

The formalization of artisanal and small-scale mining: Taking stock and charting the future

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Abstract

We are delighted to introduce this special issue, the purpose of which is to develop a deeper understanding of the operational outcomes of the artisanal and small-scale mining (ASM) industry. Each of the articles in the collection contributes important insights to our understanding of the dynamics of ASM operations and, collectively, they provide important benchmarks for subsequent research on this phenomenon. In different ways, they explore how different stakeholders and institutions shape the ASM space and influence outcomes despite the existence of formal rules and structures meant to formally regulate ASM operations. In doing so, they shed considerable light on how formalisation mechanisms can shape – or fail to shape – the ASM world in which both formal and informal operators exist.

Keywords

artisanal and small scale mining, formalization, environmental challenges, policy making, ASM operations

Background

The examination of the operational outcomes of the artisanal and small-scale mining (ASM) industry is still a hot topic across the social and natural sciences. Disciplines such as economics, geography, sociology, development studies, environmental studies, medicine, policymaking and beyond all continue to place emphasis on the operational outcomes of the industry (Clifford, 2022; Dembetembe, 2026; McKay and Hall, 2025; Siaw et al., 2026). This is because while the sector is increasingly relied upon as a generator of employment opportunities (Hilson and Garforth, 2013; Kudzawu-D’Pherdd et al., 2026; Okoh and Hilson, 2011), yet it is widely known for its potential

to threaten society through the environmental excesses it generates (Arthur-Holmes and Abrefa Busia, 2022; Macháček, 2019).

Broadly defined as individual or collective labour-intensive mineral extraction with limited capital investments (Jønsson and Bryceson, 2009), ASM operations, are known to be significant contributors to micro

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level economic developments. Especially in areas with limited formal employment opportunities, the operations have continuously filled the job gaps by providing employment and income earning opportunities for many people including women (Arthur-Holmes et al., 2022; Morgane et al., 2018; Ofosu et al., 2024a). On the macro level, ASM is also known to be a significant contributor to government revenue and foreign exchange earnings. In Ghana, for example, ASM is known to have consistently accounted for about 40% of national gold output, with the recently instituted gold purchasing programme, implemented through the newly established GoldBod, reportedly generating billions of dollars within its first few months of operation (Kudzawu-D'Pherdd et al., 2026).

Notwithstanding its socioeconomic importance however, ASM's dark side – the socio environmental challenges it engenders – continues to be of great concern to policymakers and mining governance regimes (Clifford, 2022; Stemn et al., 2025). Both formal and informal ASM operations continue to pose serious challenges to both the physical environment and the wellbeing of the inhabitants in the mining communities (Botchwey et al., 2022; Ofosu et al., 2020). These challenges have, among others, included land degradation (Bansah et al., 2018; Macháček, 2019), water pollution (Gyamfi et al., 2019), and precarious labour conditions (Arthur-Holmes and Abrefa Busia, 2022; Stemn et al., 2021, 2025).

In view of the ASM-related environmental challenges, over the years, formalisation, that is, registration, licensing and regulation of operations has emerged as a key reference point in debates on ASM sustainability and socio-economic transformation (Arthur-Holmes and Ofosu, 2024; Marshall and Veiga, 2017; Mckay, 2025; Ofosu et al., 2025). While formalisation is increasingly promoted as a pathway to decouple ASM activities from environmental destruction through cleaner production mechanisms, and waste reduction, it has also become firmly

embedded in policy discourse at the national level as well as within supranational bodies such as the World Bank (Geenen, 2012; Morgane et al., 2018; Siwale and Siwale, 2017; World Bank, 2019). Formalisation has also gained prominence on local governmental strategic agendas, wherein it is frequently framed as an instrument for restructuring and sustainable development in ASM (Hilson et al., 2019). Simultaneously, this efficiency-oriented framing has been noted to rely on assumptions that may not automatically translate into broader sustainability outcomes (Martinez et al., 2021, 2023; Siwale and Siwale, 2017).

In the ASM literature, research has expanded rapidly, often focusing on the adoption and implementation of formalisation and the scaling processes (Jiménez et al., 2024). Studies have analysed formalisation implementation across diverse regions and countries, providing rich insights into the roles of institutional quality, governance capacity, policy coherence among others (Geenen, 2012; Siwale and Siwale, 2017). These studies appear to converge on the point that formalisation must move beyond mere registration and licensing (Martinez et al., 2023; Siwale and Siwale, 2017). Formalisation must encapsulate the provision of technical and material support to ASM actors (Marshall and Veiga, 2017; Martinez et al., 2023; Siwale and Siwale, 2017). The contributions in this special issue (SI) adds to these insights, advancing discussions on other broader issues in ASM.

Overview of research works in this special issue

The following seven articles are exemplary in shedding light on issues on ASM and the formalisation agenda, offering new theoretical and empirical insights. We present Table 1 as a simplified overview of the various research questions, theoretical lenses and key recommendations examined by the authors. The

Table 1. Summary of the papers contained in the special issue.

Study (year)	Research question	Context-industry	Conceptual lens	Key recommendations
1 Arthur-Holmes and Abrefa Busia (2026)	How do we account for the latent socioenvironmental indicators that serve as essential metrics for grasping the complex, evolving fabric of extractive impacts?	Perils of artisanal and small-scale mining	Pernicious extractivism	To address the perils of ASM, formalisation mechanisms can embed the tenets of collaborative governance and social fairness
2 Montford et al. (2026)	How do diverse actors influence the outcomes and management of the conversions of cocoa-farms to ASM operations?	Cocoa farms-gold mine conversions in Ghana	Process net map and thematic analysis	Policymaking must strengthen collaborative governance and leverage the agency of key actors to manage the cocoa-farms-ASM operations interrelationship
3 Afful and Asante (2026)	How does the media frame ASM narratives and operational outcomes?	Ghana's ASM industry	Frame theory	Media narratives must encapsulate the good framings of ASM to help in the promotion of support for ASM
4 Sarfo et al. (2026)	How does legal and institutional multiplicity shape formalisation and actors' behaviour in ASM?	Institutional multiplicity in ASM	Institutional bricolage	Formalisation processes should be responsive and reflexive of the institutional and legal conditions in ASM
5 Wachira et al. (2026)	How do weak institutional and formalisation frameworks impact revenue generation in ASM?	Kenya's gemstone industry	Value chains	Attention must be directed to the building and strengthening of traceability architectures and the expansion of grading and valuation services
6 Ofosu and Sarpong (2026)	What does the actions of miners, and their relationship with state regulation, imply for ASM governance?	Global artisanal and small-scale mining	De certeaus' tactics of the weak	Policymaking should prioritise hybrid policies and bottom-up practices of ASM governance
7 Ezeh et al. (2026)	How have the intellectual structures and the thematic areas of ASM research evolved?	Africa's major mining countries	Bibliometric assessment	Scholarly works must continuously articulate context-sensitive, policy-relevant knowledge for the enhancement of ASM operations

following paragraphs provide a synopsis of each of the research articles, drawing particularly attention to the originality of the contributions made by the researchers.

Introducing ‘pernicious extractivism’ as a conceptual lens for understanding the socio-environmental implications of ASM, the study of [Arthur-Holmes and Abrefa Busia \(2026\)](#) highlights the often seen but unnoticed, cumulative harms prevalent in ASM spaces. While the environmental externalities of ASM are often pronounced, there is the existence of other ASM-related subtle forms of damage whose impact may not be recognised until they are severely entrenched. Rather than only through grand episodes of dispossession or pollution, these harms, often irreversible, are reproduced through quotidian practices and governance reforms.

Breeding chronic social disintegration and symbolic violence that erode trust and imperil rights, these harms also potentially jeopardize intergenerational (un)wellbeing, deepening community vulnerabilities. Formalisation mechanisms, the study explicates, may have the potential to mitigate pernicious extractivism through the promotion of policies aimed at individual and community wellbeing. However, formalisation mechanisms also risk exacerbating these harms through elite capture, bureaucratic complexities, and regulatory loopholes, potentially marginalising vulnerable miners and entrenching systemic imbalances that engender inequality and harm. To address pernicious extractivism therefore formalisation mechanisms must move beyond static approaches, to ways of ensuring the embeddedness of the tenets of collaborative governance, social fairness and the Sustainable Development Goals. This would (re)make formalisation mechanisms into driving forces for both alleviating harm and ensuring the enhancement of the resilience of ASM communities ([Arthur-Holmes and Abrefa Busia, 2026](#)).

The rise in ASM activities in cocoa growing communities continue to be of great concern. This is because although ASM may generate

positive outcomes such as employment generation, its environmental harms pose serious threats to cocoa farms ([Siaw et al., 2023](#)). Not surprisingly therefore regulatory interventions have often sought ways to address the ASM-cocoa farms conundrum. These regulatory responses to the mostly negative outcomes of ASM in cocoa communities have, however, received modest results in some ASM-cocoa communities. Other outcomes, however, have been different; a few success stories exist, raising scholarly and policy discussions as to the factors influencing these differences in outcomes.

To help throw more light on this phenomenon, [Montford et al. \(2026\)](#) sought to examine the processes involved in the conversion of farmlands into ASM sites within two different mining jurisdictions. The study also sought to highlight the influence of the prime actors within these conversion processes and how the agency of these stakeholders influences outcomes. Employing the process net map and a thematic analysis framework, the study found that from the standpoint of some of the local respondents, those with most influence in the ASM-cocoa farm conversion dynamics were the chiefs (the traditional custodians of most lands in Ghana), and landowners. Although miners attained some level of agency, their influence was, at best, average. The presence of other stakeholders was also evident, but their influence in impacting the phenomenon produced mixed outcomes. For example, while CSOs were found to be influential actors in some areas, their roles could only help, at best, in the management of the outcomes of conversion and not in the conversion process proper. Even in some whereas their presence and influence were significantly minimal. Regarding mining outcomes, the study shows that enabling factors included the nature of the land tenure system present, the type of miner, and the presence or absence of an industrial mine. Stakeholders seeking to manage the proliferation of ASM and its formalisation outcomes should pay more attention to stakeholder involvement.

The media (both traditional and social) have always served as important agents on discourses on ASM (Sojková, 2022). Media reports have not only continued to shape narratives but have also influenced public opinion and policy formulation on ASM. Policy-wise, the media, for example, has been very instrumental in the StopGalamsey projects – campaigns that have advocated for a ban, and sometimes, elimination of all ASM activities due to the deleterious environmental externalities associated with the operations (Hilson, 2017; Ofosu et al., 2024b).

ASM operations, however, is not only about environmental destruction and precarious work conditions. The operations, as has been noted throughout, has revolutionised especially local economies, serving as avenues for employment generation for millions of people. Generally however Afful and Asante (2026) note that media narratives that dominate the public discourse on ASM have excessively concentrated on the negative operational outcomes of ASM. These narratives have potentially eclipsed the numerous ‘good’ alternative framings of ASM situations.

This phenomenon however the study argues, may have perverse consequences to efforts to formalise the sector and enhance its long-term sustainability. The focus on the negative narratives and on the solutions recommended (i.e. ban on mining) may lead to results that clash with their intended purposes of achieving a cleaner, more environmentally friendly ASM operations. The negative narration phenomenon may not only dissuade the public from providing full support for the sector’s formalisation but may also affect the commitments of other stakeholders including governments and international organisations to formalising ASM. The media industry, the study recommends, must therefore strive to understand the complexity of the ASM issues, and seek to present nuanced narratives, (re) orienting public discourses and policy programmes to some other necessary measures such as the provision of support to ASM

operators, and the minimisation of corruption in ASM spaces.

As indicated throughout, ASM operations are highly informal. The actors in the industry mostly operate outside the view of formal governance arrangements. Hence popular policy and governance discourse often depict the industry as chaotic, thus in need of regulation. In these contexts, formalisation - framed as a linear progression from informality to legality - has often been espoused as the panacea to cure the informality-induced chaos in ASM; formalisation is portrayed as a mechanism through which the industry can be transformed from its state of disorder to institutional coherence. However, employing ‘institutional bricolage’ as a theoretical standpoint the contribution of Sarfo et al.(2026) highlights that in contexts of legal and institutional plurality and complexity, as is the case in ASM, instead of ensuring smooth transitions into legal domains, formalisation efforts generate hybrid arrangements in which continuous negotiations between legality, authority and compliance become the norm rather than the exception. The prevalence of institutional multiplicity enables ASM actors to construct functionality and legitimacy across different, and sometimes conflicting institutional regimes. In the ASM context, the important elements do not simply lie in the adoption of formal templates to regulate operations, rather the essential elements are to be found in the assemblage of fragments of law, custom, morality, and market practice in creating workable arrangements. These findings drive home this point: formalisation efforts and mechanisms need not be static, with ‘a one size fits all approach’, rather they need to be adaptive, flexible to the needs of miners and reflexive of the institutional conditions in the industry.

The study of Wachira et al. (2026) tackles issues of traceability in Kenya’s gemstone ASM sector. This is quite refreshing because beyond gold (the main mineral often discussed in the ASM scholarly and policy literature) the

study brings to our attention the important dynamics present in other minerals which are artisanally mined. Seeking to examine the economic cost of the untraceable gemstone trade, the study explicates how weak documentation, inconsistent valuation, and a fragmented mine to-market value chain has created a system where significant portions of production and trade go unrecorded. This has, to a greater extent, led to the loss of macro and microeconomic revenue, eroding the incomes of miners who operate in the sector. Worth mentioning however is the fact these situations have been occasioned by the incomplete/weak formalisation mechanisms in the ASM sector. To help address these occurrences therefore the study recommends the strengthening of the traceability architecture, the expansion of the services related grading and valuation, and the incentivisation for domestic beneficiation. These mechanisms, the study concludes, could serve as the essential components of a practical formalization pathway.

Mining governance regimes have always sought to eliminate or minimise unlicensed ASM operations as a way of controlling the socio-environmental excesses of the operations. Employing strategies such as formalisation and military enforcement, attempts by governance regimes to eliminate informal ASM have generated conflictual and sometimes tenuous relationships with miners. Employing the concept of ‘tactics of the weak’ (De Certeau, 1984) to theorise the relationships between the state and miners, the contribution of Ofosu et al. (2026) highlights the frames of engagement that have often resulted in confrontations between the state and miners: the strategies of the state, played out in the form of formalisation and military action have often been confronted with miners’ tactical, subversive responses through ‘bribery’ and ‘hide and mine’. Emphasising the might in miners’ resistance and its domination in everyday worlds, the study delineates the reasons for the failure of the strategies of mining governance regimes, especially in weak institutional contexts.

Further exploring the dynamics of the deployment of strategies and tactics in different mining contexts, the study highlights the fact that the relationship between miners and the state have not always been confrontational. There are numerous instances of the building of hybrid governance regimes to regulate ASM operations. These instances exemplify the possibilities of the enactment of ‘hybrid’ policies and bottom-up practices of governance that consider the needs of both miners and the state. Mining governance regimes should therefore fully engage with the dynamic processes of institutional hybridisation and make efforts to enhance governance and formalisation processes through engagements with miners.

Finally, Ezech et al. (2026) map the depth, the intellectual structure and the thematic evolution of ASM research through a bibliometric analysis. In so doing, the trends and the productive countries, and the dominant research themes related to ASM are identified. Further, the study provides several fruitful avenues for further research. Summarily the study identifies an evolutionary trend in ASM research priorities. The study highlights that whereas the focus of earlier studies was on environmental degradation and occupational health and safety, more recent works have become more diverse, with an examination of how the environmental quagmire associated with ASM could be minimised/eradicated. The heavy scholarly focus on ASM sustainability and governance demonstrates the maturation of the ASM literature, underscoring the continuous need for more works aimed at shaping policy formulation and scholarly articulation of the formalisation of ASM.

Conclusion

This introductory piece offers a thematic synthesis of the studies in this SI, examining how contemporary scholarship analyses, and responds to, the operational outcomes of ASM.

Together the voices in these studies are unanimous that although formalisation mechanisms could serve to eliminate the excesses of ASM, they would need to embed the tenets of collaborative governance. Formalisation processes would also need to be responsive and reflexive of the legal and institutional conditions in ASM.

Building on these insights, this piece outlines a forward-looking research and policy agenda for ASM scholarship. Key priorities include advancing scholarship on the socio-economic and environmental outcomes once ASM operations become formal; interrogating the interconnection between formal and informal ASM and how formalisation processes can manage these dynamics effectively; examining how the legal and institutional conditions in ASM could be managed to enhance the operational efficiency of the industry; examining ASM governance under institutional fragility; and attending to the diverse spaces in which environmental knowledge, related to ASM, is produced, and mobilized.

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