

Mining **Future Skills**



MINING QUALIFICATIONS AUTHORITY

Final Report

**TITLE: CHALLENGES AND OPPORTUNITIES FOR SMALL-SCALE
MINING**

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Acronyms and Abbreviations

AMV:	African Mining Vision
ASM:	Artisanal and Small-Scale Mining
CLAS:	Cement, Lime, Aggregates and Sand
DMRE:	Department of Mineral Resources and Energy
EIA:	Environmental Impact Assessment
GDP:	Gross Domestic Product
LMI:	Labour Market Intelligence
LSM:	Large Scale Mining
MCSA:	Minerals Council South Africa
MHSA:	Mine Health and Safety Act
MHSC:	Mine Health and Safety Council
MMS:	Minerals and Mining Sector
MPRDA:	Mineral and Petroleum Resources Development Act
MQA:	Mining Qualifications Authority
NEMA:	National Environmental Management Act
NGO:	Non-governmental Organisation
OHS:	Occupational Health and Safety
OHSA:	Occupational Health and Safety Act
PGM:	Platinum Group Metals
R&D:	Research and Development
SADC:	Southern African Development Community
SAIMM:	Southern African Institute of Mining and Metallurgy
SDG:	Sustainable Development Goals
SHE:	Safety Health and Environment
SLT:	Sustainable Livelihoods Theory
SOE:	State-Owned Enterprise
SSM:	Small-Scale Mining
SSP:	Sector Skills Plan

EXECUTIVE SUMMARY

The report examines the challenges and opportunities present within South Africa's artisanal and small-scale mining (ASM) sector, underscoring its significance as a vital driver of rural development and employment. Notwithstanding its capacity to make substantial contributions to local economies and poverty alleviation, the ASM sector encounters numerous challenges that impede its sustainability and growth.

The study utilised a mixed-methods approach, integrating qualitative and quantitative data, to examine critical aspects of ASM, including its economic, social, and environmental impacts, regulatory frameworks, and skill requirements. The principal findings indicate that ASM serves an essential function in job creation, especially in rural regions, providing livelihoods to thousands who may otherwise encounter economic marginalisation. Furthermore, ASM activities foster community development by channelling income back into education, healthcare, and housing.

Nonetheless, the sector faces substantial challenges. Regulatory and legal impediments, including intricate permit and licensing procedures as well as elevated compliance costs, compel numerous operators to operate informally. Inadequate environmental practices, resulting from limited access to sustainable technologies, further intensify land degradation and water pollution. Additionally, ASM workers frequently encounter hazardous working conditions, underscoring the necessity for improved health and safety protocols.

The report delineates a critical necessity for capacity building within the ASM sector. Deficiencies in skills relating to financial management, environmental stewardship, and project planning contribute to operational inefficiencies and challenges in securing funding. Mitigating these deficiencies through targeted training programs and mentorship initiatives is poised to substantially enhance the sustainability and productivity of the sector.

Opportunities for ASM include the strategic utilisation of government policies, such as the 2022 ASM Policy, to formalise operations and enhance access to resources, funding, and markets. Moreover, establishing partnerships with large-scale mining companies may offer technical support and

facilitate access to advanced processing facilities. Additionally, the expansion into niche markets, particularly in renewable energy minerals, constitutes another pathway for growth.

In conclusion, the ASM sector provides a significant opportunity for South Africa to tackle unemployment, promote inclusive economic growth, and advance sustainable mining practices. It is imperative that targeted interventions—such as regulatory reforms, capacity building initiatives, and community engagement—be implemented to fully realise the sector's potential while minimising its environmental and social repercussions.

1. INTRODUCTION

Comprehending small-scale mining (SSM) in South Africa is essential for promoting sustainable economic development, particularly in rural regions where such operations are common. Small-scale mining, frequently characterised as informal or semi-formal, significantly contributes to the livelihoods of thousands, offering employment opportunities and bolstering local economies. Nevertheless, SSM confronts various challenges, including limited access to capital, inadequate technical knowledge, and regulatory obstacles. These issues can result in unsafe working environments and environmental degradation.

There exist numerous challenges as well as opportunities for SSM in South Africa. The Mining Qualifications Authority (MQA) has conducted research that offers significant insights into the challenges and opportunities pertinent to SSM, in conjunction with issues related to and influencing development within the minerals and mining sector (MMS). The study was directed by four primary research objectives aimed at delivering the insights sought by the MQA. These objectives were:

- Determine the extent/coverage and scope of SSM within the geographical area of South Africa.
- Ascertain what the main resources and skills requirements are for small-scale mines.
- Identify the main challenges faced by SSM operations.
- Identify the main opportunities that SSM operations

To address the above objectives there was the need to investigate various factors, which included:

- The legislative and policy frameworks within which SSM operations are governed.
- The economic, social and environmental impacts of SSM, including considerations as to why individuals engage with SSM operations.
- The typical workforce composition of an SSM operation.
- The financial, technological and infrastructure resources required by SSM operations.
- Identifying the technical and managerial skills required by SSM operations.

It was identified early in the study that narratives or depictions of illegal, artisanal, and SSM operations are often unduly conflated, thereby obscuring the understanding of SSM operations. The literature review delineated the distinctions among the various types of operations, a finding that was corroborated during stakeholder engagement sessions. This report concentrates on the facets of legal SSM operations within South Africa. A conceptual framework was employed to guide the formulation of the research questions and the development of data collection instruments.

2. RESEARCH METHODOLOGY

A mixed methods approach, which integrates both qualitative and quantitative methodologies, was employed in the study. This approach is deemed most suitable for comprehending skill sets while also acquiring insights into the experiences of stakeholders. By amalgamating both methods, the research team was able to corroborate findings from one methodology with those of the other (e.g., triangulation), attain a more representative perspective, and address research questions from various angles. This approach further contributed to the quantitative data that substantiated the themes identified during qualitative engagements.

2.1 Problem Statement

The scope of the study has indicated the problem statement of the study, which is defined as:

Small-scale mining in South Africa has various challenges and opportunities that have not been clearly identified, which could affect planning for this specific section of the sector.

2.2 Research Questions

From the scope and problem statement, the following research questions were developed:

1. What is the extent and scope of SSM within South Africa?
2. What are the resources and skills requirements of small-scale mines to operate effectively within the sector?
3. What are the challenges faced by SSM operations?
4. What are the opportunities for SSM operations?

2.3 Conceptual Framework

Prior to addressing the research questions, it was necessary to establish a conceptual framework that delineates parameters for data collection and adequately addresses the research inquiries. The conceptual framework for this study encompasses the identification of challenges and opportunities by examining the following influences (i.e., key dimensions) on SSM:

Key dimensions of conceptual framework:

Opportunities in SSM

- Economic contributions – potential job creation and poverty alleviation.
- Support from policy and stakeholders – government incentives for SSM, and potential partnerships.
- Mineral resource potential – use of local knowledge for resource identification and leveraging from large-scale mining (LSM) operations.

Challenges in SSM

- Regulatory and legal barriers - complex permitting processes, and lack of legal recognition and compliance issues.

- Environmental impacts - land degradation and pollution, and challenges in adopting sustainable practices.
- Socio-Economic challenges – including exploitation and unsafe working conditions, as well as a lack of access to capital, skills, and markets.
- Technological gaps - limited access to modern tools and techniques, and inefficient and hazardous extraction methods.

The conceptual framework incorporated the relationships between internal and external factors influencing SSM operations, by considering the following:

Internal Factors:

- Entrepreneurial capacity and skills of miners – investigating the critical managerial and technical skills required by SSM.
- Financial resources and investment capabilities – determination on what the financial influences are on SSM.
- Technological adaptability – understanding the need to incorporate technology for higher efficiency in operations.

External Factors:

- Regulatory environment: Impact of laws, policies, and enforcement mechanisms on formalisation and growth.
- Market dynamics: Fluctuations in mineral prices and competition with large-scale mining operations.
- Stakeholder influence: Role of government, industry associations, and non-governmental organisations in addressing challenges and creating opportunities.

Conceptual model

The conceptual framework integrates the following components into the conceptual model:

- Drivers of Opportunities – policies, local mineral wealth, market demands, and stakeholder support.
- Barriers to Growth – challenges related to legality, sustainability, socio-economic factors, and technology.
- Outcomes – Sustainable SSM practices, enhanced livelihoods, and broader socio-economic development.

Theoretical lens

The framework is founded upon Sustainable Livelihoods Theory (SLT), which emphasises the necessity of balancing economic, social, and environmental dimensions for long-term development. Additionally, it incorporates elements of Institutional Theory, which underscores the significance of both formal and informal institutions in influencing SSM activities.

2.4 Significance of Study

The significance of this study, which explores the opportunities and challenges associated with SSM, resides in its potential to influence both local and national economies, particularly in developing regions where such mining activities offer livelihoods for numerous individuals. The research underscores key opportunities, including job creation, local entrepreneurship, and access to resources, all of which contribute to poverty alleviation and regional development.

The study additionally sought to identify challenges such as environmental degradation, constraints within the legal framework, safety concerns, and limited access to capital or technology, all of which impede sustainable growth within the sector. By gaining an understanding of these dynamics, policymakers may formulate targeted interventions aimed at supporting the SSM industry, thereby balancing economic development with environmental sustainability and social responsibility. Furthermore, the study ultimately aims to enhance strategies to unlock the sector's potential while concurrently addressing its limitations. As a foundational element, the study also contributes to the effective planning of skills that cater to the needs of small-scale miners in South Africa.

2.5 Data Collection and Analysis

Data was collected through three primary approaches in a sequential manner. These included structured subject matter expert interviews, focus groups and distribution of a survey. A total of 9 focus groups were held with representatives from the following commodities:

- Gold
- Coal
- Cement, Lime, Aggregates and Sand (CLAS)
- Platinum group metals (PGM)

The representatives included executives, management and operational staff. The inclusion of these various levels of representatives ensured a sufficient variety of perspectives. The sample pertaining to mining operations included representatives from the Mpumalanga, North West, Gauteng, and Northern Cape provinces. This sample incorporated both medium and large-scale mining operations to elicit their insights regarding SSM's operations. The focus group sessions concentrated on addressing qualitative inquiries. Furthermore, the interviews with subject matter experts encompassed both expert researchers in the SSM field and executives or owners of SSM operations.

The survey that was developed was disseminated to a total of 1,250 individuals, which included executives, management personnel, operational staff, manufacturing representatives, advisory bodies, skills development facilitators, and training providers (refer to Figure 1). In total, 102 respondents completed the survey. The survey incorporated both quantitative and qualitative questions (see Annexure A). Figure 2 depicts the distribution of respondents categorised by commodity.

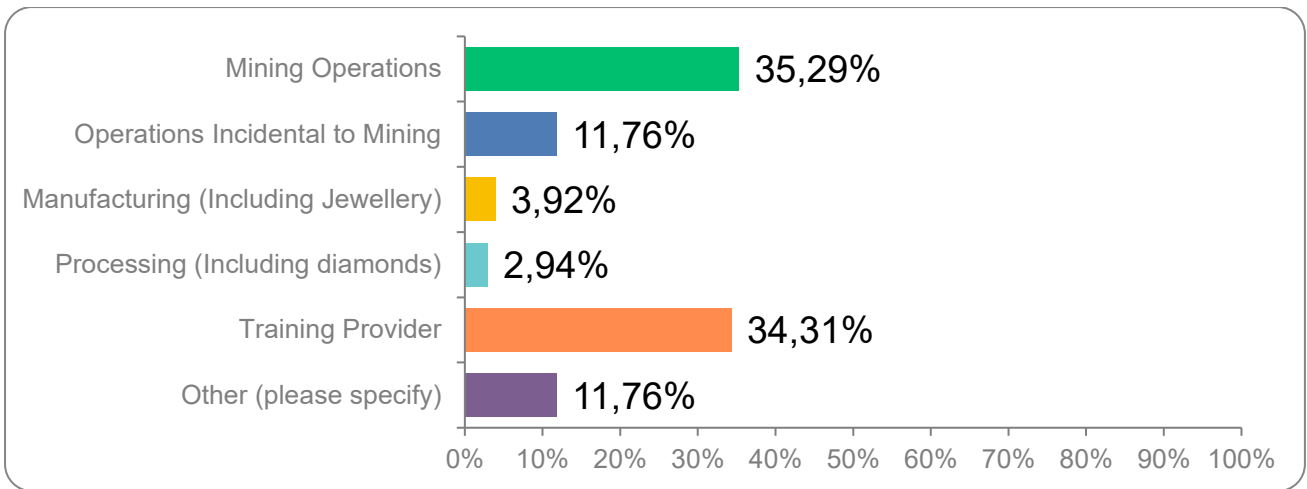


Figure 1: Distribution of Respondents

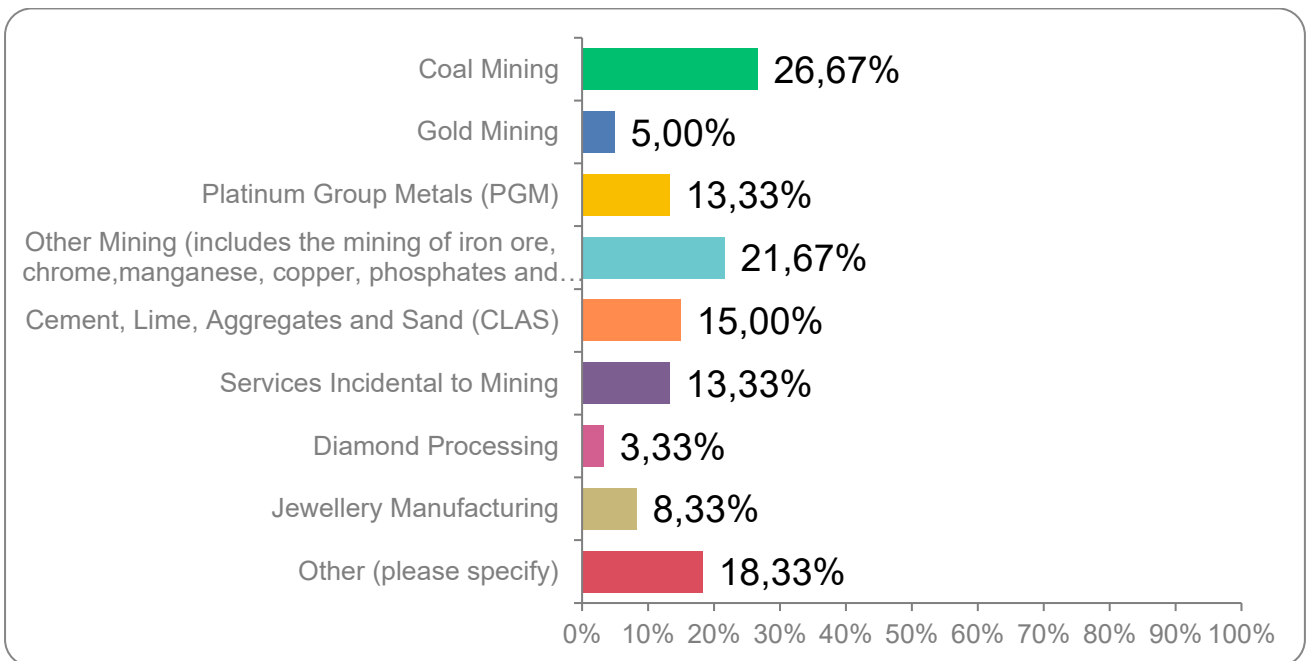


Figure 2: Distribution per Commodity

The data analysis methods utilised in the study:

- Thematic analysis for qualitative data. The data gathered was reviewed with themes identified. The themes highlight the common understanding, experiences or expert opinions around a specific research objective.
- Inferential analysis was utilised to make reasonable inferences towards the larger population. This was done by ensuring that there is representation from various mining methods/commodities, as well as representation from various employee levels in operations.

The data collected was sufficient to ensure that the findings are reliable and sound.

2.6 Ethical Considerations

The research team placed significant emphasis on obtaining informed consent, ensuring that participants comprehended the purpose, scope, and potential outcomes of the study in their entirety. Considering the socio-economic vulnerabilities faced by numerous small-scale miners, particular attention was devoted to preventing exploitation or harm, thereby guaranteeing that participation remains voluntary and devoid of coercion. Furthermore, the research rigorously protected participants' privacy and confidentiality, especially in relation to sensitive matters such as income, working conditions, and informal mining practices.

The researchers consistently endeavoured to provide an accurate and respectful representation of miners' experiences while consciously avoiding the perpetuation of detrimental stereotypes. Furthermore, the study aims to positively contribute to the welfare of the participants by either emphasising methods to enhance their livelihoods or by promoting a deeper understanding of their contributions to the economy and society. Ensuring equity and justice throughout the research process is paramount, particularly considering the historical marginalisation of small-scale miners in South Africa.

2.7 Conclusion

The methodology employed in this study adhered to established research principles. The integration of both qualitative and quantitative methods ensured a comprehensive perspective was achieved through the various data inputs collected. The study has adequately addressed the scope of identifying the challenges and opportunities for SSM in South Africa by utilising a conceptual framework that directed the literature review and various engagement sessions.

3. LITERATURE REVIEW

The literature review clearly established that there is a predominant lack of differentiation between artisanal mining and small-scale mining. The terms are utilised synonymously and collectively referred to as ASM. Chuma, Field, and Mutemeri (2024) indicate that ASM is frequently associated with informal and illegal economic activities. However, a distinct differentiation exists between ASM and illegal mining activities. It is imperative to differentiate between illegal, informal, and SSM mining activities and operational types.

3.1 Foundational Concepts

In South Africa, illegal and unregulated mining activities are carried out by groups commonly referred to as “zama-zamas” (Madimu, 2022). These illicit “zama-zama” mining operations occur informally, conducted by individuals or collectives that lack the necessary permits, licenses, or legal approvals. It is imperative to note, however, that informal mining does not inherently equate to illegal mining (Chuma *et al.*, 2024; Madimu, 2022). The term “informal mining” is frequently associated with artisanal mining. Bester (2023:375) asserts that artisanal mining “continues to operate informally or, in many instances, in an illegal context.” This situation is often attributed to informal miners’ inability to fulfil the legal requirements (Twala, 2023). Notably, artisanal mining is not necessarily regarded as illegal mining if the operation possesses the requisite permits. The Department of Mineral Resources and Energy (DMRE) has published an ASM Policy to facilitate the formalisation and regulation of the ASM sector (Bester, 2023). The Gazetted Artisanal and Small-Scale Mining Policy (DMRE, 2022) delineates the two concepts as follows:

- “Artisanal mining” means traditional and customary mining operations using traditional or customary ways and means. This includes the activities of individuals using mostly rudimentary mining methods, manual and rudimentary tools to access mineral ore, usually available on surface, or at shallow depths.
- “Small scale mining” means a prospecting or mining operation which does not employ specialised prospecting, mechanised mining technologies, chemicals including mercury and cyanide or explosives; or the proposed prospecting or mining operations, do not involve an investment or expenditure which exceed such amount as may be prescribed.

From the aforementioned definitions, it is evident that artisanal mining employs rudimentary mining techniques, which correlates with minimal levels of technological utilisation. This form of mining frequently depends on individuals to extract commodities manually. The Minerals Council South Africa (MCSA, n.d.) underscores that artisanal mining is characterised by high labour intensity, limited capital investment, and a lack of mechanisation and advanced technology. In contrast, small-scale mining incorporates the use of machinery to facilitate the extraction process. Rupprecht (2017:26) asserts that small-scale mining encompasses the application of “basic mining and processing technologies, including mechanical drilling and blasting, mechanised loading and hauling, hoisting, as well as processing through gravity concentration and analogous techniques.”

It is noted that SSM classification is not only determined by the number of employees, but rather by the size of investment into operations (e.g. R1 million for artisanal and R10 million for small-scale), operational area dimensions [e.g. limited to 5 hectares under the Mineral and Petroleum Resources Development Act (MPRDA) of 2002], and mining methodology incorporated (e.g. operations not utilising specialised machinery and technologies).

This study specifically examines legal SSM operations. It is important to note that there may be an influence on the literature review section, as several articles and journals use the terms ASM and SSM interchangeably. Although this study concentrates on SSM, the consideration of ASM remains pertinent. Therefore, the term ASM will be utilised throughout the study.

3.2 Impacts of ASM (Geographic, Employment, Economic, Social and Environmental)

ASM in South Africa exhibits notable geographical diversity, primarily occurring in rural regions where mineral resources such as gold, diamonds, and various industrial minerals are abundant (Twala, 2023). Existing literature indicates a deficiency of baseline data that can accurately ascertain the number of individuals employed within the ASM sector (Bester & Uys, 2023). ASM predominantly operates in rural areas characterised by a scarcity of various resources (Nhlengetwa, 2019). The informal nature of these mining operations often results in a lack of reliable data. Mhangara, Tsoeleng, and Mapurisa (2020:299) assert that “the illicit nature of most artisanal mining operations and the volatile prices for mineral commodities render ASM patterns and trends unpredictable.” Provinces such as Limpopo, Mpumalanga, KwaZulu-Natal, the Northern Cape, and the Eastern Cape

are recognised as significant hubs for ASM activities (Dube, Mutemeri & Petersen, 2016). These operations are typically situated in regions with inadequate infrastructure, which impedes their capacity for sustainable growth.

Economically, ASM significantly contributes to local economies by providing employment opportunities and fostering entrepreneurship within rural communities. It generates income for households that might otherwise be marginalised from formal employment (Mutemeri & Petersen, 2021). Current economic conditions in South Africa are unfavourable, with Statistics South Africa (2024) reporting an unemployment rate of 32.1% in the third quarter. These unemployment statistics offer valuable insights into potential factors driving individuals to engage in ASM, particularly within the artisanal value chain. Twala (2023:11) articulates the following: “There exists a narrative suggesting that many individuals participate in ASM due to the allure of becoming wealthy (commonly referred to as the ‘get-rich-quick’ perspective). Conversely, it is important to acknowledge that ASM is predominantly a poverty-driven activity, with many individuals entering the sector in pursuit of sustainable livelihoods.”

Socially, ASM operations enable community development by providing livelihoods and helping reduce poverty levels (Baddianaah, Abdulai & Dordaa, 2023). However, there are associated social issues, operations, including health and safety risks, incidents of victimisation and abuse, the involvement of foreign nationals, and gender inequalities in employment opportunities (Twala, 2023).

Environmentally, the degradation of local ecosystems, soil erosion, deforestation, and water pollution represent prevalent concerns (Teschner, 2019). A significant number of small-scale miners do not have access to environmentally sustainable technologies, which exacerbates these challenges. Additionally, the dust generated from mining activities, processing, and unsealed roads may comprise radioactive or heavy metals released into the surrounding atmosphere (De Haan, Dales & McQuilken, 2020).

3.3 Regulatory and Legal Impacts for SSM

As indicated in Section 3.2 ASM provides employment opportunities for local communities. Furthermore, as previously established, these employment opportunities tend to be less regulated and informal in character. Figure 3 illustrates the regulatory levels applicable to ASM within South Africa. The regulations presented in Figure 3 are not comprehensive but offer an overview of the various levels of regulations and legislation that govern and influence the ASM sector.



Figure 3: Regulatory Levels for ASM (Source: Author's Own)

The mining legislation in South Africa includes specific provisions for small-scale miners, as articulated in the Mineral and Petroleum Resources Development Act (MPRDA) of 2002, which facilitates the granting of mining rights to small-scale operators (DMRE, 2019). Nevertheless, notwithstanding these provisions, the development of this sector is constrained by bureaucratic impediments, elevated compliance costs, and an absence of dedicated support frameworks. Twala (2023) elucidates that ASM operations are subjected to bureaucratic complexities and must navigate unnecessary administrative challenges. Furthermore, it has been ascertained that a discrepancy exists between compliance obligations and the actual practices of ASM (Twala, 2023). The MPRDA also stipulates

adherence to environmental and safety regulations; however, the enforcement of these mandates is frequently insufficient for small-scale operators (Dube *et al.*, 2016).

Hilson and Maconachie (2020:136) broadly outline the fact that within sub-Saharan Africa “...a poor understanding of its (i.e. ASM) activities has spawned inappropriate policy frameworks and regulations”. At an international level, there is the argument that the development of the Sustainable Development Goals (SDGs), which influence local policy, was developed around large-scale operations with little to no consideration given to ASM operational and social aspects (Hirons, 2020). An aspect such as environmental impact assessments is costly for AMS operations working with limited capital (Twala, 2023). The legislative and regulatory framework governing ASM in South Africa has sought to address the specific needs of these mining activities and rectify persistent regulatory shortcomings.

The primary legislative instrument governing mining activities in South Africa is the Mineral and Petroleum Resources Development Act (MPRDA) of 2002. Historically, this Act has lacked specific provisions pertaining to ASM. For instance, prior legislation did not differentiate between artisanal, small-scale, and large-scale operations, nor did it facilitate access to the sector via the issuance of dual licensing permits. The identified regulatory deficiencies prompted the DMRE to publish a revised ASM policy in 2022, which introduced substantial amendments aimed at aligning the legal framework with the specific needs of ASM. This updated policy delineates between artisanal and small-scale operations while also introducing dual licensing options—namely, Artisanal Mining Permits and Small-Scale Mining Permits. These measures are designed to streamline entry requirements for ASM miners while concurrently ensuring the necessary regulatory oversight (DMRE, 2022; Cliffe Dekker Hofmeyr, 2021).

The 2022 ASM policy encompasses provisions aimed at enhancing the formalization of ASM activities, thereby distinguishing legally compliant ASM operations from illicit mining practices. Furthermore, it establishes mechanisms that facilitate the advancement of ASM miners into larger-scale operations. The policy prioritizes South African citizens for the issuance of ASM permits and promotes the formation of cooperatives over individual ventures, with the objective of fostering collaborative relationships with LSM operators. This collaboration is achieved through agreements that permit ASM access to processing facilities and provide essential technical support. Additionally, the policy

mandates compliance with environmental, health, and safety regulations for ASM operations and offers training programs designed to assist miners in meeting these standards in conjunction with the Mining Qualifications Authority (Mondaq, 2022; Cliffe Dekker Hofmeyr, 2021). This legislative framework, complemented by structured permits and support programs, highlights South Africa's commitment to achieving a balance between the economic potential of ASM and the principles of regulatory accountability and environmental stewardship.

3.4 Essential Technical and Managerial Skills for ASM

To run ASM operations effectively, certain technical and managerial skills are necessary. Technical skills related to mining processes, such as geology, mineral extraction, processing techniques, and safety management, are critical (Hentschel, Hruschka & Priester, 2003; Litvinenko, Bowbrick, Naumov & Zaitseva, 2022). Managerial skills, including financial management, project planning, and human resource management, are equally important. Business management and marketing skills have been identified as lacking within SSM (Wilson, 2018). Further, Wilson (2018) asserts that the lack of business skills and market knowledge contributes to small-scale miners being unable to develop sound business plans, consequently leading to reduced project profitability.

Furthermore, the significance of environmental management skills is escalating considering the increasingly stringent regulations governing sustainable mining practices (Mutemeri & Petersen, 2021). Additionally, proficiency in environmental management practices—including waste disposal and pollution control—is progressively acknowledged as essential, facilitating small-scale miners' compliance with regulatory standards and minimising the ecological footprint associated with ASM activities (Zvarivadza, 2018).

Given that ASM activities are frequently informal in nature, it is imperative for miners to possess a comprehensive understanding of the legal and regulatory frameworks that govern small-scale mining operations (refer to Figure 3) to successfully navigate the processes of obtaining licenses and permits (Perkins, 2019). Furthermore, the safety and health management constitute an essential component of the skill set required for ASM workers. Mkhize (2017) indicates that due to the inherently hazardous and unregulated characteristics of this sector, it is crucial for miners to receive training in health and safety protocols, particularly to mitigate the risks associated with underground mining,

such as rock falls, inadequate ventilation, and exposure to toxic substances. In addition, ASM practitioners must acquire competencies in basic mine planning, which entails strategies for mineral extraction that minimise environmental degradation while maximising profitability. Training in techniques such as hand digging, tunnelling, and surface mining is vital for miners to enhance both the efficiency and safety of their operations (Dlambulo & Motsie, 2014).

3.5 Identification of Key Challenges

The literature review has identified a range of significant challenges encountered by ASM operations. Twala (2023) has thoroughly summarised the specific challenges faced by ASM operations. Figure 4 delineates the challenges within the ASM sector as outlined in a comparative literature review conducted by Twala (2023).

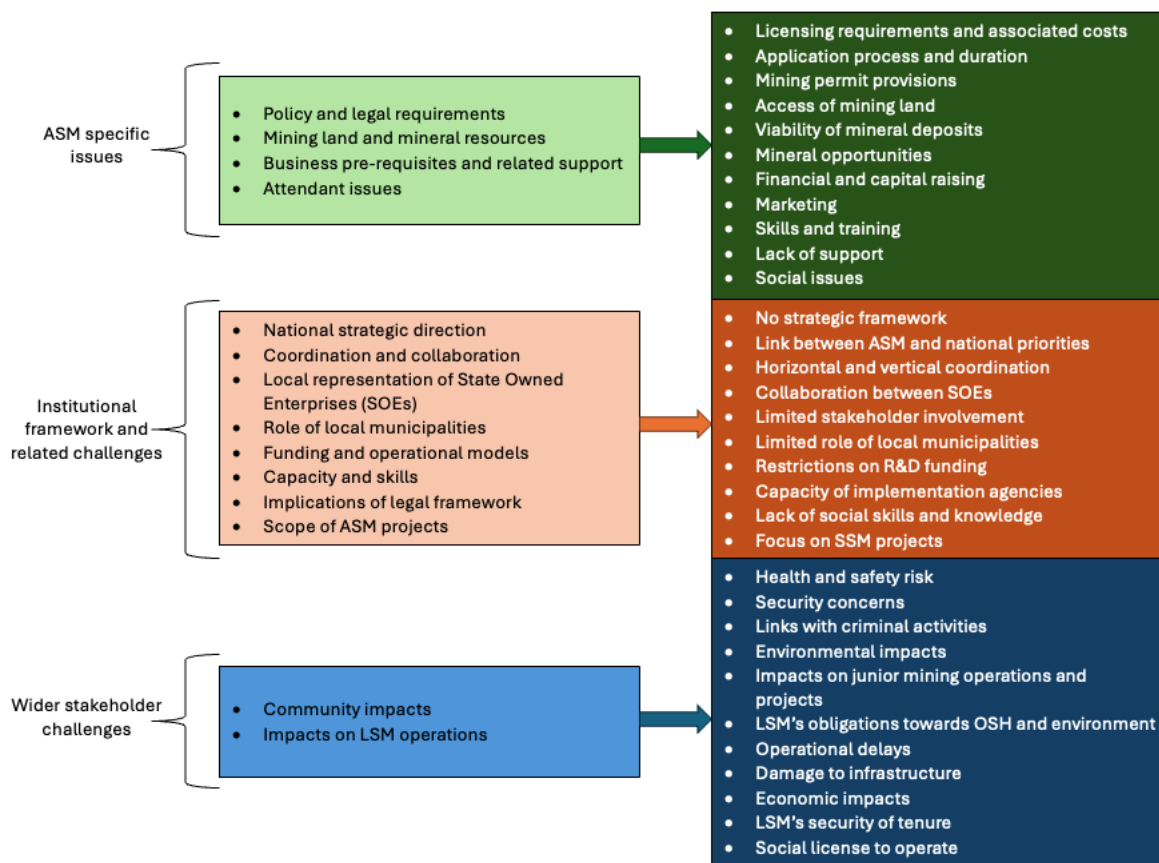


Figure 4: Challenges for ASM (Source: Twala, P.F., 2023)

The challenges depicted in Figure 4 demonstrate a significant correlation with the findings derived from the literature review conducted within this report. Additionally, Table 1 presents a comprehensive summary of the literature review findings regarding the challenges encountered by ASM operations.

Table 1: Challenges for ASM Operations

Impact Area	Challenges
Regulatory and legal (including governance and institutional challenges)	<ul style="list-style-type: none"> • Complex and lengthy licensing processes • Limited enforcement of mining and environmental laws • Conflicts with LSM companies over land rights • Weak support structures for ASM at the local and national levels. • Poor coordination between government agencies, communities, and miners. • Corruption and exploitation by intermediaries or law enforcement bodies
Socio-Economic (including community and cultural challenges)	<ul style="list-style-type: none"> • High levels of informality and lack of access to financial services • Limited market access and price volatility for raw materials • Low levels of education and skills development among miners • Prevalence of child labour and gender inequalities in mining communities • Conflicts between ASM operators and local communities over land use • Traditional practices that may conflict with formal mining regulations • Social stigmatisation of ASM activities
Environmental and health	<ul style="list-style-type: none"> • Land degradation, deforestation, and pollution from mining activities

	<ul style="list-style-type: none"> • Use of harmful substances like mercury in processing • Poor waste management practices • Exposure to unsafe working conditions and health risks
Technological	<ul style="list-style-type: none"> • Limited access to modern mining and processing equipment • Reliance on outdated and inefficient mining techniques • High costs of adopting sustainable technologies
Economic	<ul style="list-style-type: none"> • High operating costs relative to returns • Vulnerability to fluctuating commodity prices • Inability to scale operations due to financial and technical barriers • Positioning of value proposition into larger value chains
Skills (including technical and managerial)	<ul style="list-style-type: none"> • Utilisation of unskilled labour due to less formal structure • Lack of business management skills • High dependency on external expertise (i.e. EIA and SHE compliance) • Lack of financial management and literacy skills • Reactive to skills needs – lack of skills planning • Gaps strategic and business planning skills • Environmental and sustainability practices skills are lacking

Note: Table 1 was developed from the following sources: Bester (2023), Chuma et al. (2024), Dube et al. (2016), Madimu (2022), Mhangara et al. (2020), MCSA (n.d.), Mutemeri et al. (2019), and Twala (2023).

The challenges confronted by ASM operations encompass both direct and indirect issues, as can be inferred from Table 1. Twala (2023) elucidates that ASM operations are also required to address the challenges encountered by the broader stakeholder network, including energy consumption, municipal infrastructure obstacles, commodity prices, and so forth. These challenges contribute to diminished success rates in ASM’s financial growth and sustainability.

3.6 Identification of Key Opportunities

The primary opportunities for ASM reside in its capacity to facilitate rural development, contribute to poverty alleviation, and foster job creation. As South Africa endeavours to confront challenges related to inequality and unemployment, Small-scale Mining (SSM) is positioned to assume a critical role (Dube *et al.*, 2016; De Haan, Dales & McQuilken, 2020). Furthermore, SSM operators have the prospect of engaging with emerging markets, particularly around renewable energy minerals such as lithium and rare earth elements (Teschner, 2019). Although the mining sector has experienced a decline due to various factors, the ASM sector appears to be undergoing growth (DMRE, 2021; Twala, 2023). This expansion is evidenced by the proliferation of ASM activities throughout the nation (DMRE, 2021). The continuous growth of the SSM sector indicates a significant opportunity for SSM operations to scale and undergo formalisation.

The ASM sector presents considerable prospects for growth, economic inclusion, and optimal resource utilisation, particularly for marginalised communities. Recent policies, such as the 2022 Artisanal and Small-Scale Mining Policy (Department of Mineral Resources and Energy, 2022), seek to formalise ASM operations and establish clearer pathways to legality, thereby offering artisanal miners the opportunity to advance to small-scale and ultimately junior mining categories. This policy fosters local economic development by granting ASM operators access to marginal resources that are not conducive to large-scale operations, potentially transforming subsistence miners into small enterprise proprietors and contributing to rural employment (Mondaq, 2022; Sunday News, 2024). Furthermore, the government has allocated significant funds to support ASM initiatives, including a R400 million exploration fund aimed at facilitating resource discovery and technological advancements, thereby further enhancing the viability and resilience of ASM operations.

Table 2 outlines the summary of the literature review findings on opportunities experienced by ASM operations.

Table 2: Opportunities for ASM Operations

Impact Area	Opportunities
Economic	<ul style="list-style-type: none"> • Job creation: ASM provides employment to many, especially in rural and economically depressed areas. • Income Generation: Enables local communities to benefit directly from mineral wealth. • Contribution to GDP: Potential for significant contributions to the national and regional economies. • Local economic development: Opportunities for small businesses to grow around ASM operations (e.g., supply chains, services).
Social	<ul style="list-style-type: none"> • Community development: Revenue from ASM can support infrastructure development like schools and clinics. • Poverty reduction: Provides livelihood options in regions with limited economic opportunities. • Empowerment of women and youth: Encourages participation of underrepresented groups in mining.
Environmental	<ul style="list-style-type: none"> • Rehabilitation projects: Potential for ASM operators to participate in land rehabilitation and biodiversity conservation initiatives. • Innovation in sustainable practices: Opportunities to develop and adopt eco-friendly technologies in small-scale mining. • Partnerships for sustainable mining: Collaboration with NGOs and government bodies to improve environmental stewardship.
Policy and governance	<ul style="list-style-type: none"> • Formalisation of ASM sector: Provides an avenue for regulation, enhancing safety and reducing illegality. • Revenue Collection: Formalisation can boost government revenue through taxes and royalties.

	<ul style="list-style-type: none"> • Improved compliance: Encouraging adherence to environmental and safety standards.
Technological	<ul style="list-style-type: none"> • Access to modern tools: Adoption of low-cost and efficient mining and processing technologies. • Innovation hubs: Opportunity to create centres that promote the development of ASM-specific technologies. • Training programmes: Skills development in technical and operational aspects of ASM.
Market access	<ul style="list-style-type: none"> • Fair trade initiatives: Access to global markets through certification programs (i.e., Fairmined). • Value addition: Processing raw materials locally to increase profits. • Niche markets: Supplying unique or rare minerals for specific industries (i.e., gemstones, artisanal crafts).
International partnerships and investments	<ul style="list-style-type: none"> • Funding opportunities: International agencies and NGOs may invest in ASM for sustainable development. • Knowledge sharing: Partnerships with other countries or regions to exchange best practices.

Note: Table 2 was developed from the following sources: Bester (2023), Chuma et al. (2024), De Haan et al. (2020), Dube et al. (2016), Madimu (2022), Mhangara et al. (2020), Mutemeri et al. (2019), Perkins (2019), Teschner (2019) and Twala (2023).

The integration of ASM, into the broader mining economy is facilitated through initiatives that foster cooperation with LSM companies. Collaboration agreements, such as tributing and buy-back schemes, enable ASM operators to gain access to processing facilities and obtain equipment or land use support from established mining firms, thereby enhancing ASM productivity and sustainability (Perkins, 2019; Sunday News, 2024). These agreements may contribute to the growth experienced in ASM activities, as previously indicated in this section.

Furthermore, the ASM policy encourages structured market access, which protects ASM operators from unfair trading practices and ensures equitable prices for their products. These opportunities

align with South Africa's objectives of creating a competitive and inclusive mining sector that supports local communities and increases economic participation from historically marginalised groups (Perkins, 2019; Sunday News, 2024).

It is evident that numerous opportunities exist within the ASM sector, which can positively contribute to the broader mining industry. Nevertheless, it is imperative to ensure that adequate formalisation initiatives are implemented, accompanied by the necessary support. During these formalisation initiatives, there is also an opportunity for governing structures to identify the skills development needs.

3.7 Conclusion

It has been established that ASM operations yield significant economic, environmental, and social impacts. It is imperative to consider methods for effectively managing these impacts and to identify the requisite skills involved. The legislative policy regarding ASM has been formulated to facilitate improved market access. Nevertheless, the realignment of policy does not inherently result in increased accessibility or heightened compliance levels. ASM operations continue to face challenges, including but not limited to financial constraints and knowledge deficiencies concerning successful sector entry.

Specific technical and managerial skills are essential within ASM operations. While ASM operations typically possess technical expertise related to mineral extraction, there exists a notable deficiency in the capacity to foster sustainability within these endeavours. This deficiency is particularly pronounced in the challenge of establishing regulatory-compliant ASM operations, especially among artisanal practices. The requisite skills encompass a range from purely technical competencies to comprehensive business management.

In the section, Tables 1 and 2 delineate the challenges and opportunities identified during the literature review. It is evident that numerous socio-economic challenges and opportunities exist for ASM in South Africa. The formalisation of ASM operations could significantly contribute to the local economic development of communities. Unfortunately, ASM operations are also beset by adverse social influences, such as substance abuse, victimisation, and other forms of abuse.

It has been established that ASM operations frequently have detrimental effects on the environment. These impacts encompass land degradation, deforestation, and pollution resulting from mining activities. Furthermore, inadequacies in waste management practices are evident within ASM operations. The aforementioned impacts are particularly relevant to artisanal-level operations. The literature review indicates that artisanal mining is generally more informal in comparison to SSM. However, it is important to note that these two levels of operation, artisanal and SSM, are interrelated and cannot be easily separated.

Both spheres of mining necessitate attention concerning formalisation, support, and development. Consequently, the literature review employed the terms interchangeably. Additionally, it can be concluded that SSM typically exhibits higher levels of regulatory and legal compliance; nonetheless, there remains a requirement for assistance across various internal (e.g., skills development, occupational health and safety compliance) and external (e.g., financial support, access to markets) dimensions of their operations.

4. DATA COLLECTION AND ANALYSIS

Two interviews with subject matter experts and nine focus groups were conducted, alongside the completion of 102 surveys. The subsequent section addresses the analysis of the collected data. The data was examined through thematic identification and inferential analysis. Sufficient engagement and data collection occurred to substantiate the validity and reliability of the findings.

4.1 Legislative and Policy Support of ASM

The participants indicated that there is not very strong support for ASM through the legislative and policy frameworks, within South Africa. Figure 5 illustrates the percentage of participants who responded, to determine how well legislation and policies address the specific needs of ASM operations.

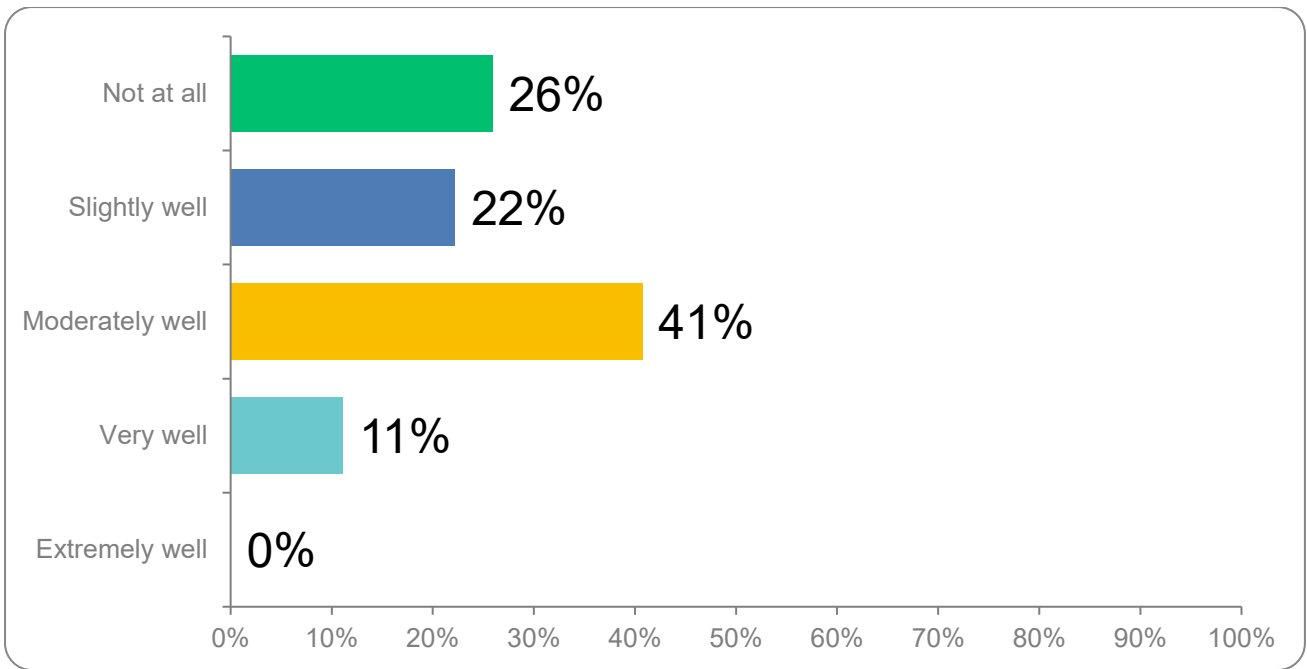


Figure 5: Alignment of ASM Needs and Policy/Legislation

The participants are of the opinion that legislative and policy frameworks are not addressing the needs of ASM, in South Africa. Only 11% of the participants indicated that the legislation and policy adequately address the needs of ASM. It must be noted that the respondents who indicated “very well” were from medium and LSM operations, which could indicate that this is not from the perspective of ASM operations. However, there was the input that the ASM policy has contributed to providing better guidance within the sector.

Participants in the focus groups indicated that the process of applying for a mining permit is both protracted and expensive. The application process impedes access to the market and inadvertently promotes illegal operations. Such operations frequently circumvent the application process, thus functioning outside of established legal compliance requirements. This observation aligns with the findings presented in the literature review. Figure 6 depicts the perceptions of stakeholders regarding the degree of support that legislation and regulations afford to ASM operations.

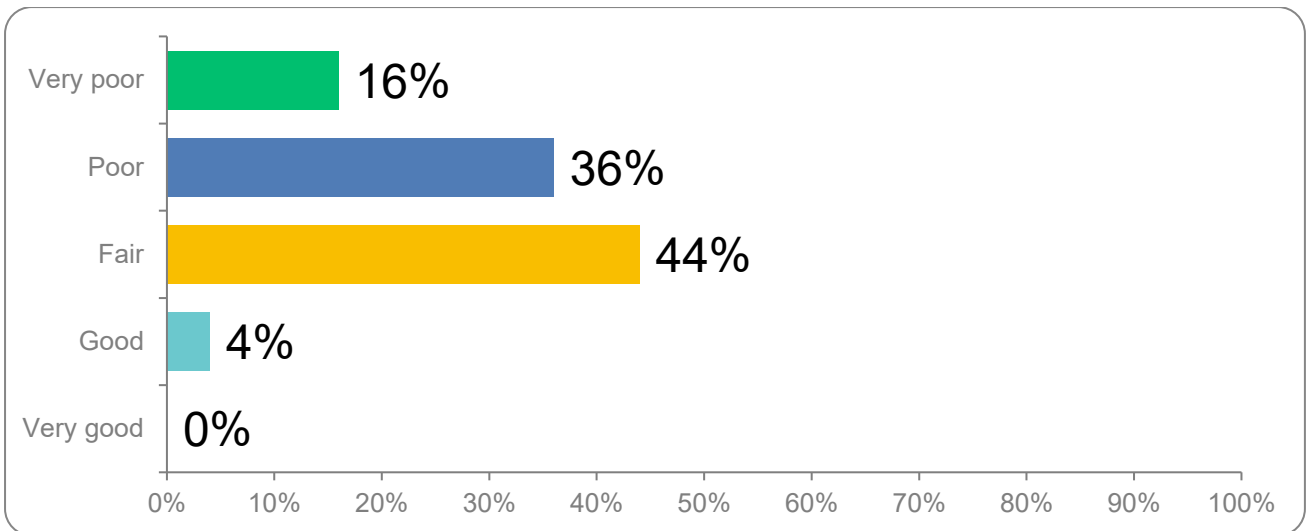


Figure 6: Support to ASM Through Legislation and Regulations

There were 44% of participants who were of the opinion that the support provided to ASM operations is fair. The concern is that there were only 4% who indicated that the support is good, with no respondents indicating that the support is very good.

Participants in the focus group expressed that there has been an enhancement in the clarity surrounding the legal framework governing ASM operations following the issuance of the ASM policy. Nevertheless, there was a predominant sentiment that the policy's application is not consistently practical or enforceable. This perception is partially attributed to the informal nature exhibited by numerous artisanal operations as well as the financial limitations faced by small-scale businesses.

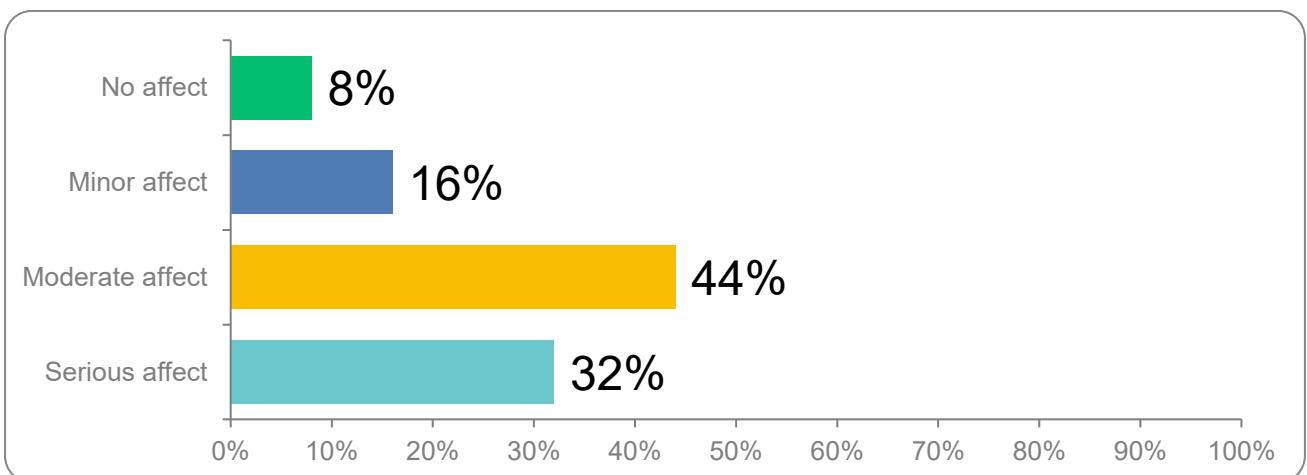


Figure 7: Policy Support Influence on Sustainability and Legal Status of ASM

Figure 7 outlines that the majority of respondents believe that a lack of policy support has a moderate to serious effect on the sustainability and legal status of ASM operations. As stated previously, the lack of support in policy implementation drives persons to circumvent the process and operate illegally. A valid input from stakeholders was that the change in the mining method brings about a change in risk. The application of the MHSa thus becomes different when applied to ASM operations, which make use of rudimentary mining methods and machinery. Participants were clear, that this did not translate to no risks associated with their mining methods, but that the identification and assessment compliance of Section 11 in the MHSa could be more systems driven. This system could be provided to AMS operations to assist in compliance with the Act.

It can be summarised from the engagements, that the ASM policy has contributed positively to the sector. However, there is a need to refine the application of the policy. The environmental requirements (i.e., EIA to be conducted for all operations) were clearly identified as a challenge and were not necessarily supportive of ASM operations. There were numerous comments from experts, and focus group participants, that they understand why EIAs should be conducted, but that they do not possess the skills or the financial resources to carry out these assessments effectively. The recommendation was that the MQA could support ASM operations by multi-skilling ASM employees with the necessary skills to be compliant. It was, however, identified that if this is to be executed successfully, there would need to be a focus on the educational levels of ASM employees, which could limit employment opportunities.

4.2 Factors Driving Persons to Engage with ASM Activities

An overwhelming response indicated that unemployment rates are a significant factor motivating individuals to participate in the ASM sector. Input indicated that individuals are drawn to artisanal mining primarily due to the income opportunities it provides. This observation is directly correlated with the findings from the literature review. Furthermore, ASM operations are predominantly characterised by surface mining, or at minimum, shallow depths, requiring lower skill levels, thereby rendering it more appealing to local communities.

Additionally, participants indicated that there is often a lack of certification of skills, and that ASM operations have a lower focus or requirement for certification. ASM operations focus on whether the

individual can perform the required work, not primarily if the person is certified. The example of LSM operations requiring Grade 12 as a prerequisite for employment was provided, whereas ASM operations would not necessarily have this requirement. A valid comment, from some stakeholders, was that ASM operations have less bureaucracy and are more involved with the needs of employees. ASM operations are also often based in remote rural areas where access to skills is difficult. Therefore, persons learn the skills informally and utilise learnings in ASM operations.

ASM operations are better positioned to effectuate substantial improvements in the lives of their employees and the communities in which they operate. Fundamentally, individuals are frequently motivated to pursue employment opportunities within the ASM sector due to various socio-economic factors, including unemployment, lower skill levels, and a scarcity of opportunities. Moreover, there have been corroborated observations indicating that ASM involvement is often intertwined with family history in specific geographic regions. Additionally, communities aspire to attain financial independence and to extract their own minerals, in contrast to the practices of large mining corporations.

4.3 Managerial and Technical Skills Required in ASM

There was significant engagement on this topic. Themes were clearly identified during the discussions. While analysing these themes, it was determined that three areas of skills are required: business skills (including financial management), health and safety, and environmental management skills. Table 3 indicates the various skills identified and practical applications of these skills.

Table 3: Managerial and Technical Skills Required by ASM

Skills Cluster	Skill Identified	Application
Business skills	Financial management	<p>Basic Budgeting and Cost Management</p> <ul style="list-style-type: none"> Understanding and managing operational costs, such as labour, equipment maintenance, fuel, and logistics.

		<ul style="list-style-type: none"> • Preparing and adhering to budgets to ensure resources are allocated effectively and prevent financial shortfalls. <p>Cash Flow Management</p> <ul style="list-style-type: none"> • Monitoring cash inflows from mineral/commodity sales and managing outflows for operational expenses. • Maintaining liquidity to address unforeseen costs, seasonal variations in production, or price volatility in mineral markets. <p>Record Keeping and Accounting</p> <ul style="list-style-type: none"> • Maintaining accurate financial records to track income, expenses, and profits. • Using basic accounting principles to analyse financial performance and inform decision-making. <p>Risk Management</p> <ul style="list-style-type: none"> • Assessing and mitigating financial risks, such as mineral/commodity price fluctuations or equipment failures. • Diversifying income streams or savings to buffer against unpredictable market conditions. <p>Understanding Financing Options</p> <ul style="list-style-type: none"> • Knowledge of formal and informal financing mechanisms, such as loans, grants, and cooperative savings schemes. • Building relationships with financial institutions to improve access to capital for equipment upgrades or expansion. <p>Tax and Regulatory Compliance</p> <ul style="list-style-type: none"> • Awareness of relevant tax obligations and the ability to calculate and pay taxes accurately.
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		<ul style="list-style-type: none"> • Understanding and adhering to financial regulations to operate within the legal framework and access government incentives. <p>Investment Decision-Making</p> <ul style="list-style-type: none"> • Evaluating the cost-benefit of potential investments, such as new equipment or technology. • Balancing short-term profitability with long-term operational sustainability. <p>Negotiation Skills</p> <ul style="list-style-type: none"> • Negotiating fair prices for minerals and competitive rates for purchasing equipment or services. • Developing partnerships or cooperative agreements to reduce costs and share resources. <p>Financial Planning and Goal Setting</p> <ul style="list-style-type: none"> • Developing financial plans that align with short- and long-term business goals. • Setting measurable financial objectives to track progress and guide growth. <p>Digital and Technological Literacy</p> <ul style="list-style-type: none"> • Utilising digital tools for financial management, such as mobile banking, accounting software, or mineral sales platforms. • Leveraging technology to enhance record-keeping, budgeting, and reporting accuracy.
	Communication skills	<p>Interpersonal Communication</p> <ul style="list-style-type: none"> • Building trust and maintaining relationships with workers, community members, and external stakeholders. • Engaging with diverse groups, including suppliers, buyers, government officials, and financiers. <p>Negotiation and Persuasion</p>

		<ul style="list-style-type: none"> • Negotiating fair terms for mineral sales, equipment purchases, or access to mining land. • Persuading potential investors, buyers, or partners of the value and credibility of the mining operation. <p>Cultural and Social Sensitivity</p> <ul style="list-style-type: none"> • Recognising and respecting cultural norms and practices in communities where mining activities take place. • Using culturally appropriate communication styles to foster mutual understanding and prevent conflict. <p>Clarity in Information Sharing</p> <ul style="list-style-type: none"> • Conveying complex information, such as regulatory requirements or safety procedures, in an understandable manner. • Ensuring instructions and agreements are clear to avoid misunderstandings among team members or stakeholders. <p>Conflict Resolution and Mediation</p> <ul style="list-style-type: none"> • Addressing disputes with workers, landowners, or other miners constructively and diplomatically. • Mediating tensions between community members and mining operators to maintain social harmony. <p>Advocacy and Lobbying Skills</p> <ul style="list-style-type: none"> • Effectively presenting issues affecting ASM to policymakers or advocacy groups. • Communicating the benefits and challenges of ASM to secure support from governments, NGOs, and international organisations. <p>Team Communication</p>
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		<ul style="list-style-type: none"> • Facilitating collaboration and information sharing among team members to enhance productivity and safety. • Providing clear, concise instructions during daily operations and responding to workers' concerns effectively. <p>Stakeholder Engagement</p> <ul style="list-style-type: none"> • Interacting with government bodies, financial institutions, and NGOs to access resources or comply with regulations. • Presenting mining projects or plans professionally to attract partnerships or funding. <p>Documenting and Reporting</p> <ul style="list-style-type: none"> • Preparing and delivering written reports, proposals, or compliance documents to stakeholders. • Using communication tools such as email, social media, or formal presentations to share information effectively. <p>Crisis Communication</p> <ul style="list-style-type: none"> • Managing communication during emergencies, such as accidents or disputes, to ensure transparency and minimise harm. • Addressing community concerns promptly and professionally to maintain trust.
	<p>Problem solving</p>	<p>Critical Thinking</p> <ul style="list-style-type: none"> • Analysing situations to identify the root causes of problems, such as equipment failures, declining ore quality, or community conflicts. • Evaluating potential solutions and their implications to make informed decisions. <p>Decision-Making Under Uncertainty</p>

		<ul style="list-style-type: none"> • Making timely and effective decisions despite limited information or unpredictable circumstances, such as fluctuating mineral prices or sudden regulatory changes. • Prioritising actions that balance short-term needs with long-term sustainability. <p>Innovation and Creativity</p> <ul style="list-style-type: none"> • Developing innovative approaches to maximise resource use, such as repurposing materials or adopting cost-effective mining techniques. • Creating alternative solutions to overcome logistical or financial barriers, including the use of locally available tools and resources. <p>Conflict Resolution</p> <ul style="list-style-type: none"> • Addressing disputes with team members, local communities, or competitors constructively and diplomatically. • Negotiating win-win outcomes to maintain relationships and ensure operational continuity. <p>Environmental Problem Solving</p> <ul style="list-style-type: none"> • Implementing strategies to mitigate environmental impacts, such as reducing water usage, managing waste, or rehabilitating mined areas. • Adapting mining practices to comply with environmental regulations and minimise ecological harm. <p>Operational Troubleshooting</p> <ul style="list-style-type: none"> • Diagnosing and resolving technical issues with equipment, tools, or mining processes. • Implementing quick fixes to reduce downtime and maintaining productivity.
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		<p>Problem Solving Applied to Risk Assessment and Management</p> <ul style="list-style-type: none"> • Identifying potential risks to workers, operations, or the environment and developing mitigation strategies. • Planning for emergencies, such as accidents, natural disasters, or regulatory penalties, to reduce their impact. <p>Team Collaboration for Problem Solving</p> <ul style="list-style-type: none"> • Working collaboratively with team members to brainstorm and implement solutions. • Encouraging participation and leveraging the diverse expertise of the workforce to address challenges. <p>Adaptability and Resilience</p> <ul style="list-style-type: none"> • Adjusting plans and strategies in response to unforeseen challenges, such as resource shortages or shifts in policy. • Maintaining focus and perseverance in the face of setbacks or operational difficulties. <p>Systems Thinking</p> <ul style="list-style-type: none"> • Understanding the interconnections between various components of the ASM operation, such as labour, equipment, supply chains, and market conditions. • Anticipating the ripple effects of decisions and actions across the entire operation. <p>Time and Resource Management</p> <ul style="list-style-type: none"> • Allocating limited resources, such as labour, materials, and financial capital, efficiently to solve problems.
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		<ul style="list-style-type: none"> • Ensuring that solutions are implemented within a reasonable timeframe to avoid operational delays.
	<p>Regulatory and legal knowledge – relates to environmental management skills</p>	<p>Knowledge of Mining Legislation and Policies</p> <ul style="list-style-type: none"> • Understanding the Minerals and Petroleum Resources Development Act (MPRDA), which regulates mining rights, permits, and environmental responsibilities. • Familiarity with the National Environmental Management Act (NEMA) and its implications for environmental compliance in mining activities. • Awareness of government initiatives such as the Small-Scale Mining Support Framework and other sector-specific policies. <p>Compliance Management</p> <ul style="list-style-type: none"> • Ensuring adherence to mining permit conditions, environmental standards, and safety regulations. • Maintaining records and documentation required for audits or inspections by regulatory bodies. <p>Permit and Licensing Skills</p> <ul style="list-style-type: none"> • Navigating the processes to obtain mining permits and licenses, including prospecting and mining rights applications. • Preparing required documentation, such as environmental impact assessments (EIAs) and community engagement plans. <p>Environmental Legal Compliance</p> <ul style="list-style-type: none"> • Understanding laws related to waste management, water use, and land rehabilitation under NEMA. • Implementing practices to mitigate environmental impacts, as required by legislation. <p>Labour Law Awareness</p>

		<ul style="list-style-type: none"> • Knowledge of South Africa’s labour laws, including the Basic Conditions of Employment Act, OHSA, MSHA. • Ensuring fair treatment of workers, adherence to safety standards, and avoidance of child or forced labour. <p>Community and Landowner Negotiation</p> <ul style="list-style-type: none"> • Engaging with landowners and communities to secure access to mining areas while respecting land use rights. • Drafting and negotiating agreements that meet both legal requirements and stakeholder expectations. <p>Awareness of International Standards and Agreements</p> <ul style="list-style-type: none"> • Knowledge of global standards, such as the Kimberley Process Certification Scheme for diamond mining, to access international markets. • Adhering to principles of sustainability and ethical mining to meet global buyer expectations. <p>Advocacy and Lobbying Skills</p> <ul style="list-style-type: none"> • Representing ASM interests in discussions with government bodies or industry stakeholders. • Advocating for policy reforms or support mechanisms tailored to the needs of small-scale miners. <p>Record Keeping and Legal Documentation</p> <ul style="list-style-type: none"> • Keeping detailed records of mining operations, environmental impact, labour practices, and community agreements to ensure legal compliance. • Understanding contract law to draft or review agreements related to partnerships, sales, or land use.
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		<p>Crisis Management and Legal Risk Mitigation</p> <ul style="list-style-type: none"> • Responding effectively to potential legal challenges, such as regulatory violations or environmental accidents. • Proactively identifying and mitigating risks to prevent legal disputes or penalties.
	<p>Project management</p>	<p>Strategic Planning</p> <ul style="list-style-type: none"> • Developing comprehensive plans that outline objectives, timelines, budgets, and resource allocation for mining activities. • Setting measurable goals that align with regulatory requirements, community expectations, and market demands. <p>Time Management</p> <ul style="list-style-type: none"> • Organising tasks and operations to ensure mining activities are completed within specified timelines. • Prioritising activities to address urgent issues while maintaining overall project momentum. <p>Resource Management</p> <ul style="list-style-type: none"> • Effectively utilising human resources, equipment, and materials to maximise productivity. • Monitoring resource use to prevent wastage and reduce costs. <p>Risk Management</p> <ul style="list-style-type: none"> • Identifying potential risks, such as equipment failures, environmental impacts, or market fluctuations, and creating contingency plans. • Implementing measures to minimize health, safety, and environmental risks associated with mining operations.

		<p>Budgeting and Financial Management (see financial management skills cluster)</p> <ul style="list-style-type: none"> • Preparing and managing budgets to ensure operations remain financially sustainable. • Tracking expenditures and revenues to maintain cash flow and profitability. <p>Team Leadership and Coordination</p> <ul style="list-style-type: none"> • Leading and motivating a team of workers to achieve project goals effectively. • Assigning tasks and responsibilities to team members based on their skills and experience. <p>Environmental and Social Impact Management</p> <ul style="list-style-type: none"> • Planning and implementing practices to minimise environmental damage, such as proper waste management and land rehabilitation. • Engaging with communities to address concerns and foster positive relationships. <p>Monitoring and Evaluation</p> <ul style="list-style-type: none"> • Establishing performance indicators to track the progress and success of mining projects. • Conducting regular evaluations to identify areas for improvement and ensure goals are being met. <p>Supply Chain and Logistics Management</p> <ul style="list-style-type: none"> • Coordinating the procurement and transportation of materials, equipment, and supplies needed for mining operations. • Managing supply chain disruptions to avoid delays in project execution. <p>Data Management and Reporting</p> <ul style="list-style-type: none"> • Collecting and analysing data on production, costs, and market trends to inform decision-making.
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		<ul style="list-style-type: none"> • Preparing reports to provide transparency and accountability to stakeholders.
Health and safety	Risk assessment and identification (varies in level - from OHS representatives to senior management decision-making on risks)	<p>Hazard Identification</p> <ul style="list-style-type: none"> • Recognising common risks in ASM operations, such as unstable ground, equipment malfunctions, or exposure to hazardous materials. • Assessing external risks, legal non-compliance, and community conflicts. This level is often too high for OHS representatives. <p>Understanding Risk Categories</p> <ul style="list-style-type: none"> • Differentiating between various types of risks: <ul style="list-style-type: none"> ○ Operational Risks: Equipment failure, worker accidents, or production disruptions. ○ Financial Risks: Cash flow problems, mineral price volatility, or theft. ○ Environmental Risks: Water contamination, deforestation, or waste mismanagement. ○ Regulatory Risks: Non-compliance with permits, labour laws, or environmental regulations. <p>Data Collection and Analysis</p> <ul style="list-style-type: none"> • Gathering relevant data on site conditions, worker behaviour, and environmental impact to identify risk patterns. • Using simple tools or frameworks to analyse risks, such as checklists, surveys, or basic risk matrices. <p>Risk Evaluation and Prioritisation</p> <ul style="list-style-type: none"> • Estimating the likelihood and severity of identified risks to determine their significance.

		<ul style="list-style-type: none"> • Prioritising risks that pose the greatest threat to safety, profitability, or sustainability for immediate action. <p>Health and Safety Risk Assessment</p> <ul style="list-style-type: none"> • Identifying workplace hazards, such as unsafe mining practices or inadequate protective gear. • Assessing health risks, such as dust inhalation, noise exposure, or waterborne diseases. <p>Legal and Regulatory Risk Awareness</p> <ul style="list-style-type: none"> • Understanding the legal requirements and potential penalties for non-compliance with South African mining and environmental laws. • Identifying risks related to permit lapses, unregulated activities, or labour law violations. <p>Community and Social Risk Assessment</p> <ul style="list-style-type: none"> • Assessing potential conflicts with local communities over land use, environmental impact, or resource sharing. • Evaluating the social impact of mining activities and developing strategies to foster positive relationships. <p>Risk Communication Skills</p> <ul style="list-style-type: none"> • Clearly communicating identified risks to workers, stakeholders, and community members. • Ensuring all parties understand the potential consequences and the importance of mitigation measures. <p>Mitigation Strategy Development</p> <ul style="list-style-type: none"> • Designing and implementing measures to reduce or eliminate identified risks, such as safety training, equipment upgrades, or environmental controls.
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		<ul style="list-style-type: none"> • Developing emergency response plans for high-priority risks, such as mine collapses or chemical spills. <p>Monitoring and Review</p> <ul style="list-style-type: none"> • Continuously monitoring risks and assessing the effectiveness of mitigation strategies. • Updating risk assessments to reflect changes in operations, regulations, or environmental conditions. <p>Use of Risk Assessment Tools</p> <ul style="list-style-type: none"> • Utilising basic tools such as risk matrices, hazard identification checklists, or site inspection reports to formalise the risk assessment process. • Leveraging digital tools or mobile apps where possible for more systematic data collection and analysis. <p>Scenario Planning</p> <ul style="list-style-type: none"> • Anticipating worst-case scenarios, such as natural disasters or sudden regulatory enforcement, and preparing contingency plans. • Using simulations or drills to practice responses to high-risk situations.
	<p>Risk management (varies in level - from OHS representatives to senior management decision-making on risks)</p>	<p>Risk Identification and Assessment</p> <ul style="list-style-type: none"> • Recognising potential risks in mining operations, including safety hazards, financial uncertainties, environmental damage, and regulatory non-compliance. • Analysing risks to determine their likelihood and potential impact, prioritising those that pose the greatest threat. <p>Risk Mitigation Planning</p>

		<ul style="list-style-type: none"> • Developing strategies to reduce the likelihood or severity of risks, such as adopting safer mining techniques or implementing environmental controls. • Establishing clear protocols for handling identified risks to ensure consistent responses. <p>Regulatory Compliance Management</p> <ul style="list-style-type: none"> • Understanding and adhering to South African laws governing mining activities, labour practices, and environmental protection. • Regularly reviewing compliance to avoid legal penalties or operational shutdowns. <p>Health and Safety Risk Management</p> <ul style="list-style-type: none"> • Identifying workplace hazards, such as inadequate equipment or unsafe working conditions, and implementing safety measures. • Conducting regular safety training and ensuring access to protective gear for all workers. <p>Financial Risk Management</p> <ul style="list-style-type: none"> • Monitoring and managing financial risks, such as fluctuations in mineral prices, theft, or operational cost overruns. • Establishing financial buffers or savings plans to address unexpected expenses or income gaps. <p>Environmental Risk Management</p> <ul style="list-style-type: none"> • Assessing and mitigating environmental impacts, such as land degradation, water pollution, or waste management issues. • Rehabilitating mined areas to meet legal requirements and community expectations. <p>Emergency Response Planning</p>
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		<ul style="list-style-type: none"> • Preparing contingency plans for emergencies, such as mine collapses, equipment failures, or natural disasters. • Conducting regular drills to ensure workers are familiar with emergency protocols. <p>Conflict Management and Resolution</p> <ul style="list-style-type: none"> • Addressing disputes with communities, workers, or other miners effectively and diplomatically. • Establishing mechanisms to prevent conflicts, such as community engagement programs or stakeholder consultations. <p>Monitoring and Evaluation</p> <ul style="list-style-type: none"> • Continuously monitoring risks to identify new threats or changes in existing risks. • Evaluating the effectiveness of implemented mitigation measures and adjusting as needed. <p>Communication Skills</p> <ul style="list-style-type: none"> • Clearly conveying risk-related information to workers, stakeholders, and community members. • Ensuring that all parties understand the risks and their roles in mitigation efforts. <p>Team Collaboration and Leadership</p> <ul style="list-style-type: none"> • Leading teams in the implementation of risk management strategies, fostering a culture of safety and accountability. • Encouraging collaboration among team members to address risks effectively. <p>Adaptability and Problem-Solving</p> <ul style="list-style-type: none"> • Responding quickly and effectively to unexpected challenges or risks, such as sudden regulatory changes or equipment breakdowns.
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		<ul style="list-style-type: none"> • Innovating solutions to manage risks in resource-constrained environments. <p>Use of Risk Management Tools</p> <ul style="list-style-type: none"> • Utilising basic tools, such as risk registers, checklists, or templates, to formalise risk management processes. • Exploring digital tools for tracking risks, monitoring compliance, and enhancing operational safety.
Environmental	Energy management	<p>Energy Needs Assessment</p> <ul style="list-style-type: none"> • Identifying the specific energy requirements of mining operations, including powering equipment, processing minerals, and lighting. • Assessing the efficiency of current energy sources and technologies to identify areas for improvement. <p>Resource Optimisation</p> <ul style="list-style-type: none"> • Efficiently managing energy resources to minimize waste and reduce costs. • Implementing operational changes, such as scheduling high-energy tasks during off-peak hours or optimising machinery usage. <p>Renewable Energy Integration</p> <ul style="list-style-type: none"> • Understanding renewable energy options, such as solar, wind, or biomass, and their applicability to ASM operations. • Designing systems to integrate renewable energy sources, reducing reliance on non-renewable or grid-based energy. <p>Energy Efficiency Practices</p> <ul style="list-style-type: none"> • Adopting energy-efficient technologies, such as modernised equipment or energy-saving lighting systems.

		<ul style="list-style-type: none"> • Training workers on energy-efficient practices to reduce unnecessary consumption. <p>Financial Management of Energy Costs</p> <ul style="list-style-type: none"> • Budgeting for energy expenses and evaluating the cost-effectiveness of different energy sources. • Identifying funding or incentives available for implementing energy-saving or renewable energy solutions. <p>Monitoring and Measurement</p> <ul style="list-style-type: none"> • Using tools or systems to track energy consumption and identify high-usage areas. • Analysing data to make informed decisions about energy use and efficiency improvements. <p>Risk Management in Energy Supply</p> <ul style="list-style-type: none"> • Anticipating energy-related risks, such as supply interruptions or price increases, and developing contingency plans. • Diversifying energy sources to mitigate the impact of energy shortages or fluctuations. <p>Knowledge of Regulatory Compliance</p> <ul style="list-style-type: none"> • Understanding energy-related regulations, such as tariffs, renewable energy incentives, or emissions standards. • Ensuring compliance with legal requirements to avoid penalties and benefit from government programs. <p>Technological Adaptation</p> <ul style="list-style-type: none"> • Staying updated on advancements in energy technologies and integrating them into operations where feasible.
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		<ul style="list-style-type: none"> • Adopting low-cost or off-grid solutions to improve access to energy in remote areas. <p>Environmental Impact Mitigation</p> <ul style="list-style-type: none"> • Reducing the carbon footprint of ASM operations through cleaner energy choices and efficient practices. • Implementing sustainable energy systems to align with community and environmental expectations. <p>Collaboration and Stakeholder Engagement</p> <ul style="list-style-type: none"> • Working with energy suppliers, government agencies, and NGOs to secure affordable and reliable energy solutions. • Engaging with local communities to develop shared energy projects, such as solar micro-grids. <p>Training and Capacity Building</p> <ul style="list-style-type: none"> • Educating workers on the importance of energy management and sustainable practices. • Building internal capacity to identify, plan, and implement energy solutions effectively. <p>Strategic Planning for Long-Term Energy Sustainability</p> <ul style="list-style-type: none"> • Setting long-term goals for reducing energy costs and improving efficiency. • Planning for the gradual transition to renewable energy sources to ensure sustainable operations.
	Water management	<p>Water Needs Assessment</p> <ul style="list-style-type: none"> • Evaluating the specific water requirements for mining operations, including daily volumes and quality standards for different processes. • Identifying peak water demand periods and planning resource allocation accordingly. <p>Water Source Identification</p>

		<ul style="list-style-type: none"> • Locating sustainable and reliable water sources, such as boreholes, rivers, or rainwater harvesting systems. • Assessing the impact of water extraction on local ecosystems and community access. <p>Efficient Water Use Practices</p> <ul style="list-style-type: none"> • Implementing techniques to reduce water usage, such as recycling water in ore processing or using alternative methods for dust control. • Training workers on best practices for conserving water during mining activities. <p>Wastewater Management</p> <ul style="list-style-type: none"> • Treating and managing wastewater to remove contaminants before discharge, in compliance with environmental regulations. • Designing systems for safe storage and disposal of process water to prevent leaks or spills. <p>Rainwater Harvesting and Storage</p> <ul style="list-style-type: none"> • Installing and maintaining systems to capture and store rainwater as an alternative water source. • Building storage facilities to secure water availability during dry periods. <p>Environmental Impact Mitigation</p> <ul style="list-style-type: none"> • Identifying potential water pollution risks, such as chemical runoff or sedimentation, and implementing preventive measures. • Restoring water sources affected by mining activities, including riverbanks or wetlands. <p>Regulatory Compliance and Licensing</p>
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		<ul style="list-style-type: none"> • Understanding South African water laws, such as the National Water Act, and obtaining necessary permits for water use and discharge. • Maintaining accurate records and reporting water usage to regulatory bodies. <p>Risk Management for Water Supply</p> <ul style="list-style-type: none"> • Anticipating and planning for risks, such as droughts, contamination, or changes in water availability. • Developing contingency plans to secure alternative water sources during shortages. <p>Monitoring and Evaluation</p> <ul style="list-style-type: none"> • Regularly measuring water usage, quality, and discharge rates to ensure compliance and identify inefficiencies. • Using simple tools, such as flow meters or water testing kits, to monitor water systems. <p>Community Engagement</p> <ul style="list-style-type: none"> • Collaborating with local communities to ensure shared water resources are managed equitably. • Addressing community concerns related to water access, pollution, or depletion caused by mining activities. <p>Infrastructure Development and Maintenance</p> <ul style="list-style-type: none"> • Building and maintaining water storage, treatment, and recycling systems to ensure operational continuity. • Ensuring infrastructure is durable and adapted to local environmental conditions. <p>Knowledge of Sustainable Practices</p>
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		<ul style="list-style-type: none"> • Understanding and adopting sustainable water management techniques, such as phytoremediation or biofiltration, to minimize environmental impact. • Aligning water management strategies with international best practices and standards. <p>Data Collection and Reporting</p> <ul style="list-style-type: none"> • Keeping detailed records of water use, treatment, and discharge to facilitate compliance and decision-making. • Preparing reports for stakeholders, including regulators and community representatives, to demonstrate responsible water use.
	Waste management	<p>Waste Identification and Classification</p> <ul style="list-style-type: none"> • Identifying the different types of waste generated during mining, such as mineral waste (tailings, slag), hazardous waste (chemicals, oils), and general waste (packaging, scrap). • Understanding the specific risks associated with each type of waste to manage them appropriately. <p>Waste Reduction and Minimization</p> <ul style="list-style-type: none"> • Implementing practices to reduce the volume of waste produced, such as optimizing resource extraction processes or reusing materials. • Adopting efficient mining techniques to minimize the generation of tailings and overburden. <p>Hazardous Waste Handling</p> <ul style="list-style-type: none"> • Safely managing hazardous materials, such as mercury, cyanide, or acids, to prevent leaks or spills. • Using personal protective equipment (PPE) and following protocols to protect workers and the environment.

		<p>Waste Storage and Containment</p> <ul style="list-style-type: none"> • Designing and maintaining secure storage facilities for different types of waste to prevent contamination of soil and water. • Ensuring tailings dams or waste heaps are constructed to withstand weather conditions and avoid collapses. <p>Recycling and Resource Recovery</p> <ul style="list-style-type: none"> • Identifying opportunities to recycle materials, such as scrap metals or used equipment, to reduce waste. • Exploring methods to recover valuable minerals from tailings or other waste streams. <p>Wastewater Management</p> <ul style="list-style-type: none"> • Treating and managing wastewater generated during mining processes to remove contaminants before discharge. • Reusing treated water in operations to reduce overall water consumption and waste. <p>Environmental Impact Mitigation</p> <ul style="list-style-type: none"> • Assessing the environmental impacts of waste disposal and implementing measures to mitigate harm. • Restoring and rehabilitating areas affected by waste dumping, including soil stabilisation and re-vegetation. <p>Compliance with Waste Management Regulations</p> <ul style="list-style-type: none"> • Understanding South Africa’s waste management laws, including the National Environmental Management: Waste Act (2008).
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		<ul style="list-style-type: none"> • Maintaining proper records of waste generation, handling, and disposal to ensure compliance with legal requirements. <p>Community Engagement</p> <ul style="list-style-type: none"> • Collaborating with local communities to address concerns about waste management and its impact on shared resources. • Involving community members in waste recycling or reclamation projects to create mutual benefits. <p>Monitoring and Reporting</p> <ul style="list-style-type: none"> • Tracking waste generation, storage, and disposal to identify inefficiencies and areas for improvement. • Preparing reports for regulatory authorities to demonstrate compliance and responsible waste management practices. <p>Training and Awareness</p> <ul style="list-style-type: none"> • Educating workers about proper waste management techniques and the importance of following protocols. • Raising awareness about the environmental and health impacts of poor waste handling practices. <p>Emergency Response for Waste Incidents</p> <ul style="list-style-type: none"> • Preparing and implementing response plans for incidents such as tailings dam breaches or chemical spills. • Conducting regular drills to ensure readiness for waste-related emergencies. <p>Sustainable Disposal Methods</p> <ul style="list-style-type: none"> • Exploring sustainable methods for waste disposal, such as composting organic waste or using inert materials for construction purposes.
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		<ul style="list-style-type: none"> • Avoiding harmful practices, such as open burning or illegal dumping, which can cause environmental damage.
	Impact assessment	<p>Understanding of EIA Principles and Objectives</p> <ul style="list-style-type: none"> • Comprehending the purpose of EIAs: identifying environmental risks, mitigating negative impacts, and promoting sustainable mining practices. • Recognising the socio-economic benefits of minimising environmental damage for long-term community and ecosystem health. <p>Baseline Data Collection</p> <ul style="list-style-type: none"> • Gathering data on pre-mining environmental conditions, including soil quality, water resources, biodiversity, and air quality. • Utilising tools such as maps, surveys, and environmental sampling techniques to establish baseline conditions. <p>Impact Identification and Prediction</p> <ul style="list-style-type: none"> • Identifying the potential environmental impacts of mining activities, such as land degradation, water pollution, or habitat destruction. • Using predictive methods to evaluate the magnitude, duration, and extent of these impacts on ecosystems and communities. <p>Risk Assessment and Prioritisation</p> <ul style="list-style-type: none"> • Assessing the likelihood and severity of environmental risks, such as chemical spills, erosion, or biodiversity loss. • Prioritising significant risks that require immediate or long-term mitigation efforts. <p>Mitigation Planning</p>

		<ul style="list-style-type: none"> • Developing strategies to prevent or reduce environmental impacts, such as waste management systems, water treatment facilities, or land rehabilitation plans. • Incorporating sustainable practices, such as reforestation, into mitigation efforts. <p>Legal and Regulatory Compliance</p> <ul style="list-style-type: none"> • Understanding South Africa’s environmental laws, including the National Environmental Management Act (NEMA) and related EIA regulations. • Preparing documentation required for environmental authorisation and ensuring adherence to permit conditions. <p>Stakeholder Engagement and Communication</p> <ul style="list-style-type: none"> • Consulting with local communities, government agencies, and other stakeholders to incorporate their concerns and knowledge into the EIA process. • Effectively communicating findings, proposed actions, and benefits of the EIA to stakeholders. <p>Monitoring and Evaluation</p> <ul style="list-style-type: none"> • Establishing indicators to monitor the effectiveness of mitigation measures and the ongoing environmental impact of mining operations. • Conducting periodic reviews and updating environmental management plans based on monitoring data. <p>Data Analysis and Reporting</p> <ul style="list-style-type: none"> • Analysing collected data to identify trends and evaluate the success of mitigation measures.
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		<ul style="list-style-type: none"> • Preparing comprehensive EIA reports that detail findings, conclusions, and recommendations in line with regulatory standards. <p>Rehabilitation and Closure Planning</p> <ul style="list-style-type: none"> • Designing plans for land rehabilitation and restoration after mining activities, including soil stabilisation and habitat recovery. • Ensuring that closure plans align with long-term environmental and community needs. <p>Knowledge of Ecological Systems</p> <ul style="list-style-type: none"> • Understanding the interconnectedness of ecosystems and how mining activities may disrupt these relationships. • Applying ecological principles to restore or protect affected environments. <p>Conflict Resolution and Mediation</p> <ul style="list-style-type: none"> • Addressing conflicts that arise from environmental concerns, such as disputes over water usage or land rehabilitation. • Facilitating dialogues to balance environmental priorities with mining and community needs. <p>Sustainability Integration</p> <ul style="list-style-type: none"> • Incorporating sustainable development principles into mining practices, ensuring that environmental, social, and economic factors are balanced. • Promoting the use of renewable energy and resource-efficient technologies in mining operations.
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An intriguing finding indicates that certain skills within LSM operations can be effectively adapted for application in ASM operations. Practical examples were presented of individuals acquiring skills in LSM operations and subsequently, following retrenchment, transitioning to employment within an

ASM operation. While the skill sets are notably similar, it is imperative that they are applied in accordance with the mining methods utilised by ASM operations.

4.4 Key Challenges Faced by ASM in South Africa

The findings from the literature review revealed numerous challenges within the ASM sector. These challenges included a deficiency of financial resources and difficulties in adhering to legislative and regulatory compliance. Stakeholders emphasized various obstacles confronting ASM operations in South Africa, with these issues exhibiting a strong correlation with the findings presented in the literature review.

A significant challenge that emerged as a recurring theme was the inadequate access to financial capital. Participants in the focus groups, along with subject matter experts, indicated that opportunities for obtaining capital through traditional funding mechanisms, such as banking institutions, are severely constrained. The majority of capital required for ASM operations is sourced from private investments, notably owner-invested capital. It was noted that banking institutions exhibit reluctance to engage in investments within ASM operations due to several factors, including the absence of robust business plans, the elevated risk associated with potential defaults on payments, insufficient credit histories, and a lack of assets that could be utilised as collateral.

There was a consensus among participants that ASM operations are frequently subject to exploitation within the mining value chain. The participants noted that ASM operations are often pressured by medium and large enterprises to modify their pricing structures, which do not align with the prevailing market demands. Furthermore, due to their relatively smaller scale, ASM operations experience a significant lack of purchasing power attributable to economies of scale. Essentially, larger operations possess a greater buying power. Participants also pointed out that ASM operations frequently incur higher per-unit costs resulting from the inefficiencies associated with manual labour and rudimentary equipment. Moreover, the absence of economies of scale prevents ASM operations from reaping the benefits of bulk purchasing or efficiencies gained through large-scale production.

Another financial challenge faced by ASM operations involves the consideration of compliance costs. Participants provided a practical example regarding the necessity of conducting Environmental

Impact Assessments (EIAs) and the associated expenses. ASM operations frequently lack the requisite expertise to perform EIAs and, consequently, are compelled to outsource this function to consultants, incurring additional costs. Stakeholders expressed the viewpoint that ASM operations are frequently overregulated and are required to adhere to the same standards as LSM operations, despite possessing fewer resources.

Figure 8 illustrates whether ASM operations are aware of funding (including investments) or grant opportunities available to their sector.

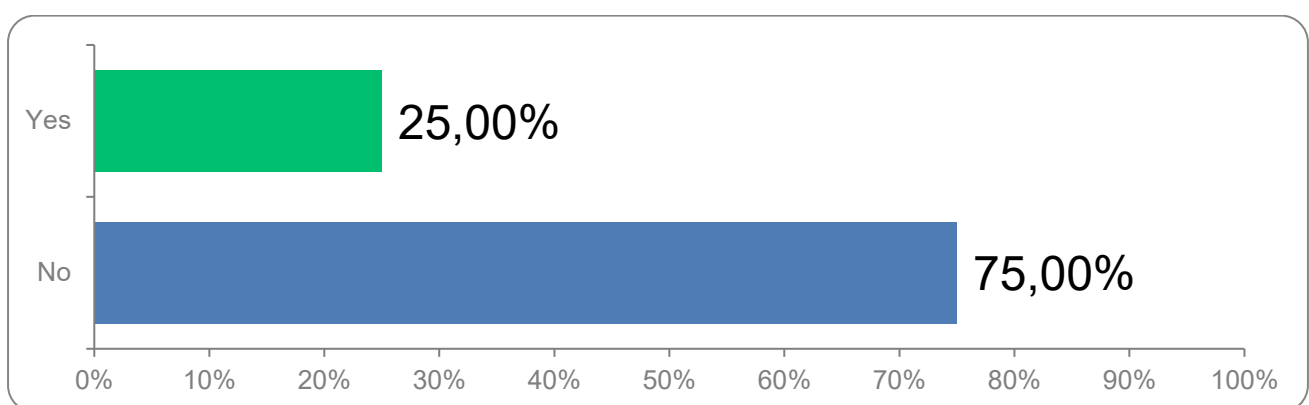


Figure 8: Awareness of Funding/Grant Opportunities for ASM

The responses indicate that a significant majority of participants are not cognisant of any funding or investment opportunities within the sector. Additionally, some participants who responded in the affirmative to the inquiry have indicated that these funding models are not consistently accessible. Therefore, it can be concluded that ASM operations are not universally aware of funding and investment opportunities, despite the potential availability of such resources.

Lastly, stakeholders also indicated that ASM operations face broader challenges. These broader challenges refer to aspects that fall outside of the control of mining operations. The following were the major themes identified during the engagement of broader influences on ASM:

- A lack of transport networks around operations, which makes the transport of goods expensive.
- There is difficulty in finding skilled persons within the immediate areas. Many of the participants also indicated that the average level of education is low in rural areas.

- Energy dependency is a serious influence on operations and there is often an interruption of energy supply.
- Water supply into rural areas. Many participants indicated that there are often water supply issues in their operations, which are most often located in remote areas. The lack of water supply also indicated that there remains a need to address effective water management within ASM operations. This was identified as a skills development need in the engagements.
- The socio-economic conditions of local communities are often characterised by poverty and the necessity to fulfil basic needs. This situation has prompted local communities to interact negatively with mining operations, leading to increased demands for essential resources from these entities. Several participants indicated that local communities have resorted to intimidating workers and causing damage to operations as a result of unmet demands. Nonetheless, ASM operations lack the capacity to address the broader socio-economic challenges local communities face.

In conclusion, ASM operations are currently facing a multitude of challenges, which encompass both controllable and uncontrollable factors. However, during the discussions, it was identified that there exist numerous opportunities for ASM operations, provided they receive adequate support.

4.5 Key Opportunities ASM in South Africa

During engagements and the distribution of surveys, the primary objective was to identify opportunities for ASM operations within South Africa. It was ascertained that a variety of opportunities exist, with the most significant being the potential for job creation within this sector. This sector possesses the capacity to generate both direct and indirect employment. The direct opportunities created provide livelihoods for miners, labourers, and operators who may otherwise be subjected to economic exclusion. Similar to the LSM value chain, there exists potential for creating opportunities within ancillary industries, such as equipment manufacturing, transportation, and small-scale processing. Numerous participants indicated that informal services—such as food and catering, basic vehicle services, and physical labour—are being offered to ASM operations, thereby contributing to poverty alleviation within local communities. Furthermore, ASM encourages the development of micro-enterprises, enabling individuals to establish small businesses tailored to the sector, including food supply, equipment rentals, and the distribution of safety gear. These ancillary

businesses contribute to the establishment of a broader supply chain. It was noted by various stakeholders that these enterprises often operate informally and, as a result, do not directly contribute to tax revenues.

A prominent theme identified pertains to the contributions made by ASM operations to local communities. The revenue generated from ASM activities is frequently reinvested into these communities, thereby supporting essential services such as education, healthcare, and housing, despite this often being classified as informal expenditure. Additionally, ASM operations provide opportunities for historically marginalised groups, including women and youth, to engage in economic activities, thereby fostering greater inclusivity. Moreover, ASM generates income at the local level, particularly in regions where large-scale mining activities are absent or economically unfeasible.

An additional opportunity identified is that South Africa possesses the potential for an increase in surface mining or shallow-depth mining. This development offers an avenue for lower-skilled individuals to participate in the mining value chain. However, it is imperative to ensure compliance with the legal requirements of the sector.

To develop the mentioned opportunities - the following aspects need to be considered:

- **Capacity Building:** Investments in training and mentorship can help miners adopt safer, more efficient, and environmentally sustainable practices.
- **Access to Markets and Finance:** Establishing fair trade mechanisms and improving access to capital can ensure ASM operators receive fair compensation for their products and invest in their operations. This would also lower the exploitation experienced by ASM operations currently.
- **Community Engagement:** Encouraging collaboration between ASM operators, local communities, and government authorities ensures equitable benefit-sharing and minimises conflicts. This was indicated as a skills development requirement in Table 3.

The ASM sector offers a significant opportunity for South Africa to tackle urgent socio-economic challenges, especially in rural and marginalised areas. By promoting job creation, facilitating community development, augmenting economic contributions, and encouraging skills development,

the ASM sector can make substantial contributions to the sustainable growth of the nation. With targeted support and effective governance, this sector possesses the potential to serve as a cornerstone in South Africa's inclusive development strategy

5. KEY FINDINGS

The study identified several challenges and opportunities. The findings are summarised as follows, comprising seven principal points:

1. Economic and Social Contributions of ASM:

The operations associated with ASM make substantial contributions to rural livelihoods, employment opportunities, and local economies, particularly in regions with a scarcity of formal employment options. This sector possesses the capacity to mitigate poverty and promote entrepreneurship within marginalised communities.

2. Regulatory Challenges:

The intricate and protracted licensing procedures, substantial compliance expenses, and deficiencies in legislative support present significant obstacles to the formalisation of ASM. Furthermore, the absence of explicit guidelines frequently compels operators to engage in informal or illicit activities.

3. Environmental and Health Risks:

The prevalence of poor environmental practices, including land degradation and water pollution, can be attributed to limited access to sustainable technologies. Furthermore, unsafe working conditions present significant health risks to workers.

4. Skills and Capacity Gaps:

There exists a pervasive deficiency in managerial, technical, and financial competencies within ASM operations. This deficiency leads to inefficiencies, decreased productivity, and challenges in securing funding and accessing markets.

5. The Potential for Job Creation and Economic Growth:

With appropriate formalisation and support, ASM has the capability to generate significant employment opportunities and positively influence the national economy, especially in specialised sectors such as renewable energy minerals.

6. Community Development and Inclusivity:

ASM offers historically marginalised groups, including women and youth, opportunities to engage in economic activities, thereby fostering inclusive growth.

7. Opportunities for Modernisation and Formalisation:

Emerging policies, such as the ASM Policy of 2022, present avenues for integrating ASM into the formal economy, fostering partnerships with large-scale mining enterprises and enhancing access to essential resources.

The ASM sector in South Africa possesses significant potential to drive economic growth, generate employment opportunities, and promote community development, especially in rural regions. However, realising this potential necessitates the resolution of critical challenges identified in the findings, including regulatory barriers, environmental degradation, health hazards, and skill deficiencies. The informal nature of the sector, coupled with the absence of clear support mechanisms, has constrained its ability to contribute comprehensively to sustainable development. Nevertheless, emerging opportunities such as formalisation initiatives, collaborations with large-scale mining enterprises, and the exploration of niche markets like renewable energy minerals present a transformative pathway. Through targeted interventions aimed at capacity building, streamlined regulatory frameworks, and sustainable practices, the ASM sector could serve as a catalyst for inclusive economic growth and environmental stewardship in South Africa.

6. RECOMMENDATIONS

In accordance with the findings presented in the report, Table 4 delineates four specific, measurable, achievable, relevant, and time-bound (SMART) recommendations for the ASM sector in South Africa:

Table 4: Recommendations from Study

Research Recommendation	Activity	Key stakeholders and responsibilities	Timelines
<p>Recommendation 1: Streamlining licensing and permit processing</p>	<p>1.1 Simplify the ASM licensing/permit framework by introducing a digital application platform with pre-defined, clear guidelines tailored to small-scale operators.</p> <p>1.2 Engage with mining sector at ASM level to determine what specific application processes are barriers.</p> <p>1.3 Leverage the ASM Policy of 2022 to develop a system that aligns with the needs of small-scale miners. Pilot the program in key mining provinces like Limpopo and Mpumalanga before national rollout.</p>	<p>DMRE – Lead</p> <p>MQA – Support</p> <p>Legal subject matter experts</p> <p>MHSC – Inputs and guidance</p> <p>Systems developers and administrators (i.e. architects, UX/IX specialists)</p>	<ul style="list-style-type: none"> • Initial process development: 6 months • Framework development: 6 months • Roll-out 24 months
<p>Recommendation 2: Establish capacity</p>	<p>2.1 Determine relevance and practical application of current</p>	<p>MQA – Lead</p> <p>EUP – input of best practice & coordination</p>	<ul style="list-style-type: none"> • 18 months (6 months analysis)

Research Recommendation	Activity	Key stakeholders and responsibilities	Timelines
development programmes.	<p>capacity development programmes. Provide recommendations on the programmes to be realigned/developed.</p> <p>2.2 Create training centres or capacity building projects focusing on financial management, environmental compliance, and safety for ASM miners.</p> <p>2.3 Train 3000 to 3500 ASM workers/community members annually by end 2026 in financial literacy, environmental sustainability practices, and safety measures.</p> <p>2.4 Collaborate with institutions like the training authorities, TVET operations, research foundations and NGOs to design</p>	<p>NGOs – funding and access to operations/local communities</p> <p>MCSA - input</p> <p>Industry – input</p> <p>Private and public training providers – programme development and implementation</p> <p>DMRE – Directorate of SSM (inputs)</p> <p>Mining universities – provide guidance on best practices</p>	and planning, 12 months roll out)

Research Recommendation	Activity	Key stakeholders and responsibilities	Timelines
	and fund the programs.		
<p>Recommendation 3: Foster Public-Private Partnerships for Equipment and Market Access</p>	<p>3.1 Map the various stakeholders within the partnership framework and determine relationships and potential supply chain links.</p> <p>3.2 Facilitate partnerships between LSM companies and ASM operators to provide access to equipment, technical expertise, and processing facilities.</p> <p>3.3 Sign agreements with at least 10 LSM operators and integrate 50 ASM operators into formalised buy-back or tributing schemes by 2027. Further research will be required into</p>	<p>Lead not identified (TBC)</p> <p>MEMSA – Facilitation</p> <p>Mandela Mining Precinct</p> <p>MCSA – Input and facilitation</p> <p>MQA – input and facilitation</p> <p>merSETA – equipment manufacturing stakeholder access</p> <p>DMRE – Directorate of SSM (inputs, facilitation and needs identification)</p> <p>Employee representatives</p>	<ul style="list-style-type: none"> • 6 months – stakeholder engagement, mapping and planning for positioning • 6 months negotiation and integration.

Research Recommendation	Activity	Key stakeholders and responsibilities	Timelines
	<p>what is practical for this specific objective.</p> <p>3.4 Engage industry stakeholders and establish government incentives for partnerships.</p>		
<p>Recommendation 4: Promote Environmental Stewardship and Compliance</p>	<p>4.1 Develop a subsidised EIA support program for ASM operators.</p> <p>4.2 Conduct EIAs/assist for/with at least 40-50% of registered ASM operations by 2027.</p> <p>4.3 Allocate funding through existing environmental grant programs and deploy technical teams to assist ASM operators.</p>	<p>DMRE – Lead</p> <p>MQA – programme development</p> <p>Private/public providers – coordination and implementation</p> <p>EUP – input & coordination</p>	<ul style="list-style-type: none"> • 24 months (6 months programme development, 18 months rollOut)

The recommendations in Table 4 serve to tackle significant challenges within the ASM sector, which encompass issues of informality, skill deficiencies, market accessibility, and ecological ramifications. Furthermore, these recommendations are in alignment with the broader economic and sustainability objectives of South Africa.

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ANNEXURE A: SURVEY QUESTIONNAIRE

Please select your stakeholder group	Mining operations
	Operations incidental to mining

	Manufacturing (including jewellery)
	Processing (including diamonds)
	Training provider
	Other: open-ended
Please indicate your current job role	Open-ended
Please indicate the size of the organisation	Small (0 - 49 employees)
	Medium (50 - 149 employees)
	Large (150+ employees)
Please select all sub-sector/s applicable to the operations	Coal mining
	Gold mining
	Platinum Group Metals (PGM)
	Other mining (includes the mining of iron ore, chrome, manganese, copper, phosphates and salt)
	Cement, Lime, Aggregates and Sand (CLAS)
	Services incidental to mining
	Diamond processing
	Jewellery manufacturing
	Other: open-ended
What are the primary economic, social, and environmental factors that motivate individuals to pursue SSM as a livelihood in South Africa?	Open-ended
What specific technical and managerial skills are essential for the effective functioning of SSM operations, and how can skills development programs be tailored to meet these needs? (e.g., mining techniques, environmental management, financial management)	Open-ended
How well do current South African mining laws and policies address the specific needs and challenges of SSM,	Likert

particularly in terms of regulatory compliance, access to resources, and operational support?	
How would you rate the support provided to SSM through government policies and regulations? How do these perceptions influence their ability to operate legally and sustainably?	Likert
How does this support influence their ability to operate legally and sustainably?	Likert
What are the key financial, regulatory, and infrastructural challenges faced by SSM in South Africa, and how do these impact their operations and sustainability?	Open-ended
Are you aware of any financial and investment opportunities, including government grants and private sector partnerships, available to SSM in South Africa? If yes, please explain how they contribute to the sector's growth and sustainability.	Multiple choice