rather as medium-scale miners. For instance, a-47-year-old surface/open-pit miner at Nsuta had this to say:

Some small-scale miners are using cyanide to process the gold ore instead of mercury. They use sophisticated technologies to extract gold… Because of the chemicals they use in extracting gold and their scale of operations, they can't be called small-scale mining… If these miners release this chemical into local streams, its harm and damage would be more severe than mercury used by other miners.

This explanation was provided because of ASM miners' perceived notion about mercury use. Some miners believed that mercury is used in ASM but not cyanide and arsenic, which are thought to be used in medium-scale and large-scale mining. Based on the ideologies and expectations of ASM miners, they called out the differences in mining operations, and stated why they thought having different mining licence types is crucial to the proper management of chemical exposures and their effects on human health. Meanwhile, some ASM operators and the ASM association executives stressed that the one-size-fits-all mining licence or state-oriented ASM formalisation arrangement has an operational weakness to effectively tackle the "galamsey menace" that jeopardises environmental safety through heavy metal contamination in the water and the soil.

Lastly, our findings showed that the one-size-fits-all 'small-scale' mining licence does not promote women's economic empowerment. In Ghana, there are several barriers to women's participation in ASM, such as gender struggles, financial constraints, lack of mineral access, poor working conditions, and social taboos (see Adomako and Hausermann, 2023; Baddianaah, 2023; Mengba et al., 2022; Arthur-Holmes, 2021; Arthur-Holmes and Abrefa Busia, 2021; Koomson, 2019). Women who desire to participate in a specific ASM operation need to acquire the general small-scale mining licence, but many women cannot afford the cost. Though women miners, who carry mineralised materials, would prefer to have their own ASM operations through a partnership, where they can have control over mineral extraction and undertake key mining decisions without the influence of men, this is not possible for them. This situation results from their inability or decision not to spend a large sum of money to secure a licence for mining activities, which are considered not to merit the cost of the licence. Consequently, some women miners interviewed stressed that having different categories of mining licence for ASM operations would motivate women to form a business partnership to acquire a concession and mining licence that would suit their financial capacity. Some women miners emphasised that for women to be considered as miners but not as workers by the male miners, women might need to either acquire a licence to mine or have access to abandoned concessions of large-scale multinational mining companies on their own to create economic opportunities for themselves and others. However, as one female ore transporter from Prestea working in Gambia stated:

We can undertake mining activities if we can get a mining licence that corresponds to women's strength and the kind of mining activities women can do… Not use heavy machines but simple tools and equipment that are permitted by the mining licence… But at the moment, there is nothing of that sort to enable women with limited financial resources to secure a lesser category licence at a lower cost.

4.2. *Justifications for the different mining licensing types for ASM operations*

Interviewees suggested multiple licence types in the sector would be appropriate to address most of the ASM problems that promote illegal mining activities. Based on our data analysis, seven (7) key points were mentioned as benefits that can be derived from categorising and implementing multiple mining licensing types to effectively formalise ASM operations and ensure environmental sustainability, as elaborated in the subsequent sections.

4.2.1. *Environmental regulations and mine waste management practices*

Some interviewees stated that different categories of mining licence types could help provide specific documents for prospective miners to conduct their mining operations as sustainably as possible without destroying the environment through land degradation, water pollution, heavy metal contamination, and biodiversity destruction. In view of this, the new types of ASM licensing would pave the way for the key state institutions, including the Minerals Commission, Environmental Protection Agency (EPA), and Ministry of Lands and Natural Resources, to design specific environmental regulations and sustainable practices for each mining method employed for ASM operations. Such specificity would help change the mindset and attitude of ASM operators and those prospective miners who believe that there are no specific guidelines for their chosen mining method to address the various negative

environmental concerns.

In the interviews, underground miners contended that different types of mining licence would be beneficial to the growth of the ASM sector by promoting mining practices and providing information to miners that can assist them in managing mine waste. However, some miners, in general, believe that the inability of state institutions, particularly the Minerals Commission, to provide different types of mining licence contributes to the lack of relevant waste mine management information for miners to prevent inappropriate mining practices that negatively affect the environment through land degradation, and water contamination and pollution. For instance, as this 36-year-old alluvial miner at Prestea declared:

> How can all we miners have the same mining licence type and be expected to manage the waste that comes out of our mining operations with what mine waste management guidelines. For us galamsey operators and small-scale miners to address the negative impact of our mining activities, we need different mining licences that can force the Minerals Commission and the Ministry of Lands and Natural Resources to implement different environmental monitoring activities tailored to a particular mining method for small-scale gold mining.

4.2.2. Provision of specific land reclamation approaches

We found that the different environmental impacts of the ASM methods manifest in different ways depending on the geologic formation and soil type of the land or concession in which the ore was extracted. This, according to some interviewees, determines and influences the processes for reclaiming mined land or restoring affected water-related ecosystems. In view of this, it was commented that multiple mining licensing types could make the state institutions consider different ways of providing operators with specific land reclamation approaches that apply to the mining method they employ to extract the gold ore.

Some registered ASM operators highlighted that the regulatory framework does not provide specific instructions on how reclamation should be implemented for the various mining methods employed in the ASM sector. This situation seems unhelpful to operators who are interested in land reclamation due to the different forms of land reclamation exercises whether through chemical, physical, or biological processes depending on the purpose of the reclamation. As one registered ASM miner at Bogoso noted:

> Reclaiming mined land for agricultural purposes needs to go through the chemical processes that will detoxify the poisonous chemicals, such as mercury, arsenic, or cyanide, in the soil before (…) considered appropriate for cultivation [of crops].

Many ASM miners, including registered operators, possessed no knowledge of land reclamation approaches. Though prospective ASM miners provided the EPA with reclamation plans as part of the licensing procedure for permits through an assessment of the environmental impacts, most plans were prepared by mining professionals, with miners having little or no knowledge of the reclamation processes. As we found from the interviewees, the Minerals Commissions and the EPA were aware of this issue; however, no educational programmes were being delivered. Until recently, ASM miners were made to have training on the operations at the University of Mines and Technology (UMaT) at Tarkwa (Arthur-Holmes et al., 2023). Despite this, some miners contended that the lack of knowledge of land reclamation resulted from the inability of regulatory bodies to provide relevant information on land reclamation and remediation strategies for a particular mining method within a geological landscape. Consequently, as was reported in the interviews and FGDs, many licensed ASM miners conducted their operations without having post-mining management activities such as land restoration in mind. This situation had become the case for most formal ASM operations. As one ASM miner at Bogoso rightly said:

> Formalising the galamsey operations is not just about acquiring the licence … It goes beyond that to include education on land reclamation, provision of institutional support, regular monitoring of mining sites to enforce safe and responsible mining and health promotion of miners to prevent accidents and injuries…Education is crucial to adherence to the ASM regulations and environmentally friendly operations, especially when miners have adequate knowledge of what to do after mining.

From the interviews, many ASM operators do not even contemplate reclaiming the mined land because their motives for participating in ASM are purely economic; they lack social and environmental consciousness. Though some informal ASM operators desire to operate in sustainably manner by restoring some damaged land, they are impeded by their lack of knowledge on land reclamation practices, as this condition is exacerbated by the government's lack of commitment and technical support to address the environmental impacts associated with ASM.

4.2.3. Specific occupational health and safety protocols and practices

Justifying the need for different categories of mining licence, miners reported that it would help regulatory bodies to provide more, specific occupational health and safety protocols and practices for different ASM operations. As highlighted during the FGDs, having different mining types in place would encourage ASM operators to obtain the appropriate type with relevant information to protect the miners or workers from occupational hazards and risks. According to a-29-year-old alluvial miner at Nsuta:

> All small-scale mining activities do not have the same risk and hazards, that is why different licences are needed. Underground miners feel reluctant to obtain mining licence because the mining activities are done in underground pits. But we will do so because they the government will then support them in reducing the risks and safety issues that we face.

Currently, as reported by two registered ASM operators, the mining licence fails to stipulate the specific safety practices miners should comply with to prevent any safety issues or hazards at mine sites. In this connection, the development of multiple mining licensing types would be a starting point for a discussion on the safety and occupational health regulations for specific mining methods used in the sector. As this underground miner (47-year-old) at Prestea noted:

> Underground miners do not engage in safe mining practices, leading to the collapse of underground pits, yet for years now, the government has done nothing to help them…A mining licence for underground mining will force the Minerals Commission to outline safety practices, such as the use of personal protective equipment and proper blasting procedures in the underground pits…People will begin talking about underground 'ghetto' mining and the safety issues and risk factors if they can obtain a specific mining licence for such mining activities.

Another underground miner (43-year-old) at Bondaye also added:

> There is little attention paid to underground 'ghetto' mining. As a result, safety or risks in underground mines are ignored. A mining type for underground mining will also persuade government institutions in charge of the small-scale mining sector to provide safety regulations to reduce the incidence of injuries, accidents, and deaths.

These quotations point to a lack of recognition for some ASM operations due to their less noticeable environmental, health and safety impacts that happen within the (underground) mining working spaces. This situation is likely to change if different mining licensing types are in place.

4.2.4. Provision of logistics, training, and technical/financial assistance

Another factor making stakeholders support new mining licensing systems is the provision of logistics, training, and technical/financial assistance. According to the FGDs and the interviews, ASM operators stressed that multiple types of licence could change the government's attitude towards the growth of the sector. This, in many ways, would increase the commitment level of both the government and its mining regulatory institutions to addressing the factors responsible for the increasing rate of illegality in the sector. Because they would need to offer different provisions of logistics, training, and technical assistance for various ASM operations that have their own unique mining type. As was clearly stated during an interview with a 41-year-old surface/open-pit miner at Kwamenianpa:

> I heard that the government is organising training for small-scale miners at the University of Mines and Technology (UMaT). But, the training is general for small-scale mining, and is not specific to a particular mining method and its environmental impacts and health outcomes. Consequently, having different mining licences helps the trainers provide the required training, knowledge, and logistics small-scale miners need. The one [small-scale mining] licence is why the government's effort to tackle illegal is in vain.

Another open-pit miner (39-year-old) at Prestea also commented that:

> How can the government and the Minerals Commission assist us, we the galamsey operators and registered small-scale miners, with technical assistance if they categorise the ASM activities across the country and give one licence? It is not possible to address all the small-scale mining activities with one regulatory framework for licence acquisition and environmental protection. With different licences, the government can address our concerns and support us with appropriate training and logistics for our mining activities. We blame the government for the galamsey mess in the country.

From the findings, the lack of multiple licensing types inhibits the government from determining the financial support that can be considered fair for different ASM operators. However, with different licensing types, the government could provide numerous types of financial support to different ASM miners depending on the kind of mining method they have adopted. More importantly, financial assistance by the government could enable people, especially those who desire to operate within the formal spheres of ASM, to apply for mining permits and subsequently purchase appropriate inputs, whereas they currently lack the financial means to do so. For instance, a 38-year old underground miner at Prestea had this to say:

> The current mining licence was not designed to offer varied forms of financial assistance to artisanal or small-scale miners. So, the government does not have any requirement in place to offer financial assistance to the diverse ASM miners who have different financial needs. That is why it is important for a multi-tier categorisation of mining licences to guide the government or the regulatory bodies in offering financial assistance to miners, which can be loans to pay for the licence.

4.2.5. Flexibility in the provision of credit facilities and collateral assessment

Our research demonstrates that the lack of multi-tier classification of mining licences restricts ASM miners from securing credit facilities (such as loans) from financial institutions like microfinance institutions or rural banks. This circumstance results from limited information on the mining licence for what type of ASM methods and risks are involved for that particular mining method. Many miners cannot secure loans for their ASM operations after their loan application assessment because they fail to meet the payment and collateral requirement or because the ASM operations, on which they will spend the loan, carry high financial risks.

Based on these aforementioned factors, some miners explained that different licensing types would provide flexibility for financial institutions to devise various credit facility provisions and collateral assessments for miners based on their mining method, whether underground, surface/open-pit, or alluvial mining. With changes in the regulatory ASM framework, bank institutions can determine the right amount of money for miners or prospective ASM miners who apply for loans with a particular mining licence. For instance, a Small-scale Mining Association Executive member at the Prestea Branch stated:

> Some use the mining licence to obtain loans. But their small-scale mining operations cannot generate enough funds to repay it… Many banks don't have a fair idea of the income small-scale miners generate. The current mining licence is general and gives no clue of economic returns… Specific mining licences will make it easy for banks to estimate miners' returns and assess their loan applications properly. General things don't help when in dicey situations like a general mining licence, though some people can secure loans for their small-scale mining activities. They do so by convincing the banks with better collateral.

We found from the interviewed miners that simplifying the ASM regulatory framework by having different mining licensing categories would help prospective miners to undertake more geo-prospecting and exploration activities to obtain reliable geological data. This, in turn, would facilitate the provision of sufficient information about the potential income of their operations to secure loans from banks. As some miners emphasised, geo-prospecting an area to obtain adequate knowledge of the gold grade through assaying requires sufficient funds. Thus, a well-defined mining licence will encourage prospective miners to get geological data to support their credit (loan) application to banks. However, many miners do not have enough funds for geo-prospection and exploration activities, and for conducting assaying to estimate the gold grade for mine-life analysis.

4.2.6. Towards state-LSM-ASM/traditional authorities arrangements

As presented in section 4.1, for example, in the PBMA, where many ASM miners did not operate with mining licences due to LSM companies' possession of a larger portion of mineralised lands, having differentiated licensing procedures and types would provide an avenue for the state, LSM companies, and traditional authorities to make a cohabitation arrangement for indigenous miners to operate on the companies' older shafts or abandoned open pits. The arrangement by the state-LSM-ASM/traditional authorities would be possible if a particular licence type were to support ASM-LSM cohabitation and partnership. That, in turn, would avert violent confrontations between the LSM companies and the indigenous mining groups. Often, the conflict between these two parties arises from competition for mineralised land for the same purpose. The scarcity of mineralised lands for indigenous mining groups or people in rural communities to build livelihoods to meet basic needs intensifies rural poverty.

According to many interviewees, government must engage in dialogue and stakeholder discussions with LSM companies and traditional authorities to create sustainable solutions for the LSM-ASM conflict in the PBMA and other mining communities. In light of this, many interviewees stressed that having different licence types would make provisions for the LSM companies to assist indigenous mining groups or operators in developing environmental solutions for mining challenges they encounter. Some ASM operators stated that the LSM companies could provide sustainability initiatives for them to operate efficiently and safely, especially in the case where the companies monitor their mining activities to ensure that they comply with the cohabitation regulations or agreements. In doing so, illegal or informal mining activities will be eradicated in rural mining communities with restricted access to mineralised lands for indigenes. For instance, a surface/open pit miner (aged 33) at Bondaye noted the following:

> Mining companies like B/PGL (Bogoso/Prestea Golden Limited) can help us address the galamsey issues, people not getting land for mining activities...This company can provide initiatives tailored to achieving sustainable mining within the frame of the informal mining operators relying on large-scale mining companies' permission to operate without destroying local streams, rivers, and water-related ecosystems…In Prestea, if there is a proper arrangement between the mining companies and galamsey groups through the government, mining companies will provide the necessary technical support and mechanisms to help galamsey people operate responsibly and minimise occupational hazards.

4.2.7. *Integration of indigenous knowledge systems and environmental ethics into the formalisation framework*

From our empirical analysis, informal mining operators justified the need for the multi-tier classification of mining licences in the ASM sector because of its capacity to promote a hybrid system of mineral resource governance that integrates indigenous knowledge systems and environmental ethics into the formalisation framework. Some interviewees mentioned that environmental ethics are fundamental to the protection of the natural environment, especially the water resources, agricultural lands, and the forest. Traditional authorities have instituted sacred days for 'mother' nature to rest and to conduct sacrifices to the gods. The sacred days differ from community to community. In some mining communities, for example, in Bondaye, Thursdays are known as the day for traditional rituals, whereas in Himann and Prestea, Fridays are their sacred days (and also the breaking day for miners where they are forbidden to undertake mining activities at the sites. These environmental ethics are essential elements of Ghanaians' social values, practices, and norms.

However, some interviewed informal miners emphasised that different mining licensing types would enable state institutions to assess other environmental ethics and indigenous knowledge systems and thus connect them to each licensing system that suits a particular ASM operation. Embedding appropriate indigenous knowledge systems into categorised licensing systems within a reformed ASM regulatory framework will send an important message to traditional leaders about the role of environmental ethic and indigenous practices in promoting environmental sustainability. In support of the aforementioned empirical discourse, for example, a 38-year-old underground miner at Prestea asserted:

> Our traditional practices, especially for mining activities, are important, and we cannot discard them for the white ones (Western practices). We can embed traditional knowledge of mining into the white ones…Now you see, any mining activity that we want to undertake, the government wants us to go through the formal process to get a licence. But there is one licence for all artisanal and small-scale mining activities…We need different licensing systems and regulations because traditional mining practices and environmental conservation mechanisms are applicable to specific ASM operations. Some can work for underground mining but cannot work for alluvial mining or open-pit mining…We were practising traditional knowledge systems for underground mining but were not destroying the local streams and rivers. We used metal mortar and pestle for grinding the mineralised rocks and checking the sample for the gold grade…We did not pollute the rivers … Even when we sent the mineralised rocks to the milling centre, we washed the grinded ore in a well-managed basin filled with water …Open pit mining that uses heavy machinery will need different traditional knowledge and practices for environmental conservation…Underground mining will need the environmental ethics that are suitable to its operations.

4.3. *Proposed multi-tier mining licence classification for artisanal, small- and medium-scale mining (ASMM)*

In the FGDs and interviews, stakeholders explained that classifying small-scale mining into artisanal, small-scale and medium-scale mining (ASMM) must allow different categories of mining licences with differentiated procedures to address the challenges that currently create burgeoning illegal mining activities. In 2016, the Minerals Commission through the Chief executive, Dr Tony Aubynn, proposed reclassification of small-scale mining sector into artisanal mining, small-scale mining, and medium-scale mining.[1] The medium-scale mining was considered because it would allow foreigners to engage in mining activities that are not small-scale or artisanal and to reduce illegal mining. This reclassification was proposed to avoid the situation where foreigners connive with locals to engage in artisanal or small-scale mining activities, as the regulatory and legal framework permits only Ghanaians aged 18 years and above to be active in these mining activities. If foreigners are interested in mining activities in the country, then they should rather secure a licence to engage in medium-scale or large-scale mining. The issue of Chinese involvement in ASM in recent years has caused a stir, especially their role in the environmental destruction, such as land degradation, water pollution, and heavy metal contamination.[2] Consequently, this has led to the arrest of the Chinese nationals and the destruction of their mining equipment. In Ghana, the ASM operations are subsumed under the small-scale mining in the Minerals and Mining Act, 2006 (Act 703) (amended in 2019, Act 995).

The three-tier classification in ASMM paves the way for multiple categories of mining licences as proposed in Table 2 according to the FGDs and the interviews with ASM operators. For category 1, an underground 'ghetto' licence was suggested for artisanal mining that takes place in stopes (i.e., underground mining workings) or a ghetto form through vertical openings to access gold ore; this is because of the mining methods employed and the scale of operations having only a minimal impact on local surface waters. Category 2 of the multi-tier mining licensing system is the *alluvial licence,* which is differentiated into two subgroups: *alluvial licence A type* = artisanal mining (based on

Table 2
Proposed typology for a multi-tier classification of mining licence versus ASMM Classification.

Mining Licence Categories	Licensing type	ASMM Classification
Category 1	Underground "ghetto" licence	Artisanal mining
Category 2	Alluvial licence (A & B)	A = Artisanal mining B=Small-scale mining
Category 3	Surface/open-pit licence	Small-scale mining
Category 4	Medium-scale licence	Medium-scale mining that either adopts alluvial or surface open-pit mining with arsenic and cyanide as chemicals for gold processing
Category 5	Coexistence/ partnership licence (A, B & C)	A = Underground 'ghetto' mining (artisanal) B=Alluvial mining (artisanal or small-scale mining) C= Surface/open-pit mining (small-scale mining)

[1] https://www.doobia.com/news/policy-proposal-to-classify-medium-scale-mining-underway-1276.

[2] For detailed understanding of Chinese involvement in ASM in Ghana and the socio-economic and environmental dynamics of their involvement, see works by Hilson et al. (2014), Crawford and Botchwey (2016, 2017), Hausermann et al. (2020), and Kumah (2022b, 2023).

mining method, scale and depth of operations, and number of workers or miners), and *alluvial licence B type* = small-scale mining (based on the mining method, scale and depth of operations, and number of workers or miners). The *alluvial licence B type* was mentioned because some alluvial miners employ washing plants, milling machines, and other sophisticated technologies, such as excavators, to dig for mineral ore at greater depths. In contrast, the *alluvial licence A type* should be used for alluvial mining that employs the "dig and wash" mining method or any other alluvial mining technique to extract mineral ore at a shallow depth. The "dig and wash" mining uses a sluicing board and smaller blanket for washing and processing and a workforce of often fewer than 8. As the riparian zone of 100–500m applies to alluvial mining, both alluvial licences (A and B) must seek to ensure the licensees comply with this important instruction to protect local streams and water bodies.

Category 3 is the *surface/open-pit licence* because of the surface or open-pit mining methods prospective miners may intend to use. Because of this licence type, the technologies that would be used and the scale of operations will qualify it as a small-scale mining. Category 4, that is, the *medium-scale licence*, can be regarded as medium-scale mining because the mining firms operate on a medium-scale basis with sophisticated mechanisation and use cyanide and arsenic for extracting gold through the various stages of gold recovery. The last one, i.e., Category 5, is the *co-existence licence type* with three (3) subgroups, as shown in Table 2. They have the same explanation for the first three categories of types of mining licence. However, this type does not require local people or prospective miners to apply for a mining licence for a concession or land they have secured for mining activities. As its name suggests, the *co-existence/partnership licence type* must be acquired from the regulatory body through an endorsement application from multinational mining companies to allow indigenous mining groups to undertake ASM activities on a section of their abandoned mine sites or unused concession. In this context of mining with *co-existence licence*, negotiations with mining companies for concession releases are mandatory. The findings demonstrate that holding a *co-existence licence* makes a difference because the arrangements for special licences are done through three parties (i.e., the Minerals Commission, indigenous mining groups and large-scale multinational mining companies). Unlike this, the one 'small-scale' mining licence involves only prospective ASM operators or mining groups without the involvement of large-scale multinational mining companies. Some informal miners explained that if the indigenous mining groups want a partnership arrangement with large-scale multinational mining companies by working on their unextracted concession, the latter will receive a share of the extracted ore.

In support of these categories of types of mining licence, we found that having different licence types will force prospective miners to acquire the services of professional mining engineers to help fill in and complete the differentiated licence applications for the different stages. It will also help professional mining engineers design appropriate post-mining management activities to restore mined lands based on their environmental assessment of their mining activities and the geology of the area to be mined. This is important because the sector needs mining professionals to help local miners who have little or no knowledge about land reclamation or mine waste management to ensure that any ASM activities are safe and sustainable, and thus are not polluting water bodies and destroying the biodiversity and ecosystems.

We found that the different licence specifications would make it easier for security officers to check during military-led sweeps at ASM sites whether the operators are using the mining licence they acquired for their operations. Besides, the Minerals Commissions and anti-galamsey taskforce can deal with those who are found guilty of using their (specific) acquired licence for different mining operations.

Additionally, the differentiated mining licence types and documentation are self-explanatory for financial institutions and important stakeholders, including traditional leaders and government officials, when inquiring about their licence. In support of this, a 38-year-old alluvial miner at Bondaye mentioned: *When you hear the licence name, it should tell the right way, the method used, what will be required to address the mining impacts, and how the land restoration will be done.* This explanation offers the possibility for key stakeholders in the ASMM industry to gain knowledge about the mining licences and their mining methods. A 41-year-old open-pit miner at Kwamenianpa also provided his reasons for the multi-classification of ASM licence:

> We need to categorise the [small-scale] mining licence into groups, possibly more than three. So, if you are asked about your licence type, you could say it. Now you can't say it. So, the Minerals Commission must know that the current [situation] is not good…The community mining programme is not transparent because of how local miners are selected though everybody can be involved. Therefore, having different categories will create a flexible platform that features this programme to halt illegal mining.

Some interviewees also justified that tackling the problems fuelling illegal mining activities, such as customary land and tenure problems and the inaccessibility of mineralised lands for mining activities, is a shared responsibility for all citizens and not just for the government and its institutions. Thus, having different types of ASM licence would provide different stakeholders, including the chiefs, community leaders, and state institutions, with detailed, specific information they can use to question miners if they engage in different mining operations or operate irresponsibly, that is, not in compliance with the regulations and conditions of the licence acquired. For instance, an executive member of ASM association body – Prestea Branch had this to say:

> Dealing with illegal mining is not just the governments responsibility but a shared responsibility for all Ghanaians. Chiefs, community leaders, district assemblies, the EPA [Environmental Protection Agency], Land Commissions officers, Ghana Water Authority, Water Resources Commission, Minerals Commission, galamsey operators, university lecturers, and you too as a researcher… Everybody must be involved in this fight against illegal mining. That is why we need different types of ASM licence for everybody [i.e. the key stakeholders in the sector] to monitor what scale the miners are operating.

5. Discussion

In expanding the discourse on the factors fuelling illegal or informal ASM in Ghana, this paper explains why the ASM licensing system is a contributory factor and why it limits the promotion of the formalisation agenda. Though the mandatory licensing scheme is praised as a laudable policy for formalising ASM operations, our findings suggest that different mining methods are employed in the ASM sector because of different kinds of ore deposits and geologies. As a result, the general small-scale mining licence with bureaucratic process is hindering illegal or informal miners to formalise their activities by securing the licence. In this study, miners questioned the potency of one-size-fits-all mining licence, regarding it as problematic and unresponsive to the various dimensions of ASM operations and their capital-forming effects and environmental impacts. Studies show that the ore deposits influence and determine the techniques used in ore extraction (Arthur-Holmes et al., 2022b; Aryee et al., 2003).

Consistent with our findings, previous studies have highlighted that different kinds of socio-ecological impacts of ASM characterise the changes in the geological landscapes in which local indigenous people extract mineral ore (Pedersen, 2023; Ferring and Hausermann, 2019; Hausermann et al., 2018). As a result, these dynamics influence land reclamation plans. This is why having a multi-tier classification of mining licences can facilitate the provision of specific mining method-related impact instructions for land reclamation and remediation. It is, therefore, essential to recognise that some people, especially the so-called powerful elites and those with political connections, secure environmental permits from the EPA and other permits without designing effective reclamation plans as part of the 8-step ASM licensing

procedure specified on the Minerals Commissions' website. This happens when prospective ASM miners bribe some EPA officials involved in administrating the documentation or use their political affiliations to secure approval for their permit document without going through the proper institutional review. As a solution, the institutional review for identifying political connections should involve checks on the persons acquiring the licence for ASM operations. If the licensee is a parliamentarian or is highly affiliated with minister(s), there should be an enactment against these groups of people obtaining a licence for ASM operations, especially through an informal medium. Besides, there should be proper educational system in place to ensure people's moral compass towards environmental sustainability by complying with the mining regulations and code of mining practices.

Moreover, as our findings suggest, ASM miners and other local stakeholders recognised the differences in the ASM operations, generating diverse environmental impacts, occupational hazards and safety concerns, and economic outcomes. On this basis, ASM miners questioned the relevant state institutions' lack of effort to have different categories of mining licences that respond to various dimensions of ASM operations that utilise different technologies, tools, and mining practices. This, however, demonstrates that the Minerals Commission's commitment to the growth of the ASM sector into the formal sphere is relatively low compared to LSM. Hilson (2019), in particular, explained this using what he termed large-scale mining 'bias' showing that the various governments in sub-Saharan Africa do not pay as much attention to the ASM sector compared to the LSM sector. The governments go to the extent of providing tax rebates and institutional support to encourage foreign investment in the industrial mining sector.

Due to the alarming rate of the environmental impacts of ASM, especially water pollution and contamination, "officials at the Water Resources Commission have started to exert pressure on the Minerals Commission to ensure that applicants also secure a *Water Use Permit as it is a legal requirement since* implementation of the *Water Use Regulations*, 2001 (LI 1692) but has been rarely enforced" (Hilson et al., 2022, p. 209). Though acquiring the permits from the Water Resources Commission and the EPA prompts ASM miners – and this is crucial to ensure sustainable mining operations, this can be achieved only if ASM miners comply with the regulations and acceptable mining practices. However, as highlighted earlier in the findings section 4, many "miners deliberately evade laws and are not interested in securing a licence" (Banchirigah, 2008, p. 30). These complex licensing procedures oblige applicants to secure an Environmental Permit and Water Use Permit and to go through other bureaucratic processes that deter many from applying for a mining licence before commencing any ASM activities.

In this study, our analysis suggests the ineffectiveness of the ASM formalisation regime in the context of a one-size-fits-all mining licence that fails to acknowledge that customary land and tenure problems prevent prospective miners from acquiring the standard licence as there are no alternative licences. To address these issues, there must be differentiated forms of mining licence with different application processes and costs (Akyeampong and Xu, 2023; Kumah, 2022a). Findings from our study, therefore, support Kumah's (2022a) argument that Ghana's ASM legal and regulatory framework "lacks differentiation and recognition for the diverse forms of the sector's activities to be formalised and the complex socio-economic conditions of miners" (p. 7).

Studies have shown that many indigenes in some mining communities have difficulty accessing mineralised lands, which results in conflict with multinational mining companies when they are evicted from or denied access to the companies' older shafts or portions of their concessions (Aubynn, 2009; Hilson and Yakovleva, 2007). As the findings suggest, this situation requires a specific mining licence that takes account of the socio-technological and socio-political dynamics of miners working in multinational companies through ASM-LSM-government arrangements. Though the community mining scheme (CMS), through a decentralised system of assisting groups of people or individuals, has the potential to reduce illegal mining activities, it still has that cumbersome procedure of obtaining the operating permit for ASM activities despite district assemblies being involved in the licensing process. In practice, the CMS has many illegal/informal miners in designated areas across different regions of the country, who operate legally while receiving support services to mine sustainably. However, there is limited research on the CMS, especially its coverage, implementation challenges, and role in ensuring environmental health and occupational safety. More studies are required to investigate whether CMS operators are practising environment-friendly mining practices and not destroying water-related ecosystems and forest biodiversity.

Another important factor associated with the problematic one 'small-scale' mining licence is its impediment to women's economic empowerment and visibility in the sector. Gender-mainstreaming in ASM and institutional support for women, especially with access to mineralised lands, mining licences, and financial assistance for mining inputs could help women to address the barriers to full participation with a resultant effect of increasing their economic benefits in the sector. This, however, would help them to change gendered traditional household norms and increase their bargaining power in the household (Ofosu et al., 2024a; Arthur-Holmes and Abrefa Busia, 2020; Danielsen and Hinton, 2020; Buss et al., 2017). In this study, the current situation of there being only one mining licence has negative implications for women's economic visibility and empowerment because they cannot afford the costly regulation process. To reduce women's gendered struggles in ASM, a differentiated mining regulation process with different costs would enable women to secure a mining licence for a particular ASM operation that matches their financial capacity. This further suggests that Ghana's current ASM formalisation framework may influence women's decision to acquire a licence to operate in the formal domain where they can provide economic protection for the other women they employ. Thus, increasing women's participation in formal ASM would reduce the economic exploitation, discrimination, and gender-based violence they receive at the hands of men in informal ASM spaces. This would be possible because the women employed would have "female mining bosses", who would be likely to provide better working conditions than "male mining bosses".

In aligning with the needs and capabilities of operators and addressing ASM problems in Ghana's sector and elsewhere in Africa, multiple categories of mining licence are recommended as a realistic strategy to pave the way for 1) detailed information on environmental regulations and mine waste management practices, 2) provision of land reclamation approaches for the mining methods employed, 3) specific occupational health and safety protocols depending on the kind of ASM operations, 4) provision of logistics, training, and technical/financial assistance, 5) flexibility in the provision of credit facilities and collateral assessment, 6) more geo-prospecting and exploration activities for reliable geological data to seek loans or for mine life assessment, 7) arrangements by the state-LSM-ASM/traditional authorities to address the inaccessibility of mineralised lands by indigenous ASM groups, and 8) integration of indigenous knowledge systems and environmental ethics into the formalisation framework. For these benefits to be derived from the multi-tier classification of ASM licences, the emerging use of more toxic chemicals like arsenic and cyanide, and the questioning of the one-size-fits-all mining licence, five multiple categories of mining licences – *underground 'ghetto' licence, alluvial licence (A & B)*, *surface/open-pit licence, medium-scale licence*, and *co-existence/partnership licence (A, B & C)* – vis-à-vis the ASMM classification would create different mining opportunities for those who can secure mining titles to carry out mining or those indigenous populations who want to operate through the *co-existence/partnership licence route*. This classification of mining licences could serve as guide for policy-makers not only in Ghana but also in other countries in Africa, Asia and Latin America to reconsider reforming their ASM regulatory and policy frameworks to reflect the dimensions of ASM operations that need different support and technical services to promote environmental sustainability.

In the case of the most studied communities in this research, the

PBMA and other mining communities like Abosso and Damang, where natives especially indigenous mining groups are in conflict with LSM companies (see e.g., Aubynn, 2009; Hilson and Yakovleva, 2007), the *co-existence/partnership licence route* based on mining arrangements and agreement between the government, LSM companies, and traditional leaders/indigenous mining groups presents a solution to often heated, violent confrontations between the two parties. In 2017, the Ministry of Lands and Resources launched the Multi-Sectoral Mining Integrated Project (MMIP), a five-year project to "firmly deal with, once and for all, the illegal and unsustainable practices so far associated with what clearly are irresponsible small-scale mining activities in Ghana" (Government of Ghana, 2017, p. 3 cited in Hilson et al., 2022). For the MMIP activities, the Ministry sought to "explore the possibility of introducing Medium-Scale Mining category to the legislation" (Hilson et al., 2022, p. 223).

Despite these suggested guidelines and proposals for the recategorisation of mining licences in line with the ASMM sector, the GTZ small-scale mining project in the 1990s in Ghana went against different categories of mining licences. Probably because of the challenges the project encountered in reducing illegal mining activities. Hilson and Maconachie (2020), based on their findings from a research conducted in Liberia and Sierra Leone, argued that such classification inhibits innovation in the sector. As argued by these scholars, governments may feel the need to implement more costly licensing requirements. Though we support this assertion, different licensing requirements and costs would not hinder technological transformations and innovation in the sector. In many ways, they would not impede innovations and growth in various aspects of the ASM sector considering the heterogenous nature of ASM operations. The operators would want to increase their ore production to obtain higher profits or incomes. Besides, operators cannot be left in a vacuum when discussing innovation and mechanisation because they are not static in their operations. Instead, they are dynamic, adapting to their mining operations' socio-economic, technological, and environmental conditions. Perhaps, other scholars have made such arguments because the state may need substantial financial resources and different mining and environmental management officers to commit to the technical and administrative needs of the differentiated mining licensing procedure.

Important to the discussion on the multi-tier classification of mining licences for ASM is the professionalisation of the sector for environmental sustainability and responsible mining. The multi-tier classification of mining licences could increase the number of mining professionals involved in the sector and help indigenous mining groups or prospective miners utilise mining services provided by mining and engineering professionals. This, in turn, would help address various problems that ASM operators face, such as mining licencing applications, occupational health and safety concerns, equipment repair and maintenance, mine waste management and mining pit designs. Supporting this, a study conducted on educated youth involvement in ASM in Ghana revealed that youth who had acquired mining-related knowledge and skills at higher educational settings utilised such relevant knowledge and skills to develop tailings structures to manage mine waste and share information on unsafe mining practices and safety with uneducated ASM miners (Arthur-Holmes et al., 2023). This demonstrates that the multi-tier classification of mining licence could provide an entry point for the professionalisation of the ASM sector in Ghana and other mineral-resources dependent countries in the global South.

6. Conclusion

In this paper, we have demonstrated that having an ASM regulatory and legal framework that recognises the dimensions of ASM operations would pave the way for differentiated mining licensing procedures and costs, thus encouraging prospective miners to secure the appropriate licence for their envisaged mining operations. Our findings have justified that ASM formalisation goes beyond securing a licence to mine to include the provision of detailed mining information from regulatory bodies regarding how to engage in post-mining activities – such as land reclamation and remediation – and safety and occupational health risks at the mine sites, receiving institutional and technical support to operate sustainably, and where necessary, obtain the needed financial assistance from financial institutions to engage in geo-prospecting and purchase mining inputs for their operations. Thus, the regulatory bodies should focus on making the ASM formalisation more enticing for prospective miners because of the need to receive technical support, training, and education about their secured licence and chosen mining operations. We found that the multi-tier classification of mining licences would address the problematic one 'small-scale' mining licence hindering women wanting to acquire a mining licensing type that they can afford. In many instances, women's empowerment is observed from the income women earned working in informal ASM spaces, which enhances their bargaining power in the home (Arthur-Holmes and Abrefa Busia, 2020).

Our findings show that rather than focusing on one-size-fits-all mining licence, categorisation of ASM licences, such as *underground 'ghetto' licence, alluvial licence (A & B)*, *surface/open-pit licence, medium-scale licence*, and *co-existence/partnership licence (A, B & C)*, based on the dimensions of ASM operations would help to address the diverse environmental impacts, societal impacts, and occupational health and safety issues. As a premise for categorising mining licences, it would change the narratives and attitudes of miners who hold the view that the existing state-led ASM formalisation regime does not consider the economic and environmental impacts of the diverse ASM operations. Such a perception would encourage miners to secure mining licences within the newly proposed ASM licence categories, thus increasing the opportunities for informal miners to operate legally and obtain support services from regulatory bodies (such as the Minerals Commission, the EPA, and the Water Resources Commission) and international organisations. For ASM to promote local development and transform rural economies through job creation, wealth creation, and the establishment of small- and medium-sized enterprises, policymakers need to simplify the regulatory framework and reduce the cost of securing the licence to mine. The findings also show that having a multi-tier classification of mining licences would play a crucial role in the integration of indigenous knowledge systems and environmental ethics into the formalisation framework because appropriate environmental ethics and traditional mining practices would align a particular ASM operation with its licence type.

Contributing to the ASM scholarship in Africa, the general small-scale mining licence is not only about the cost and the bureaucratic process of acquiring it but also the lack of recognition for the diversity of ASM operations and institutional support for the growth of the sector. Thus, we argue that the regulatory bodies can effectively and efficiently address the environmental, safety, and health concerns in ASM if they pay critical attention to the heterogenous nature of ASM operations and offer a range of technical support and on-site training to build miners' capacity for and knowledge of responsible and sustainable mining. Without recognising the diversity in ASM operations, donors' support for land reclamation programmes and alternative livelihood projects will not yield the desired results.

CRediT authorship contribution statement

Francis Arthur-Holmes: Writing – original draft, Visualization, Validation, Supervision, Resources, Data curation, Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Writing – review & editing. **George Ofosu:** Writing – review & editing, Writing – original draft, Validation, Conceptualization, Data curation.

Declaration of Competing interest

The authors declare that they have no conflict of interest.

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