



## SOCIO – CULTURAL IMPLICATIONS OF ARTISANAL AND SMALL SCALE MINING ON RICE FARMING COMMUNITIES IN JEMA’A LOCAL GOVERNMENT AREA, KADUNA STATE

Zankan, J. A. A.

Department of Environmental Management, Kaduna State University



Corresponding Author’s Email: [zankanabdul@gmail.com](mailto:zankanabdul@gmail.com)

### Abstract

<https://doi.org/10.65760/sjgs.v4.i1.8>

*Artisanal and small-scale mining (ASM) plays an important role in rural livelihoods by providing employment and income opportunities. However, its rapid expansion generates significant socio – cultural, environmental, and economic challenges in many farming communities. This study assesses the socio – cultural implications of artisanal and small-scale mining on rice farming communities, revealing strong perceptions of its significant impacts. A total of 327 questionnaire was administered to respondents for data collection, and analysed using descriptive statistics including mean scores, percentages and NVivo software. The findings indicate that mining activities have substantially altered social structures ( $X = 4.89$ ) and increased inequality in access to resources ( $X = 4.87$ ), suggesting a growing divide within communities. Furthermore, mining has influenced local governance systems ( $X = 4.70$ ) and posed a threat to traditional ways of life ( $X = 4.74$ ), highlighting disruptions to cultural norms and leadership patterns. The results also show that mining contributes to shifts in community dynamics ( $X = 3.83$ ) and a decline in agricultural practices ( $X = 4.13$ ), as labour and attention are redirected from farming to mining activities. This trend poses risks to rice production and rural livelihoods. Concerns about sustainability ( $X = 4.13$ ) further emphasise apprehension regarding the long-term environmental and economic viability of mining. Additionally, changes in leadership approaches to agricultural issues ( $X = 4.12$ ) suggest reduced prioritisation of farming, potentially exacerbating food insecurity. However, the relatively low mean value for community identity and pride ( $X = 2.22$ ) indicates that respondents were divided or generally disagreed on whether mining negatively affects their sense of identity. It is therefore recommended that agricultural support programmes such as access to credit facilities, improved rice seedlings, farm inputs, and youth empowerment initiatives should be introduced to encourage farmers and young people to return to agriculture and promote sustainable rural livelihoods.*

**Keywords:** *Sociocultural Implication, Artisanal and Small Scale Mining, Rice Farming Communities, Food Security and Rural Livelihoods.*

### Introduction

Artisanal and small-scale mining (ASM) has become one of the fastest-growing livelihood activities in many developing countries, particularly in sub-Saharan Africa, where rural populations increasingly depend on mineral extraction as a source of income and survival (Hilson, 2016; World Bank, 2024). In Nigeria, the expansion of ASM has been driven by widespread poverty, unemployment, rising mineral prices, and limited economic opportunities in rural areas (Hilson, 2016; ADB, 2024). Although the sector contributes significantly to household income and local economies (UNDP, 2023), its rapid and largely unregulated expansion has generated serious social, cultural, economic, and environmental challenges for farming communities (Omotehinse, 2025).

Food accessibility and utilization, are critical for food security in non-agricultural rural areas such as mining sites (Winch *et al.*, 2020; FAO, 2025).

Rice farming communities are among the most affected by artisanal mining activities because mining operations are often carried out on fertile agricultural lands, wetlands, and upland areas that support crop cultivation (Mandal *et al.*, 2022; Owolabi *et al.*, 2021). In many rural communities in Nigeria, rice farming remains a major source of livelihood, food supply, and cultural identity (Afodu *et al.*, 2020; Onakuse, 2012). However, the increasing involvement of farmers and youths in mining activities has contributed to labour shortages in agriculture, decline in food production, and weakening of traditional farming systems. Studies have shown that ASM frequently attracts rural labour away from agriculture because of the perception of quick and higher financial returns compared to farming (Omotehinse, 2025; Ofosu *et al.*, 2020).

Beyond its economic implications, ASM has profound sociocultural consequences on host communities. The influx of migrant miners into rural settlements often alters community structures, social relationships, and traditional authority systems. In many mining areas, increased competition over land and mineral resources has intensified conflicts, weakened communal cohesion, and encouraged inequality in access to resources and opportunities (Hussain & Gbadeyan, 2023; Tella & Danjibo, 2024). Recent studies in Nigeria and other African countries indicate that mining communities frequently experience social tensions, crime, child labour, school dropout, and erosion of traditional values due to the rapid growth of informal mining activities (Adeola *et al.*, 2024; Hilson, 2016; Maconachie & Hilson, 2011).

The environmental consequences of artisanal mining further worsen the situation for rice farming communities. Mining activities involving excavation, deforestation, and the creation of pits contribute to soil erosion, land degradation, and destruction of wetlands and fadama lands used for rice cultivation (Sonter *et al.*, 2018; Organisation for Economic Co-operation and Development (OECD) & United Nations, 2024). In mining-affected areas of Zamfara State, Nigeria, studies have reported contamination of rice fields with toxic substances such as lead and arsenic, posing serious health risks to farming households and consumers (Mandal *et al.*, 2022). These environmental problems reduce agricultural productivity and threaten long-term food security and sustainability within rural communities.

Furthermore, the growth of ASM has increasingly influenced local governance and leadership structures in rural communities. Community leaders and local elites often prioritise mining-related benefits over agricultural development, thereby weakening support for farming activities and creating governance challenges (Amoako *et al.*, 2023; Manga & Tukura, 2025). In some communities, disputes over land ownership, mining licenses, and benefit-sharing arrangements have resulted in mistrust, protests, and violent conflicts (OECD & United Nations, 2024). Such developments undermine social stability and threaten sustainable rural development (Adeola *et al.*, 2024).

Although studies on artisanal mining in Jema'a Local Government Area have examined environmental degradation, health risks, and livelihood impacts (Zankan *et al.*, 2022; 2024; 2025a), limited research has explored its sociocultural implications for rice farming communities, especially in rural Kaduna State. Consequently, there is a need to assess how artisanal and small-scale mining affects social structures, traditional livelihoods, governance systems, agricultural practices, and community sustainability among rice farming populations. Understanding these implications is important for developing policies and interventions aimed at balancing mineral exploitation with

agricultural sustainability, social cohesion, and rural development.

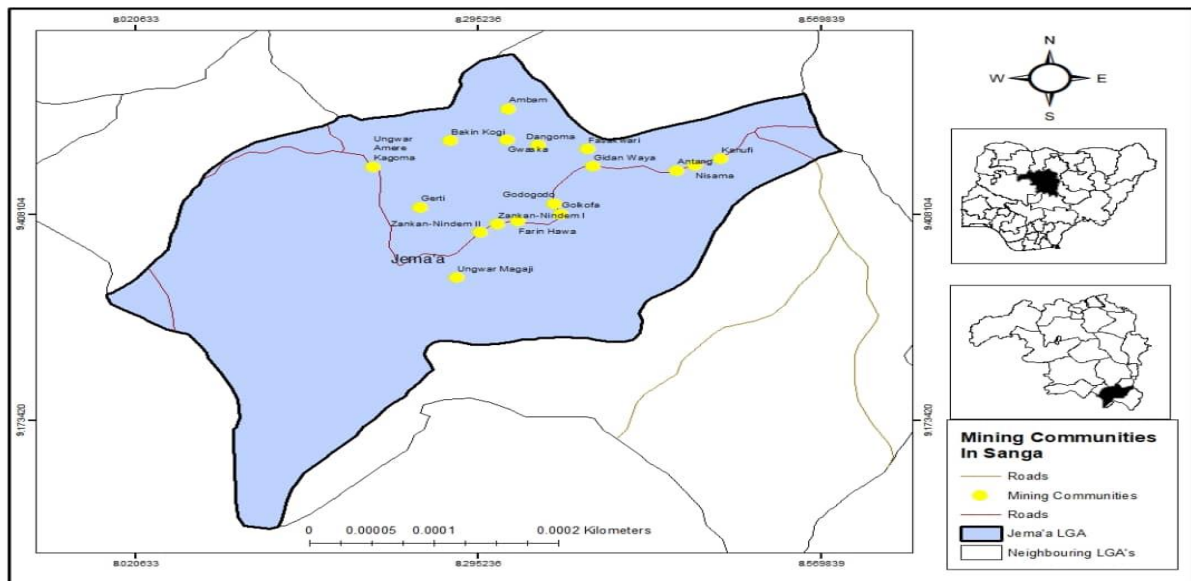
## Materials and Methods

### Study Area

The study was conducted in Jema'a Local Government Area, which is located between Latitudes  $9^{\circ}11'$  to  $9^{\circ}30'$  N and Longitudes  $8^{\circ}00'$  to  $8^{\circ}30'$  E in the southern part of Kaduna State. The local government shares boundaries with Zangon Kataf Local Government Area to the north, Kaura Local Government Area and Plateau State to the east, Jaba Local Government Area and Nasarawa State to the west, and Sanga Local Government Area to the south. The area comprises several rural communities including Zankan-Nindem, Godo-Godo, Gidan Waya, Bakin Kogi, Dangoma, Gwaska, Antang, Nisama, and Kanufi, where artisanal and small-scale mining (ASM) activities are common (Figure 1).

Jema'a Local Government Area is predominantly agrarian, with rice farming serving as one of the major livelihood activities among rural households. The area possesses favourable climatic conditions, fertile soils, and access to water resources that support the cultivation of rice and other crops. However, the increasing expansion of artisanal and small-scale mining in many of the communities has created significant interactions between mining and agricultural activities. The coexistence of farming and mining within the same environment makes the area suitable for investigating the effects of ASM on rice farming.

Artisanal mining activities in the study area often involve land excavation, vegetation clearing, and the use of rudimentary mining methods, which contribute to environmental degradation. Productive farmlands are sometimes converted into mining sites, reducing the land available for rice cultivation. In addition, mining activities may lead to soil erosion, loss of soil fertility, and pollution or diversion of water sources used for irrigation and domestic farming purposes. These environmental impacts negatively affect rice productivity and the sustainability of agricultural practices in the area.



**Figure 1: Jema'a Local Government Area of Kaduna State showing Mining Communities**  
Source: Field Survey January, 2026

Jema'a Local Government Area is richly endowed with a variety of mineral resources, including tin, tantalite, lithium, mica, and sapphire, many of which occur in commercially viable quantities. The abundance of these valuable minerals attracts both artisanal and small-scale mining activities, making the area an important mining destination. As a result, mineral extraction has become a significant economic activity, providing income opportunities for local residents while influencing land use patterns and rural livelihoods in the region.

### **Type and Sources of Data**

Data for this study were collected through questionnaire and direct field observations in the study area. The target population comprised rice farmers who were knowledgeable about the socio-cultural implications of artisanal and small-scale mining (ASM) activities on rice farming in Jema'a Local Government Area. The questionnaire contained both closed-ended and open-ended questions. The type of data collected for the research included the demographic characteristics of the respondents such as sex, age, education, marital status. Others include agricultural practices, local governance and social structures. The data was source using the questionnaire.

### **Sampling Technique**

A field survey was carried out in the study area to obtain primary data for the research. Communities identified with intense artisanal and small-scale mining (ASM) activities, namely Godogodo, Gidan Waya, Nisama, Antang, Kanufi, Zankan-Nindem, Dangoma, Bakin Kogi, and Gwaska, were purposively selected due to the prevalence of mining operations within these locations. The target population for the study comprised 2,228 registered rice farmers recorded during the period of data collection. From this population, a sample size of 327 respondents was selected using Yamane (1967) formula for determining sample size. A systematic random sampling technique was used to administer the questionnaire to ensure equitable representation of respondents across the selected communities. A total of 325 copies of the questionnaire were successfully retrieved and used for analysis. Furthermore, direct field observation and in-depth interview with officials of the rice farmers were employed to examine and identify the socio-cultural implications associated with artisanal and small-scale mining activities in the study area.

### **Data Analysis**

The data was analysed using percentages (%), mean scores ( $\bar{X}$ ), and Nvivo software to summarise the findings, while the analysed results were presented and interpreted using tables, figures and charts for clarity and easy understanding. Nvivo software was also used to analysed the qualitative data of the study.

## **Results and Discussion**

### **Demographic Characteristics of the Respondents**

The demographic characteristics of the respondents reveal important socio – cultural implications of artisanal and small-scale mining (ASM) on rice farming communities in Jema'a Local Government Area. The result indicates that females constituted the majority of respondents with 62.2%, while males accounted for 37.8% (Table 1). This suggests that women are increasingly involved in rice farming activities, especially as many men may be shifting from agriculture to artisanal mining because of the quick income associated with mineral extraction. Similar findings were reported in



Kaduna State where mining activities altered household labour structures and increased women’s participation in farming and domestic responsibilities (Zankan and Abubakar, 2024).

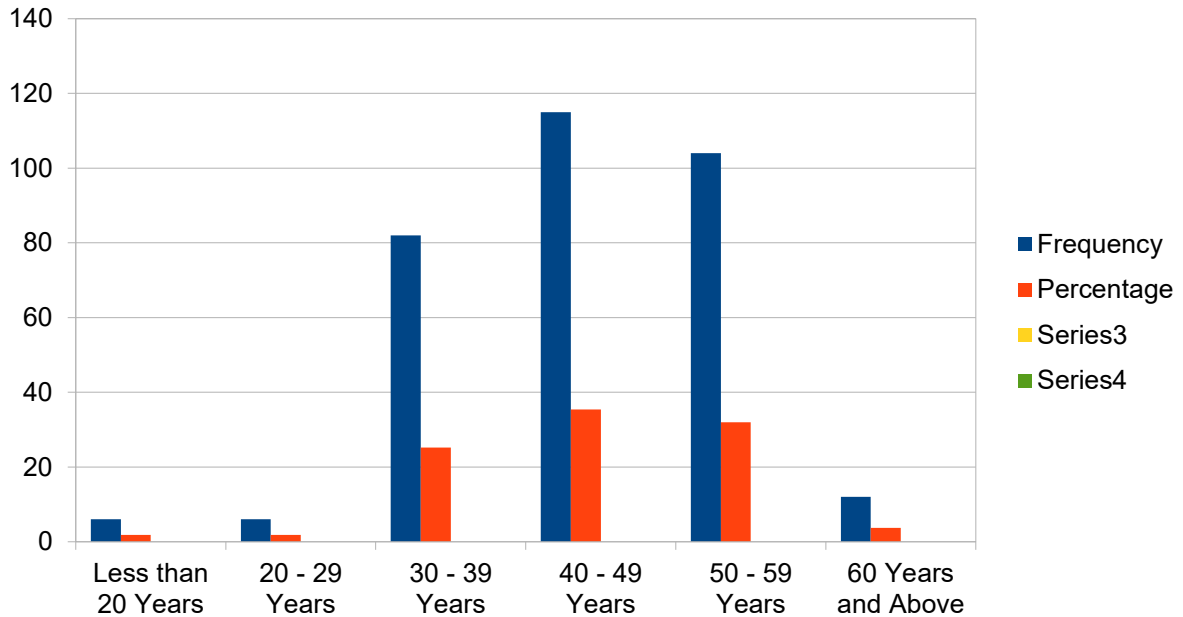
**Table 1: Gender Characteristics of the Respondents**

Variable	Categories	Frequency	Percentage (%)
Sex	Male	123	37.8%
	Female	202	62.2%
Total		325	100%

Source: Field Survey January, 2026

The age distribution shows that respondents within 40–49 years (35.37%) and 50–59 years (32%) formed the majority (Figure 2). This implies that middle-aged adults dominate rice farming in the area, while youths are less involved. The low participation of younger people may be attributed to migration into artisanal mining activities due to unemployment and the perceived profitability of mining. Studies in northern Nigeria observed that ASM attracts economically active youths away from farming, thereby reducing agricultural labour availability and threatening food production systems (Salawu and Sadiq, 2020; Zankan *et al.*, 2025a).

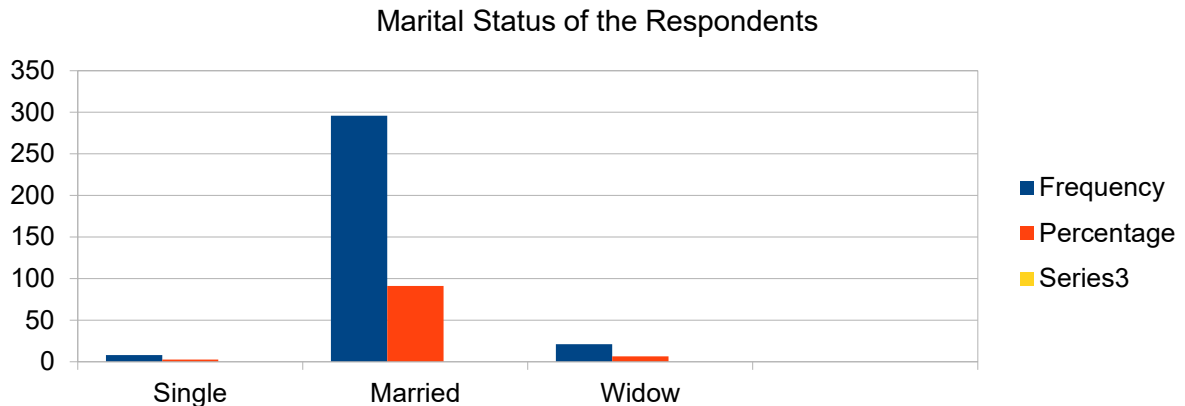
Age Distribution of the Respondents



**Figure 2: Age Distribution of the Respondents in the Study Area**

Source: Field Survey January, 2026

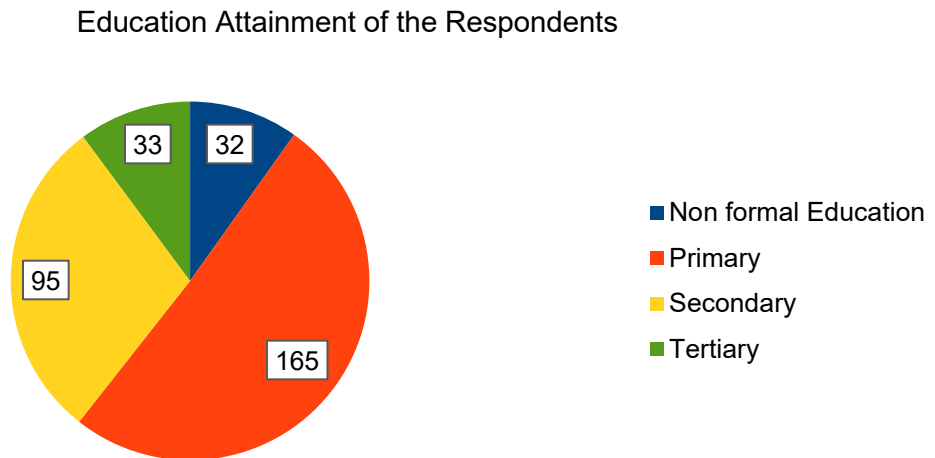
Marital status revealed that 91% of respondents were married, indicating that rice farming remains a household-based livelihood activity (Figure 3). However, the growing involvement of household members in mining may disrupt family stability, increase workload on women, and reduce communal agricultural participation. Previous studies noted that artisanal and small scale mining communities often experience changes in social relationships, traditional livelihood systems, and communal cooperation patterns due to income diversification into mining activities (Zankan *et al.*, 2025b).



**Figure 3: Marital status in the Study Area**

Source: Field Survey January, 2026

Educational attainment showed that 50.8% had basic education, while only 10.2% attained tertiary education (Figure 4). This reflects relatively low educational development in the farming communities. Low literacy levels may limit farmers’ ability to adopt improved rice farming technologies and sustainable environmental practices. Research has shown that low educational attainment among rural farmers contributes to poor adaptation to environmental degradation caused by mining activities and climate variability (Ajunwa *et al.*, 2026).



**Figure 4: Educational Attainment of the Respondents**

Source: Field Survey January, 2026

The occupational structure indicates that farming remained the dominant occupation with 52% of respondents identified as farmers, while others combined farming with civil service or trading (Table 2). This demonstrates that rice farming continues to be the backbone of rural livelihoods despite the growing influence of artisanal mining. Nevertheless, the diversification of occupations reflects economic pressure and the need for alternative income sources. Studies in Kaduna State reported that artisanal mining contributes to employment creation and poverty reduction, but simultaneously exposes farming communities to land degradation, reduced agricultural productivity, and socio – cultural transformation (Zankan and Abubakar, 2024; Zankan *et al.*, 2025b).

**Table 2: Occupation of the Respondents**

Variable	Categories	Frequency	Percentage (%)
Occupation	Farmer	169	52
	Civil Servant/farmer	87	26.8
	Trader/farmer	35	10.8
	Civil Servant	24	7.3
	Artisan	10	3.1
Total		325	100

Source: Field Survey January, 2026

The findings imply that artisanal mining has significant socio – cultural implications on rice farming communities in Jema'a LGA, including labour redistribution, reduced youth participation in agriculture, changing gender roles, livelihood diversification, and weakening of traditional farming systems. While mining provides alternative income opportunities, its long-term effects may undermine agricultural sustainability and rural social cohesion if not properly regulated.

### Socio – cultural Implications of Artisanal Mining on Rice Farming Communities

The results in Table 3 show a strong overall perception that artisanal and small-scale mining has significant socio – cultural impacts on rice farming communities. Most of the mean ( $\bar{X}$ ) values are above 4.0, indicating a high level of agreement among respondents on the listed issues. Firstly, respondents overwhelmingly agreed that mining has led to changes in social structures ( $\bar{X} = 4.89$ ) and a rise in inequality in access to resources ( $\bar{X} = 4.87$ ). This suggests that mining is reshaping traditional social arrangements and creating economic disparities within the communities. Similarly, the influence on local governance ( $\bar{X} = 4.70$ ) and threat to traditional ways of life ( $\bar{X} = 4.74$ ) indicate that leadership patterns and cultural norms are being significantly altered. The shift in community dynamics ( $\bar{X} = 3.83$ ) and decline in agricultural practices ( $\bar{X} = 4.13$ ) further confirm that mining is drawing people away from farming, thereby affecting rice production and rural livelihoods. In addition, farmers' perceptions of sustainability ( $\bar{X} = 4.13$ ) reflect concerns about the long-term environmental and economic viability of mining activities. The result for changes in leadership approach to agricultural issues ( $\bar{X} = 4.12$ ) shows that leaders are increasingly less focused on agriculture, which may worsen food insecurity. However, the only variable with low agreement is the impact on community identity and pride ( $\bar{X} = 2.22$ ), indicating that respondents generally disagreed or were divided on whether mining has negatively affected their sense of identity and pride. Overall, the findings reveal that artisanal mining has profound social, economic, and governance impacts, with particularly strong effects on inequality, agriculture, and traditional community systems.

**Table 3: Sociocultural Implications of Artisanal Mining on Rice Farming Communities**

SA-Strongly agree, A-Agree, U – Undecided, disagree, D-disagree, SD-Strongly,  $\bar{X}$  - Mean

S/N	Item	SA	A	U	D	SD	$\bar{X}$	Remark
1	Changes in social structures in the mining community	285	40	0	0	0	4.89	Agreed
2	Influence on local governance in rice farming communities	243	82	0	0	0	4.7	Agreed
3	Shift in community dynamics	245	80	0	0	0	3.83	Agreed
4	Decline in agricultural practices	123	162	0	40	0	4.13	Agreed
5	Threat to traditional way of life	244	81	0	0	0	4.74	Agreed
6	Farmers' perceptions on sustainability	163	121	0	0	41	4.13	Agreed
7	Rise in inequality in resource access among community members	284	41	0	0	0	4.87	Agreed
8	Impact on community identity and pride	39	40	0	122	124	2.22	Agreed
9	Changes in leadership approach to agricultural issues	140	135	0	50	0	4.12	Agreed
	Grand Mean Score						4.18	Agreed

Source: Field Survey January, 2026

**Changes in Social Structures in the Mining Community:** Changes in social structures within a society often occur as a result of various influencing factors such as wars, diseases, and economic activities. Evidence has shown in Table 2, that artisanal and small-scale mining activities have contributed significantly to changes in the social structure of communities in Jema'a Local Government Area. The high mean score of 4.89 reflects respondents' strong agreement that mining has substantially altered social relationships, institutions, and community dynamics in the area. Some of the social structures identified by the respondents in the study area affected by mining activities are Shift in occupational patterns, school dropout and decline school attainment, decline in community cohesion, and traditional values and norms. One of the most concerning impacts is the alarming rise in school dropout rates. Many children are increasingly losing interest in formal education, as they perceive mining as a more immediate and profitable alternative. This finding is consistent with recent studies which indicate that artisanal and small-scale mining (ASM) in Nigeria and other parts of sub-Saharan Africa encourages child labour and reduces school attendance, as households prioritise immediate income over long-term educational outcomes (Hilson *et al.*, 2017; UNICEF/ILO, 2024). In addition, traditional values and norms are gradually eroding. Children no longer show the expected level of respect for parents and elders, a change attributed to their exposure to diverse groups of people who migrate into these communities with different beliefs and behaviours. According to one of the officials:

“Mining activities have drawn many children out of school and into mining sites, resulting in declining educational participation and a noticeable reduction in respect for elders and traditional authority.”

Similar observations have been made in mining regions where the influx of migrant workers alters cultural dynamics and weakens traditional authority structures (Matanzima, & Loginova, 2024).

Furthermore, there is shift in occupation from agricultural practices to mining of minerals in the study area. This shift is negatively affecting rice production. Income generated through artisanal and small-scale mining activities has become a major attraction for many local residents, leading to a gradual shift away from traditional agricultural practices toward mineral extraction. The prospect of earning quick and relatively higher returns from mining compared to farming encourages many individuals, particularly youths and able-bodied adults, to abandon agricultural activities in favour of mining. As a result, farming households often experience labour shortages, reduced agricultural productivity, and a decline in cultivated farmland. This occupational transition not only alters local livelihood patterns but also threatens food security and the long-term sustainability of agricultural production within mining communities. The findings align with World Bank (2023) and United Nations Development Programme (UNDP, 2022) which indicate that artisanal and small-scale mining frequently competes with agriculture for labour, land, and other productive resources. The findings are also in line with assertion which noted that ASM contributes to land degradation, reduced agricultural productivity, and livelihood displacement in rural areas (Baah-Ennumh, & Forson, 2017).

Additionally, income from the mining is often uneven and unstable, which has widen social inequalities among individuals in the communities. Some individuals have accumulated wealth, while others remain poor, and this created new class distinctions within the communities. This economic disparity has led to social tensions, conflicts, and increased crime rates, as also reported in recent studies linking mining economies with rising inequality and community-level conflicts (World Bank, 2023; Mutemeri, 2024).

**Influence on Local Governance in Rice Farming Communities:** The item had a mean score of 4.70 indicating that artisanal and small scale mining influenced local governance in rice farming communities of Jema'a local government area (Table 2). Artisanal and small-scale mining has significantly influenced local governance in the mining communities of Jema'a Local Government Area of Kaduna State. The emergence and rapid expansion of mining activities have shifted the priorities of local leaders from effective governance and community development to mining of minerals. Rather than upholding their primary responsibilities, they increasingly engage in facilitating mining activities by granting consent to external operators and guiding them in obtaining licenses. This pattern reflects broader findings across sub-Saharan Africa, where artisanal and small scale mining has been shown to reshape local governance systems, often encouraging elite capture and weakening accountability mechanisms at the community level (Hilson et al., 2021; World Bank, 2023).

Some of the respondents noted that in several instances, this process has been carried out without proper consultation or adherence to communal land ownership structures. They stated that some leaders allocate lands that do not legitimately belong to them or their communities, leading to disputes, mistrust, and, in some cases, violent conflicts both within and between neighbouring communities. Studies have shown that weak institutional oversight and informal land transactions in mining regions frequently result in tenure insecurity and community conflicts (Sarpong *et al.*, 2025). Furthermore, there has been a noticeable neglect of the agricultural sector, particularly rice farming, which traditionally sustains local livelihoods. Local leaders have made limited efforts to encourage a return to farming or support agricultural productivity. This neglect has contributed to declining food production and increasing food insecurity in the region, thereby compounding the socio-economic challenges already facing these communities. Similar trends have been reported in recent literature, where the expansion of artisanal and small scale mining displace agriculture and undermines rural food systems (UNDP, 2023).

**Shift in Community Dynamics:** The item had a mean score of 3.83 indicating that artisanal and small scale mining led to a shift in community dynamics such as increase conflict in rice farming communities of Jema'a local government area (Table 2). The introduction of artisanal and small-scale mining in Jema'a Local Government Area has brought about significant changes in community dynamics, particularly in the form of increased conflicts (Table 2). In several rice-farming communities where mining activities take place, some local leaders allocated farmlands and forest areas for mineral extraction without rightful ownership or proper authorisation. This resulted in disputes both within individual in the communities and between neighbouring ones. This situation reflects broader patterns observed in artisanal mining regions, where weak land governance and elite capture often lead to unauthorised land transfers and heightened communal tensions (Sarpong *et al.*, 2025; Hilson & Maconachie, 2023). A notable example is the mining and leadership crisis in Zankan-Nindem, which led to the suspension of the substantive Village Head after community members accused him of acting unjustly by securing mining licenses and permitting mineral extraction without their consent. This situation triggered a series of protests that eventually drew the attention of the government. Similar cases across sub-Saharan Africa show that lack of transparency and exclusion of local stakeholders in mining decisions frequently result in resistance, protests, and governance crises (Hilson *et al.*, 2021).

Artisanal mining, typically carried out using rudimentary tools by local individuals, also attracts miners from different regions. Some of the local rice farmers noted that the influx of miners contributed to tensions and conflicts, both among the miners themselves and between them and host communities, thereby posing serious risks to local safety and security. Communities within Jema'a

Local Government Area continue to experience such challenges due to the persistent inflow of miners. A clear example is the conflict between miners and the host community in Bakin Kogi, Kaninkong, in 2001, which resulted in the loss of lives and destruction of property. This trend aligns with findings that artisanal mining sites often become centres of migration and competition over limited resources, which can escalate into violent clashes and insecurity when not properly managed (OECD & United Nations, 2023; Rigterink *et al.*, 2023).

**Decline in Traditional Agricultural Practices:** The item had a mean score of 4.13 indicating that artisanal and small scale mining led to a decline in traditional agricultural practices in rice farming communities of Jema'a local government area (Table 2). Engagement in artisanal and small-scale mining in Jema'a Local Government Area has significantly contributed to a decline in agricultural practices among farmers. Many members of the mining communities have shifted their primary occupation from farming, particularly rice production to mineral extraction. This transition is driven by several factors, including the lure of quick financial returns, widespread poverty, and the growing desire for rapid wealth accumulation. According to local accounts, mining provides immediate income that agriculture cannot match, especially for peasant farmers who largely produce for subsistence and have limited surplus for sale. This observation is consistent with findings that artisanal and small-scale mining (ASM) often draws labour away from agriculture due to its perceived higher and faster economic returns, particularly in rural economies with limited livelihood options (Huntington & Marple-Cantrell. 2022; African Development Bank, 2024).

As a result, agricultural activities have been increasingly neglected, with fewer individuals willing to invest time and labour in farming. This has led to a noticeable reduction in rice production within the study area. The decline in local food production not only affects household livelihoods but also contributes to broader food insecurity, as dependence on external food sources increases and the stability of local food systems becomes undermined. Similar patterns have been reported in recent studies, which highlight how the expansion of mining activities contributes to land degradation, labour displacement, and reduced agricultural productivity in rural communities (UNDP, 2023; FAO, 2022). These dynamics underscore the growing tension between extractive activities and sustainable agricultural development in mining-affected regions.

**Threat to Traditional Way of Life:** The item in table 2 had a mean score of 4.74 which reveal that farmers perceive artisanal and small-scale mining as a significant threat to their traditional way of life. This perception stems largely from the relatively high and immediate income generated from mining activities, which attracts many farmers in the mining communities of Jema'a Local Government Area. As a result, a growing number of farmers are abandoning their long-established agricultural occupations, particularly crop cultivation, to engage in mineral extraction. This shift has serious implications for food security, as agricultural production continues to decline. This finding is consistent with existing literature, which shows that artisanal and small-scale mining (ASM) diverts labour from agriculture due to its quick and higher financial returns, thereby weakening traditional farming systems and threatening long-term food security (Hilson, 2016; Osumanu, 2020).

Another threat to life of the expansion of mining activities to the traditional agriculture as identified the farmers is the loss and degradation of farmlands. This situation further weakens local food systems and rural livelihoods. Moreover, the introduction of mining has attracted people from different regions, bringing with them diverse behaviours and intentions that have influenced the social fabric of the communities. Notably, the youth have been negatively affected, as increased exposure to mining environments has contributed to involvement in substance abuse and other social vices, thereby posing risks to both individual well-being and community stability. Similar patterns

have been reported in recent studies, where mining-induced migration is associated with environmental degradation, social disruption, and increased youth vulnerability to risky behaviours (UNICEF, 2017; NEITI, 2020; Teku, 2025).

**Farmers' Perceptions of Sustainability:** The item had a mean score of 4.13 indicating that artisanal and small-scale mining has significantly influenced farmers' perceptions of sustainability in the study area (Table 2). Artisanal mining, which is largely informal and unregulated, is carried out by individuals primarily to meet basic needs such as food, shelter, and healthcare. However, these activities are often conducted in unsustainable ways, as they involve the creation of pits and ponds on both agricultural and forest lands. This has resulted in reduced farming activities, as well as the degradation of forest resources and loss of biodiversity within the study area. These observations are consistent with earlier studies which describe artisanal and small-scale mining (ASM) as environmentally destructive due to weak regulation and the use of rudimentary techniques that degrade land and ecosystems (Hilson *et al.*, 2017; Arthur – Holmes & Oforu, 2024). Additionally, research has shown that ASM contributes significantly to deforestation and biodiversity loss in many rural landscapes across sub-Saharan Africa (Sonter *et al.*, 2020; Zankan *et al.*, 2025).

Furthermore, some of the farmers stated that small-scale mining activities that are mostly carried out on upland areas, are associated with high levels of soil erosion. The eroded materials are subsequently deposited in fadama and lowland plains where rice and other crops are cultivated. This process has negatively affected soil quality and productivity, leading to a decline in rice production in the study area, as observed (Plate 1). Similar findings were reported, where mining-induced erosion and sedimentation are identified as major factors reducing soil fertility and agricultural output in adjacent lowland farming systems (Mensah *et al.*, 2015; Hilson, 2016).



**Plate 1: Rice Farm Covered by Sand at Wambiya Zankan – Nindem**  
Source: Field Survey August, 2025

**Rise in Inequality in Resource Access among Community Members:** The item in Table 2 had a mean score of 4.87 which shows that artisanal and small-scale mining has led to increased inequality in access to resources among members of mining communities in Jema'a Local Government Area. With the introduction of mining activities in the study area, many individuals took advantage of emerging opportunities to acquire assets such as land, houses, vehicles, and motorcycles. People became involved in various aspects of the mining economy, including mineral extraction, trading of minerals, food vending, and commercial motorcycle transport. Some landowners also permitted the use of their land for mining in exchange for income, which enabled them to accumulate assets for future use. This pattern reflects findings which noted that artisanal and small-scale mining (ASM) can create localised economic opportunities and stimulate informal economies, often leading to asset accumulation for those able to participate actively in the sector (IGF, 2018; Perks & McQuilken, 2020; Traore *et al.*, 2024).

However, not everyone benefited equally from these developments. In contrast, some individuals experienced the destruction of their farmlands as a result of mining activities, which deprived them of their primary source of livelihood. This has limited their ability to engage in farming and has contributed to increasing levels of poverty among certain groups within the community. Such unequal outcomes are widely reported, as ASM tends to generate uneven income distribution, deepen socio-economic disparities, and marginalise vulnerable groups who lack access to capital or land (Apanisile *et al.*, 2020; Shiquan *et al.*, 2022; Beegle, 2025; Khandre 2025). These dynamics highlight how mining-driven development can simultaneously create wealth and intensify poverty within the same community.

**Impact on Community Identity and Pride:** The item in Table 2 had a mean score of 2.22 indicating that the artisanal and small-scale mining in Jema'a Local Government Area has not had a positive impact on community identity and pride. Rather than improving the economic well-being of community members, mining activities have contributed to increased poverty due to the loss of farmlands, livestock, and valuable economic trees. Important tree species such as Mahogany, Iroko, Doka, and locust bean upon which the communities depend for food and timber, have been cleared to create space for mining operations. This finding aligns with studies which indicate that artisanal and small-scale mining (ASM) often leads to deforestation, loss of ecosystem services, and declining rural livelihoods, particularly where environmental regulations are weak or poorly enforced (Sonter *et al.*, 2017; Rosa *et al.*, 2018).

In addition, some individuals involved in mining have lost their lives, while others have suffered serious injuries or permanent disabilities as a result of underground mine collapses and conflicts. Such occupational hazards are widely reported in ASM activities, where the use of rudimentary tools and lack of safety measures expose miners to significant health and safety risks (Hentschel *et al.*, 2002; Smith *et al.*, 2016). Beyond these physical and environmental impacts, mining activities have also triggered conflicts among community members and between neighbouring communities, particularly over land ownership and control. These challenges have collectively undermined social cohesion and weakened the sense of identity and pride within the affected communities. Similar patterns have been documented in mining regions where resource competition and weak governance structures intensify disputes and erode community cohesion (Maconachie, & Binns, 2007; Hilson & Maconachie, 2009; Geenen, 2015; Mutemeri, 2024; Una, 2025).

**Changes in Leadership Approaches to Agricultural Issues:** The item in Table 2 had a mean score of 4.12 which reveal that the emergence of artisanal and small-scale mining has brought about notable changes in the way local leaders address agricultural issues in the study area. With the

introduction of mining activities, many leaders shifted their priorities toward the economic benefits they could personally or collectively derive from the sector, rather than focusing on the welfare and long-term needs of the communities they govern. This shift in attention has resulted in reduced commitment to promoting agricultural development. This observation is consistent with studies showing that extractive activities often reshape local governance priorities, encouraging rent-seeking behaviour and weakening support for traditional sectors such as agriculture (Le Billon, 2014; Campbell, 2013; Ogwang *et al.*, 2019).

Consequently, little effort has been made to encourage farmers to return to or sustain agricultural practices, particularly food crop production. Farmers have received minimal support, guidance, or incentives to continue farming, despite its importance to livelihoods and food supply. This neglect has contributed to a steady decline in agricultural productivity within the study area, which in turn affects food availability and security not only locally but also at the national level. Similar findings indicate that the expansion of artisanal mining can displace agricultural labour, reduce investment in farming, and heighten risks to food security in rural economies (FAO, IFAD, UNICEF, WFP & WHO, 2022; OECD, 2011; GIZ, 2020).

## Conclusion

Mining is an economic activity undertaken by individuals, groups, or households to extract valuable mineral resources for income generation and the satisfaction of basic needs such as food, shelter, healthcare, and education. Despite its economic benefits, mining often has adverse effects on local livelihoods, particularly agriculture, through the degradation of farmlands, loss of productive labour, environmental pollution, and reduced agricultural productivity, thereby threatening food security and the sustainability of rural communities. Artisanal and small-scale mining has become a major driver of socio-cultural transformation in rice farming communities of Jema'a Local Government Area, Kaduna State. While mining has created alternative livelihood opportunities and generated income for some households, its overall influence has altered the traditional socio-economic foundations upon which these communities depend. The increasing attraction of mining activities is shifting labour away from agriculture, weakened support for rice farming, and contributes to changes in social structures, local governance systems, and community relations. The continued expansion of artisanal and small-scale mining presents a challenge to sustainable rural development. The competition between mining and agriculture for land, labour, and other productive resources has undermined the viability of traditional farming systems, thereby threatening food security and the long-term sustainability of rural livelihoods. In addition, the emergence of inequalities in access to resources, conflicts over land ownership, and changing leadership priorities indicate that mining activities are reshaping social and governance structures in ways that may weaken community cohesion if left unmanaged. It is therefore recommended that Government and relevant stakeholders should strengthen the regulation and monitoring of artisanal and small-scale mining activities through effective environmental laws, land-use policies, and community participation mechanisms to reduce conflicts, environmental degradation, and unlawful land allocation. Secondly, agricultural support programmes such as access to credit facilities, improved rice seedlings, farm inputs, and youth empowerment initiatives should be introduced to encourage farmers and young people to return to agriculture and promote sustainable rural livelihoods.

## References

- Adeola, A., Fasubaa, O. T., and Odeyemi, C. A. (2024). Evaluating socio-economic and environmental impact of artisanal and small-scale mining (ASM) of gemstones on livelihood in the Ijero-Ekiti Community, Nigeria. *International Journal of Advanced Multidisciplinary Research and Studies*, 4(5), 939–944.
- Afodu, O. J., Afolake, C. A., & Balogun, O. L. (2020). Effect of livelihood diversification and technology adoption on food security status of rice farming households in Ogun State, Nigeria. *Agricultural Socio-Economics Journal*, 20(3), 233–244. <https://doi.org/10.21776/ub.agrise.2020.020.3.7>
- African Development Bank. (2024). *African Economic Outlook 2024: Driving Africa's Transformation the Reform of the Global Financial Architecture*. Abidjan: African Development Bank Group.
- African Development Bank. (2024). Feed Africa Strategy 2016 – 2025 – ACSA Progress Report 2024. African Development Bank Group.
- Ajunwa, C. G., Aluwong, J. S., Ezekiel, O. H., Ayodele, J. T., Abah, M. O., Abdulsalam, I. Z., and Alabi, O. O. (2026). Socio-economic and environmental factors influencing the output of rice farmers in Kaduna State and Federal Capital Territory, Nigeria. *Nepalese Journal of Agricultural Sciences*, 30(1), 238–254.
- Amoako, C., Adarkwa, K. K., & Koranteng, K. A. (2023). *Survival now, sustainability later: The emerging artisanal mining and the dying agricultural livelihoods in the Akyem Abuakwa traditional area of Ghana*. Environment, Development and Sustainability: A Multidisciplinary Approach to the Theory and Practice of Sustainable Development, Springer, vol. 25(2), 1645-166.
- Apanisile, O. T., Osinubi, T. T and Ojeyinka, T. A. (2020). Economic Growth, Income Inequality and Poverty in Nigeria. *Journal of Economics and Policy Analysis*. Vol. 5, Iss 1(2020).
- Arthur – Holmes and Ofosu, G. (2024). Rethinking state-led formalisation of artisanal and small-scale mining (ASM): Towards mining licence categorisation, women empowerment and environmental sustainability. *Resources Policy*, Vol. 93, (2024).
- Baah-Enumh, TY and Forson. JA. (2017). The impact of artisanal small-scale mining on sustainable livelihoods: A case study of mining communities in the Tarkwa-Nsuaem Municipality of Ghana. *World Journal of Entrepreneurship, Management and Sustainable Development*. Vol. 13 (3): 204–222.
- Baba, I. I., Abel, R. G., Bala, T. P., and Baba, A. I. (2025). Effects of artisanal mining on land degradation in Anka and Maru, Zamfara State, Nigeria. *Sokoto Journal of Geographical Studies*, 2(2), 148–158.
- Beegle, C. (2025). Beegle, C. (2025). Economic inequality: Causes, consequences, and potential solutions. *Journal of Economics and Economic Education Research*, 26(S1), 1-3
- Campbell, B (Ed.). (2013). *Modes of Governance and Revenue Flows in African Mining*. Palgrave Macmillan
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ, 2020). *Artisanal and small-scale mining (ASM)*. Bonn and Eschborn, Germany: GIZ.

- Food and Agriculture Organisation (2022). *Land, soil and water resources at stake*. Rome: Food and Agriculture Organisation of the United Nations.
- Food and Agriculture Organization (FAO). (2025). *The State of Food Security and Nutrition in the World 2025*. FAO Regional Office for Asia and the Pacific.
- Food and Agriculture Organization of the United Nations (FAO), International Fund for Agricultural Development (IFAD), United Nations Children's Fund (UNICEF), World Food Programme (WFP), & World Health Organization (WHO). (2022). *The State of Food Security and Nutrition in the World 2022: Repurposing food and agricultural policies to make healthy diets more affordable*. FAO. <https://doi.org/10.4060/cc0639en>
- Geenen, S. (2015). African artisanal mining from the inside out. Access, norms and power in Congo's gold sector. 10.4324/9781315708553.
- Hentschel, T., Hruschka, F., and Priester, M. (2002). *Global Report on Artisanal and Small-Scale Mining*. London: International Institute for Environment and Development (IIED) and World Business Council for Sustainable Development (WBCSD).
- Hilson, G and Maconachie, R. (2009). Good governance and the extractive industries in Sub-Saharan Africa. *Mineral Processing and Extractive Metallurgy Review* 30(1):52-100. DOI:10.1080/08827500802045511
- Hilson, G. (2016) Artisanal and small-scale mining and agriculture: Exploring their links in rural sub-Saharan Africa. IIED, London.
- Hilson, G. (2016). Farming, small-scale mining and rural livelihoods in sub-Saharan Africa: A critical overview. *The Extractive Industries and Society*, 3(2), 547–563. <https://doi.org/10.1016/j.exis.2016.02.003>
- Hilson, G. Hilson, A. Maconachie, R. McQuilken, J. and Goumandakoye, H. (2017) Artisanal and small-scale mining (ASM) in sub-Saharan Africa: Re-conceptualizing formalization and 'illegal' activity. *Geoforum*. 83. pp. 80-90. ISSN 0016-7185.
- Hilson, G., and Maconachie, R. (2023). Artisanal and small-scale mining, land governance and rural conflict in sub-Saharan Africa. *Resources Policy*, 85, 103879. <https://doi.org/10.1016/j.resourpol.2023.103879>
- Hilson, G., Hilson, A., Maconachie, R., McQuilken, J., and Goumandakoye, H. (2017). *Artisanal and small-scale mining (ASM) in sub-Saharan Africa: Re-conceptualizing formalization and 'illegal' activity*. *Geoforum*, 83, 80–90. <https://doi.org/10.1016/j.geoforum.2017.05.004>
- Hilson, G., Sauerwein, T., and Owen, J. (2021). Large and artisanal-scale mining in sub-Saharan Africa: A comparative review of impacts on local communities. *The Extractive Industries and Society*, 8(2), 100–110.
- Huntington, H and Marple-Cantrell. K. (2022). The Importance of Artisanal and Small-Scale Mining for Rural Economies: Livelihood Diversification, Dependence, and Heterogeneity in Rural Guinea. <https://www.sciencedirect.com/science/article/pii/S0743016722001486>
- Hussain, A. D., and Gbadeyan, O. J. (2023). Politics of resource control and peacebuilding in Nigeria: An analysis of mining in Nigeria. *FUOYE Journal of Criminology and Security Studies*. Vol. 3, NO 1(2024).
- Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF, 2018). *Global Trends in Artisanal and Small-Scale Mining (ASM): A review of key numbers and*

- issues*. prepared by the International Institute for Environment and Development (IIED) for the Intergovernmental Forum on Mining, Minerals and Sustainable Development (IGF).
- Khandre, S. (2025). Income Inequality and Economic Growth: A Study of Developing Countries. *Journal of Indian Research*. Volume 12, N0. 3 (2024).
- Le Billon, P. (2014). *Wars of plunder: Conflicts, profits and the politics of resources*. New York: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199333462.001.0001>
- Maconachie, R., and Binns, T. (2007). Beyond the resource curse? Diamond mining, development and post-conflict reconstruction in Sierra Leone. *Resources Policy*, 32(3) 104-115.
- Maconachie, R., and Hilson, G. (2011). Safeguarding livelihoods or exacerbating poverty? Artisanal mining and formalization in West Africa. *Natural Resources Forum*, 35(4), 293–303. <https://doi.org/10.1111/j.1477-8947.2011.01407.x>
- Mandal, J., Bakare, W. A., Rahman, M. M. (2022). Varietal differences influence arsenic and lead contamination of rice grown in mining impacted agricultural fields of Zamfara State, Nigeria. *Chemosphere*, 305, 135339. <https://doi.org/10.1016/j.chemosphere.2022.135339>
- Mandal, J., Bakare, W. A., Rahman, M. M., Rahman, M. A., Siddique, A. B., Oku, E., Wood, M. D., Hutchinson, S. M., and Mondal, D. (2022). Varietal differences influence arsenic and lead contamination of rice grown in mining impacted agricultural fields of Zamfara State, Nigeria. *Chemosphere*, 305, 135339. <https://doi.org/10.1016/j.chemosphere.2022.135339>
- Manga, J., & Tukura, N. T. (2025). *Socio-economic and environmental consequences of the informal and formal governance arrangements on mining communities in Taraba State. Multidisciplinary Journal of Management and Social Sciences*. Vol. 2 No. 3(2025).
- Matanzima, J and Loginova, J. (2024). Sociocultural risks of resource extraction for the low-carbon energy transition: Evidence from the Global South. *The Extractive Industries and Society*. Vol. 18 (2024).
- Mensah, A.K., Mahiri, I. O., Owusu, O., Mireku, O. D., Wireko, I., and Kissi, E. A. (2015). Environmental Impacts of Mining: A Study of Mining Communities in Ghana. *Applied Ecology and Environmental Sciences*. Vol. 3, No. 3 (2015) 81-94.
- Mutemeri, N. (2024). Mineral Resource Governance in Africa. A Comparative Study. International IDEA <https://doi.org/10.31752/idea.2024.116>
- Nigerian Extractive Industries Transparency Initiative (NEITI, 2020). Impact of Mining on Women, Youth and others in Selected Communities in Nigeria. NEITI Occassional Paper Series Issue 7 – October, 2020.
- Ofori, G., Dittmann, A., Sarpong, D and Botchie, D. (2020). Socio-economic and environmental implications of Artisanal and Small-scale Mining (ASM) on agriculture and livelihoods. *Environmental Science and Policy*. Volume 106, (2020) 210-220.
- Ogwang, T. Vanclay, F and van den Assem, A. (2019). Rent-Seeking Practices, Local Resource Curse, and Social Conflict in Uganda's Emerging Oil Economy. *Land* 2019, 8(4), 53; <https://doi.org/10.3390/land8040053>
- Omotehinse, A. O. (2025). Assessment of food and nutrition security practices of the artisanal and small-scale mining communities in Nigeria. *World Development Sustainability*, 7, 100239. <https://doi.org/10.1016/j.wds.2025.100239>

- Onakuse, S. (2012). The future of subsistence agriculture in the rural community of Uzanu, Edo State, Nigeria. *Journal of Agriculture, Food Systems, and Community Development*, 3(1), 51–62. <https://doi.org/10.5304/jafscd.2012.031.021>
- Organisation for Economic Co-operation and Development (OECD) and United Nations. (2023). *Conflict transformation and the role of responsible artisanal and small-scale mining: Supporting peace through supply chain due diligence*. OECD Business and Finance Policy Papers No. 28. Paris: OECD Publishing. <https://doi.org/10.1787/cdbd61d1-en>
- Organisation for Economic Co-operation and Development (OECD) and United Nations. (2024). *Framework for Responsible Mineral Supply Chains and Community Sustainability*. Paris: OECD Publishing.
- Organisation for Economic Co-operation and Development (OECD). (2011). *OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*, OECD Publishing. <http://dx.doi.org/10.1787/9789264111110-en>
- Osumanu, I. K. (2020). Small-scale mining and livelihood dynamics in North-eastern Ghana: Sustaining rural livelihoods in a changing environment. *Progress in Development Studies*, 20(3), 208–222. <https://doi.org/10.1177/1464993420934223>
- Owolabi, A. O., Amujo, K., and Olorunfemi, I. E. (2021). Spatiotemporal changes on land surface temperature, land and water resources of host communities due to artisanal mining. *Environmental Science and Pollution Research*, 28(27), 36375–36398. <https://doi.org/10.1007/s11356-021-12512-w>
- Perks, R and McQuilken, J. (2020). Artisanal and Small Scale Mining (ASM) and Sustainable Development Goal 8 (SDG8). World Bank, Pact
- Rigterink, A. S., Ghani, T., Lozano, J. S., and Shapiro, J. N. (2023). *Mining competition and violent conflict in Africa: Pitting against each other* (ESOC Working Paper No. 35). Empirical Studies of Conflict Project, Princeton University. Available at: [ESOC Working Paper No. 35](#)
- Rosa, J. C. S., Morrison-Saunders, A., and Sánchez, L. E. (2018). Improving stakeholder engagement in closure planning through an ecosystem services approach. Second International Conference on Planning for Closure of Mining Operations. Santiago, Chile: GECAMIN. Recuperado de [https://repositorio.usp.br/directbitstream/9a08d0f7-4498-4103-a16c-ae7e0b79166/Sanchez-2018-Improving\\_Stakeholder\\_Engagement\\_in\\_Closure.pdf](https://repositorio.usp.br/directbitstream/9a08d0f7-4498-4103-a16c-ae7e0b79166/Sanchez-2018-Improving_Stakeholder_Engagement_in_Closure.pdf)
- Salawu, O. G., and Sadiq, Y. O. (2020). Artisanal quarries in Kaduna metropolis with associated socio-economic benefits. *Science World Journal*, 15(4), 95–102.
- Sarpong, E., Dinye, R. D., and Sarpong, C. K. (2025). Managing land use disputes in mining areas in Sub-Saharan Africa. *Journal of Modern Social Sciences*, 2(3), 215–225. <https://doi.org/10.71113/JMSS.v2i3.188>
- Shiquan, D. Amuakwa-Mensah, F. Deyi, X and Chen, Y. (2022). The impact of mineral resource extraction on communities: How the vulnerable are harmed. *The Extractive Industries and Society*. Vol. 10 (2022).
- Smith, N. M. Ali, S. Bofinger, C. and Collins, N. (2016). Human health and safety in artisanal and small-scale mining: an integrated approach to risk mitigation. *Journal of Cleaner Production*. Vol. 129, (2016) 43-52.

- Sonter, L. J., Herrera, D., Barrett, D. J., Galford, G. L., Moran, C. J., and Soares-Filho, B. S. (2017). *Mining drives extensive deforestation in the Brazilian Amazon*. Nature Communications, 8(1), Article 1013. DOI: <https://doi.org/10.1038/s41467-017-00557-w>
- Sonter, L.J., Ali, S.H. and Watson, J.E.M. (2020). Mining and Biodiversity Key Issues and Research Needs in Conservation. Proceedings of the Royal Society of London. *Biological Sciences*, 285(1892), 20181926. <https://doi.org/10.1098/rspb.2018.1926>
- Teku, G. (2025). Geo-environmental and socio-economic impacts of artisanal and small-scale mining in Ethiopia: challenges, opportunities, and sustainable solutions. *Environmental Policy and Governance*. Vol. 13 (2025), <https://doi.org/10.3389/fenvs.2025.1505202>
- Tella, A. A., and Danjibo, N. D. (2024). Local conflicts around mining activities in Ibise-Komu Community in Oyo State, Nigeria. *International Journal of Social Work*. Vol. 11 (1), 80–94. <https://doi.org/10.5296/ijsw.v11i1.21858>
- Traoré, M., Hilson, G., and Hilson, A. (2024). Reimagining entrepreneurship in the artisanal and small-scale mining sector: Fresh insights from sub-Saharan Africa. *Africa Journal of Management*. Vol. 10(2), 176–207. <https://doi.org/10.1080/23322373.2024.2349481>
- Una, S. (2025). Illegal Mining and Insecurity in Nigeria. National Assembly Library Trust Fund (NALT) Research Paper United Nations Children’s Fund & International Labour Organization (2024). *Child Labour: Global Estimates 2024, Trends and the Road Forward*. Geneva and New York: ILO and UNICEF. DOI: <https://doi.org/10.54394/HGQM8706>
- UNDP (2023). Beaming the Light on a Hidden Sector: Artisanal and Small-scale Mining (ASM) as a vital sector for sustainable development in Nigeria. United Nations Development Programme Report.
- United Nations Children’s Fund (UNICEF, 2017). Mining-related in-migration and the impact on children in Mongolia. Research Findings and Recommendations. United Nations Children’s Fund (UNICEF).
- United Nations Development Programme (2023). *The silent ecological tragedy: Artisanal mining and ecosystem degradation*. United Nations Development Programme, Rwanda. United Nations Development Programme, Rwanda.
- United Nations Development Programme (UNDP). (2023). Beaming the Light on a Hidden Sector: Artisanal and Small-scale Mining (ASM) as a vital sector for sustainable development in Nigeria. New York: UNDP.
- Winch. P. J Zhang, L. X. Koroma, F and Fofana, M. L. (2020). Food Security in Artisanal Mining Communities: An Exploration of Rural Markets in Northern Guinea. *MDPI* 9(4):479. Doi: 10.3390/foods9040479
- World Bank. (2024). *Achieving sustainable and inclusive artisanal and small-scale mining (ASM): A renewed framework for World Bank engagement*. Washington, DC: World Bank.
- World Bank. 2023. 2023 State of the Artisanal and Small Scale Mining Sector. Washington, D.C.: World Bank.
- Zankan J.A.A, Abdul I, Mande A.J. and Abdul H.A. (2022). Livelihood Implications of Artisanal Mining on Herders in Jema’a and Sanga Local Government Areas of Kaduna State, Nigeria. *African Journal of Social Sciences and Humanities Research*. Vol. 5, Issue 5 (2022) 27-47.



- Zankan, J. A. A., Abubakar, M. Y., and Yusuf, J. A. (2025b). Livelihood vulnerability of household natural capital from artisanal mining in Sanga, Jema'a, Kajuru and Birnin-Gwari Local Governments in Kaduna State, Nigeria. *Journal of Applied Sciences and Environmental Management*, 29(9), 138–148.
- Zankan, J. A. A., Abubakar, M. Y., Zankan, H. P., and Yusuf, J. A. (2025a). Impact of artisanal mining on environmental sustainability and resource management in Kaduna State, Nigeria. *Asian Journal of Environment and Ecology*, 24(4), 75–88.
- Zankan, J. A. A., and Abubakar, M. Y. (2024). Contributions of artisanal mining to livelihood enhancement in Kaduna State, Nigeria. *Sokoto Journal of Geographical Studies*, 1(1), 1–14.