

# Artisanal and small-scale mining in Nigeria: Prospects, opportunities, and challenges

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ナイジェリアにおける人小規模採掘

—将来の展望、機会と課題—

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## 要約

本研究は、ナイジェリアの人小規模採掘 (ASM) を包括的に分析し、経済や治安、健康、ジェンダーや環境への影響を整理した上で、持続可能な ASM の実現に向けた方向性を提示する。まず ASM が地域経済の発展と貧困削減に及ぼす可能性について、資金や技術的アクセス等の課題を踏まえながら議論する。さらに、ASM はその性質から法制度の枠外で行われることが多いこともあり、様々な課題があることを報告する。すなわち、鉱山労働者や住民への襲撃や強奪など治安上の問題が見られること、採掘活動が呼吸器疾患、鉛中毒、水銀曝露などの重大な健康被害をもたらすこと、女性が排除され補助的な仕事に限定されることで経済的利益が制限されるというジェンダー面の課題があること、土地浸食や景観劣化、土壌肥沃度の喪失や植生変化などの環境影響があること等を報告する。最後に本研究は、対象を絞った介入や戦略的規制、ステークホルダー間の協働を可能にするようなコミュニティ組織の設立を支援し、ガバナンスを強化することが、持続可能な ASM を実現するためには重要だと論じる。

## Key words

associations, governance, cooperatives, sustainable development goals, environmental degradation

## 1. Introduction

### 1.1 Global and African perspectives

Artisanal and small-scale mining (ASM) is a global practice with various definitions depending on the contexts and organizations involved (Nhlengetwa, 2019). Generally, ASM encompasses mining by individuals or small groups employing minimal mechanization (Hentschel, Hruschka, & Priester, 2003). The United Nations defines “small-scale mining” based on production levels or exploitation methods, while “artisanal” refers to rudimentary tools and limited capital investment (Nhlengetwa, 2019).

Mining, one of humanity’s ancient activities, is vital economically but poses hazards occupationally and environmentally (Silva, 2016). Typically poverty-stricken, ASM miners often lack experience and work under precarious conditions (Oramah, Richards, Summers, Garvin, & McGee, 2015). Despite its risks, ASM is a significant livelihood for millions globally, particularly in developing countries (Atoyebe, 2022). Moreover, ASM is prevalent in developing regions, sustaining millions and contributing substantially to the global mineral output (Hentschel et al., 2003). It also bolsters livelihoods and economies in Africa (Schwartz, Lee, & Darrah, 2021).

Artisanal miners tend to transition from farming to mining for supplemental or primary income (Musah-Surugu, Owusu, Yankson, & Ayisi, 2018). In some areas, ASM surpasses farm-

ing as the main income source. Despite the challenges, many individuals continue to engage in ASM out of economic necessity. In Africa, many nations participate in ASM, with 23 Sub-Saharan African countries heavily relying on it as a vital income source for rural communities (Paschal, Kauangal, & Nuhu, 2024).

The historical background of ASM in Nigeria can be traced back to the pre-colonial era, when indigenous communities engaged in small-scale mining activities, extracting tin, gold, and iron for trade and local use (Morrison, 1977). ASM became particularly popular in the early 20th century, with the establishment of tin mining in Jos, Plateau. Following the indigenization decree of the 1970s, local participation in mining increased as expatriate companies withdrew, leading to a surge in informal mining activities. The structural adjustment programs of the 1980s further accelerated the expansion of ASM, as declining formal employment drove rural populations to engage in mining for survival (Brown, 2020). Its rapid proliferation since the 1990s has transformed it into a significant socio-economic and policy issue, drawing attention for its environmental, security, and developmental implications.

It has been argued that the Sustainable Development Goals (SDGs) were designed without considering ASM, a significant developmental oversight for Sub-Saharan Africa, one of the poorest regions of the world (Hilson & Maconachie 2020). ASM is often carried out informally and illegally because formal licensing processes are both costly and highly complex. This environment allows miners to evade taxes and operate in areas with minimal state oversight. Considering its potential to gener-

ate revenue, the negative impacts of mining frequently outweigh its benefits. This indicates that formalizing and supporting ASM—low-tech, labor-intensive mineral processing and extraction—would help governments in Sub-Saharan Africa meet several targets associated with the SDGs.

## 1.2 Research question

Over the past several decades, numerous scholars have highlighted the need for sustainable practices in ASM to mitigate its negative consequences (Maconachie & Binns, 2007). These studies underscore the multifaceted nature of ASM, encompassing its impact on poverty alleviation, environmental sustainability, gender dynamics, and governance. ASM can contribute to livelihood (Bryceson & Jönsson, 2010), although these challenges continue to threaten the success of governance and sustainable development.

The literature on ASM in Nigeria is expanding, yet most studies provide fragmented insights or superficial overviews. This narrow focus fails to capture the sector's full complexity, which is crucial for developing effective governance strategies. Although some researches have examined the economic, environmental, or institutional dimensions of ASM, these aspects are often treated in isolation. For instance, Eniowo, Kilambo, & Meyer (2022) investigate ASM's role as a livelihood provider, Awomeso et al. (2017) explore its environmental consequences, and Oramah et al. (2015) highlight institutional weaknesses. However, these studies do not offer an integrated framework explaining how economic pressures, governance deficits, and environmental impacts are causally linked.

This research addresses that gap by proposing a holistic framework that connects economic motivations, governance structures, and environmental outcomes. By moving beyond siloed analyses, this approach provides a comprehensive understanding of ASM. It not only enriches academic discourse but also offers policymakers an actionable roadmap to tackle root causes rather than symptoms—supporting efforts to formalize the sector and align it with the SDGs. An integrated framework is underscored by evidence showing that single-sector interventions often fail to address ASM's multifaceted challenges, whereas only a coordinated, policy-relevant approach can generate sustainable solutions by embedding these connections into policy design and ensuring that governance responses are not only technically sound but also contextually grounded and systemically effective (Wilson et al., 2015).

The current work examines the opportunities and challenges faced by ASM in Nigeria, specifically regarding attaining the SDGs and explores the sector's fragmented nature to assess its potential for sustainable development. This study poses the following research questions: (i) what opportunities are available for ASM in Nigeria?; (ii) what challenges does ASM face in attaining the SDGs in Nigeria?

## 1.3 Methods

In addition to the national review of Nigerian ASM based on literature and interviews, this research will employ a case study research design to ensure a comprehensive understanding of the perspectives of all stakeholders involved in ASM. As theorized by Yin (2014), the case study research design is particularly suited for this study due to its emphasis on exploring complex phenomena within their real-life contexts, which aligns well with the intricate dynamics of ASM.

As depicted in Figure 1, ASM activities are notably concentrated in four states within Nigeria: Plateau, Nassarawa, Niger, and Zamfara. These states are recognized for their substantial contributions to the ASM sector, which plays a critical role in the local economies. Although ASM is prevalent across these regions, this study will specifically focus on conducting in-depth case studies in Plateau and Zamfara States.



Figure 1: Map of Nigeria

Plateau State was selected because of its distinctive characteristics and significant relevance to the research question. It is specifically renowned for its extensive tin and columbite mining operations and has the largest ASM activities in Nigeria. With its extensive history of mining, rich mineral resources and substantial economic contributions, Plateau State presents an ideal context for investigating the multifaceted challenges and opportunities within ASM.

Zamfara has been a focal point for ASM, particularly in gold mining, which has resulted in severe environmental and health issues, including lead poisoning. These challenges highlight the urgent need for sustainable practices and effective regulations. Moreover, interventions that have been made in Zamfara can serve as a case for other regions facing similar issues, promoting broader SD across Nigeria.

Fieldwork for this study spanned over two years, during which three communities in Plateau State were visited for interviews and participant observation. In each community (Bishichi, Foron, and Wereh), interviews were conducted with two ASM

operators and ten other individuals, involving the families of the ASM operators, community heads, laborers, and residents. The participants in this study were intentionally selected to represent a broad spectrum of viewpoints from all groups involved (Otoijamun, Kigozi, Abdulraman, Adetunji, & Onwualu, 2021). Additionally, data collection in Zamfara State encompassed similar methods, with visits to two communities, Anka and Bukkuyum, where interviews and participant observation were performed with ASM operators, local leaders, and residents to capture diverse perspectives on ASM activities.

Interviews were also conducted with government officials, NGO staff members, experts, and two employees from private mining companies—Consolidated Tin Mines Ltd. and Astro Minerals Ltd. The government interviewees included staff from the Federal Ministry of Solid Minerals Development, the Ministry of Health, security agencies (Nigeria Security and Civil Defense Corps: NSCDC), SDG offices, Plateau State's Universal Basic Education Board, Plateau State's Ministry of Women Affairs, and the Ministry of Lands, Survey, and Town Planning. The NGO interviewees included staff from Search for Common Ground, Women for Women International, and Christian Women for Excellence and Empowerment in Nigerian Society. Among the experts, one environmentalist, two lawyers, two political scientists, and four policymakers who are relevant to the study's focus were interviewed.

## 2. Economic opportunities

Nigeria is endowed with abundant solid mineral resources, including iron ore, tantalite, barites, gold, tin, bentonite, and gypsum (Federal Ministry of Solid Minerals Development, 2004), which are spread across more than 500 locations in the 36 states and the Federal Capital Territory (UNDP, 2024). These resources provide numerous opportunities for ASMs to explore and exploit. The sector is an important component of the mining industry, with the potential to increase internally generated revenue, boost foreign exchange earnings, generate employment, mitigate poverty, and encourage foreign direct investment if properly managed.

However, the exploitation of most of these minerals remains extremely low relative to the number of deposits (Adewumi & Laniyan, 2020). Many minerals are yet to be exploited to their full potential (Ebunu, Olanrewaju, Ogolo, Adetunji, & Onwualu, 2021). A miner explained: "One such reason is the lack of testing kits to ascertain where mineral deposits are in large quantities, making the miners dig numerous pits hoping to get lucky, a venture which is indeed frustrating" (Miner 1, personal communication, November 1, 2023).

In Nigeria, agriculture and mining are the two main economic activities. Most farmers turn to mining during the rainy season, often driven by poverty and dissatisfaction with agricultural livelihoods due to unfavorable policies by the government (Oramah et al., 2015). For many engaged in ASM, the economic

benefit of mining outweighs that of farming. A miner disclosed, "Mining gives quick returns, the hardship keeps growing worse with each passing day, how can I cater for my family?" "What kind of work gives quick money other than mining?" (Miner 3, personal communication, November 2, 2023).

Economic hardships have compelled many individuals to engage in small-scale mining as a means of subsistence. The majority of those involved are economically disadvantaged, with mining representing their most viable and sometimes only source of income. Most miners are predominantly unskilled and semi-skilled, as is common among artisanal miners. In communities like Foron and Werh in Plateau State, efforts have been made to liaise with the government to authorize ASM operations on their land, aiming to promote economic stability (Miner 1, personal communication, November 4, 2023).

ASM serves as a crucial source of wealth for numerous communities but is often neither monitored nor regulated. This lack of oversight is primarily due to the absence of reliable information regarding the exact locations of ASM operations, which are predominantly conducted informally or illegally (Couttenier, Di Rollo, Inguere, Mohand, & Schmidt, 2022).

Small-scale miners are typically self-driven, starting their enterprises with minimal or no government support. In the 1990s, perceptions of ASM began to evolve, resulting in its rapid expansion, particularly in Sub-Saharan Africa. This sector has increasingly employed vulnerable groups. Evidence suggests that up to 90 % of the mining activities in the country fall under the ASM sub-sector (Miner 4, personal communication, October 27, 2023).

Approximately 500,000 people are directly involved in ASM operations, with the livelihoods of an additional 2,500,000 people depending on this industry (Hilson, Maconachie, McQuilken, & Goumandakoye, 2017).

Despite efforts to regulate the ASM sector, significant challenges persist due to inadequate management and regulation in Nigeria, and the majority of ASM activities are not monitored (Oramah et al., 2015). Weak implementation and enforcement of laws for ASM, inadequate support, limited access to modern equipment and technology, and infrastructure deficiencies continue to be significant obstacles. These persistent issues suggest that, while efforts have been beneficial, they have not yet fully addressed the complexities of the ASM sector in Nigeria.

The employment challenges faced by miners are multifaceted and significant. One miner expressed his concerns, stating, "Here, at the mining site, we have different categories of miners. As a middleman, I am also a graduate and obtaining employment that can sustain my family is increasingly challenging. Being a middleman between the miners and the buyers, how can I earn sufficient income to support my family with inadequate regulations by the government?" (Miner 4, personal communication, October 27, 2023).

To enhance employment generation, a government official

commented as follows:

There is a need for registering ASM activities as a cooperative to enhance formal recognition and regulation as well as to structure employment management, better access to financial resources, and improved training and skill development. Considering this, the Plateau State Government requires all ASM activities to be registered with it to promote job creation and economic stability, hence integrating artisanal miners to operate within a structured framework (Ministry of Environment, Climate change and Minerals Development staff, personal communication, November 2, 2023).

The challenge of generating employment in ASM is significant, highlighting the need for the government to establish associations by involving traditional rulers, women in mining, and youth groups to formalize mining activities into cooperatives. A private company worker commented that “Inconsistent reporting of ASM activities, such as the locations of ASM sites, impedes effective regulation. The persistent lack of collaboration between federal, state, and local authorities encounters difficulties in collaborative activities that promote the formalization of ASM operations” (Astro Minerals Ltd. staff, personal communication, November 4, 2023). This demonstrates the necessity for more robust mechanisms and coordinated efforts to address the sector’s complexities.

ASM has the potential to drive the growth of the Nigerian economy by generating revenue. ASM can be managed in a sustainable way through collaborative efforts involving local communities, government agencies, and mining companies (Boboye, 2023). This position reflects the case in Nigeria as “ASMs are rarely monitored or regulated” (Government official ASM1, personal communication, October 26, 2023); hence, the local impacts of their activities are significant.

### 3. Education and child labor

Education is often disrupted by ASM, as many children are involved in mining activities rather than attending school. In Nigeria, children from large families, poorly educated households, and those living with non-relatives are particularly vulnerable to child labor (Fetuga, Njokama, & Olowu, 2005). Generally, child labor is a significant issue in Nigerian ASM. Children involved in mining sites often work to assist their mothers with errands, care for younger siblings, or contribute to family income by covering part of their school fees (Miner 2, personal communication, November 2, 2023). The integration of economic pressures and limited educational resources in mining regions contributes to higher school dropout rates.

Despite the ongoing challenge of child labor in Nigeria, recent government regulations and community efforts have resulted in a noticeable reduction in the number of children working at certain ASM sites. Field research conducted in the Gwol

community of Jos, Plateau State—encompassing Foron, Bisichi, and Wereh—found no children present on-site. This finding was further supported by a miner who emphasized the significance of prioritizing the education of children despite the external challenges faced in the area (Community leader, personal communication November 3, 2023). Nonetheless, this observation may not be indicative of other communities within the state.

This raises the following question: why has there been a decrease in child labor in these specific communities? Field research affirms that the implementation of a multistakeholder cooperative strategy has significantly mitigated child labor incidents. By integrating government bodies, non-governmental organizations (NGOs), and local communities, this method ensures robust enforcement of child labor laws, promotes educational opportunities, and fosters community awareness, thereby creating a safer and more supportive environment for children (Miner 2, Personal communication, November 3, 2023). Associations such as Search for Common Ground and Christian Women for Excellence and Empowerment in Nigeria (CWEENS) have been actively involved in child protection through community-based interventions. In Jos, they often engage families and local leaders to rescue children from exploitative conditions, promote child protection, and reduce the economic pressures that contribute to child labor (CWEENS staff member, personal communication, November 5, 2023). Similarly, immediate rescue and support efforts have a broader impact by fostering safe environments, raising community awareness, and establishing child protection norms. By piloting collaborative care programs, advocating for children’s rights, and training families and local leaders, these organizations connect grassroots initiatives with national and international child protection strategies. This approach catalyzes policy change and drives coordinated action to end child labor.

In Nigeria, the Education Act (Section 2(2)) guarantees free universal basic education. Numerous children still engage in ASM to afford additional educational costs like uniforms, textbooks, and exams (Plateau State Universal Basic Education Board staff, October 2023). According to the World Bank, these hidden costs create financial barriers despite the promise of free education.

The primary reason children work at ASM sites is poverty, directly tied to the first goal of the SDGs: “No Poverty.” Poverty traps represent a crucial factor hindering economic progress, characterized by a critical threshold of assets below which families struggle to educate their children, build productive assets, and achieve upward economic mobility over time (Carter, Forsyth, Mazzula, & Williams, 2007).

Thus, ASM offers substantial economic opportunities for Nigeria. ASM can promote local economies by creating jobs and fostering local businesses. However, realizing these benefits requires efforts to prevent children from laboring. Appropriate institutional arrangements should be considered.



#### 4. Security challenges

Nigeria's ASM sector faces significant security challenges, encompassing threats from kidnapping, insurgencies, and communal conflicts. These issues collectively undermine the stability and development of ASM operations. The prominence of ASM in the solid minerals sector dates back to the indigenization decree of the 1970s, prompting efforts such as registration policies in Plateau State to enhance industry security. Additionally, the abundance of natural resources has led to violent conflicts and criminality in communities, resulting in significant loss of lives and property (Achumba, Ighomereho, & Akpor-Oboro, 2013).

Accessing the security challenges in Gwol, where heavy ASM activity is underway, there have been incidents of raids on innocent citizens, attacks on gardens, and, in 2023, an assault in Dorowa Babuje, where miners were attacked and their winnings forcibly taken by the assailants (Ministry of Environment Plateau staff, personal communication, November 2, 2023). Similarly, "there was an attack by gunmen on the miners, and the incident was reported to my ministry" (Ministry of Environment staff, personal communication, November 2, 2023).

Rural banditry in Nigeria encompasses armed violence that targets human life and property, including armed robbery, kidnapping, and cattle rustling. Victims are typically individuals and communities with valuable assets (Okoli & Ugwu, 2019). Mr. Dachung Musa Bagos, a member of the House of Representatives representing the Jos South/Jos East Federal Constituency of Plateau State, has highlighted areas constantly targeted by bandits in Plateau State, such as Jos South and Barkin Ladi, which are rich in valuable mineral resources (Sahara reporters, 2024). Essential for manufacturing drones, phones, and weapons, these minerals are in high demand globally.

In Africa, poverty often drives conflicts, which are further exacerbated by large companies engaging in surface mining, resulting in competition over land and resources (Alkire & Foster, 2011). ASM, particularly in Sierra Leone and the Democratic Republic of Congo, has financed civil wars and terrorist activities (Sankey, 2022). It can be argued that security issues in Nigeria can be as significant as in these surrounding nations if appropriate measures are not implemented.

Bedeveled by insecurity and limited economic opportunities in the Gwol community, most of those who are involved in ASM are youths, with some of them being neck deep into being petty thieves (Vigilante group Foron, personal communication, November 2, 2023). The Nigerian Security and Civil Defense Corps (NSCDC) is saddled with the responsibility of monitoring the activities of these miners through a collaborative effort with other security bodies like the police for arrest and prosecution.

The widespread theft of natural resources in Nigeria underscores a significant gap in the response of relevant authorities. ASM has contributed to violent conflicts locally in two key ways. First, sponsors of ASM operations, commonly protected

by certain state governments, engage in power struggles over mine control with impunity (Ogbonnaya, 2020). Second, these sponsors of illegal mining also fund banditry and cattle rustling in mining communities, worsening violence and displacement, and offering opportunities for illegal miners (ENACT, 2020).

The NSCDC also cracks down on the miners involved in the sale or purchase of illicit substances. Working in the pit, they claim, requires bravery, and many miners resort to substances for Dutch courage to remain fearless. These substances encompass marijuana, Tramadol, Goskolo (also known as Kai-kai, dry gin, or ogogoro), and Burukutu or Pito (a locally brewed beer, typically made from fermented corn) (Nigeria Security and Civil Defense Corps staff, personal communication, November 2, 2023). This cartel thrives in mining sites because the places are in dense forests where security presence is highly unlikely (Nigerian Security and Civil Defense Corps staff, personal communication, November 2, 2023). These places are nicknamed Hai mot (our forest) (Youth leader Wereh, personal communication, November 2, 2023).

Recently, the Chief of Defense Staff of Nigeria linked the security issues in Zamfara State in Nigeria to ASM activities. Considering that people involved in ASM are highly mobile and unable to infiltrate mineral-rich areas, the trade continues to thrive. Plateau, Niger, and Nasarawa States are also affected by this issue (Nigerian Security and Civil Defense Corps staff, personal communication, November 1, 2023).

High-ranking Nigerians in positions of authority, along with international corporations and other multinational companies, are implicated in driving rural banditry and violent local conflicts (Punch, 2020). Some studies have asserted that international personnel and corporations play a significant role in ASM, commonly funding these activities alongside influential individuals in local mining communities (Ogbonnaya, 2020).

Recent arrests in May 2020 of some international personnel and locals in Zamfara State offer evidence of organized criminal networks encompassing both domestic and foreign individuals (Ogbonnaya, 2020). Negotiations between state governors and sponsors of illegal mining in 2019 indicate a significant level of political connection and state protection enjoyed by these syndicates (Human Rights Writers Association of Nigeria, 2019). The former Nigerian Minister of Mines and Steel Development has linked a loss of 353 billion naira (over \$900 million as at November 2023) to ASM and associated syndicates (Ogbonnaya, 2020). Furthermore, the smuggling of gold across porous borders, culminating in unprocessed and low-grade minerals entering the global market, persists as a substantial challenge (Amosu & Adeosun, 2021).

Proponents argue that security encompasses critical aspects vital for survival at the individual, community, and national levels. Natural resource theft in Nigeria remains unabated due to high international demand and abundant domestic resources, intensified by lax control regimes, corruption, and poverty in ru-

ral areas (Olade, 2019). Violence persists in rural communities, driven by the interplay between natural resources and insecurity, encompassing domestic and international actors, such as multinational companies (Hutchful & Aning, 2004). Gold smuggling, estimated at 10,000 kg annually and valued at over \$400 million, significantly contributes to insecurity, with armed actors in the North-West region exchanging gold for weapons (Olade, 2019).

Natural resource conflicts encompass disputes over access to, control, and use of resources. In Northern Nigeria, land issues related to natural resources are the primary conflict drivers (Mercy Corps, 2016). A tragic event on Christmas Day December 25, 2023, shocked Nigeria and the international community when numerous citizens in the Mangu and Barkin Ladi areas of Plateau State were murdered by alleged Fulani bandits (Aid to the Church in Need (ACN), 2024). This attack, which humiliated both state and federal governments, resulted in significant casualties and displacements. The attackers reportedly vowed to continue their violence and target more communities in Plateau North. Security experts Roland Ogbonnaya and Onoja Audu attribute these frequent and shameful killings to assailants with questionable motives associated with land resources (Ogbonnaya & Audu, 2024).

Experts attribute rural banditry to poorly governed ASM activities and the proliferation of small arms (Nigerian Security and Civil Defense Corps staff, personal communication, November 1, 2023). Much of the mining workforce are in remote areas with minimal law enforcement presence. Criminal groups target ASM sites and village markets due to the prevalence of unbanked cash. A tragic incident in Bindin village, Zamfara State, on November 7, 2016, saw approximately 40 miners killed by gunmen on motorcycles, who stole gold and cash (ENACT, 2020). Weak state capacity and security provisions exacerbate the problem, with allegations of corruption against security operatives undermining public confidence. Bandits exploit ungoverned spaces to launch attacks, typically forewarning villages. Rural banditry in Nigeria is a complex problem driven by economic, ecological, and governance factors, necessitating a comprehensive understanding of enhanced security (ENACT, 2020).

## 5. Gender and health dynamics

ASM in Nigeria faces significant health and gender obstacles that hinder the sector's sustainable development and equitable participation. Women who engage in ASM are adversely affected, as many face despair and marginalization in mines as they engage in various activities referred to as "support work" (Serwajja & Mukwaya, 2020). Significant measures within the production sequence, particularly those in mineral refinement, demand laborious efforts, such as fetching water for the purification of ores. These activities are frequently performed across difficult terrains and are typically met with inadequate

remuneration (Consolidated Tin Mines Ltd. Jos staff, personal communication, November 5, 2023).

Women in mining face various challenges, including limited access to different levels of activities, particularly underground mining, where they are typically excluded from access to underground mines (Lawson & Lahiri-Dutt, 2020), hence limiting the financial benefits among other activities. This exclusion is primarily due to traditional gender roles and societal norms that typically restrict the participation of women in such physically demanding tasks. The absence of site accessibility not only curtails their monetary profits but also obstructs their vocational development in the field (Traditional leader, personal communication, November 5, 2023).

The earnings associated with mining tend to yield daily returns. In the Gwol community, women have increasingly taken on the role of "breadwinners," often due to being widowed or having an ailing spouse.

ASM remains predominantly male-dominated, with physically demanding and hazardous conditions. Despite increasing female participation, gender norms continue to shape roles within ASM, thereby limiting the entrepreneurial opportunities available to women and confining them to peripheral tasks associated with traditional household responsibilities (Arthur-Holmes & Abrefa Busia, 2021). Women in ASM commonly occupy unpaid or underpaid positions, reflecting the perception that mining is a male domain (Koomson-Yalley & Kyei, 2022). While some women challenge these norms, gender disparities in access to resources and remuneration persist (Yakovleva et al., 2022).

Healthwise, ASM poses significant risks due to factors such as illegal activities, remote locations, and proximity to violence, especially in impoverished regions lacking adequate medical and institutional support. As observed in Nigeria, incidental chemical exposure exemplifies the dangers associated with ASM, encompassing the contamination of water sources and food chains with toxic substances like mercury (WHO, 2016). Health crises associated with ASM continue to affect marginalized communities, driven by the global demand for minerals such as coltan and gold, as seen in Zamfara State (Casey, 2022). There is a long list of severe health effects associated with airways, lungs, neural problems, and other body systems (WHO, 2016).

In Jos, Plateau State, the legacy of mining activities continues to impact the health of indigenous communities in areas like Chugwi and Kewa-Bisichi, located approximately 15 kilometers from Jos. These communities continue to face the lasting consequences of exposure (Nwafor, 2023). Unfortunately, many miners are unaware of the health dangers associated with this exposure. Repeated exposure conditions result in issues such as stomach aches, anemia, liver problems, kidney issues, and even lung damage and heart conditions. Other exposures encompass cyanide used in secondary processing and toxic gases (e.g., H<sub>2</sub>S and carbon monoxide) (WHO, 2016). Beyond the risk of lung

cancer, silicosis increases the risk of tuberculosis by a factor of three (Cowie, 1994), as well as pneumonia, kidney pain, miscarriages, and other lung maladies exhibited in studies due to the accumulation of chemicals around ASM sites. Furthermore, the nature of ASM, characterized by high stress and physical strain, increases the risk of substance abuse among workers, with reports specifying significant rates of alcohol and drug use and dependence among mine workers (Bush & Lipari, 2015).

Gender and health issues often intersect. Women in communities such as Foron and Gwol in Plateau State face compounded health risks from prolonged exposure to dust and hazardous minerals. Gendered labor expectations, including unpaid domestic responsibilities, further intensify physical strain on women, limit access to protective resources, and reinforce systemic vulnerability (Ministry of Women Affairs staff, Plateau State, personal communication, November 5, 2023).

## 6. Environmental degradation

Environmental degradation caused by ASM activities has been ongoing for a very long time, and its impact has remained devastating to Plateau State, with erosion and gullies taking over farmlands. These gullies are found in expansive, serpentine formations across areas such as Rayfield, Maiadiko, Kuru, Foron, Gwol, Heipang, Fan, Bisichi, Dorowa, Gana Ropp, Gyel, Rafin Jaki, to mention a few (Ministry of Environment Staff, Plateau State, personal communication, November 2, 2023). However, we will focus on the Gwol community.

The degradation associated with ASM encompasses “risky burrows” (Lotto) associated with unsafe mining practices. Miners may dig deep, resulting in unstable tunnels or burrows in their search for minerals. When the desired mineral is extracted from the earth, the remaining unwanted material is typically piled up in large heaps. There are numerous invisible chemicals in the sources from mining tails, and these spoil heaps can pose significant environmental hurdles. The sector faces environmental impacts like those experienced in other countries (Omotehinse & Ogunlade, 2022).

This has resulted in land degradation, altering the natural landscape, causing soil fertility loss, accelerated erosion, and flooded excavations (paddocks), all of which adversely affect vegetation (Plateau State Universal Basic Education Board staff, personal communication, November 2, 2023). Field interviews confirm these significant issues. A miner in Foron highlighted that abandoned mining sites have turned into stagnant pools, creating breeding grounds for mosquitoes and disrupting local vegetation (Miner 2, Personal communication, November 2, 2023). Moreover, Adeferati et al. (Adefarati, Oloruntoba, & Adgebite, 2024) also noted that the creation of large, water-filled pits from mining activities can disrupt local ecosystems and result in the loss of vegetation. These findings underscore the severe environmental impacts of mining, supporting the assertion that such activities lead to significant land degradation.

A community leader experienced severe soil erosion caused by deforestation and poor land management, which led to the formation of deep gullies and a reduction in available land for cultivation (Community leader 1, personal communication, November 2, 2023). Similarly, an environmentalist underscored the impacts of overgrazing and deforestation on local flora, highlighting the loss of a native plant (Yep), a cactus species, and a decrease in biodiversity (Youth leader Gwol, Plateau State, personal communication, November 2, 2023). The impacts of land degradation on local communities remain a cog in the wheel of ASM.

ASM activities contribute significantly to environmental degradation, particularly in the Jos Plateau region (Ministry of Environment staff, Plateau State, personal communication, November 2, 2023). These activities also leave behind devastated landscapes, encompassing unstable waste piles, abandoned excavations, and barren land, which present hazards such as drowning or falling into uncovered mining pits (Aryee, Ntibery, & Atorkui, 2003). In some instances, mining craters from extensive tin mining operations act as fatal traps, contributing to gully erosion and endangering humans and animals (FIDA Jos branch member, personal communication, November 9, 2023). This environmental degradation has resulted in land scarcity and reduced agricultural productivity, further worsening poverty and reliance on ASM for livelihoods.

Plateau State is primarily an agricultural community, but land degradation has led to a significant loss of arable land. As more land is taken over by mining activities, fewer areas remain available for farming. This has affected yields, especially because most of the farmlands have lost their fertility due to overuse. Moreover, most of the farmlands close to the mining sites are highly contaminated because of minerals deposited on such lands, and the yields are continually reducing leading to food scarcity (Miner 2, personal communication, November 2, 2023).

One of our interviewees (Ministry of Environment staff, Plateau, State, personal communication, November 2, 2023) also specified that significant portions of farmlands have been eroded by gullies. “Over recent years, the expanse of land I cultivate has shrunk to nearly half its original size. The relentless expansion of these gullies and the subsequent collapse of the terrain force us to continually retreat from them. Ignoring this threat could result in being engulfed by the encroaching land one day.” He further asserted that the yield of crops has experienced a severe decline. Thus, the issue is not only the reduction of arable land but also the diminishing returns from the limited land that remains. “Where we once harvested seven sacks of millet, we now barely manage to gather three or four, even after investing heavily in fertilizers” (Ministry of Environment, Climate change and Mineral Development staff, Plateau State, personal communication, November 2, 2023).

The Nigerian mining sector encounters numerous obstacles, encompassing a complex regulatory framework, inadequate

infrastructure, and security concerns, which exacerbate the environmental and social impacts of mining operations. These issues underscore the need for stringent environmental regulations and effective management practices to mitigate the adverse effects of mining in Nigeria.

Despite the economic benefits that ASM may offer, specifically in rural economies, the adverse environmental impact of the sector remains a significant concern (Hentschel et al, 2003). Generally, unregulated mining activities continue to threaten the environment and livelihoods across Africa, highlighting the urgent need for sustainable resource management practices and regulatory enforcement. Despite regulations in resource-rich nations mandating licensing and regulations for small-scale miners, the majority operate informally without proper authorization (Veiga & Marshall, 2019). This informal operation is partly a result of the fragmented nature of ASM.

## 7. Discussion: Role of associations for sustainable ASMs

The review of opportunities and challenges for Nigerian ASMs in the preceding chapters underscores the importance of local-level associations, such as local-level cooperatives. This emphasis aligns with global practices in ASM governance documented in the literature. In the following discussion, we examine the significance of establishing and supporting local associations within the sectors reviewed so far.

For conceptual clarity, this paper defines “associations” as organized, voluntary groups—such as cooperatives, trade unions, or local groups formed by miners or residents to pursue shared economic or social objectives within ASM contexts. The term “community” refers to the broader social and geographic entity in which these associations operate. To maintain terminological precision, the paper consistently uses “association,” “cooperative,” or “local association,” and avoids substituting these with “community organization” unless explicitly referring to wider, non-mining social groups.

In the Nigerian context, associations manifest in several forms, reflecting the country’s rich social and institutional diversity. Common structures include cooperative societies, trade and professional associations, faith-based groups, traditional councils, women’s associations, and youth organizations. Within the ASM sector, relevant examples are local miners’ cooperatives, women associations and community development associations, which operate at village or ward levels. These organizations serve as conduits for collective action, resource pooling, and local governance, often bridging the gap between state institutions and informal actors. However, their effectiveness varies widely, depending on leadership capacity, institutional support, and the strength of regulatory frameworks that recognize their roles.

### 7.1 Economy

From an economic perspective, associations within communities can play a crucial role in the formalization process by

organizing miners, facilitating access to resources, and ensuring compliance with regulations. Drawing insights from countries like Ghana and Tanzania, formalizing and regulating ASM in Nigeria can integrate miners into the formal economy, granting them legal recognition and access essential to support services. This encompasses issuing licenses, creating regulatory frameworks, and offering technical assistance to mitigate illegal mining, enhance working conditions, and boost government revenue (Hilson & McQuilken, 2014).

Formalization enhances policy intervention. Mining activities in Nigeria are spread across the six geopolitical zones, including the Federal Capital Territory, Abuja, and are more predominant in Plateau, Nasarawa, Niger, and Zamfara States. At both federal and state levels, the Nigerian government has established a department within the Ministry of Mines and Steel Development to classify artisanal miners into groups through formalization programs.

Despite these efforts, the formalization of ASMs in Nigeria remains limited (Federal Ministry of Mines and Steel Development staff, Plateau State, personal communication, November 10, 2023). A key obstacle is the absence of a consistent government presence in remote mining areas, which severely limits the ability to monitor activities, enforce regulations, and uphold safety and environmental standards. As a result, the sector remains largely unregulated, allowing harmful practices to persist unchecked.

Another major barrier is the complexity and cost of the licensing process. The procedures are typically designed for large-scale corporate entities and are inaccessible to most artisanal miners, who often lack the financial resources, formal education, and technical capacity to navigate the bureaucratic requirements, which includes extensive paperwork and high fees. Furthermore, government programs suffer from limited support and ineffective engagement with mining communities. Crucially, there is a lack of tailored financial and technical assistance to help miners upgrade equipment, adopt safer practices, and improve productivity. Without clear incentives or a practical understanding of the benefits of formalization, miners remain disengaged.

This gap between policy design and on-the-ground realities underscores the need for alternative approaches, such as initiatives led by miners’ associations that are more responsive, inclusive, and grounded in local contexts. Associations play a critical role in advancing ASM formalization by organizing miners into cooperatives, thereby enhancing regulatory compliance and access to legal frameworks. Through capacity-building initiatives, policy advocacy, and structured engagement with governmental institutions, these organizations contribute to the institutionalization of mining practices, promote transparency, and support the integration of ASM into national development strategies (Search for Common Ground Jos staff, personal communication, November 10, 2023).



Secondly, local associations can help address economic/financial hurdles by augmenting the financial stability and profitability of ASM activities. Miners can boost their bargaining power, access superior markets, and secure equitable prices for their products through resource pooling and knowledge sharing. This collective approach can improve income distribution and reduce poverty. For instance, cooperative societies can negotiate better prices for minerals, thereby limiting exploitation by middlemen and ensuring fairer compensation for miners. In Bolivia, mining cooperatives successfully manage resources sustainably by pooling resources, sharing knowledge, and negotiating favorable product terms. These cooperatives also involve local communities in decision-making, aligning mining activities with community needs. Adopting a similar model in Nigeria could promote economic stability and social cohesion within mining communities (Hentschel et al., 2003).

Moreover, this collective approach facilitates access to financial services, such as loans and savings schemes, which are commonly inaccessible to individual miners. Cooperatives can also invest in shared infrastructure and equipment, thereby reducing costs and increasing productivity.

Currently, funding for ASM typically comes from multiple sources, including international donors, government budgets, and private investments. These resources are rarely pooled or strategically allocated, resulting in financing gaps and uneven support across different aspects of ASM. For instance, some miners may obtain sufficient funding for technological upgrades, while others struggle to secure resources for health and safety improvements. This uneven distribution exacerbates the challenges faced by ASM communities and hinders the holistic achievement of the SDGs (UNDP, 2024). As one local NGO worker observed, “We see some miners getting new equipment while others cannot even afford basic safety gear. It is a huge disparity” (Search for Common Ground Jos staff, personal communication, September 16, 2024). Associations such as local mining associations and cooperatives can help coordinate these funds to ensure more equitable distribution.

## 7.2 Education and child labor

Addressing child labor in ASM necessitates coordinated efforts by associations to enforce regulations and provide alternatives for children. These organizations help children transition from mining to safer and more productive activities by promoting education and vocational training. Community-based monitoring systems identify and address instances of child labor, thereby ensuring that children are protected and given opportunities to thrive outside the mining sector.

Cooperative societies can allocate financial support through scholarships and savings facilities, build and maintain community schools, and partner with NGOs and government bodies (Ministry of Women Affairs staff, Plateau State, personal communication, November 3, 2023). The goal is to offer vocational

training, conduct awareness campaigns on health and gender dynamics, and promote inclusive and sustainable education for all children in communities surrounding ASM sites. Stakeholders can optimize these initiatives and prioritize education and sustainable development by pooling resources, sharing expertise, and fostering a supportive environment (Ministry of Women Affairs staff, Plateau State, personal communication, November 3, 2023).

For instance, the ACCEL Africa Project (Accelerating Action for the Elimination of Child Labor) has significantly mitigated child labor in Nigeria’s ASM sector, specifically in artisanal gold mining activities predominant in Zamfara State. By collaborating with government agencies, NGOs, and local communities, the project has reintegrated 1,400 children into schools and economically empowered over 800 individuals (International Labor Organization, 2023). Key strategies include community sensitization and strengthening legal frameworks. The National Policy on Child Labor supports these efforts. However, gaps remain in fully eradicating child labor, particularly in rural and impoverished areas of Zamfara, where resources and enforcement are still insufficient (Lamai, 2021). Further efforts are therefore needed, with active involvement of local associations.

The challenges encountered by the Gwol community in Plateau State are severe. Gwol community has suffered substantial setbacks due to persistent attacks, and most children must work to catch up educationally (Miner 3, personal communication, November 2, 2023). Providing access to education and facilitating training and capacity-building programs are imperative for optimizing the skills and productivity of miners. A proactive community like Gwol can leverage the support of cooperatives to improve techniques, adopt sustainable practices, and expand economic opportunities, serving as a model for other ASM communities.

## 7.3 Security, gender, health, and environment

Associations can play a crucial role in enhancing security within ASM by implementing well-defined boundaries and regulations for mining activities. These organizations mitigate disputes over land and resources through local monitoring and enforcement mechanisms supported by community members, ensuring adherence to agreed-upon rules and deterring illicit activities. This collective security strategy fosters a safer working environment and promotes trust among miners and the broader community.

Local associations are central to improving security and conflict mitigation in ASM communities. Field research conducted in Plateau State highlights the role of organizations such as the International Federation of Women Lawyers (FIDA) Plateau and Christian Women for Excellence and Empowerment in Nigerian Society (CWEENS) in establishing informal monitoring systems that regulate access to mining sites and mediate disputes. These associations work closely with traditional leaders

and community stakeholders, such as vigilante groups, to foster trust and promote local oversight of mining activities (CWEENS staff, personal communication, November 9, 2023). Interviews with residents and community leaders during field data collection reveal that such initiatives have strengthened coordination with law enforcement and contributed to reductions in violence and illicit practices within ASM zones.

Gender equality in ASM is essential, and associations can support this by offering training programs and support networks that help women develop the skills and confidence necessary to participate fully in mining activities (FIDA Jos branch member, personal communication, November 9, 2023). Addressing gender inequality requires integrated policies that foster gender equity across all aspects of ASM. Inclusive decision-making and equitable access to resources can enhance the sustainability and community development of the sector.

Local associations play a transformative role in advancing gender inclusion within ASM communities by creating platforms for advocacy, education, and leadership. In Barkin Ladi, Plateau State, for instance, Women in Mining Nigeria (WIMIN) have partnered with mining cooperatives to train women on licensing procedures, safety standards, and financial literacy, empowering them to move beyond labor-intensive roles into decision-making positions. Similarly, the Ziva Community Initiative (ZCI) has facilitated the formation of women-led savings groups and supported female entrepreneurs in mining-adjacent trades, helping them access capital and diversify income sources (Search for Common Ground Jos staff, personal communication, November 9, 2023).

Ensuring the health and safety of miners requires an integrated approach that aligns health policies with broader SDGs. Associations optimize health and safety in ASM by offering training on safe mining practices and promoting the utilization of protective equipment. They also offer medical services and support to miners, addressing health issues related to mining activities. Additionally, cooperative governance can lead to elevated working conditions through collective bargaining and adherence to safety standards. This ensures that miners work in safer environments, promotes decent work, and implements health and safety training programs, thereby reducing the risk of accidents and occupational diseases.

In Peru, cooperatives and community-led initiatives, assisted by organizations such as Pure Earth, collaborate with local mining associations to implement mercury-free mining practices. These efforts mitigate the environmental impact of ASM by promoting mercury-free technologies and rehabilitating mined areas. Training and financial incentives further support environmentally friendly practices. Implementing similar programs in Nigeria could mitigate ASM-related environmental degradation and promote sustainable mining (Veiga, Maxson, & Hylander, 2006).

Local associations can also contribute to environmental con-

servation. They can monitor and evaluate environmental conditions, which are essential to sustainable mining but are generally neglected. Regular policy assessment and adjustment are necessary to ensure that objectives are met. An expert emphasized the significance of “regularly monitoring and adjusting policies to ensure that they meet their objectives” (Expert 3, personal communication, November 9, 2023). Inconsistent monitoring results in outdated and ineffective policies that fail to address the evolving needs of the ASM sector.

As Ostrom (1990) theorized, associations can enhance sustainable resource management. They enable local mining communities to develop and enforce their regulations, promoting sustainable practices. Associations mitigate conflicts and prevent overexploitation, while collective-choice arrangements ensure that regulations reflect local needs, thereby enhancing compliance. Effective monitoring and graduated sanctions maintain these regulations, with community-based monitoring fostering trust. Conflict-resolution mechanisms help resolve disputes and maintain social cohesion.

There are several examples in Nigeria that demonstrate the significance of associations for environmental conservation. The United Nations Environment Programme (UNEP) has contributed significantly through community-based initiatives aimed at reducing mercury pollution via its planetGOLD initiative, which advocates for safer mining technologies. The Artisanal Gold Council (AGC) supports environmentally responsible mining practices in Zamfara State, addressing lead and mercury contamination that poses severe health risks. Collectively, these organizations provide essential technical assistance, capacity-building, and policy advocacy for safer and sustainable ASM practices in Nigeria.

#### 7.4 A Theoretical perspective: Associative governance

Overall, associations and cooperatives are essential in addressing economic, security, education, child labor, gender, environmental, and health challenges in ASM. Some studies have highlighted the potential of cooperative governance in fostering sustainable development (Schwettmann, 2014). Understanding artisanal miners’ information-seeking behavior and enhancing it through cooperative structures could significantly improve sustainability in the sector (Nwagwu & Igwe, 2015).

The needs of local ASM associations underscore the significance of associative democracy or associative governance. Associative governance can optimize the impact of ASM on the SDGs by strengthening partnerships and enhancing miners’ skills for enhanced resource management and equitable outcomes (Agyei, 2016). Without cooperative structures, systemic issues in mineral governance persist, making it difficult to eradicate harmful practices (Lara-Rodríguez & Fritz, 2023).

Local associations can help overcome sectionalism embedded in government structures, which often hinders the delivery of effective policies on cross-sectoral issues such as ASM. ASM-

related policies are generally developed in isolation, prioritizing immediate economic benefits over long-term sustainability. For example, policies aimed at increasing mineral production may neglect environmental protection and social welfare, resulting in conflicting objectives. This inconsistency undermines the holistic approach crucial for achieving the SDGs, as economic growth policies may inadvertently exacerbate other setbacks (World Bank, 2023). One miner expressed frustration: “As miners, we experience an increase in production often, but there’s no support for managing the environmental damage caused” (Miner 5, personal communication, November 15, 2023). Similarly, one agency may prioritize improving ASM techniques, while another focuses on health and safety. Without integrating these efforts, SDG policy implementation is hampered, restricting their impacts on ASM communities (Pact, 2020). As one interviewee noted, “The lack of communication and collaboration between different agencies often leads to overlapping projects and wasted resources” (Traditional Ruler 3, personal communication, October 2, 2023).

Being independent from government structures and working closely with local communities, local associations are better positioned to deliver holistic and context-appropriate interventions for ASM-related issues. Associations can foster collaboration and a shared vision while overcoming the fragmented nature of relevant policies.

Associations can also promote more democratic governance with enhanced participation. Associative democracy advocates inclusive decision-making processes that engage all stakeholders, ensuring community interests are adequately represented (Bell & Reed, 2022). This is particularly important because persistent interference by top government officials, who prioritize their own interests over the public good, undermines efforts to support ASM miners. In Nigeria, ASM operations involving foreign nationals are often facilitated by corrupt officials who exploit weaknesses in regulatory bodies and poor enforcement of mining laws, ultimately depriving the government of revenue. Heightened insecurity and environmental degradation also persist unchecked (Ministry of Environment staff, Plateau State, personal communication, November 13, 2023). One expert emphasized, “It is paramount to minimize government interference to ensure transparency and accountability if ASM is to thrive” (Expert 2, personal communication, November 9, 2023). Such interference commonly results in weak enforcement of mining laws and inadequate support from the government and development partners.

Empowerment and inclusion of ASM miners face substantial hurdles due to limited forums for participation in decision-making. As one expert affirmed, “ASM miners should have a say in decisions affecting them through established forums” (Expert 3, personal communication, November 9, 2023). Community associations could help miners advocate for their rights, but many miners remain unaware or disengaged, often due to

fear of risks or a lack of commitment from others.

However, the effectiveness of associations depends on specific enabling conditions. According to Ostrom’s (1990) principles, successful collective action in commons management requires clearly defined membership and boundaries, inclusive decision-making processes, mutually agreed rules, transparent monitoring systems, and graduated sanctions for non-compliance.

These principles as proffered by Ostrom help explain why many Nigerian associations struggle: they often lack legal status, inclusive leadership, and systems to monitor or enforce rules. To become credible and effective, associations need supportive laws, stronger leadership, gender-balanced participation, and better integration of traditional and modern governance practices. To function effectively, associations must operate within supportive legal and regulatory frameworks that ensure autonomy, accountability, and cooperation with state actors. These are essential for transforming these associations into credible agents of sustainable ASM governance.

## 8. Conclusion

In conclusion, the current work has examined the opportunities available to ASM in Nigeria and the challenges it encounters in attaining the SDGs. ASM presents significant potential for economic growth by enhancing household incomes and augmenting government revenues through effective regulation.

Nonetheless, the sector encounters numerous setbacks that hinder its contribution to the SDGs. Limited access to capital, complex regulatory frameworks, inadequate technical skills, and poor labor conditions present significant obstacles. This research also highlights the urgent need to address the devastating environmental impacts of ASM activities in Nigeria, encompassing land degradation, erosion, and soil and water pollution. Additionally, issues related to security, education, gender, health, child labor, and the economy require immediate attention.

The current policies and institutions in ASM in Nigeria are multifaceted or rather fragmented. Together with the weak implementation of current mining laws, inadequate support, and poor infrastructure, it calls for policy reforms (Adefarati, Oloruntoba, & Adegbite, 2024). Hence, as this research has suggested, such efforts must be discussed in a cross-sectoral manner.

Implementing AG and promoting sustainable resource management are vital steps toward overcoming these barriers. Moreover, the establishment of associations like the ones mentioned would require a concerted, cross-sectional effort. Sector-specific approaches alone may lack the vision and resources necessary to establish such associations.

Associations can address ASM challenges in Nigeria by classifying miners to streamline regulation, training, and sustainability. They enhance access to financial resources, technical support, and market opportunities for ASM. This collective

strategy formalizes the sector, mitigates environmental damage, and elevates health and safety standards. Additionally, associations offer advocacy platforms, enabling miners to engage in policy discussions and negotiations with larger entities and government agencies, thus fostering equitable resource distribution and economic benefits for local communities.

The theoretical framework of AG underscores the essential role of self-organized or government-established associations in fostering democracy by promoting civic virtues, political skills, power balance, representation, public deliberation, and direct citizen participation (Warren, 2001). Interviews and participant observation in the Nigerian ASM case study offer practical insights into the impact of these associations, elucidating the challenges, benefits, and daily interactions that influence their effectiveness. These approaches enrich the theoretical framework by grounding it in empirical experiences, demonstrating AG's contribution to sustainable ASM development in Nigeria.

In considering the efforts to develop appropriate associations for Nigerian ASM, the concept of AG appears to offer promising pathways to attaining the SDGs, although further theoretical and empirical work is necessary to make workable policy recommendations. Cooperative societies can ensure that the benefits of natural resources are maximized for the well-being of all members of the community through collective action and democratic decision-making. It is also essential to bolster the legal and regulatory framework supporting cooperatives/NGOs, provide technical and financial support to cooperatives, and promote awareness and education on the benefits of an associative democracy to maximize the potential of AG for ASM.

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