

Socio-Economic Impacts of Artisanal and Small-Scale Mining in Parts of Niger State, Central Nigeria

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Abstract: Niger state, central Nigeria is blessed with abundant mineral resources and has been described as the home of gold, in addition other gemstones. Because of these, Artisanal and Small-Scale Miners (ASM) flocked to the state in search of these minerals. The mined materials are often washed in open waterways, rivers and streams thus polluting such sources, while other materials are taken home for further processing thus exposing children and animals to associated minerals like lead. The activities of artisanal miners result in many devastating impacts on the environment which includes land degradation, pollution of soil and water, erosion, desertification and waste disposal. The most obvious to any casual observer is the land degradation created by open mine pits. However, the most serious impact, which affects the health of the population results from contamination of soils, surface water bodies and crops are the Potentially Toxic Elements (PTEs) such as lead, copper, zinc, together with arsenic which has posed serious challenges to the health of the populace. Mitigation Strategies involves Disaster Risk Reduction strategies in solid minerals mining in the state which will involve revisiting the current practices towards improving operations in this potential revenue generating sector.

Keywords: Minna; Niger State; Artisanal; Small Scale Mining; Nigeria

1. INTRODUCTION

A variety of mining activity is carried out in Nigeria by diverse group of people and mining companies. Most mining activities in Nigeria and Niger State by extension is done by Artisanal and Small Scale miners using simple and basic technology.

Artisanal and Small-Scale mining (ASM) refers to informal mining activities carried out using low technology or with minimal machinery. Artisanal and Small Scale mining is an important source of income for millions of poor people around the world. The past decade has seen increasing numbers of individuals and households turn to ASM, and this trend is likely to grow in the face of high mineral prices, population growth, poverty and climate change. Because ASM activities contribute to poverty reduction in remote rural areas, efforts to simply eradicate the activity tend to fail.

However, ASM tends to destroy and degrade forest ecosystems (through habitat destruction, the use of toxic chemicals, pollution of waterways, etc.) and threatens the practices on which mining populations depend (for example, gathering firewood, bush meat hunting, timbering for construction, etc). It is also a growing driver for internal migration and colonization of frontier forest lands that may lead to permanent land clearance.

Key Features of Artisanal & Small-scale Mining (ASM)

Artisanal and Small-scale Mining (ASM) is often characterized by its key features, which include (Hentschel, 2002);

- Minimal machinery or technology used; instead, ASM mining relies on simple techniques and physical labour;
- Operates without legal mining titles (concession, claim) or a valid contract with the title holder;
- Low productivity since ASM often takes place in very small or marginal plots, is limited to surface or alluvial mining, and uses inefficient techniques. (However, total recovery is improved by repetitive scavenging & reprocessing);

- Lack of safety measures, health care or environmental protections;
- May be practised seasonally (e.g., to supplement farm incomes) or temporarily in response to high commodity prices; and
- Economic insecurity.

Artisanal and Small-Scale Mining occurs in approximately 80 countries worldwide. There are approximately 100 million artisanal miners globally. Artisanal and small-scale production supply accounts for 80% of global sapphire, 20% of gold mining and up to 20% of diamond mining (World Bank, 2013). It is widespread in developing countries in Africa, Asia, Oceania, and Central and South America. Though the informal nature and overall un-mechanized operation generally results in low productivity, the sector represents an important livelihood and income source for the poverty affected local population. It ensures the existence for millions of families in rural areas of developing countries. About 100 million people – workers and their families - depend on artisanal mining compared to about 7 million people worldwide in industrial mining (World Bank, 2013).

Nigeria has over 40 different types of minerals spread across the country. These include gold, barite, bentonite, clay, ilmenite, silica sand, topaz, gemstones (tourmaline, aquamarine, sapphire, and amethyst), ilmenite, rutile, limestone, coal, bitumen, iron ore, tantalite/columbite, niobium, lead/zinc, barites, gemstones, granite, limestone, marble, gypsum, talc, iron ore, lithium, silver, pyrite and wolframite.

Niger State lies between latitudes $8^{\circ} 15' - 11^{\circ} 15' N$ and longitudes $4^{\circ} 00 - 7^{\circ} 15' East$. It is bordered to the north by Zamfara State, west by Kebbi State, south by Kogi State, south-west by Kwara State, north-east by Kaduna State and south-east by the FCT (Fig. 1). The state also has an international boundary with the Republic of Benin to the north-west. The land mass of Niger state is about 76,469.903 Km² which is approximately 10 % of the total land area of Nigeria. This makes the state the largest in terms of landmass. The 2006 national population and housing census puts the state's population at 3,950,249. The population was projected to 2014 using an annual growth rate of 3.4 to give a total projected population of 5,164,563. Figure 1 is the map of Niger state showing the twenty-five local government areas, inset is the map of Nigeria showing the location of Niger state. The state is drained by River Niger, from which it derives its name, which runs from west to east to join the ocean and forms the southern boundary of the state, and River Kaduna which runs from the eastern part of the state to the southern to join River Niger at Nupeko. The two major rivers have numerous tributaries including Shiroro and are homes to three hydro-electric dams, Kainji, Shiroro and Jebba including an on-going one at Zungeru area. The tributaries serve as areas for prospecting for alluvial gold deposits as well as points for washing and panning of rock materials for gold recovery, thereby causing contamination of these sources by heavy metals.

2. AIM AND OBJECTIVES

The study is aimed at assessing the impacts of Artisanal and Small Scale mining on the socio-economic aspects of the populace and the environment. The objectives include;

- i. A study of the detailed geology of the state
- ii. The mineral potential of the state and mining activities
- iii. Socio-economic effects of Artisanal and Small-Scale mining in the state
- iv. Remedial action



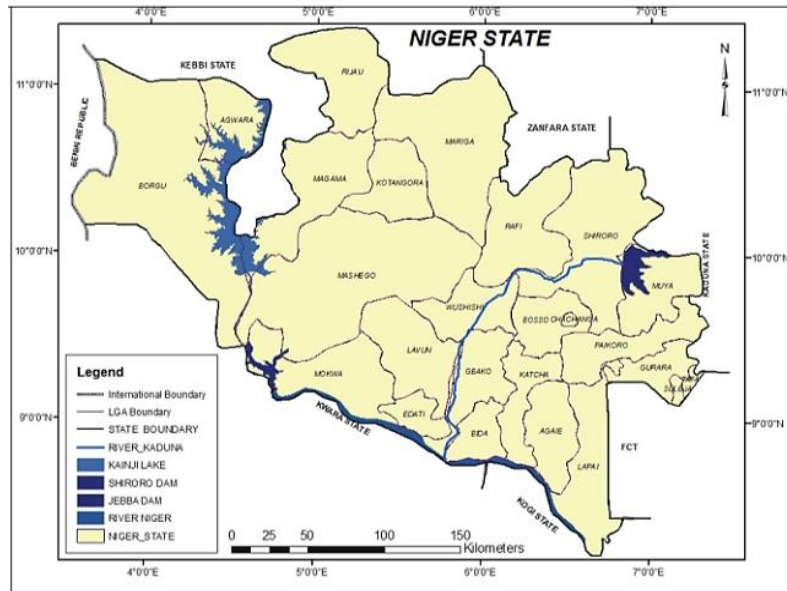


Figure1. Map of Niger state showing the twenty-five (25) local government

3. METHODOLOGY

Geology of the state was studied on a regional scale of 1:250,000 with the aim of identifying broadly the areas underlain by the major rock types. The geology was further studied on a scale of 1:100,000 in the areas underlain primarily by rocks that host the various minerals that occur in the state and that are mined at artisanal level.

The mineral potential of the state was determined using maps from data obtained from areas where mining is actively taking place or had taken place. The information used included the types of minerals mined, the type of mining method adopted and market for the mined minerals. Further information on the number and types of licences in the state was obtained from the Nigeria Mining Cadastre Office (MCO).

Effects of Artisanal and Small-Scale mining on the various communities in the state was studied using structured questionnaires, oral interviews and personal observations by the authors. Information on possible remedial action was also factored into the questionnaire and administered to the miners, community leaders, service providers in the mining areas, health officials and environmentalists. The questionnaire was designed to answer the following questions: approximate number of people involved in ASM, common causes of fatalities in mine sites, marketing of mined minerals and what the money earned is mostly used for, payment of taxes or other forms of payments to government or communities, dangers/threats posed to the communities close to the mine sites, forms of ASM whether working for self, company or cooperative society, and impacts of ASM on the social and economic aspects of the communities, Local Government Area, State and the Federal Government.

4. RESULTS AND DISCUSSION

4.1. Geology

The geology of Niger state comprises of both basement and sedimentary rock terrain. The basement terrain covers the north, northwest and north-eastern part of the state which is approximately 60% of the total area and consists mainly of granites, schists, migmatites, gneisses and quartzite of Precambrian age (> 550 million years old). The sedimentary terrain falls within the Bida Basin of central Nigeria and covers the central and southern part of the state. The rocks of the basin comprise of conglomerates, sandstones, siltstones, mudstones and ironstones. Four major lithostratigraphic units are present in the Basin; From the oldest, the unit consists of Bida Formation, Sakpe Formation, Enagi Formation and Batati Formation. The Bida Formation comprise predominantly of sandstones with subordinate amount of siltstones and mudstones while the Sakpe Formation is made-up of ironstone. The Enagi Formation consists of siltstones, mudstones and sandstones while the Batati Formation comprises of ironstone. Geological research shows that the rocks of the Bida basin were deposited in the Campanian - Maastrichtian times (about 75 million years ago). Parts of the

sedimentary terrain that occurs around New Bussa and Agwara areas fall within the Sokoto (Iullemeden) Basin and consists mainly of sandstone and mudstone. The Sokoto Basin is part of a large Basin that covered most parts of Niger, Benin to Mali and occurs in the north-western part of Niger state where it terminated. Figure 1 is a simplified geological map of Niger state showing the distribution of the various rock types in the state.

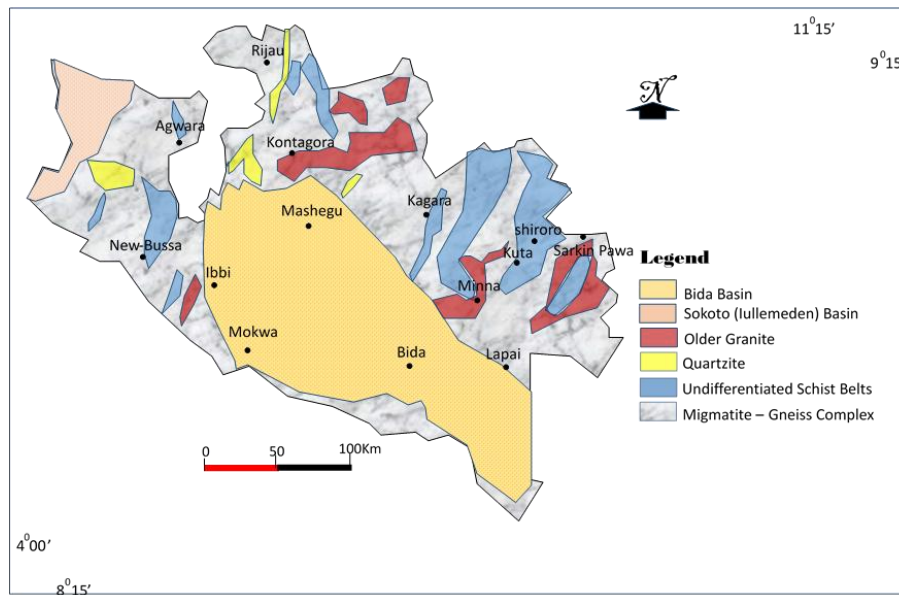


Figure1. Geological map of Niger State

4.2. Mineral Potential

The areas underlain by the Basement Complex is rich in mineral resources most especially the schist belt. Some minerals found in the schist belt includes gold, iron ore, chromite, talc, serpentinites and asbestos. Those that are being mined at Artisanal and Small-Scale level include Gold, Beryl, Scheelite and Tourmaline.

Table1. Solid mineral resources of Niger state and geological setting.

S/No	Mineral Name	Geological Formation
1	Galena (PbS)	Igneous and metamorphic
2	Gold (Au)	Igneous, metamorphic and sedimentary
3	Graphite	Igneous and metamorphic
4	Iron Ore	Igneous, metamorphic and sedimentary
5	Kaolin	Igneous, metamorphic and sedimentary
6	Kyanite	Igneous and metamorphic
7	Marble / Dolomite	Metamorphic
8	Silica sand / quartzite	Igneous, metamorphic and sedimentary
9	Talc	Igneous and metamorphic
10	Tourmaline, beryl	Igneous and metamorphic
11	Scheelite (CaWO ₄)	Igneous and metamorphic
12	Wolframite((Fe,Mn)WO ₄)	Igneous and Metamorphic

According to data from the Mining Cadastre Office most states in Nigeria are presently under various licences with Niger State having 296 licences ranked third, second to Kaduna and Nassarawa states with 404 and 338 number of licences respectively at the end of September, 2016 (figure 3).

Table2. Spread of the various licences in Niger State.

Type of Licence	Number of Holders
Exploration Licence (EL)	183
Small Scale Mining Lease (SSML)	57
Mining Lease (ML)	3
Quarry Lease (QL)	36
Quarry Licence (QLS)	17
Total	296

Table3. Percentage distribution of the minerals the licences in Niger State cover

S/No	Type of Mineral	Percentage of licence
1	Gold	60
2	Granite (Quarry)	20
3	Emeralds, Tourmaline, Beryl, Topaz, Wolframite	15
4	Kaolin, Feldspar, Sand	5

From table 2 the areas under different mining leases are less than 40%, the larger percentage of the licences are exploration licences that only empower the holder to explore for the mineral of interest and if found in sufficient quantity the holder will then apply for a lease to commence mining operations. 60% of the licences in the state were issued for the mining of gold which abounds in the state, while 20% is for granite quarry and 15% for tourmaline and emeralds.

5. ARTISANAL AND SMALL-SCALE MINING IN NIGER STATE

Artisanal and Small-Scale mining is presently taking place in about sixteen out of the twenty-five local government areas of the state. Figure 2 shows the distribution of valid licences across the 25 local government areas of the state. The areas with the highest licences also represent the areas with the highest concentration of artisanal miners. This implies that artisanal mining is taking place in areas that cover over 60% of the state. Table 4 shows the areas where artisanal and small-scale mining is actively taking place and the minerals being mined.

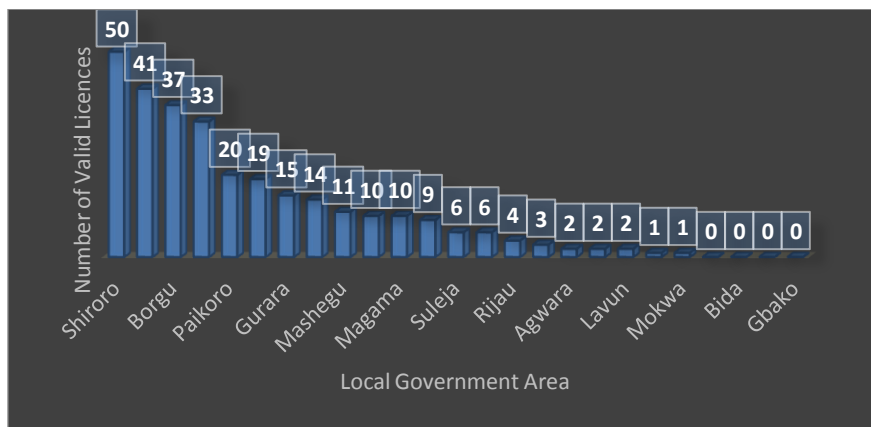


Figure2. Number of valid licences per local government area in Niger state

Table4. Some Artisanal and Small-Scale mining sites in Niger State

S/No	Mining Site Location	L.G. A	Mineral(s) mined
1	Shafini Libale Tungan -Kade	Magama	Gold & Copper Gold Gold, Tantalite
2	Lioji Narungu	Kontagora	Bismuth, Tantalite Tantalite, Beryl, Feldspar
3	Nakomi- Gunu Rafin Sanyi Bwisidna Shakwata Gusoro Gurmana Galkogo Chukuba Allawa Kwaki Zumba Kuta	Shiroro	Gold Iron -Ore Gold Gold Gold Gold Gold Gold Gold Gold Wolframite Kyanite
4	Makaura Shadadi Kwuimo	Mariga	Iron- Ore Topaz, Beryl Gold, Tantalite, Amethyst
5	Maiwayo Baddegi	Katcha	Gold Silica sand

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6	Kwale	Edati	Amethyst
7	Gado Kwakuti Danu Paiko	Paikoro	Gold Dolomite Gold Granite, Manganese
8	Zazzaga Sarkin-Pawa Gunki	Munya	Gold, Tantalite Tourmaline Gold
9	Gulu-Kandi Nugbangi Mayaki	Lapai	Kaolin Kaolin Gold
10	Konkoso Malale Koro Leshigbe Woko Garafini	Borgu	Iron-Ore Iron-Ore, Baryte Gold Gold Gold Gold
11	Tashan-Jatau Yakila Tegina Ushiba Uregi Garun- Gabas Gulenge Gidan-Ugwu Madaka Ringa	Rafi	Gold Talc, Gold Granite Tantalite Gold Gold Gold Gold Manganese Talc, Kaolin, Manganese
12	Sabon-Ushe Darga/ Dukku Warari	Rijau	Gold Topaz, Beryl, Quartz Tourmaline
13	Mamuzhi kutigi	Lavun	Kaolin Kaolin
14	Tsauni Bakwai FM- Maitumbi	Bosso	Gold, Laterite Gold, Granite, Clay,
15	Igade Kwatachi Kanti/Leaba Makera	Mashegu	Gold Scheelite Gold, Scheelite Iron-Ore
16	Luku	Suleja	Gold, Granite
17	Tafa	Tafa	River sand, granite, Clay
19	Makici, Kontagora	Kontagora	Tantalite, Beryl
20	Uregi	Rafi	Gold
21	Alawa	Shiroro	Gold
22	Gyaramia	Shiroro	Gold
23	Baduku	Rafi	Gold
24	Durumi	Rafi	Gold
25	Farin Kasa	Rafi	Gold
26	Kukoki	Rafi	Gold
27	Kurmin Giwa	Rafi	Gold
28	Ungwan Kaura	Rafi	Gold
29	Usde	Kontagora	Beryl
30	Ukuru	Mariga	Gold
31	Kutunku	Wushishi	Gold
32	Kwanzo-Kwanzo	Magama	Gold

5.1. Effects of Artisanal and Small Scale Mining in Niger State

5.1.1. Reason for ASM

The reasons that individuals enter ASM are varied and include both 'push' and 'pull' factors.

- a. Decline in the viability of agriculture, or as a way to supplement agricultural income.
- b. Other push factors include poverty, conflict, natural disasters, or economic crisis.

- c. Pull factors that encourage people to enter this sector include the potential for high profits.
- d. Idleness due to available time with nothing to do after harvests.

5.1.2. Features of ASM in Niger State

- a. Minimal machinery or technology is employed; instead, the miners rely on simple techniques and physical labour;
- b. Operates without legal mining titles (concession, claim) or a valid contract with the title holder. They simply rely on information on success by other miners.;
- c. Low productivity since ASM often takes place in very small or marginal plots, is limited to surface or alluvial mining, and uses inefficient techniques. (However, total recovery is improved by repetitive scavenging & reprocessing);
- d. Lack of safety measures, health care or environmental protections;
- e. Mostly practised seasonally by the local community (e.g., to supplement farm incomes) or temporarily in response to high success rates by other miners in the area.
- f. Professional artisanal miners come in from neighbouring states and even countries like Niger, Mali, Benin and Togo to mine prospective areas.
- g. Economic insecurity and the need to compliment or supplement existing sources of income, this especially affects women in mining.

5.1.3. Economic Opportunities

ASM has contributed to development in most of the areas by providing employment, increasing local purchasing power, stimulating local economic growth and slowing urban migration.

However, this sector also creates social, environmental and financial challenges that may undermine development.

ASM involvement presently takes two forms: that practiced by the members of the local communities and those that involve individuals from other communities, states and other parts of west Africa.

5.1.4. Social and Environmental Issues

The artisanal mining sector has adversely affected mining communities in the state and had not provided them with any benefit at all during or after mining except the adverse effects on the environment.

ASM has lead to an influx of workers and created conflict in the communities, and indigenous populations. This influx had often led to upsurge in crime, drug abuse, alcoholism, prostitution, communicable diseases and other vices that were probably previously unknown to the communities. Sanitation and basic health care are completely lacking in these areas common ailments are often treated using self-medication by buying drugs from peddlers that abound in such sites.

Women and children are also frequently involved in ASM activities creating health, physical and psychological concerns as well child labour because most of the children involved in ASM are below the age of sixteen (Idris-Nda et al, 2015)

The lack of legality in the ASM sector also affects mines design, management of excavations and groundwater and worker safety. Dangers in the mine sites include lack of training, poor ventilation, lack of safety equipment, improper use of chemicals, and obsolete equipment (Hentschel, 2002). ASM can be very dangerous; at least 28 children died of lead poisoning in one location alone in the state because of ASM, death has become a common feature among ASM workers in the state with more lives being lost from collapse and caving-in of mine pits burying the workers. In 2016 alone more than 10 fatalities were reported from mine sites while most cases of death often go unreported.

ASM communities may also be affected by environmental degradation which range from scaring of the environment, loss of farmland, loss of flora and fauna, surface and groundwater contamination and plant and soil contamination (Idris-Nda, 2013). ASM can pollute waterways through mercury use, dam construction, a build-up of silt, poor sanitation, and effluent dumped in rivers.

5.2. Mineral Marketing

Miners involved in ASM trade gold and minerals informally and do not pay tax or royalties, limiting the ability of governments to provide services or enforce laws. ASM may also be used to fund drug peddling, procurement of arms, and support insurgency activities while undercutting the viability of legal mining (CASM, 2009).

6. CONCLUSION

Artisanal mining takes place in zones B & C in Niger State with only few areas in zone A affected. The reason for it been that over 90% of the land mass of zone A falls within the sediments while zone B& C are wholly within the basement complex (the schist belt). Been within the shist belt, these zones are gold laden and the fact that the area is a basement gives room for the occurrence of other minerals too. For economic reasons both the employed and unemployed scout for these minerals since there are ready buyers to mine and sell for self-sustenance. In each of these geographical zones where mining is practiced in Niger State, there are over ten thousand artisans actively involved in the business.

The common causes of death in mining areas are crisis amongst the miners which often leads to clashes that may result in death, the greatest cause of death in mine sites however is pit collapse.

Most of the artisans have sponsors who are dealers in the product mined. The artisans sell their winnings to them or travel out of the state to other places to sell them for better profit. Some of the artisans are responsible family men so, they use the money to solve family problems. I know so many artisanal miners who own fine cars and house her in Niger state but there are others too that are grossly irresponsible, they use their money for all sort of vices ranging from womanizing to smoking of Indian hemp and drinking of alcohols.

In some communities, they make arrangements for tax collection but due to the highly un organize nature of artisanal mining business, it mostly not sustained. in essence, the artisanal miners don't pay taxes at all.

Artisanal mining degrades the environment completely; it is a breeding ground for all types of criminals because of the presence people from different environments, ethnic and religious backgrounds with different ways of behaviors in a particular environment at the same time. This also changes the way of behaviors of the children in that community to issues generally. Artisanal mining is a money spinning venture but the impacts are many as listed above.

Majority of Artisanal miners work for self, only less than 30% of them work for companies. How many of these companies are even on ground to work now in Niger state giving the current state of insecurity in the County?. Only a few indigenious and poorly funded companies are working and they are the ones that engage the artisans to work for them.

Artisanal mining practice needs to be encouraged to reduce the rate of un employment in the State but there is also the need to greatly re-organise them , educate them and get technically competent persons to man the affairs of these group of people on mining sites to reduce death. The security operatives to have to be available on ground to check all forms of anti-social behaviors on mining sites because majority of reported cases of crime on mining sites is due to drug addiction or alcoholism.



Artisanal miners in a mine site in the state



Dammed stream by artisanal miners for panning and washing of gold bearing material



Typical mine pit by artisanal miners in the state



Women artisanal miners and service providers in a mine site



Bagged gold bearing material ready for transportation to other parts of the country.



Artisans involved in repair of mining tools and milling of gold bearing material for further processing.

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