

Risk factors limiting access to formal financing: Perceptions from artisanal and small-scale mining (ASM) operators in Nigeria

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Highlights

- The perspectives of artisanal and small-scale miners (ASMs) is essential in tackling their difficulties in accessing formal lending.
- Inability of ASMs to prove feasibility of their operations, lack of knowledge on efficient ore reserves estimation methods, and lack of physical collateral are amongst factors that inhibit their credit access.
- Permanency of mining activity, proof of ownership and availability of social collateral such as being a member of a registered mining association, should be considered as attributes that can qualify ASMs for formal loans.

Abstract

This paper reflects critically on why individuals engaged in artisanal and small-scale mining (ASM) struggle to obtain formal loans. Several studies have concentrated on the perceptions of formal lenders on the risks associated with providing loans to this group of miners. It is argued in this paper that understanding more about the limiting factors from the perspectives of ASM operators will provide better guidance when formal lenders scrutinise the requirements for issuing loans to this group of borrowers. In this study, face-to-face interviews were conducted with senior management officers at the Nigeria Bank of Industry (BOI) and a selected number of miners within the study area. The findings indicate that the inability of ASM operators to prove the feasibility of their operations, lack of knowledge of efficient ore reserve estimation methods, as well as lack of physical collateral are among the factors that make them unfavourable clients to formal lenders. The paper recommends that government considers strengthening miners' organisations and cooperatives as a way of enhancing the access of ASM operators to formal finance.

Keywords: artisanal and small-scale mining (ASM), risk factors, formal financing, Nigeria Bank of Industry

1. Introduction

Artisanal and Small-Scale Mining (ASM) activities have continued to grow in sub-Saharan Africa, serving as a source of livelihood for many communities. Even though mining is not the economic mainstay in Nigeria, evidence suggests that up to 90 per cent of the mining activities in the country fall under the ASM activity sub-sector (Lawal, 2002; Oramah et al., 2015). An estimated population of 500,000 people are considered to be in ASM operations, and the livelihood of another 2,500,000 depends on their occupation (Hilson and McQuilken, 2014; IGF, 2018). In many countries, despite the proliferation of these activities, the occupation exists on the periphery of the formal economy, is characterised by low-tech, labour-intensive extraction methods and processing, and is blamed for causing environmental degradation (Environmental Law Institute, 2014; Hentschel et al., 2003). The activities are predominantly carried out within mining communities, sometimes in ghost mine towns or concessions which were vacated by Large-Scale Mining (LSM) companies (Huggins, 2022), and are mostly situated in remote or rural areas. Artisanal and small-scale miners (simply referred to as ASM operators) use largely inexpensive tools and rudimentary technologies. They are often exposed to safety and health hazards and are blamed for widespread environmental degradation (Clement and Olaniyan, 2016; Owolabi and Opafunso, 2017). Even though ASM operations are less financially productive than LSM operations, they play a significant role in local and national economies (Eniowo et al. 2022; Huggins, 2022). Across sub-Saharan Africa, ASM activities are a major source of income for millions of otherwise impoverished people (Hilson and McQuilken, 2014; Hilson et al., 2018), but it hardly takes this group out of poverty circles (Environmental Law Institute, 2014).

Formalisation has been widely touted as a way of enhancing the potential of this occupation, in the hope that it will provide the necessary exposure that can influence access to a formal source of funding to upgrade these operations, among other benefits. One crucial objective of formalisation is to incorporate the extra-legal economy into the mainstream formal economy (Siegel and Veiga, 2009). For governments, this will potentially expand the tax base and the tax net of the national economy. Such policy direction could help to mobilise the revenue needed for development, achieve redistributive justice and enhance sustainable development (Ezenagu, 2021). Moreover, if ASM activities were to be structured and formalised, any effort by external parties such as governments and non-governmental organisations (NGOs) would be more likely to succeed, especially since the measures to support the development initiatives would be driven by members of the structured ASM community themselves (Hinton et al., 2003). Formalisation, however, has not been easy for ASM operators; scholars mention a few of the factors responsible for this. These include the inability of ASM operators to present proof of availability of ores that will assure recovery of costs and some margin for profits, and the lack of technical competencies, documents proving ownership, and important supporting information about the feasibility of the investment (Hilson et al., 2021; Marin et al., 2016; Spiegel, 2012; Van Bockstael, 2014). Thus, in many cases, even when miners succeed in formalising their operations, questions as to why ASM operators across sub-Saharan Africa still find it difficult to obtain formal funding remain. Siwale and Siwale (2017) say that the answer lies in the factors that seem important on the side of formal lenders' evaluations before they issue loans.

Apart from mine titles, lenders' main preoccupation remains the borrowers' ability to repay the loans, the level of risk involved in mineral extraction, and the viability of the project itself (Siwale and Siwale, 2017). ASM borrowers cannot meet the requirements of formal lenders and thus, in reality, even if they formalise their operations, they will continue to suffer from lack of access to formal funding. As indicated by Perks (2016), this could also be due to the

inexperience of local banks in a technical field such as mining. They might therefore fail in translating geological assets into a form of collateral with which they are familiar. Succeeding in translating assets into collateral might help ASM operators enjoy formal finance provided by local banks. This paper conjectures that although the lending requirements are well understood by the formal lenders (the suppliers of funds) themselves, they are not well understood by operators (the demanders) and vice versa. In other words, there could be a lack of familiarity of local banks with risk factors from the perspective of ASM operators.

The paper argues that unless the perspectives of ASM operators of what factors constitute their risks, or what factors contribute to them being unable to obtain formal funds are understood, formal lenders are going to stick to their traditional list of formal requirements and leave the ASM operators out of the picture as possible loan beneficiaries. Thus, a bottom-up approach to solving the financing constraints is needed. The approach needs to explore and understand the perspectives of ASM operators. In other words, why do they themselves think they do not obtain funds or become attractive prospective borrowers? In this paper, therefore, we aim to explore the perspectives of ASM operators in Nigeria in terms of factors that they think limit their access to formal funding. The aim translates into two specific goals. The first is to explain requirements that are considered essential when formal lenders evaluate the creditworthiness of a particular ASM operator before he/she is granted a loan. The second is to explore the perceptions of the ASM operators themselves regarding what factors limit them from obtaining funds from formal lenders.

A survey of the Nigerian ASM industry by the authors shows that there are different levels of actors in the industry. They consist, on the one hand, of legitimate licence holders who employ workers and pay them on a daily or monthly basis. In some cases, instead of paying the miners to work for them, the licence owner will allocate mining spaces to others (lessees) who are prepared to work for themselves, or even employ yet others to work for them. The licence holders then charge a commission on every product that leaves each mining pit, depending on the agreements made. On the other hand, there are those who do not own licences and are just itinerants scavenging through marginal deposits. Most in this group are those who occupy mines illegally and take advantage of the improper closure of abandoned mine sites by legitimate licence holders. They are usually on the run from the hot chase of security agencies. In alluvial mining of gold, for example, these miners are commonly referred to as “re-washers” and they scavenge for any leftover gold deposits. The discussions in this paper are not centred on this class of illegal miners, but rather on legitimate small-scale miners who aim not only to improve productivity through improved mechanisation and to obtain profits, but also to enhance the safety and health of their workforce.

This paper is descriptive in nature and is based on a qualitative study approach using both secondary and primary sources. Primary sources involved face-to-face interviews conducted with two groups of respondents. The first interview was with a bank authority – the Nigerian Bank of Industry (BOI) – to find out about the policies that guide bank loans, especially to ASM operators. The second group involved a selected sample of formal ASM operators from South West Nigeria. In exploring the perspectives of ASM operators in the mining industry, the study found several factors that limit the ability of those in such occupations to access formal loans; these factors are expounded in the paper.

2. Literature findings

The literature that concentrates on why ASM operators are not viable clients or, in other words, cannot attract formal funding is extensive and cannot be adequately covered here, but some findings are discussed.

2.1. Risk factors relating to formal lending to ASM operators

ASM operators who are regarded as formalised and have mining licences are assumed to be eligible for a formal loan. However, they are exposed to different requirements by formal lenders (Seccatore et al., 2014). Formal lenders such as banks consider whatever factors that can contribute to a borrower's inability to make loan repayments as risk factors. They therefore look out for the existence of risk factors before deciding whether or not to approve a loan application during their due diligence when assessing the competence of the loan application. The foremost element that banks consider important in the assessment of risk in mining investments is the *ore body risk* (Benning, 2000). In simple terms, the ore body is the mass of the particular mineral resource that is to be mined. The ore body or resource base is one element that cannot be ignored as it represents the real asset in a mining project that can be sold to generate revenue. Rozman and West (2001) assert that if the resource base is flawed or one cannot properly quantify the ore body or mineralisation in the ground, then the estimation of the risks of a loan may be an impossible task. Thus, for banks to be comfortable in investing in the mining operation of a particular ore body, they will want to see that an extensive exploration programme has been undertaken which will certify the viability of the ore body. Data compiled from the exploratory work is used to prepare a bankable feasibility study that will contain the ore reserve estimates, the scale of the project, the construction budget, the schedule for the project, a cost estimate for operating and capital investment, market estimates, a cash flow study, a risk and sensitivity analysis, and contingency (Rupprecht, 2004).

Another important element that constitutes a risk in mining projects is *technological risk*. Among other factors, the use of technology improves the efficiency and viability of a mining operation (Eniowo et al., 2022; Owusu et al., 2019). As such, banks desire to see particulars of proven technology as a means of satisfying themselves that the operations would be efficient and ensure recovery (Benning, 2000). The availability of technology is considered important in reducing risks to lenders as it convinces them that the miners will produce efficiently, be able to afford loan repayments, cover other costs and still obtain profit. The core reason bankers are more comfortable dealing with larger mining companies with substantial financial muscle than with smaller ones is their ability to show that they possess appropriate technology that will ensure operations are conducted efficiently, especially for projects at their early stage (Benning, 2000). It is perceived that a project is usually vulnerable at this stage because the debt burden is at the maximum, and any delays in production build-up caused by technological shortfalls will affect cash flows to the extent that these can quickly put the investment in jeopardy. Thus, banks believe that in such situations, larger companies will not allow their investment to be liquidated but would rather inject more capital and apply more technology to get their project through the initial teething problems. To avoid these teething challenges entirely, some formal lenders hesitate to lend to greenfield companies – which are mining projects that have not yet started producing (Eniowo et al., 2022; Lawal, 2002). It is further argued that considering the operational method of average ASM operators, these two identified factors may provide some indications as to why they may suffer from banks' apathy.

Binks et al. (1992) mention the lack of physical collateral. This is a form of property pledged by a borrower to a lender to secure repayments, which protects the interests of the lender, just in case the borrower defaults on payments. A lack of collateral is regarded as one of the credit risk factors. Binks et al. (1992) opine that small businesses have trouble securing loans because they have no or insufficient physical collateral. Collateral can take several forms; these may include real estate, cash, equipment, inventory, or property on paper, as long as there is a recognisable value associated with them (Cozad, 2022). Considering the unassailable value that proven ore reserves carry, it goes without saying that such a geological asset could be a

viable form of collateral for loan applications. This would be especially important considering the peasant nature of some ASM operators who may find it difficult to provide another common, generally acceptable form of physical collateral for loan applications such as real estate or equipment. Other studies have identified the usefulness of social capital as a viable asset, especially in microfinance. Postelnicu et al. (2014) define social capital as a pool of resources embedded in one's social ties. Microfinance institutions use group lending with joint liability to improve repayments by reducing information asymmetries. Being an active member of a social group such as a village savings and loans association or a cooperative society is perceived as a form of social capital. Postelnicu et al. (2014) therefore posit that by being jointly bound for the repayment of a group loan, borrowers pledge the capital they have in their social ties, that is, they provide social collateral. Thus, not being a member of any social group can be considered another form of risk to formal lending.

For ASM operators specifically, the list of risk factors limiting their access to formal finance is long; one of these factors is the perceived itinerant nature of miners (i.e. miners who move from one location to another in search of minerals) (Hayes and Van Wauwe, 2009). Kumah (2022), who studied the grassroots perspectives of ASM formalisation in Ghana, suggests that the transient and migratory character of local artisanal mines does not synchronise with the existing complex and usually lengthy bureaucratic licensing regime in place, which defeats any economic logic for informal miners wanting to formalise their operations. Other credit risk factors for ASM operators include the remoteness of mining areas, which makes service delivery by banks not profitable; the lack of land ownership and land ownership documents, and tenure arrangements that do not provide for physical collateral; the informal or illegal status of miners; poor financial and business planning skills; little access to geological assessment data; limited skills and equipment which would allow identification of the scale and value of the resource; lack of anticipated guaranteed return on investments; and lack of social collateral as discussed above (Hayes and Van Wauwe, 2009). Reichel (2019) suggests that any combination of these factors may contribute to actual or perceived challenges for ASM operators to be accepted for formal funding.

2.2. Consequences of lack of access to formal funding

Literature on the consequences of the limited financing available to ASM operators is quite expansive. The discussions first centre on how miners resort to cheap techniques such as mercury amalgamation commonly used for the processing of gold ore. This causes pollution as well as safety and health hazards (Environmental Law Institute, 2014; Spiegel and Veiga, 2005; etc.). Another grouping of literature discusses the under-recovery of valuable mineral resources owing to the crude and inefficient techniques being used by ASM operators. An illustration of this scenario is a situation where ASM operators discover very rich mineral deposits through their exploratory activities but, owing to financial and technological limitations, they are only able to “scratch the surface” of the area and are unable to afford deep-level mining technology. They therefore leave behind huge potential for large-scale mineral producers who can afford good technology and deep-level mechanisation (planetGOLD, 2020). Thus, whereas the ASM operators who are mostly locals discover these minerals, many of these deposits usually make their way into the hands of the big players in the industry (Hentschel et al., 2002). In effect, ASM operators only make enough to cater for daily subsistence, which is the main reason for the perpetuity of their poverty. Spiegel (2012) points out that inequitable access to credit fuels this poverty. Even though the informal lending arrangements used to fund ASM operations are sometimes riddled with exploitation, miners consider their reliance on these credits as an unavoidable coping strategy for the continuity of operation, in a system where there are few or no alternatives.

2.3 Experiences of bank lending

Bank lending is quite rare in the ASM industry, especially in sub-Saharan Africa. The few recorded attempts to fund ASM operations using formal bank loans came up against some brick walls. One notable example was an initiative to supply credit to emerald miners in Zambia by European Investment Bank (EIB), as documented by Siwale and Siwale (2017). The major stumbling block from the study was that the miners could not provide bankable documents to apply for the loans. In particular, the costs of obtaining such documents were unaffordable, leading to a complete failure of the scheme. A review of financing schemes provided in various other countries is provided in Table 1. Even for those who have the opportunity to be part of the formal economy, the bulk of their operations are either self-financed or funded using cooperative loans, grants, or informal sources (Eniowo et al., 2022). It is common for ASM operators to receive funds from “external sponsors” who are often the buyers for what they would produce. Both would-be buyers and ASM operators may enter into agreements or arrangements that monies are provided in advance; they will then produce the mineral products and sell them to those who provided the finance, usually below the market price. Thus, “pre-paid” funds of this kind, based on the future demand of those who need the commodity, become essential investment capital to miners. This paper later provides accounts of some of the experiences of the ASM operators that fell into this sample.

Table 1. A review of credit schemes used to fund ASM activities in selected sub-Saharan African countries (Source: Eniowo et al., 2022)

Credit scheme	Country	Remarks	Reference
Government loan facilities	South Africa	Unsuccessful, borrowers were unable to repay	PlanetGOLD (2020)
Government loan facilities	Namibia	Successful: 92% repayment rate recorded	Siegel and Veiga (2009)
Government loan facilities	Mozambique	Successful, but out of reach to most miners	Siegel and Veiga (2009)
Government loan facilities	Zimbabwe	Successful, but short-lived	Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF) (2018)
Government loan facilities	Ghana	Successful, though had initial teething problems	planetGOLD (2020)
Mining cooperatives	Rwanda	Successful	Perks (2016)
Village Savings and Loans Associations (VSLAs)	Democratic Republic of Congo (DRC)	Successful	Reichel (2019)
Donor grants – World Bank	Nigeria	Satisfactory	World Bank (2012)
Donor grants – World Bank	Uganda	Successful	Intergovernmental Forum on Mining, Minerals, Metals, and Sustainable Development (2018)
Donor grants – World Bank	Tanzania	The scheme is just emerging.	Fold, Jönsson, and Yankson (2014)
Informal finance	Ghana and Tanzania	Unfavourable to miners	Fold et al. (2014)
Informal finance	Rwanda	Unfavourable to miners	Perks (2016)
Commercial loan	Zambia	Unsuccessful	Siwale and Siwale, (2017)
Microfinance loan	Ghana	Successful	planetGOLD (2020)

3. Policy and regulatory overview of the ASM sector in Nigeria

3.1. Registration and licensing

In Nigeria, registration and licensing of mining companies are coordinated by the Nigeria Ministry of Mines and Steel Development (MMSD), and final approval of mining titles is provided by the Mining Cadastre Office. The department in charge of coordinating the registration of ASM activities at the MMSD is the ASM department. Other functions of the ASM department are to: formalise the ASM sector to provide extension services to ASM operators; assist them with exploration, mineral processing, and entrepreneurial training; facilitate healthy relationships between ASM operators and the community and between ASM operators and large-scale mining corporations; and coordinate involvement with international governments and multilateral organisations (including UNEP, the World Bank, and DFID) (Environmental Law Institute, 2014).

The law in Nigeria that regulates the ASM industry is the Nigerian Minerals and Mining Act 49 of 2007 and the Nigerian Minerals and Mining Regulation of 2011. The Act describes the conditions that qualify an organisation for a small-scale mining lease. Table 2 shows the classification criteria used in the Nigerian mining industry. The Mining Act in Nigeria does not expressly make provision for registration of an “artisanal mining” operation, but artisanal miners are encouraged to come together and form a “mining cooperative” which makes them eligible to acquire a small-scale mining lease. For the government, this brings about smooth monitoring, control, and administration. For the miners, it creates social ties that could potentially engender access to credit to upgrade their operations.

To promote the formation and development of mining cooperatives of ASM operators, Article 91 of the Act states that the government, through the ministry, shall provide the following extension services to duly registered and performing mining cooperatives: prospecting and exploration services for registered mining cooperatives to determine the geological setting, structure, and nature of occurrence, quantity, and quality of minerals being mined; mineral testing standards and the determination of minerals grade; evaluation of a proven mineral reserve, including a feasibility report; assistance with mine design and planning suitable for the deposit; teaching adequate mining-related skills in mining; and regularly introducing ASM operators to new mining technology. How well the above-stated extension services have been provided by the government to ASM operations is yet to be fully investigated. Also, the question remains as to how well the support of the government in line with the formalisation drive has helped artisanal miners achieve well-funded and sustainable mining operations.

Table 2. Classification criteria for the mining industry in Nigeria (Nigeria Minerals and Mining Act, 2007)

Definitive criteria	Artisanal and Small-scale Mining (ASM)	Large-Scale Mining (LSM)
Type of operation	Limited to the use of crude tools/Intense use of manpower	Highly mechanised
The area of land covered	Covers between 5 acres and 3 square kilometres	Above 3 square kilometres
Mining right in use	Small-scale mining lease	Mining permit

3.2. Access to geological data

The Nigeria Geological Survey Agency (NGSA) is the government agency that has the mandate to carry out periodic aerial and ground exploration for mineral resources, as a way of asserting the certainty of mineral resources in various locations in the country. One notable recent initiative from the NGSA is the National Integrated Mineral Exploration Project (NIMEP), which is a project designed by the federal government of Nigeria and sponsored by the World Bank to conduct integrated exploration to reduce business risks in the mining industry and to capture the geoscientific data needed for the Fourth Industrial Revolution (Oluyole, 2021). The project aims to stimulate investments and attract foreign exchange to the Nigerian mining sector by generating geoscientific information in the greenfield and brownfield environments. By means of the NIMEP project a detailed survey involving airborne and ground surveys to establish the extent of minerals resources across the country would be made available. Potential domestic and foreign investors in the mining sector could then interact with the NGSA to have access to these geological data to ascertain the resources on the ground and their estimate, and then bid for any mineral category of their choice (Oluyole, 2021).

4. Methodology

This study involved the use of both secondary and primary sources. The secondary sources (literature, open-access documents, etc.) were used to understand ASM as a subject and, in particular, risk assessments. Primary sources included face-to-face interviews. The study principally involved two groups of participants, namely ASM stakeholders and formal lenders. The first phase of interviews involved formal lenders, in particular bank authorities, to understand more about what qualities they consider important when evaluating the credit risks of their clients, with emphasis on ASM operators in Nigeria. Initially, the study targeted a few commercial banks. However, a few of them – Guaranty Trust Bank, Zenith Bank, Stanbic IBTC Bank and Wema Bank – indicated that although they do provide loans for business entities in general, they do not provide them for ASM activities, indicating they do not have risk thresholds for them. Consequently, the Nigerian Bank of Industry (BOI), the foremost Development Finance Institution (DFI) which has a mandate to cater to industries in the country, including mining, was approached. Efforts were made to access various documents, including checklists containing requirements for loan applications which were reviewed. Information from Nigeria Bank of Industry helped in formulating questionnaires for the interviews conducted with ASM respondents.

The second phase involved drawing a purposeful selective sample of ASM actors, drawn to avoid bias in the selection of respondents. The ASM stakeholders that participated in the study were therefore selected across different forms of mining and mineral categories, including industrial minerals, gemstones, gold, sand, and laterite. A total sample involving six groups of ASM stakeholders was selected, comprising presidents of cooperatives, heads of unions, heads of associations, and senior miners on site. The list showing the number of respondents in each mineral category and their designations is shown in Table 3. Face-to-face interviews were conducted with a sample of ASM stakeholders. The themes of the interview questions focused on the legal status of the operations; experiences in obtaining funding and other interventions from the government; other existing sources of funding used by the miners for their operations, with a focus on informal sources; and the challenges affecting miners' access to formal funds. Other themes were technical issues, such as the methods that the miners use in ascertaining the viability of their mineral resource base, and, most importantly, the general perceptions of the risks and other factors that hinder the miners from obtaining funding from formal banks. These

interviews were conducted from 26 September to 2 November 2021. In addition, two supplementary interview sessions were conducted with ASM stakeholders in Oyo state between 12 and 13 September 2022. The study covered four states in South West Nigeria – Ekiti, Ondo, Osun and Oyo. A map of the study location is shown in Figure 1. These are areas where mining activities in all the mineral categories specifically targeted by ASM operators, such as gold and gemstones, are predominant (Nigeria Ministry of Foreign Affairs, 2022). Audio recordings from fieldwork were analysed using *ATLAS.ti*.

Table 3. List of ASM groups interviewed

S/N	Mining type	State	Community	Designation of respondent(s)	Number of respondent(s)
1	Industrial mineral (feldspar)	Ekiti	Ijero	President of the mining cooperative society	1
2	Gemstone	Oyo	Komu	Secretary of the miners' association	1
		Oyo	Komu	Senior miner on site	1
		Ekiti	Ijero	Secretary of the mining cooperative society	2
3	Gold (alluvial mine site)	Osun	Ilesa	Senior miners on site	6
4	Gold (surface mine site)	Osun	Ilesa	Senior miners on site	2
5	Sand	Ondo	Akure	Chairman of the miners' association	1
		Ondo	Apomu	Senior miner on site	1
6	Laterite	Ondo	Akure	Secretary of the miners' union	1
Total respondents					16

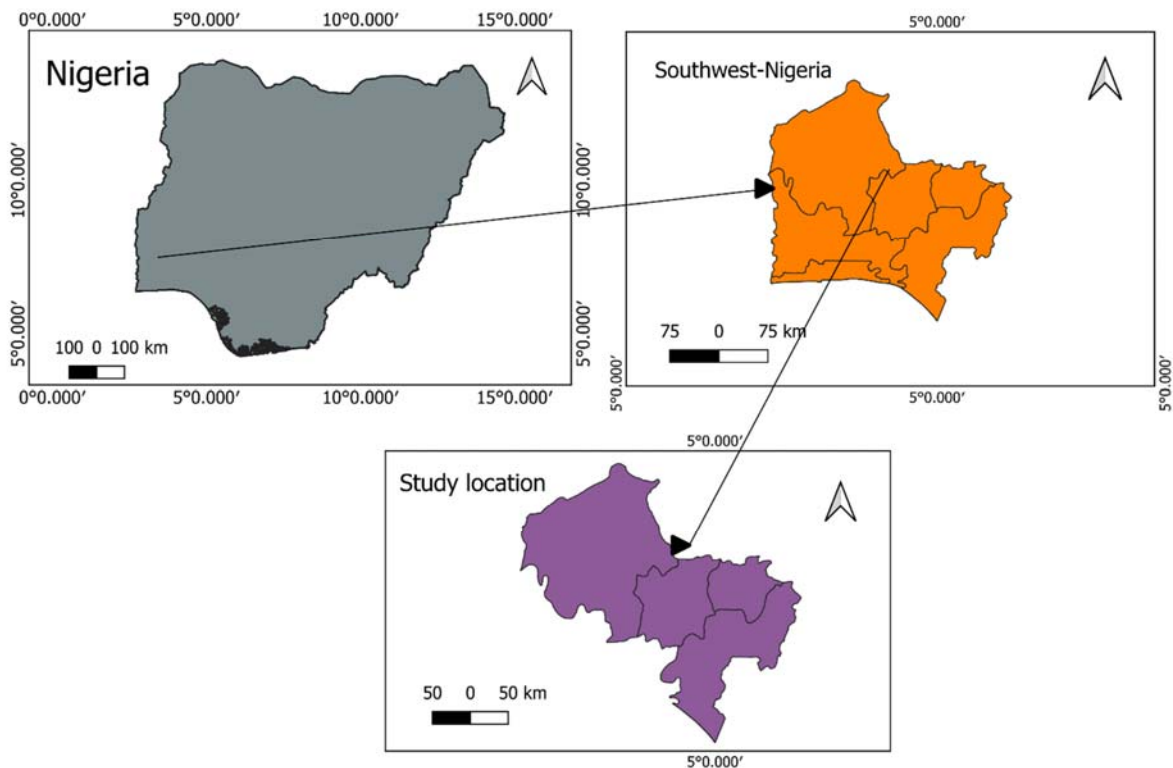


Figure 1. Map of the study location in South West Nigeria

5. Findings of the study

The purpose of the study was mainly to explore the experiences and perspectives of ASM operators regarding why they do not get formal loans. As stated earlier, the perspectives on these risks and other factors that lenders consider important may differ from those of the borrowers, particularly in mineral extractive industries, which may ultimately hinder the ability of ASM operations to attract funding. The study had to be limited to the loan schemes at the Nigerian Bank of Industry (BOI), which is a bank with an interest in lending to ASM operations within the study area. The following are the major findings of the study elaborated under various themes.

5.1. Requirements for obtaining loans for ASM activities

It was found that the Bank of Industry partners with the government of Nigeria through an initiative named the Nigerian Artisanal and Small-Scale Miners Financing Support Fund (ASM-FSF). This programme is provided through a collaboration between the Bank of Industry and the Federal Ministry of Mines and Steel Development (FMMSD), representing the government. Among its mandates, the Bank of Industry is responsible for facilitating the entire process of accessing funds for large enterprises and SMEs. This process starts right from pre-loan application and continues through the loan application, due diligence on application forms, site visitation, and loan issuance.

The foremost requirement for a miner to access a loan is to obtain a licence. The Bank of Industry expects a prospective loan applicant to own an existing valid small-scale mining lease or have written permission from a lease owner stating that the miner may operate within the owner's lease area. Through an attempt to understand the experiences of ASM operators about licensing, the study found that the process is quite costly and rigorous. An applicant seeking a licence is required to pay for a small-scale mining lease that expires after every five years. The applicant will also obtain an air permit and an environmental audit permit. Sharing his experience, a respondent at the feldspar mine site explained the procedures of getting licences. He indicated that usually each ASM operator is given cadastral units within a small-scale mining lease area where he is permitted to work. One pays an annual service charge of N20,000 (\$40) for each cadastral unit, and since this miner has three cadastral units within his small-scale lease area, he pays a total of N60,000 (\$120) as an annual service charge. These costs are in addition to the costs of obtaining the mining lease itself. When asked about the cost of obtaining all the necessary documents to operate in general, the respondent vented his feelings thus: "I can't quantify, it is a lot of money that runs into millions of Naira". He complained that the high costs of obtaining licences erode profits and there are very fine profit margins because it costs up to N10,000,000 (\$20,000) to get the business started, and owing to the limited capacity for mechanised excavation and processing, a miner can barely make up to N1,500,000 (\$3,000) as annual returns after payment of tax, wages, and royalties. Thus, obstacles in obtaining a licence are seen as a limiting factor to accessing formal loans. As indicated by Huggins (2022), the ambitious financial conditions imposed on ASM operations usually make it difficult for ASM actors to conform or thrive.

Applicants with valid licences do get help when applying for loans. According to a respondent at the Bank of Industry (the regional manager of the bank), to aid the loan application process, the bank uses business development service providers (BDSPs). These are service providers, registered with the bank, who have a thorough understanding of the bank's requirements for the viability of loan applications, including microcredits. They check whether the application forms have been properly filled in and whether applicants meet all requirements before their loan application form is submitted.

The bank manager gave his assurance that there is a fund scheme in place to enhance access to funds for ASM operators. However, according to this bank manager, the fund scheme was still new and applications had not started coming in by 2021, during the time of the study leading up to this paper. The range for the microcredit facility offered by the bank is from N1,000,000 (about \$2,000) to N10,000,000 (about \$20,000). Under the ASM-FSF scheme, each ASM applicant will only be able to access a maximum of N2,000,000 (about \$4,000). There are requirements to be met though: the business has to meet legal requirements such as being duly registered by the regulatory authority, must have run for a minimum of 1 year, and must have a performing bank account that is registered in the name of that business. Another requirement that borrowers need to meet is the availability of physical collateral. An applicant who cannot provide physical collateral must have a guarantor(s). These are people who are prepared to stand as surety for the loans; they could even be people prominent in political circles. To minimise risks and protect itself from losses, the bank also carries out other measures. These include an “integrity search” to determine whether the loan applicant is financially or politically exposed, and a “credit search” to examine the applicant’s credit history. Most importantly, the prospective borrower must show proof of the availability of mineral resources, and a geotechnical review of the resource base would be checked as part of the bank’s due diligence.

Furthermore, the Bank of Industry considers it important that prospective ASM borrowers who are not already registered as companies should coordinate among themselves to form cooperative societies. These should be formal mining businesses that are registered with the Nigeria Ministry of Mines and Steel Development. Thus, being part of a cooperative is one of the criteria that increases their chance of obtaining a loan. Other loan requirements mentioned by the respondent at the Bank of Industry are market-related considerations such as assurances on mineral products to be offered, target customer base, value propositions, and elaborated strategies for generating revenue.

5.2. ASM operators’ perceptions of government schemes in Nigeria

It was interesting to explore the awareness of the ASM operators in the study sample about the Bank of Industry loan schemes available to them. All respondents acknowledged that they were indeed aware of the loan schemes provided by the Bank of Industry. The problem, however, was that they were not optimistic about the scheme. In general, there exists some form of apathy regarding the programme. The reasons given by the respondents boil down to their previous experiences with commercial banks and government agencies. A respondent from an alluvial gold mine, for example, shared his experience. He said that he was aware of the loan scheme, but he recalled that some time ago a few officers from Abuja (the federal capital territory of Nigeria) once visited his site, did some inspection of the site, measured the size of his mine area, asked about his tonnage, and how he was able to sustain the site financially. He further said the government authorities promised to come for a second site visit, after which he would have the opportunity to request a grant. However, he has since not heard from them. Thus, he did not even have the opportunity to apply for financial support from the team and he has since become sceptical about government financial intervention programmes.

This viewpoint corroborates an experience shared by a respondent from a gemstone cooperative society (the secretary of this society). In his opinion, there is insincerity on the part of the government about the loan schemes. In particular, he argued that the financial support promised by government agencies as an intervention for ASM operations is just a “political statement”. He claimed that officers of the agency have approached them several times regarding plans to support the cooperative with investment capital. It even reached the point

where they (the ASM cooperative) filled in forms, but nothing came of it. They therefore now consider it a waste of time to apply for intervention programmes linked with the government. Judging from such accounts, being a member of a cooperative society does not automatically mean that ASM operators will receive financial support from the government. The respondent continued that when his team (of five miners) approached the Bank of Industry on the said loan scheme, the bank advised the operators to form a group of five, and that each of the operators would access N2million (\$4,000), meaning that the group would access up to N10million (\$10,000), which would be attached to the purchase of equipment. To him, such amounts were inadequate due to high equipment costs – for example, it costs over N35million (\$70,000) to purchase an excavator they needed on site. This was well above the sub-total of N10million (\$10,000) promised by the Bank of Industry for all their group members together. Thus, even if the government is sincere in offering the loan, they are unwilling to tie themselves to such equipment purchase agreements. Again, this indicates that the funds provided by government funding agencies are inadequate.

The secretary of the laterite miners' union confirmed that their cooperative society is aware of the new Bank of Industry loan scheme. However, he stated that he once approached the Bank of Industry for financial support for his members, but was informed that the bank no longer offers loans to unions, because “some unions have disappointed them in the past”. The Bank of Industry did not even investigate whether they fell into the group that did not pay. The respondent interpreted this attitude as “unfriendly”, which discouraged the group from applying. The respondent also shared the familiar view about the insincerity of government agencies in their intervention schemes. However, he revealed that the only support they had received from the government was during the previous political dispensation when the then-state government between 2008 and 2016 acquired tippers for the transport of sand and put them on the basis of a hire-purchase agreement. This simply implies that political will is an important factor for intervention programmes to succeed. From what has transpired here, it is obvious that ASM operators do not rely entirely on government funds as a source of funding.

Again, another worry for this group of miners about formal loans is the ability to afford the interest rates attached to loans. The interest rate for the Bank of Industry's ASM-FSF was set at 5%, which is relatively inexpensive in the Nigerian context. However, it is worth noting that bank financing in general is expensive in Nigeria. A careful look at the official lending rate in Nigeria reveals that the Monetary Policy Rate (MPR) as released by the Central Bank of Nigeria (CBN) for April 2022 was 11.5% (Central Bank of Nigeria, 2022). In contrast, during the same period, the MPR in the UK, set by the Bank of England, was 0.75% (Bank of England, 2022). In Nigeria, the MPR serves as a guide for the minimum price of credit and represents the floor for interest rates in the country (FINT, 2019). Since every lending institution cares about the real return on money, they will price their interest rates above the existing inflation rate, which had an average of 12% in Nigeria between 2000 and 2017 (FINT, 2019). Consequently, it is not uncommon to find commercial banks in the country that charge interest rates as high as 20–30% on loans.

Like other miners, ASM operators need funds during the mine development and mineral excavation phases. In their day-to-day activities, they might face different challenges. Verbrugge (2014) give examples of unexpected situations that may arise, often when miners have to follow veins of gold deeper into the earth. During this process, the risks of flooding or collapse of the tunnel increase. This is the time when the urgent intervention of financiers becomes very helpful to construct reinforcement that will forestall further tunnel collapse or to buy other equipment such as water pumps.

The necessary question then was: In the absence of formal funds, how are ASM operators coping? Some of their other sources of finance are indicated in the following section.

5.3. Other common sources of funding for ASM activities

In the absence of government financial support or other formal bank funding, it was important for the study to explore various funding sources accessible to ASM operators. Almost all respondents mentioned informal sources of funding as being important for them to continue with their activities. Informal funding was one of the most common and easily accessible financing options for ASM operators. Although across sub-Saharan Africa, studies have indicated that informal financiers do exploit the ASM operators, as indicated by Fold et al. (2014), Hilson and Ackah-Baidoo (2011), IGF (2018) and Perks (2016), such financial sources come with conditions that seem to be acceptable to borrowers. A respondent at the feldspar mine site stated that he does not obtain investment capital from formal lenders, but rather from personal savings, family, friends and cooperatives. These are common sources among many respondents. This study further revealed that ASM borrowers use other sources referred to as “buyers’ funds”. Respondents provided details of how buyers’ funds work and the conditions attached to the loans offered by these buyers. At the feldspar mine site, the respondent provided further details about the nature of funding obtained from buyers, explaining that, usually, the miners obtain funds from the companies that buy their minerals to produce glass. These companies sometimes give them the loans in advance, which they deduct as the miner’s supply the minerals.

When asked what percentage interest is charged, whether the rates are fair, and what other conditions are attached to such loans, the respondent said:

"The percentages of interests charged are very fair because they (lenders) don't even charge any percentages. The only thing is that when you supply, say you supply 30 tons, they will set aside money for 10 tons as repayment of your debt, and they will pay you money for 20 tons. So that you can continue to produce, not like you pay all the debt at once. By the time you supply another 30 tons, they will still deduct money for 10 tons, until you finish repaying all the loan. For us, that's a good deal."

Buyers’ funds were also common among ASM operators in the gold mining sub-sector. A respondent affirmed that buyers do give him funds in advance for gold production and he would eventually supply to the buyers upon completion of the mining operation. Again, he is lucky that the rate at which he sells to the buyers is always the existing market rate. However, it seems not all ASM operators can access such funds. Respondents from the gemstone mine sites get financial support from buyers, not because of the gemstones that they mine, but because of the other associated minerals, which are like by-products. Usually, when they mine gemstones they also get other gangue minerals associated with the gemstone, such as kaolin, silicate and feldspar. Then they get buyers’ funds based on these gangue minerals. Otherwise, it is hard to get buyers’ funds from gemstone mining because the buyers are from abroad and do not have close relationships with the ASM operators who mine the gemstones. Most sell their products to the middlemen with whom again it is difficult to build the relationships and trust that could help foster such buyers’ fund arrangements.

The study was also interested in finding out about the downside of buyers’ funds. Most respondents indicated that such sources are not completely reliable. The buyers only provide loans at their discretion and can always choose to buy from a completely different client, leaving the previous one destitute. There is no guarantee that an ASM operator will always

secure a loan each time he requests one. Because of this, any reasonable miner would not depend on buyers' funds alone for the smooth running of the mining operation. Still, it is obvious from the above narratives that the loans provided by the buyers are very beneficial for the miners' continuity of production. The borrowers have the opportunity to obtain interest-free loans and can repay the loans in instalments as they supply to the buyer which, in a way, encourages them to produce more so that they can get more loans. There was also a mention of loans from cooperatives as another source of funding. Sharing his experiences, a feldspar mine respondent said that within their own cooperative, each miner puts some financial resources into a common fund or account which is owned jointly. Then anyone within the group may borrow from the cooperative.

Another interesting funding arrangement was identified at the gemstone mine sites in Komu. In this mining community, the operations are funded by what are commonly called "sponsors". The responsibilities for handling each ASM company are shared between the company (the licence holder) and the sponsor. The company carries out site preparation: they acquire and maintain the mining titles; liaise between the landowner and the government; and, in some instances, they provide some light equipment for the labourers to operate with. Additionally, the staff of the company is always on the ground to monitor the operations of the labourers and to protect against any theft when the product is successfully extracted. The sponsors provide the wages of all the labourers who operate the pits, their working materials and their food, explosives for blasting operations, a compressor for drilling operations, and some other items that will make the work easier for the labourers. Whenever there is a "win" of gemstones at the site, there is a sharing formula for all the proceeds: typically, the proceeds from the sale of the gemstones are shared equally on a 50/50 arrangement between the company and the sponsor. The relationship between the licence holders and the sponsors is usually cordial and that aids the smooth running of the operations all year long. However, there are still challenges about funding. One respondent at this location, who is the secretary of the Nigerian Miners' Association, compared their operation to subsistence farming. In his words, "I can tell you that what we are doing is subsistence mining, not large-scale mining, because of these constraints, funding constraints". He further argued that the unavailability of bankable exploration data limits the ability of the sponsors and the licence holders to attract funding to the operations.

Despite this sombre picture of ASM operators struggling with sourcing funds, few depend on self-financing. Contrary to the popular notion of the "live-and-go" or poverty-stricken nature of ASM operators in sub-Saharan Africa as indicated in the literature (Environmental Law Institute, 2014; Hilson and McQuilken, 2014, etc.), it was revealed in this study that a few do enter with financial muscles and were well-to-do financially when they ventured into mining. Asked about the source of funding, an alluvial gold ASM respondent disclosed that formerly he was a haulage truck merchant. When he decided to embark on mining, he sold a few of his trucks and reserved others to help him with transport. However, being a well-to-do operator does not imply that he does not need external help. Like others in the study, he affirmed that sometimes, whenever he has a financial crisis, he benefits from informal financing arrangements. Considering the limitations of informal financing arrangements which form a significant part of the funding source for most ASM operations in this study, it was essential to examine the perspectives of the respondents on what they consider are the factors that limit them from obtaining funds from formal sources.

5.4. Ore reserve estimation

As indicated by Benning (2000) and Rozman and West (2001) earlier, efficient ore reserve estimation is a prerequisite and vital requirement taken with diligence by formal lenders. More recent studies, such as Nopeia et al. (2022), indicate that geological characterisation and the access of miners to such geological information will foster the formalisation of artisanal mining. The estimation of ore reserves proves the viability of the resource base. To put it simply, there has to be proof of adequate mineral resources on the ground that warrant investment before the commencement of mining operations. This point was explored during the interaction with respondents at the Bank of Industry during the interview conducted in this study. It was found that for the Bank of Industry, just like other funders, proof of efficient ore reserve is an important requirement for their clients to obtain loans; this has to be shown on their loan application forms. Not knowing the ore reserves comes at a cost for ASM operators. At the gem mine site, for example, a respondent complained that sometimes he could invest and work for months or even years without “winning” any gem. He was therefore left with the option of relying on proceeds from gem-associated minerals such as mica, beryllium and kaolin as a coping strategy for the continuity of the business and household survival. The questions that lingered in the study then were: Do ASM operators have ample knowledge of ore reserves? What narratives do they use to explain the term? Do they consider ore reserves as important in obtaining loans?

To explore these issues, the respondents were asked how they (the ASM operators) establish that mineral resource deposits are adequate in the locations before they commence mining operations. From the perspectives expressed across the sample group, the miners were generally in the dark when it comes to information on their mineral resource estimates. The story was, however, different for two miners, both of whom had an efficient system of estimating ore reserve. These were the gemstone and gold (surface mine sites) mining groups. At the gemstone mine location in Ijero, before operations commenced at the mine site, knowledge of the viability of mineral resources was obtained from two sources.; The first source was an ore reserve estimation carried out at the deposit initially by the former owners of the mine site before the ASM operators took over. There was no further elaboration as to whether such mines were simply vacated or whether the ASM operators had contractual agreements with those who operated there previously. The second source was from the Nigeria Geological Survey Agency (NGSA). The periodic explorations conducted by this government agency provide details of the potential of the gem resource at the location from time to time. One has to contact the NGSA to obtain information that helps ASM operators to update their reserve estimates. The respondent further stated that the agency last conducted reserve estimation at this particular location in 2019, two years before the study, and he pointed to another round of exploratory work by members of the agency taking place in the vicinity of their location which was visible from where we were conducting interviews. The respondent further revealed that the exploratory work being done by the agency is aimed primarily at investigating the characteristics of a copper resource situated beneath the gemstone reserve. At this location, the miners were simply fortunate to have their gemstone deposit coexisting in the same location as the copper resource that is of interest to the government. A reserve estimation of one of the resources is therefore tantamount to a reserve estimation of the other. Nevertheless, the government agency’s work helps them to update their reserve estimates periodically.

Those who do not have the government’s mineral of interest nearby may just have to cater for their own reserve estimation. Considering the expensive nature of exploratory work, ASM operators simply engage in rudimentary estimation methods just to have a conviction of the

existence of the mineral resource in their location of interest. A respondent at the feldspar mine site indicated that to acquire knowledge about the existence of mineral deposits, first they rely on hearsay on the occurrence of mineral deposits in certain locations. Then they have to take the trouble of visiting the locations physically and walking around. If they recognise the minerals they are interested in, and see that the quantities are promising, they start their mining operations. Thus, in this case, there is no quantification of the mineral resources at the site nor documentation of ore reserves that prove the viability of the resource base. Rudimentary measures were also used by respondents at an alluvial gold mine site visited. At this site, to estimate the volume of resources in the ground, they usually visit their location of interest, then pick a sample area of say 20 square metres. Thereafter they dig the area to check what is in the ground with their own eyes. For example, if by digging the entire 20 square meters for 1 h, they were able to recover about 10 g or 20 g using an ordinary gold detector, then they can conclude that if they dig for a longer period, say 5 to 8 h, they would have recovered enough gold to cover their investment costs and still provide some profit. They admitted that such crude measures only indicate the availability of the gold at the surface level but fall short of providing estimates of the actual quantity of the entire gold deposit. Also, they do not have a laboratory of some sort where they could test the soil for the availability of mineral deposits or even mineralogical components.

Owing to this rudimentary method of mineral resource estimation, a respondent continued to say that, by nature, their operations are risky. He reinforced this view by stating that one of such risks is a “land crash”. He described a “land crash” as a situation in which a miner invests his capital and financial resources in the belief that the deposit contains an ample quantity of gold. However, after continuing mining for some time at the near-surface levels, he discovers that the gold reserve is depleted. Then he wonders what to do about all the capital resources he has already invested. Although the term “ore reserve” was not mentioned, “land crash” simply implies the ASM operators’ inability to predict the ore reserve with sufficient accuracy to warrant pulling up capital and other financial resources. This becomes part of the risks of the business, which not only acts as a hindrance to obtaining funds, but also contributes to the inability of investing in appropriate technology to afford deep-level extractive activities. His answer does not differ much from that of a respondent at a sand quarry who provided a tale of a condition similar to a “land crash”, but referred to it as the “swelling” of the sand deposit. This occurs during a pre-mining phase where one will think that the deposits are rich, whereas they are not. The respondent gave his account as follows:

“If you are not well experienced in the occupation, you can buy a sand deposit that you would measure the thickness of the deposit, it would swell, and you will be convinced that the deposit is huge. However, once you commence mining, you discover there is not much sand there.”

The conditions explained as “land crash” and “sand swelling” as expressed by respondents here are consequences of poor knowledge of ore reserve estimation. Despite this reality, in conventional mining operations estimations of ore reserves are a vital part of the process of mineral exploration which have to be carried out before the commencement of the mining phase. This helps to possess proof of the existence of the ore body and an estimate of the actual mineral deposit in the ground, which again assists in mine planning, design of the mine, and allocation of financial resources (Eniowo et al., 2022). ASM operators are handicapped in this regard. Additionally, it has to be said that sometimes efficient ore reserve estimation is hampered not only by lack of knowledge, but also by lack of equipment. This was also indicated by Perks (2016) who contends that many small-scale miners in Rwanda, some of whom had worked in large mining companies in the past, are familiar with the use of modern machinery.

The problem is that they have been hindered by a lack of funds to acquire modern equipment and the technology that could be appropriately used in their ASM operations. In the same vein, a respondent at the feldspar mine site asserted that his group does not have the right equipment to carry out elaborate ore reserve estimation due to high costs. From the above narratives it can be concluded that although ASM operators might not mention the term “ore-reserve estimation”, their lack of knowledge of it or lack of equipment and inability to conduct such activities are contributing factors limiting them from obtaining formal funds.

5.5. Itinerant nature of ASM activities

As indicated earlier in the literature section, the itinerant nature of some ASM operators is considered one of the limiting factors to obtaining formal funds (Ofosu et al., 2020; United Nations Economic Commission for Africa, 2002). Those considered itinerant are the miners who move from one location to another in search of mineral deposits to exploit. For this reason funds committed to such ASM activities may be seen as some form of “risk capital” and local banks with tight liquidity cannot afford such a luxury (Eniowo et al., 2022). From the perspectives of the respondents in this study, it appears that ASM operators also consider the itinerant nature of their occupation as one of the factors that limits their ability to obtain funds from formal lenders. At the feldspar mine site, a respondent who was asked about his view on the perceived itinerant or nomadic nature of such mining activities, agreed that this is a limitation that may cause them not to obtain formal funds. However, he argued that this idea of their operations is not strictly true, stating that for them, the mineral is readily available in the ground, and they do not need to move around in search of it. Nevertheless, he agreed that such practices may be evident among those involved in the mining of some gemstones, such as tantalite, tourmaline, etc. In these mineral categories, a miner may mine in a particular location today, and if he wins any gemstone, he will continue to mine, but if he does not do so, he may move to another location. It was found that miners in industrial minerals, including feldspar, seemed to conduct much more stable operations.

Conversely, a respondent at a gemstone mine site refuted the perception of the nomadic nature of their operations in search of gems. He argued that, in his case, after obtaining a mining lease of five to ten years and investing more than 27 years in the gem mine site, it would be irrational for him to abscond from such an investment for any reason. To buttress his argument, he clarified the difference between artisanal mine workers and the owner of a mine site like himself, stating that in his case the mine workers visible at his site are his staff and he pays some daily and others every month. Enumerating the immense capital investment that he has put into the operation over the years, he argued that it is illogical that as an operator and owner he would just abandon his mine site because of a loan sum. Thus, he should not be tagged as an itinerant miner. Similarly, the perception of the itinerant nature of ASM operations was refuted by others who see their operations as rather permanent.

5.6. Association membership

Another factor that was picked up in the study is being a member of a registered association. This is believed to be a strong factor that could help to reduce the risk of lending by formal lenders. This idea was shared by a respondent at a gemstone mine site who contended that as long as one is a formidable member of an association, and a duly registered miners’ cooperative society, such qualities should help one to back up and strengthen a loan request. The respondent averred that being a member of an association or cooperative is an assurance that the banks will not face a huge risk of such clients defaulting on their debts. Contributing to this, a laterite miner, who is also a union president, said:

“The itinerant nature of ASM occupation is an invalid point from the perspective of our union. We are a union registered with the federal government. This is just one of our offices. So, we have a base, we are not people who do not have a location. The whole of this vast land belongs to us. We can’t leave this land and run away.”

From these narratives it seems that membership of mining associations is considered by this group of miners as a strong factor that should qualify one to be accepted by those who offer loans for mining activities. They also consider the permanence of their activities and the location where they operate as important factors that minimise their risks of loan default and thus should enhance their access to formal finance.

5.7. Instability of prices in the international market

The issue of instability of prices in the international market was explained by respondents in alluvial gold mining. While it may not affect larger gold mining companies with substantial capital bases, price instability is an issue for smaller gold miners who go into production with only just enough to cover their running costs. Usually, such miners would expect profits based on the number of kilograms of gold extracted. However, if prices fall, by the time the extraction of minerals is completed, earnings from the production are automatically depleted and one might receive only a little cash – just enough to cover operational costs but not to cover loan repayment. Thus, fluctuations in the international gold price could make it difficult for a gold miner to be faithful to loan repayments, and therefore one becomes a bad “loan payer” and loses the bank’s trust.

5.8. Nature of mine activities

Mining involves different activities, but not all activities can easily attract loans. One of the functions involves logistics and transportation matters. ASM operators believe that there are some aspects of their operations for which it is not advisable to seek external funding, especially bank loans. A respondent at the laterite mine site conceded that there may be some level of risk in transport, in particular the haulage aspect of the business. Haulage simply involves the transportation of excavated minerals after mining, from the mine sites to the buyer. Bearing in mind that Nigeria is not a manufacturer of the heavy-duty trucks used in mine haulage operations or their spare parts, which are also imported, importing trucks is quite expensive, and thus, respondents consider it risky to take loans for purchasing haulage trucks. Also, such trucks might remain unused when production is low, increasing the risk of debts not being paid. To avoid this, the majority of the respondents simply hire trucks from haulage contractors when they need them.

ASM operators also find it difficult to obtain funds to reach international markets. Since there are no local markets for many mineral products, they depend on international markets. For example, there is no place in the country where buyers and miners of gemstones can interact. The common practice is for those who can afford to reach international markets to travel abroad. As explained by the respondent at the gemstone mine site, up to 70% of their gemstones are sold in Asia, in particular, Thailand. This requires one to obtain travel documents and visas which is always difficult. It often forces them to sell to local middlemen cheaply. From the narratives and perspectives shared above, Figure 2 shows a summary of the limiting factors that affect ASM operators’ access to formal funds.

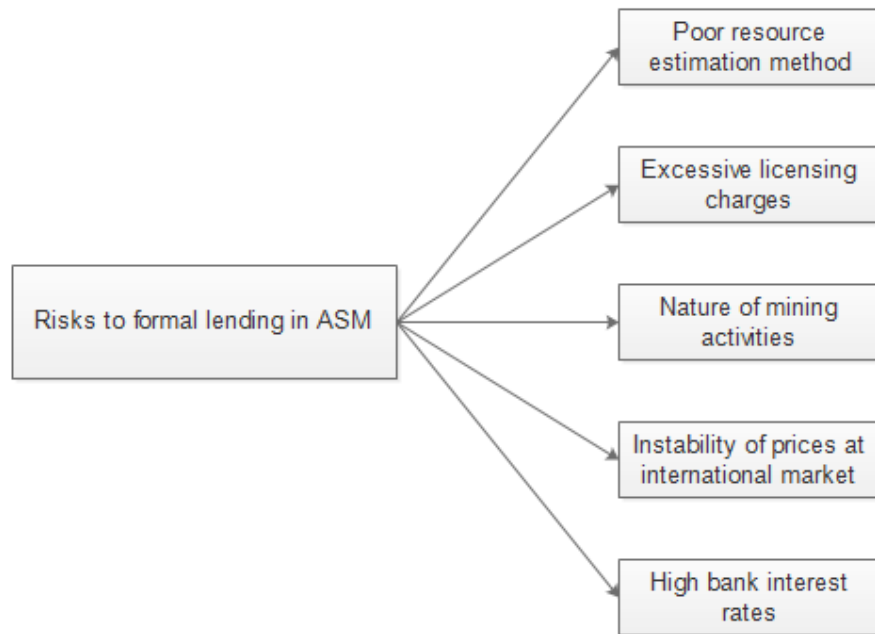


Figure 2. Summary of ASM operators’ perspectives on credit risks

6. Discussion and concluding remarks

The perceptions of formal lenders on the risks associated with providing loans to ASM operators are well reported on in the literature, but the perceptions of the miners who engage in these activities are not covered. This paper therefore tried to bridge this gap in the literature. The study investigated the perceptions of ASM operators on what they think are factors that limit or prevent them from exploiting formal financial resources. The study revealed the simple words or terms or narratives that ASM operators use to explain risks or factors that they consider limit them from obtaining formal funds. It is argued that if the ASM operators’ perspectives are not understood by formal lenders, then these miners will continue to be regarded as an unqualified category of loan applicants.

The paper first looked at what risk factors formal lenders consider important before they grant loans to their applicants. The Bank of Industry, a government development finance institution in Nigeria, was approached on this matter. Secondly, interviews were conducted with a sample of ASM operators around the South West region of the country. The findings revealed that formal lenders, including commercial banks and government financial institutions, do feel they take risks in extending loans to ASM activities. The criteria that the formal lenders consider include: the availability of physical collateral or guarantors to stand as surety for those who may not possess properties or other assets to present as collateral; the availability of a mining licence to guarantee the legal status of the operation; proof of ore reserves to guarantee that there is an adequate mineral resource on the ground for the continuity of the operations; the availability of proven technology to guaranty efficiency and productivity; the availability of social collateral (lenders avoid itinerant miners and they prefer ASM operations that are registered as mining cooperatives or with other known organisations); and the availability of markets for the mineral.

The perceptions of formal lenders differ from those of the miners. Several ASM operators interviewed are quite knowledgeable about bank financing but are either not very interested or have been discouraged from applying for bank loans. Amid other problems they face, such as the exorbitant costs of obtaining licences, paying high taxes and royalties, and tight profit margins, most ASM operators acknowledge that they cannot meet all the requirements put forward by formal lenders. They also know that they have shortcomings regarding ample knowledge of ore reserves, the technical capacity and efficient tools to conduct such estimates, lack of physical collateral, and the fact that they are regarded as itinerants. Often, they end up using rudimentary measures to estimate the existence of viable mineral resources; those who are lucky enough use expert services provided by government institutions. ASM operators themselves, however, do not perceive the sometimes itinerant nature of their activities as a factor to prevent them from getting formal funding/loans. Specifically, this group of miners argues against the perception of the itinerant nature of their operations. For this they cite historical factors such as their years of involvement and the capital invested in the operation over these years. Thus, they believe that they cannot just vacate their sites and cease their activities there. Owing to previous failed attempts at accessing formal financing, ASM operators know that they cannot easily attract funds, from formal lenders in particular, and even from government institutions. Apathy in seeking or obtaining formal finance therefore exists on both sides of the divide, that is, among both formal lenders and ASM operators. Again, the lending rates charged are exorbitant, and the funds/loans provided, especially under government intervention schemes, are usually inadequate to cater to their needs.

It is the view of the authors that to evaluate the eligibility of ASM operations for loans, perhaps bank authorities need just to check the category of the minerals in which a miner specialises, whether enough capital has been injected, and signs of permanency of the ownership of the operation. Family ventures, for example, are considered to be much more permanent. This argument is in line with the findings from a recent study by Kumah (2022) who contends that having specific policies for different small-scale mining activities can enhance effective control and accountability. Also, ASM operators regard being a member of an association or cooperative as an important requirement that should qualify them for formal loans. They think that the ties formed in associations will act as a form of social collateral and are surprised at why, despite meeting such a requirement, they are still rejected by banks. The role of social ties in bank financing, especially in microfinance, has been hailed by scholars (see Postelnicu et al., 2014) who assert that group lending with joint liability is an important instrument, mostly in informal economic activities, because it incentivises group members to use their social ties to screen, monitor and enforce loan repayment on their peers. Thus, such social ties enhance the collective action of the group members and allow them to coordinate their repayment decisions and cooperate for their mutual benefit. It is believed from the findings of this study that it is essential for banks to exploit such benefits to enhance access to credit for this group of prospective borrowers.

In the absence of formal bank loans, ASM operators have developed some level of coping strategies and are widely involved in informal financing arrangements. This finding supports the widespread nature of informal arrangements for the funding of operations across the continent (see Fold et al., 2014; Perks, 2016). The bulk of the ASM operators' activities depend on self-financing, and on other informal sources such as borrowings from friends and relatives, their associations, and cooperatives. Specific mention was made of "buyers' funds" where one obtains funds before supplying mineral products. These sources help to get operations up and running, do not carry interest rates (i.e. are interest-free) but depend greatly on long-standing trade relationships, although even a long-term client can be dropped. However, their experiences and narratives shared here indicate that informal financial sources are not a

problem-solver for ASM operators. This paper supports the notion of Spiegel and Veiga (2005) and Reichel (2019) that this group continues to be locked out of formal financing sources.

The Nigerian government's interest in promoting the formation of cooperatives for the registration and licensing of ASM operations has helped in formalising many operations across the country. But this has done little in bridging the funding gap to achieve more productive and sustainable operations. Due to the importance of ASM activities in the economy as a source of livelihood for many impoverished populations in mineral-abundant countries in the Third World, and in particular in Nigeria, both formal lenders and government institutions are encouraged to put more effort into meeting the funding gaps of ASM activities. In the Nigerian context, the government's failure to meet the financial/investment needs of ASM operators constitutes an obstacle to the emergence of the formalisation of ASM operations in the country. If the formalisation of the Nigerian ASM sector is to be actualised, then financial inclusiveness of actors in the industry is essential. It is recommended that to achieve a formalised ASM sector, the federal government should strengthen the efforts aimed at filling the gap created by the unavailability of geological data, which is one factor that limits ASM operators' access to formal loans. In this regard, the recent conception of the National Integrated Mineral Exploration Project (NIMEP), which is designed by the federal government of Nigeria to conduct integrated exploration to reduce risks to mining in the country, is commendable. However, the evidence presented by respondents in this study shows that benefits from the project have not been felt across the sector, and that the funding challenges created by the lack of access to geological data persist.

Furthermore, it is recommended that the Bank of Industry should harness the benefit of social collateral, which is particularly important in a sector such as ASM where physical collateral is rare. It is also recommended that the Nigerian government should develop a local gemstone marketplace of international standard where buyers and gem miners can interact. This will provide a legitimate and easily accessible market for these miners. Also, since market consideration is one of the key areas for due diligence by formal lenders, the availability of a high-standard local gem marketplace may convince potential lenders of the viability of the gemstone mining business, which could ultimately enhance access to credit for gem miners.

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References

- Bank of England. (2022). The bank rate increased to 1% - in May 2022. Retrieved 9 June 2022, from Bank of England website: <https://www.bankofengland.co.uk/monetary-policy-summary-and-minutes/2022/may-2022>
- Benning, I. (2000). Bankers' perspective of mining project finance. *The Journal of The South African Institute of Mining and Metallurgy*, (May/June), 145–152.
- Binks, M. R., Ennew, C. T., & Reed, G. V. (1992). Information Asymmetries and the Provision of Finance to Small Firms. *International Small Business Journal*, 11, 35–37. <https://doi.org/10.1177/026624269201100103>

- Central Bank of Nigeria. (2022). Money market indicators. Retrieved 9 June 2022, from Central Bank of Nigeria website: <https://www.cbn.gov.ng/rates/mnymktind.asp>
- Clement, A., & Olaniyan, O. (2016). Environmental Assessment of Lead Contaminated Site from Artisanal Gold Mining in Bagega Community, Nigeria. *Archives of Current Research International*, 5(4), 1–9. <https://doi.org/10.9734/acri/2016/29551>
- Cozad, M. (2022). Collateral: Definition, Types, and Examples. Retrieved 7 June 2022, from study.com website: <https://study.com/academy/lesson/collateral-definition-types-examples.html>
- Eniowo, O. D., Meyer, L. D., Kilambo, S. R., & Gerber, L. J. (2022). Implications of credit constraint on the formalization of artisanal and small-scale mining (ASM) in sub-Saharan Africa. *The Journal of the Southern African Institute of Mining and Metallurgy*, 122(03), 97–106.
- Environmental Law Institute. (2014). *Artisanal and Small-Scale Gold Mining in Nigeria: Recommendations to Address Mercury and Lead Exposure Copyright*. Washington, DC.
- Ezenagu, A. (2021). Boom or bust, extractives are no longer saviours : The need for robust tax regimes in Gulf countries. *The Extractive Industries and Society*, 8(2), 100848. <https://doi.org/10.1016/j.exis.2020.11.014>
- FINT. (2019). Why are interest rates in Nigeria so high? Retrieved 9 June 2022, from Stears Business website: <https://www.stearsng.com/article/why-are-interest-rates-in-nigeria-so-high/>
- Fold, N., Jønsson, J. B., & Yankson, P. (2014). Buying into formalization? State institutions and interlocked markets in African small-scale gold mining. *Futures*, 62, 128–139. <https://doi.org/10.1016/j.futures.2013.09.002>
- Hayes, K., & Van Wauwe, V. (2009). ASM: An opportunity for rural development. *9th Annual CASM Conference*. Maputo-Chimoio.
- Hentschel, T., Hruschka, F., & Priester, M. (2002). *Global Report on Artisanal and Small-Scale Mining (ASM)*.
- Hilson, G. (2020). ‘Formalization bubbles’: A blueprint for sustainable artisanal and small-scale mining (ASM) in sub-Saharan Africa. *The Extractive Industries and Society*, 7(4), 1624–1638. <https://doi.org/10.1016/j.exis.2020.11.001>
- Hilson, G., & Ackah-Baidoo, A. (2011). Can Microcredit Services Alleviate Hardship in African Small-scale Mining Communities? *World Development*, 39(7), 1191–1203. <https://doi.org/10.1016/j.worlddev.2010.10.004>
- Hilson, G., & McQuilken, J. (2014). Four decades of support for artisanal and small-scale mining in sub-Saharan Africa: A critical review. *Extractive Industries and Society*, 1(1), 104–118. <https://doi.org/10.1016/j.exis.2014.01.002>
- Hilson, G., Zolnikov, T. R., Ortiz, D. R., & Kumah, C. (2018). Formalizing artisanal gold mining under the Minamata convention: Previewing the challenge in Sub-Saharan Africa. *Environmental Science and Policy*, 85(April), 123–131. <https://doi.org/10.1016/j.envsci.2018.03.026>

- Hinton, J. J., Veiga, M. M., & Veiga, A. T. C. (2003). Clean artisanal gold mining: a utopian approach? *Journal of Cleaner Production*, *11*(2), 99–115.
- Huggins, C. (in press). (2022). Is collaboration possible between the small-scale and large-scale mining sectors? Evidence from ‘ Conflict-Free Mining ’ in the Democratic Republic of the Congo (DRC). *The Extractive Industries and Society*. <https://doi.org/10.1016/j.exis.2022.101163>
- Intergovernmental Forum on Mining, Minerals, Metals, and Sustainable Development (IGF). (2018). *Global trends in Artisanal and Small-scale Mining (ASM): A review of key numbers and issues*. Winnipeg.
- Kumah, R. (2022). Artisanal and small-scale mining formalization challenges in Ghana: Explaining grassroots perspectives. *Resources Policy*, *79*(102978).
- Lawal, M. A. (2002). Constraints To Small Scale Mining In Nigeria: Policies And Strategies For Development. *CEPMLP Research Publications, Volume 6*, 1–27.
- Marin, T., Seccatore, J., De Tomi, G., & Veiga, M. (2016). Economic feasibility of responsible small-scale gold mining. *Journal of Cleaner Production*, *129*, 531–536. <https://doi.org/10.1016/j.jclepro.2016.03.161>
- Nigeria Mineral and Mining Act. (2007). The Federal Republic of Nigeria. A479 – A539
- Nigeria Ministry of Foreign Affairs. (2022). Nigeria Natural Resources. Retrieved 23 September 2022, from Natural Resources website: <https://foreignaffairs.gov.ng/nigeria/natural-resources/>
- Nopeia, M., Mondlane, S., Takahashi, R., Jamal, D., Abdulgani, I., & Baptista, I. (2022). An integrated geoscience approach to effective formalization of artisanal mining in Mozambique: A case study of Namuno District, northeastern Mozambique. *Extractive Industries and Society*, *11*(101098).
- Ofori, G., Dittmann, A., Sarpong, D., & Botchie, D. (2020). Socio-economic and environmental implications of Artisanal and Small-scale Mining (ASM) on agriculture and livelihoods. *Environmental Science and Policy*, *106*(April 2019), 210–220. <https://doi.org/10.1016/j.envsci.2020.02.005>
- Oluyole, F. (2021). National Integrated. Retrieved from NNN website: <https://nnn.ng/tag/national-integrated-mineral-exploration-project-nimep/#:~:text=NIMEP is a project designed, for the Fourth Industrial Revolution>
- Oraham, I. T., Richards, J. P., Summers, R., Garvin, T., & McGee, T. (2015). Artisanal and small-scale mining in Nigeria: Experiences from Niger, Nasarawa and Plateau states. *Extractive Industries and Society*, *2*(4), 694–703. <https://doi.org/10.1016/j.exis.2015.08.009>
- Owolabi, A., & Opafunso, Z. (2017). Quality Assessment of Water Bodies in Selected Mining Communities of Plateau State, Nigeria. *Archives of Current Research International*, *7*(1), 1–7. <https://doi.org/10.9734/acri/2017/32323>
- Owusu, O., Bansah, K. J., & Mensah, A. K. (2019). “Small in size, but big in impact”: Socio-environmental reforms for sustainable artisanal and small-scale mining. *Journal of Sustainable Mining*, *18*(1), 38–44. <https://doi.org/10.1016/j.jsm.2019.02.001>

- Perks, R. (2016). I loan, you mine: Metal streaming and off-take agreements as solutions to undercapitalisation facing small-scale miners? *Extractive Industries and Society*, 3(3), 813–822. <https://doi.org/10.1016/j.exis.2016.04.007>
- planetGOLD. (2020). Access to finance: Options for artisanal and small-scale mining. In *Global Environment Facility (GEF). UN Environmental Programme*. <https://doi.org/10.4337/9781785360510.00027>
- Postelnicu, L., Hermes, N., & Szafarz, A. (2014). Defining social collateral in microfinance group lending. In R. Merseland & R. O. Strom (Eds.), *Financial and Social Performance of Microfinance Institutions* (pp. 187–207). Hampshire, UK: Palgrave Macmillan.
- Reichel, V. (2019). Financial inclusion for women and men in artisanal gold mining communities: A case study from the Democratic Republic of the Congo. *Extractive Industries and Society*, (October 2018), 0–1. <https://doi.org/10.1016/j.exis.2019.05.003>
- Rozman, L. I., & West, R. F. (2001). Risk in resource and reserve estimation. In A. C. Edwards (Ed.), *Mineral resource and ore reserve estimation - The AusIMM guide to good practice* (pp. 499–504). Melbourne: Australian Institute of Mining and Metallurgy.
- Rupprecht, S. (2004). Establishing the feasibility of your proposed mining venture. *The South African Institute of Mining and Metallurgy*, (International Platinum Conference ‘Platinum Adding Value’), 243–247.
- Seccatore, J., Marin, T., De Tomi, G., & Veiga, M. (2014). A practical approach for the management of resources and reserves in Small-Scale Mining. *Journal of Cleaner Production*, 84(1), 803–808. <https://doi.org/10.1016/j.jclepro.2013.09.031>
- Siegel, S., & Veiga, M. M. (2009). Artisanal and small-scale mining as an extra-legal economy: De Soto and the redefinition of ‘formalization’. *Resources Policy*, 34(1–2), 51–56. <https://doi.org/10.1016/j.resourpol.2008.02.001>
- Siwale, A., & Siwale, T. (2017). Has the promise of formalizing artisanal and small-scale mining (ASM) failed? The case of Zambia. *Extractive Industries and Society*, 4(1), 191–201. <https://doi.org/10.1016/j.exis.2016.12.008>
- Spiegel, S. J. (2012). Microfinance services, poverty, and artisanal mine workers in Africa: In search of measures for empowering vulnerable groups. *Journal of International Development*, 24, 485–517.
- Spiegel, S. J., & Veiga, M. M. (2005). Building capacity in small-scale mining communities: Health, ecosystem sustainability, and the Global Mercury Project. *EcoHealth*, 2(4), 361–369. <https://doi.org/10.1007/s10393-005-8389-9>
- United Nations Economic Commission for Africa. (2002). *Compendium on best practices in small-scale mining in Africa*. Addis Ababa.
- Van Bockstael, S. (2014). The persistence of informality: Perspectives on the future of artisanal mining in Liberia. *Futures*, 62, 10–20. <https://doi.org/10.1016/j.futures.2014.02.004>

Verbrugge, B. (2014). Capital interests: A historical analysis of the transformation of small-scale gold mining in Compostela Valley province, Southern Philippines. *Extractive Industries and Society*, 1(1), 86–95. <https://doi.org/10.1016/j.exis.2014.01.004>

World Bank. (2012). Implementation Completion and Results Report (IDA-401120) on a credit in the amount of SDR 80.1 million (US\$120 million equivalent) to the Federal Republic of Nigeria for a Sustainable Management of a Mineral Resources Project. *The World Bank Report No: ICR2258*.