

DELVE COUNTRY PROFILE

Nigeria

ARTISANAL AND SMALL-SCALE MINING SECTOR



DELVE

A GLOBAL PLATFORM FOR ARTISANAL & SMALL-SCALE MINING DATA



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Delve is an initiative to build a global platform for artisanal and small-scale mining (ASM) data. Its vision is a world in which ASM is recognized as an important contributor to global development.

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Cover Photo: Miners in Itagun, Nigeria gathering their gold finds in one pan. Photo by Dame Yinka under ([CC BY-SA 4.0](#))

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Definitions & Acronyms

ASGM	Artisanal and Small-scale Gold Mining
ASM	Artisanal and Small-scale Mining
ASMD	Artisanal and Small-scale Mining Department
AWIMA	Association of Women In Mining in Africa
BGS	British Geological Survey
CAHRAs	Conflict - Affected and High - Risk Areas
CASM	Communities and Small-Scale Mining
CBO	Community Based Organization
COMEG	Council of Nigerian Mining Engineers and Geoscientists
CSR	Corporate Social Responsibility
EIA	Environmental Impact Assessment
EITI	Extractive Industries Transparency Initiative
EL	Exploration License
FCT	Federal Capital Territory
FDI	Foreign Direct Investment
FEPA	Federal Environmental Protection Agency
FMH	Federal Ministry of Health
FMoE	Federal Ministry of Environment
GBC	Gold Buying Centres
GDP	Gross Domestic Product
GEUS	Geological Survey of Denmark and Greenland
GIN	Gemological Institute of Nigeria
GMMAN	Gemstones Miners & Marketers Association of Nigeria
GNI	Gross National Income
IAISMP	Integrated Automation and Interactive Solid Minerals Portal
ILO	International Labour Organization
JMG	Journal of Mining and Geology
LBMA	London Bullion Market Association
LSM	Large-Scale Mining
MAN	Miners Association of Nigeria
MCO	Mining Cadastre Office
MEC	Mines Environmental Compliance
MID	Mines Inspectorate Department

MIREMCO	Mineral Resources and Environmental Management Committee
MIST	The Mining Implementation and Strategy Team
ML	Mining Lease
MMSD	Ministry of Mines and Steel Development
NEITI	Nigeria Extractive Industries Transparency Initiative
NESREA	National Environmental Standards Regulatory Enforcement Agency
NGO	Non-Government Organization
NGSA	Nigerian Geological Survey Agency
NIMEP	National Integrated Mineral Exploration Programme
NIMG	Nigerian Institute of Mining and Geosciences
NMGS	Nigerian Mining and Geosciences Society
NSCDC	Nigeria Security and Civil Defence Corps
PAGMI	Presidential Artisanal Gold Mining Development Initiative
PPE	Personal Protective Equipment
QL	Quarry Lease
RP	Reconnaissance Permit
SAICM	Strategic Approach to International Chemicals Management
SDG	Sustainable Development Goal
SMDF	Solid Minerals Development Fund
SME	Small and Medium Enterprises
SMMRP	Sustainable Management of Mineral Resources Project
SMSTF	Special Mines Surveillance Task Force
SSML	Small Scale Mining Lease
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
USGS	United States Geological Survey
WHO	World Health Organization
WIMIN	Women in Mining in Nigeria (referred to as Women in Mining Nigeria)
WIMOWA	Women in Mining of West Africa

Country Profile Snapshot: Nigeria



MATERIALS MINED BY ASM

Metallic Minerals (gold, cassiterite, columbite, tantalite)

Industrial/Development Minerals (aggregates, barite, coal, clay, dolomite, feldspar, gypsum, limestone, kaolin, mica, sand, silica sand, salt, and talc).

Gemstones (aquamarine, amethyst, garnet, quartz, ruby, sapphire, topaz, tourmaline).



MINERAL GOVERNANCE FRAMEWORK

Government priorities

Formalization of Artisanal and Small-Scale Miners: Nigerian government is advancing efforts, legislation and initiatives to formalize the sector. It is doing this by incentivizing and supporting formalization of the artisanal mining sector, along with providing extension and technical services to improve mining capacity, access to social services, build capacity among miners and regulators, through both legislation and various initiatives with formalization components.

Enhance geological data and integrate mineral exploration activities: In order to stimulate investment and the sectors development the Ministry of Mines and Steel Development is taking steps to expand access and availability of geological data including the investment in an online solid minerals portal and further geochemical mapping.

Address illegal mining linked to criminality in northwest states & designated conflict affected and high-risk areas (CAHRAs): Mining activity has been linked to organized crime and regional instability in Zamfara State and the EU has designated four other states as CAHRAs (Yobe, Borno, Adamawa and Kaduna). Efforts are underway to increase transparency, accountability and promote better management of the sector by local and national stakeholders.

Laws and policy

[Nigeria Ministry of Solid Minerals Investment Brochure](#)
[Roadmap for the Growth and Development of the Nigerian Mining Industry \(On the Road to Shared Mining Prosperity\)](#)

[ASM Handbook for Nigeria 2015](#)

[Guidelines on Mineral Titles Application \(2014\)](#)

[Nigerian Minerals and Mining Regulations 2011](#)

[National Minerals and Metals Policy 2008](#)

[Nigerian Minerals and Mining Act 2007](#)

Government institutions

Ministry of Mines and Steel Development (MMSD)

Artisanal and Small-scale Mining Department (ASMD)

Council of Nigerian Mining Engineers and Geoscientists (COMEG)

Mineral Resources and Environmental Management Committee (MIREMCO)

Mines Environmental Compliance (MEC)

Mines Inspectorate Department (MID)

Mining Cadastre Office (MCO)

Nigerian Geological Survey Agency (NGSA)

Nigerian Institute of Mining and Geosciences (NIMG)

Solid Minerals Development Fund (SMDF)

Special Mines Surveillance Task Force (SMSTF)

Federal Ministry of Environment (FME)

National Environmental Standards and Regulatory Enforcement Agency (NESREA)

Associations, member organizations and NGOs

Miners' Associations of Nigeria (MAN)

Gemstone Miners & Marketers Association of Nigeria (GMMAN)

Women In Mining Nigeria (WIMIN)

Nigerian Mining and Geosciences Society (NMGS)



Economic and development dataⁱ

2019 Population

Total: 200,963,599

Women: 49.328%

Men: 50.672%

Labor force: 63,226,718

2019 Classification (GNI per capita)

Lower middle income

GNI per capita, atlas method (current USD): 2030

GNI per capita (constant 2010 USD): 2294.54

2019 Gross Domestic Product

USD \$ 448.12 Billion

Poverty headcount ratio (2011 purchasing power parity)

Population on/below poverty line: 40.1% (2018)

Population living on < USD 1.90 per day: 39.1% (2018)

Population living on < USD 5.50 per day: 52.8% (2018)



LIVELIHOODS

Employment

ASM: The artisanal and small-scale mining sector is a vital livelihood for thousands of people across Nigeria. Estimates of direct employment provided by the sector vary from 400,000 (AMDC 2017; Oramah et al. 2015) to 500,000 people (Azubike 2009; Government of Nigeria 2009; Pulse 2019) with most individuals driven to the sector because of lack of alternative employment opportunities. ASM activity occurs in multiple regions across the country with varying compositions of mining populations (e.g., traditional livelihood for indigenous communities, migrant populations from neighboring countries, seasonal mining participation by farmers).

LSM: Attempts to diversify Nigeria’s economy apart from a reliance on crude oil have prioritized the development of the mining sector with incentives for foreign investment. The large-scale mining sector is largely dominated by limestone, granite, laterite, and coal production with other metals (aluminum, iron ore, niobium, tantalum) being produced in lesser amounts. Various major exploration activities are ongoing with Nigeria’s first large scale gold mine (Segilola – Thor Exploration) set to begin production in 2021.

Gender participation in ASM

Women’s participation in the sector is varied, but generally more marginalized than men as they face discrimination and lack of access to capital and often occupy less capital-intensive parts of mine operations (transportation, processing, provision of food and goods). More research and support for female mining associations like Women in Mining Nigeria is needed to understand and support female’s full participation in the sector.

MINING SECTOR SUMMARY

General Mining Context

Nigeria's mining sector is diverse in mineral resources including high value commodities. To date, 44 different types of minerals are identified in more than 500 locations, most of which are yet to be explored. ASM accounts for over 90% of solid minerals mining in the country. (GEUS 2011, 11). The seven strategic minerals designated by the government as being of priority and having the potentials to make significant contributions to Nigeria's economic development include gold, coal, baryte, limestone, bitumen, iron ore and lead/zinc (MMSD 2017, 9). There is therefore a huge investments opportunity in the solid mineral sector in Nigeria. Current exploratory studies show that there is potential for exploration and exploitation of diverse minerals within the 36 states of the Federation (MMSD 2017, 11).

Archaeological studies indicate that Nigeria has a long history of exploitation of mineral resources. Dating back to 900 BC, records indicate tin ore was mined from the Jos Plateau (B. Gagg, 1946 via [Okonkwo and Ibeanu 2016](#)). The Nok culture, an early Iron Age population known for its terra cotta figurines was evidenced to mine local clays beginning around 500 BC. Further records indicate exploitation of minerals including iron, copper, tin, lead, zinc and gold for metal sculpting by the Igbo-Ukwu, Kano, Benin, Ife and Oyo. ([Jemkur et al. 2006](#) via [Omarah et al. 2015](#); [Okonkwo and Ibeanu 2016](#)).

The sovereign territories of Nigeria remained diverse until efforts by the British in the early 20th century began to establish colonial rule over the country. The British made forceful attempts to claim legal authority over the territory and its resources starting in 1900 with the Mineral Ordinance of 1916 claiming control over all minerals and oils within Nigeria to the Crown (Raji and Abejide 2014). Through relationships with traditional authorities, the British exploited coal, tin, columbite and iron deposits relying on an indigenous labor force, often operating for little to no pay, under the management of chiefs. Coal production grew fivefold in a three-year period from 1916 (24,500 tons) to 1918 (148,214 tons) and continued to about 1948 (Boyle 1918, 6). During the colonial period Nigeria became the largest columbite exporter globally and the sixth-largest tin producer coming from exploitation of the Jos Plateau (Michelou 2006; Wardell Armstrong 2008). Laborers suffered varying degrees of abuse including 'force labor, underpayment, withholding of salaries and detention at mines' (Chimmee 2014, 24). In a striking example, workers in iron mines, operating with pickaxes, shovels and baskets, were forced to carry on their heads ore to the port of Onitsha on the Niger river, a distance of almost a hundred miles from the mine (Chimmee 2014, 22). Independence from the British was realized in October of 1960.

Beginning in the mid-20th century the decline of the Nigeria mining sector began and compounded by several social and economic factors. The discovery of oil and gas reserves in 1956 shifted investment focus and was coupled by global declines in prices of coal, iron and tin. The Nigerian civil war (1967-1970) saw many expatriates leave the country and passage of the Nigerian Enterprise Promotion Decree in 1972 seeking to transfer business ownership to Nigerians both contributed to a further decline in foreign investment. As the sector declined the disengaged mine workers shifted into informal operators that have become widespread in the mineral rich regions of Northern Nigeria. From 1970 to the present day, ASM has continued to dominate mining in Nigeria. ASM accounts for over 90% of solid minerals mined in the country. Minerals produced include, but are not limited to, gold, barite, cassiterite, limestone, gemstones and gypsum (GEUS 2011, 10).

The Ministry of Mines and Steel Development, Nigeria's present day administrative body for the management of solid mineral resources was established in 1985. The Ministry is responsible for 'identifying the nation's solid minerals, advising government on the formulation and execution of laws and regulations

guiding the various stages of prospecting, quarrying, mining, handling sale and consumption of solid minerals in the country, through the issuance of Permits, Licenses, Leases and Collection of rents, Fees and Royalties'.ⁱⁱ Prior to reform activities in 2005 the mining sector faced a multitude of challenges. Inadequate geological information and data stymied both exploration and investment. The licensing procedure was inefficient and opaque leading to uncertainty around titles and landing holdings. Artisanal and small-scale mining operations continued with little government oversight and management, and jurisdictional conflicts persisted between Federal and State governments (Adelugba 2017).

Enactment of the Nigerian Minerals and Mining Act 2007 was a seminal reform effort for Nigeria's mineral sector striving to make the country more attractive to foreign investment. Overall, the reforms reoriented the government's relationship to the sector moving from 'Owner-Operator' to 'Administrator-Regulator.' The government divested from mining operations and created fiscal incentives to promote private sector growth (Adelugba 2017). They also established federal ownership of mineral resources and institutional structures to manage the mining sector along with procedure for acquiring licenses and obligations for mineral rights holders (Ango et al. 2019). The 2007 act also established a new Artisanal and Small-scale Mining Department, a Solid Minerals Development Funds, Mineral Buying Centers and provisions for extension services for small-scale miners which were key reforms implemented for the management and development of the sector (Azubike 2009). In 2007 the Nigeria Extractive Industries Transparency Initiative (NEITI) Act was also passed making Nigeria the first country with a dedicated EITI law.ⁱⁱⁱ The Act created the national body mandated to ensure 'due process and transparency in the payments made by all extractive industry companies to the Federal Government and statutory recipients' (NEITI Act 2007).

In 2011 the Nigerian Minerals and Mining Regulations provided further guidance regarding the laws and directives for mineral license holders as well as stipulating the duties of the ministerial offices regarding titles (Mining Cadastre Office), mining operations and health and safety (Mines Inspectorate Department), environmental management (Mines Environmental Compliance Department), and artisanal and small-scale mining operations (Artisanal and Small-scale Mining Department) (NMMR 2011).

Despite reforms from the Mining Act of 2007, the mineral sector's growth and contribution to GDP did not improve significantly. In 2015 the mining and metals sector only contributed about 0.33% to GDP (₦400 billion) (MMSD 2016, 8), a slight decline from 2011 (0.36%) and 2012 (0.38%) levels (National Bureau of Statistics 2012, 14). In light of this limited expansion, the Ministry of Mines and Steel Development (MMSD) developed a strategic roadmap for the growth and development of the sector in 2016. The 'Roadmap for the Growth & Development of the Nigerian Mining industry' set out an ambitious goal for the mining sector to contribute to 3% of GDP by 2025. The strategy reviewed the history and challenges facing Nigeria's mining sector and proposed eight critical levers for success that are translated into an action plan establishing ongoing, immediate, short-, medium-, and long-term measures to be taken. Notably the strategy recognized the number of major challenges the ASM sector faced including operating without proper licenses, under harsh working conditions, being unregulated or poorly regulated resulting in environmental damages and lacking training in operations and business management. In response the roadmap outlined key short-term actions to support the sector including continuing to incentivize and support formalization of the artisanal mining sector, along with providing extension and technical services to improve mining capacity along with social services to address the underlying health and social issues (e.g. drug addiction, HIV prevalence, physical and sexual violence) (MMSD 2016).

In 2017, the World Bank approved a credit of USD \$150 million to enhance the contribution of the mining sector to the Nigerian economy. The project extending through June 2022 aligns with many of the themes from the 2016 Roadmap seeking to strengthen the sector's development and competitiveness through improvements to information infrastructure, strengthening government institutions and growing domestic investment in the sector. Again, formalization of the artisanal and small-scale mining sector is considered

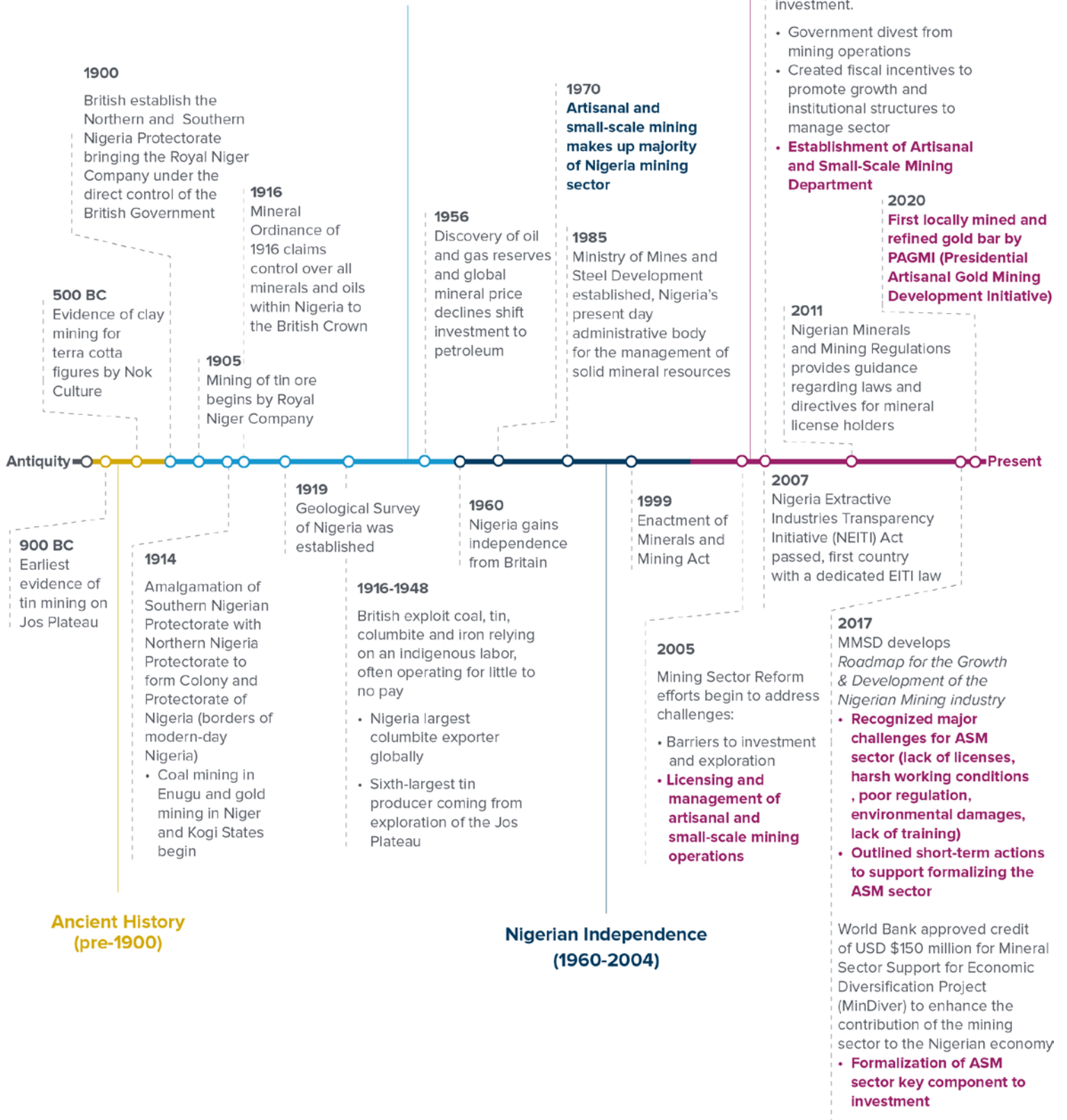
a foundational component to the project.^{iv} Currently the project is implementing activities to formalize artisanal miners into cooperatives, implement a remote sensing monitoring system, provide technical assistance and capacity building to ASM inspectorate services, and support the growth of the small-scale mining enterprises ([Stanley 2020](#)).

Based on most recent data from 2017, the mining sector accounts for 0.3% of national employment, 0.02% of exports and about USD \$1.40billion to the Nigerian GDP ([MMSD 2017, 5](#)).

Timeline

Mining Sector Reform (2005-Present)

British Colonial Period (1900-1959)



ASM context and livelihood

The artisanal and small-scale mining sector is a vital livelihood for thousands of people across Nigeria. Estimates of direct employment provided by the sector vary from 400,000 (AMDC 2017; Oramah et al. 2015) to 500,000 people (Azubike 2009; Government of Nigeria 2009; Pulse 2019) with most individuals driven to the sector because of lack of alternative employment opportunities. ASM activity occurs in multiple regions across the country with varying compositions of mining populations (e.g., traditional livelihood for indigenous communities, migrant populations from neighboring countries, seasonal mining participation by farmers). Women's participation in the sector is varied, but generally more marginalized than men as they face discrimination and lack of access to capital and often occupy less capital-intensive parts of mine operations (transportation, processing, provision of food and goods). More research and support for female mining associations like Women in Mining Nigeria is needed to understand and support female's full participation in the sector.

EMPLOYMENT

The artisanal and small-scale mining sector provides an essential livelihood to thousands of people across Nigeria. ASM activity is widespread across the country to varying extents. Currently, there does not exist a reliable source for information on the total number of individuals involved in the ASM sector in Nigeria. Historical resources exist that estimate the sector directly employs around 400,000 (AMDC 2017; Oramah et al. 2015) to 500,000 people (Azubike 2009; Government of Nigeria 2009; Pulse 2019). An oft-cited statement by the then Minister of State, Ministry of Mines and Steel Development, Alhaji Abubakar Bawa Bwari, in 2018 stated that more than two million people in Nigeria directly or indirectly depend on ASM for their livelihood.^v An accurate estimate or census of the sector is a challenging task, complicated in large part by the sector's fluctuating nature as new sites are discovered, others are exhausted, mineral prices rise and fall, seasonality, and the informal nature of many sites.

Individuals are largely driven to the ASM sector due to unemployment or a lack of alternative employment opportunities. Two surveys (Aliyu et al. 2006, Babatunde et al. 2013) among stone quarry workers in Nigeria found very high percentages of miners (81%, 96%, respectively) who have received at least one form of formal education. Poverty is also a push factor for individuals to join the sector with the allure of potential earnings which would exceed the national average. Miners typically have sponsors who financially support their operations and implement purchase agreements to obtain the minerals mined for trade and export (Idris-Nda et al. 2018).

The sector also represents a traditional livelihood in some areas. For example, the brine mining (salt) community of Keana in Nasarawa dates back hundreds of years (Avre 2008). In some areas, the ASM activity is conducted seasonally as farming remains the primary livelihood. In the dry season when farming is difficult, individuals may participate in mining. This seasonal participation can also be influenced by global mineral prices, particularly gold which during peaks in 2008 saw an increase in traditional farmers participating in the sector.^{vi}

The composition of mine sites can vary by location as in some areas miners are predominantly from indigenous origins and other areas miners are largely migrant populations. Migrant populations from neighboring West African countries like Mali, Ghana, Niger, Cote d'Ivoire, Senegal, Chad, Benin Republic

as well as Chinese nationals have all been evidenced to participate in the ASM sector. In some contexts the influx of workers has created conflicts with communities and indigenous populations. Perceived increases in crime, drug use, alcoholism, prostitution, and communicable diseases are noted among communities impacted by migrant miner populations (Idris-Nda et al. 2018).

Table 1. ASM employment at national level

Year	Labor Force, Total	Employment in large scale mining	% large scale mining to total labor force	Employment in ASM	% ASM to total labor force
1999	40,378,166	-	-	10,000-20,000	0.025-0.050%
2009	51,791,903	-	-	500,000	0.97%
2015	54,557,232	15,035	0.027%	400,000	0.73%

Sources: National employment data in all sectors derived from [World Bank Data](#), large-scale mining sector NEITI 2015, artisanal and small-scale mining derived from publications of ILO 1999, Government of Nigeria 2009, and Oramah et al. 2015

GENDER PARTICIPATION

Women’s participation in the mining sector is varied across Nigeria. No national level studies or data on female participation in the sector are currently available, but a number of state and regional studies have touched on the role of women in the artisanal mining sector in Nigeria (See Environmental Law Institute 2014; Olayide, Olawoye and Olayide 2013; Okereke 2021).

Generally, women participate in the more marginalized, less capital-intensive parts of mine operations due in part to discrimination and lack of access to capital. This includes involvement as pan carriers, processors of ore (crushing, washing, rock-grinding) and providers of food and goods (Okereke 2021). There are examples of mine sites where women occupy positions of greater authority (e.g. concession owners, site managers) but these are less common. A 2008 survey found only 12 out of one hundred and one sites visited had women involved in running the site or as site owners (Wardell Armstrong 2008, 72). Most commonly women participating in the sector as laborer’s have limited education, families to support, and may come from religious or traditional backgrounds that limit their participation in decision making or asserting formal rights (Wardell Armstrong 2008). In some mining areas, researchers have noted that women are not involved in mining activities due to local beliefs and customs. This has been noted in gold mining operations in Anka ((Salati, Mireku-Gyimah, Eshun 2014), as well as in the Zamfara State. In Zamfara, a predominantly Muslim community under Sharia law, women stay within family compounds and may be involved in the processing of ores, rock-grinding and crushing within the compounds. This has been noted to increase the risk of lead exposure for women and their children present in the compound ([Grossman 2012](#)).^{vii}

Data on income earned by women who participate in ASM is also limited. A 2021 investigative news article looking at women’s participation in the tin mining in the Plateau State stated that women can make between ₦30,000 – ₦50,000 per week (USD \$78 – \$130) in tin mining, depending on the quality of the deposit. This money is primarily used to meet domestic needs and is difficult for women to accumulate sufficient savings to assume the role of sponsor for mining sites.^{viii} Another study in 2008 found that at a limestone mining site in Edo State, women earned ₦250 per day (USD \$2.10) as opposed to men who

earned ₦1000 per day (USD \$8.40). At this particular site, the variance was suggested to be linked to perceived productivity and role at the site with men being perceived as doing more physical work (Wardell Armstrong 2008, 60).

Women in Mining Nigeria is a non-profit organization established in 2005 to protect the rights of all groups of women affected by mining operations. The organization, a country-level chapter of the broader global Women in Mining movement, has supported the Ministry of Mines and Steel Development and other partners to enhance opportunities for women's participation in the mining sector, improve health and safety capacity of women in mining, and conduct studies to understand and improve the role of women in the sector. The organization remains active in ongoing efforts to support women in the mining sector.

LABOR, SAFETY AND WORKING CONDITIONS

All forms of mining face various hazards that impact the safety and working conditions of participations. These hazards include blasting, landslides, rockfalls, machinery operations, exposure to toxic chemicals and poor air quality. Artisanal and small-scale mining by its definition is a labor-intensive operation primarily relying on manual labor which is both physically demanding and linked to numerous health and safety risks. The largely informal nature of operations for much of the ASM sector in Nigeria further contributes to hazards in mine design, site management and occupational health and safety (Idris-Nda et al. 2018). These challenges are further complicated by the mining workforce whose participation in the sector is largely driven by poverty or lack of alternative employment and their ability to advocate for improved working conditions is limited. The Nigerian Minerals and Mining Act (2011), responsible for regulating all aspects of the mining sector in Nigeria, does not explicitly make provisions for the enforcement of occupational health and safety. The Act does obligate the holder of a mining license to report the occurrences of accidents as soon as possible and outlines the steps for investigating accidents and associated penalties.

To date a limited number of studies have been conducted in Nigeria to understand the occupational hazards and safety practices among miners (Asogwa 1980, Aliyu et al. 2006, Babatunde et al. 2013, Gottesfeld et al. 2019). Use of preventative and safety measures among miners varies by region and mine site. A 2006 study among stone quarries workers in Zaria, Northern Nigeria, found that 100% of worker (n=74) did not use Personal Protective Equipment (PPE) while 52% exhibited respiratory symptoms. Furthermore, the sites surveyed had no lavatory facilities on the site (Aliyu et al. 2006). Another study among artisanal miners in Southwest Nigeria in 2013 found increased use of PPE among miners (44%, n=127) along with miners experiencing physical injuries (45.8%), chest pains (39.8%) and chronic cough (33.1%) (Babatunde et al. 2013, 627).

A gold rush in Northern Nigeria State of Zamfara received international attention in 2010 as over 400 children died from exposure to lead dust generated from the processing of ore ([Grossman 2012](#)). The outbreak drew international efforts from Doctors Without Borders, the World Health Organization and the United States Centers for Disease Control and Prevention, along with coverage from [Human Rights Watch](#). Researcher identified lead dust trapped in miners clothing, the practice of processing of ore in homes are two common pathways for children to be exposed. Rarely fatal, lead poisoning has significant impacts on neurological, cognitive and biological functions and is especially threatening to children. During the 2010 outbreak, lead concentrations were so high that the mortality rate was estimated as 40 percent among children who showed symptoms of lead poisoning in Zamfara State villages of Abare, Daretta, Duza, Sunke, Tungan Daji, Tungan Guru, and Yargalma ([Human Rights Watch 2012](#)). Lead poisoning was also observed

among domestic free-range chickens present in the community ([Oladipo et al. 2020](#)). Government and international efforts to provide public health messaging campaigns, soil remediation and chelation therapy treatment were critical in managing the outbreak. Over 3,000 children received chelation therapy treatments which brought a substantial reduction in the mortality rate and venous blood lead levels among children post treatment ([Thurtle et al. 2014](#)). A 2018 study ([Gottesfeld et al. 2018](#)) piloted wet spray misting technology in two villages affected by the lead poisoning outbreak. The pilot demonstrated how a significant reduction in airborne lead (95% reduction) and respirable silica (80% reduction) levels was possible using this low-cost intervention. The study also demonstrated that miners were motivated to take measures to reduce exposures to lead and silica dust as they contributed to efforts to construct changing and eating areas and hand washing stations adjacent to the work areas.

ASM communities also face challenges associated with environmental degradation from mining activities. Many mine sites also do not employ responsible environmental remediation practices. Mined-out pits, sometimes exceeding 10 meters in depth, that are left open present a risk to other miners, local residents and livestock, especially during the rainy season when they can become flooded for falls and drownings ([Salati, Mireku-Gyimah and Eshun 2014](#)). A 2016 study into the underlying geology of artisanal gold mining region in the Kataregi area in North Central Nigeria found that gold was hosted in sediments highly enriched with silver and moderately enriched with mercury. The two elements present an environmental health risk for surrounding communities as they can contaminate the effluent disposed of from gold mines and cause adverse environmental and health impacts to plants and humans ([Omanayin and Ogunbajo 2016](#)). Additionally, studies in the Jos Plateau have noted radionuclides of uranium and thorium in soils, mineral samples and some foodstuffs associated with the tin mining activities present in the region ([Jibiri et al. 2007](#); [Arogunjo et al. 2009](#)).

The use of mercury in artisanal gold mining poses a significant health and environmental hazard to miners and their communities. Used principally in the amalgamation process to separate gold from ore, mercury can enter the body during the amalgamation process, from discharge of mining waste or contamination present in air, water, soil and food. Once in the body, mercury is known to disrupt multiple systems (nervous, hematological, immune, respiratory, gastrointestinal, cardiovascular) along with impacting kidney and reproductive function.

Mercury's use in ASGM has received significant international attention through the Minamata Convention, of which Nigeria ratified in 2018. Mercury use in ASGM is believed to be a relatively new process in Nigeria, estimated by some to have been introduced around 2010. In Nigeria mercury is believed to be smuggled and introduced by foreigners from Ghana, Mali, Niger, Senegal and Guinea ([Hunter 2018](#)). The Nigerian Government (Federal Ministry of Environment, Ministry of Mines and Steel Development, WHO) is currently developing their National Action Plan on Mercury in the Nigerian Artisanal and Small-Scale Gold Mining sector with a target completion at the end of 2021.^{ix}

Key Minerals

Nigeria is enriched with a variety of minerals ranging from precious metals and gemstones to development and energy minerals along with other metal minerals like columbite, tantalite and cassiterite. Artisanal and small-scale mining accounts for most mineral production with gold, gemstones and cassiterite (tin), being the most well studied and geographically widest ranging mineral commodities. Estimates of employment for each mineral are not known, but various estimates for the value of each mineral sector exist as much attention has been given to loss revenue through informal exports of gold and gemstones. The Nigeria government through the Ministry of Mines and Steel Development and the Presidential Artisanal Gold Mining Development Initiative along with various national organizations are leading efforts to increase miners capacity and grow the sectors while also offering formal channels for trade to support national development.

GOLD

Nigeria has an abundance of gold deposits found primarily in Northern Nigeria in the Borno, Kaduna, Kebbi, Kogi, Niger, and Zamfara States as well as Southwestern Nigeria in the Osun State. Gold mining in Nigeria dates to the colonial period when mining began in 1914 in the Niger and Kogi States. Gold production peaked in the 1930s declining during World War II and nationalization policies in the 1970s (MMSD 2016). The sector's industrial mining activities have not since recovered as the country's first modern industrial gold project, Segilola mine, is set to begin production in 2021.^x Artisanal and small-scale operators dominate almost all of the gold mining across the country. Most recent production estimates from United States Geological Survey (USGS) set gold production at 7,900 kilograms in 2015 (USGS 2019, 31.6).

Anka, a typical gold mining town in Zamfara State, is one of the major areas where gold deposits are located within the schist belt of Northwestern Nigeria. Gold mining is a seasonal activity for many who alternate between farming in the rainy season and mining during the dry season when pits are not flooded. ASGM activities in Anka can be broken down into three sets of activities: "Rock breaking activities such as drilling and blasting mostly in the remote bushes of Abare, Dareta, Horo-Sunke and Gonar-Kowar; transportation of ore from the mining sites to processing points in Bagega and Shabili; and processing of gold ores and transportation of gold bars to marketing points in Bagega, Shabili and Gusau (Salati, Mireku-Gyimah and Eshun 2014, 151).

Much attention has been focused on the use of mercury in the artisanal gold mining sector in Nigeria. As a Minamata Convention signatory, Nigeria has performed the initial mercury assessment in 2017 (Okoh 2017) and is in the process of developing a National Action Plan for completion in 2021.^{xi} The country is in the second phase of planetGOLD project (planetGOLD+) with work to be undertaken across four knowledge areas: technical solutions, access to finance, formalization and awareness raising.^{xii} Lead poisoning associated with the extraction and processing technique used by artisanal gold miners in Zamfara State have also received significant national and international attention. Further detail of the outbreak and response efforts are noted in the *Labor, Safety and Working Conditions* section of this profile.

The Nigerian gold supply chain has developed largely outside the formal sector. It is reported that the majority of gold is smuggled out of Nigeria to neighboring countries Cameroon, Niger and Togo^{xiii} with an

estimated 97 tonnes of gold being smuggled out of the country between 2012-2018, valued at over USD \$3 billion dollars.^{xiv} The government has taken steps to develop a formal supply chain through the Presidential Artisanal Gold Mining Development Initiative (PAGMI) launched in 2019. The Initiative intends to establish a National Gold Purchase Program and deploy technical services to train miners in safer more efficient extraction and processing techniques. Overall, the government estimates the creation of over 500,000 new mining and formalized jobs and an annual average of \$150 million in taxes, \$25 million in royalties and \$500 million in accretion to foreign reserves from PAGMI.^{xv} In conjunction with the Initiative the creation and licensing of national gold refineries was announced in 2018^{xvi} and anticipated to be online in 2021.^{xvii}

GEMSTONES

Nigeria is considered the most important producer of multiple-colored gems in West Africa, known for its diverse colored gemstones (MMSD 2017, 17). The variety of colored gemstones found in Nigeria include aquamarines, beryl, corundum, emeralds, garnet, kunzite, ruby, sapphires, spinel, tourmaline, topaz and zircon (Adesugba and Hoon 2018; MMSD 2017, 17). The majority of gemstone mining activity, which is 100% artisanal and small-scale, takes place in Plateau, Kaduna and Bauchi States, but the sector is considered largely underdeveloped. The first recorded discovery of gemstones in Nigeria was in 1984 (Floter, Lujala and Rod 2005). There does not exist a formal estimate of the number of individuals participating in the gemstone sector nor data on the value of the sector. A former Minister of Mines and Steel Development claimed “gemstones worth \$3 billion are exported annually from Nigeria, but mostly unofficially.”^{xviii} Others have claimed Nigeria could earn over \$12 billion from gemstones should investments be made in a national laboratory to certify values of stones.^{xix}

Gemstone miners are known to use a variety of mining methods (vertical underground mining, ground sluicing and panning) depending on the nature of the deposit (Ahmed and Oruonye 2016). Miners typically operate with the financial support of a sponsor but these relationships have been characterized as exploitative as the sponsors typically receive a large portion of the sales and leave a small portion to the miners who possess limited knowledge of the actual value of their stones. Miners also do not have access to cutters or treaters and sell directly to rough dealers who export the rough gemstones to cutting centers in Thailand, Sri Lanka and India (Adesugba and Hoon 2018). Most of the rough dealers are individuals from other countries such as China, Gambia, Guinea, Sri Lanka and India who smuggle the stones to foreign countries (Adesugba and Hoon 2018). It has been estimated that Nigeria provides 10% (USD \$1.2 billion) of the total \$12 billion dollar revenue that Thailand generates annually from gemstone trading.^{xx} Without processing capabilities in Nigeria a large portion of the gemstone value chain is being exported along with the stones limiting economic growth and poverty reduction by the sector.

A detailed socioeconomic impact study from 2016 (Ahmed and Oruonye 2016) on gemstone mining in the Taraba State provides the most robust data on the demographics of individuals involved in one region of the gemstone sector. The site was characterized as a ‘rush’ location triggered by the discovery of blue sapphire minerals in 2013. Many respondents identified farming as their primary occupation (95%) citing income generation as the primary reason for involvement (75%). Miners reported income varied, but nearly 80% of all respondents earned less than ₦40,000 per month (US \$240) and with all respondents indicating they were paid in cash for gemstones (Ahmed and Oruonye 2016, 7).

A number of organizations have been formed in recent years to build capacity and advocacy efforts for the growth of the gemstone sector in Nigeria. The Gemological Institute of Nigeria (GIN) was established by private stakeholders to offer training programs regarding gemstone identification, grading, appraisal along with research and analysis for the international market.^{xxi} Two newer associations, Gemologists and

Jewelers Association of Nigeria and Gemstone Miners and Marketers Association of Nigeria (GMMAN) have been created to target jewelers and miners respectively. GMMAN is seeking to develop the capacity of miners to identify, grade and sell their gemstones and link miners to international buyers. The MMSD has also established the Nigeria Institute of Mining and Geoscience (NIMG) with support from the World Bank, and some Nigerians have been trained as master cutters by NIMG. The institute is currently working in partnership with GIA Thailand to build capacity among workers in the gemstone value chain in Nigeria.

CASSITERITE (TIN)

Cassiterite, the chief ore of tin, is found in various regions across Nigeria, but artisanal mining activities for cassiterite are concentrated primarily in the Plateau, Nasarawa, and Kaduna States (Ebikemefa 2020). The Jos Plateau is the most significant tin mining region historically as mining activity dates back to 900 BC with significant commercial exploitation occurring after early 20th century prospectors from the Royal Niger Company became aware of the area's rich deposits (Alexander 1990). It is reported 80% of tin production nationally comes from the Jos Plateau (Omotehinse and Ako 2019). Government oversight of the sector is limited and lacking detailed data on daily production and employment in the sector.

At a typical cassiterite mine site, men will work in teams of ten to fifteen carrying out the ore extraction in mining pits at depths of 30-50m. Mechanization is limited as operations involve diggers, shovels, wheel and buckets systems to haul ore out of pits and head pans for transportation of ore to ground sluices where cassiterite is concentrated. At some sites, women are involved in the transport of the mineral ore from the pits to the banks of the ponds used for processing. At one site in the Jos Plateau women were engaged as contractors and paid for their services through in-kind supplies of the lower grade mineral ores referred to as 'kwangila' (Mallo et al. 2011). A 2020 study by Ebikemefa sampling active and inactive pits in the Jos Plateau estimated daily mine site production at 200 kg of tin which could generate ₦660,000 (using the 2018 price of ₦165,000 per processed 50 kg of tin). Earnings estimated to be generated by the mines are well above the minimum wage in Nigeria and provide significant potential to strengthen GDP if formalized (Ebikemefa 2020).

The environmental impacts of cassiterite mining on land and water have been studied by a variety of authors (Gyang and Ashano 2010, Omotehinse and Ako 2019). Impacts include degradation of pastoral lands caused by exploration activities and erosion, abandoned mine tailings and mine ponds containing radioactive waste, and surface water contamination. Radioactive materials have been found in the mine tailings associated with cassiterite and columbite, but the radiation exposure was determined to not be high enough to be considered a significant occupational health risk (Aluwong et al. 2017). However long-term exposure and impact on the local environment could cause issues if radionuclides build up in the food chain. Education and awareness raising efforts are needed among mining communities to address the environmental impacts. Remediation efforts are rarely taken due to the lack of financing, technical knowledge, and mine site planning. Increased engagement from the local government, Ministry officials and formation of cooperatives could support capacity development and mitigation measures to reduce environmental impacts.

Development & Economic Indicators

As the most population country in Sub-Saharan Africa, Nigeria is a multi-ethnic and culturally diverse federation of 36 states. With a large percentage of population living below the poverty line - 40% (83 million), the country faces a complex web of development challenges associated with economic diversification, infrastructure, governance, and security. The growth of the mining sector in Nigeria remains a priority in the national development as the country aims to diversify its economy reducing dependency on oil (80% of national exports). Artisanal and Small-scale Mining accounts for most of the activity in the mining sector (roughly 80%). The sector's formalization remains a development priority with provision for increased technical assistance and social services to promote the sustainable development of the sector. Data and information exist to demonstrate ASMs contribution to poverty reduction, employment, economic growth and achieving SDGs 1, 2, 5, 8, 10, 17.

GENERAL DEVELOPMENT & ECONOMIC CONTEXT

Nigeria accounts for about half of West Africa's population with roughly 201 million people making it also the most populated country in Sub-Saharan Africa (World Bank 2020). The country is Africa's biggest oil exporter with oil accounting for 80% of national exports and half of government revenues. The fall of oil prices in 2016 resulted in an economic recession where prior to the recession Nigeria's economy was growing at 6.3%, growth rates fell to around 2%.

The COVID-19 pandemic has further slowed economic growth and the country remains challenged by unemployment and underemployment (World Bank 2020). Prior to the COVID-19 crisis, 40% of Nigerians (83 million) were living below the national poverty line of ₦137,430 (\$381.75) per year (National Bureau of Statistics 2020). An additional 25% of the population (53 million) were considered vulnerable^{xxii} of falling below the poverty line due to the crisis (World Bank 2020). The World Bank's Multidimensional Poverty Measure – which captures dimensions of education, basic infrastructure in addition to monetary poverty - finds 47.3% of Nigerians (98 million) live in multidimensional poverty (Lain and Vishwanath 2021).

In terms of human capital development, Nigeria is one of the lowest ranked countries according to the World Bank (2020) ranking 168 out of 174 countries. Nigeria's Vision 20:2020 aimed to bring the country into the world's 20 leading economies by 2020 by diversifying the economy in order to stimulate growth and realize equitable social development for all citizens. Key to the development vision was the growth of the mining sector in its contribution to GDP. Unfortunately, many of the main targets of economic and social development for the Vision 20:2020 were not realized as the country ranked 27th in total GDP globally in 2019.^{xxiii} Population growth outpaced economic growth resulting in 2019 GDP per capita (\$2,229) remaining relatively similar to 2010 (\$2,280).^{xxiv} Nigeria faces key development challenges in terms of infrastructure, strong and effective institutions, economic diversification (dependency on oil), security, governance and public financial management systems (World Bank 2020). In country perceptions of national development place inequality and employment opportunities as key areas of increasing concern (World Bank 2019, 9). The ongoing insecurity in North-East Nigeria caused by Boko Haram beginning in 2011 continues to challenge development in the border region and displace communities.

The Ministry of Mines and Steel Development (MMSD) developed a strategic roadmap for the growth and development of the mining sector in 2016. The 'Roadmap for the Growth & Development of the Nigerian Mining industry' set out an ambitious goal for the mining sector to contribute to 3% of GDP by 2025 with




immediate, short-, medium-, and long-term objectives, The formalization of the ASM sector was a key short term (6 months - 2 years) objective (MMSD 2016, 8). Growth rates of the sector are not made publicly available, but the government remains optimistic in achieving the 3% goal while critics cite national infrastructure as a potential limiter to industrial operations.^{xxv}





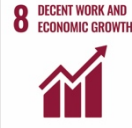


ASM LINKAGES TO DEVELOPMENT INDICATORS

ASM impacts on Sustainable Development Goals (SDGs) are both positives and negatives. Formalization efforts can help mitigate the ASM sector’s challenges and further realize its potential. Incentives provisions for integration into formal, legalized sector combined with the enforcement of legal requirements and the strengthening of the financial and technical capacity of miners can effectively accelerate poverty reduction in rural areas, provide more decent employment and enhance economic growth. Further, access to basic services and technical services to improve production methods and operations can help ensure clean water and sanitation, the protection and restoration of biodiversity as well as healthier miners and surrounding communities. Undertaking reforms to give women equal rights in the sector and access to ownership and control of overland and financial services in accordance with national laws will help increase gender equality in the sector. Formalized and well-managed ASM can also support other economic activities such as agriculture by creating the capital necessary for the growth of the sector, and thus contribute to reducing food insecurity (De Haan, Dales, McQuilken 2020).

The table/figure below shows examples of linkages between ASM and SDGs in Nigeria.

Table 2. ASM linkages to development indicators

 <p>1 NO POVERTY</p> <p><i>End poverty in all its forms everywhere</i></p>	<ul style="list-style-type: none"> o An estimated 500,000 individuals are directly employed in ASM whilst over 1.2 million are indirectly engaged in ASM operations (Adelugba 2017). o ASM is an accessible livelihood strategy adopted primarily in rural areas, open to poor and marginalized people. (Adelugba 2017) o ASM is a production system that allows local people to earn cash income, it serves as a support operation in times of environmental or economic stress (Adelugba 2017)
 <p>2 ZERO HUNGER</p> <p><i>End hunger, achieve food security and improved nutrition and promote sustainable agriculture</i></p>	<ul style="list-style-type: none"> o ASM complements other livelihood activities, such as agriculture, animal husbandry and hunting (Adelugba 2017). o A 2016 study found that 95% of miners in the Taraba State identified ‘farming’ as their primary occupation and mining provided an additional income generating activity for them. Miners reported income varied, but nearly 80% of all respondents earned less than ₦40,000 per month (US \$240) and with all respondents indicating they were paid in cash for gemstones (Ahmed and Oruonye 2016)
 <p>5 GENDER EQUALITY</p> <p><i>Achieve gender equality and empower all women and girls</i></p>	<ul style="list-style-type: none"> o Generally, women participate in the more marginalized, less capital-intensive parts of mine operations due in part to discrimination and lack of access to capital. This includes involvement as pan carriers, processors of ore (crushing, washing, rock-grinding) and providers of food and goods (Okereke 2021). o A 2008 survey found only 12 out of one hundred and one sites visited had women involved in running the site or as site owners (Wardell Armstrong 2008, 72). o Most commonly women participating in the sector as laborer’s have limited education, families to support, and may come from religious or traditional backgrounds that limit their participation in decision making or asserting formal rights (Wardell Armstrong 2008). o A 2008 study in 2008 found that at a limestone mining site in Edo State, women earned ₦250 per day (USD \$2.10) as opposed to men who earned ₦1000 per day (USD \$8.40). At this particular site, the variance was suggested to be linked to perceived productivity and role at the site with men being perceived as doing more physical work (Wardell Armstrong 2008, 60).

 <p>3 GOOD HEALTH AND WELL-BEING</p>	<p><i>Ensure healthy lives and promote well-being for all at all ages</i></p>	<ul style="list-style-type: none"> • The largely informal nature of operations for much of the ASM sector in Nigeria further contributes to hazards in mine design, site management and occupational health and safety. These challenges are further complicated by the mining workforce whose participation in the sector is largely driven by poverty or lack of alternative employment and ability to advocate for improved working conditions is challenged. (Idris-Nda et al. 2018).
 <p>6 CLEAN WATER AND SANITATION</p>	<p><i>Ensure availability and sustainable management of water and sanitation for all</i></p>	<ul style="list-style-type: none"> • Use of preventative and safety measures among miners varies by region and mine site. A 2006 study among stone quarries workers in Zaria, Northern Nigeria, found that 100% of worker (n=74) did not use Personal Protective Equipment (PPE) while 52% exhibited respiratory symptoms. Furthermore, the sites surveyed had no lavatory facilities on the site (Aliyu et al. 2006). Another study among artisanal miners in southwest Nigeria in 2013 found increased use of PPE among miners (44%, n=127) along with miners experiencing physical injuries (45.8%), chest pains (39.8%) and chronic cough (33.1%) (Babatunde et al. 2013, 627).
 <p>14 LIFE BELOW WATER</p>	<p><i>Conserve and sustainably use the oceans, seas and marine resources for sustainable development</i></p>	<ul style="list-style-type: none"> • A gold rush in Northern Nigeria State of Zamfara received international attention in 2010 as over 400 children died from exposure to lead dust generated from the processing of ore (Grossman 2012).
 <p>15 LIFE ON LAND</p>	<p><i>Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss</i></p>	<ul style="list-style-type: none"> • Mined-out pits, sometimes exceeding 10 meters in depth, that are left open present a risk to other miners, local residents and livestock, especially during the rainy season when they can become flooded for falls and drownings (Salati, Mireku-Gyimah, Eshun 2014). • Mercury's use in ASGM has received significant international attention through the Minamata Convention, of which Nigeria ratified in 2018. Mercury use in ASGM is believed to be a relatively new process in Nigeria, estimated by some to have been introduced around 2010. • The use of mercury in artisanal gold mining poses a significant health and environmental hazard to miners and their communities. Used principally in the amalgamation process to separate gold from ore, mercury can enter the body during the amalgamation process, from discharge of mining waste or contamination present in air, water, soil and food. Once in the body, mercury is known to disrupt multiple systems (nervous, hematological, immune, respiratory, gastrointestinal, cardiovascular) along with impacting kidney and reproductive function.
 <p>8 DECENT WORK AND ECONOMIC GROWTH</p>	<p><i>Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all</i></p>	<ul style="list-style-type: none"> ○ ASM is a means of job and wealth creation (Adelugba 2017) ○ Under the Nigerian Minerals and Mining Act of 2007 and its Regulations of 2011, artisanal miners are encouraged to form cooperatives. The grouping of ASM into cooperatives is seen as a way of establishing and defending ASM rights. It is a way of accessing supplies through collective purchase, and to access materials or resources which may be restricted for individuals. Registered cooperatives are eligible to receive Extension Services from the MMSD as well as the Small Grant Scheme.
 <p>10 REDUCED INEQUALITIES</p>	<p><i>Reduce inequality within and among countries</i></p>	<ul style="list-style-type: none"> ○ The Government through the Department of Artisanal and Small-scale Mining offers training of ASM Officers to teach the ASM sustainable mining practices, development of mining equipment leasing programs and linking ASMs to medium and large-scale mining investors.
 <p>17 PARTNERSHIPS FOR THE GOALS</p>	<p><i>Revitalize the global partnership for sustainable development.</i></p>	<ul style="list-style-type: none"> ○ The British Geological Survey (BGS) previously worked with the NGSA to carry out geochemical mapping of the surface of Nigeria as part of a World Bank project from 2008 to 2010. ○ To help the country to support formalization and put more focus on ASM, the Mineral Sector Support for Economic Diversification Project (MinDiver) a \$150 million World Bank Assisted project under the Ministry of Mines and Steel Development was approved in April, 2017 with a closing date of June 2022. The project objective is to link with the Roadmap and encourage domestic investment, create a globally competitive sector that can contribute to job and wealth creation, advancement of social and human security. Also, to enhance the mining sector's contribution to the economy by strengthening key government institutions and

	<p>improve information infrastructure and knowledge. It is assumed that the development of domestic smaller mines will be used to test proposed larger projects and to facilitate the creation of an enabling environment for FDI (Foreign Direct Investment) (Ango et al. 2019, 14).</p> <ul style="list-style-type: none"> o A number of organizations have been formed in recent years to build capacity and advocacy efforts for the growth of the gemstone sector in Nigeria [Gemological Institute of Nigeria (GIN), Gemologists and Jewelers Association of Nigeria, Gemstone Miners and Marketers Association of Nigeria (GMMAN)]
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Source: Authors' work based on various sources.

Mineral Governance Framework and ASM Formalization

The mining sector in Nigeria is governed by the Nigeria Minerals and Mining Act 2007 and Nigerian Minerals and Mining Regulations 2011. The Ministry of Mines and Steel Development, which is the regulating entity for the sector, has sought to revitalize the sector through a majority of reform efforts begun in 2005. The majority of Artisanal and Small-scale Mining operations operate outside the formal regulatory framework without mining licenses, permits or leases. The government has demonstrated intent to formalize the sector through legislation (see National Minerals and Metal Policy 2008, Nigerian Minerals and Mining Regulations 2011) and various initiatives [see 2016 Roadmap On the Road to Shared Mining Prosperity, the Presidential Artisanal Gold Mining Development Initiative (PAGMI), World Bank funded MinDiver project, National Action Plan for Minamata Convention (forthcoming)]. The Ministry is also seeking to improve access and availability of geological data, especially for mineral exploration to stimulate investment, along with addressing mining activities linkages with criminality in northwest states and to promote compliance with 2021 responsible sourcing regulations from the European Union.

MINING STRATIFICATION

Nigeria's mining industry is governed by a number of legal and regulatory frameworks. The Nigeria Minerals and Mining Act, 2007 (MMSD 2007) repealed and replaced the 1999 Minerals and Mining Act (1999 Act) and sought to establish laws that made the sector more competitive for foreign investment. The Act established the Federal Government's ownership of all mineral resources and provided legal standing for ASM activities in Nigeria (Adelugba 2017). Also in 2007, the Nigeria Extractive Industries Transparency Initiative Act 2007 was passed to promote due diligence and transparency on revenue from the extractive industry. (NEITI Act 2007). The National Minerals and Metal Policy 2008 (MMSD 2008) restructured the MMSD and established of the Mining Cadastre Office (MCO) and ASM Department, Mine Inspectorate and Mine Environmental Compliance Departments. In 2011 the Nigerian Minerals and Mining Regulations (NMMR 2011) in accordance with the 2007 Act provided guidelines to mining operations. To strengthen the regulatory frameworks, a new bill that would replace the 2007 Act is currently being considered by the National Assembly. The two main changes in the bill are the establishment of Nigerian Mining & Minerals Commission, a new "super"-regulatory agency for the mining sector and creation of a separate mineral lease and licensing process for artisanal miners (Ango et al. 2019, 19). This will give more room for diversification of the economy, modernization of the sector with international best practices in mining. The

country's investment attractiveness was last ranked in 2014 by the Fraser Institute and was positioned 114 out of 122 jurisdictions (Jackson and Green 2014, 3).

The 2007 Minerals and Mining Act has different categories of mineral title and licenses administered by Mining Cadastre Office. It is autonomous and solely in charge of all matters relating to mineral titles, administering mineral titles, interfacing with investors with respect to granting and processing of mineral titles, and maintaining the cadastral atlas and title registers. A mining title can be granted to an individual, a company or a cooperative (MMSD 2017, 20). Applicants need to provide proof of sufficient working capital and technical competence to qualify for a title and license (MMSD 2007, 22). As of June 2021, the MCO had issued 255 Mining Leases, 2502 Exploration License, 2097 Quarry Leases and 1522 SSML (Small Scale Mining Lease) (Mining Cadastre Office) demonstrating that the majority of artisanal mining operations exist outside the licensing framework (Ango et al. 2019 pg16). Historically the application process for mineral titles at the MCO in Abuja was in paper format but under the World Bank MinDiver an electronic portal is being developed. This will give rise to the establishment of local offices, enabling of online applications, e-recording and archiving. The upgrade will also include an online map for viewing and searching existing mineral titles (Ango et al. 2019, 20).

The different types of mining lease, permits and license are:

(1) **Reconnaissance Permit (RP):** issued for one year, not transferable but renewable annually. It enables the holder to carry out reconnaissance for minerals on a non-exclusive basis. Holder is not to engage in drilling, excavation or other sub-surface techniques, will compensate for any damage to crops and property in the course of prospecting, and must conduct activities in an environmentally and socially responsible manner (Mining Cadastre Office).

(2) **Exploration License (EL):** For 3 years initially and renewable for further two terms of 2 years each, on condition that the title holder adhere to the minimum work commitment/program and all other legal requirements. Application period is 30 days on receipt of valid application. It is not granted over any land that is subject of an existing Exploration License, Quarry Lease, Small Scale Mining Lease, Mining Lease or closed to prospecting/mining activity, for example forest reserves, national heritage, military and government developed areas. The mining area is not more than 200sq km (1000 CUs) (Mining Cadastre Office).

(3) **Small Scale Mining Lease (SSML):** Initially valid for 5 years, renewable for further period not exceeding 5 years. The holder of the lease has the exclusive right to carry out small-scale mining operations. The mining area is greater than 5 acres but less than 3 km² (MMSD 2017, 20).

(4) **Quarry Lease (QL):** Valid for 5 years and renewable every 5 years, provided that holder has complied with the minimum work program, all other legal and regulatory requirement. Application period is 45 days on receipt of valid application. It allows the holder to perform quarrying activities. Area of land shall not be more than 5 km² (Mining Cadastre Office).

(5) **Mining Lease (ML):** Valid for 25 years initially and renewable every 24 years provided that holder has complied with the minimum work program plus all other legal and regulatory requirements. The lease shall be granted and issued within 45 days of receipt of a valid application.

Its area shall be determined in relation to the ore body as defined in the feasibility study with an additional area reasonably required for the working of the deposit, not more than 50 km² (Mining Cadastre Office).

(6) **Water Use Permit (WUP):** Right to use water for exploration, mining or quarrying (Mining Cadastre Office).

MINING FORMALIZATION REGULATIONS (ASM FOCUS)

In Nigeria, the majority of artisanal and small-scale mining operations operate outside the formal regulatory framework without mining licenses, permits or leases. The government has demonstrated intent to formalize the sector through legislation (see National Minerals and Metal Policy 2008, Nigerian Minerals and Mining Regulations 2011) and various initiatives [see 2016 Roadmap On the Road to Shared Mining Prosperity, the Presidential Artisanal Gold Mining Development Initiative (PAGMI), World Bank funded MinDiver project, National Action Plan for Minamata Convention (forthcoming)].

Nigeria faces multiple challenges for the formalization agenda, for example the lack of adequate and up to date geological and operational data on the sector, limited regulatory enforcement and in some instances corrupt practices by regulatory agents can undermine national efforts. For miners there is a lack of access to sufficient capital to obtain licenses and meet operational and environmental standards as well as limited technical and operation capacity to promote efficiency, safety and compliance in practice. Additionally, the incentive structures of formal supply chains like the PAGMI may not be apparent to miners as they may conflate government buying channels with having to pay taxes, mineral pricing may not be competitive with informal channels and relationships with financiers may preclude sale into formal channels (Ango et al. 2019, 64).

Registration of miners is believed to be a key first step for the government to achieve their set objectives for formalization. This process includes the registration of all the miners - individually or as cooperatives, institutions and workers along the mineral supply chain for better organization (Ango et al. 2019, 3). Under the Nigerian Minerals and Mining Act of 2007 and its Regulations of 2011, artisanal miners are encouraged to form cooperatives. Cooperatives are defined by the NMMA of 2007 as a group of artisanal miners, of not less than 20, mutually agreed to work together to pool and harness their resources for the purpose of mining and registered as a cooperative under relevant Federal and State laws. The grouping of ASM into cooperatives is seen as a way of establishing and defending ASM rights. It is a way of accessing supplies through collective purchase, and to access materials or resources which may be restricted for individuals. The cooperatives are registered in their respective state through the Artisanal and Small-scale Mining Department (ASMD). Registered cooperatives are eligible to receive Extension Services from the MMSD as well as the Small Grant Scheme. The Government through the Artisanal and Small-Scale Mining Department offers training of ASM Officers to teach the ASM sustainable mining practices, development of mining equipment leasing programs and linking ASMs to medium and large-scale mining investors.

Under the Presidential Artisanal Gold Mining Development Initiative (PAGMI) in June 2020, Nigeria produced its first artisanal-mined gold that was processed and refined according to the London Bullion Market Association (LBMA) standards for use as a reserve instrument by the Central Bank of Nigeria.

PAGMI was piloted in Kebbi and Osun States and involved the establishment of gold aggregation centers in addition to supporting licensed buying centers and aggregators with access to financing options, responsible sourcing mechanisms, management and technical expertise including improved testing and processing equipment. The Central Bank plans to purchase gold that is mined, processed and refined under the PAGMI for use as part of Nigeria's external reserves. This initiative intends to offer safer, more efficient artisanal gold mining and processing technologies and through the National Gold Purchase Program (Ango et al. 2019, 9) create an access to the international market for the artisanal miners and buying centers.

GOVERNMENT PRIORITIES & KEY TOPIC AREAS

Formalization of Artisanal and Small-Scale Miners: Miners will be better able to comply with policies and regulations, carry out tax payments, access financial and socioeconomic factors, have better administrative and management practices, obey environmental laws, ample exposure to capacity development and empowerment. These efforts are best noted in legislation (see National Minerals and Metal Policy 2008, Nigerian Minerals and Mining Regulations 2011) and the various initiatives with formalization components [see 2016 Roadmap On the Road to Shared Mining Prosperity, the Presidential Artisanal Gold Mining Development Initiative (PAGMI), World Bank funded MinDiver project, National Action Plan for Minamata Convention (forthcoming)].

Enhance geological data and integrate mineral exploration activities: In order to make data more useful and accessible to miners, the limited geological data on mineral resources available in Nigeria is being further developed by the MMSD. The Nigerian Geological Survey Agency (NGSA) has been commissioned to compute the detailed geochemical maps of the surface of Nigeria. The British Geological Survey (BGS) previously worked with the NGSA to carry out geochemical mapping of the surface of Nigeria as part of a World Bank project from 2008 to 2010. With the SMMRP then, NGSA completed airborne geophysical surveys of the entire country, the surface of Nigeria was divided into 44 cells for the geochemical mapping, 8 cells were computed in details, the remaining 36 cells are to be completed under the current MinDiver geochemical mapping project. BGS is under contract through the World Bank MinDiver geodata project to provide technical assistance to the NGSA, specifically to review and compile an electronic geodata archive, develop a geodata policy and data protocols to support data transparency and beneficial uses with targeted end date of 2022 (Ango et al. 2019, 20). The development of the Integrated Automated and Interactive Solid Mineral Portal (IAISMP) is of great importance for government in the formalization and modernization of the sector. All processes of MMSD are being migrated online for better accessible to interested and would-be investors from all over the world (<https://portal.minesandsteel.gov.ng/>). Through the National Integrated Mineral Exploration Programme (NIMEP) the Federal Government seeks to develop a high-quality portfolio of geoscience data that can create a basis for foreign direct investment in the mining sector. The main objective of NIMEP is to reduce investors risk, provide information, create wealth along the mineral value chain and enable a more investor-friendly environment. Nigerian Geological Survey Agency (NGSA).

Address illegal mining linked to criminality in Northwest States: In April 2019 MMSD suspended mining activity in Zamfara State as in some locales, it is linked to organized crime and contributes to overall regional instability in northwest states that has been ongoing since 2014. Recently too, in March 2021, the President declared a no-fly-zone and banned all mining activities in order to curb rising insecurity in

Zamfara State.^{xxvi} MMSD has established State Mineral Resources and Environmental Management Committees (MIREMCOs) and operationalized the Special Mines Surveillance Task Force (SMSTF) in 2017 to address the prevalence of illegal mining nationally. The MIREMCOs provide a channel for issues to be resolved and the SMSTF equips law enforcement with resources to promote compliance with regulations (Ango et al. 2019).

Address designated conflict affected and high-risk areas (CAHRAs): From 1st January, 2021, Regulation (EU) 2017/821 requires supply chain due diligence to be conducted by European Union importers of gold – metals, ores, concentrate and 3TG (tin, tantalum/niobium and tungsten) from Conflict – Affected And High – Risk Areas (CAHRAs). This Regulation provides monitoring of mineral production and processing to ensure that suppliers do not contribute to conflict, do not violate international laws and must respect human rights. The states identified in Nigeria as Conflicted Affected areas are Zamfara, Yobe, Borno, Adamawa and Kaduna. This list is reviewed and updated on a quarterly bases, it was developed based on data from January 2021 and was last updated in March 2021. Thus, there is the belief that by organizing the mining sector through formalization and the development of the Integrated Automation and Interactive Solid Minerals Portal (IAISMP) the challenges of illegal mining can be overcome leading to more transparency, accountability, responsible sourcing practices and better management of Nigeria's abundant mineral resources.

GOVERNMENT INSTITUTIONS

Ministry of Mines and Steel Development (<https://portal.minesandsteel.gov.ng/>) is the main overseer of the mining activities in Nigeria. The Ministry is supported by technical departments and agencies (MMSD 2017, 18). Government is building the organizational and functional capacities of the Ministry of Mines and Steel Development and a stronger regulatory framework for the industry, resolving regulatory conflicts between the existing guiding regulations and the industry, improving policy consistency and direction, improving enforcement of existing regulations and ensuring stronger economic and political coordination of minerals and Mining policies in Nigeria (MMSD 2017). The obligation of the Ministry of Mines and Steel Development (MMSD) through the Artisanal and Small-scale Mining Department are in accordance with the Nigerian Mineral and Mining Act, 2007 to provide extension services to mining communities (GEUS 2011, 13). In 2017, MMSD operationalized the Special Mines Surveillance Task Force (SMSTF), a Task Force made up of police and the Nigeria Security and Civil Defence Corps (NSCDC) established in 2012 to target illegal mining (Ango et al. 2019, 21). The Ministry also enforces compliance with the provisions of international agreements, protocols, conventions and treaties on the environment, the Minamata Convention, Basel Convention, Strategic Approach to International Chemicals Management (SAICM) (Environmental Law Institute 2014, 25) and Extractive Industries Transparency Initiatives (EITI) – [Nigeria Extractive Industries Transparency Initiatives (NEITI)]. Mineral Resources and Environmental Management Committees (MIREMCO) handle environmental matters and sustainable management of mineral resources. (Environmental Law Institute 2014, 26).

Federal Ministry of Environment (<http://environment.gov.ng/#>) established in 1999 carries out the coordination of all environmental matters. It monitors and enforces environmental protection matters, prescribes standards, and enacts regulations on water and air quality, effluent limitations, atmospheric and ozone protection, noise control, and the removal and control of hazardous substances. The Federal

Ministry of Environment cooperates with Federal and State Ministries, Local Government, statutory bodies and research agencies on matters of environmental protection and conservation of natural resources (Environmental Law Institute 2014, 25).

National Environmental Standards and Regulation Enforcement Agency (NESREA) is a parastatal entity under the Federal Ministry of Environment that conducts Environmental Impact Assessment (EIA) and carries out general protection of the environment. There is mandatory pre-construction EIA for all mining leases in the Minerals and Mining Act and its regulations. Completed EIAs are reviewed by the Ministry of Environment and the Mines Environmental Compliance Department within the MMSD (Environmental Law Institute 2014, 21). Miners must obey environmental laws in the Ministry of Environment through NESREA. Its also tasks the Ministry of Environment with passing regulations for the protection of public health or welfare (Environmental Law Institute 2014, 22).

Table 7 provides a list of other government institutions, technical departments, and agencies of MMSD, the key drivers that are specifically involved in the regulation and enforcement of ASM in the country. These are classified according to their functions and responsibilities as regulators in the implementation and management of ASM at both the national and state levels (MMSD 2017, 18)

Table 7 Government Stakeholders Mapping

Aspect	Institutions	Scope/mandate
Geoscience Data Generation	<u>Nigerian Geological Survey Agency (NGSA)</u>	Focus on acquisition, management, storage, interpretation and communication of geoscience information to promote the country's resource potential, responsible for the generation of up-to-date geoscientific data for investors and the general public and encouraging investment in detailed mineral exploration by the private sector.
Licensing	<u>Mining Cadastre Office (MCO) 2007 Mining Act, Sec. 5</u>	Promote private sector investment in solid minerals sector, generate appropriate revenue for government, improve the investment climate and attract foreign investors.
Provision of Extension Services to Mining Communities	Artisanal and Small-scale Mining Department	Organize, support and assist small scale mining operations, provide extension services to mining cooperatives on exploration, exploitation, mineral processing, entrepreneurial training and environmental management, and improve sustainable livelihood in ASM communities.
Law Enforcement and Revenue Collection	Mines Inspectorate (MID)	Maintain the database of operators and production records, responsible for the supervision of industry operations in exploration, evaluation, mine development and production activities, enforcement of mining laws, collection of revenues and ensure safety in operation.
Monitoring and Enforcement of	Mines Environmental Compliance (MEC)	Establish environmental procedures and requirements applicable to mining operations, the review of all plans, studies and reports required to be prepared by holders of mineral titles, enforce environmental best practices in mining, monitor

Environmental laws		and enforce compliance of all environmental requirements and obligations.
State Intermediary for Local Communities	Mineral Resources and Environmental Management Committee (MIREMCO) <i>2007 Mining Act, Sec. 19</i>	State committee serving as intermediary for local communities, state and federal government, miners and mining companies and responsible for deciding disputes between mineral title holders and local communities.
Regulatory Body	Council of Mining Engineers and Geoscientists (COMEG). <i>Established through Decree No. 40 of 1990</i>	Maintain a register of all professionals, including mining engineers, metallurgists, geoscientists and others in related fields, who are to practice the professions above within Nigeria, regulate and control the training and practices of professionals in the extractive industries.
Capacity Development	Nigerian Institute of Mining & Geosciences (NIMG)	Train the requisite manpower for the emerging mining industry, provision of postgraduate training in mining and geosciences, short courses in mining, geosciences and extension services, consultancy services, research and development.

Sources: MMSD 2016, 25; MMSD 2017, 18; Ango et al. 2019, 18

ASM ASSOCIATIONS AND ALLIANCES

The Miners Association of Nigeria (MAN) (Previously known as Association of African Miners): National Industry Association with thirty-two state chapters, is the umbrella body of all other trade and industry associations in the Nigerian mining industry. The association has diverse membership of entities and individuals that are directly involved in mineral resources exploration and exploitation in the country. At inception in 1944, the Association was meant to protect the interest of the African mine workers. After independence, it changed into an association of Nigerian Mine Owners which later changed its name to Miners Association of Nigeria (MAN) in 1993. The association's main interest is to move mining activities to greater height whereby operators would be empowered to mine with ease for the betterment of mining industry, wealth creation, and employment generation in Nigeria, and to positively engage the Government to provide enabling environment for mining activities to thrive.

Gemstones Miners & Marketers Association of Nigeria (GMMAN): a membership organization founded to develop the capacity of its members. The Association is involved in the development of the Gemstones sector of the Nigerian economy. It helps its members in the identification and grading of Gemstones, linking members to buyers and assisting international buyers in sourcing for Gemstones in Nigeria. It also provides information on the Nigerian Gemstones sector.

Women in Mining Nigeria (WIMIN): NGO that is represented in all the states of the Federation and Federal Capital Territory (FCT). Established by Janet Febisola Adeyemi, a Geologist and an Engineer. It was registered in 2005 as the Association of Women Miners to protect the rights of all the groups of women affected by mining operations. Membership cut across both women and men with diverse occupational

trade and professional backgrounds who actively support the minerals and mining industry. Renamed Women in Mining Nigeria in 2014 engages to:

- Promote mining operations in accordance to environmental guidelines for sustainable mining.
- Work to promote and progress the employment, retention and professional development of women through advocacy while demonstrating the value of women who are often left out in all negotiations relating to mining.
- Encourage Women in ASM to engage in other seasonal activities like agriculture.
- Provide valuable education benefits and offer members the opportunity to become acquainted and work with others involved in the mining industry both locally and internationally, to acquire new personal and professional contacts.
- Provide a national voice within the global minerals and mining community.
- Affiliate to Women In Mining of West Africa (WIMOWA), Association of Women In Mining in Africa (AWIMA) and International Women in Mining (IWIM).

Nigerian Mining and Geosciences Society (NMGS): An international, non-governmental and nonprofit making professional society previously Nigerian Mining Geological and Metallurgical Society (NMGMS) founded in 1961 and officially inaugurated in 1962. In 1977 the name was changed to Nigerian Mining and Geosciences Society. Its main objectives include: a) Advancement and practice of Mining, Earth Sciences and Metallurgy. b) Acquisition, preservation and dissemination of mining geoscientific and metallurgical knowledge. c) Publication of an interdisciplinary learned Journal of Mining and Geology (JMG), the CRUST, periodicals and specialized books including annual books of abstracts and programmes of the society's conferences and activities; d) Upholding the ethics and safeguarding the interests of the professions covered by the society. The society also has statutory representation in the Council of the Nigerian Mining Engineers and Geoscientists (COMEG) established by the Federal Republic of Nigeria Decree No. 40 of 1990. Membership cut across Nigerian, foreign professionals and practitioners who had worked or are still working in the country. In order to sufficiently serve the interests of the various disciplines like mining engineering and geosciences represented in the society and its widely dispersed membership of Fellow, Corporate, Graduate, Students, Affiliate, Institutional and Honorary fellow in the academia, public and private sector, the society recognizes local chapters and specialist groups whose activities are directed at strengthening the NMGS in achieving its main objectives. The affairs and operations of the NMGS are managed by its Council; consisting of Executive Officers' Ordinary Members, Fellow Representatives, Affiliate Representatives and Institutional Representatives.

Other associations with limited online information available: Dimension Stones Association of Nigeria, Association of Miners and Processors of Barite in Nigeria, Women in NMGS and Women in COMEG Mining are new women's groups being created from the regulatory and professional bodies.

Key Data Needs & Calls to Action

There is limited up-to-date data and information on ASM in Nigeria. There does not exist a reliable source for information on the total number of individuals involved in the ASM sector in Nigeria whereas a few estimates without demonstrable methodologies have been recycled through the literature on the sector (AMDC 2017; Oramah et al. 2015; Azubike 2009; Government of Nigeria 2009; Pulse 2019). Published research on women's participation in Nigeria's artisanal mining sector is also very limited, as is assessments of the presence of children on mine sites. Government, international institutions and researchers should look to local civil society organizations like [Women in Mining Nigeria](#) and [Women's Right to Education Programme](#) to engage in building capacity around data collection and management in order to accurately understand the challenges women face in the sector and identify opportunities for strengthening women's equal participation. Better data on the differences in pay between men and women, women's roles and working conditions at the mine site versus men, access to and control over resources and decision making between men and women are some of the indicators that will improve understanding of gender participation in the sector.

As the Nigerian government moves forward with the 2016 'Roadmap for the Growth & Development of the Nigerian Mining Industry' and the Presidential Artisanal Gold Mining Development Initiative (PAGMI) it will be critical for the government to address the ASM sector's informality. Data generated through components of these initiatives (remote sensing monitoring systems, capacity building of local authorities, training of miners) will be critical to understanding the extent of mining activity, barriers to formalization experienced by ASM and how the Nigerian government can enable the sector's growth and contribution to national development. The issue of informal trading and smuggling is a key area in which better monitoring data of the sector can drive policy makers and local officials to create enabling environments that incentivize formalization and realize the sector's significant potential to contribute to the formal growth of the local and national economy.

The largest body of literature on Nigeria's ASM sector focuses on the health and environmental impact of ASM. The lead dust poisoning in Zamfara State in the early 2010s has been well documented and efforts to assess environmental contamination caused by ASM operators continue to be produced by researchers in the sector. Such data is valuable in understanding the long-term health and environmental impacts of the informal sector and the need for government and civil society to take appropriate measures to build capacity and create attainable standards that promote best practice among miners.

Compiling and researching key data and information gaps in Nigeria's ASM is a key activity in understanding the sector and measuring changes over time that can reflect the success of interventions, initiatives and policy reforms and persistent challenges.

Endnotes

- ⁱ World Bank and OECD National Accounts data files
- ⁱⁱ See Ministry of Mines and Steel Development (<https://www.minesandsteel.gov.ng/about/>)
- ⁱⁱⁱ See EITI Nigeria (<https://eiti.org/nigeria>)
- ^{iv} See MinDiver project page on the World Bank website (<https://projects.worldbank.org/en/projects-operations/project-detail/P159761>)
- ^v See Construction & Engineering Digest (<https://www.cedmagazineng.com/mmsd-holds-first-national-stakeholders-discourse-on-opportunities-and-challenges-of-artisanal-mining-in-nigeria/>)
- ^{vi} See The Guardian “Nigerian gold mining: farmers choose death by lead poisoning over poverty.” (<https://www.theguardian.com/global-development/2014/mar/17/nigeria-gold-mining-farmers-lead-poisoning-poverty>)
- ^{vii} Further discussion of a lead poisoning outbreak in Zamfara state can be found in the Labor, Safety & Working Conditions section.
- ^{viii} See ‘Special Report: Lacking capital, Nigeria’s women artisanal miners are relegated to menial labour’ (<https://www.premiumtimesng.com/news/headlines/434427-special-report-lacking-capital-nigerias-women-artisanal-miners-are-relegated-to-menial-labour.html>)
- ^{ix} See NAP in Nigeria (<https://open.unido.org/projects/NG/projects/150170>)
- ^x See Nigeria Pins Hopes on First Gold Project to Boost Mining Sector (<https://www.bloomberg.com/news/articles/2020-10-09/nigeria-pins-hopes-on-first-gold-project-to-boost-mining-sector>)
- ^{xi} See NAP in Nigeria (<https://open.unido.org/projects/NG/projects/150170>)
- ^{xii} See PlanetGold Phase 2 (<https://www.planetgold.org/planetgold-phase-2>)
- ^{xiii} See “Nigeria’s first gold refinery plans to triple capacity in five years” (<https://www.reuters.com/article/us-nigeria-gold/nigerias-first-gold-refinery-plans-to-triple-capacity-in-five-years-idUSKBN1OH1OC>)
- ^{xiv} See Everything You Need to Know About the PAGMI (<https://statehouse.gov.ng/news/everything-you-need-to-know-about-the-presidential-artisanal-gold-mining-development-initiative-pagmi/>)
- ^{xv} *Ibid*
- ^{xvi} See “Nigeria’s first gold refinery plans to triple capacity in five years” (<https://www.reuters.com/article/us-nigeria-gold/nigerias-first-gold-refinery-plans-to-triple-capacity-in-five-years-idUSKBN1OH1OC>)
- ^{xvii} See “Nigeria’s government licenses two gold refineries” (<https://www.miningglobal.com/automation-and-ai/nigerias-government-licenses-two-gold-refineries>)
- ^{xviii} See Premium Times Nigeria “Gemstones could earn Nigeria over \$12 billion” <https://www.premiumtimesng.com/business/business-news/349194-gemstones-could-earn-nigeria-over-12-billion-don.html>
- ^{xix} *Ibid*.
- ^{xx} See Nigeria Premium Times “Gemstones could earn Nigeria over \$12 billion” (<https://www.premiumtimesng.com/business/business-news/349194-gemstones-could-earn-nigeria-over-12-billion-don.html>)
- ^{xxi} See Gemological Institute of Nigeria (<https://gin.org.ng/index.html>)
- ^{xxii} Vulnerability is defined as those with consumption levels between 1 and 1.5 times the poverty line.
- ^{xxiii} See World Bank GDP data (https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?most_recent_value_desc=true)
- ^{xxiv} See World Bank GDP data (https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=NG-1W&most_recent_value_desc=true)
- ^{xxv} See Mining Weekly “Nigeria sets ambitious target for mining sector growth” (<https://www.miningweekly.com/article/nigeria-sets-ambitious-target-for-mining-sector-growth-2020-02-06>)
- ^{xxvi} See Guardian Nigeria “Buhari declares Zamfara no-fly-zone, bans mining activities” (<https://guardian.ng/news/buhari-declares-zamfara-no-fly-zone-bans-mining-activities-2/>)

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