European Journal of Management and Marketing Studies
ISSN: 2501 - 9988
ISSN-L: 2501 - 9988
Available on-line at: http://www.oapub.org/soc

DOI: 10.46827/ejmms.v10i2.2025 Volume 10 | Issue 2 | 2025

SUSTAINABLE DEVELOPMENT OF THE TIN MINING INDUSTRY IN PLATEAU STATE, NIGERIA

Ephraim Yeipeng Samuel[i]
Master in Development Management,
University of the Cordilleras,
Baguio City, Philippines

Abstract:
This study investigated the impact and sustainability of current tin mining practices in selected communities in Plateau State, Nigeria, focusing on social, economic, and environmental dimensions. Using a mixed-method research design, data were gathered from 385 community members through structured questionnaires and from 12 purposively selected participants via semi-structured interviews. The findings reveal that, despite the industry's historical significance in the region, tin mining has contributed little to the overall social development of the affected communities. Inadequate infrastructure, limited access to quality education and healthcare, and the absence of inclusive development programs highlight the industry's failure to foster meaningful social progress. Economically, the industry has not significantly enhanced livelihoods, with many residents remaining economically marginalized and excluded from stable income opportunities. Environmentally, mining activities have led to widespread degradation, including water and air pollution, deforestation, and soil erosion, with minimal evidence of remediation efforts. Social and economic challenges associated with mining were perceived as moderate but persistent, affecting quality of life, employment stability, and fair distribution of economic benefits. Environmental challenges, however, were viewed as severe, posing significant risks to health and ecological balance. Community perceptions overwhelmingly indicate that current mining practices are unsustainable due to exclusion from decision-making, unchecked environmental damage, and minimal long-term benefits. Based on these findings, the study concludes that for tin mining to become a vehicle for sustainable development, a shift in policy and operational practices is imperative. It is recommended that mining firms and government agencies implement inclusive community engagement strategies, ensure equitable economic participation, and enforce strict environmental protection regulations, including rehabilitation of degraded areas and adoption of sustainable mining technologies.

[i] Correspondence: ephraimsam10wo@gmail.com

Keywords: sustainable development, natural resource, management, social, economic, environmental

1. Introduction

The concept of sustainable development, which promotes the integration of economic growth, environmental protection, and social equity, has gained global recognition, particularly in managing natural resources (Emina, 2021). Mining, while economically significant, poses complex sustainability challenges. The global focus on the United Nations Sustainable Development Goals (SDGs), specifically Goals 12 (responsible consumption and production), 13 (climate action), and 15 (life on land), reiterates the need for responsible mining practices that ensure equitable benefit distribution, protect ecosystems, and support social well-being (Arora & Mishra, 2023). The global mining industry, valued at approximately $2 trillion in 2022 and projected to grow to $3.5 trillion by 2032, exemplifies this challenge (Knowledge Institute, 2024). Tin mining, in particular, plays a vital role in industrial growth but often causes environmental degradation, displaces communities, and affects livelihoods (Rahayu *et al.*, 2024). In Africa, the African Mining Vision (AMV) of 2009 offers a strategic framework for integrating mining into broader development planning. It emphasizes transparent governance, equitable benefit sharing, and environmental stewardship (Grant *et al.*, 2022). However, many sub-Saharan African countries still experience issues such as forced displacement, unsustainable land use, and community conflict linked to mining activities (Tiamgne *et al.*, 2022). In Nigeria, although rich in mineral resources, the sector's potential remains largely untapped. Following the oil boom in the 1970s, attention to solid minerals declined, resulting in the rise of unregulated artisanal and small-scale mining (ASM), often linked to health risks and environmental damage (Sha, 2024; Tioluwani, 2023).

As of 2024, the mining sector contributes about 8.64% to Nigeria's GDP and provides employment to over 500,000 people, primarily in ASM (National Bureau of Statistics, 2024; De Dieu-Izerimana & Godwin, 2024). However, these jobs are typically low-paying, unsafe, and environmentally harmful (Otoijamun *et al.*, 2021). Despite policy reforms, including the establishment of the Nigerian Mining Cadastre Office and the Roadmap for Mining Growth, issues like weak institutional capacity and lax environmental enforcement persist (Olujobi & Irumekhai, 2024). In Plateau State, mining communities such as Barkin Ladi, Bokkos, Jos South, and Riyom have long histories of tin mining, which have shaped their socio-economic landscapes. While mining has contributed to employment and local revenue, it has also led to land degradation, reduced agricultural productivity, and environmental pollution (Onyeka *et al.*, 2024). The dominant mining methods, open-pit, dredging, ASM, and hydraulic mining, have caused habitat destruction and soil erosion, with inadequate regulatory oversight.

Socially, mining has led to community disintegration, increased crime, and the displacement of households, undermining traditional structures and social cohesion (Owolabi *et al.*, 2024; Okyere *et al.*, 2022; Kana & Goki, 2022). Education and healthcare often receive less attention compared to mining infrastructure, disproportionately

affecting vulnerable populations. Economically, mining-induced income is unstable and unsustainable. Artisanal miners face exploitation, lack of protection, and minimal opportunities for skill development (Bansah & Adonteng-Kissi, 2025; Van Buren, 2024). Local businesses suffer during mining downturns, and increased demand raises living costs (Dikgwatlhe & Mulenga, 2023; Obodai *et al.*, 2024). Environmental consequences remain among the most severe, with widespread soil degradation, toxic water contamination, and poor air quality (Padhiary & Kumar, 2024; Obasi *et al.*, 2024). Ecosystem disruption and inadequate waste management further threaten long-term community viability (Nakade & Dhadse, 2024; Shengo, 2021). These interconnected social, economic, and environmental issues demand a comprehensive, sustainable development approach to mining governance, balancing economic objectives with environmental protection and social welfare to ensure equitable and lasting benefits for Plateau State's communities.

2. Literature Review

The literature on sustainable development in tin mining presents varied findings across different countries and contexts, revealing recurring social, economic, and environmental concerns in host communities. Socially, studies show that mining rarely delivers meaningful benefits to local populations. In Ghana, Nartey and Manu (2023) observed that mining primarily benefits political and economic elites rather than improving community welfare. Similar findings by Mnwana and Bowman (2022) in South Africa and Kalokoh and Kochtcheeva (2022) across several African countries confirm that promised social benefits are often unmet. In Mongolia, Turkina (2024) found that corporate social investments are often shallow, serving more as public relations tools than genuine development efforts. Research from Peru and Indonesia (Culp, 2022; Meutia *et al.*, 2022) also noted limited gains in education and health, even where companies tried community integration. However, positive outcomes were recorded in Korea by Lee *et al.* (2024), who found that social development improved when mining activities were coupled with participatory governance and targeted investments in social infrastructure.

Economically, while mining contributes significantly to national income, its benefits often bypass local communities. Randrianarisoa (2022) observed similar patterns in Madagascar, with profits going to elites while rural populations remained poor. In China, Chen *et al.* (2022) identified a lack of reinvestment and employment opportunities for locals. Aurélien *et al.* (2022) noted that Zambia's copper revenues did not translate into local entrepreneurship or development. These findings suggest that mining economies in developing countries often operate in ways that marginalize host communities. Environmentally, the literature reveals widespread degradation. In Ghana, Achina-Obeng and Aram (2022) linked small-scale mining to land and water damage due to weak regulations. Cuya *et al.* (2021) documented water contamination in Peru, and Rana *et al.* (2024) reported that in India, firms failed to follow through on environmental restoration. Similarly, in Cambodia and Indonesia, Zhang *et al.* (2023) and Tegnan *et al.* (2021) found that companies promoted environmental responsibility in rhetoric but did

not implement effective practices. In contrast, Jackson *et al.* (2023) described Canada's mining model as successful due to strict regulation and accountability, which supported environmental rehabilitation.

Further studies reported how communities suffered from pollution, land loss, and forced displacement. Rivera-Parra *et al.* (2021) and Reyes (2022) detailed health risks and social breakdown in Ecuador and Latin America. Blay (2022) and Wilson *et al.* (2022) found that mining activities often increase crime, reduce access to services, and undermine traditional livelihoods. Economically, Radley (2022) and Kwao (2024) described poverty and exploitative work in mining towns of the DRC and Ghana. Shiquan *et al.* (2022) and Mbilima (2021) noted inflation and unsustainable dependency in mining regions of China and Zambia. Environmental damage is extensive. Mimba *et al.* (2023) and Hoang *et al.* (2022) linked mining to ecosystem destruction, pollution, and deforestation in Cameroon, Vietnam, and Peru. Zárate-Rueda *et al.* (2021) and Ofori *et al.* (2023) documented widespread discontent rooted in exclusion, displacement, and environmental neglect. However, there remains a gap in the literature focusing on how these social, economic, and environmental challenges intersect in specific localities, especially in under-studied regions like Nigeria. This study seeks to address that gap by providing localized, integrated knowledge into community-level experiences with tin mining.

3. Theoretical Framework

The Sustainable Livelihood Framework (SLF), developed by Chambers and Conway (1992), serves as the theoretical foundation for this study. It offers a multidimensional approach for understanding how individuals and communities use available resources to maintain and improve their livelihoods while ensuring environmental sustainability. According to the SLF, a livelihood is sustainable when it can cope with external shocks, maintain or enhance capabilities, and provide long-term opportunities without degrading natural resources. The framework highlights five critical capital assets necessary for sustainable livelihoods: natural, human, social, physical, and financial capital (Natarajan *et al.*, 2022; Tambe, 2022). The SLF is particularly relevant in the context of Plateau State, Nigeria, where tin mining is a dominant economic activity. The framework helps analyze how mining disrupts community resilience by diminishing natural capital through land and water degradation, weakening human capital through health risks and poor education, and fragmenting social capital via displacement. Furthermore, mining often compromises physical capital due to weak infrastructure and reduces financial capital through irregular incomes from artisanal activities (Jiménez *et al.*, 2022; Baffour-Kyei *et al.*, 2021).

SLF also considers the role of external structures and institutions, such as policies, governance systems, and regulatory bodies, in shaping access to livelihood assets (Li *et al.*, 2023). In Nigeria, poor institutional oversight and policy gaps exacerbate the vulnerabilities of mining communities, limiting their ability to benefit sustainably from the industry (Onyeka *et al.*, 2024). Therefore, the SLF aligns well with this study's aim to

assess the social, economic, and environmental implications of tin mining. It enables a comprehensive evaluation of the interplay between resource use and livelihood security while identifying key intervention points, such as policy reform, environmental rehabilitation, and community empowerment. Overall, the SLF offers a robust and integrative lens through which the sustainability and resilience of mining-dependent communities in Plateau State can be critically assessed.

4. Research Objectives

The aim of this study was to assess sustainable development and natural resource management in Plateau State, Nigeria. Specifically, it provided answers to the following research objectives:

1) What is the level of benefits of tin mining to local communities in Plateau State in terms of:
    a. social;
    b. economic; and
    c. environmental?
2) What is the level of problems faced by local communities as a result of tin mining in Plateau State in terms of:
    a. social;
    b. economic; and
    c. environmental?
3) What are the perceptions of community members regarding the sustainability of current tin mining practices in Plateau State?

5. Importance of the Study

The findings of this study are expected to deliver multifaceted benefits to a range of stakeholders affected by mining activities, particularly in Plateau State, Nigeria. For federal and state policymakers, the research provides empirically grounded insights that can inform the development of more inclusive and environmentally sound mining policies. These insights help address governance gaps, ensuring that both community welfare and ecological sustainability are central to regulatory frameworks. Mining companies operating in Plateau State stand to benefit from a deeper understanding of the socio-economic and environmental impacts of tin mining as perceived by local communities. This knowledge enables the design of context-sensitive corporate social responsibility (CSR) initiatives that address critical concerns such as land degradation, health issues, and economic marginalization. By aligning their operations with community needs, companies can improve relations, reduce conflict, and contribute positively to sustainable development goals.

Local government authorities and urban planners can use the study to incorporate community perspectives into development plans. Emphasizing participatory governance will enhance transparency, accountability, and the legitimacy of local initiatives. For

residents of mining-impacted communities, the study offers a platform to voice their experiences, promoting greater engagement in advocacy and policy dialogue. Environmental and development NGOs can utilize the research as a reliable evidence base to support campaigns for sustainable extraction practices, environmental rehabilitation, and stronger regulatory oversight. Investors and mining companies are also guided by this data in aligning operations with community expectations, thereby enhancing CSR effectiveness and operational stability. Academically, the study enriches literature on sustainable development in resource-dependent regions, especially in under-researched areas like Nigeria's Middle Belt. It fills key empirical gaps and lays a foundation for future research on natural resource management, environmental governance, and community development, making it both a practical and scholarly contribution to the discourse on sustainable livelihoods.

6. Methodology

This study adopted a mixed-method research design, combining descriptive quantitative and qualitative approaches to capture both statistical patterns and deeper community insights regarding sustainable development in tin mining communities of Plateau State, Nigeria. Quantitative data were collected through structured questionnaires distributed to 385 respondents across four major mining-affected areas: Bassa, Barkin Ladi, Riyom, and Jos South. These communities were selected due to their high exposure to tin mining and its socio-environmental impacts. A stratified random sampling method was used to ensure proportional representation based on each community's population size. Additionally, twelve participants were purposively selected for semi-structured interviews to offer deeper insights into community experiences. These interviewees included community leaders, artisanal miners, women, youth leaders, educators, and environmental advocates, chosen for their diverse perspectives and experiences. Data collection tools included a structured questionnaire and a semi-structured interview guide. The questionnaire covered demographic information, perceived benefits and challenges of tin mining (social, economic, and environmental), with 36 Likert-scale items developed from existing literature. The interviews focused on community perceptions of mining's sustainability and were divided into two sections addressing benefits/challenges and sustainable practices.

The research tools underwent content validation by three academic experts and a Principal Component Analysis (PCA), confirming that the questionnaire captured the study's core dimensions. A pilot test with 20 respondents from Bauchi State produced a Cronbach's Alpha reliability coefficient of 0.831, indicating high internal consistency. Due to geographical constraints (the researcher being based in the Philippines), the questionnaire was administered via Google Forms, enabling efficient and broad data collection. Interviews were conducted through WhatsApp, Zoom, and Facebook Messenger, and recorded with participants' consent. Transcriptions were analyzed thematically. Ethical standards were rigorously maintained, including informed consent,

anonymity, confidentiality, and participants' right to withdraw. Data were securely stored and only accessible to the researcher and statistician.

6. Results and Discussions

Table 1: Level of Tin Mining Benefits Across Key Dimensions for Local Communities

No.	Indicators	Weighted Mean	Interpretation
1	Environmental	2.49	Low level of benefits experienced
2	Social	2.45	Low level of benefits experienced
3	Economic	2.34	Low level of benefits experienced
Overall Weighted Mean		**2.43**	**Low level of benefits experienced**

The findings in Table 1 show that the perceived benefits of tin mining across environmental (2.49), social (2.45), and economic (2.34) dimensions remain low, resulting in an overall weighted mean of 2.43. This indicates that tin mining has not meaningfully contributed to improving the quality of life for residents in the four mining communities surveyed in Plateau State. Although mining operations exist, respondents perceive limited advantages in employment, infrastructure, environmental protection, and social welfare. Most community members have lived in the area for over 16 years, yet only 16.62% are involved in tin mining, mainly in low-paying support roles like cooking. This suggests limited integration into the mining economy. These results raise concerns about continuing socio-economic challenges faced by the communities despite their proximity to resource extraction sites. Mining companies may face resistance and deteriorating relations due to unfulfilled expectations of local development. Policymakers are encouraged to reconsider existing strategies to ensure that resource wealth contributes to local progress. Nartey and Manu (2023), in their study of Ghana, found similar outcomes, where mining regions saw little progress in areas such as infrastructure and health. Instead of becoming centers of development, these communities often remain neglected.

Mnwana and Bowman (2022) also found that in South Africa, mining benefits were often confined to elite circles, with most community members receiving little to no share of the wealth generated. Kalokoh and Kochtcheeva (2022) noted that mining companies frequently made promises related to development and environmental restoration, which seldom materialized. In contrast, Cassotta *et al.* (2021) reported that Australia's effective policies and regulatory systems ensured that mining companies fulfilled their social responsibilities, contributing to better infrastructure and community welfare. Using Chambers and Gordon's (1992) Sustainable Livelihood Framework, the data suggest that human, social, and natural capital remain underdeveloped in Plateau's mining communities. Interviews reinforce this point. One resident said, "*we see the trucks and hear the machines, but our lives remain the same*". Another noted, "*my son is a graduate but works as a cook in the mine*" and others lamented the lack of local development over the past decades. These voices confirm that tin mining has not substantially improved local living conditions.

Table 2: Summary of the Dimensions of the Level of Problems Experienced by Local Communities Due to Tin Mining

No.	Indicators	Weighted Mean	Interpretation
1	Environmental	3.32	Very high level of problems encountered
2	Economic	3.13	Very high level of problems encountered
3	Social	3.01	Very high level of problems encountered
Overall Weighted Mean		**3.15**	**Moderate level of problems encountered**

The findings in Table 2 provide a summary of the extent of problems experienced by local communities in Plateau State, Nigeria, due to tin mining. Environmental issues recorded the highest weighted mean (3.32), followed by economic (3.13) and social (3.01) concerns. While all dimensions indicated a very high level of problems encountered, the overall weighted mean of 3.15 suggests that tin mining presents a moderate but widespread burden across the communities studied.

Environmentally, residents report pollution of water sources, soil degradation, and health issues related to dust and noise pollution. Economically, many residents do not receive fair compensation or benefit from the mining operations despite their proximity to mineral-rich lands. Socially, issues such as displacement, rising crime, and weakened access to education and healthcare are prevalent. These findings align with Rivera-Parra *et al.* (2021), who found similar environmental and economic challenges among communities near artisanal mining in Ecuador. Likewise, Reyes (2022) highlighted that rural mining regions in Latin America often suffer environmental degradation and economic instability despite the presence of extractive industries. Blay (2022) also reported displacement, reduced access to traditional livelihoods, and exclusion from decision-making among communities near mining operations.

Respondents from the Plateau mining communities vividly confirmed the harsh realities posed by tin mining during qualitative interviews, painting a troubling picture of their day-to-day experiences. One respondent lamented the pollution of the community's primary water source, stating that the river, once relied upon for drinking, is now contaminated, putting health and safety at risk. Another individual noted that, despite the substantial profits generated by tin mining activities, workers remain underpaid, with no corresponding improvement in living conditions. A female participant, trained in agriculture, reported that the soil has become infertile due to continuous mining, rendering her unable to practice her profession and threatening local food production. Yet another respondent expressed frustration over the absence of any tangible benefits from mining operations, despite their proximity to resource-rich sites. These narratives were not isolated but echoed by many long-term residents, most of whom are well-educated, suggesting that knowledge and awareness of their situation are not lacking. Rather, the problem lies in the systemic neglect of community interests. The persistence of these issues reveals the urgent need for comprehensive government intervention, stricter corporate regulations, and genuine community involvement in mining-related decisions to foster sustainable development and secure environmental and social justice in affected areas.

Table 3: Community Perceptions on the Sustainability of Current Tin Mining Practices

No.	Indicators	Frequency (F**)	Percent (%)
1	Tin mining practices are not environmentally sustainable.	11	91.67
2	Mining activities cause long-term damage to land and water sources.	9	75.0
3	Current practices lack proper rehabilitation or restoration programs.	7	58.33
4	There is little to no community involvement in mining decisions.	7	58.33
5	Mining generates short-term economic benefits but no long-term development.	5	41.67
6	Tin mining companies do not follow strict environmental regulations.	5	41.67
7	There is a need for alternative livelihoods beyond tin mining.	4	33.33
8	Tin mining should be phased out for more eco-friendly and sustainable ventures.	2	16.67

F** = Multiple responses

Table 3 presents community perceptions regarding the sustainability of tin mining practices in Plateau State. An overwhelming 91.67% of respondents believe current mining operations are environmentally unsustainable. Additionally, 75% agree that mining causes long-term damage to land and water sources. A further 58.33% report the absence of effective rehabilitation programs and limited community involvement in mining-related decisions. Around 41.67% state that mining brings short-term gains but lacks long-term developmental impact, with the same percentage alleging that environmental regulations are poorly enforced. One-third of respondents see the need for alternative livelihoods, and 16.67% believe tin mining should eventually be replaced with eco-friendly ventures. These responses reflect growing dissatisfaction among residents with how mining is managed. Communities face health risks, degraded farmlands, and loss of biodiversity, undermining their ability to sustain livelihoods. Residents feel excluded from decisions affecting their environment and well-being. For mining companies, these views signal growing reputational risks and potential for community resistance. Policymakers are urged to review mining governance frameworks, enforce environmental regulations, and ensure local involvement.

Similar challenges have been observed globally. Chen *et al.* (2022) found that artisanal mining communities in Asia faced contaminated water sources and reduced agricultural productivity. Zárate-Rueda *et al.* (2021) described how limited community participation in Latin America led to unequal development, social divisions, and local resentment. Ofori *et al.* (2023) showed that mining-induced displacement in Ghana caused long-term economic instability, while Matanzima and Loginova (2024) reported that large-scale mining in Papua New Guinea led to cultural erosion and environmental degradation due to the exclusion of indigenous voices. These outcomes reflect a failure to uphold the principles of Chambers and Gordon's (1992) Sustainable Livelihood Framework, which stresses the need to preserve human, social, and environmental

capital. In Plateau State, these vital resources continue to decline due to extractive activities.

Interviews reinforce these findings. One respondent said, "*the rivers we used to fish in are now full of mud and chemicals*". Another noted, "*they come to mine and leave behind gaping holes*". A third said, "*we have no say in how mining is done*", while a fourth remarked, "*it helps a few people short-term but ruins the land*". A mine kitchen worker added, "*even though I work here, I worry about the dust and noise harming my kids*". These accounts reflect a deep sense of exclusion, environmental anxiety, and the unmet promise of development.

7. Conclusions

Based on the empirical and thematic evidence gathered from this study, several conclusions have been drawn, each reflecting the critical dimensions outlined in the research objectives and offering insights into the socio-economic and environmental impacts of tin mining in Plateau State. First, the social footprint of tin mining remains remarkably shallow. Despite the long-standing presence of mining operations in the region, there is a clear disconnect between resource extraction and visible improvements in communal well-being. Basic public infrastructure, such as healthcare, education, and clean water supply, shows limited enhancement, suggesting that the social benefits of mining have not sufficiently permeated local communities. This situation underscores a pattern where the presence of a lucrative natural resource does not automatically translate to local development.

Second, the economic framework surrounding tin mining in Plateau State appears to be predominantly extractive rather than inclusive. The benefits of mining are disproportionately concentrated in the hands of private operators and external stakeholders, with minimal trickle-down effect to local populations. Employment opportunities are often temporary or low-wage, and there is scant evidence of reinvestment into the local economy or support for community-driven enterprises. This economic structure fails to stimulate sustainable growth or foster widespread prosperity among residents.

Furthermore, tin mining activities in the region have continued to prioritize production output at the expense of ecological responsibility. The operations leave visible and long-lasting environmental scars, open pits, deforestation, polluted waterways, and degraded soil—while rehabilitation or conservation efforts remain largely absent or poorly implemented. This neglect of environmental stewardship threatens the long-term ecological balance and the livelihoods dependent on agriculture and natural resources. In addition, mining activities, while not always perceived as overtly destructive, have subtly undermined social stability and reduced access to essential services. The increased strain on already limited infrastructure, displacement of households, and degradation of land suitable for farming contribute to a gradual erosion of community resilience. The inability of the mining sector to serve as a reliable engine of inclusive economic

development, especially in terms of job creation, fair compensation, and equitable wealth distribution, further compounds the socio-economic challenges.

Moreover, the operations have precipitated a serious environmental crisis in many mining communities. Residents have voiced intense concern over the persistence and severity of ecological damage, with many reporting increased health risks, declining agricultural yields, and contamination of traditional water sources. These issues signal an urgent need for more effective environmental regulation, remediation efforts, and public health interventions. Finally, a growing sense of dissatisfaction is evident among local communities regarding the current direction of tin mining in the state. This sentiment is driven by mounting concerns over the long-term viability of mining as a development strategy and its failure to adhere to sustainability principles. The lack of inclusive participation in mining-related decision-making processes and the absence of community empowerment mechanisms reflect broader governance gaps. Together, these conclusions call for a rethinking of mining policies to ensure they align more closely with sustainable development goals and genuinely benefit host communities.

7.1 Recommendations

Drawing from the key findings and corresponding conclusions of this study, several recommendations are proposed to address the critical issues identified, enhance policy responses, and promote sustainable practices in tin mining operations and community development across Plateau State. First, mining companies, in partnership with the Plateau State Government, should implement Community Development Agreements (CDAs) that require significant investments in health, education, and infrastructure within host communities. These CDAs should be made a mandatory component of all mining licenses and monitored by Community Liaison Committees composed of local leaders, non-governmental organizations (NGOs), and government officials. This approach will ensure that mining activities lead to tangible improvements in social welfare.

Furthermore, introducing a local content policy is essential to prioritize employment and procurement from the affected communities. This policy should include enforceable hiring quotas and penalties for companies that fail to comply. To foster economic resilience, micro-grants and revolving funds should be introduced to support local enterprises, thereby reducing the overdependence on mining. Moreover, mining companies should be legally mandated to implement Environmental Management Plans (EMPs) that incorporate land reclamation, reforestation, and pollution control. These EMPs should be periodically reviewed, and mining permits should be conditional on compliance. A dedicated Environmental Remediation Trust Fund, jointly managed by the government and civil society, can ensure sustained funding for environmental restoration initiatives.

Second, it is recommended that Mining-Community Mediation Councils (MCMCs) be created to facilitate regular dialogue between mining firms and local residents. These councils would be responsible for resolving conflicts, improving access to services, and promoting social harmony. To address health and education deficits, the

deployment of mobile health clinics and modular schools should be prioritized. Additionally, mining companies can support youth-focused programs that promote civic engagement and community development, funded through corporate social responsibility (CSR) allocations. To promote economic fairness, a Mining Economic Equity Framework should be adopted, which would include a community mining dividend scheme to distribute a portion of mining revenues to local households or reinvest them in shared infrastructure like roads and markets. Formalizing artisanal miners into cooperatives would also enhance their access to financial tools, safety training, and better market opportunities. Public-private partnerships should be promoted to stimulate non-mining sectors such as agro-processing, thereby diversifying and strengthening the local economy. An independent Mining Environmental Task Force should also be established to monitor and manage ecological impacts. This task force should conduct baseline studies of mining sites, perform regular environmental assessments, and utilize satellite technologies and drones to detect violations. Mining companies that breach environmental regulations should face real-time penalties.

Finally, mining practices in Plateau State should be restructured using a participatory sustainability framework that holistically integrates environmental, social, and economic goals. The Sustainable Livelihood Framework (SLF) may serve as a strategic tool for planning and policy assessment, ensuring that local communities have an active role in shaping mining-related projects. Mining companies should also be required to conduct Environmental and Social Impact Assessments (ESIAs) in close consultation with local stakeholders before initiating any operations. To ensure transparency and public accountability, sustainability scorecards should be developed and published annually. These scorecards should be jointly compiled by community representatives and government agencies and used to evaluate mining companies' performance in delivering on their environmental and social responsibilities. Through these comprehensive measures, Plateau State can move toward a more equitable and sustainable mining future.

Conflict of Interest Declaration

This author declares that there is no conflict of interest associated with its conduct. The researcher affirms that there are no personal, financial, or institutional relationships that could have influenced the research outcomes. All data collection, analysis, and interpretations were carried out objectively and independently. The findings and conclusions presented are solely based on scholarly investigation and are free from any external influence.

About the Author

Ephraim Yeipeng Samuel is a highly driven and detail-oriented professional with a strong academic background and a proven track record in virtual assistance and digital media management. He holds a Master’s degree in Development Management and a Bachelor’s degree in Civil Engineering, both from the University of the Cordilleras in Baguio City, Philippines. Over the past five years, he has accumulated extensive

experience providing top-tier remote administrative support to entrepreneurs, executives, and businesses across various industries. Ephraim has worked with reputable organizations such as Max Bergstrom, Creed Media in Sweden, Batsy Barr, and INNODATA in Manila, where he demonstrated expertise in social media management, content creation, influencer relations, video editing, and data moderation. His role as a digital assistant involved managing online campaigns, producing engaging multimedia content, and maintaining client relations, which sharpened his communication and multitasking abilities. Ephraim is also proficient in website design, SEO, email copywriting, lead generation, and cryptocurrency trading. With a deep understanding of digital tools and a passion for delivering exceptional results, Ephraim is committed to contributing meaningfully to any dynamic organization he joins while pursuing continuous professional growth and excellence in remote support services.

References

Achina-Obeng, R., and Aram, S.A. (2022). Informal Artisanal and Small-Scale Gold Mining (ASGM) in Ghana: Assessing Environmental Impacts, Reasons for Engagement, and Mitigation Strategies. *Resources Policy, 78.* https://doi.org/10.1016/j.resourpol.2022.102907

Arora, N.K., and Mishra, I. (2023). Sustainable Development Goal 13: Recent Progress and Challenges to Climate Action. *Environmental Sustainability, 6*(3), 297-301. https://doi.org/10.1007/s42398-023-00287-4

Arora, N.K., and Mishra, I. (2023). Responsible Consumption and Production: A Roadmap to Sustainable Development. *Environmental Sustainability, 6*(1), 1-6. https://doi.org/10.1007/s42398-023-00266-9

Aurélien, N., Hu, J., Ousmane, S., Makuza, B., and Pitiya, R. (2022). Impact of the Mining Rights Allocation Process on the Sustainable Development of the Copper Mining Industry in Zambia. *Journal of Geoscience and Environment Protection, 10*(4), 227-246. https://doi.org/10.4236/gep.2022.104014

Baffour-Kyei, V., Mensah, A., Owusu, V., and Horlu, G.S. (2021). Artisanal Small-Scale Mining and Livelihood Assets in Rural Southern Ghana. *Resources Policy, 71.* https://doi.org/10.1016/j.resourpol.2021.101988

Bansah, K.J., and Adonteng-Kissi, O. (2025). Child Labor in Artisanal and Small-Scale Mining: Implications for Health, Development and Poverty. *The Extractive Industries and Society, 21.* https://doi.org/10.1016/j.exis.2024.101577

Blay, J.K. (2022). A Phenomenological Study of Artisanal and Small-Scale Gold Mining in Ghana: Rural Poverty Mitigation or Aggravation? Unpublished Doctoral Dissertation, Niagara University, United States. Retrieved from https://www.proquest.com/openview/c97bacf98df1c5b4a407ac49278621d2/1?pq-origsite=gscholar&cbl=18750&diss=y

Cassotta, S., Cueva, V.P., and Raftopoulos, M. (2021). Australia: Regulatory, Human Rights and Economic Challenges and Opportunities of Large-Scale Mining

Projects: A Case Study of the Carmichael Coal Mine. *Environmental Policy and Law, 50*(4-5), 357-372. http://dx.doi.org/10.3233/EPL-200238

Chambers, R., and Gordon, C. (1992). Sustainable Rural Livelihoods: Practical concepts for the 21st Century. IDS Discussion Paper 296, IDS, Brighton, United Kingdom. Retrieved from https://www.ids.ac.uk/download.php?file=files/Dp296.pdf

Chen, Z., Yang, Y., Zhou, L., Hou, H., Zhang, Y., Liang, J., and Zhang, S. (2022). Ecological Restoration in Mining Areas in the Context of the Belt and Road Initiative: Capability and Challenges. *Environmental Impact Assessment Review, 95.* https://doi.org/10.1016/j.eiar.2022.106767

Culp, F. (2022). Mining for Progress: Copper, Conflict, and Corporate Social Responsibility. Unpublished Doctoral Dissertation, University of South Carolina, United States. Retrieved from https://scholarcommons.sc.edu/etd/6568/

De Dieu-Izerimana, J. and Godwin, L. (2024) Opportunity and Side Effects of Artisanal and Small-Scale Mining in Nigeria. *Modern Economy, 15*, 233-250. https://doi.org/10.4236/me.2024.153012

Dikgwatlhe, P., and Mulenga, F. (2023). Perceptions of Local Communities Regarding the Impacts of Mining on Employment and Economic Activities in South Africa. *Resources policy, 80*. https://doi.org/10.1016/j.resourpol.2022.103138

Emina, K.A. (2021). Sustainable Development and the Future Generations. *Social Sciences, Humanities and Education Journal, 2*(1), 57-71. http://dx.doi.org/10.25273/she.v2i1.8611

Grant, J., Mayanja, E., Taodzera, S., and Tesfamichael, D. (2022). Natural Resource Governance in Africa. https://doi.org/10.1093/acrefore/9780190846626.013.617

Oxford Research Encyclopedia of International Studies. https://oxfordre.com/internationalstudies/view/10.1093/acrefore/9780190846626.001.0001/acrefore-9780190846626-e-617.

Hoang, A.N., Pham, T.T.K., Mai, D.T.T., Nguyen, T., and Tran, P.T.M. (2022). Health Risks and Perceptions of Residents Exposed to Multiple Sources of Air Pollutions: A Cross-Sectional Study on Landfill and Stone Mining in Danang City, Vietnam. *Environmental Research, 212.* https://doi.org/10.1016/j.envres.2022.113244

Jackson, S., Poelzer, G., Poelzer, G., and Noble, B. (2023). Mining and Sustainability in the Circumpolar North: The Role of Government in Advancing Corporate Social Responsibility. *Environmental Management, 72*(1), 37-52. https://doi.org/10.1007/s00267-022-01680-1

Jiménez, A.D., Smith, N.M., and Holley, E.A. (2022). Capitals in Artisanal and Small-Scale Mining in Marmato, Colombia: Using the Sustainable Livelihoods Framework to Inform Formalization. *The Extractive Industries and Society, 12.* https://doi.org/10.1016/j.exis.2022.101157

Kalokoh, A., and Kochtcheeva, L.V. (2022). Governing the Artisanal Gold Mining Sector in the Mano River Union: A Comparative Study of Liberia and Sierra Leone. *Journal of International Development, 34*(7), 1398-1413. https://doi.org/10.1002/jid.3643

Kana, A.A., and Goki, N.G. (2022). Illegal mining, Conflicts, and Policing in Africa. Policing Criminality and Insurgency in Africa. *Perspectives on the Changing Wave of Law Enforcement, 273.* Retrieved from https://www.researchgate.net/publication/383873835_Illegal_Mining_Conflicts_and_Policing_in_Africa_in_Policing_Criminality_and_Insurgency_in_Africa_Perspectives_on_the_Changing_Wave_of_Law_Enforcements

Knowledge Institute. (2024). Mining Industry Outlook. Accessed Online on May 1, 2025 from: https://www.infosys.com/iki/research/mining-industry-outlook2024.html

Kwao, B. (2024). Labour Control through Risk and Profit-Sharing: Social Inequalities and Exploitation through Artisanal and Small-Scale Mining in Ghana. *Geoforum*, 154. Retrieved from https://doi.org/10.1016/j.geoforum.2024.104070

Li, T., Singh, R.K., Cui, L., Xu, Z., Liu, H., Fava, F., and Cui, X. (2023). Navigating the Landscape of Global Sustainable Livelihood Research: Past Insights and Future Trajectory. *Environmental Science and Pollution Research, 30*(46), 103291-103312. https://doi.org/10.1007/s11356-023-29567-6

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, 18.* https://doi.org/10.1016/j.exis.2024.101478

Mbilima, F. (2021). Extractive Industries and Local Sustainable Development in Zambia: The Case of Corporate Social Responsibility of Selected Metal Mines. *Resources policy, 74.* https://doi.org/10.1016/j.resourpol.2019.101441

Meutia, A.A., Lumowa, R., and Sakakibara, M. (2022). Indonesian Artisanal and Small-Scale Gold Mining: A Narrative Literature Review. *International Journal of Environmental Research and Public Health, 19*(7). https://doi.org/10.3390/ijerph19073955

Mimba, M.E., Mbafor, P.U.T., Fils, S.C.N., and Nforba, M.T. (2023). Environmental Impact of Artisanal and Small-Scale Gold Mining in East Cameroon, Sub-Saharan Africa: An Overview. *Ore and Energy Resource Geology, 15.* https://doi.org/10.1016/j.oreoa.2023.100031

Mnwana, S., and Bowman, A. (2022). Land, Conflict and Radical Distributive Claims in South Africa's Rural Mining Frontier. *The Extractive Industries and Society, 11.* https://doi.org/10.1016/j.exis.2021.100972

Nakade, D., and Dhadse, S. (2024). Biodiversity Loss Due to Mining Activities. *Sustainability and Biodiversity Conservation, 3*(3), 49-65.

Nartey, S., and Manu, F.A. (2023). Host Communities' Infrastructural Development Expectations of Multinational Mining Companies in Ghana's Mining Industry. *Africa Journal of Management, 9*(3), 259-282. https://doi.org/10.1080/23322373.2023.2232132

Natarajan, N., Newsham, A., Rigg, J., and Suhardiman, D. (2022). A Sustainable Livelihoods Framework for the 21st Century. *World Development, 155.* https://doi.org/10.1016/j.worlddev.2022.105898

National Bureau of Statistics. (2024). Nigerian Gross Domestic Product Report Q4 2024. Retrieved from

https://microdata.nigerianstat.gov.ng/index.php/catalog/147/download/1157/Q4_2024_GDP_Report.pdf

Obasi, P.N., Eyankware, M.O., and Edene, E.N. (2024). Contamination of Potable Water Supply Sources in the Lead–Zinc Mining Communities of Mkpuma Akpatakpa, Southeastern Nigeria. *International journal of energy and water resources, 8*(2), 225-239. https://doi.org/10.1007/s42108-022-00199-9

Obodai, J., Bhagwat, S., and Mohan, G. (2024). The Interface of Environment and Human Wellbeing: Exploring the Impacts of Gold Mining on Food Security in Ghana. *Resources Policy, 91.* https://doi.org/10.1016/j.resourpol.2024.104863

Ofori, R., Takyi, S.A., Amponsah, O., and Gagakuma, D. (2023). Mining-Induced Displacement and Resettlement in Ghana: An Assessment of the Prospects and Challenges in Selected Mining Communities. *Social Network Analysis and Mining, 13*(1), 61. https://doi.org/10.1007/s13278-023-01075-y

Okyere, E.A., Ennumh, T.Y.B., Opoku, M., Nketsia, W., Amponteng, M., Saah, R., and Takyiakwaa, A. (2022). "We Are Losing Our Identity as People": The Impact of Mining on the Sociocultural Practices of People in Mining Communities in Ghana. *The International Journal of Sustainability in Economic, Social and Cultural Context, 18*(2), 77. http://dx.doi.org/10.18848/2325-1115/CGP/v18i02/77-93

Olujobi, O.J., and Irumekhai, O.S. (2024). Strategies and Regulatory Measures for Combatting Illicit Mining Operations in Nigeria: A Comprehensive Legal Perspective. *Resources Policy,* 88. https://doi.org/10.1016/j.resourpol.2023.104459

Onyeka, N.E., Chukwu, I., and Adebayo, O.F. (2024). The Economic Consequences of Tin Mining for Rural Livelihoods and Regional Development in Jos Plateau, Nigeria. *Law and Economy, 3*(4), 10-14. Retrieved from https://www.paradigmpress.org/le/article/download/1084/952/1239

Otoijamun, I., Kigozi, M., Abdulraman, S.O., Adetunji, A.R., and Onwualu, A.P. (2021). Fostering the Sustainability of Artisanal and Small-Scale Mining (ASM) of Barite in Nasarawa State, Nigeria. *Sustainability, 13*(11). https://doi.org/10.3390/su13115917

Owolabi, A.O., Eniowo, O.D., Grobler, H., and Mulaba-Bafubiandi, A.F. (2024). Socioeconomic and Environmental Assessment of Artisanal and Small-Scale Mining in Jos and Barkin Mining Communities, Plateau State, Nigeria. *Zhongguo Kuangye Daxue Xuebao, 29*(4), 276-287. Retrieved from https://zkdx.ch/journal/zkdx/article/view/109

Padhiary, M., and Kumar, R. (2024). *Assessing the Environmental Impacts of Agriculture, Industrial Operations, and Mining on Agro-Ecosystems*. In *Smart Internet of Things for Environment and Healthcare.* Cham: Springer Nature Switzerland, 107-126. https://doi.org/10.1007/978-3-031-70102-3_8

Radley, B. (2022). Class Formation and Capital Accumulation in the Countryside: Artisanal and Small-Scale Gold Mining in South Kivu, DR Congo. *Journal of Agrarian Change, 22*(2), 398-414. https://doi.org/10.1111/joac.12474

Rahayu, D.P., Rustamadji, M., Faisal, and Sari, R. (2024). Illegal Tin Mining, Policy Gaps and the Plight of Small-Scale Tin Miners in Indonesia. *South East Asia Research, 32*(4), 351-369. https://doi.org/10.1080/0967828X.2025.2462727

Rana, K.K., Pachu, A.V., Jeeva, V., Rao, N.R., Sekhar, A., Singh, A.N., and Kumar, S. (2024). Enhancing Sustainability: Reclamation and Rehabilitation Strategies for Restoring Mined-Out Lands in India to Mitigate Climate Change Impacts. In Forests and Climate Change: Biological Perspectives on Impact, Adaptation, and Mitigation Strategies. *Springer Nature*, 573-603. http://dx.doi.org/10.1007/978-981-97-3905-9_28

Randrianarisoa, A.T. (2021). *Large-Scale Mining in Madagascar: an interdisciplinary assessment of economic and social impacts at national, regional and local levels.* Unpublished Doctoral dissertation, RMIT University, Australia. Retrieved from https://www.diapason.mg/large-scale-mining-in-madagascar-an-interdisciplinary-assessment-of-economic-and-social-impacts-at-national-regional-and-local-levels/

Reyes, C. (2022). *Mining Our Hopes and Dreams: Large-Scale Mines and Youth Outcomes in Peru*. Unpublished Doctoral Dissertation, Pennsylvania State University, United States. Retrieved from https://etda.libraries.psu.edu/catalog/19625cfb132

Rivera-Parra, J.L., Beate, B., Diaz, X., and Ochoa, M.B. (2021). Artisanal and Small Gold Mining and Petroleum Production as Potential Sources of Heavy Metal Contamination in Ecuador: A Call to Action. *International Journal of Environmental Research and Public Health, 18*(6). https://doi.org/10.3390/ijerph18062794

Sha, D.P. (2024*). New Resource Discoveries, Old Patterns of Accumulation, Politics, and Development in Nigeria. The Politics of New African Resource Discoveries in the Post-Curse Era*, 249.

Shengo, L.M. (2021). Review of Practices in the Managements of Mineral Wastes: The Case of Waste Rocks and Mine Tailings. *Water, Air, and Soil Pollution, 232*(7). https://doi.org/10.1007/s11270-021-05198-w

Tambe, S. (2022). *Sustainable Livelihoods Approach*. In *Teaching and Learning Rural Livelihoods: A Guide for Educators, Students, and Practitioners*. Cham: Springer International Publishing, 45-56.

Tegnan, H., Karjoko, L., Barkhuizen, J., and Bajrektarevic, A.H. (2021). Mining Corruption and Environmental Degradation in Indonesia: Critical Legal Issues. *Bestuur, 9*(2), 90-100. Retrieved from https://jurnal.uns.ac.id/bestuur/article/view/55219

Tiamgne, X.T., Kalaba, F.K., and Nyirenda, V.R. (2022). Mining and Socio-Ecological Systems: A Systematic Review of Sub-Saharan Africa. *Resources policy*, 78. https://doi.org/10.1016/j.resourpol.2022.102947

Tioluwani, C.T. (2023). *Towards a Stakeholder Model for Institutional Voids: Integrating Host Communities in the Corporate Governance of Nigerian Mining Companies.* Unpublished Doctoral Dissertation, University of Essex, United Kingdom. Retrieved from https://repository.essex.ac.uk/37083/

Turkina, N. (2024). Neither Naïve Nor Fatalistic: Decolonizing Mining Partnerships with Indigenous Communities in Mongolia and Australia. *Business & Society 7*(5). Retrieved from https://doi.org/10.1177/00076503241283802

Van Buren, M. (2024). *Silver "Thieves," Tin Barons, and Conquistadors: Small-Scale Mineral Production in Southern Bolivia*. University of Arizona Press. Retrieved from https://www.jstor.org/stable/jj.14203786

Wilson, S.A., Wilson, C.O., and Moise, I.K. (2022). Livelihood Impacts of Iron Ore Mining-Induced Land Change in Sierra Leone: A Time Series Analysis. *Applied Geography, 144*. https://doi.org/10.1016/j.apgeog.2022.102713

Zárate-Rueda, R., Vélez-Hernández, C.L., and Caballero-Márquez, J.A. (2021). Socio-Environmental Conflicts Resulting from Extractive Activities in Latin America and Corporate Social Responsibility. *Estudios Gerenciales, 37*(161), 668-679. Retrieved from https://www.redalyc.org/journal/212/21269361014/html/

Zhang, Y., West, P., Thakholi, L., Suryawanshi, K., Supuma, M., Straub, D., and Agyei, F.K. (2023). Governance and Conservation Effectiveness in Protected Areas and Indigenous and Locally Managed Areas. *Annual Review of Environment and Resources, 48*(1), 559-588. https://doi.org/10.1146/annurev-environ-112321-081348