Zhongguo Kuangye Daxue Xuebao
Journal of China University of Mining and Technology

2024 | Vol 29 | Issue 4 | Page 276-287
Journal Homepage: https://zkdx.ch/
DOI: 10.1654/zkdx.2024.29.4-27

Socioeconomic and Environmental Assessment of Artisanal and Small-Scale Mining in Jos and Barkin Mining Communities, Plateau State, Nigeria

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Abstract
Artisanal and small-scale mining (ASM) activities – low tech, labour intensive mineral extraction and processing - continue to grow in sub-Saharan Africa. It serves as a source of livelihood to many local community dwellers. The enormous contribution of this occupation to employment generation in local communities cannot be over emphasized. Yet, the rapid proliferation of ASM has huge consequences on the environment and alternative means of livelihood such as agriculture. This article examines the socioeconomic and environmental implications of ASM in two selected mining communities in the northern part of Nigeria – Jos and Barkin, in Plateau state, Nigeria. The findings revealed that rather than complementary, the practice of ASM in Northern Nigeria has had a competitive and negative role on the survival of Agriculture in this region due to evidence of deforestation, land degradation and pollution caused by ASM. The study posits that if the dangers of ASM are not curtailed and the prospects harnessed, then the occupation poses risks to other alternative means of livelihood in Nigeria.

Keywords
Artisanal and Small-Scale Mining, Environment, Historical Background, Socioeconomic Factors, Loto Mining

1. Introduction
ASM is a form of mining that involves low level of technology or mechanisation for mineral extraction and processing (Hilson & McQuilken, 2014). The occupation is carried out by individuals, groups, families and cooperatives usually with minimal mechanisation, often in the informal sector of the market (Hentschel et al., 2003). ASM is usually influenced by poverty and unavailability of alternative means of livelihood. It is a resilient livelihood choice for vulnerable people and has provided a means of livelihood for millions of people mostly in developing nations across the globe (Eniowo et al., 2022). The socioeconomic benefits of artisanal and small-scale mining (ASM) has been well documented in the literature. Studies have provided evidence of how ASM supports rural communities and reduce poverty and hunger (Mallo, 2011; Oramah et al., 2015). Globally, ASM employs 45 million people in 2020 (Adranyi et al., 2024). This figure grew from 40.5 million in 2017, 30 million in 2014, 13 million in 1999 and 6 million in 1993 (IGF, 2018). Also, ASM provides indirect support to three to five times the number of employment it generates worldwide (Buxton, 2013).

ASM has immense socioeconomic significance in Nigeria, a nation having a population of more than 186 million people, 64% of which resides in rural areas (Adesugba, 2018). It has been estimated that up to 500,000 people are directly employed by ASM in the country (Hilson & McQuilken, 2014). The mining industry plays a huge role in opening remote areas to industrial development. Mine development comes with economic benefits to host communities which includes: creation of jobs, creation of power and transportation infrastructure among others (Sumi & Thomsen, 2001). The peculiarities of ASM implies that, local indigenes, and not expatriates, are mostly engaged in its operation. Hence, the occupation reduces rural hardship, promote socio-economic activities and limits rural-urban migration. In places where the potentials of ASM are well harnessed, it also provides a means of generating tax and other revenues for state and national government (Perks, 2016).

However, the role of ASM as a sustainable means of livelihood is questionable. There are documented evidence of devastation to the environment and other means of livelihood which can be attributed to the methods with which ASM is being practiced (Fonshiynwa et al., 2024). Despite the economic significance of ASM, the occupation is widely known for its associated safety, environmental, health and social issues (Hentschel et al., 2003). These include land degradation, mercury/lead contamination and pollution, communal conflict, overpopulation (mineral-rush), increased crime rate, prostitution among others. According to Mallo (2011), the practice of ASM has stripped thousands of square miles of arable lands across Nigeria and has destroyed forests and aquatic habitats. The study of Adeoye (2015) asserts that while ASM has immense socioeconomic significance for rural communities, it brings adverse effects as well.

In Nigeria, the origin of the proliferation of artisanal and small-scale mining can be traced to historical political events. Mining of metals in Nigeria dates back to the 19th century, several decades before the promulgation of the Nigeria Minerals Act of 1946 (Mallo, 2011). Prior to the political independence of Nigeria in 1960, mining of cassiterite (tin ore) was done primarily by several large-scale mining companies such as Tin Fields of Northern Nigeria ltd, and some small producers (FELL, 1939). By 1937, the output for tin concentrate production in northern Nigeria which was about 408 tons in 1908, had increased to 15,035 tons with a value of over £2,500,000, while the total global output for tin was then 145, 000 tons (FELL, 1939). Indicating that during the era of predominance of large-scale mines, Nigeria supplied more that 10% of the global output of tin concentrate. After Nigeria obtained its independence as a colony of Britain in 1960, the success achieved in the quest for political independence stimulated a drive for economic independence by Nigerian elites from the hand of foreign nations. Consequently, in 1972, the military government in Nigeria then made an indigenisation decree (officially called the Nigeria Enterprise Promotion Decree). The aim of the decree was to maximise local retention of profits and to create opportunities for Nigeria businessmen. This drive eventually led the government of the time to make a decree that ropes off certain type of businesses from foreigners (mining inclusive) and reserving these businesses exclusively to the ownership and control of Nigerians (Ogbuagu, 1983).

However, the politicised nature in which the indigenisation policy was implemented sacrificed economic efficiency in the efforts to replace foreigners with indigenes in the economic sector of Nigeria. According to Fayemi (2017), even though there were some isolated positive reasons why the government embarked on the indigenisation policy, the decree had an adverse effect on the mining sector. Evidence showed that many Nigerian investors lacked the technical knowledge, the required capital or the managerial skills to effectively replace the foreigners in the industries reserved for them legally (Ogbuagu, 1983). The nationalisation (indigenisation) policy therefore hampered the participation of mechanised high-tech mining companies in Nigeria, paving way for the proliferation of artisanal and small scale mining in the country (Mallo, 2011).

In addition to the indigenisation policy, there were other factors that encouraged the rise of ASM over established large-scale mining in Nigeria. Prior to independence in 1960, mining and agriculture were the primary economic activities in Nigeria (Adie, 2011). However, many factors, coupled with the indigenisation decree led to decline of the fortunes of mining in Nigeria. These factors include: a fall in global metal prices (including Tin) in the 1980s, the Nigerian civil war (1966–1970), the crude oil boom in 1970s and subsequent overdependence on the oil sector, the depletion of alluvial reserves, and ineffective state control (Adie, 2011; Oramah et al., 2015; World Bank, 2012). Hence, the unfavourable and uncompetitive legal and regulatory framework, coupled with the worsened macroeconomic condition in the country lead to the withdrawal of foreign investments in the mining sector (World Bank, 2012).

In recent times, large-scale mining in Nigeria is mainly limited to aggregate rocks, coal mining and iron ore (Lawal, 2002). Still, these mines do not operate at full capacity and as such, they generate relatively little revenue, which creates opportunities for ASM (Lawal, 2002; Oramah et al., 2015). The obliteration of large-scale mining and proliferation of ASM has resulted in meagre contribution of mining sector to the Nigerian economy. The mining industry, which used to contribute about 5% to the Gross Domestic Product (GDP) of Nigeria in the 1970s, contributes only 0.34% as at 2017 (Fayemi, 2017). This figure has recently increased to 0.77% in 2023 (KPMG, 2024).

At the moment, ASM dominates the entire Nigeria mining industry, constituting an estimated 95% of the industry (Oramah et al., 2015). The tin mining industry which was formerly dominated by established large-scale mining companies prior to indigenisation policy, is now controlled by artisanal and small-scale miners. The largely informal nature of artisanal miners means they give little regard to environmental protection (Eniowo et al., 2017). Studies such as Clement and Olaniyan (2016); and Owolabi (2018) provide evidence of environmental degradation caused by artisanal and small-scale miners in the Northern part of Nigeria. Yet, due to the contribution of ASM to poverty alleviation and domestic sustenance, the occupation cannot simply be criminalised or "wiped away".

Another dimension of the challenges associated with ASM is its negative effect on sustainable livelihoods. For example, there are various mechanisms through which ASM as an extractive activity adversely affects agriculture. One of the mechanisms is through land degradation. The methods with which ASM is being practiced usually render previously fertile soils unsuitable for crop production, thereby reducing the availability of arable lands for agricultural production (Ofosu et al., 2020). Studies such as Boadi, Nsor, Antobre, & Acquah (2016) decried the effect of land degradation and destruction of forest reserves caused by poorly regulated artisanal and small scale mining in Ghana. Boadi et al. (2016) concluded that with the destruction of farmlands, water pollution, high cost of living, and increase in social vices and school dropouts caused by unregulated artisanal mining; the negative effects of ASM outweighs its benefits.

ASM is often practiced by poor and uneducated people who sometimes may not realise that their mining and processing methods do pose a great danger to their health and the environment. While a lot of research have examined the quantitative impact of environmental degradation caused by ASM in northern Nigeria (Clement & Olaniyan, 2016; Environmental Law Institute, 2014 etc.), very few have investigated the socioeconomic benefits in relation to the attributed environmental concerns. One of the few studies that evaluated the relationship between ASM and agriculture in Nigeria (Oramah et al., 2015), presents a positive relationship whereby ASM is considered as an occupation that provides an alternative source of livelihood for farmers due to farming seasonality. However, the socioeconomic consequence of ASM on agriculture vis-a-vis the environment in Nigeria has not been fully explored. This article therefore adds to the existing knowledge on the study of artisanal and small-scale mining in this regard. Thus, this study assesses the socio-economic implications of mining of cassiterite (tin ore) by ASM operators in the study area (Jos and Barkin local govt areas of Plateau state, Nigeria). To better explain the socioeconomic implications of the operations, the study also examines the perceived impact of ASM on the environment in the study area.

2. Methods

For this study, relevant literatures that expound the origin and history of artisanal and small-scale mining in Nigeria were reviewed to provide information on the background of the proliferation of ASM in the country. Also, literatures that discussed the socio-economic and environmental effects of ASM were reviewed, with a keen focus on secondary data available on the case study. For primary data, quantitative and qualitative data were obtained through the use of a well-structured questionnaire and interview sessions respectively in the study area and from regulatory institutions. The primary data for this study were obtained in a field study undertaken between April 2017 and September 2022 in the two communities that constitute the study area of the research.

2.1 Data Collection and Sampling Technique

A well-structured questionnaire was designed and administered to the study population. The questions were divided into four sections. Section A collected personal information of respondents, section B sought information about the effects of mining on the environment, section C on effects of mining on health of people living in the area, while section D contained questions related to social and economic factors.

Cluster sampling technique was employed to estimate the number of households to be surveyed across the locations which make up the sample size. This sampling technique was chosen to overcome the challenge of non-availability of up-to-date records on the number of households in the residential locations. Ibanga (2006) recommends the use of cluster sampling technique where the exact population size is not known in advance or where the population under consideration exists across a wide geographic region as it is the case in this study. The study also assumed that people of similar characteristics do "cluster" or live together in designated residential areas. Ibanga (2006) referred to these areas as "cultural areas". All together 450 households were surveyed.

In addition to questionnaire administration, interview sessions were also conducted to gather qualitative data from the respondents. The literacy level in the study area is commendable; therefore, it was relatively easy for the respondents to understand and respond to the questionnaire. The researcher conducted oral interviews with relevant stakeholders like officials of the National Environmental Standards and Regulations Enforcement Agency (NESREA), officials of the Ministry of Mines and Steel Development (MMSD) as well as local government officials. The interview method also gave the researcher a better appreciation of the research problem.

2.2 Study Area Description

The study area is located within Jos South and Barkin Ladi Local Government Areas of Plateau State, Nigeria. It lies between latitude 9°32'N to 9°54'N and longitude 8°50'E to 8°55'E on Naraguta topographical sheets. It covers a total area of about 356.4km^2. It is in the North central geopolitical region of Nigeria and situated almost at the geographical centre of Nigeria at about 179 km from Abuja, the nation's capital. Jos is linked by rail, road and air to the rest of the country (Adepetu & Dung, 1999). The study area is best known for mining, but agriculture is another occupation that is prominent in the area. According to Owolabi and Opafunso (2017), the study area had played host to a lot of foreign companies that mined the area before the advent of ASM and the failure of the foreign companies to effectively reclaim the mined area leaves the landscape in devastating conditions with several pits ranging from 10m to about 40m left bare without being reclaimed.

2.2.1 History of Mining in the Study Area

The two mining communities which make up the study area in this article are situated in Plateau state – a state in the north-central geopolitical zone of Nigeria. As discussed earlier in this article, Plateau State is renown since pre-independence era for the exploitation of mineral resources. Local Government Areas such as Bassa, Mangu, Barkin Ladi, Riyom, Bokkos and Jos North and South were widely known for mining activities during the colonial era. Thus, these areas are referred to as Jos-Plateau tin fields. Cassiterite mining had been and is still a predominant activity in Jos and environs. Other prominent economic activities in Jos are in the service, manufacturing and agro-allied industries that provide employment for a significant number of the town's population. The mining industry has transformed the agricultural economy. The agricultural industry is now dominated by the retrenched tin-mining workers. These tin-mine

workers had achieved relatively higher levels of socio-economic expectation and attainments than the indigenous farmers who are engaged predominantly in small-scale traditional rain-fed agriculture. Thus, from their farming activities, the retrenched tin-mine workers who chose to become farmers expected a level of income that would sustain the level of socio-economic status they had attained. This they did by engaging in all-year cultivation using irrigation systems. Another major occupation done by the retrenched tin-mine workers is artisanal and small-scale mining (ASM).

2.2.2 Mining Methods Used in the Study Area

Prior to the era of ASM dominance in the Jos-Plateau, the foreign companies that were extracting cassiterite in the region used a well mechanized open-pit method of mining. Open-pit method of mineral extraction is a surface mining technique that involves extracting mineral resources through an open pit or borrow. It is used for mineral resources found close to the surface of the earth and it contrasts with underground mining techniques that require tunneling or construction of shaft or hoists.

However, since the advent of artisanal and small-scale mining in the study area, some artisanal miners also use surface open pit mining method while others use a sub-surface local method of mining called "loto" mining. The loto mine pits are sunk to an average depth of about 30m and a diameter of about 1.3m. The mining method involves groups of artisanal miners of about ten to fifteen who usually form clusters by separating themselves into groups of those who extracts the cassiterite ore and those that processes it. The cycle of production using the loto mining method involves manual digging of pits; hoisting using bucket roll on wooden support; concentration of cassiterite by hauling water on the unprocessed ore along a sluice using a water pump; and sun-drying of the processed ore after which it is sold. Studies such as Mallo (2011) that studied the nature of loto mining in relation to its environmental impacts asserts that the mining technique results in large scale environmental degradation which adversely affects the land, waters and other aspects of the ecosystem.

Theoretically, the life cycle of a mine involves: exploration; development; excavation; and mine closure. The exploration is generally the most important aspect of mining cycle because it is the stage that involves gaining knowledge on whether the mineral to be mined can be mined at a profit or not. Exploration involves determining the grade, volume, orientation and other characteristics of the mineral to be mined. It is at the stage a prospective mine operator will make the decision whether to continue with the mining operation or not, based on the estimated economic, safety, environmental and social impact of the mine. However, artisanal and small-scale miners generally do not conduct exploration but rely on instincts and their experience gained from working with established mines over the years. In the case of Jos-Plateau, many of the artisanal miners were those who worked for the defunct large mining companies in the locality.

Most metallic minerals occur in association with other materials. Therefore, the extraction process involves separation of the valuable mineral from the unwanted materials that they are in association with it. These unwanted minerals are referred to as gangue or wastes. For example, in the Jos-Plateau, cassiterite and columbite occur in association with tantalite, wolframite, zircon, quartz, monazite, ilmenite, magnetite and thorite. Usually, tin, columbite and tantalite are recovered while the others are discarded as wastes. Hence, the tailings consist of these heavy accessory minerals.

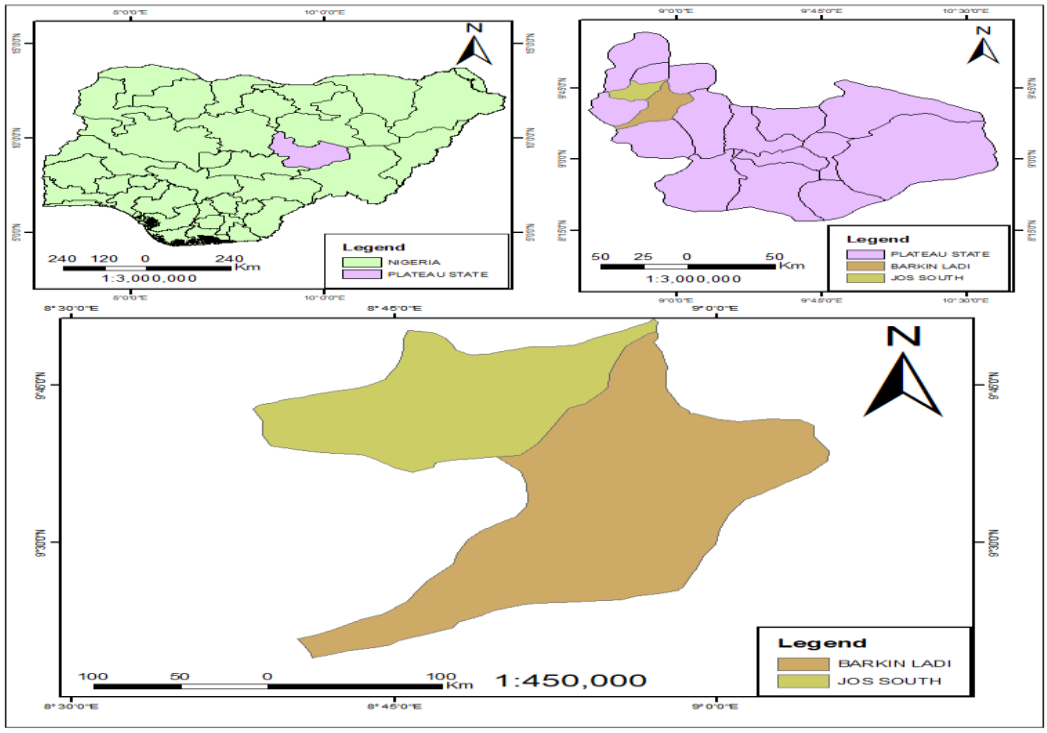

Fig. 1 Map of Nigeria showing the study area

3. Results

This section presents the major findings of the analysis of data obtained from the study. The findings are captured under the following headings: demographics of the respondents, socioeconomic implications of ASM, and effect of the operations on the environment and heath and availability of health facilities.

3.1 Demographics of the Respondents

ASM is a major source of livelihood for the people of Jos and Barkin, both men and women. A large percentage of the inhabitants of the two communities that constitute the study area are Artisanal and small-scale miners. However, to have a balanced survey, participants from other works of life who reside near the mining sites were also recruited into the study in order to evaluate their perception of the mining activities in their community. A summary of the occupational characteristics of the respondents reveals: farmers (8.3%), artisans (26.7%), traders (8.3%), civil servants (13.3%), and artisanal miners (26.7%). The result of the demographic characteristics of the artisanal miners interviewed indicate that 30% of the 80 artisanal miners interviewed were women. The study reveals that women are actively involved in ASM operation in the study area. The primary role of women in the operation in the study area is hauling. The women transport the tin ore using head pans from the pits to the banks of the ponds for processing. These women do not usually receive cash for their labour but are paid with the tin ore (lower grades) which they usually share among their pairs.

3.2 Socioeconomic Implications of ASM

An investigation of the monthly earnings of artisanal miners from the study reveals that 52.7% earned less than ₦20,000 ($55), 45.3% earned between ₦21,000 and ₦80,000 ($58 and $222), and only 1.7% earned above ₦81,000 ($225). While majority of the miners (52.7%) earn less than $55, the investigation also reveals that a slight majority of the miners (above 50%) earn above the minimum wage in Nigeria, which was ₦18,000 ($50) at the time, the field study commenced. The identified socioeconomic implications of the mining operations on the community dwellers include overpopulation which is caused by influx of people moving in from neighbouring communities because of the mining operations; loss of cultural heritage which involves demolitions of ancestral homes and structures; communal conflict that arises from disagreements between the miners and landowners; increased crime rate; loss of farmland and inflation.

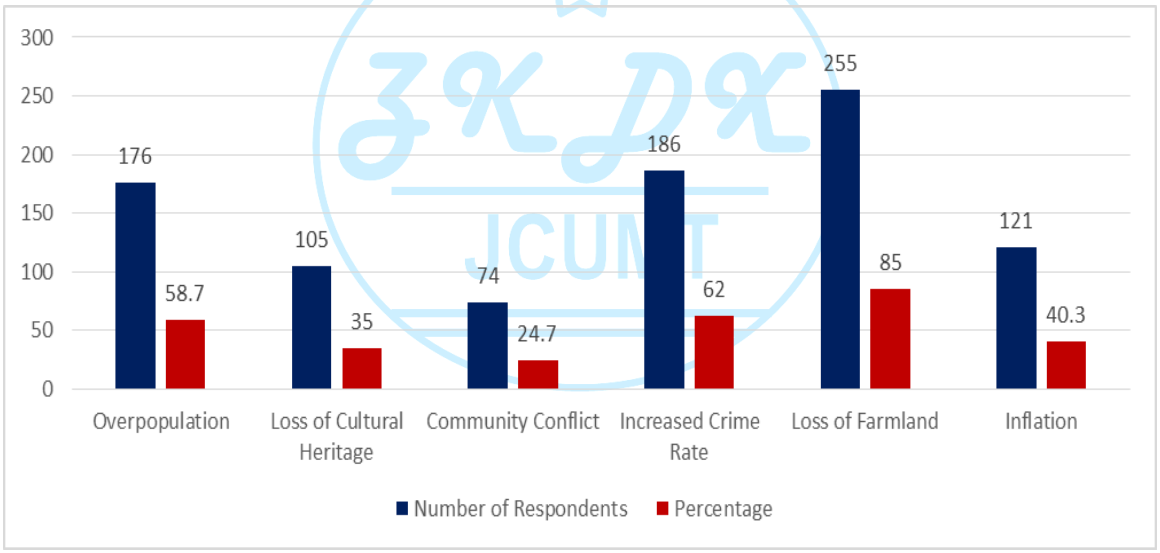

Fig. 2 Socio economic effect of ASM in the study area

3.3 Environmental and Health Impacts of ASM

The study identified several environmental impacts of ASM in the study area and they include: deforestation; air, water and noise pollution; and land degradation. It is noteworthy that, deforestation and land degradation have the highest rank of the environmental impacts identified by the respondents, as 89% and 80% of the respondents see deforestation and land degradation respectively as major negative impacts of mining. In addition to land degradation which was vivid in the study area through several abandoned pits from the time of large-scale mining in the communities and results of earlier environmental studies in the communities, there are several tailing dams created by the ASM operation which possess immense danger to animals and plants.

An analysis of the source of drinking water in the mine community indicate that the major source of water for drinking are drilled borehole; well; stream; and tap water. However, most of the residents usually drink from well water. When queried further, most of the residents agreed that they drink tasty water from their wells and the stream, which can be attributed to the presence of dissolved mineral substances from the mines in the water bodies. It was therefore not surprising that most of the residents report incessant cholera. This may be caused by the pollution of water bodies used for drinking by the mining industries. It is particularly noteworthy that the response from the residents suggest a very weak and unaffordable health system in their community. Our assessment revealed that majority of the respondent resorts to self-medication when ill. It can be observed that majority of the respondents do not patronise hospitals because of lack of

money. This indicate that a very high proportion of the indigenes do not have access to free or affordable health facilities. The observed and documented environmental impact caused by ASM operation in the study area is consistent with documented environmental impact of ASM worldwide (see, Environmental Law Institute, 2014; Hentschel et al., 2003; Ingram et al., 2011 etc.).

Fig. 3 Artisanal mining of Cassiterite in the study area

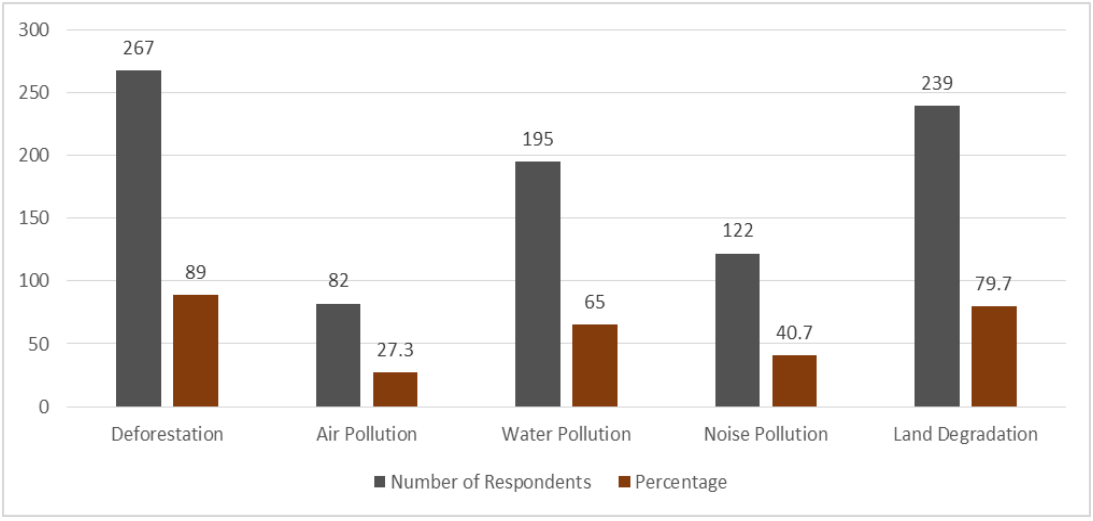

Fig. 4 Environmental Impacts of ASM

4. Discussion

Even though the danger of the mining operation to health, safety and the environment is immense, the occupation provides financial gains to the miners when compared to other rural occupations such as farming and petty trading. The income a worker receives will depend on the responsibility of the worker in the production chain and the number of workers sharing the proceeds. This gives rise to the wide margins and varying income of the miners. Nevertheless, the findings of the study on income of miners is consistent with other related studies such as Oramah et al. (2015) on the relatively good pay the occupation brings when compared with other informal jobs in the study area.

The financial benefits of the mining activities in the study area were evident from the result of the study. However, there were several negative socioeconomic implications of the mining activities on the communities, and they include: overpopulation, loss of cultural heritage, community conflict, increased crime rate, loss of farmland and inflation of the price of basic commodities in the communities that can be directly attributed the mining activities in the communities. A point worthy of note is that, of all the negative impacts of mining in the communities, the loss of farmland is most highly ranked based on the responses from the respondents. This suggests that mining operations had caused vast number of farmlands to be lost in the study area.

Available evidence in previous studies indicate that the practice of ASM in Nigeria does more harm than good to the environment. In Zamfara, a state also in the northern part of Nigeria, the centre for disease control and prevention (2010) reports a study where, 26% of the children (<5 years) surveyed in selected family compounds of gold mining communities in the year 2010, died within 12 months of the study. 82% of the children who died had convulsions which was a sign of lead poisoning. After testing the blood samples of selected living children (of same age bracket) in the same community, it was discovered that 97% of them had lead poisoning above the threshold for initiating chelation therapy. A test on the soil and dust also revealed lead concentration exceeding the US Environmental Protection Agency in 85% of

the family compounds evaluated (Centers for Disease Control and Prevention, 2010). Other studies such as Clement & Olaniyan (2016) also discovered lead content, greater than World Health Organisation (WHO) standard in some ponds located in communities in northern part of Nigeria where artisanal mining of precious minerals is carried out.

Similarly, Environmental Law Institute (2014) reports mercury poisoning caused by artisanal and small scale mining of gold in the northern part of Nigeria. Artisanal and small-scale gold mining (ASGM) is currently the largest contributor towards global anthropogenic mercury emissions since it is responsible for 37% of all such emissions (Environmental Law Institute, 2014). Like lead, the health implications of mercury contamination are not usually noticeable immediately, but manifest overtime. According to UNEP (2013), some of the common effects of mercury exposure are delayed development, mental retardation, seizures, and vision and hearing loss. Other health issues relatable to ASM communities include neurologic and kidney problems and possible immunotoxin/autoimmune challenges from mercury exposure.

An earlier study by Owolabi, Opafunso, & Lajide (2017) reveals the presence of high acidity and heavy metals pollution in soil samples within the vicinity of the cassiterite mine area in this case study. The pH values of the samples indicated that they were all acidic. The index of geo-accumulation (Igeo) in the samples of the study area were of the order Cd > As > Pb > Cr. The high Igeo of Cd, As, Pb and Cr in soil could lead to accumulation of toxic minerals in food crops due to water intake by plants from the soil. This could have serious health effects, including mental retardation in children. Studies have shown that plants growing on soils that are polluted with heavy metals concentration show reduction in growth, performance and yield (Chibuike & Obiora, 2014). This is a pointer to the negative impact of ASM on agricultural production in the study area. Evidence in this study therefore corroborates previous studies on the negative impact of ASM on the environment in the study area. There is need for bioremediation as a means of reviving the soil near the mine area, thereby sustaining farming activities, which is also a major means of livelihood in this study area. There is also need for sensitisation of the community dwellers on the direct negative impacts of the poor mining practices by ASM operators on the farming activities in the community.

5. Conclusion

This study assesses the socioeconomic and environmental implications of artisanal and small-scale mining operation in Nigeria. The study area for the assessment is situated along Jos and Barkin local government areas of Plateau state in Nigeria. Analysis of the result obtained from field work indicates that the practice of Artisanal and Small-scale Mining (ASM) provides succor for community dwellers who have limited means. As such, the practice of ASM cannot be discouraged or outlawed. ASM operation in Jos and Barkin mining communities contribute to livelihoods of both miners and the women who usually assist them with haulage and other support operations. The result of this research is consistent with similar studies on the socioeconomic impact of ASM (Hilson et al., 2018; Ingram et al., 2011; Ofosu et al., 2020; Oramah et al., 2015; Owusu et al., 2019). Apart from financial benefits obtained directly by ASM operators, ASM indirectly provides means of livelihood for other rural dwellers who support the operation through provision of miner's needs such as food and other supplies.

However, attention must be drawn to the environmental and potential health issues that the occupation brings, with a view to provide mitigating measures that enhance sustainability of ASM operation. To mitigate the negative issues associated with ASM in Nigeria, it is important for the mines inspectorate division of the Nigeria Ministry of Mines and Steel Development (MMSD) to improve its monitoring activities and sensitize artisanal miners on the health and environmental dangers of their mining practices. It is also important that miners are trained on more innovative and sustainable mining techniques, and this should be incorporated into the government's formalisation efforts on ASM.

We recommend further studies that will quantitatively evaluate the environmental hazards of ASM with focus on health risks associated with ASM operation in this study location and the entire northern Nigeria where ASM is prominent.

Acknowledgement

The authors wish to thank all the participants in this study for their valuable contributions.

Funding Information

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Conflict

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Research Questionnaire
Department of Mining Engineering,
Federal University of Technology Akure.
20th May, 2016.

Environmental and Health Implications of Artisanal and Smal- Scale Mining In Jos Area, Nigeria

Dear respondent,
This questionnaire is assessing the effects of ASM on the environment as well as Health and socio-economy of the inhabitants of the host communities of Rayfield, Gero, Sabongida Kanar and Kuru Jantar in Jos South Local Government Area as well as Bisichi and Barkin Ladi.in Barkin Ladi Local Government Area of Plateau State, Nigeria Your sincere response to the questions will be appreciated as it will permit me to complete the study successfully. The provided information will be utilized for academic purpose and shall be treated confidentially.
Thanks for your cooperation.
Yours sincerely,

OWOLABI, A.O.
(Research Student)

Section A: Background Information
1. Name of your Organisation: _____
Please tick the appropriate option
2. Gender: Male _____ Female _____
3. Age: 15-29 _____ 30-44 _____ 45-60 _____ Above 60 _____
4. Marital Status: Married _____ Unmarried _____ Widowed _____ Divorced _____
5. Academic Level: Uneducated _____ Primary _____ Secondary _____ Tertiary _____
6. Occupational Distribution: Farmers ____ Artisans ____ Civil Servants ____ Traders ____ ASM _____
7. Monthly Earnings: ≤N20K ____ N21-40K ____ N41-60K ____ N61-80K _____ 81-100K _____

Section B: Respondent's Opinion on the Negative Impacts of Mining
Please tick the appropriate option(s) for each of the following

S/N	Statements	Yes	No
1.	Respondent's Opinion on the Negative Impacts of Mining:		
a	Overpopulation		
b	Loss of Cultural Heritage		
c	Community Conflict		
d	Increased Crime Rate		
e	Loss of Farmland		
f	Inflation		

Others (please specify) ……

2.	Negative Effect of Mining on Farming Activities:	Yes	No
a.	Decrease in Farm Output		
b.	Crop Theft		

Others (please specify) ……..

3.	Effect of Mining on the Tourism Capability of the Study Area	Yes	No
a.	Respondents who believe that Mining Affects the Tourism Capability of the Study Area		

Others (please specify) ……..

Section C: Environmental Effects of Mining in the Study Area

S/N	Environmental Effects of Mining in the Study Area	Yes	No
	Environmental Effects of Mining in the Study Area		
1	Respondents who know of the Environmental Impact of Mining		

Others (please specify) ……

Section D: Various Environmental Impact of Mining
(Please tick the appropriate option for each)

S/N	Knowledge of the Respondents on the various Environmental Impact of Mining	Yes	No	Partly
1	Deforestation			
2	Air Pollution			
3	Water Pollution			
4	Noise Pollution			
5	Land Degradation			

Others (please specify) ……

Section E: Responses of Respondent as Regard the Causes of Land Degradation

S/N	Causes of Land Degradation	Yes	No
1	Tailings Dams		
2	Toxic Materials		
3	Heavy Machines		
4	Deforestation		
5	Long Period of Extraction		

Others (please specify) ……

Section F: Responses of Respondent as Regard the Causes of Pollution

S/N	Causes of Pollution	Yes	No
1	Tailings Dams		
2	Toxic Materials		
3	Heavy Machines		
4	Deforestation		
5	Long Period of Extraction		

Others (please specify) ……

SECTION G: Effect of Mining on Water in the Study Area
Please tick the appropriate box on each of the statements

1	Major Source of Drinking Water	Yes	No
a	Borehole		
b	Well		
c	Stream		
d	Tap		

Please tick the appropriate box on each of the statements

1	Coloured, Tasty and Odorous Water	Yes	No
a	Coloured Water		
b	Tasty		
c	Odorous		

Section I: Health Status of Respondents

S/N	Health Status of Respondents	Yes	No
1	Malaria Fever		
2	Typhoid Fever		
3	Diarrhoea		
4	Cholera		
5	Skin Diseases		

Others (please specify) ……

Section J: Causes of Diseases

S/N	Causes of Diseases	Yes	No
1	Mining		
2	Not Mining		
3	No idea		

Others (please specify) ……

Section K: Places Respondents Patronise for their Health Solution

S/N	Places Respondents Patronise for their Health Solution	Yes	No
1	Clinics and Hospitals		
2	Drug Stores		
3	Herb Sales		

Others (please specify) ……

Section L: Reasons why Respondents patronize other health Facilities apart from Hospitals

S/N	Reasons why Respondents patronize other health Facilities apart from Hospitals	Yes	No
1	Availability		
2	Lack of Money		
3	Effectiveness		

Others (please specify) ……