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SPECIAL ISSUE: CELEBRATING 20 YEARS OF GEOGRAPHY IN KADUNA STATE UNIVERSITY - ADVANCES AND FRONTIERS IN GEOGRAPHY

Livelihood Vulnerability in Artisanal Mining: Impacts on Physical and Financial Capital in Kaduna State

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ABSTRACT

Artisanal mining serves as a vital livelihood strategy for millions of people in developing countries, especially in regions where access to formal employment opportunities is limited, offering income generation and economic survival for marginalised and rural communities. Despite its significance, the sector remains predominantly informal and highly vulnerable, characterized by unsafe working conditions, limited access to financial resources, and significant environmental degradation resulting from unregulated mining practices. However, this study assesses livelihood vulnerability in artisanal mining: impacts on physical and financial capital in Kaduna State, so as to provide information for sustainable management of natural resources. Quantitative approaches, such as a structured questionnaire, were used to collect data for the study. The data was analysed using descriptive statistics such as percentages and means. The study found that the Livelihood Vulnerability Index (LVI) was significantly higher in mining communities (0.549) compared to non-mining communities (0.396). This elevated vulnerability in mining areas was largely attributed to challenges related to physical capital, including poor road access, limited availability of farm production inputs, and housing damage caused by mining activities. Additionally, households in mining communities exhibited greater financial vulnerability, particularly due to limited assets and financial resources. Factors contributing to this included a lower average landholding index and restricted access to savings. Interestingly, access to credit was found to be more constrained in non-mining communities. Policies should prioritize road maintenance, sustainable production practices, housing rehabilitation, and enhanced access to formal financial services to bolster resilience and sustainable livelihoods in affected communities.

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1 Introduction

Artisanal mining is a critical livelihood strategy for millions across developing countries, particularly where formal employment is scarce. In Africa, artisanal mining provides significant livelihood opportunities, such as employment and income for rural communities, and serves as a means of poverty alleviation (Funoh, 2014). For example, there are approximately three million people employed directly by artisanal mining in Africa (Aboagye et al., 2014). In Tanzania, artisanal mining accounts for over 90 percent of the mining sector's employment, and is more accessible to the poor, especially in rural areas (World Bank, 2015). For example, between 1987 and 1997, artisanal mining accounted for almost the entire Tanzania's production of gold, copper, and silver and currently is the major producer of gemstones, copper ore, iron ore, tin, bauxite, industrial minerals, and building materials (World Bank, 2015). In Ghana, at least 60% of Ghana's mine labour force is employed within the artisanal sites (Aboagye et al., 2014).

In Nigeria, artisanal mining contributes over 70 % of the mining sector and sustains millions of households economically (United Nations Development Project - UNDP, 2023). Despite its importance, the sector remains largely informal and vulnerable, with poor working conditions, limited access to capital, and widespread environmental degradation (Tunji, 2025), which reduces access to cultivated land (Ladewig et al., 2024). Artisanal mining in Nigeria frequently degrades physical capital, damaging infrastructure, natural assets, and ecosystem services essential for development. For instance, in Niger State, miners wash ore in open waterways, polluting water sources and undermining soil and water systems vital for agriculture and community infrastructure (Idris-Nda et al., 2018). While in Ife-East, Osun State, artisanal gold mining caused land-cover change, expanding bare surfaces and mine tailings while diminishing vegetation, impairing land integrity, and building capital over time (Oluwasegun et al., 2023).

Physical capital, which includes tools, infrastructure, and environmental assets, is heavily degraded. Soil erosion, land degradation, and water source contamination weaken agricultural productivity and reduce community assets like roads, bridges, and water systems, limiting communities' ability to invest in infrastructure and land (Ako et al., 2014; Idris-Nda et al., 2018; Ofosu et al., 2020). Poor access to safe equipment and the lack of reclamation practices further damage physical infrastructure (Fagariba et al, 2024; Donkor et al., 2024).

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Financial capital is equally precarious. Artisanal mining in Nigeria undermines financial capital through informality, limited access to structured finance, and revenue leakage. Research highlights that the sector remains marginalized, with insufficient access to formal loans, pushing miners to inefficient, low-yield practices and reducing profitability and resilience (Oramah, 2013). Artisanal mining operators often rely on low, unstable daily incomes, lacking savings, access to credit, or social protections, especially during accidents or health crises (Ajith et al., 2021). These conditions perpetuate a poverty trap, low investment, inefficient techniques, and weak yields reinforce financial vulnerability (Assan & Muhammed, 2018; Baddianaah et al., 2022; Adranyi et al., 2023). This dual erosion of physical and financial capital places miners in a precarious position - their ability to produce is compromised, and their financial resilience is minimal.

While existing studies have broadly examined the environmental and socio-economic impacts of artisanal mining (Kareem & Owao, 2000; Adekoya, 2003; Yunana & Banta, 2014; Gadzama, 2015; Vivan et al., 2020; Zankan et al., 2022), there is limited empirical evidence on how such activities specifically affect vulnerability in physical capital components, such as roads, housing, and productive infrastructure within artisanal mining zones. Moreover, the financial capital dimension remains underexplored, especially concerning asset depletion (e.g., land and tools) and access to formal financing. Few studies disaggregate these vulnerabilities, making it difficult to understand how artisanal mining increases exposure and reduces resilience across both capitals. As such, there was a need to carry out a study that addresses issues related to the impacts of artisanal mining on physical and financial capital in Kaduna state. However, this study assesses livelihood vulnerability in artisanal mining: impacts on physical and financial capital in Kaduna State, so as to provide information for sustainable management of natural resources.

2 Materials and methods

2.1 Study area

Kaduna State is located in northern Nigeria, a country in West Africa. It is one of the 36 states of the Federal Republic of Nigeria. It lies between latitudes 9° 03′ N to 11° 32′ N and longitudes 6° 05′ E to 8° 38′ E East of the Greenwich Meridian. It covers an area of 46,053 km², which is about 5% of the total land area of Nigeria. It is bordered to the north by Kano, Katsina, and Zamfara States, to the east by Bauchi and Plateau States, to the west by Niger State, and to the south by FCT and Nasarawa State, respectively. Politically, Kaduna State consists of 23 local governments, as shown in Figure 1.

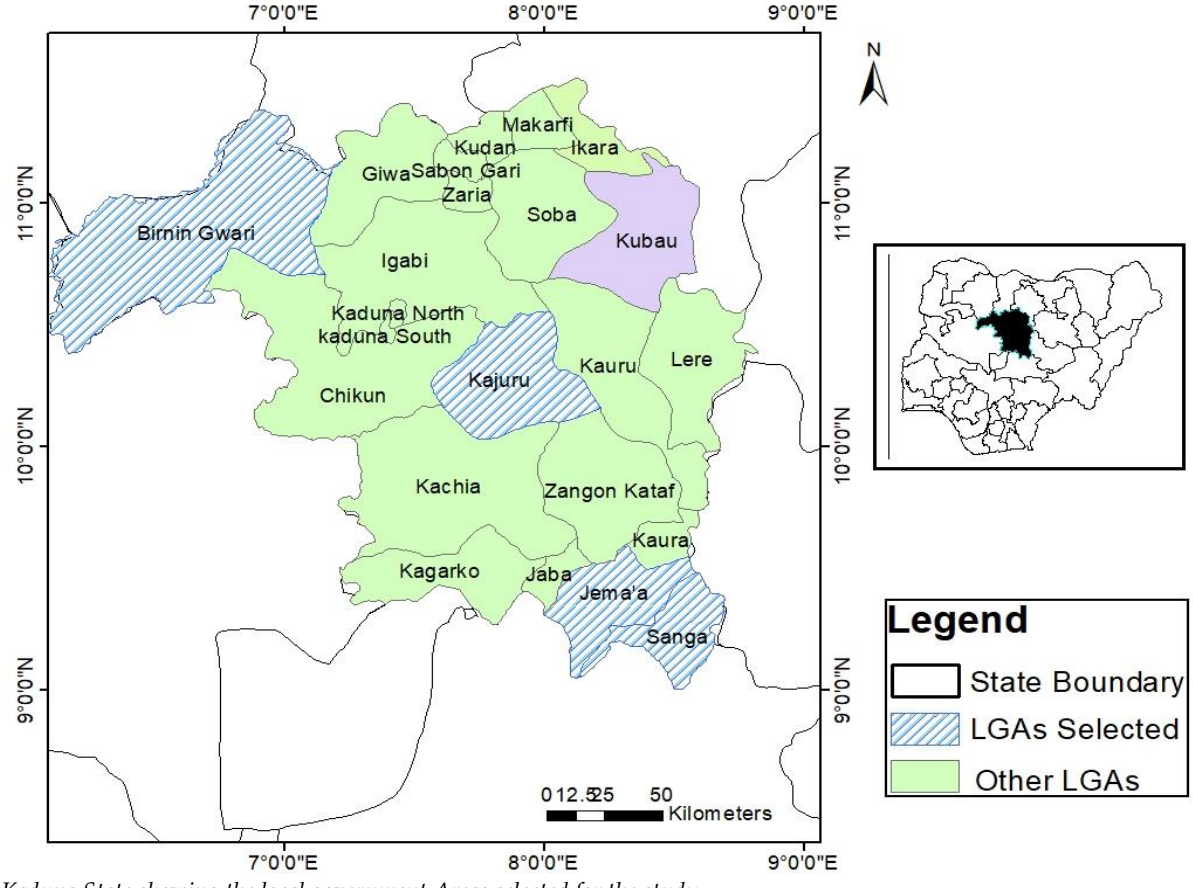

Figure 1: Kaduna State showing the local government Areas selected for the study
Source: Modified from GRID3, 2025.

Kaduna State has an *Aw* type of climate as classified by Köppen with two distinct seasons (dry and wet). The wet (rainy) season is much longer in the southern part of the State around Kafanchan and Kagoro, where it begins in April and ends in October, while in the northern part (Zaria and Makarfi), the rainfall regime is similar to that of the Kano region, which lasts from mid-May to September (Abaje et al., 2018). The State experiences a single peak of rainfall either in August or September. The seasons are influenced by the tropical maritime and tropical continental air masses. Mean annual rainfall of the study area decreases from about 1659.44 mm in the southern part of the State (Kafanchan) to about 1245.97mm in the central (Kaduna) and 1016.66 mm in the northern part (Zaria) (Abaje et al., 2018). The average annual rainfall and humidity for the whole area are 1307.36mm and 56.64%. The average minimum and maximum temperatures are 15.1°C and 35.18°C. The orographic effects of the Jos Plateau and the Kagoro hills have positive effects on the climate in the southern part, influencing rainfall, temperature, and relative humidity (Ishaya & Abaje, 2008).

The study area lies within the Guinea savanna region of Nigeria, where rainfall is heavier and is not subjected to too much firing (Buba, 2015). The geology of the study area consists of underlain Pre-Cambrian rocks of the basement complex, which are mainly granite, gneiss, migmatite, and quartzite (Nigeria Metal & Mining Sector (NMMS), 2017), which promotes mining of minerals. While dominant economic activities are farming, mining and commerce, rearing of animals, and hunting. The population is culturally diverse with differences in traditions and social norms between the predominantly Hausa/Muslim population in the northern part of the State and Christians of a variety of ethnic groups in the south.

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2.2 Data Collection

The study involved reconnaissance visits to mining areas with the help of subsistence miners present to have first-hand information about the study area. These visits identified four local government areas in Kaduna State where mining occurs (Sanga, Jema'a, Kajuru, and Birnin-Gwari local governments). Data for this study were collected through the questionnaire and direct field observation. Rural household heads from both mining and non-mining communities were purposively selected for the study because these groups of people are directly affected by artisanal mining and were in a better position to share their knowledge as well as voice out their concerns and worries about the mining activities.

Those of the mining communities were selected based on proximity to mining sites and the intensity of artisanal mining activities in such areas. While from the non-mining communities served as "control" Household heads at the age of 18 or above, because of their adequate knowledge and information they have on artisanal mining activities, assets, and livelihood outcomes. The minimum age threshold was used because, at that age, every person could decide for themselves and participate in decision-making at both the local and national levels. A total of three hundred and eighty-four (384) respondents were administered a questionnaire across the study area (Krejcie & Morgan, 1970). This involved self-questionnaire administration to avoid incompleteness of the questionnaire and increase the response rate of the respondents.

2.3 Data Analysis

Data for the study were analysed using percentages, means. Livelihood vulnerability of the impact of the mining and its activities was computed with the Livelihood Vulnerability Index (LVI) developed by using a balanced weighted approach (Hahn et al., 2009). Each sub-indicator of livelihood assets contributes equally to the overall index, even though each major component or major indicator comprises different numbers of sub-indicators (sub-components). A simple method with equal weights was applied for all major components. Because each sub-component is measured on a specific scale, it is therefore normalized as an index. For this purpose, the equation used in the LVI computation is shown below:

$$Index_{sv} = \frac{S_V - S_{min}}{S_{max} - S_{min}} \quad (1)$$

where Sv is the value of the sub-component for village v; Smin and Smax are the minimum and maximum values, respectively, from the data of that sub-component in the study area. After normalising sub-component values, the value of each major component was calculated by Eq. (2):

$$M\,vj = \frac{\sum_{i=1}^{n} Index_{sv}}{n} \quad (2)$$

Where Mvj is the value of major component j for village v; indexsvi represents the value of sub-components indexed by i of major component Mj; and n is the number of sub-components in major component Mj. The major component values are directly used in Eq. (3) or aggregated before being used to obtain the weighted average of LVI:

$$LVI_v = \frac{\sum_{j=1}^{n} w_{MJ} M_{vj}}{\sum_{j=1}^{n} w_{MJ}} \quad (3)$$

$$LVI_v = \frac{w_P P_v + W_F F_V}{w_P + w_F} \quad (4)$$

Where, LVIv is the livelihood vulnerability index of the study area and its weight value of major component j; wP, wF are the weight value of asset P, F, respectively. The LVI ranged from 0 to 1; 0 denoting the least vulnerable and 1 denoting the most vulnerable.

3 Results and Discussions

3.1 Demographic Characteristics of the Respondents

Table 1 depicts the demographic characteristics of the respondents in both mining and non-mining communities. However, more than half, 54.7% (105) and 71.9% (138) of the respondents were males in both mining and non-mining communities, while 87(45.3%) and 54(28.1%) were females, respectively. 40.1% and 41.7% fall within the age range of 30–39 years, respectively, in both communities. About 57.3% and 75% were married respectively in both communities, 19.8% did not attend school in mining communities, and 10.9% in non-mining communities. In terms of farming, 40.6% and 59.9% respectively, were farmers in both mining and non-mining communities. However, even those who claimed not to be farmers practice little agriculture, such as planting of crops and rearing of animals in their gardens.

Table 1: Demographic Characteristics of the Respondents

Variable	Categories	Mining Community n (%)	Non-Mining Community n (%)	Total n (%)
Sex	Male	105 (54.7%)	138(71.9%)	
	Female	87(45.3%)	54(28.1%)	
Total		**192(100%)**	**192 (100%)**	**384 (100%)**
Age	Less than 20	24(12.5%)	14(7.3%)	
	20-29 years	32(16.7%)	30(15.6%)	
	30-39 years	77(40.1%)	80(41.7%)	
	40-49 years	41(21.4%)	19(9.9%)	
	50-59 years	12(6.3%)	45(23.4%)	
	60 and above	6(3.0%)	4(2.1%)	
Total		**192(100%)**	**192(100%)**	**384(100%)**
Marital Status	Single	20(10.4%)	8(4.2%)	
	Married	110(57.3%)	144(75%)	
	Widow	62(32.3%)	40(20.8%)	
Total		**192(100%)**	**192(100%)**	**384(100%)**
Education	Non formal Education	38(19.8%)	21(10.9%)	
	Basic	77(40.1%)	66(34.4%)	
	Secondary	46(23.9%)	57(29.7%)	
	Tertiary	27(14.1%)	46(23.9%)	
	Others	4(2.1%)	2(1.1%)	
Total		**192(100%)**	**192(100%)**	**384(100%)**
Occupation	Farmer	78(40.6%)	115(59.9%)	
	Artisan/farmer	11(5.7%)	22(11.5%)	
	Trader/farmer	17(8.9%)	25(13.0%)	
	Civil Servant	19(9.9%)	28(14.6%)	
	Miner	67(34.9%)	2(1.0%)	
Total		**192(100%)**	**192(100%)**	**384(100%)**

3.2 Livelihood Vulnerability of Artisanal Mining on Household Physical and Financial Capital in Kaduna State

The overall Livelihood Vulnerability Index (LVI) of households in the study area (Table 2) was higher in the mining communities (0.549) compared to the non-mining communities (0.396).

Table 2: Livelihood Vulnerability Index of Livelihood Indicators in the Rural Communities of Kaduna State

Capital	Components	Sub-components	VI in Mining Com.	VI in Non-Mining Com
Physical	Road	Average time to reach the district capital	0.53	0.511
	Road Vulnerability(A)		**0.53**	**0.511**
	Production	HH without access to farm production inputs	0.646	0.25
	Production Vulnerability(B)		**0.646**	**0.25**
	Housing	HH with houses damaged by miners	0.323	0
	Housing Vulnerability(C)		**0.323**	**0**
Weighted Average for Physical Capital			**0.499**	**0.254**
Financial	Assets	Inverse of the average land holding index	0.51	0.33
	Assets Vulnerability (K)		**0.51**	**0.33**
	Finance	HH without access to credit	0.651	0.896
		HH without access to savings	0.73	0.594
	Finance Vulnerability (L)		**0.6905**	**0.745**
Weighted Average for Financial Capital			**0.600**	**0.538**
LIVELIHOOD VULNERABILITY INDEX			**0.549**	**0.396**

Note: VI-Vulnerability Index

Physical Capital Associated with Artisanal Mining in the Rural Communities of Kaduna State

The physical capital associated with artisanal mining in Kaduna State showed higher vulnerability in mining communities (0.499) than in non-mining communities (0.254). The physical capital comprises three major components: roads, production, and housing.

a. Road component

Regarding the road component, the average time taken to reach the district capital indicated vulnerability in both mining and non-mining communities, with vulnerability indices of 0.53 and 0.51, respectively. This prolonged travel time is primarily attributed to the poor condition of access roads. These findings align with those of Danquah et al. (2017), who reported that high road vulnerability indices in mining communities were due to deteriorated road infrastructure. The poor road conditions not only increase travel time to district capitals but also hinder trade and marketing activities, while simultaneously raising transportation costs.

Roads in both mining and non-mining communities were vulnerable due to the frequent use of heavy-duty vehicles and the use of substandard materials by construction companies during road building (see Plate 1). This has significantly increased the average travel time for households to reach district capitals. On average, it takes about 39 minutes for households in mining communities and 38 minutes in non-mining communities to reach district capitals, much longer than the expected 15 minutes. This delay adversely affects other economic activities in the area. These findings are consistent with Danquah et al. (2017), who reported that poor road conditions extended average travel times to district capitals to 55 minutes, rendering some roads nearly inaccessible.

Plate 1: Road Collapse Resulting from Artisanal Mining at Dan Kurciya, Jema'a Local Government

Households in both mining and non-mining communities use the same roads to transport people, goods, and services. Hundreds of heavy-duty vehicles from companies such as Dangote and BUA regularly traverse these routes daily, carrying cement, wood, and food items. These vehicles have caused more extensive damage to the roads than the mining operations themselves. However, it was observed that roads in non-mining communities of Kaduna State were more vulnerable than those in mining communities. This vulnerability is largely due to the use of substandard materials during construction and the lack of government efforts to rehabilitate or reconstruct damaged roads. For instance, roads connecting Angwan Rimi Kafanchan to Kwoi and Samaru Kataf-Mariri to Angwan Bawa were in very poor condition during data collection, whereas roads linking mining communities such as Godogodo-Gidan Waya and Antang were comparatively better. Although miners have contributed to road damage by digging underground tunnels beneath roads and, in some cases, chopping pillars supporting bridges and culverts (see Plate 1), leading to road collapses, the overall impact from heavy-duty vehicle traffic is more significant.

Mining in the study area has minimal impact on roads because it is conducted on an artisanal scale using rudimentary tools. Miners primarily utilise nearby rivers for washing minerals. While a few vehicles are used to transport sand to the rivers, most miners rely on water pumping machines to draw water from rivers or underground sources for mineral washing, eliminating the need to move large quantities of sand. Those without pumping equipment transport sand in sacks to the rivers for washing. Consequently, the mining activities have had a greater impact on the rivers than on the roads. Large amounts of sand accumulate daily along the river channels, reducing both water quality and volume.

b. Production Component of the Physical Capital

In terms of production, approximately 64.6% of households in mining communities lacked access to farm production inputs, compared to only 25% in non-mining communities (Table 2). The study revealed that many households in the mining communities of Kaduna State had limited access to inputs such as fertilisers, herbicides, and insecticides. This can be attributed to the fact that most have abandoned farming in favour of mineral mining, resulting in diminished interest in purchasing agricultural inputs. Instead, they tend to buy food from the market rather than produce it themselves, leading to reduced acquisition of farm inputs compared to non-mining communities. Conversely, households in non-mining communities primarily rely on farming as their main livelihood, which motivates them to obtain necessary farm inputs to support crop production during the rainy season.

Most households in non-mining communities that did not acquire farm production inputs are engaged in alternative livelihoods such as trading, marketing, or wage labour, often opting to purchase food during the harvest season rather than engage in farming. Excessive mineral mining has been shown to reduce agricultural production among rural households, particularly in

developing countries, thereby contributing to food insecurity. This occurs because mining draws people away from farming, leading to decreased agricultural output. In Kaduna State's mining communities, this trend is evident, as many farmers have shifted their focus from agriculture to mineral mining.

c. Housing Component of the Physical Capital

In terms of housing, approximately 32.3% of households in mining communities reported damage to their homes due to mining activities, while no such damage was recorded in non-mining communities. These highlights greater housing vulnerability in mining communities, primarily due to the influx of miners. Although mining in the area is artisanal, the steady movement of people into these communities in search of minerals has increased pressure on housing infrastructure. Many of the incoming miners rent homes during their stay, often causing wear and tear through the misuse or improper storage of mining tools, which can scratch floors and damage walls.

Additionally, in some communities, such as Godogodo in Jema'a Local Government and Rubu in Kajuru Local Government, mining activities are conducted even within built-up areas. This has resulted in the collapse of some buildings due to underground digging and structural weakening. The presence of such informal and unregulated mining not only damages existing housing but also reduces the overall quality and safety of residential structures. These findings align with the observation by the Centre for Development Studies, University of Wales (2004), which noted that in areas dominated by migrant miners, housing conditions tend to deteriorate. The combination of increased population pressure, poor infrastructure maintenance, and direct mining within residential areas contributes significantly to the heightened housing vulnerability in Kaduna State's mining communities.

The impact of mining has compelled many households in mining communities to renovate or rebuild their homes. Instead of benefiting financially from rental income, these households often incur losses by spending that income on repairs caused by damage from miners. In contrast, households in non-mining communities do not experience such mining-related damage. While their homes may occasionally suffer from natural events like wind or rainstorms, they are not burdened with repairs resulting from mining activities.

Financial Capital Associated with Artisanal Mining in the Rural Communities of Kaduna State

Financial capital exhibited higher vulnerability in the mining communities (0.600) compared to the non-mining communities (0.538). This capital comprised two key elements or components: assets and finance.

a. Asset Component of the Financial Capital

With respect to assets, the inverse of the average landholding index indicated significantly higher vulnerability in the mining communities (0.51) compared to the non-mining communities (0.33). This higher value implies that landholdings in mining areas are more unevenly distributed, with a few individuals or entities controlling a larger share of land resources. As a result, most households in mining communities possess smaller landholdings or lack land ownership altogether, making them more economically vulnerable. In contrast, non-mining communities show relatively better land distribution, contributing to lower asset-related vulnerability.

b. Finance Component of the Financial Capital

The second major component of financial capital was access to finance, which exhibited a lower vulnerability index of 0.691 in mining communities compared to 0.745 in non-mining communities (Table 2). This component comprised two sub-components, one of which was access to credit. In the mining communities, approximately 65.1% of households lacked access to credit, compared to 89.6% in non-mining communities. The relatively lower vulnerability in mining communities can be attributed to the income generated from artisanal mining activities. Mining offers individuals opportunities for quick income (Traore et al., 2024), thereby enabling easier access to credit or loans from individuals and financial institutions. These findings align with Baffour-Kyei et al. (2018), who reported that household financial assets are positively influenced by artisanal mining activities. However, they contrast with the findings of Muka'ila et al. (2022), who observed that access to credit was limited among rural women, thereby exacerbating poverty levels. Similarly, de Dieu Izerimana and Godwin (2024) noted that artisanal miners face significant challenges in accessing credit and formal banking services, as financial institutions often perceive the sector as high-risk. Even institutions that are open to engaging with artisanal miners typically impose high interest rates.

Although mining communities exhibited a degree of vulnerability, their level of vulnerability regarding access to credit was lower compared to non-mining communities. In the non-mining areas, higher vulnerability was observed due to the predominance of subsistence farming. Most households engage in small-scale agriculture primarily for family consumption, leaving little surplus for commercial sale. Consequently, many lack the financial capacity to repay loans, further compounded by widespread insecurity, including the

destruction of crops by herders, resulting in significant economic losses. This situation discourages lenders from providing credit due to fears of default. These findings support Gadzama (2015), who reported limited access to credit among farmers in the study area. In contrast, households in mining communities are largely composed of artisanal miners, who, when fortunate, can generate substantial daily income. This potential for high returns enhances their perceived creditworthiness and ability to repay loans, despite the inherent risks of mining, where miners may spend months without significant earnings. As Nyathi (2024) observed, a lack of financial capital exacerbates livelihood vulnerabilities to external shocks.

A higher percentage of households in mining communities (73%) lacked access to savings compared to 59.4% in non-mining communities. This indicates a greater vulnerability in terms of savings among mining communities in Kaduna State, Nigeria. Results of this study support Ajith et al. (2021), who noted that artisanal mining operators often rely on low, unstable daily incomes, lacking savings or social protections, especially during accidents or health crises. The limited access to savings among rural households in these areas is largely due to the nature of artisanal mining; many participants tend to spend earnings as they come, with little emphasis on long-term financial planning or saving for the future. These findings align with the Ministry of Petroleum and Mining (MPM, 2021), which highlighted that informality, difficulty in attracting financial resources, and limited business skills among artisanal miners significantly constrain the economic potential of the sector.

Although the majority of artisanal miners lack a savings culture, a few individuals within the mining communities do make deliberate efforts to plan for the future and save. Some have used their mining income to acquire assets such as houses, hotels, vehicles, and motorcycles. These investments were made possible through long-term savings accumulated over time. In certain cases, motorcycles purchased with mining proceeds have been converted into income-generating assets through commercial Motorcycle riding (Okada). These findings agreed with Baffour-Kyei et al. (2021) and Badianaah et al. (2021), who reported that participating in artisanal mining exerts a positive effect on the financial assets of the miners. In contrast, households in non-mining communities, primarily composed of subsistence farmers, are generally more conscious of the need to save. Aware that farming is their main source of livelihood, they tend to save money or store seeds in preparation for the next planting season, an essential practice that contributes to sustaining food production and supply across the country.

4 Conclusion

Artisanal mining exerts profound negative effects on the physical and financial capital of mining communities compared to non-mining counterparts. Households in artisanal mining communities experience significantly higher livelihood vulnerability than those in non-mining communities. Physical capital emerged as a major source of vulnerability in the mining areas, with challenges linked to poor road conditions, reduced access to agricultural inputs, and increased housing damage. Although both mining and non-mining communities suffer from deteriorated road infrastructure largely due to heavy-duty vehicle use and substandard construction materials, mining communities experience additional pressures from population influx and unregulated underground excavation, which weaken housing structures and increase repair costs.

In terms of production, the shift from farming to artisanal mining has reduced agricultural engagement in mining communities, limiting access to essential farm inputs and contributing to declining food production. Financial capital also showed higher vulnerability in mining areas, particularly due to unequal land distribution and limited savings culture. While miners sometimes gain easier access to credit due to potential high earnings, most lack long-term financial planning, leaving them more exposed to shocks. Overall, artisanal mining offers short-term financial opportunities but simultaneously undermines physical and financial stability, thereby intensifying livelihood vulnerability in rural Kaduna State. Policies should prioritize road maintenance, sustainable production practices, housing rehabilitation, and enhanced access to formal financial services to bolster resilience and sustainable livelihoods in affected communities.

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