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# Artisanal and small-scale gold mining and trade in Tanzania pre to post independence: A review

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## Abstract

Appraisal of gold production and trade via Artisanal and Small-Scale Mining (ASM) in Tanzania has been achieved through assessing the literature and onsite interviews. Authors settle on the understanding that ASM is extricated to Industrial Mining (IM) upon funding, informality, and applications of technology. However, ASM has been embraced in Tanzania pre-to post-independence based on two facts: i) its gold production in the primordial period made a gateway to export trade, and ii) ASM was a feasible means of gold production in periods of insufficient infrastructures and geo-political and economic challenges.

Gold produced via ASM worth £363,084,500 equivalent to Sh. 1,194.3 billion (in present-day values) was recorded during the German colonial administration (1886-1920). For the British colonial administration (1920-1961), gold worth of £169,854,560 equivalent to Sh. 558.7 billion was produced. Smuggling and illegal markets obscured the amount of gold produced and traded immediately after independence. However, two years after the establishment of the local mineral markets (2019 – 2021), Government's collection from ASM gold sales rose from Sh. 61.53 billion to Sh.154.49 billion making 151.08% increase. In 2021, gold ASM contributed 2.6% to the GDP implying that, ASM holds a great potential of contributing significantly to the social-economic development of the resource-rich developing countries.

Tanzania has worked to formalize ASM legally, and through the establishment of demonstration centers, demarcating sites, oversight, and mineral markets. Nevertheless, lack of access to loans because of bankers' stringent conditions deters its growth. Therefore, it is imminent for scholars to research on appropriate mechanisms of ASM financing, and for the government to institute policy changes that will recognize Primary Mining Licenses (PMLs) as assets, to help alleviate the problems with lending practices and enhance ASM's economic contribution.

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## 1. Introduction

Artisanal and Small-Scale Mining (ASM) lacks a universally accepted definition. However, it is distinguished from Industrial Mining (IM) owing to its low levels of production, lower degree of mechanization and technological applications, high degree of labor intensity and little capital investment. Other factors include lack of long-term planning, informality, poor occupational health, safety and environment conditions (Hentschel et al. 2003; Mangasini et al. 2024). Financing of their operations is yet another key difference between two modes of mining. IM uses debt, equity or own funding whereas ASM, relies on own and external informal funding to finance its operations (Myers and Majluf 1984; Weldegiorgis and Buxton 2017; Kinyondo and Huggins 2020; Eniowo et al. 2022a; Laing et al. 2023).

According to World Bank (2020) and Laing and Pinto (2023), ASM predominates in nearly 80 countries worldwide and is an employer of many people participating as either producer (individuals, cooperative societies and limited companies), buyers (brokers, dealers and traders) or service providers in mine sites (Bryceson et al. 2020; Laing et al. 2023; Rwiza et al. 2023). According to Hentschel et al. (2003) and the World Bank (2020), ASM is responsible for the livelihood of more than 100 million people in the developing world.

Through production and trading of building materials, industrial minerals, base metals, gemstones, and precious minerals, ASM supports local economies (Kinyondo and Huggins 2020; Adranyi et al. 2024). Additionally, it contributes to clean energy transition and high-tech revolution through the production of critical minerals (Schütte and Näher 2020; Laing and Pinto 2023).

Tanzania is among the top African producers of gold, being grouped together with South Africa, Ghana, and Mali (Elbra 2017; Poignant 2023; Rwiza et al. 2023). Gold is produced via



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both IM and ASM (Fisher 2008; Kinyondo and Huggins 2020; ITA 2022). However, the literature widely discusses about IM in Tanzania (Magai and Márquez-Velázquez 2013; Hilson 2018; Rhee et al. 2018) and scarcely talks about ASM, particularly on its footprints to the environment and society (Taylor et al. 2005; Kinyondo and Huggins 2021).

This study is a review of the literature on ASM gold production and trading in Tanzania pre- to- post independence. It covers the period between 800 B.C. and 2021 articulating details of ASM in the primordial period, during Germany and British colonial administrations, and in the independent Tanzania. The challenges that hinder ASM to acquire loans and operate as a formal business are also reviewed.

## 2. Methodology

This work adopted a mixed research design covering a literature review and semi-structured interviews. Books, book chapters, conference papers, dissertations, journal articles, scientific reports, and theses on ASM were filtered using Google search engine on different platforms mainly Google Scholar and Scopus. Treaties were reviewed in the Geological Survey of Tanzania's archives. The keyword terms for this search were designed to identify any study on ASM in Tanzania.

Studies related to IM contexts were deliberately not included. The search keyword terms used include: artisanal mining, small-scale mining, gold mining, and trade in the primordial period, gold mining during the Germany colonial administration, gold mining during the British colonial administration, and gold mining in Tanzania. The desk work was complemented by onsite interviews at the Chunya mineral market in SW Tanzania on matters related to trading processes and impact of mineral markets on revenue collections.

A total of 137 references based on different aspects of ASM in Tanzania were selected for the review. Among them are 11 books and 10 book chapters, 5 conference papers, 1 dissertation, 68 journal articles, 21 scientific reports, 3 theses, and 18 treaties. Therefore, this work is confined to secondary sources of information that have provided qualitative and quantitative data showing the contribution of ASM in gold production and trade in Tanzania pre – to – post-independence.

## 3. Results and discussion

We discuss the discovery of gold mining and trading activities in the primordial Tanzania. Next, we assess ASM during the Germany colonial administration, pointing to its key reasons for embracing ASM over IM. Further, we discuss ASM during the British colonial administration and the independent Tanzania, placing emphasis on the initiatives undertaken to support ASM operations. Lastly, we discuss the challenges that ASM encounters for debt financing.

### *3.1 ASM during pre-colonial period (800 B.C. – 1886)*

Prehistoric mining activities in the hinterland of East Africa (EA) are reported by Speke (1864) following the expedition of 1856 to 1859. The Nyamwezi in Tanganyika (now Tanzania) were found smelting and trading implements (Fig. 1). The Nyamwezi land being referred to was made up of the following chiefdoms: Mirambo of the Nyamwezi, Simba of the Konongo, Nyungu ya Mawe of the Kimbu, and Kasogera of the Pimbwe (Abrahams 1967; Waters 2009). In fact, Tcherkézoff (1985) and Bennett (1971) notes of more chiefdoms belonging to Nyamwezi land including the rulers in the present-day Katanga region of the Democratic Republic of Congo (DRC).

Chirikure (2018) adds to the pre-history mining in Africa by mentioning gold mining in the vicinity of Lake Victoria around 800 and 400 B.C. Other scholars of the primordial mining include Frankema et al. (2023) who wrote about pre-colonial gold mining in the Great Zimbabwe and its trading with East Africa, Wisnicki (2008) who explains about the batter trade of the Nyamwezi and Arabs from the towns of Malindi, Mombasa and Kilwa; and Ntui et al. (2020) and Oliver (1961) who talks about gold trading in Kilwa Kisiwani, the oldest coastal town of Tanzania with a written history since the tenth century A.D.

Records of the gold produced in the primordial period are missing. However, Mangasini et al. (2024) mention Olfert Dapper's book first published in Amsterdam in 1668 in which the gold riches of Africa are described. Similarly, Habashi (2009) discusses about the Gold of Africa Museum in Cape Town, within which the history and artistry of African gold is preserved. These resources and others about barter trade in primordial Africa (Chirikure 2017; Rönnbäck 2020; Omeihe and Omeihe 2023), signify ASM's economic contribution via gold production and trading. Though different from modern forms of export earnings, ASM gold trading in the primordial period is considered a gateway for the export trade of Tanzania (Kai 2020).

### *3.2. ASM during German colonial period (1886 – 1920)*

Narratives about Africa's gold resources in the pre-colonial era stirred interests of European imperialists (Alpers 1969; Boahen 1990; Kai 2020; Peša 2024). Leon (1886) for example, explains the existence of treaties about colonial occupations in Africa that had spread based on the foretold stories. As a result, in Tanzania, the German company, *Koncession für Edelmineralien*, among others, was able to conduct systematic exploration and discover gold at Saragura Hill in 1898 (Bryceson et al. 2012; Mshiu 2014).

Foreign-led gold exploration post 1898 discovered deposits at Ikoma, Iramba and Usongo between 1902 and 1906 (Hetzer 1995). Other discoveries were Sigi River in 1912, Lupa Gold Field in 1922, Itumbi in 1934 and New Saza in 1939 (Mackay 1936; Van Straaten 1984; Roberts 1986; Hetzer 1995). Except for the Iramba deposit at Sekenke, which in 1909 was established as the first IM in Tanzania, other gold deposits were mined as ASM (Henckel et al. 2016). Records of gold production at this time are incomplete. Kaijage (1983) reports of minerals produced by ASM during German colonial period to be worth £5,000,000 equivalent to £363,084,500 or Sh. 1,194.3 billion in present-day values (conversion is based on Bank of Tanzania c2025; Official Inflation Data 2025).

Additionally, Lemelle (1986) reports that official gold production increased from 467 kg in 1928 to 1711 kg in 1934. Our review did not find sufficient explanation for the growth. However, according to Bryceson et al. (2012) gold exports constituted 20% of export earnings, and were a significant contributor to the territory's economy. Today, gold ASM constitute 21.2% of Tanzania's export earnings (Tanzania. Ministry... 2024). Such figures, although inconclusive, help to understand ASM's economic contribution through gold production and trade.

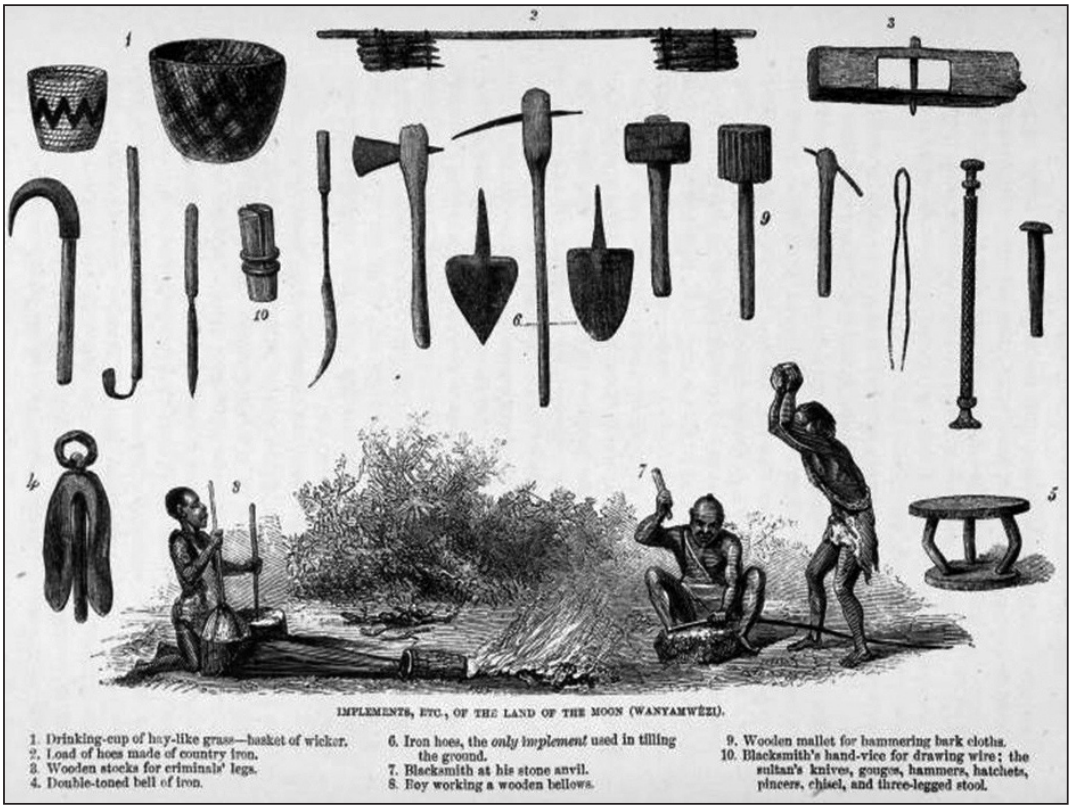


**FIGURE 1**. Implements smelting by the Nyamwezi people 1856 - 1859 (Source: Speke 1864).

### 3.2.1. Mining laws under German colonial administration

The German colonial administration embraced ASM via reforming of laws. Originally, the Prussian Law (General State Law), was enforced in all Germany states. However, to regulate mineral prospecting, the Ordinance of the imperial governor of German East Africa (the *Verordnung des Kaiserlichen Gouverneurs von Deutsch-Ostafrika betreffend des Schürfens*) was enacted in 1895. With it, rights to prospect, explore and extract minerals were given for six months with a provision for a renewal (Kai 2020).

In 1898, a new Mining Ordinance for German East Africa was enacted (the *Verordnung zum Bergwesen in Deutsch-Ostafrika*). Unlike the former, the new law granted miners the right to mine all over the colony, except for areas reserved for public interests (for example settlement areas). Also, the number of licenses obtained per person was not limited, as long as they were able to pay the required fees (Kai 2020).

In 1905, the Imperial Mining Ordinance for the African and South Seas' Protectorates with exception of German Southwest Africa (the *Kaiserliche Bergverordnung für die afrikanischen und Südseeschutzgebiete mit Ausnahme von Deutsch-Südwestafrika*) was enacted to provide additional regulations regarding mineral deposits, large scale plants, crude oil, bitumen, and sulfur resources. Besides licensing, charging fees and delegation of duties, the law entitled miners to build facilities necessary for their operations outside their concessions. The 1905 Ordinance sustained only for a decade before the conquest of German East Africa by British troops in 1916, which resulted into the seizure of all mines (Hetzer 1995).

Pierard (1968) contemplates that, although the German colonial administration made efforts to attract large capital from foreign private companies, ASM operations were equally important to its strategies based on the available infrastructures and power supply capacity at that time. At this moment construction of the railway line had not reached mine locations, the gravel roads were limited in their ability to transport heavy machinery, and electric generation and supply was insufficient and localized (Kai 2020). Therefore, mining via ASM was an alternative because the machines and electric power required to facilitate gold production were found affordable (Chudson and Hayes 1958).

### *3.3. ASM during British colonial period (1920 – 1961)*

Under the British colonial administration Tanganyika was a mandated territory reporting to the League of Nations (Wright 1965). Through this arrangement, native interests were to be given sufficient attention over those of non-indigenous settlers (Bryceson et al. 2012). The country had not been adequately explored, therefore mining operations were carried out on a small scale in a few areas, which were known to be mineralized (Neal 1981). Similarly, many venture capitalists were doubtful about the security of their investments in Tanganyika because Germany had intentions to regain the colony (Lemelle 1986). Few investors who had shown interest were struggling to get capital to carry out reef mining (Neal 1981).

As a result, a significant amount of the gold mining activities that took place under British rule arose just in the context of the declined agricultural prices, soaring gold prices as a result of the great depression (1928-1939), and prevalent ASM (Bryceson et al. 2012; Solimano 2020). According to Neal (1981), in 1937

the British colonial administration spent £40,000 equivalent to £2,284,708 or Sh. 7.5 billion (in present-day values) of its surplus balance to finance small loans for ASM (conversion is based on Bank of Tanzania c2025; Official Inflation Data 2025). Records of gold production during British colonial administration are provided in Table 1 and Table 2.

From Tables 1 and 2, production records from ASM were consistent from 1922 to 1938. No ASM gold production is reported thereafter because lucrative gold prices prompted the British colonial rule to ban ASM activities and encourage IM (Fawley 1951; Bryceson et al. 2012). Again, figures in Table 2 overlap to post-independence in 1961. This is because mine ownership did not change immediately after independence. Nevertheless, these records help to comprehend the contribution of ASM on gold production and trade during that particular period.

#### 3.3.2. Mining laws under the British Colonial Administration

We present legal changes during British rule to indicate how they honored ASM. Under British rule, Tanzania was led using the Tanganyika Order in Council of 1920, the law that transferred Germany´s rights and titles over her overseas possessions to the British. Under this law, the Mining Ordinance of 1920 was enacted to provide the first framework for mineral extraction under British mandate (Lemelle 1986).

Amendments to the 1920 Ordinance were made in 1929. The law allowed native and foreigners who could afford ten shillings and could fill out a form to apply for a prospecting license to be given the right to prospect (Bryceson et al. 2012). However, Africans had limited access to the institutions set up to regulate and protect Europeans' rights to land (Pedersen et al. 2016). As a result, up to 1938 there were about only 32,000 Africans involved with mining activities, 85% in gold with the majority (73%) working as ASM in the Lupa Gold field (Lemelle 1986).

Therefore, unlike its predecessor, the British rule supported ASM because of the reluctant IM in fear of German's regain of the Tanganyika territory (Neal 1981; Sandler 2024). Secondly, as Tanganyika was a mandated territory, so natives were to be given a priority (Pim 1945; Wright 1965). Thirdly, it was since few areas had been explored and the rising of the gold price during the great recession (1929-1939) prompted rulers to support ASM, which unlike IM was able to mine within unproven reserves (Cooksey 2011; Bryceson et al. 2012).

**TABLE 1:** Gold production in Tanganyika 1922-1938 (Source: Neal 1981).

| Year | Amount (kg)* | Value (£) | Percentage Total exports |
|---|---|---|---|
| 1922 | 7.06 | 850 | 0.7 |
| 1923 | 37.42 | 5,937 | 0.4 |
| 1924 | 214.81 | 30,349 | 1.2 |
| 1925 | 300.91 | 42,506 | 1.5 |
| 1926 | 228.19 | 31,290 | 1.0 |
| 1927 | 270.70 | 36,203 | 1.1 |
| 1928 | 422.93 | 56,942 | 1.5 |
| 1929 | 296.60 | 39,184 | 1.0 |
| 1930 | 367.73 | 46,585 | 1.6 |
| 1931 | 430.92 | 60,183 | 3.7 |
| 1932 | 879.70 | 157,726 | 7.2 |
| 1933 | 1097.30 | 195,369 | 7.7 |
| 1934 | 1,546.24 | 295,690 | 11.2 |
| 1935 | 1,818.20 | 369,742 | 10.7 |
| 1936 | 2,436.70 | 489,796 | 10.8 |
| 1937 | 2,638.90 | 526,277 | 10.6 |
| 1938 | 3,182.77 | 589,135 | 15.9 |
| Total | 16,177.08 | 2,973,764 | |

* Original figures were reported in Ounces (oz), 1oz equals 0.02835 kg

**TABLE 2:** Cumulative figures of gold production after ban of ASM (Source: Van Straaten 1984)

| Mine | Years | Gold Produced (Kg) |
|---|---|---|
| Geita | 1939 – 1966 | 29,237 |
| Buhemba | 1927 – 1970 | 11,819 |
| Kiabakari | 1959 – 1966 | 8,709 |
| New Saza | 1939 – 1956 | 7,776 |
| Mpanda mineral field (as a by-product) | 1950 – 1966 | 2,177 |

### *3.4. ASM soon after independence (1961 - 1967)*

Tanganyika declared independence on December, 9th, 1961 (Tanzania 1961) and adopted most of the existing British laws (Allen et al. 2013). Mining was regulated by the colonial legislation of 1929 and exclusively foreign-owned IM, was promoted with less attention given to ASM (Lange 2008). As a result, ASM activities continued, but smuggling and black markets were intense as miners avoided state controls (Cooksey 2011; Kahyarara 2024). Records are missing for the gold smuggled and traded in illegal markets.

### *3.5. ASM after the Arusha Declaration (1967 – 1997)*

The Arusha Declaration in 1967 committed Tanzania to nationals' ownership of major means of production including mining (Coulson 2013; Arikawei 2015; Bjerk 2023). There were several initiatives to support ASM, one being purchasing gold produced by ASM. According to Cooksey (2011), gold purchased by the Bank of Tanzania increased gold exports in value from $ 1.1 million in 1989 to $ 40.4 million in 1992.

Similarly, via the Small-Scale Mining Policy of 1983, citizens were officially encouraged to participate in mining (Mutagwaba et al. 1997). They were instructed to supplement their incomes through participating in ASM. Additionally, Regional Mining Associations (REMAs) were registered to mobilize ASM, and they were set to operate under the auspices of FEMATA, the Federation of Miners' Association of Tanzania (Tanzania. Vice... 2020).

### *3.6. World Bank, UNIDO and ILO initiatives to formalize ASM*

There have been initiatives by multilateral organizations to formalize ASM (Barry 1995; Traoré 1997; ILO 1999). Analogous to such efforts, the Government of Tanzania undertook several interventions to transform ASM via policy and regulatory changes.

#### 3.6.1. The 1997 Mining Policy and Mining Act of 1998

Objectives of the Mining Policy of 1997 were to comply with the World Bank's demand that contribution of the mining sector to the national economy reaches 10% of the GDP by 2025 (Tanzania. Ministry... 1997). Therefore, the Government

had to provide a conducive environment for investment by both IM and ASM. Such objectives were incorporated into the Mining Act of 1998, and through the Ministry of Energy and Minerals measures for improving ASM operations to enhance their productivity were implemented (Tanzania 1998).

### 3.6.2. The Mining Policy of 2009 and Mining Act of 2010

The Mining Policy of 2009 was instituted to accelerate Tanzania's socio-economic development via mining. For ASM, the Government had to support training, their access to financial services and technology. Furthermore, the government established local mineral markets to ensure fair pricing for ASM and curb smuggling (Tanzania. Ministry... 2009). Additionally, promote mineral value addition, establish mineral processing units, refineries and smelters; and STAMICO was given a mandate to oversee all ASM transformation programs (Tanzania 2009; Tanzania. State... 2015).

Through the Mining Act of 2010 Tanzania demarcated areas for ASM operations (Steinmüller 2017). Until 2022, there were 36 demarcated sites for ASM with a total of 280,000 hectares (Tanzania Extractive... 2022). Similarly, the law decentralized processing of the Primary Mining Licenses (PMLs) to the Regional Mines Offices to minimize costs of license processing and increase efficiency (Tanzania 2010; UNEP 2012). Other initiatives entailed establishment of ASM demonstration centers to coach ASM on all matters in the mineral value chain (Kinyondo and Huggins 2020).

### 3.6.3. The Unconscionable Terms Act of 2017, the Permanent Sovereignty Act of 2017 and the Written Laws (Miscellaneous Amendments) Act of 2017

In 2017, the above-mentioned laws were passed to increase public gains in the extractive industry. A raw mineral export ban was introduced, and sales of minerals were restricted to mineral markets. Rights to export were given to licensed dealers alone, and all earnings derived from mining were to be deposited with local financial institutions (Tanzania 2017).

## 4. Mineral markets and ASM gold trading

Mineral markets were established in 2019 to support minerals trading and to control exports. Up to 2021 there were 42 markets and 28 buying centers established countrywide (Mining Commission 2022; Tanzania Extractive... 2022). To explain ASM gold trading in mineral markets, we have included a flow chart (Fig. 2) to provide a quick view of processes in the ASM gold supply chain. The interactions across the main components are briefly discussed:

### *4.1. ASM*

ASM collectively represent license holders, pit owners (renters) and miners (employees). Mines are operated by either license holders or by renters on a dividend agreement.

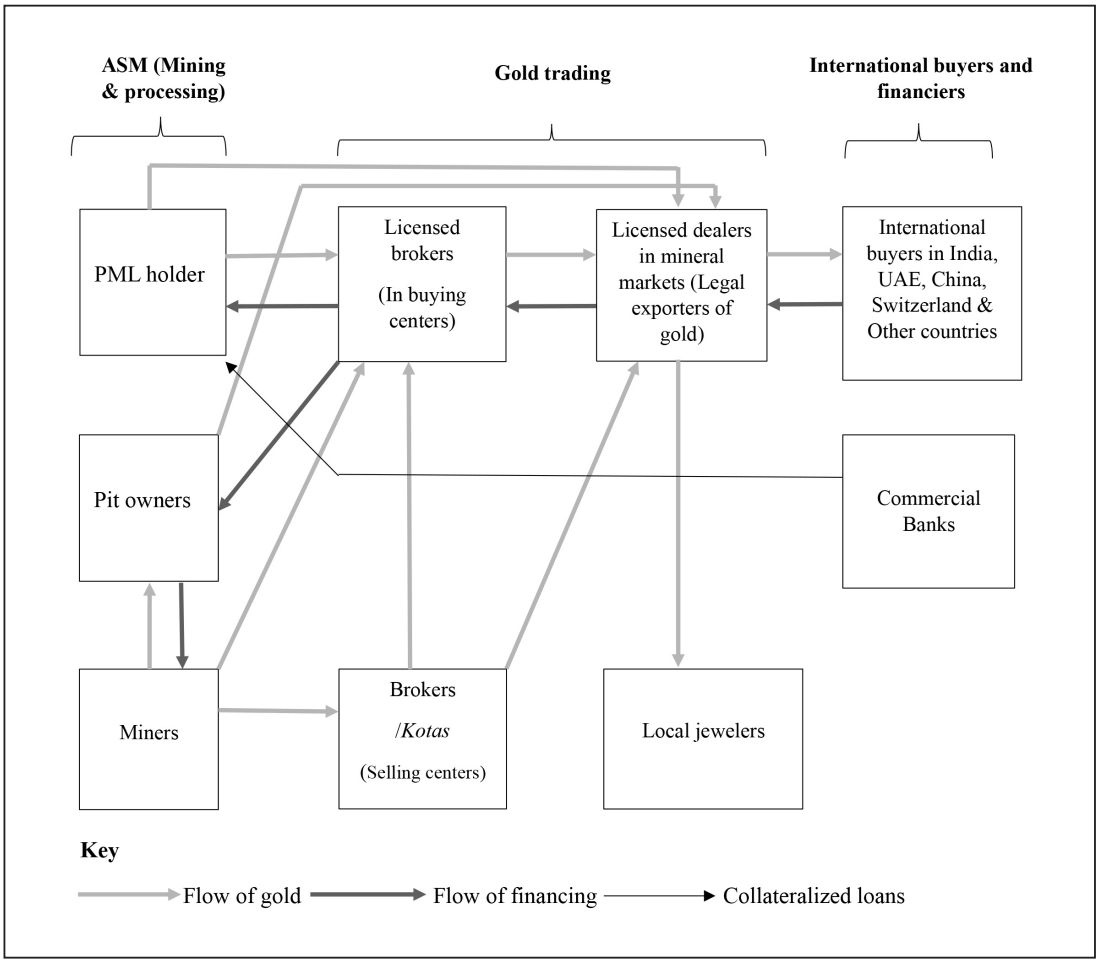


**FIGURE 2**. Visual of Tanzanian ASM gold supply chain (after Mutagwaba et al. 2018).

Mining requires capital, so ASM normally seeks external funding from sponsors (international buyers). The money is brought through dealers and brokers, who are agents for the sponsors on a commission. The agents lend miners with machines, equipment and cash for future gold sales (Laing et al. 2023). License holders and pit owners sell their gold to the dealers in mineral markets who finally export purchased gold to the international markets, after having paid all taxes and levies (Brugger et al. 2024).

### *4.2. Gold trading*

To ease the trading process, markets are equipped with all transactional and authorization offices (Pedersen et al. 2021). Therefore, within markets are offices for the Mining Commission (MC), Tanzania Revenue Authority, dealers, and banks. Also, there are smelting, weighing, and inspection chambers. Indicative mineral prices provided by the MC are displayed on boards or screens. Selling is done after registration, weighing and purity verification of the lot.

Gold sales in mineral markets are subject to a 6%royalty and 1% inspection fee. In the refineries, only 4% royalty is being charged. The Government lowered royalty charges and waived inspection fee for sales done in refineries to encourage export of refined minerals, and to support local value addition. In either case, there is 0.3% service levy due to the local Government.

Miners with less than 1g gold are allowed to sell to *kotas* (brokers) in the buying centers around the mines. However, an

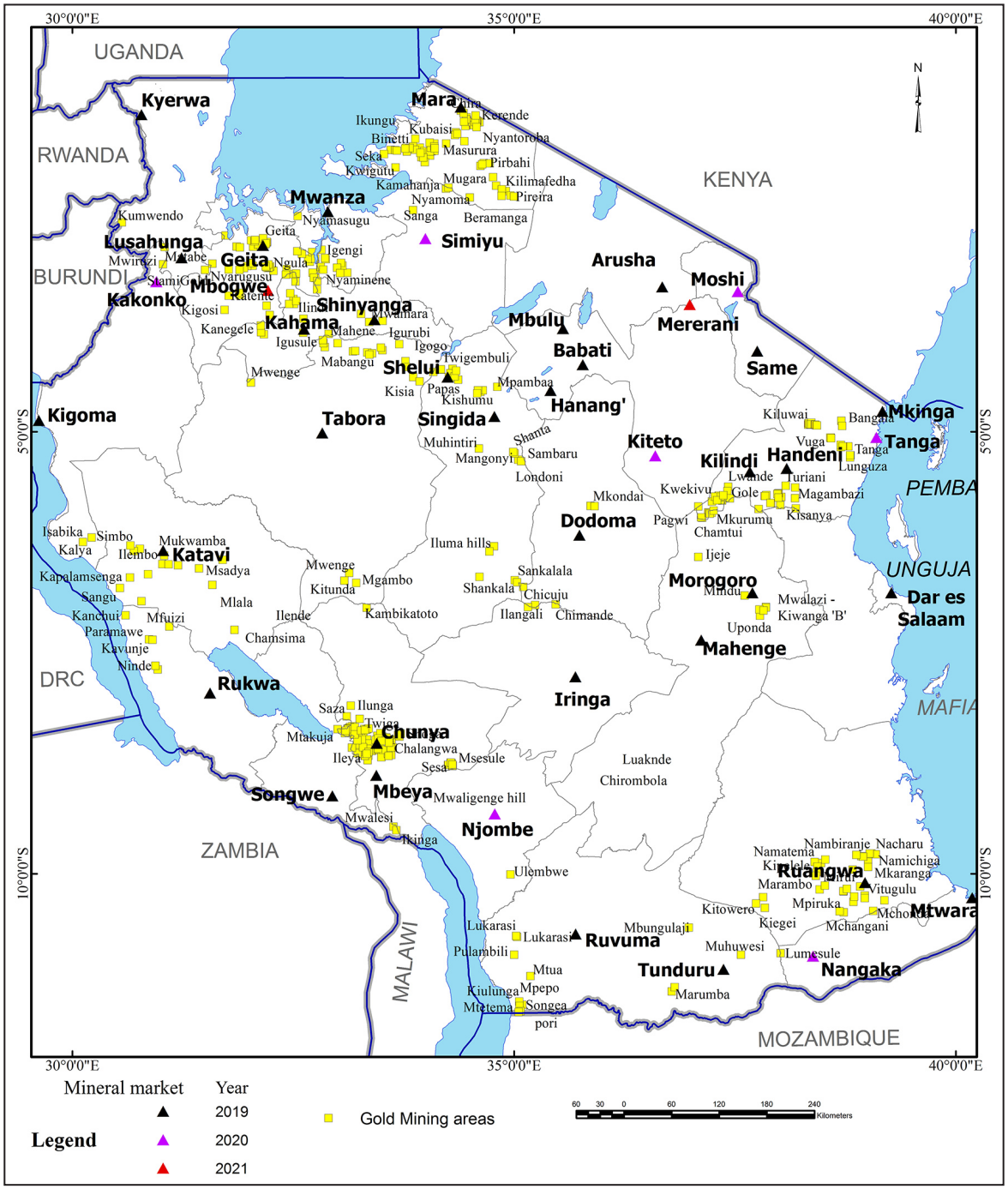


**FIGURE 3**. Map of Tanzania showing distribution of the mineral markets with respect to major gold ASM areas (Source: Author).

inspection must be done by the mine resident officer before trading. Therefore, different from dealers, *kotas* usually buy small quantities of minerals and finally take them to the dealers in mineral markets (Tanzania 2019).

### *4.3. International buyers and financiers*

International markets that receive gold from Tanzania include United Arab Emirates, India, China, and Switzerland (United Nations 2019). In there, foreign entities of the Tanzanian dealers (sponsors) receive exported gold, take back their advanced money and give the remaining amount to the ASM, and the financing cycle repeats. Sponsors do that to capture the gold supply, which is competitive in the field (Sofala Partners 2019; Makungu et al. 2024).

## 5. The Impact of Mineral Markets (2019 -2021)

To appreciate the impact of established mineral market in Tanzania we analyze performance of ASM gold sales in these markets between 2019 and 2021. Gold sales in 2019 when markets were being established were 8,970 kg. Two years later, rose to 18,282 kg equivalent to 103.81% increase (Fig.4). Government collections on the other hand, rose from TZS 61.53 billion to TZS 154.49 billion making 151.08% increase (Fig. 5). In 2021, gold ASM made 2.6% contribution to the GDP (Bank of Tanzania 2024).

This implies that, established mineral markets brought efficiency to mineral sales via improved market access, fair pricing mechanisms, elimination of exploitative intermediaries; and the introduction of transparent valuation processes. This encouraged more miners to participate in the formal trading system, tax compliance and minimized smuggling. Established mineral markets also increased government controls over revenue collection.

The integration of ASM into the formal economy has not only improved the livelihoods of miners but also it has strengthened Tanzania's position as one of the leading gold producers in Africa. This indicates that, if properly managed, ASM carries a great transformative potential to the social-economic development of the developing resource-rich countries.

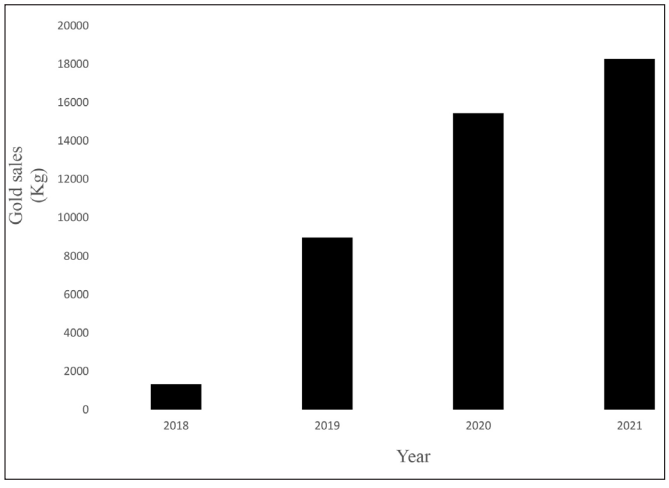


**FIGURE 4**. ASM gold sales in Tanzania between 2018 and 2021 (Source: Mining Commission 2022)

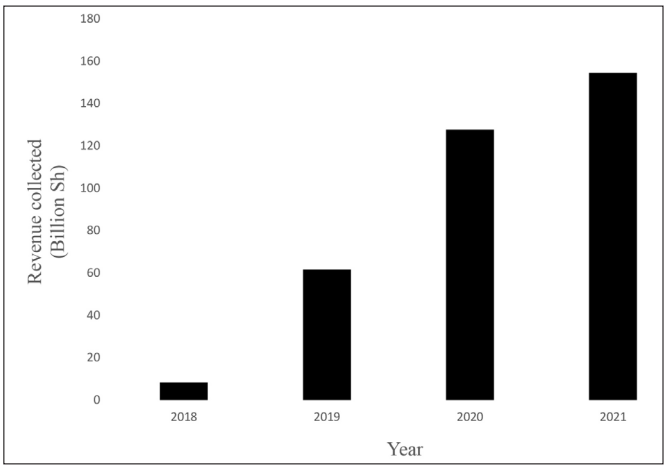


**FIGURE 4**. Revenue collections from ASM in Tanzania between 2018 and 2021 (Source: Mining Commission 2022)

## 6. Barriers to ASM Financing

Despite its appealing performance, ASM encounters great challenges to finance its operations. We review barriers to ASM financing in Tanzania based on the Pecking Order Theory (POT). According to Guizani (2020), POT maintains that company managers follow a hierarchy when considering sources of financing. Preference is given to own source, debt financing then equity in case debt financing is not sufficient (Ahmad and Atniesha 2018).

Our study found that the majority ASM in Tanzania finance their operations using own sources that include informal sponsorship and own funding (Weldegiorgis and Buxton 2017; Kinyondo and Huggins 2020). However, like for other Small and Micro Enterprises (SMEs), own sources are commonly insufficient for development and profitability (Kira and He 2012). Records of equity financing to ASM are missing because ASM are not public companies to be listed on stock markets (Matswiwira et al. 2022). In that regard, our discussion is based upon barriers of debt financing since loan accessibility is essential to solve ASM cash flow shortages (Beck and Demirguc-Kunt 2006; Nguyen and Canh 2021).

ASMs require loans to enlarge their business operations, explore new deposits, improve production operations, for human resource development; and to acquire production equipment and technology (Kira and He 2012). Barriers being reviewed are categorized into those related to nature of ASM projects, banking regulation and lending conditions, legal provisions, and project management and financial literacy.

### *6.1. Barriers related to ASM exploration projects and understanding of their operations*

#### 6.1.1. Lack of bankable feasibility study

One barrier for debt financing of ASM in general is their inability to present proof of availability of ores that will assure recovery of costs and some profit margins (Eniowo et al. 2022b). Bankers require an official report communicating the results of an exploration campaign to delineate the ore body and measure the inferred, indicated and measured resources; and reports that convert these resources into probable and proven reserves after

incorporation of metallurgical, economic, environmental, social, and other considerations that form part of the feasibility study.

Resource estimation and preparation of such documents require a qualified person, something that ASM misses due to among others lack of funding to employ them (Eniowo et al. 2022b). As a result, ASM fails to acquire loans from the financing institutions.

#### 6.1.2. Risky exploration projects

Financiers consider mineral exploration as extremely risky and uncertain business (Singer and Menzie 2020). Only 0.1% of exploration projects succeed to become mines (Suopajärvi et al. 2023). Irrespective of mineral discovery in the ground, volume, content, and quality of the deposit must all be economically justifiable to get funding in the financial markets (González-Ruiz et al. 2021). With such a limited chance of success, the probability is high that a single ASM venture will usually become a failure. Logically, it minimizes the chance of exploration projects by ASM to get funded.

#### 6.1.3. Inability to apply non-recourse financing schemes

Capital intensive greenfield exploration projects are commonly financed via project financing (Grieg-Gran 2002). This is a non-recourse scheme where borrowers establish Special Purpose Vehicles (SPV), and loan repayment comes from the cash flow of the particular projects; and the assets of the project are used as security (Pinto 2016). Financing institutions are involved directly through project finance or indirectly as insurers (Grieg-Gran 2002). This scheme has not been proven applicable to ASM because their projects are very small (cannot establish SPV), their cash flows are uncertain, and assets for security are not available (Baena and Mendoza 2021). In that regard, exploration projects for ASM fail to get bankers lending.

#### 6.1.4. Inability to translate underground resources into conventional financial assets

Successful exploration project is a complex, multiple-stages process and decision points that requires sound economic analysis (Davies et al. 2021). Banks are either inexperienced or lack understanding of technical fields such as mining and geology so, fail to translate geological assets into forms of collateral they are familiar with (Perks 2016). This hinders ASM exploration projects from getting financed by the banks.

#### 6.1.5. Informality of ASM

Attractive client for a bank is someone with good income, healthy administration and good liquidity or possesses capital and investment assets that can guarantee good financial management (Berry and Robertson 2006; Nilsson and Öhman 2012). ASM is commonly informal and lacks most of the above bankers' prerequisite client characteristics (Aizawa 2016). As a result, it is unattractive for lending by the banks.

#### 6.1.6. Size and Activities of ASM entities

Company size and its activities are key to determining financing possibilities from the financing institutions (Rajamani et al. 2022). Firms that are larger in size and oriented towards production and processing have multiple alternatives in funding. Contrary, small entities in prospecting and exploration works face considerable barriers to finance their projects (Baker et al. 2020).

ASM operates on informal financing (Hilson and Ackah-Baidoo 2011; Verbrugge 2014). Whenever formal financing is opted, the financiers choose to fund post exploration operations, namely mining, mineral processing, value addition and trading activities (Perks 2016). Commercial banks in Tanzania like others in Africa, for example the Nigeria Bank of Industry (BOI), whilst having dedicated funds to finance ASM operations, their services have largely supported non- or post-exploration activities including facilitation of international transactions, safe deposits, escrow-accounts; and asset-based lending of mining machinery and mineral processing equipment (Bank of Industry 2018; African Mining Market 2021).

Banks use firms' assets (acquired equipment, machines and deposits) as their primary sources of repayment (Kiisel 2013). Such selective funding of (just a part of) ASM activities hinders their loan acquisition possibility.

### *6.2. Barriers related to banking regulation and lending conditions*

#### 6.2.1. Limitations from Banking Regulations

Banks are regulated based on the Basel Accords (Basel I, II and III) set by the Basel Committee on Bank Supervision (BCBS). Their key function is to ensure banks hold enough cash reserves to meet their financial obligations and survive in financial and economic distress and strengthen corporate governance, risk management and transparency (Pham and Daly 2020).

While it is necessary to ensure systemic stability, regulation in general, and capital requirements in particular, are associated with costs, which include reductions in lending. Instead of raising equity to comply with target ratios, banks mostly choose to reduce lending affecting SME including ASM (Aiyar et al. 2015; Fraisse et al. 2017).

#### 6.2.2. Stringent Lending Conditions

Banks perceive ASM as a high-risk sector and so they require hard collateral, set high interest rates and impose strict repayment schedules (Caven et al. 2020). To explain this, we draw an example from ASM lending experience in DRC. According to Sofala Partners (2019), the borrowing ASM are required to put up at least 150% hard collateral, at the interest rate ranging between 15% and 22% without having a grace period on repayment of the principal. Such terms have generally made the loans prohibitively expensive or inaccessible for most ASM.

Similarly, local banks' practices of financial statement lending also impedes ASM access to loans, as extension of the credit relies on borrower's strong financial condition as reflected in the financial ratios calculated from the statements, such as current ratio, debt to equity ratio, gross profit percentage, return on assets, and return on equity (Cole et al. 2004; Berger and Udell 2006).

Unlike public companies that are expected to observe standards of corporate governance, ASM do not produce

audited financial statements that yield credible financial information; and have no obligation to make public disclosures of their financial reports. These features prevent ASM from being financed by banks (OECD 2006; Matswiwira et al. 2022).

#### 6.2.3. Poor Performance on the Credit Score

ASM commonly performs poorly on small business credit score, a loan evaluation tool based on the analysis of large amounts of historical data (in addition to financial statements and business plan) about the business owner and the firm (Torre et al. 2010). Migration, business seasonality, informality, poor health practices, labor exploitation, and environmental mismanagement issues are common characteristics of ASM, which weakens their performance during evaluations; and hinders them from receiving loans from banks (Craig and Hardee 2007; Landrigan et al. 2022).

#### 6.2.4. High Monitoring Cost

ASM monitoring costs are too high, and the data needed to manage credits on a statistical basis are not available (Sofala Partners 2019). Most banks find that the poor ratio between financial risk and return represents the greatest obstacle to engagement with the ASM. This is because the quantum of financing is smaller, the financial returns are weak, and compliance costs are much higher (Sule 2019).

### *6.3. Barriers related to legal provisions*

#### 6.3.1. Disharmony between Land and Mineral Laws

According to the Land Act of 1999 (Cap 113) Section 22(2), minerals are by definition not a part of land in Tanzania. However, once minerals are discovered the land turns into mineral land and falls under the Minerals Act and policies, which take precedent over land policy and laws that govern surface rights. Although the two laws have operated side by side, the disharmony between them and their enforcement poses a barrier to lending whenever loan applicant wants to use mineral land as collateral (Lugoe 2011).

#### 6.3.2. Non-recognition of PML as Asset

In Tanzania, Primary Mining Licenses (PMLs) issued to ASM grant them the right to prospect and mine minerals for a validity of seven (7) years with a possibility of renewal (Tanzania 2019). Compared to title deeds, which grants the right to occupy land for terms up to but not exceeding 99 years (Tanzania 1999) and can be used as collateral on lending because they are assets. PMLs are not used as collateral on bank lending since they are not considered as assets.

#### 6.3.3. The Possibility of PML to be interfered by PL

Tanzania (2019) provides for a PML to be granted on the same land issued for Prospecting License (PL) provided that the PL holder consents, and the mineral(s) mined by the PML holder are different from the mineral(s) being prospected by the PL. This scenario makes ASM (PML holders) face considerable difficulties with lending because financiers are skeptical of potential conflicts in case the original occupant (PL holder) upholds another legal commitment that may affect repayment of the loan.

#### 6.3.4. Human Rights Violations and Exploitation

The Child Act of 2009 prohibits any engagement of a person below 18 years in hazardous work, including mining and quarrying. However, in 2014, the National Bureau of Statistics published the number of children between 5 and 17 years engaged in ASM at 30,827, or 5% of the total workforce (Tanzania. National... 2014). Further, in 2020, children aged between 10 and 17 years engaged in ASM operations were estimated to be 10,000 (Tanzania. Vice... 2020).

The Labor Law of 2004 require workers to be given written employment contract at the start of employment (Tanzania 2004). However, ASM workers are not given contracts and regulatory oversight is minimal (Merket 2018). Such circumvention of labor and other human right laws hinder ASM debt financing.

#### 6.3.5. Environmental Degradation

ASM degrades the environment via deforestation, siltation and pollution of water bodies, degradation of agricultural lands, destruction of ecological habitats and use of toxic chemicals (Macháček 2019). Bankers are highly sensitive to the reputational risk and will not commit to any investment unless they meet the International Finance Corporation Performance Standards on Environmental and Social Sustainability. Based on the above, ASM find it difficult to get loans from banks (Yang et al. 2022).

### *6.4. Project management and financial literacy barriers*

ASM is dominated by numerous entities that generally lack formalized management and governance structures. They do not have demonstrable financial track records often due to a lack of financial accounting and management skills (Mutagwaba et al. 2018; Merket 2018). These features make it difficult for banks to lend ASM.

## 7. Conclusion

This review presents overwhelming evidence that ASM is an important social-economic activity that Tanzania has embraced pre- to post-independence. First, gold from ASM was a major commodity for the export trade in the primordial period, and attracted intrusion of the future capitalism. Second, colonial administrations in Tanzania, initially German and later British both valued ASM as a feasible means of gold exploitation when investments in IM were economically not feasible based on lack of infrastructures or geo-political factors. Third, independent Tanzania has invested heavily in ASM and witnessed immediate proliferations in terms of gold sales and Government revenues.

However, there remains a major challenge of ASM financing to enable it to operate as a formal business. The challenge is greatly associated with bankers' stringent conditions imposed to safeguard against the perceived risks of ASM. Consequently, ASMs fail to acquire loans from bankers and are stunted. Therefore, it is imminent for scholars to research on appropriate mechanisms of ASM financing, and

for the Government to make policy changes that will recognize Primary Mining Licenses (PMLs) as assets to help alleviate the problems with lending practices and enhance ASM's economic contribution.

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**A** - Study design/ Conceptualization **B** - Investigation/ Data acquisition
**C** - Data Interpretation/ Validation **D** - Writing
**E** - Review/Editing **F** - Supervision/Project administration

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