Baseline Assessment of Development Minerals

Zambia

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Cover Photo: Road paving using cobblestones, Lusaka, Zambia

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LIST OF ACRONYMS

Abbreviation	Full Name
7NDP	Seventh National Development Plan (2017 – 2021)
ACP	African, Caribbean and Pacific
ASM	Artisanal and Small-Scale Mining
AZMEC	The Association of Zambian Mineral Exploration Companies
CBO	Community Based Organisation
CEEC	Citizens Economic Empowerment Commission
CEJ	Centre for Environment Justice
CSO	Civil Society Organisation
CSR	Corporate Social Responsibility
CTPD DMs	Centre for Trade Policy and Development Development Minerals
EIA	Environmental Impact Assessment
EITA	Extractive Industries Transparency Alliance
EITI	Extractive Industries Transparency Initiative
ESIA	Environmental and Social Impact Assessments
ESMAZ	Emerald and Semi-Precious Stone Miners Association of Zambia
FDI	Foreign Direct Investment
FSSMAZ	Federation of Small Scale Mining Associations of Zambia
GRZ GSD	Government of the Republic of Zambia Geological Survey Department
ILO ITC	International Labour Organisation International Trade Centre
IPPA	Investment Promotion Protection Agreement
JCTR	Jesuit Centre for Theological Recovery
JICA	Japanese Development Agency
KCB	Kalulushi Clay Bricks
KML	Kagem Mine Limited
LVMM	Low Value Minerals and Materials
MISA	Media Institute of Southern Africa
MLC MDD MCD	Mining License Committee Mining Cadastre Department Mines Development Department
MMMD	Ministry of Mines and Minerals Development
MRDP	Mineral Resources Development Policy
MOU	Memorandum of Understanding
MSG	Multi Stakeholder Group
OHSEC	Occupational Health, Safety, Environment and Community
NCC	National Construction Council
NGO	Non-Governmental Organisation
NLP	Ndola Lime Plc
PACRA	Patents and Companies Registration Agency

PanAfGeo	Pan-African Support to the EuroGeoSurveys-Organisation of African Geological Surveys
PPE	Personal Protective Equipment
RDA	Roads Development Agency
RFP	Request for Proposal
SME SSM	Small and Medium Sized Enterprises Small Scale Mining
SNDP	Sixth National Development Plan
UNDP	United Nations Development Programme
UNZA	University of Zambia
UQL	United Quarries Limited
VCA	Value Chain Analysis
ZACCI	Zambia Chamber of Commerce & Industry
ZACSMBA	Zambia Chambers of Small & Medium Business Association
ZDA	Zambia Development Agency
ZEITI	Zambia Extractive Industries Transparency Initiative
ZEMA	Zambia Environmental Management Agency
ZRA	Zambia Revenue Authority

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EXECUTIVE SUMMARY

The ACP-EU Development Minerals Programme is a three-year capacity building program that aims to build the profile and improve the management of Development Minerals (industrial minerals; construction materials; dimension stones; and semi-precious stones). The program is an initiative of the African, Caribbean and Pacific (ACP) Group of States, financed by the European Union and the United Nations Development Programme (UNDP), and implemented by UNDP. The Ministry of Mines and Minerals development is the implementing partner of the programs in Zambia.

The aim of the capacity building program is to provide training and support in the following thematic areas of importance to the sector: 1) mine and quarry management; 2) environment, health and safety; 3) entrepreneurship skills; 4) market analysis and investment promotion; 5) geo-data and maps design; 6) community relations and addressing grievances.

In Zambia, the project has provided capacity-building support to the small-scale private sector, mining associations, public sector, business development stakeholders, academia and the social stakeholders that operate in the Development Minerals and materials sector to increase the sector's productivity; better manage mining operations; adhere to national and international environmental and health standards; and prevent conflict through effective community relations.

Activities and support have included training and capacity building workshops; disbursement of small grants and partnership building to upgrade value chains. To support the aims and activities, the programme has carried out sector studies and capacity assessments, as well as formulated capacity development roadmaps. Against this background the programme has conducted a comprehensive "Baseline Assessment and Value Chain Analysis of Development Minerals in Zambia" that highlights the current dynamics and key issues relevant to the sector. The study focussed on the Artisanal and Small-Scale Mining (ASM) operators and related value chain actors in the Development Minerals sector. The study has provided a foundation for evidence-based policy and decision-making in Zambia by profiling the economic significance, scope and potential of the sector, as well as enhancing the understanding of the sector's technical, legal, social, occupational and environmental challenges and opportunities.

Zambia is endowed with mineral resources which are being extracted by both large scale and small-scale enterprises. However, the full potential of the Artisanal and Small-Scale Mining (ASM) sector in Development Minerals has not been fully realized. The inability to diversify away from copper remains a constraint on sustained growth in the mining sector. The opportunity therefore

is for Development Minerals – whether construction and industrial minerals, dimension stones or gemstones – to boost diversification within the mining sector. This study has used a holistic and interdisciplinary approach covering national, subnational and community levels to interrogate a variety of issues in the Development Minerals sector.

In order to prepare this report, the team conducted a mission to Zambia in June 2017, which involved consultations with 26 informed stakeholders across government, the private sector and civil society in Lusaka, as well as 26 sites visits across Zambia.[1] A second field work exercise was conducted in January 2018. The combined field work yielded a total of 94 one-to-one interviews and 15 focus group discussions with identified target groups.

This report presents findings based on data collected in Zambia in July 2017 and January 2018. Feedback from the first version of the first field work identified several key areas of missing data (specifically in terms of detailed site assessment, social and environmental and value chain data), which required a second data collection exercise. The data from the second field work, in January 2018, complemented the earlier exercise by addressing data gaps.

The field work involved consultations with 94 informed stakeholders across government, the private sector and civil society, as well as 26 sites visits across Zambia.[2] During the second field visit the field research collected data from five Provinces (regions) of Zambia, covering a total of twelve districts and twelve mine sites. The field data was collected on a total of 12 mineral commodities (sand, clay, limestone, dolomite, basalt, micaceous shale (used to produce dimension stones), stone aggregate, talc, amethyst, granite, silica, and gravel) and 20 products (namely: construction sand, dimension stones, black soil, quarry dust, soak away stones, flat stones; cement, pavers, blocks, bricks, kerb stones, ready mixed concrete, aggregates, quicklime, hydrated lime, agriculture lime, and lime, gemstones, and ceramic and cosmetic products). Field data was also collected from a total of 25 points of sale sites.

The study has assessed all key aspects of Development Minerals at the site level, such as capturing data on access to finance, mining type, production volumes, number of employees (by gender), licensing status, point of sale buyers, commodity prices across the value chain, working conditions, site safety, environmental and social impacts, in-migration, use of child labour, payments to local and national government and so on.

[1] A documentary video of the site visits is available here: https://vimeo.com/226122852 (password: on request)

[2] A documentary video of the site visits is available here: https://vimeo.com/226122852 (password: on request)

Data was collected primarily through interviews with Development Minerals miners and operators. Interviews with government officials were also conducted to obtain information on policy and regulation of the sector. Key informant interviews were held with other relevant government ministries and regulators, large scale mining industry representative body, small scale miners' associations, Civil Society Organizations and a training institution.

15 Focus group discussions (FGDs) were conducted at selected mine sites to complement information emanating from individual respondent interviews.

The principal criterion for selection of sampling sites was the need to capture the variety of Development Minerals found in Zambia. The selection was through consultations between the research team, the ACP-EU Development Minerals Programme team and the Technical Working Committee. Purposive sampling based on commodities was thereafter used to select sites. The sampling of respondents at the sites was guided by the site managers.

Since more specific information was required on (i) access to finance, (ii) site data, (iii) site data assessment of environment, health & safety and socio-economic impact and (iv) on-site trading, the site managers selected individuals to interview. Interviews with site managers were held to validate some of the information obtained from the interviews with mine workers.

In terms of the value chain analysis, the study examines the extent to which there are asymmetries in pricing-knowledge, the degree to which middlemen are involved in the value chain and notes possible market efficiencies. The report also highlights the interlinkages between the mining and quarry sector and the other sectors of the economy and recommends ways that the sector could be further integrated into the economy.

There are 119 licensed companies in the Development Minerals sector, and, conservatively, at least the same number of unlicensed sites. While full employment data is not available (precisely because of the large number of unregistered operations), the Snap Survey conducted prior to this report notes 6,815 people employed in the sector across 126 sites (55 licensed, 71 unregistered). Meanwhile employment for the 26 sites visited during this study report totals 3,626.

The report has provided a baseline of the Development Minerals sector in Zambia and will enable policymakers and development partners to consider and evaluate the various policy options and interventions available to catalyse the sector and address the needs of those involved.

KEY FINDINGS

Sector Profile

There is potential for substantial import-substitution and saving in foreign exchange if Zambia were to develop its Development Minerals sector, through appropriate policies and legislation. Zambia imports about US$200 million worth of its fertilizer requirements per annum to support the agricultural sector and yet a significant saving would be made with an investment in the production of phosphate fertilizer from the locally available 709 million tonnes of phosphate resource.

The manufacturing sector accounted for 11% of Zambia's GDP. This has been growing at an average rate of 3% per annum indicating that there is potential for deepening this growth. The growth in the manufacturing industry has largely been driven by agro-processing (food, oil seeds, beverages, and livestock products). There is great potential to develop the manufacturing of chemical/industrial products such as adhesives, explosives, glass, paints, (all from Development Minerals), sulphuric acid soaps and detergents as wells for manufacturing of textile, garments and apparel[3].

Diatomite, a key component in the manufacture of nitro-glycerine, is available in Mongu. Nitro-glycerine is a widely used explosive consumables in the mining sector. The Development Minerals sector can be up scaled by expansion of industry to use diatomite in the manufacture of explosive material as per a scoping study undertaken in 2013 on diatomite deposits in Zambia[4].

The value of limestone varies from as little as US$3.00 per tonne when used as crushed stone for construction aggregate, to as high as US$200 per tonne when pure and used as filler in the chemicals industry[5]. Between the two extreme values is a range of prices that depend on the specification and use of the material. This points to the un-tapped potential in developing the Development Minerals sector which would spawn many downstream industries from just one category of Development Minerals.

[3] Zambia Development Agency, 2013

[4] www.anzaplan.com/company/news/archive-2013/archivdetail-2013/article/scoping-study-for-diatomite-deposits-in-zambia-started/

[5] Wilson and Amavilah, 2007

Formalisation is key to development of the ASM sector. Through formation of cooperatives, ASM can access finance, grants and equipment loans to grow their enterprises; enter into partnerships for business ventures on similar lines as the BBM/Kyulu Trust partnership; acquire concessionary finance from institutions such as the Citizen Economic Empowerment Commission (CEEC), which is mandated to empower citizens; and access funding through grants similar to those provided by multi-lateral organisations such as EU and UNDP.

Policy and Legal Framework

The overall policy and legislative framework with regards to mining in Zambia has a clear vision, objectives and implementation strategies for the Development Minerals sector. This vision is broadly aligned to international frameworks such as the Africa Mining Vision and SADC Protocol on Mining.

The current Mines and Minerals Development Act does not reflect the different capacities and needs of different types of mining operations. This lack of differentiation has the potential to severely hinder formalization of the ASM Development Minerals sector. It is also worth noting that adherence by miners of Development Minerals to different legislation is not always consistent – i.e. that mine operators are either compliant with everything or nothing.

Formalization can be achieved, in part, through greater decentralization. Individuals, communities and companies are all required to apply for licences and submit reports in Lusaka.

There are several factors in the legislative framework, that discourage formalization, and these include the:

- very short tenure of 2 years for an artisanal license which is non-renewable;
- very high obligations and reporting requirements under section 35 of the Mines and Minerals Development Act (2015), irrespective of the size of an operation;
- need for an Environment Project Brief approval from Zambia Environmental Management Agency (ZEMA); and
- licensing function is still centralized.

Assessment of Institutional and Technical Operating Context

There is low institutional capacity to support extraction and value addition to Development Minerals within the MMMD. The Geological Survey Department lacks geologists with adequate technical expertise on Development Minerals and capacity to carry out reserve estimation.

There is no evidence of deliberate institutional arrangements to foster joint and more cost-effective interventions between actors such as Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA), National Council for Construction (NCC), Ministry of Mines and Minerals Development, the Gemstone Processing and Lapidary Training Centre, ZEMA, industry and business associations, among others.

The geo-data on the Development Minerals sector is not readily available to actors in the sector and this is especially so with the ASM sector. UNDP through the ACP-EU Development Minerals Programme is working with Geological Survey Department (GSD) to compile data into a database.

Environmental, Health and Safety, and Socio-economic in Socio-economic Impact Analyses

Most of the operators in the Development Minerals sector are informal and have little to no environmental management plans, occupational health and safety, and community health and safety management plans. This has also led to lack of mitigation measures for the various negative environmental impacts, unfavorable practices in occupational health and in community health and safety at informal sites.

In general, the formal operators implement good mining practices and overall have mitigation systems. However, some of the operators have environmental health and safety systems that are insufficient to address the range of environmental impacts at such sites.

Both the formal and informal segments of the Development Minerals sector provide the opportunity for employment and income generation for women and youths. Overall, 33 % of the entire workforce across the 10 sites visited for this report consisted of women. According to the World Bank, the Zambian national labour force consisted of 47.8% female in 2017.[6] However, jobs for females are often limited to the agricultural sector in Zambia, and females made up only about 22 % of the non-agricultural work force[7]. Therefore, the Development Minerals sector employs more women in Zambia than the national female labour force participation rate in non-agricultural work.

[6] https://data.worldbank.org/indicator/SL.TLF.TOTL.FE.ZS

[7] http://datatopics.worldbank.org/gender/country/zambia

The Development Minerals sector contributes revenue to the national, subnational, chiefdom, and community governance system through levies, royalties and taxes. The sector is a source of construction material responsible for infrastructure development in the country, agricultural lime used in the agricultural sector, as well as a wide range of industrial and semi-precious stones. Additionally, it provides rural employment, and improved livelihoods of rural communities through provision of jobs and employment for women and youths.

Despite Zambia being a signatory to the 1999 ILO Convention No. 182 on Worst Forms of Child Labour (WFCL), and the enactment of national laws prohibiting child labour, more than one out of every three children aged 7-14 years were at work in economic activity in 2008[1] in Zambia, according to an Inter-Agency Research Cooperation Project Report of September 2012 by ILO, UNICEF and World Bank.

In this study two categories of child involvement in Development Minerals sector were identified: children who were at the mine site not as employees or workers but accompanying someone; and children who were at the mine site as employees or workers.

The ages and the status of children at the project sites were not determined. A total of 68 children have been reported or visually confirmed as working at the mine sites, representing 3.9% of the total workforce across the assessed project sites.

RECOMMENDATIONS

The report makes the following key recommendations:

1. **Government Ownership. Cabinet level leadership of the proposed inter-agency** approach to governing the sector. Governance for the sector must be an inter-agency collaborative effort, because the issues facing the sector go far beyond the statutory mandate of the Ministry of Mines and Mineral Development.
2. **Traditional Leadership.** The very localized nature of the informal aspect of the Development Minerals sector differs significantly from standard ASM practices, which often involve migrant labour. The community has a lot at stake in terms of jobs, working practices and the environment. Given the strong role of traditional leaders in Zambia, it is vital that there is a meaningful role given to traditional authority in the oversight of local mine and quarry sites.
3. **Policy, Legislation and Institutional Development.** There is need for a dedicated Development Minerals policy which reflects the specific

needs of the sector. This policy must eventually be accompanied by updates to the 2015 Mines and Mineral Development legislation.

4. **Market Development and Formalisation.** It is important that beyond this Baseline report, there are further studies assessing the specific market opportunities of the Development Minerals sector in different parts of Zambia, as well as a review of the formalisation support process to ensure lessons are learnt from other sectors. The outcome of these studies should inform targeted sector specific formalisation and extension services.
5. **Health and Safety.** Many informal Development Minerals sites exhibited poor health, safety and environmental practices. Continued training and capacity building is required to ensure there are more positive outcomes of Development Minerals mining in Zambia.
6. **Sustainability.** The formalisation process and formation of cooperatives must be undertaken based on sustainability focused business plans; and effective and accountable leadership in the cooperatives with entrenched good governance practices.
7. **Human Rights.** Personnel from the Ministry of Mines and Minerals Development, Ministry of Gender and Ministry of Sport, Youth and Child Development should support families to phase out presence of children/child labour in mines as part of livelihood and business improvement strategies.
8. **Data.** There is currently scant data on the Development Minerals sector, both from a geological but also a market-based perspective. It is key that a follow-on study from this report is commissioned that prioritizes Development Minerals and pilot areas, in terms of economic and employment opportunities. This report would feed into the formulation of a dedicated Development Minerals policy.
9. **Environment.** The Environmental Management Act must be updated to reduce the practice of discretionary decision making on approvals by the Minister. Additionally, once the new EIA Regulations have been promulgated, model project briefs and EIAs should be developed that vary according to the size and the commodity being mined, so that the EIA process is more appropriate for artisanal and small-scale miners of Development Minerals.
10. **Access to Finance and Equipment.** One option is to consider restructuring the Environment Protection Fund (set up by a regulation in 1998) to address Development Minerals. There is potential for the credit guarantee facility provided by the African Guarantee Fund for SMEs (AGF) and UNDP in support of small-scale operators of Development Minerals to feed into the planned Trade and Industrial Development Fund. There is also potential for support to cooperatives to be integrated into the Business Linkages Programme and the Investment Promotion Protection Agreements required of large-scale companies (a type of

local content framework) and other initiatives being promoted by the ZDA.

NEXT STEPS

In terms of next steps beyond this report, the Government of Zambia is exhorted to create a dedicated implementation plan for the Development Minerals policy framework which is guided by these three key principles:

- Interagency governance and decentralized administration
- Dedicated licensing at a local level for artisanal and small-scale operators
- Incentivized formalisation process.

Given that the policy framework around minerals development is already *extensively* developed, it is the recommendation of this report that the Development Minerals policy framework should be focused less on re-stating objectives (the Zambia 2030 Vision, Seventh National Development Plan, and Mineral Resources Development Policy already all do this well, including with specific references to Development Minerals), and instead be primarily focused on moving immediately to operationalization of recommendations. The first step in this framework, for example, could be a quick prioritisation process to assess those recommendations according to:

- Barriers and catalysts to implementation
- Likely costs, including identifying existing capacity and resources
- Likely impacts

1. INTRODUCTION

The ACP-EU Development Minerals Programme is a three-year, €13.1 million capacity building program that aims to build the profile, and improve the management, of Development Minerals (industrial minerals, construction materials, dimension stones, and semi-precious stones). The program is an initiative of the African, Caribbean and Pacific (ACP) Group of States, financed by the European Union and the United Nations Development Programme (UNDP), and implemented by UNDP.

Often referred to as Low Value Minerals and Materials (LVMM) due to their low price as a function of their weight, and their relatively low value to international commodity markets, Development Minerals provide crucial inputs for domestic economic development (infrastructure, manufacturing, construction and agriculture to name a few) and have the potential to be high value in terms of national development.

Traditionally, minerals development frameworks were driven by the kind of economic hierarchy in which policies were structured around large-scale mines as drivers of Foreign Direct Investment, exports and government revenues. However, Development Minerals are much more important to employment and economic development than they are to fiscal flows. Development Minerals are therefore aligned more with the aspirations of frameworks such as the Africa Mining Vision and Zambia 2030 – both of which emphasise the need for minerals to be strongly linked to local economies – rather than the 'extract and export' model that has applied to large scale metals mines. Comparing and contrasting the economic contribution of large-scale mining with the Development Minerals sector presents a clear-cut case for a focus on the latter, both in terms of employment, but just as importantly in terms of the opportunities for domestic value addition and local economic linkages.

Prior to this baseline report, an inception report was produced, which lays out the methodology for the project. This was followed up by two field study reports, which provided a comprehensive description of all activities which took place while the team was on mission in Zambia. This baseline report is the final deliverable for this project.

With the support of the Zambian Ministry of Mines & Minerals Development (MMMD), the purpose of this project is to conduct a baseline assessment of Development Minerals in Zambia.

2. APPROACH AND METHODOLOGY

The methodology outlines the road map for undertaking the baseline and the methods that were utilised to respond to the set terms of reference. The baseline considered qualitative and quantitative data available on Development Minerals in Zambia. The Chapter begins by defining Development Minerals, thereafter describing the overall approach for the study and then detailing the purpose and process for primary data collection, including sampling methods utilised to identify sites and respondents visited. The methods for analysing both quantitative and qualitative data are indicated. Finally, some limitations were also highlighted.

2.1 Definition of Development Minerals

Development Minerals are minerals and materials that are mined, processed, manufactured and used domestically in industries such as construction, manufacturing, and agriculture. Development Minerals are economically important close to the location where the commodity is mined and include:

i. Construction materials (such as gravel, crushed aggregate, sand, clay, limestone);
ii. Dimension stones (such as marble, granite, syenite and basalt);
iii. Industrial minerals (such as limestone, phosphate and silica sand); and
iv. Semi - precious stones (such amethyst, garnet and quartz).

2.2 Overall Approach

The baseline assessment combined secondary data from literature on Development Minerals and primary data from field visits. The field study was conducted in two phases. The initial phase, conducted in June 2017, covered 26 development minerals project sites. The second phase conducted in January 2018 covered 10 sites, bringing the total of sites visited to 36.

The first phase of site visits interrogated several aspects of Development Minerals such as access to finance, mining methods, production volumes, number of employees (where possible by gender), licensing status, point of sale buyers, commodity prices across the value chain, working conditions, site safety, environmental and social impacts, in-migration, use of child labour, payments to local and national government etc. Gaps were identified from the initial phase which necessitated a second phase of site visits. The identified gaps included the need for more detailed site assessment, social and environmental impacts and the

Development Minerals value chain. Therefore, the second phase included some sites that had been covered in the initial phase of the field exercise.

2.3 Methods for Primary Data Collection

Individual interviews

Data was collected primarily through interviews with a total of ninety-four Development Minerals miners, operators and other key stakeholders. Interviews with government officials from Zambia Environmental Management Agency (ZEMA), Mines Development Department (MDD), Geological Survey Department (GSD), Mining Cadaster Department (MCD) and Ministry of Mines and Minerals Development (MMMD) were also conducted to obtain information on policy and regulation of the sector. For example, information on licensing was obtained from the MCD (Annex 8) while production data was sourced from the MDD). Targeted interviews were also held with officials from the three MMMD departments. The interviews with key government officials were complemented by interviews with selected members of the Technical Working Committee (TWC) of the ACP-EU Development Minerals Programme. Information collected was also instrumental in determining sites of interest to be visited. Key informant interviews were held with other relevant government ministries and regulators, large scale mining industry representative body, small scale miners' associations, Civil Society Organizations and a training institution.

Focus Group Discussions

During site visits, fifteen focus group discussions (FGDs) were conducted at selected mine sites to complement information emanating from individual respondent interviews.

Observations

Transect walks through Development Minerals sites was also used to further triangulate the information that was being provided during interviews and what had been established in literature, for example in terms of environmental compliance. Before conducting field visits, a training was conducted for the team involved in data collection.

2.4 Data Collection Tools

The instruments for collecting primary data during field visits comprised of: Access to Finance Questionnaire; Site Data Assessment Questionnaire; Environment, Health & Safety and Socio-Economic Impact Questionnaire; On-site Trading Questionnaire; Point of Sale Questionnaire; Focus Group Discussion Guides and Interview Guide for Government.

2.5 Sampling

The field work covered five provinces as shown in Table 1. These included the Copperbelt province (Kalulushi, Kitwe, Ndola and Masaiti Districts), Central province (Chisamba District), Lusaka province (Chongwe, Chilanga and Lusaka Districts), Southern province (Siavonga, Kalomo, and Livingstone Districts) and North Western Province (Solwezi District). The field work visits were undertaken by a team that comprised a local consultant and three other researchers.

Table 1: Regional Coverage of Survey by Commodity Type

Province (Region)	District	Development Mineral Category	Commodity type
Central Province	Chisamba	Construction materials	Sand
Copperbelt Province	Kalulushi	Construction materials	Clay
	Kitwe	Construction materials and Industrial minerals (PoS)[8]	Aggregate
	Masaiti	Industrial minerals	Limestone
	Ndola	Construction materials and Industrial minerals (PoS)	Lime & Cement
Lusaka Province	Chilanga	Industrial minerals and Construction materials	Cement & Aggregate
	Chongwe	Construction materials	Sand
	Lusaka	Industrial minerals	Talc
Southern Province	Kalomo	Semi-precious stones	Amethyst
	Livingstone	Construction materials	Aggregate
	Siavonga	Dimension stones	Quartzite
North Western Province	Solwezi	Construction materials	Silica sand

The different mineral types were identified by actual commodity mined. Table 2 provides additional information on sites sampled and points of sale where applicable, especially where this was different from site of extraction.

Table 2: Coverage of Survey by area/region, commodities and point of sale (PoS)

Areas / region	Commodities	Sites Visited	PoS visited
Lusaka Province – Lusaka, Chongwe, Chilanga	Sand	Chongwe, Kachangwa and Kalimansenga Sand Quarries	Mutumbi and Kalingalinga
	Sand	Kasisi Sand, Chongwe	Chalala and Bauleni
	Talc	Talc Cooperative, Lilayi; Lusaka	Production site

[8] Kitwe and Ndola are the main points of sale for construction and industrial minerals on the Copperbelt province. In general, the minerals were mined in one district and the main points of sale were in different districts and province, especially Lusaka.

	Aggregate, limestone, granite and dolomite operations	United Quarries, Oriental Quarries and Lafarge	Makeni area, Chilanga
North Western Province-Solwezi	Washed silica sand	BBM Sand Washing	Production site
Copperbelt Province-Kalulushi, Ndola, Lufwanyama, Kitwe, Luanshya	Clay	Kalulushi Clay Bricks (KCB)	Production site
	Brick clay, gravel and silica	Tekela Clay Bricks; Kalulushi	Chibuluma township Kitwe town
	Beryl	Kagem	Lusaka & Kitwe
	Amethyst	Kanyafimbolo Quartz Mine	Production site
	Granite	Lesa Wamaka Cooperative	Kalulushi Town and Kitwe town
	Washed silica sand	Atlantis Investment Ltd	Production site
	Granite	Nizam Crushers Ltd	Production site
	Sand, laterite	Reycus Supplies(Z) Limited	Production site
	Sand, sandstone	Dickson Sinyangwe General Dealers Ltd	Production site
	Lime	Ndola Lime	Ndola; Livestock services in Lusaka
Southern Province-Livingstone, Kalomo and Siavonga	Basalt	Ngwenya Stone Crushers	On-site (Ngwenya stone Crushers) and Kalomo Town
	Amethyst	Kariba Minerals	Lusaka town
	Dimension stones	Zambezi Natural Stones; Siavonga	Makeni and Kalingalinga
	Amethyst	Gramiraji Investments Limited	Lusaka town
	Sandstone, limestone, granite, tourmaline, calcite, kariba flat stones	Tip Top Mining	Production site
Central Province – Kabwe, Chibombo	Sand, laterite	Moyo Farm	Production site
	Sand	Kalimansenga Sand Quarry	Production site

The principal criterion for selection of sampling sites was the need to capture the variety of Development Minerals found in Zambia. The selection was through consultations between the research team, ACP-EU Development Minerals Programme team and the Technical Working Committee. Purposive sampling based on commodities was thereafter used to select sites. The sampling of respondents at the sites was guided by the site managers.

Since more specific information was required on (i) access to finance, (ii) site data, (iii) site data assessment of environment, health & safety and socio-economic impact and (iv) on-site trading, the site managers selected individuals to interview. Interviews with site managers were held to validate some of the information obtained from the interviews with mine workers.

Selection of participants to the fifteen FGDs was determined by the site managers. The FGDs comprised mine workers. The research team advised site managers to take into account the position/job in the production and value chain and gender.

There was a potential risk of the site managers acting as gatekeepers to select participants based on highly charged mine politics, national politics and other contrasting views. It is also possible the gatekeepers had identified people they had influence over and whose views they understand, which the sampling process could not completely eliminate, although this was some-what mitigated by triangulation of the data and information collection from other sources.

2.6 Training of Field Research Team

Intensive training of the research team was undertaken over a 3-day period. The first day of training mainly involved a review of documents and data collection tools that cultivated a shared understanding of the assignment. It also ensured that all methods, tools and approaches were clearly understood and could be effectively applied. The second day of training gave significance to quantifying production and incomes and the general measures of units. This also involved a pilot of the data collection tools in Kasisi area in Chongwe District to assess whether the tools would collect the right information. The third day emphasized mapping steps in Development Minerals production and supply chains and common units-of-production commonly used by miners and traders (e.g. based on sacks, wheelbarrows, truck sizes).

3. FIELD WORK AND OUTCOME

In preparation for the field work, a field schedule was prepared in consultation with the ACP-EU Development Minerals Programme Coordinator to secure agreement on the selection of sites. An implementation schedule was generated as summarised in Annex 4 of the report. The duration of the field visits was three weeks and was guided by an agreed road map in an Inception report submitted by the Consultant. A total of 94 one-to-one interviews were held with the identified target groups of respondents with 15 focus group discussions achieved. The field activities of the study resulted in the following outcomes:

- Data collected from five Provinces (regions) of Zambia, covering a total of twelve Districts and twelve mine sites;
- Data collected on a total of 12 mineral commodities namely: sand, clay, limestone, dolomite, basalt, micaceous banded quartzite, stone aggregate, talc, amethyst, granite, silica, and gravel and 20 products: namely construction sand, dimension stones, black soil, quarry dust, soak away stones, flat stones; cement, pavers, blocks, bricks, kerb stones, ready mixed concrete, aggregates, quicklime, hydrated lime, agriculture lime, and lime, gemstones, and ceramic and cosmetic products;
- Data collected from a total of 25 points of sale sites;
- Data collected from 8 government officials from various Ministries and Departments including the ACP-EU Programme Technical Committee;
- Interviews of 136 people (men and women) individually, in meetings and in focus group discussions; and
- Completion of 109 surveys. The key site visit data is shown in Annex 2.

4. FIELD WORK CONSTRAINTS

The field research encountered several limitations and challenges. These include the following:

- Most of the mine sites visited were active but record keeping ranged from inadequate to non-existent, hindering validation of any historical data. For example, there were discrepancies in data concerning incomes, collection of data on individual production capacity (per week, day, month, seasonally). Sales data collected at different steps of the value chain provided a means to cross-check reported incomes. Figures obtained by different team researchers were then discussed by the researchers during data consolidation and anomalies identified;

- Negotiating access to sites was not always easy. In some cases, the research team had to revisit the planned schedule in order to have access to the sites and therefore obtain information. In one case, the research team was denied

access to the site and in consultation with the Development Minerals Country Coordinator, an alternative replacement site was arranged.

5. SECTOR PROFILE

5.1 Introduction and Background

Zambia is a land-locked country measuring about 750,000 Km^2 in size (Fig. 1) implying that Zambia relies on road, railway and air networks for export and import of goods. Zambia's population, as per the census of 2010, stood at 13,850,033 and is projected to grow to 24,859,376 by 2030 and to 41,000,000 by 2050 (Fig. 2). Zambia's population is dominated by youths and the projection to 2050 indicates that this trend will continue, as demonstrated by the median age of 16.6 years in 2000 and 22.1 years in 2050 (Fig. 3). According to the Central Statistical Office (CSO) 2017, overall unemployment for Zambia is estimated at 12.6% (i.e. 4.9% rural and 7.7% urban). Youth unemployment in 2018 stood at 12.8% but has been projected to drop to 11.7% in 2019, 10.6% in 2020 and 10.0% in 2021.

The Zambian people's vision is to become "A Prosperous Middle-Income Nation by 2030". Through this vision, Zambia aspires, by 2030, to be a strong and dynamic middle-income industrial nation that provides opportunities for improving the well-being of all Zambians. The desire to become a prosperous middle-income country takes into account implementation of frameworks such as the MDGs and SDGs as well as Agenda 2063 of the African Union. The 7th National Development Plan (2017-2021) aspires, in part, to achieve the following: (i) accelerate economic diversification and (ii) build a strong manufacturing and industrial base for Zambia. It is estimated that during the 7th National Development Plan implementation economic growth will average 5%, which is expected to be driven by increased investments in prioritized growth sectors of agriculture, tourism, manufacturing and energy supported by mining, economic infrastructure in transport and communication. One of the focus areas for the plan is to create decent, productive jobs, and increase incomes; promote climate smart and organic agriculture, sustainable forestry, sustainable construction and sustainable small-scale mining sectors as these are labour absorptive. Interestingly, during the consultative process for the development of the 7thNDP nearly all the 10 provinces indicated that there were opportunities for investment in agriculture (arable land available), livestock, fisheries, energy, mining, and development of natural resources but poor infrastructure and lack of social amenities such as schools and health facilities hinders investment in such opportunities.

Fig. 1: Map of Zambia (in red) showing its landlocked nature

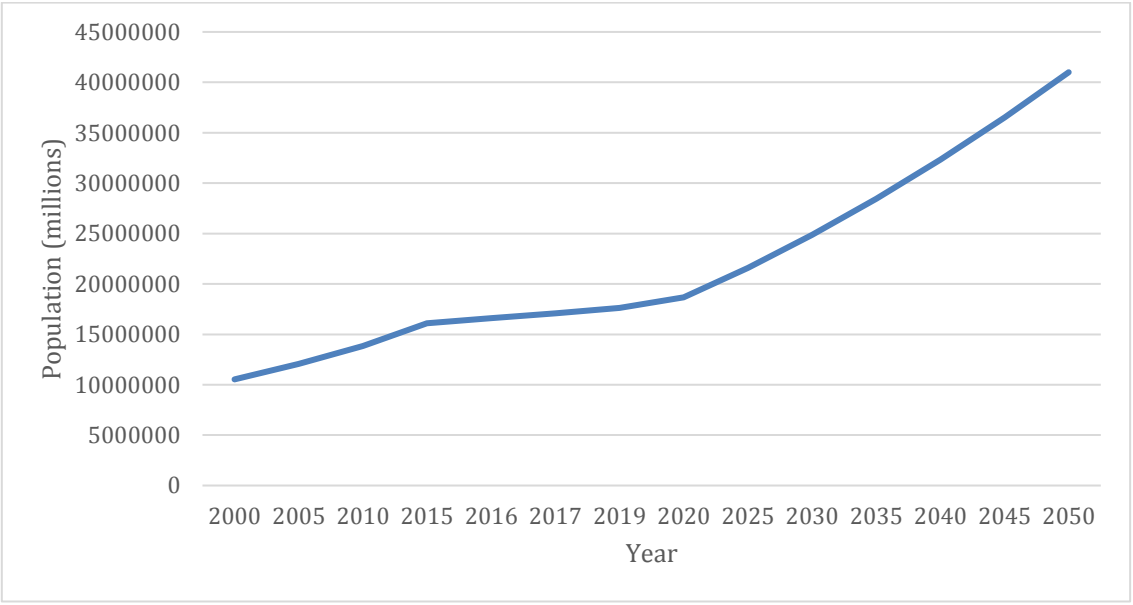


Fig. 2: Zambia's Population Current and Projected (CSO, 2013)

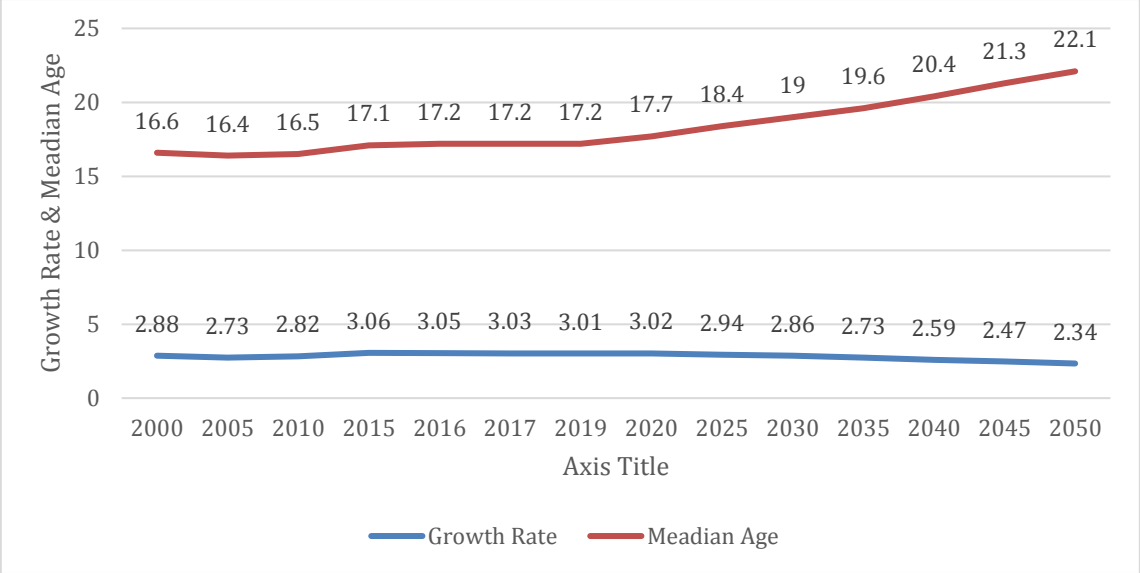


Fig. 3: Zambia's Population Growth Rate and Median Age (CSO, 2013)

The contribution of mining & quarrying and construction sectors to Zambia's GDP stood at 13% and 10% respectively in 2015 (CSO, 2016). According to 2016 estimates, the deficit in housing units for Zambia stands at 1.5 million and is expected to grow to 4 million by 2030. The rate of construction per year to address this deficit is estimated at 200,000 housing units.

The Development Minerals sector has the capacity to create not only wealth, but also a significant number of jobs that would absorb large numbers of the unemployed labour force currently estimated at 427,125 and a potential labour force estimated at 1,650,765. This is particularly so for the construction, mining and agricultural industries, because of their labour intensive nature and the wide geographical spread of Development Minerals occurrences and deposits.

It is estimated that in 2017 Zambia imported goods worth US$5,137.00 million and exported goods worth US$6,788 million in total[9]. This gives a general positive outlook as the value of exports was higher than that of imports. However, an examination of the Zambia's imports and exports for 2017 in relation to Development Minerals (DMs) and related products shows a negative outlook. Zambia imported Development Minerals and related products totaling US$522 million, while exporting the same minerals and products worth US$6 million in 2017. This demonstrates that a reliance of imports of Development Minerals and their products contributed to negative (-) US$516 million in trade deficit for the year 2017, yet a significant proportion of these

[9] http://countries.bridgat.com/Top_Products_Imported_by_Zambia.html; Accessed on 5th January 2019

Development Minerals and related products can be extracted and transformed/beneficiated locally.

Several factors are currently driving demand for Development Minerals in Zambia. They include: projected population growth; expected increase in life expectancy; aspirations to diversify and industrialise the economy; expected and sustained growth in GDP; increased construction and infrastructure development (roads, housing, office blocks, railway, schools, hospitals, energy facilities, water supply and sanitation facilities, irrigation dams and communication facilities); growth in the manufacturing sector; the desire by Provincial and District Governments for increased investments in agriculture (crop, livestock and fisheries); increased investments in the chemicals industry; the desire by government to create employment especially for the youth; and the need to address the export/import deficit in Development Minerals and related products.

5.2 Development Mineral Occurrences and Geographic Distribution in Zambia

Zambia is endowed with a diverse range of Development Minerals, which are also widely distributed geographically (Fig 4; Table 3). Due to lack of reliable geological data the western area of Zambia does appear to be dominated by sand; as other Development Minerals are not sufficiently documented (Fig. 4). The wide geographic distribution of Development Mineral occurrences means that each region (province or district) has the potential of hosting at least one or several of the Development Mineral type occurrences that can be extracted both for local use in various sectors and possibly for export in sub-regional, regional and global value-chains.

Examples of Development Minerals in Zambia that are reported as occurrences, deposits being extracted currently or have been extracted before and abandoned for economic reasons, and, as defined by the EU-ACP Development Minerals Programme, include those found in Fig. 4; Table 3:

- **Construction Materials:** sand, gravel, crushed stone aggregate (granite, marble, basalt, quartzite), sandstone, limestone/dolostone, clay, shale and phyllite;
- **Industrial Minerals:** gypsum, potash, salt, graphite, clay, bentonite, talc, phosphate, limestone/dolostone, feldspar, silica sand, barite, kyanite, magnesite, mica, vermiculite, zeolite, kyanite, diatomite, pyrite, zeolite, fluorite and kaolin;
- **Dimension Stones:** granite, rhyolite, gneiss, marble, syenite, quartzite, slate and gabbro/meta-gabbro; and
- **Semi-precious stones:** amethyst, citrine, rose quartz, tourmaline, quartz, beryl, red garnet and corundum.

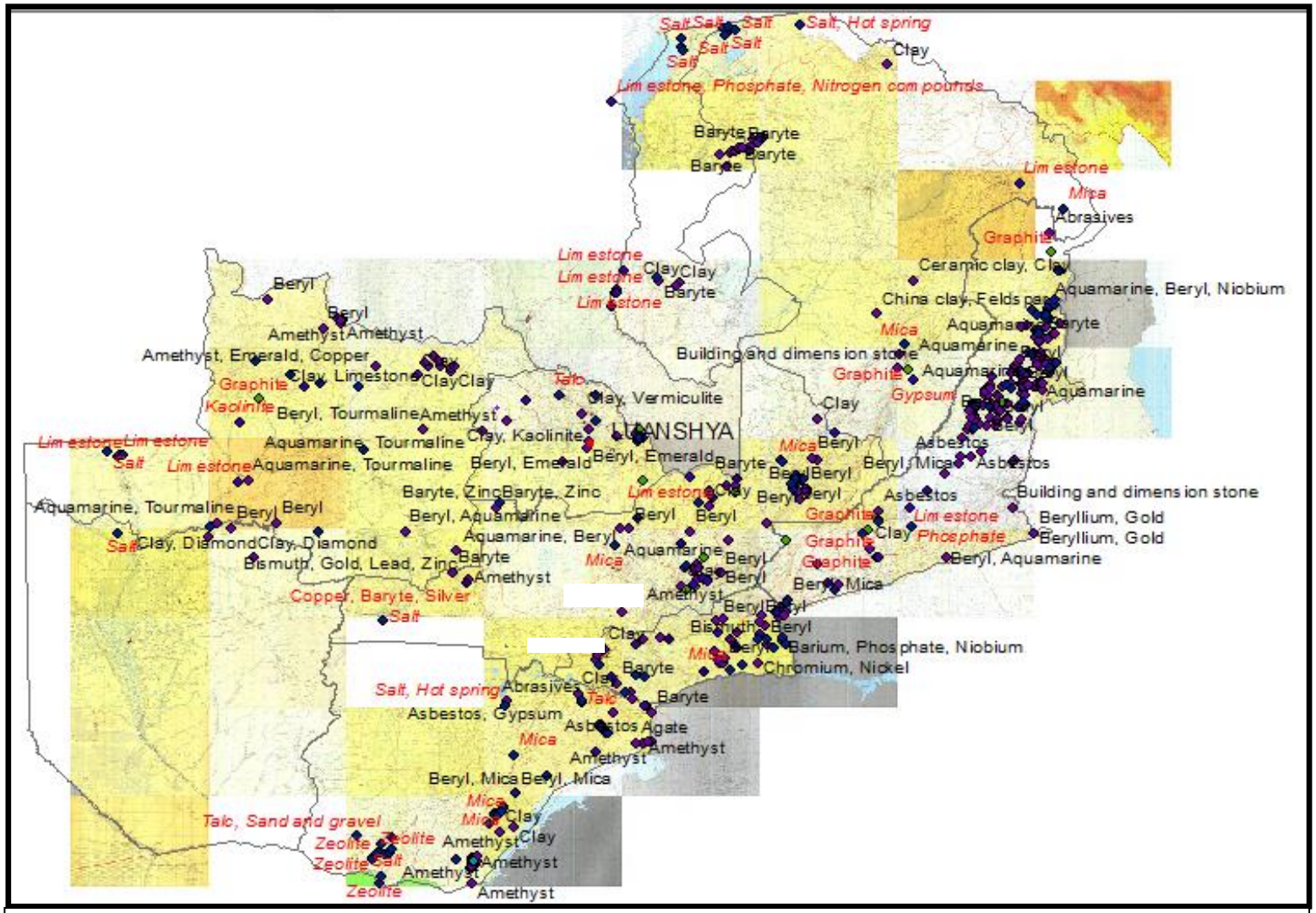


Fig. 4: Map of Zambia showing a wide range of Development Minerals occurrences. (E. Chikambwe, personal Communications)

Notwithstanding the ready availability and wide distribution of Development Minerals locally, Zambia is yet to take advantage of this potential to ensure a more diversified economy as well as the development of local (District and Provincial) economies driven by extraction and use of Development Minerals found at these local levels. This would spur inclusive economic development, from the grassroots to the national level countering the current trend where Zambia still imports, at great cost, significant amounts of ceramic products such as tiles, toilet pans and accessories; silica sand products such as glass; gypsum products such as boards; raw materials for the manufacture of cement such as gypsum; raw materials for manufacturing fertilizer such as phosphate; and dimension stone products such as wall and floor tiles.

Development Mineral Commodity/Product	Location of Occurrence	Comments
Amethyst	**Mapatizya, Zimba District of Southern Province; Lufwanyama District of Copperbelt Province & Solwezi District of Northwestern Province; and Mumbwa District in Central Province**	**Occurs in veins and geods hosted by metamorphic rocks.**
Barite	Chibote Mission in Luwingu of Northern Province; Chasefu in Lundazi of Eastern Province; Ndabala in Mkushi of Central Province	Remains largely unextracted but occurs within basement rocks. Grade ranges from 90 to 95 wt. % BaSO4.
Beryl	Lufwanyama District of Copperbelt, and Lundazi and Nyimba Districts of the Eastern Province, Feira District of Lusaka Province	Associated with pegmatites.
Clay: ball clay	Chamba Valley, Lusaka Province; Solwezi, Northwestern Province; Loshi, Luapula Province	River and dambo clay deposits of variable plasticity & fired colour.
Clay: bentonite	Luano Valley, Central Province	Low quality bentonitic clays associated with mudstone, Lower Karoo.
Clay: brick clay	**Dambo clay throughout Zambia but mostly in Kalulushi District of Copperbelt Province**	**Large volume resource, however little information on firing properties**
Clay: fire clay	Maamba Colliery, Southern Province	Fireclay hosted in mudstone associated with Karoo age coal measures.
Kaolin	Masuku kaoline in Choma District in Southern Province	The kaolin is from weathering of feldspar from pegmatites.
Corundum	Rufunsa, Lusaka Province and Lundazi, Eastern Province	Corundum occurs within pegmatites & mica schists.
Crushed stone aggregate (basalt, granite and marble)	**Livingstone of Southern Province (basalt); Kafue of Lusaka Province (granite); Chilanga and Makeni of Lusaka Province (marble); Ndola District of Copperbelt Province (marble)**	**Many other rocks can be a source of crushed stone aggregate such as quartzite, gabbro, and gneiss.**
Diatomite	Mongu District of Western Province	Assessed in 2012 by Spectra Mining Ventures Limited for high value applications in the filtration and paints industries.
Dimension stone: 'black granite'	Chipata, Eastern Province; Lusaka, Lusaka Province, Mpika District Muchinga Province	Occurrences of gabbro and meta-gabbro.
Dimension stone: marble	Marble occurrences across Zambia but mainly in Lusaka and Copperbelt Provinces	Occurrences of marble (or metamorphosed limestone).

Dimension stone: syenite	West of Solwezi in Northwestern Province and Mumbwa, Central Province	Solwezi occurrence consists of sodalite-bearing syenite
Dimension stone: micaceous banded quartzite	**Siavonga District of Southern Province**	**Banded quartzite within Palaeoproterozoic to Mesoproteroic Basement rocks.**
Red garnet (semi-precious stone)	**Siavonga District of Southern Province and Lundazi District in Eastern Province**	**Associated with schists in basement rocks.**
Graphite	Petauke, Eastern Province and Mkushi in Central Province	Occurs in graphitic schists.
Kyanite	Kafue, Leopards Hill, Mwembeshi River & Chalenga River, Lusaka Province.	Kyanite schists with large resources of high purity kyanite (up to 61% Al_2O_3)
Limestone/marble and dolostone	**Throughout Zambia but mainly in Chilanga and Makeni Areas of Lusaka Province; Ndola of Copperbelt Province; Central, Sowlezi of Northwestern Province; Magoye of Southern Province**	**Limestone/marble is produced Oriental Quarries and Larfage Zambia for cement and aggregate**
Magnesite	Leopards Hill, Lusaka Province	High purity magnesite, although low volume
Mica (muscovite)	Southeast of Serenje, Central Province; Lundazi, Eastern Province; Southeast of Choma, Southern Province	Coarse muscovite mica in pegmatites associated with granitic gneisses
Phosphate (apatite)	The Nkombwa Hill carbonatite in Isoka District; Muchinga ProvinceThe Chasweta, Mwambuto, Nachomba and Kaluwe carbonatites Luangwa-Rufunsa area in the Feira District); Lusaka Province; Chilembwe, Petauke District Eastern Province; Sugar Loaf, in Mumbwa District, Central Province and Keshya Ravine carbonatite, Kafue District in Lusaka Province	The Nkombwa carbonatite surface samples average 4 – 5% P2O5. The Chilembwe deposit has been fully assessed and the produced partially acidulated phosphate fertilizer found to compare very well with conventional fertilizer.
Quartz and tourmaline (semi-precious stones)	**Serenje of Central Province (quartz and tourmaline); Nyimba of Eastern Province & Siavonga of Southern Province (tourmaline); quartz in Lufwanyama District**	**Hosted in veins and pegmatites.**
Salt	Northern, Luapula, Northwestern., Western & Southern Provinces	Salt pans association with saline spring water
Sand	**Occurs throughout Zambia but significant amounts supplied to urban centres are from Chisamba, Chongwe, Chibombo**	**Focussed on sand exploited closed to Lusaka City.**
Silica sand	**Throughout Zambia, but notable deposits around Solwezi in Northwestern Province; Kapiri Mposhi in Central Province; Rufunsa in Lusaka Province and the Copperbelt**	**Currently silica sand is being supplied to large mining companies where it is used in smelting as a flux; The unprocessed silica sand in Kapiri Mposhi contains 99% quartz. The Rufansa one has largely remained unexploited.**

Talc	**Lilayi and Chipapa talc deposits in Lusaka Province; Mushish deposit in Ndola in Copperbelt Province; Other occurrences are reported in Central, North-Western and Eastern Provinces**	**Talc results from regional metamorphism of siliceous dolostones and hydrothermal alteration of basic intrusions hosted in dolostones. Lilayi is the most important deposit. The Mushishi deposit has, after floatation, been found to between 95 and 99 wt.% talc and ranging in brightness from 54 to 78%.**
Vermiculite	Kankomo dambo, Kalulushi, Copperbelt Province	Weathered shale and clay deposits
Zeolite	Dombwe Hill, Kafue in Lusaka Province; Singwe Gorge, Livingstone, Southern Province; Mongu, Western Province	Stilbite & heulandite occur as vesicular infilling in Karoo basalts.

Table 3: Development Mineral Occurrences in Zambia (highlighted in orange are Development Minerals the study focused on)

5.3 Major Extraction and Processing Sites

A geographic description of the Development Minerals currently being extracted and processed in Zambia by artisanal and small-scale mining (ASM), medium-scale mining (MSM) to large-scale mining (LSM) operators is provided in sub-sections below.[10]The types of Development Minerals described include: construction materials, agricultural and industrial minerals, dimension stone and semi-precious minerals. The extraction and local use of have significantly been driven by the growth in the construction, mining, manufacturing and agricultural sectors of Zambia. ASM operators have been involved in the supply mainly of sand, aggregate and clay.

5.3.1 Construction Materials

Limestone/marble and dolostone

Occurrences/deposits of limestone/marble/dolostone are found in many parts of the country including Lusaka, Copperbelt, Southern, Central, North-western, and Northern Provinces. The limestone/marble and dolostone are extracted and processed mostly by medium to large scale companies, such as (i) Larfage Zambia, Sinoma Cement and Oriental Quarries in Lusaka Province, (ii) Dangote Cement and Zambezi Portland Cement in Copperbelt Province. Most of the limestone/marble/dolostone deposits in Lusaka and Copperbelt Provinces are extracted for production of lime for cement.

Sand

Sand, commonly referred to as either building sand or river sand is extracted in various parts of the country particularly from stream/river channels, flood plains and dambos (complex shallow wetlands). This study reveals that a significant amount of sand is extracted within Kasisi and Kachangwa areas of Chongwe District located within a large expanse of land under traditional authority (Fig. 5) and in the Kalimansenga area of Chisamba District. Extraction is mostly conducted by ASMs because the material is largely unconsolidated, requiring simple, cheap tools such as shovels and is labour intensive. In general, the extracted sand is mostly used in urban centres where demand is very high due to the booming construction activities driven by the need for housing units.

[10] This assessment draws from the Report on the Snap Survey Conducted on Development Minerals in Zambia, Feb 2017

Fig. 5: Kasisi Sand Mine Site (left) and a truck loading sand (right) in Chongwe, Zambia. The sand mined here is mainly used in Chongwe and Lusaka Towns.

Photo credit: Nixon Chisonga.

Crushed stone aggregate

Crushed stone aggregate is rock that is fragmented through crushing and thus its production can be from any rock with characteristics suitable for aggregate. Crushing of rocks such as basalt, granite and marble for aggregate is therefore a country-wide phenomenon and is practiced by ASMs, MSMs and LSMs. The study has revealed that most operations of crushed stone aggregate are undertaken around densely populated areas and close to urban centres such as Ngwenya which services markets in Livingstone (Fig. 6); Kalulushi which services Kitwe and Ndola markets (Fig. 7); and Makeni Kongo which services the market in Lusaka (Fig. 8). Crushing of rocks for aggregate is done by (i) ASMs using simple and cheap tools such as hammers, (ii) MSMs using mechanised systems such as crushers and screens (e.g. Oriental Quarries in Lusaka) and (iii) LSMs using even more sophisticated mechanised crushing and screening systems (e.g. Lafarge Zambia in Lusaka). Crushed stone aggregate is used in construction and infrastructure sectors. It is worth noting though that a significant amount of crushed stone aggregate for construction is supplied by ASMs especially in Lusaka, Copperbelt and Southern Provinces.

Fig. 6: Aggregate production at Ngwenya Mine Site, Livingstone, Zambia.
Photo credit: Nixon Chisonga.

Fig. 7: Aggregate production from a Mine waste damp at Lesa Wamaka Association Site in Kalulushi. Photo credit: Nixon Chisonga.

Fig. 8: Concrete block making from aggregate produced at Oriental Quarries Site in Makeni Konga Area, Lusaka, Zambia. Photo credit: Nabita Zaloumis.

Clay

Clay is a very fine grained sediment deposited in stream & river plains and dambos in many parts of the country. Key areas where clay occurrences/deposits have been reported include Kalulushi in Copperbelt Province, Lusaka in Lusaka Province, Kasama in Northern Province, and Lundazi in Eastern Province. Clay is extracted in all parts of Zambia mostly for brick making and plastering of housing units especially in rural areas and to a limited extent in urban areas. The study, however, indicates that, in the investigated sites, clay is mainly extracted for brick making, especially in Kalulushi (Fig. 9), Lusaka, Kasama, Isoka and Lundazi. Bricks are made on site and sold to buyers who transport the bricks to urban centres. The largest brick manufacturer in Zambia is Kalulushi Clay Bricks Limited, which produces 2 million burnt bricks per month. However, there are several smaller but formal producers of burnt bricks in Lusaka and other towns within Zambia. The Census of Population and Housing Report of 2010 released by the Central Statistics Office shows that out of a total of 2,660,989 housing units surveyed, 40.7% and 24.3% respectively used mud bricks/compressed mud and burnt bricks for walls. The report also reveals that 56.8% used mud for floors.

Fig. 9: Clay Mine and Processing Site in Chibuluma and Chibote Townships, Kalulushi, Zambia. Photo credit: Nixon Chisonga.

5.3.2 Industrial Minerals

Limestone/marble and dolostone

Occurrences/deposits of limestone/marble/dolostone for agricultural and stockfeed lime are found in many parts of the country including Lusaka, Copperbelt, Southern, Central, North-western, and Northern Provinces. The limestone/marble and dolostone are extracted and processed mostly by medium to large scale companies, such as (i) Uniturtle Industries, in Lusaka Province and (ii) Ndola Lime and Neelkhant in Copperbelt Province. Uniturtle Industries produces 1200-1600 tonnes/day of limestone/marble and dolostone for agricultural and stockfeed lime and Ndola Lime produces about 9,000 tonnes/day of limestone/marble for quick and hydrated lime.

Talc

Talc, a hydrated magnesium silicate, occurs mostly in areas that are underlain by dolomitic carbonate rocks within Zambia. Such areas include Lusaka, Copperbelt (Ndola District) and North-western (Solwezi District) Provinces. The Lilayi talc deposit occurs 5 km south of Lusaka (Fig. 10) and consists of lenses of massive talc (steatite) up to 6 m in thickness within a dolomite host. The steatite talc consists of white, relatively pure material (containing 90% talc with traces of dolomite and chlorite). It was previously extracted on a small-scale by Crushed Stone Sales Limited for many years. Crushed Stone Sales Limited, which started as Jerries and Mooroson in 1960, was established in 1968 after the nationalisation of privately owned quarries operating in Lusaka and became 100% owned by the Zambian Government through INDECO (IDAT, 1968). Crushed Stone Sales Limited manufactured construction aggregates, calcined lime products, crushed limestone products and talc products (Simukanga et al., 1992). After the closure of the state-owned Industrial Development Corporation (INDECO) of Zambia Ltd. due to privatisation, the Talc Association of Zambia took charge of the Lilayi Talc Mine that was formerly operated by Crushed Stone Sales Limited, albeit without a licence. An additional complication is that of negative environmental impacts as the area is now designated for residential construction. The main negative environmental impact associated with informal talc mining in Lilayi area is land degradation caused by unfilled pits (Fig.10). The land in Lilayi area, including where the talc mining operations are, has been converted, by law, from agricultural/mining land use to residential. A combination of these factors has reduced production activities at the site and it is now earmarked for closure. However, another talc deposit was discovered 25 km to the southeast of Lusaka at Chipapa, which consist of equal proportions of pyrophyllite and talc (Muibeya, 2000) and the research team found evidence of mining activities at this site. The combined reserves at Lilayi and Chipapa deposits is estimated at 1.3 million tonnes (Mambwe, 1992a).

The Mushishi deposit in Ndola, extracted by Talc Zambia Ltd and abandoned years back, is reported to contain reserves in the order of 2 million tonnes at 33% steatite (O' Driscoll, 1992). Steatite is a massive variety of talc. Briggs and Mitchell, (1991)

have reported the following as the quality of talc from the Mushishi deposit: after flotation, talc content ranged from 95 and 99 wt. % and brightness from 54 to 78%. In 1992 Talc Zambia Limited was expected to produce 30,000 tonnes of white, off-white and yellow-brown talc for the local market and export, but due to the privatisation programme that Zambia undertook in the 1990s that led to collapse of many government-owned companies, this did not happen. Talc is now mostly extracted by ASMs and, if the Development Mineral sector is properly organised and ASMs are formalised through formation of cooperatives and supported, it is possible for the talc resources especially at Chipapa in Lusaka and Mushishi in Ndola to re-start extraction.

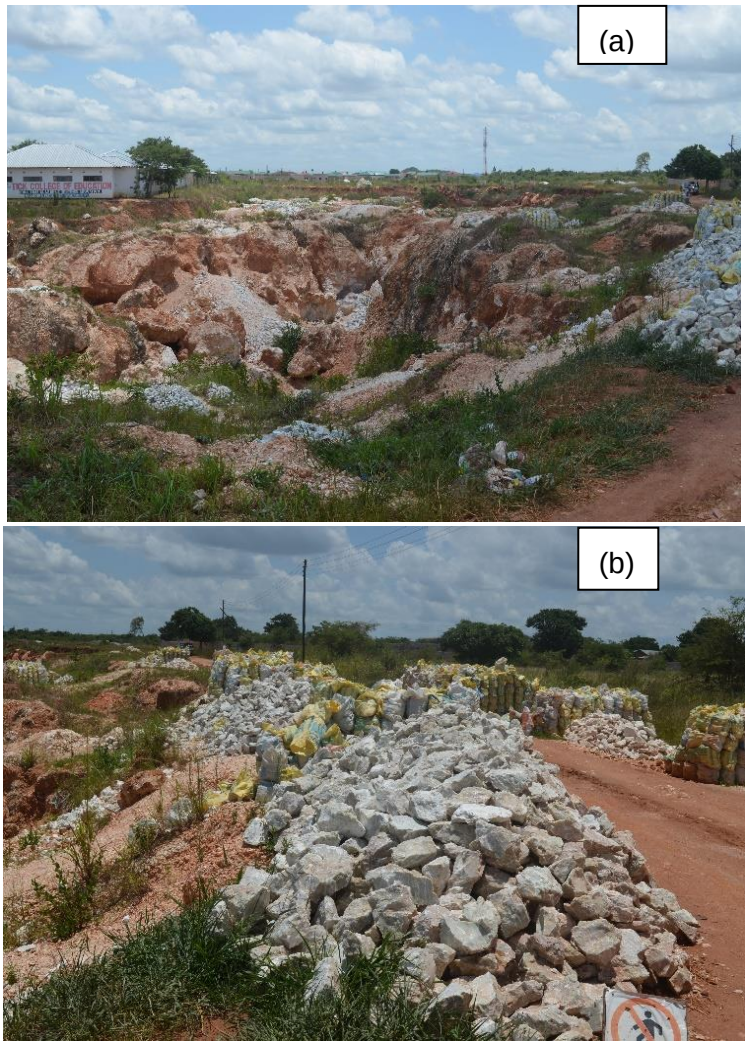


Fig. 10: Talc Quarry (a) and production (b) packed in 50 kg empty cement bags at the Lilayi Deposit in Lusaka. Photo credit: Nixon Chisonga.

Silica sand

Occurrences of silica sand, a weathering product of quartz-rocks such as quartzite, are found throughout Zambia. Notable occurrences/deposits of silica sand occur in Solwezi in North-western Province, Kapiri Mposhi in Central Province, Chibuluma in Copperbelt Province and Rufunsa in Lusaka Province. Silica sand has been used in the past by Kapiri Glass Products to manufacture glass and there are efforts by ZCCM-

IH to revive production. Silica sand is also being legally mined in the Copperbelt and supplied to the large copper/cobalt mines for use in smelting processes. BBM/KYULU Development Trust Sand Washing Plant in Solwezi produces 2,450 tonnes of silica sand daily and this is supplied to Kansanshi Mine for smelting (Fig. 11). Exploitation of silica sand is mostly conducted by ASM and MSM operators such as the BBM/Kyulu Development Trust. The growth in demand for glass products in Zambia and readily available silica sand have recently resulted in the establishment of a glass manufacturing plant (Eagle Glass Manufacturing Limited) in Kapiri Mposhi.

Fig. 11: Silica and mining BBM/Kyulu Development Trust Mine in Solwezi.

5.3.3 Dimension Stones

Dimension stone is any rock that can be cut, shaped and polished into end use products such as tiles, bench tops, tombstones and pavers or any rock exploited and used with little or no processing. Rocks such as granite, gabbro, basalt, marble, slate, syenite, quartzite, and crystalline sandstone, all of which occur in various parts of Zambia, can be extracted for dimension stone. The study reveals that dimension stone processed from micaceous banded quartzite (Fig. 12) is exploited in Siavonga District by medium scale companies such as the Zambezi Natural Stone Company. The mine, located within an estimated 3,800hectare exploration licence area, has been in production since 2007 and supplies a range of natural stone products to Lusaka and other towns along the rail way line for exterior and interior flooring, wall cladding, stair-treads and paving. A number of recently constructed shopping malls in Lusaka have had their exterior walls clad with micaceous banded quartzite tiles.

Fig. 12: Field photographs showing the Zambezi Natural Stone Company mine site (top) and plant (bottom) in Siavonga for production of dimension stone (micaceous banded quartzite). Photos courtesy of Nixon Chisonga.

5.3.4 Semi-Precious Stones

Amethyst

Occurrences of amethyst or purple quartz are found mainly in Zimba District in Southern Province, Solwezi District in North-western Province, Copperbelt Province and Eastern Province. Between 1985 and 1990, Zambia produced 21.9 tonnes (1985-1986), 7.0 tonnes (1986-1987), 3.8 tonnes (1987-1988), 4.8 tonnes (1988-1989), 6.3 tonnes (1989-1990), showing a general downward trend (Simukanga et al., 1992). In Zimba District, amethyst is extracted mostly in Mapatizya area (Fig. 13). The extraction of amethyst, particularly in Mapatizya, is conducted by MSMs such as Kariba Minerals Limited, which produces nearly a million kilograms (or 1000 tonnes) of amethyst per year[11] and a significant number of ASM operators. It is well established that extraction of semi-precious stones in Zambia is, in general, conducted mainly by informal ASM

[11] http://www.zccm-ih.com.zm/kariba-minerals/

operators and if formalised would contribute significantly to the growth of the Development Mineral sector and to national development[12].

Fig. 13: Amethyst production at Grimaraji Mine Site in Mapatizya, Zimba District, Zambia.

Other Semi precious stones

In terms of semi-precious stones, the country boasts of other occurrences including quartz, aquamarine and red garnet in Lundazi District; different varieties of tourmaline in Lundazi, Mkushi, Serenje and Nyimba Districts; quartz in Kalomo, Solwezi, Serenje and Lufwanyama Districts; agate in Livingstone District.

5.4 Production & Reserves Data

The Ministry of Mines and Minerals Development (MMMD) captures production and reserves data on Development Minerals. The available data, however is mainly from the formal medium to large scale operators. Due to the high level of non- compliance in reporting by the artisanal and small-scale mining operators, their production and reserves data are uncaptured. Development Mineral commodities, for which at least production data is available from medium-scale and large-scale operators, include **construction materials** such as limestone/marble, cement, aggregate (granite and marble), phyllite (Table 4), sand and gravel (Table 5); **industrial minerals** such as talc, limestone/marble, calcined lime, lime flour, gypsum, silica sand, feldspar and fluorite (Table 5) and clay (bricks) (Table 5); **dimension stones** (Table 5) such as micaceous banded quartzite and slate (or flat stone); and **semi-precious stones** such

[12] Simukanga et al., 1992

as amethyst (43.8 tonnes from 1985 to 1990; Simukanga et al., 1992), tourmaline and red garnet. The available production data is based on operator self-reporting, which is in line with the Mines and Minerals Development Act of 2015 requirement that mine operators provide data on a monthly basis. The production data for other types of Development Minerals, especially those that are extracted mainly by informal ASMs, are not captured for several reasons including (i) operators not being compliant with the law, (ii) inadequate staff within the Ministry to monitor and inspect operators, and (iii) operators having mining rights which remain inactive.

Table 4: Zambia's Developmental Mineral production (Simukanga et al., 1992).

Year	Calcined lime	Limestone	Aggregate	Lime flour	Silica Sand	Phyllite	Talc	Feldspar	Gypsum	Amethyst*	Cement
1980	174235	575408	-	-	8269	7506	-	600	-	3,360.0	362000
1981	177000	503489	-	-	9529	8735	931	452	-	45,222.0	372000
1982	206000	427173	-	-	9628	9353	271	362	256	23,476.0	351000
1983	169000	510627	124000	5647	8728	9881	438	220	-	33,799.0	323000
1984	197000	916164	129000	7023	8109	7358	402	184	-	34,827.0	327000
1985	255975	702155	124000	20050	9529	12573	465	256	78	19,612.0	316371
1986	242731	704919	96000	18624	10029	18607	266	214	-	6,913.1	337116
1987	235287	720231	118980	4041	7306	21767	258	45	-	3,981.7	374982
1988	288633	998733	166051	5268	8121	25066	73	120	643	4,791.0	404600
1989	230460	774661	172252	7637	7221	22310	20	20	1895	6,275.0	385937
1990	213800	77318	189368	8000	8308	23308	60	60	734	15,129.0	437421
Total	**2,390,121**	**6,910,878**	**1,119,651**	**76,290**	**94,777**	**166,464**	**3184**	**2533**	**3,606**	**197,385.8**	**3,991,427**

Note that the unit of measure is tonnes for all commodities; - data not available. * - unit of measure in kilograms.

Table 5: Zambia's Developmental Mineral production (Mitchell and Muibeya, 2000)

Development Mineral	1996	1998	1999	2000
Sand and gravel	-	200000	-	-
Talc	-	80	-	-
Quick lime	145102		-	-
Pyrite (for H2SO4 production)	-	70000	-	-
Limestone	412238		-	-
Kaolin	-	200	-	-
Hydrated lime	16103	-	-	-
Agricultural lime	-	-	20000	150000
Gypsum	-	11000	-	-
Clay for building	-	30000	-	-
Clay for bricks	-	3000	-	-
Cement	206266	-	-	-

Building stone (dimension stone)	-	700000	-	-
Aggregate (crushed limestone)	-	700000	-	-

Note that the unit of measure is tonnes for all commodities; - data not available.

5.4.1 Construction Materials Production Data

Cement

Examination of the data shows that Zambia's production of cement generally totalled 3,991,427 tonnes (see Table 4) and increased from 1980 to 1990 (Fig.14). According to the Ministry of Mines and Minerals Development, Lafarge Zambia and Zambezi Portland Cement produced 1,169,620 and 36,256 tonnes of cement in 2013 respectively. Additional data captured from the 2017 Annual Report shows that Lafarge Zambia produced a total of 4,343,000 tonnes and 919,000 tonnes of cement for the domestic and export market respectively between 2013 and 2017 (Table 6). Although cement production dropped between 2014 to 2016 due mainly to poor performance of the Zambian economy, it is interesting that the sales value, both for the domestic and export markets, has been rising steadily since 2015 (Fig.15). It should be noted that the quoted production figures are an under estimation as data for 2015 and 2016 was not provided and Dangote Cement, a major player in the cement and cement products supply chain, is omitted from the data set although it is well known that the 1.5 million tonnes per annum plant in Ndola got commissioned in August 2015. Data on Oriental Quarries (formerly Scirocco Enterprises Ltd), a Lusaka-based supplier of blocks, concrete, precast concrete, portland cement and other building materials, is also missing. Oriental Quarries operates a 0.1 million tonnes per annum cement plant in Lusaka. It is worth noting that ASMs are not involved in cement production - not even in the supply of raw materials to cement manufacturers.

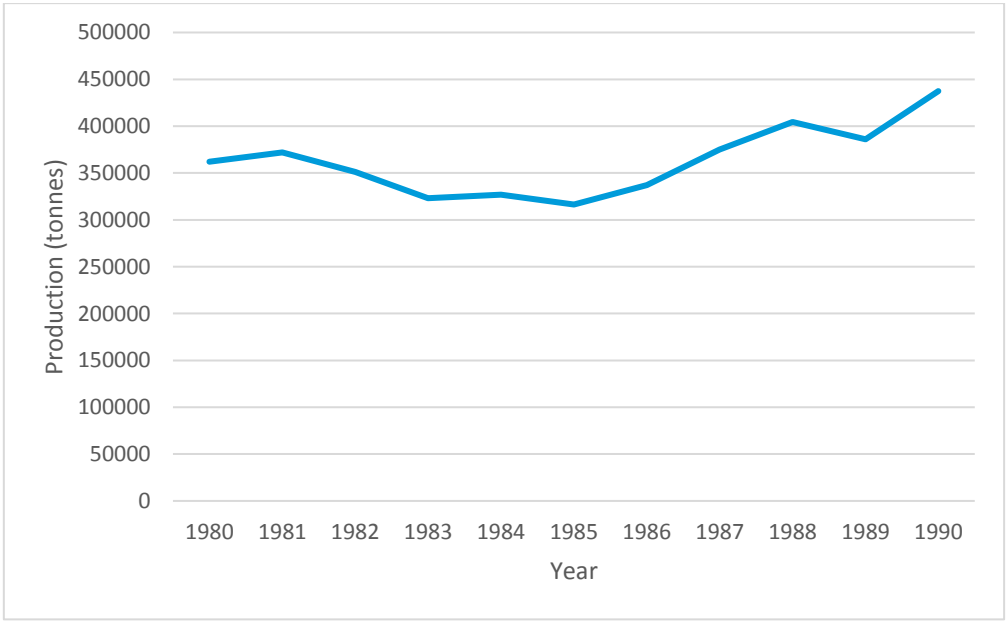


Fig. 14: Cement production in Zambia from 1980 to 1990 (Simukanga et al., 1992).

Zambia's production capacity in cement and related products will be boosted with the completion of on-going pipeline projects. This will result in competitive pricing as well as increased opportunities for export. For example, in July 2018, Sinoma commissioned the first phase of a construction materials plant in Mpande Area of Chongwe under the China National Building Material Zambia. This plant has the capacity to produce 1 million tonnes/year of cement, 60 million/year of pan bricks, 200,000 m^3/year of premix concrete, 700,000 tonnes/year of aggregate and 280,000 tonnes/year of manufactured. In November 2018, Central African Cement (ownership: 35% ZCCM-IH and 65% Sinoma CBMI of China) announced its intention to invest US$480 million in establishing a cement plant in Ndola by 2020 with a production capacity of 2 million tonnes/year of cement and 1.8 million tonnes/year of clinker with the potential to create over 1000 direct jobs.

Table 6: Lafarge Zambia Cement Production and Sales (Source: Lafarge Annual Report, 2017).

Year	Domestic Market (tonnes)	Export Market (tonnes)	Sales (ZMW)	Sales (US$)
2013	955000	219000	1,133,000.00	113,300.00
2014	1080000	142000	1,384,000.00	138,400.00
2015	1038000	121000	1,296,000.00	129,600.00
2016	605000	192000	890,000.00	89,000.00
2017	667000	245000	1,008,000.00	100,800.00

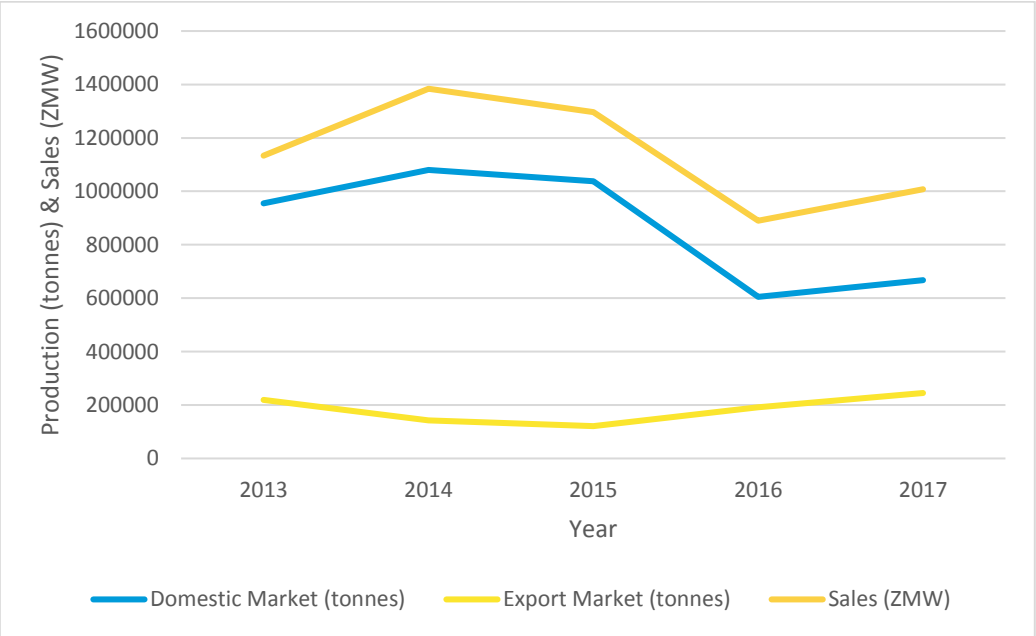


Fig. 15: Lafarge Zambia Cement Production and Sales.

Aggregates

Zambia produced a total of 1,119,651 tonnes of aggregate between 1980 and 1990 (see Fig. 16), and 700,000 tonnes of crushed limestone aggregate in 1998. The Road Development Agency (RDA) operates a number of quarries in the country. Thirty of the quarries are listed in Annex 3. One of the most active quarries is in Kafue located about 40 km south of the Lusaka City. The granite aggregate is used mainly in the road construction sector. The Kafue Quarry is operated by a private contractor involved in the construction of large government infrastructure projects such as the Kenneth Kaunda International Airport (contract sum of US$360 million), Ndola International Airport (contract sum of US$397 million), roads, hospitals and irrigation dams. They quarry produced and sold a total of 341,211.75 tonnes equivalent to ZMW44,777,010.00 (US$4,477,701.00) in value assuming an average price/tonne of ZMW120.00 (US$12.00) in 2014 and 2015 (Table 7). The data indicates that RDA is a major player in the supply chain of crushed stone aggregate.

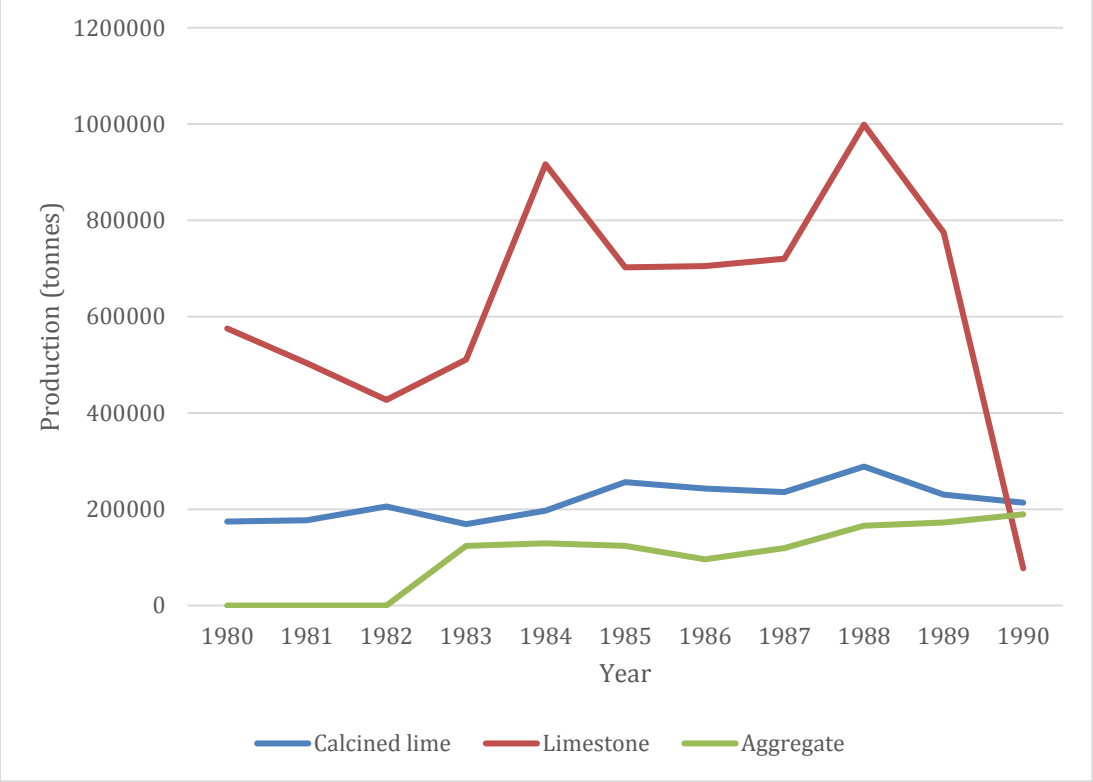


Fig. 16: Total aggregate production between 1980 and 1990.

Table 7: Aggregates Production & Sales at the Kafue Quarry.

YEAR	MONTH	AVIC INTERNATIONAL DATA	CALCULATED VALUE (AVERAGE PRICE = US$12.00/TONNE)	
		PRODUCTION (tonnes)	SALES (tonnes)	Sales (US$)
2014	4	5,550.00	3,636.11	43,633.32
	5	1,230.00	11,820.39	141,844.68
	6	19,770.00	13,613.85	163,366.20
	7	41,960.00	26,864.13	322,369.56
	8	47,484.00	16,893.47	202,721.64
	9	59,746.00	56,761.63	681,139.56
	10	64,320.00	24,509.04	294,108.48
	11	52,250.00	24,360.58	292,326.96
	12	48,850.00	25,095.73	301,148.76
TOTAL		**341,160.00**	**203,554.93**	**2,442,659.16**
2015	**1**	-	8,775.30	105,303.60
	2	3,000.00	4,377.12	52,525.44
	3	21,430.00	9,904.58	118,854.96
	4	35,550.00	24,183.00	290,196.00
	5	44,610.00	12,492.90	149,914.80
	6	25,120.00	30,445.98	365,351.76
	7	26,780.00	25,713.94	308,567.28
	8	85,790.00	53,694.00	644,328.00
TOTAL		**242,280.00**	**137,646.82**	**2,035,041.84**

There is an equally high demand for aggregates for use in construction in urban areas driven by growth of the housing sector and related infrastructure demands. The major cities of Lusaka and Ndola are located close to limestone deposits and the demand for construction materials has given rise to a number of quarry operations as indicated in Table 8. Production of limestone and dolomite in Ndola and Lusaka was 230,845 and 838,295 in 2013 respectively. Production increased to 1,171,802 tonnes in Lusaka in 2014.

Table 8: Limestone and aggregate Production.

Limestone (2013)	Production (t)
Ndola Lime	118,878
Zambezi Portland	106,146
Viking Inves	1,554
Calcite Ltd	2,977
Asshia.H. Ltd	1,290
Total	**230,845**
Aggregates (2013)	
Lions Group Quarry Ltd	325,068.40
United Quarries Ltd	189,536

Lusaka West Mailoni	323,691.18
Total	**838,295.58**
Quarry dust (2014)	
Katima Stones	6,600
Lusaka West Maloni	227,962
Total	**234,562**
Aggregate - (2014)	
Oriental Quarries	1,155,154
Gold Tiger	16,648
Total	**1,171,802**

5.4.2 Semi-precious Stones

In central and eastern Zambia, there are numerous gem-bearing pegmatite deposits which yield significant quantities of semi-precious stones such as aquamarine, tourmaline, quartz and garnet. MMMD production data available is for five types of semi-precious stones, namely: amethyst, aquamarine, garnet, tourmaline and quartz. Between 1980 and 1990 Zambia produced a total of 197,385.8 kg of amethyst, 1,120.56 kg of aquamarine and 906.08 kg of tourmaline (Table 4) and in the 2011-2015 period, 4,752,004 kg of amethyst, 1,064 kg of aquamarine, 1,302.1 kg of garnet and 3,494,404.8 kg of quartz (Table 9). It should be noted that the reported production data is only from formal operators such as Kariba Minerals for amethyst and therefore represents an under estimation as the production from informal ASMs is unknown. It was observed by Simukanga et al. (1992) that nearly all production of amethyst before 1992 was supplied by ASM operators. Data collected during this study on amethyst shows that monthly production in 2017 was 1200 tonnes and most came from Kariba Minerals.

Table 9: Semi-precious stones production (kgs).

Gemstone	2011	2012	2013	2014	2015	Total
Amethyst	1,434,163	612,835	737,729	986,437	980,840	**4,752,004**
Aquamarine	166	21	590	220	67	**1,064**
Garnet	240.10	-	57.0	885.0	120.0	**1,302.1**
Tourmaline	1,906.43	243.0	-	-	12.0	**2,161.43**
Quartz	3,480,217.97	9,479.83	659.0	-	4,048.0	**3,494,404.8**

5.4.3 Other Development Minerals

Other Developmental Minerals that Zambia produced between 1980 and 1990, with total tonnage in brackets, include calcined lime (2,390,121 tonnes), limestone (6,910,878 tonnes), lime flour (76,290 tonnes), silica sand (94,777 tonnes), phyllite (166,464 tonnes), feldspar (2,533 tonnes), gypsum (3,606 tonnes) and fluorite (115

tonnes) (see Table 4). Calcined lime and limestone show a general steady increase in production from 1980 to 1990 (Fig.16), and Lime flour, silica sand and phyllite show equally an increase in production (Fig. 17). Talc and feldspar production decreased from 1980 to 1990. Production of gypsum was irregular, with highest production levels having been in 1989 (Fig.18). Table 5 shows the production of sand and gravel, talc, quick lime, pyrite, limestone, kaolin, hydrated lime, gypsum, clay for building, clay for bricks, cement, and agricultural lime between 1996 and 2000.

During this study, monthly production data for sand, talc, agricultural lime, hydrated lime, limestone, quick lime, dimension stone, bricks and aggregate was collected and is presented in Table 10. Sand, talc, bricks and aggregate production is mostly attributed to ASMs while production of agricultural lime, hydrated lime, quick lime and dimension stone is attributed to medium scale mines.

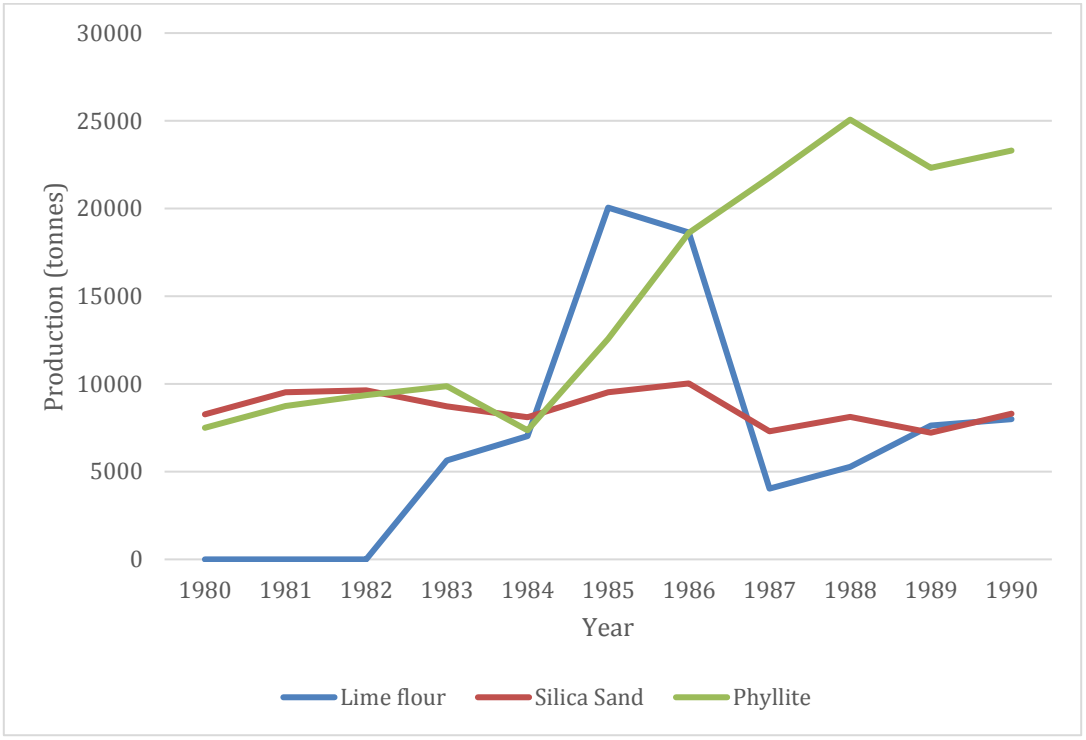


Fig. 17: Production of lime flour, silica sand and phyllite in Zambia for 1980 to 1990.

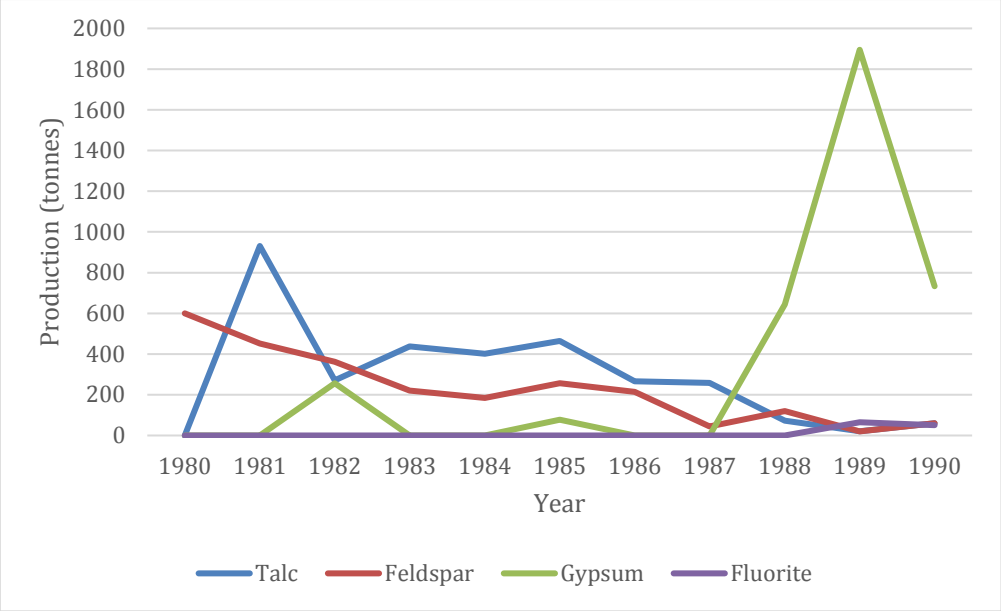


Fig. 18: Production of lime talc, feldspar, gypsum and fluorite in Zambia for 1980 to 1990

Table 10: Estimated production of Development Minerals (data captured in 2017).

Commodity/Product	Monthly Production(tonnes)
Sand	4,800
Talc	200
Agriculture lime	1,500
Hydrated lime	1,800
Lime (limestone)	2,700
Quick lime	9,000
Dimension stone	585
Bricks	700
Aggregate (crushed stone)	8,400

5.5 Reserves data

Recent data on the reserves of Development Minerals is not currently available within the MMMD database although Section 35 (b) requires holders of a mining right to submit ore resources and reserves statements to the Ministry. The Development Minerals mine operators did not provide reserves data during the study. However, the Ministry of Mines and Minerals Development (1999) reports that for some of the Developmental Minerals there is data on reserves (Table 11).

What can be assumed is that the Development Minerals sector in Zambia has abundant resources that the country can and should extract and use for its economic and social development. As an example, it is estimated that Zambia has 809.3 million tonnes of phosphate resources/reserves ranging in grade from 2.5 to 11.8% P_2O_5 on which to anchor the development of a phosphate fertilizer industry and downstream industries (Simukanga et al., 1992). Another example is the establishment, by AGIP

SPA (Zambia) Limited, of 6.5 million tonnes of fluorite grading over 85% CaF_2 at Sianyolo in Southern Province (Money, 1995). Money (1995) further reports that feasibility studies undertaken confirmed that the deposit at Sianyolo can sustain annual production of 90,000 tonnes at 98% CaF_2 for at least 20 years. Fluorite is used in steel making (30%), aluminium industry (20%), manufacture of hydrofluoric acid (20%), and in glass, enamel, ceramics, chloro fluorocarbon products and aerosols (30%) (Money, 1995).

Table 11: Reserves data on some Developmental Minerals of Zambia (Ministry of Mines and Minerals Development, 1999)

Deposit and Location	Development Material	Reserves
Chivuna, Southern Province	Agricultural lime	52 Mt @ 12-14% MgO
Mutanda, Luapula Province	Agricultural lime	5 Mt
Nkombwa Hill, Muchinga Province	Agricultural lime	700,000 t @ 17-20% MgO
Lunkunyi, Northwestern Province	Agricultural lime	6.7 Mt @ 96.3% $CaCO_3$
	Agricultural lime	2.2 Mt @ 18% $MgCO_3$
Chalata, Central Province	Ball clay	70,000 tonnes
Solwezi, Northwestern Province	Ball clay (gray)	10,075,000 m^3
	Ball clay (yellow/brown)	9,435,000 m^3
Masuku, Southern Province	China clay	3000,000 tonnes
Kafwa, Central Province	Grey clay	95,000 m^3
Mtuku, Central Province	Yellow clay	61,000 m^3
Shiwangandu, Muchinga Province	White clay	10,000 m^3
	Cream white clay	20,0000 m^3
Loshi, Luapiula Province	Ball clay	1,107,000 m^3
Kankomo, Copperbelt Province	Brick clay	5,000,000 m^3
Mwambeshi Valley, Copperbelt Province	Brick clay	5,000,000 m^3
	Brick clay	15,000,000 m^3
	Kaolin	1,800,000 m^3
	Kaolinitic sand	2,000,000 m^3
Lukashya, Northern Province	Clay	848,000 m^3
Njoka, Eastern Province	Graphite	4,000 tonnes
Kajumba, Muchinga Province	Graphite	3,000 tonnes
Lochnivar, Southern Province	Gypsum	355,000 tonnes
Sianyolo, Souther Province	Fluorite	6.1 Mt @ 84% CaF_2
Numpundwe, Lusaka Province	Pyrite	8.8 Mt @ 16.5% sulphur

Mt – Million tonnes; t - tonnes

5.6 Key Uses of Development Minerals and Their Products in Zambia

Many Development Minerals, including those extracted in Zambia, have multiple uses. For example, talc is used in ceramic tiles; limestone/marble is a source of lime (calcium oxide) used to neutralise acidic agricultural soils and acidic metallurgical waste. Lime and silica sand are also employed as:1) a flux in copper smelters, and steel manufacturing; 2) as an input in glass production; 3) a raw material in cement, fertilizer, paint and plastics production; 4) a raw material in the production of livestock feed; 5) as crushed aggregate for the construction industry; 6) as a soil conditioner; 7) for sewage and water treatment; 8) dolostone is a source of Mg, which together with Ca, is a plant nutrient. Marble, a recrystallized limestone and Granite, are cut, shaped and polished for use as a dimension (or ornamental) stone. Marble is also used in creative arts for sculpturing. Clay is used as a sealant in the copper smelters; in ceramic and tiles industry. Worldwide, it is estimated that sand, gravel, limestone, clay, sulfur, salt, and phosphate make up 90% of the total tonnage of all industrial minerals and rocks, produced and 60% of total value (Wilson and Amavilah, 2007).

The 2010 Census conducted by the Central Statistical Office of Zambia revealed the following uses of Development Minerals (Table 12; CSO, 2013):

(i) In rural areas, mud bricks/compressed mud (40.7%) is the most commonly used material for walls, followed by concrete blocks/cement blocks (25.8%) and burnt bricks (24.3%);
(ii) In rural areas, walls made from mud bricks/compressed mud accounted for 54.0% of all housing units, followed by burnt bricks (28.0%), while dagga (clay) is used for walls in 13.3% of housing units;
(iii) Concrete blocks/cement blocks (58.9%) were the most common materials used for walls in urban areas followed by mud bricks/compressed mud (20.7%) and burnt bricks (18.8%);
(iv) Majority of housing units had floors made from mud (56.8%), followed by cement (32.3%) and concrete (7.4%); and
(v) In rural areas, mud (83.1%) is the most common material used for floors, while in urban areas, cement (62.5%) is the most common material used in the floor.

The assessment is based on a total of 2,660,989 housing units (i.e. 60.1% rural and 39.9% urban) (CSO, 2013).

Table 12: Development Minerals used in the construction of housing units.

Part of Housing Unit	Development Material Used	Rural (No. of units & %)	Urban (No. of units & %)	Total (No. of units & %)
	Total No.of Units	**1,599,254**	**1,061,735**	**2,660,989**
Roof	Asbestos	35,184 (2.2%)	341,879 (32.2%)	377,063 (14.2%)
Wall	Mud bricks/compressed mud	863,597 (54%)	432,126 (40.7%)	1,295,723 (48.7%)

	Concrete/cement blocks	75,165 (14.7%)	273,928 (25.8%)	349,093 (13.1%)
	Burnt bricks	447,791 (28%)	258,002 (24.3%)	705,793 (26.5%)
	Pole & dagga	212,701 (13.3%)	--	212,701 (8%)
Floor	Mud	1,328,980 (83.1%)	663,584 (62.5%)	1,992,564 (74.9%)
	Cement	270,274 (16.9%)	398,151 (37.5%)	668,425 (25.1%)

This is a clear illustration of the critical role that Development Minerals play in the Zambian economy in the development of both urban and rural areas. Sites investigated close to Lusaka provide a good snapshot of the applications of Development Minerals and products in Zambia. Development Minerals considered in this snapshot analysis include sand and gravel, limestone/marble, crushed aggregate (limestone/marble/dolostone) and talc.

Sand and gravel

Although sand and gravel are extracted several kilometres away from the city of Lusaka, they are mostly used in peri-urban and urban centres of Lusaka Province where demand is significantly high due to the construction boom. The most obvious use of sand is for construction of buildings and housing units in Lusaka and other large towns in the Province. Gravel, on the other hand, is mainly used as aggregate in the construction of roads within Lusaka and other towns within Lusaka Province. ASMs are the key suppliers of sand and gravel.

Limestone/marble

Exploitation of limestone/marble is the most developed, formalised and diversified of all Development Minerals operations and only medium to large scale operators are involved. Limestone/marble is the key raw material in cement production (Fig.19). Cement then is used: (i) as input in the manufacture of many products including a variety of concrete products such as concrete blocks, kerbstones, slabs, dam walls, manhole covers and pavers; (ii) in the stabilisation of gravel in road construction i.e. cement is mixed with gravel; (iii) in plastering of walls of buildings i.e. cement is mixed with sand and water; and (iv) in making of flower vases.

Fig. 19: Varieties of cement produced by Lafarge Zambia.

Aggregate

Marble is extracted, crushed and screened into various types of aggregate such as coarse aggregate and quarry dust, all used in the construction industry. Aggregate, together with sand, cement and water, is used in the manufacture of various concrete products including concrete blocks and slabs. Coarse aggregate is used in the construction of soak-aways. Supply of aggregate for construction involves ASMs (Fig. 20), MSMs such as Oriental Quarries and LSMs such as Lafarge Zambia.

Fig. 20 : Aggregate from crushed marble produced by ASM

Agricultural and industrial lime

Limestone/marble is also manufactured into agricultural lime, stock feed limestone, quick lime and hydrated lime. Agricultural lime is mainly used in the neutralisation of acidic soils and soil conditioning. Stock feed limestone is ground material added to feed for animals and chickens. Limestone is a source of the essential element calcium needed for proper bone development in animals. Calcium is also essential to the formation of egg shells in chickens. Quick lime (CaO) is locally used by steel producing companies like Universal Chemicals and Mining Ltd of Zambia as a flux in the basic oxygen steel manufacturing process. Its role is to neutralise the acidic oxides to produce a basic molten slag. Hydrated lime [$Ca(OH)_2$], on the other hand, is mainly used locally as a flocculant, in water and sewage treatment, during which it forms a fluffy charged solid that aids the removal of smaller particles, resulting in more clearer water.

Clay

Clay is a very common and widely available Development Mineral in Zambia and is locally employed for a wide variety of uses. Clay is mostly used in making compressed mud bricks for constructing and plastering housing units especially in rural areas (CSO, 2010). Clay is also commonly used in manufacturing burnt bricks for the housing sector as well. For instance, Kalulushi Clay Bricks produces about 2 million high quality burnt bricks per month that are used throughout Zambia. These bricks are used in the construction of buildings, fencing walls and as pavers (Fig. 21).

Fig. 21: Kalulushi Burnt Clay Bricks. Note bricks used for fencing wall and floor (a) and for and in drainage paving (b).

Talc

Locally extracted talc is processed (i.e. flotation) to improve the quality (i.e. talc content and brightness) before being exported mainly to South Africa. Some of the processed talc is used locally for production of cosmetic powder and in the production of ceramic tiles. However, data on the quantity of talc that is exported and used domestically is not available.

Amethyst

A significant proportion of the 700 tonnes of amethyst produced annually in Zambia is exported mostly in raw form i.e. with little or no value addition. Although the use of the locally produced amethyst within Zambia is not well established, a snapshot survey within Lusaka shows that amethyst is used in the production of both low cost jewellery ranging in price from US$25 – US$448) and high cost jewellery valued at around US$1,700. (Fig. 22). In Zambia, most of the low cost amethyst is produced mainly by ASMs and is transformed into a wide variety of beads and other ornamental objects.

Fig. 22: Pictures of Zambian produced amethyst used in low cost cabbing and carving (left; www.neweragems.com) and high cost jewelry (right; www.jewelofafrica.com).

5.7 Business Types and Legal Status

Mining in Zambia is conducted generally through three business categories i.e. Micro-small-scale, medium-scale and large-scale. The same applies to the Development Minerals sector and its value chain. It is notable generally, though, that certain types of Development Minerals attract large-scale businesses, while others medium-scale and still others small-scale businesses, which include artisanal operations. For example, production of cement from limestone attracts only medium to large scale businesses such as Lafarge Zambia, Dangote Cement, Zambezi Portland Cement and Sinoma Cement due to the scale of investments required. For example, the setting up of the 1.5 million tonnes per annum Dangote Cement factory in Ndola required an investment in the order of US$400 million signalling the probable need for financing and investment facilitation. Production of sand, on the other hand, attracts artisanal and small scale operators because the financial investment required is not that substantial and it may not be necessary to seek financing from banks and other financial institutions. In fact, the scale of financial investment required for artisanal and small-scale sand mining is so insignificant that even village communities are involved as revealed by this study. The mining of sand in Kasisi area of Chongwe is conducted at family level i.e. village families own small sand mines. However, operating any type of business is regulated by several laws of the country and requirements include: registration of the business, payment of taxes and other obligations and compliance with others related laws and regulations. While medium to large scale businesses operating in Zambia are formal and compliant, more often than not small-scale businesses are often informal and non-compliant. According to the Mines and Minerals Development Act of 2015, there are three types of mining rights that can be acquired namely:

- Artisanal mining: size of area is between 1 and 2 cadastre units[13];
- Small-scale mining: size of area is between 3 and 120 cadastre units; and
- Large-scale mining: size of area is between 121 and 7,485 cadastre units.

According to records at the Department of the Mining Cadastre, there are 99 licenced Development Minerals operators in Zambia (Table 13). These 99 licensed operators span artisanal to small-scale to large-scale mining. However, out of the 99 active mining licences, 64 are granted for more than one Development Mineral commodity.

[13] A cadastre unit is a quadrilateral area covering an average planimetric surface of 3.4 hectares

Out of the 109 extraction sites covered in this study, 27 were licensed and 41 were unlicensed. At the time of this study, some of the active mining operations visited, such as Ngwenya Crushed Stones, Grimaraj Investments and Oriental Quarries did not appear in the cadastre records. It is not clear if these operations are unlicensed or they were not just captured in the cadastre records due to none renewal of license. The Mines and Minerals Development Act of 2015 requires small-scale mine operators to renew licences every 2 years.

Table 13: Active Development Mineral Licences in Zambia.

Development Mineral Commodity	Number of Licences
Sand, gravel and silica sand	9
Dimension & crushed stones	10
Silica sand-only	8
Limestone/marble only	15
Dolomite, Limestone & Granite	13
Granite, laterite and crushed stones	20
Laterite only	1
Tourmaline only	2
Amethyst, quartz and tourmaline	21
TOTAL	**99**

Artisanal mining encompasses the smallest and most rudimentary of operations. One of the principal characteristics in this category of mining is the widespread use of simple tools and the absence of a formal business enterprise structure. Artisanal activities include both informal and spontaneous operations without legal title to the mineral commodity being extracted as well as formal operations on registered claims. In terms of the former, the Kachangwa and Kasisi Sand Miners and Talc Miners Association are typical examples. These small-scale operators are mobile and can migrate quickly to new fields and present a new form of informal artisanal mining such as quarrying of talc, crushed stone aggregates, flat stones, gravel and building sand.

Small scale mining typically involves registered business enterprises that, nonetheless, are rarely licensed with the MMMD due to the inability to pay statutory annual mining licence fees. Small scale mining operations are either non-mechanised or semi-mechanised. Typically, the mining equipment used is outdated and inefficient. However, there are cases of small scale mining operations that are legally constituted enterprises, highly mechanised, and feature high capacity technical and managerial skills. Kariba Minerals, which extracts and processes amethyst, is a good example.

Large-scale operations, such as those involved in the extraction of limestone/marble mainly for cement and aggregate, are formally registered businesses. This means they have a mining licence from the MMMD, consent from the local chief (if on customary-owned land), and either have an environmental impact assessment (EIA) for large projects or environmental project brief (EPB) for smaller projects and other relevant licences.

This study revealed that within Lusaka, between 60% and 90% of operations in the Development Minerals sector and its value chain are informal. However, a survey of the 126 companies, operating within the Development Minerals sector, shows that 56% were unlicensed, informal or unverified while 44% were formal and licensed. It is therefore not clear how many Development Minerals operations exist across Zambia, as this data is on the conservative side when operations in rural areas are taken into account. This is because such operations usually find it very difficult to register businesses and access mining licences due to distances to licence issuance centres.

An analysis of the data collected on informal (unlicensed) and formal (licensed) operators involved in the extraction and processing of Development Minerals in Zambia shows the following characteristics:

5.7.1 Informal Operators

Poor Occupational Health, Safety, Environment, Community Practices (OHSEC)
Poor OHSEC practices were observed across 7 informal operating sites visited. Safety standards were particularly poor with no personal protective equipment (PPE) such as protective eyewear and dust masks. Hazards, such as land slips and holes in the ground, created through poor mining practices, were also observed across many sites, particularly where commodities such as talc, basalt and amethyst were quarried. Other occupational and community health issues included: dust from access roads and mining operations, noise, as well as vibrations from blasting and machinery. Environmental management was equally poor with issues including: water pollution (turbidity) and stagnation, deforestation, soil contamination and land degradation observed at all the 7 sites visited.

Child labour
Incidents of child labour were observed or reported at a number of investigated sites including at Kasisi Sand and Kachangwa Sand extraction sites in Chongwe District; Kalimansenga Sand extraction site in Katuba, Chibombo District; Kandabwe Small Scale Miners in Kitwe District; and Ngwenya Community Cooperative in Livingstone District. Reasons given for child labour include the need to earn money for school expenses. For instance, school-age girls engaged in sand quarrying at Katuba to raise funds for school (fees and supplies) and to help out with family expenses. In addition to child labour there were numerous examples of infants with parents/guardians at Development Minerals extraction sites due to unavailability of affordable child care.

Value addition
Overall, there was a lack of value addition or beneficiation at informal Development Minerals extraction/processing sites. For instance, at the sand mining quarries in

Kasisi and Katuba, sand is sold to individuals and commercial entities at ZMW240 (or US$24) per truck load without any processing. The Talc Mining Association in Lilayi, Lusaka, similarly sells raw talc to local buyers without any beneficiation or value addition[14]. The general lack of value addition or beneficiation limits the development of the informal Development Minerals sector as operators are not able to raise adequate revenue to re-invest, sustain and grow businesses.

Access to finance and markets

A common challenge across all visited sites of informal ASMs was the difficulty in accessing finance and markets. Interestingly, access to finance appears to be a general proxy for lack of access to equipment. Whenever access to finance was mentioned it was in the context of improving mining methods through access to more advanced and mechanised equipment. The market distribution of Development Minerals and products in the informal sector is through a combination of domestic and commercial purchases, typically within a local geographical area.[15] Informal ASMs reported difficulties in accessing local markets directly and in understanding the market and commodity prices.

Fee-collection model

A noteworthy example of 'positive deviation'[16] around the governance of the informal sand industry was observed at the Chisamba District Council. Previously, the council employed a model of revenue collection based on inspection-points where trucks of sand are stopped, and levies paid by operators. This model resulted in active evasion of inspection points by sand miners and loss of revenue by the council. Currently, in addition to inspection points, the council has employed an inspector from the local community who visits sand mining sites, audits extracted volumes and levies the miners. The levy charged is K30 (US$3.00) per 20 tonne truck load out of which 40% is apportioned to the Ward Development Committee and 60% to the council. This new *in situ* inspection method has resulted in increased revenues to the council and these revenues are reportedly reinvested in activities that assist in sand mining, such as grading of access roads to mining sites. This devolved administration model offers an

[14] Talc is exported for value addition by third parties to purchasers such as Johnson and Johnson in South Africa. The Lilayi talc mining group had ideas about how they could add value to talc, such as producing powder.

[15] This was particularly true for construction materials and dimension stones, although informal miners of non-precious stones such as amethyst were sometimes indirectly linked to global supply chains through local commercial purchases.

[16] Positive Deviance is based on the observation that in every community there are certain individuals or groups (the positive deviants), whose uncommon but successful behaviours or strategies enable them to find better solutions to a problem than their peers. These individuals or groups have access to the same resources and face the same challenges and obstacles as their peers. Source: http://www.positivedeviance.org/about_pd/

opportunity for refinement, enhancement and extension as part of the broader regulation of the sector.

Formalisation

Formalisation, in the context of informal operators in Zambia, means three things (i) getting recognised by government, (ii) getting formally registered as operating business entities and (iii) being granted a mining right. Respondents at 7 informal operators visited in the study were highly supportive of the idea of formalisation. Incorporation and formalisation of mining methods was viewed as a pathway to accessing support from the Government of the Republic of Zambia or development cooperation partners. This support would take the form of: access to training and capacity building interventions, access to markets, finance and equipment. The potential risks of formalisation – such as increased levies or fees, or loss of access to mining sites because of licensing requirements – were not brought up in conversations with informal miners, or commonly mentioned after probing questions about the possible downsides of formalisation. This should not necessarily be interpreted as a failure to appreciate the risks of formalisation, but more so a reflection of the overall desire to access support from government and/or other bilateral and development cooperation partners.

Partnership

Another example of positive deviation emerged at the BBM/Kyulu Development Trust Sand Washing Plant, which resulted from a partnership between the Kaonde Royal Establishment and a private investor. This partnership started as a small-scale operation and has now grown into a medium- to large-scale operation. Informal mining was previously conducted in the area until, the intervention of His Royal Highness Kapijimpanga, the Chief, who set up a formal sand mine and processing plant in partnership with BBM. The partnership is based on a fee-levy model rather than a percentage share structure to minimise financial risk to the Chiefdom. With the proceeds from the partnership, the Chiefdom has funded a range of community projects through the Kyulu Development Trust, including housing projects, education infrastructure and a clinic. The mine also employs 39 members of the local community (this number increases based on product demand) and has comparatively high standards of OHSEC. The operation has a major supply contract with a mine on the Copperbelt. This model of community partnership and formalisation offers the opportunity for refinement, enhancement and extension as part of the broader regulation of the Development Minerals sector.

5.7.2 Formal Operators

Occupational Health, Safety, Environment, Community Practices (OHSEC)

OHSEC practices in the formal and medium to larger mining operations were generally acceptable. Although the study team did not conduct a detailed OHSEC audit at formal sites, general adherence to industry practices around safety and environmental

management were as expected in operations of this scale. Examples of good safety management practices included: wearing of PPE, traffic management, proper benching, hazard identification and safety inductions. Examples of good environmental management practices that were observed included: dust suppression, use of green energy, stagnant water management, rehabilitation of mined areas and air pollution control. It is important to note, however, that there were still examples of OHSEC risks and poor performance issues noted at 11 formal sites and therefore improvement in OHSEC performance in the Development Minerals sector is still required. Examples of good social responsibility practices included community projects carried out by larger operators and the employment of people from local communities. For example, in 2017 Lafarge Zambia, through its Foundation, sponsored the Lafarge Lusaka marathon, which attracted more than 2,500 participants from all over the world and supported several schools with infrastructure development including Musamba Primary School and City of Hope Primary School (Lafarge Zambia Plc Annual Report, 2017).

Value addition

Instances of value addition and beneficiation processes were observed across the formal Development Minerals operations. For example, silica sand washing to produce higher quality silica sand was carried out at BBM/Kyulu Development Trust Sand Washing Plant and Atlantis Mine Ltd T/A Lunga Resources; production of burnt bricks using clay at Kalulushi Clay Bricks Limited; crushing of granite into aggregate at Nizam Crushers Limited; knocking of amethyst at Kariba Minerals Limited; the production of polished dimension stone products such as table tops and tombstones at Uniturtle Industries; and production of cut and shaped dimension stone from micaceous banded quartzite at Zambezi Natural Stone Company. With an improved policy environment, there are immense opportunities for further value addition to Zambia's Development Minerals.

Access to finance and markets

Many formal companies extracting Development Minerals, such as the Kalulushi Clay Bricks, Oriental Quarries, Ndola Lime and Kariba Minerals, have access to local and/or foreign capital. Other formalised but smaller operators, such as Tip Top Mining, face difficulties in accessing finance. A similar pattern was observed in access to markets whereby small- to medium-sized formal operators such as Kariba Minerals, Atlantis Investment and Kalulushi Clay Bricks reported more success accessing markets than smaller operators. However, all operators in the Development Minerals sector listed

access to markets and business development as major areas in which support is required.[17]

Formalisation

Medium-sized businesses involved in the Development Minerals sector indicated willingness to enter into supply partnerships with smaller and informal operators as an incentive for formalisation. One specific suggestion made by Luanga Atlantis Mine Limited was partnership with established cooperatives in a 50/50 share ownership whereby: (a) Luanga Atlantis Mine Limited and a cooperative or a consortium of cooperatives each put in 50% of the capital required to start the business; (b) Luanga Atlantis Mine Limited enters into a supply contract with a cooperative or a consortium of cooperatives for raw materials; and (c) a cooperative or a consortium of cooperatives work towards full ownership through a share buy-back scheme.

5.8 Access to Finance

The high cost of finance and the short repayment period of loans were cited by respondents as major constraints in accessing finance by players in the Development Minerals sector. It is worth noting that several of the larger-scale and already formalised operations in the sector are owned by non-indigenous Zambians who have alternative channels to access financing such as through family networks and overseas financial institutions.

Of the sites visited only 10% reported having accessed finance for operations. This is indicative of the barriers to finance faced particularly by women mining operators. Prominent among these barriers for women who needed finance were (i) lack of business and enterprise skills education – specifically in terms of business and marketing skills and (ii) lack of access to information on how to apply for bank loans.

Loans and Savings

Operators in nine out of the ten sites visited had not taken a bank loan for business development. Ndola Lime, owned by ZCCM - Investments Holdings (a large scale operator in limestone/marble production), is the exception, as it was able to access financing through borrowing. In terms of the preferred financing, six out of the ten site operators would like to participate in an equipment purchase scheme. A key constraint in terms of access to finance is insufficient collateral and interest rates being perceived as too high, as well as inadequate information on how to apply for a bank loan or for equipment financing. Small-scale operators at sites visited made meagre savings,

[17] For instance, Kalulushi Clay Bricks suggested that preferential procurement procedures for government contracts would help to build demand for clay brick products, noting that although construction with clay bricks is more expensive than alternatives products such as concrete blocks, they are more cost-effective over the life of the product.

ranging from ZMW3,700 (US$370) to ZMW12,000 (US$1,200) per annum and such savings would not support borrowing from lending institutions.

Priority needs

Findings from this study in relation to access to finance show the following as top three priority needs:

- **Working capital** – identified by four out of ten site representatives (40%);
- **Equipment and vehicles** – identified by three out of ten site representatives (30%); and
- **Business skills/entrepreneurship training** (including "education") - identified by three out of ten site representatives (30%).

5.9 Employment

Although the Employment Act of 2012 provides for labour returns from employers and the fact that Central Statistics Office regularly captures data on the labour force in Zambia through labour surveys, the employment data is not segregated to show employment numbers specific to the Development Minerals sector. Furthermore, the official employment data does not disaggregate employment numbers for formal or informal ASM operations. This poses a challenge to policy making as the contribution of the Development Minerals sector to national development in general and employment creation in particular, becomes difficult to measure. This also impedes effective planning for the development of the sector.

Table 14 summarises the employment data findings from the survey of 26 sites (this study) and 113 sites (UNDP Snap study) and with a total of 139 sites (55 licenced and 71 unlicensed). The data reveals that there is an average of 49 employees (i.e. 29 male and 20 female) per visited mining and processing site, with Lusaka sites having the highest number of female workers. The study further shows that inclusion of employment data from large Development Minerals companies such as Lafarge, Kagem and Ndola Lime may have inflated employment numbers (Table 15).[18]

Table 14: Employment Data in the Development Minerals Sector in Zambia from Snap Survey.

PROVINCE	NUMBER OF SITES VISTED	TOTAL No. EMPLOYED	MALE	FEMALE

[18] Full site visit data is found in Annex 2.

Copperbelt, Luapula & Northwestern	26	1,205	854	351
Central, Northern & Muchinga	48	910	450	460
Western, Southern & Eastern	48	2,700	1,750	950
Lusaka	17	2,000	940	1,060
TOTAL	**139**	**6,815**	**3,994**	**2,821**
Average per site		**49**	**29**	**20**

Table 15: Employment Data from visited Development Minerals sites.

Exploitation Site	District	Development Mineral	Male	Female	Total
Chongwe Sand	Chongwe	Sand	47	26	73
Kachangwa	Chongwe	Sand	85	65	150
Kalimansenga	Chisamba	Sand	60	70	130
Katuba	Chibombo	Sand	70	40	110
United Quarries Ltd	Chongwe	Aggregate (marble)	87	2	89
Liyayi Talc Mine	Lusaka	Talc	65	2	67
Larfage Zambia Plc	Chilanga	Limestone/marble	735	35	770
Oriental Quarries Limited	Chilanga	Limestone/Marble/Dolomite /Granite	13	134	147
Kandabwe Small Scale Miners	Kitwe	Aggregate (granite)	10	70	80
BBM/KYULU Trust Sand Washing Plant	Solwezi	Silica sand	37	2	39
Kalulushi Clay Bricks Limited	Kalulushi	Clay	30	67	97
Kagem Mine Limited	Lufwanyama	Beryl	347	3	350
Kanyafimbolo Mine	Lufwanyama	Quartz & amethyst	16	7	23
Lesa Wamaka Club	Kalulushi	Aggregate	9	17	26
Atlantis Mine Ltd T/A Lunga Resources	Kitwe	Silica sand	167	13	180
Nizam Crushers Limited	Luanshya	Aggregate	74	2	76
Ngwenya Community Cooperative	Livingstone	Basalt	35	70	105
Kariba Minerals Limited	Zimba	Amethyst	141	9	150
Gramiraji Investments Limited	Zimba	Amethyst	5	2	7

Tip Top Mining & Construction Limited	Siavonga	Green tourmaline & red garnet (semi-precious stones) Kariba Flat Stones (dimension stone) Granite, limestone & sandstone (aggregate)	7	1	8
Uniturtle Industries Ltd	Lusaka	Limestone, dolomite, granite	67	13	80
Ndola Lime Plc	Ndola	Limestone & aggregate	577	123	700
Reycus Supplies(Z) Limited	Kalulushi	Sand and sndstone	23	4	27
Dickson Sinyangwe General Dealers	Kalulushi	Sandstone	15	2	17
Moyo Farm Limited		Sand and laterite	57	10	67
Roads Development Agency	Kafue	Granite (aggregate)	46	12	58
TOTAL			**2825**	**801**	**3626**

A rough estimate of the number of employees in the Development Minerals sector is 6,815 (see Table 14). It is assumed that the data in Table 15 is part of the 6,815, which itself is an under estimation considering the fact that ASM operators in the Development Minerals sector countrywide are numerous, many of them informal, presenting a data capture challenge. Hentschel et al. (2003) estimate that broadly 30,000 people are involved in ASM activities in Zambia and 30% of these are women (and children). Fig. 23 and Fig. 24 below show the findings of the current survey and seem to agree with Henschel et al. (2003) in the general conclusion that broadly women make up 21.1% - 41.4 % of miners involved in ASM activities in Zambia.

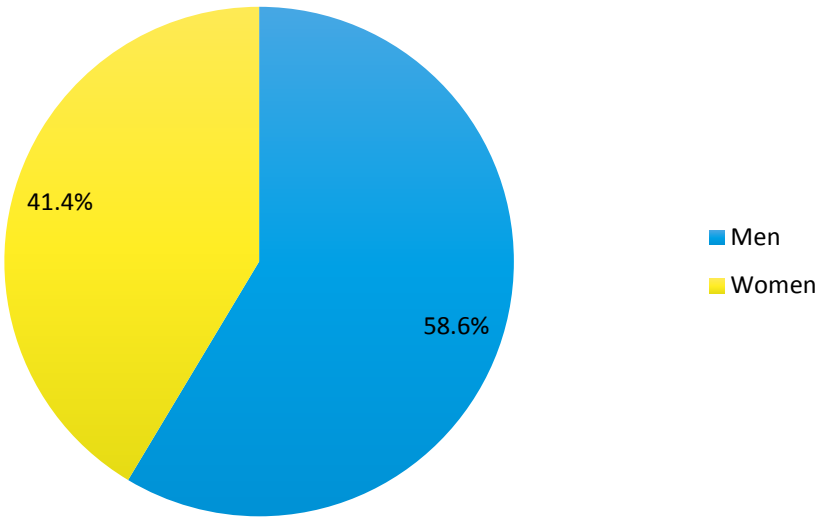


Fig. 23 : Snap Survey employment data by gender.

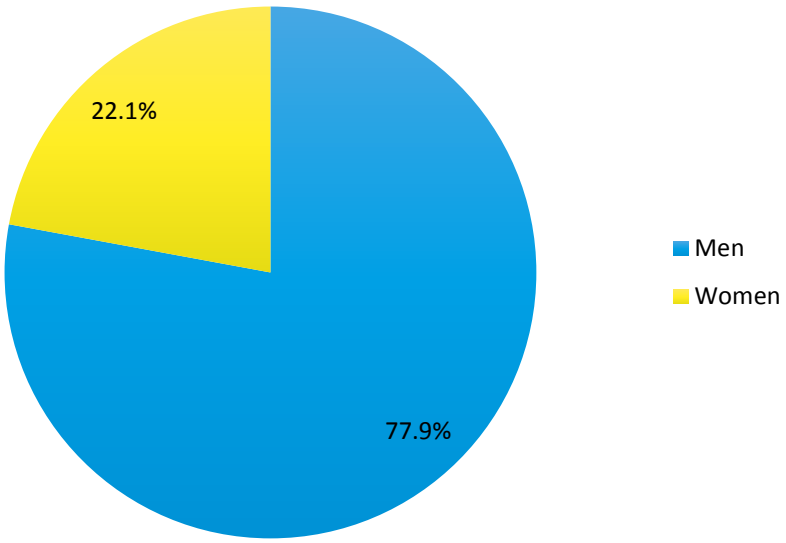


Fig. 24: Baseline survey employment data by gender.

Site assessment data indicates that the typical pay for a miner, in an informal operation, ranges from ZMW 1,000-3,600 (or US$100.00 to US$360.00) and averages ZMW1,855 (US$185.50) per month. Although reliable statistics are unavailable

regarding the Development Minerals sector, the Economist reports that miners in Zambia (across multiple size operations) make up to ZMW9,518 (or US$951.80) per month[19]. However, not all miners can work for formal mines and the visited sites often employ individuals who would otherwise live in extreme poverty. Therefore, the project sites are enhancing livelihoods and creating opportunities that would otherwise not exist for their workers. Fig. 25 shows the typical monthly salary/wage among the studied sites.

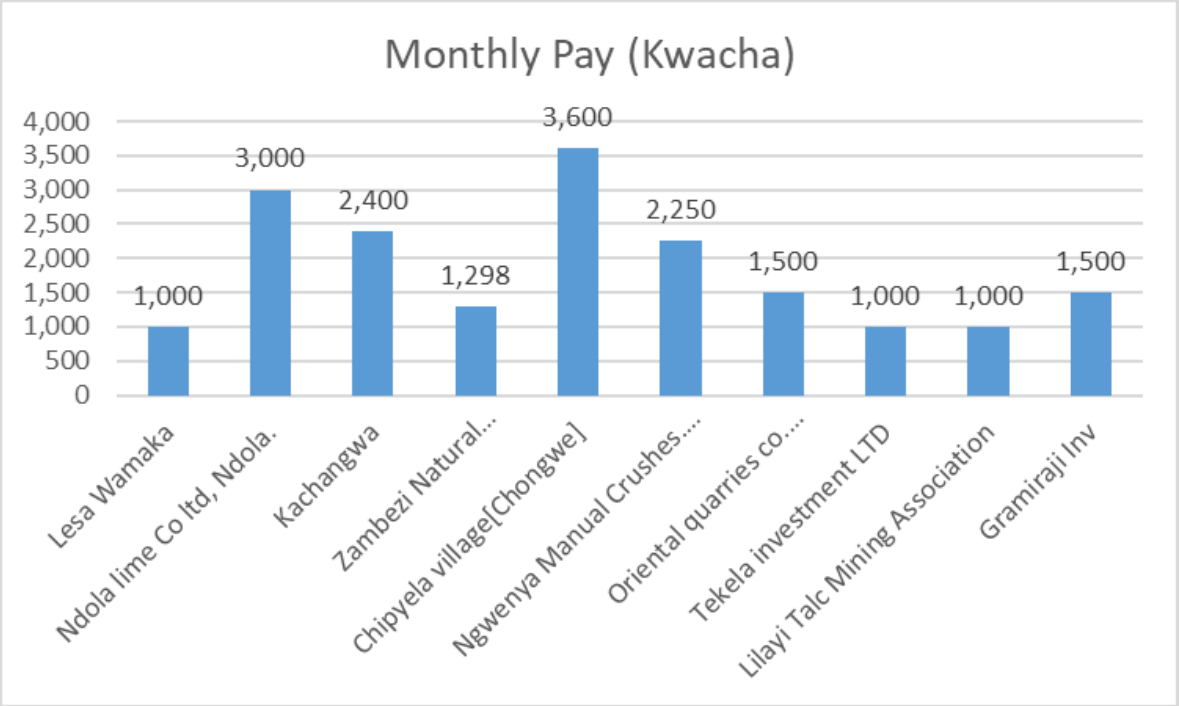


Fig. 25: Typical pay (Zambian Kwacha; Exchange rate: ZMW10/US$) of the studied mine sites.

Employment in the formal Development Minerals sector generally conforms to relevant employment and labour laws and standards[20]. However, working conditions do vary across different formal Development Minerals companies. For example, at Kalulushi Clay Bricks, work is seasonal, and 150 people are employed from the local area when bricks are being produced over a four- month period each year. However, these seasonal positions are not required in periods of non-production. Generally, most formal Development Minerals operations offer year-round work based on regular rosters and shifts.

[19] Statistics in Zambia (The Economist, 2010) https://www.economist.com/blogs/baobab/2010/12/statistics_zambia

[20] This is not to suggest that the sector is compliant across all relevant labour and employment law and legislation.

Rates of pay, labour standards and OHS practices are generally low or very low across all types of informal sector employment and work. Table 16 shows compensation data from the study alongside the total number of employees and an indication of whether the operation was formal or informal. Although data is limited, it is somewhat consistent with the general notion that informal operators pay employees less than formal operators. The average pay among formal Development Minerals operators was ZMW2,250 (US$225.00)/month compared to ZMW1,756 (US$175.60)/month amongst informal operators. However, the site with the highest reported compensation rate of ZMW3,600 (US$360.00) was Chipyela an informal sand mining site with 30 workers.

Table 16: Employee Compensation Data.

Site	Total Number of Employees	Compensation (ZMW/Month)	Compensation (US$/Month)	Formalisation Status
Ngwenya Manual Crushers in Livingstone	190	2,250.00	225.00	Informal
Zambezi Natural Stones in Siavonga	28	1,298.00	129.80	Informal
Lesa Wamaka	80	1,000.00	100.00	Informal
Ndola lime Co Ltd in Ndola.	220	3,000.00	300.00	Formal
Kachangwa	70	2,400.00	240.00	Informal
Oriental Quarries in Makeni Area, Lusaka	646	1,500.00	150.00	Formal
Tekela Investment Ltd in Kalulushi	25	1,000.00	100.00	Informal
Lilayi Talc Mining Association in Lusaka	150	1,000.00	100.00	Informal
Gramiraji Ltd	10	1,500.00	150.00	Informal
Chipyela Village in Chongwe	30	3,600.00	360.00	Informal

5.10 SWOT Analysis

Identification of strengths, weaknesses, opportunities and threats (SWOT) for any sector, including the Development Minerals one, is crucial for the development of well informed and appropriate policies for social and economic development. It should be noted, however, that a SWOT analysis, without accompanying evidence-based research, would not be effective in informing policy formulation. The “Report on

National Consultation Workshop and Development of a Road Map and Work Plan for Zambia" contains a useful summary SWOT analysis of the Development Minerals sector, which is worth reproducing here (Table 17). It is clear from this SWOT analysis that the Development Minerals sector has the potential to contribute significantly to wealth creation, diversification, industrialisation and development of Zambia's economy because Development Minerals and products are mostly used within the local economy. However, this can only happen if the country invests in appropriate skills development, research and development, infrastructure development and the development of a supportive policy framework as all these would promote the development and growth of the sector.

Table 17: Development Minerals sector SWOT Analysis.

Strengths	Weaknesses
• Abundant and easily accessible. • Strong links to wider industrial sectors and high constant demand. • Not affected by international price fluctuations. • Production is quick and low in complexity. • Has the capacity to accommodate new players without substantial new capital investment.	• Sector largely unrecognised, under-regulated, and often operating informally. • High cost of borrowing and doing business. • Low skill, low tech production. • Lack of investment (and lack of understanding by investors) makes it difficult for operators to expand or produce value added items. • Resources are poorly defined; poor and inadequate geological data. • High volume nature of the sector means high transportation costs.
Opportunities	**Threats**
• Potential to diversify mining sector and increased linkages to agriculture and construction sectors. • Potential for greater value addition. • Potential for greater employment and improvement of rural livelihoods. • Useful hedge against volatile copper prices.	• Resistance from communities due to negative environmental impacts from the sector. • Environmental damage from unregulated operators. • Lack of formalisation / regulation. • Imported development mineral products.

5.11 Conclusions and Recommendations

It is well established that Zambia's aspiration to industrialise, reduce poverty, create employment, and develop skills, through its Vision 2030 and 7thNDP, can only be achieved by ensuring that there is increased and sustained growth in sectors such as construction, agriculture, manufacturing and mining. Construction, agriculture and manufacturing sectors are known to be significant consumers of locally available Development Minerals and their downstream industrial products. There is also

potential for substantial import-substitution and savings in foreign exchange if Zambia were to develop its Development Minerals sector, through appropriate policies and legislation. For example, Zambia imports about US$200 million worth of its fertilizer requirements per annum to support the agricultural sector and yet, if the decision was made to invest in developing the production of phosphate fertilizer from the locally available 809.3 million tonnes of phosphate resource, a significant saving in foreign exchange would be made, and the funds utilised to upscale the Development Minerals sector. ZDA (2013) reports that the manufacturing sector accounted for 11% of Zambia's GDP. This has been growing at an average rate of 3% per annum, indicating that there is potential for deepening this growth. The same report indicates that the manufacturing growth has largely been driven by agro processing (food, oil seeds, beverages, and livestock products) but points out that there is great potential to localise the manufacturing of chemical/industrial products such as adhesives, explosives, glass, paints, sulphuric acid, soaps and detergents as wells for manufacturing of textile, garments and apparel.

In another example, the manufacturing of explosives (dynamite) requires nitro-glycerine and diatomaceous earth (a soft siliceous sedimentary rock composed of 80-90% SiO_2, 2-4% Al_2O_3 as clay, and 0.5-2% iron oxide) as raw materials. The role of diatomaceous earth is to act as a stabilising component of the explosive. While it may not be feasible to produce the nitrogycerine from locally available materials, it is possible to source diatomite locally as its occurrences have been reported in Mongu area[21].

Depending on end-use and specification, the value of limestone, for example, may vary from as little as US$3.00 per tonne when used as crushed stone for construction aggregate, to as high as US$200 per tonne when pure and used as a filler in the chemicals industry (Wilson and Amavilah, 2007). Between the two extreme values is a range of prices that depend on the specification and use of the material. This points to the un-tapped potential in developing the Development Minerals sector which would spawn many downstream industries from just one category of Development Minerals.

There are a range of options that need to be explored to ensure that groups of artisanal and small-scale miners who are formalising through formation of cooperatives have access to finance, grants and equipment loans to grow their enterprises. With formalisation, especially at ASM and MSM levels, it is expected that the formalised group could: (i) enter into partnerships for business ventures on similar lines as the BBM/Kyulu Trust partnership; (ii) acquire concessionary finance from institutions such as the Citizen Economic Empowerment Commission (CEEC), which is mandated to

[21] www.anzaplan.com/company/news/archive-2013/archivdetail-2013/article/scoping-study-for-diatomite-deposits-in-zambia-started/; accessed on 21 December 2018).

empower citizens; (iii) access funding through grants similar to those provided by multi-lateral organisations such as EU and UNDP.

For example, UNDP which is implementing the ACP-EU Development Minerals programme, has facilitated a partnership with the African Guarantee Fund to provide a credit guarantee facility of $12m in loans to support small businesses operating in the Development Minerals sector.[22] This facility could synergise with the planned Trade and Industrial Development Fund by the ZDA.[23] There is also potential for provision of support to cooperatives of ASM of Development Minerals to be integrated into the Business Linkages Programme and the Investment Promotion Protection Agreements which large companies must comply with, within the local content framework and other initiatives being promoted by the Zambia Development Agency (ZDA).

For the Development Minerals sector to play an increasingly important role in Zambia's socio-economic development and to contribute to empowerment of rural communities through ASM activities and employment creation, the following is recommended:

(a) Government, through the Geological Survey Department, should make a complete inventory of all Development Minerals in the country and establish their resource estimates, the licenses granted and whether extraction is undertaken by informal or formal operators;
(b) Government and Development Partners should entrench and expand the on-going geo-data mapping and digitization programme supported by the ACP-EU development Minerals Programme aimed at improving geodata accessibility by the investing public;
(c) Government should make a list of Development Minerals and products imported into the country and where possible reduce import levels by promoting the local production, especially by ASM operators, of certain goods for the home and export markets i.e. import substitution policy;
(d) Government should put in place an enabling environment to ensure ASM activities in the country are formalized as ASM has the potential to contribute to wealth and employment creation;
(e) Research and development institutions, with support from government and industry players, should conduct research on locally available Development Minerals for purposes of understanding their characteristics, understanding what other uses they can be put to, and quality enhancement;

[22] http://www.africa.undp.org/content/rba/en/home/presscenter/pressreleases/2017/06/USD_12_million_in_loans_to_support_thousands_of_small_businesses_quarrying_development_minerals_in_Africa/12_usd_million_in_loans_to_support_thousands_of_small_businesses_quarrying_development_minerals_in_Africa/

[23] This fund was referred to during consultations with the Director of Enterprise Development at the ZDA.

(f) Training institutions, working with government and industry players, should design, develop and implement an appropriate training curriculum for the development of skills in the Development Minerals sector.

(g) Support Technical Educational, Vocational and Entrepreneurship Training Authority (TEVETA) Institutions on onward implementation of the cobble stone training curricula; and

(i) Government should facilitate linkages of ASM operators to large-scale operators in Developmental Minerals the sector for support and market access.

6. REVIEW OF POLICY AND LEGAL FRAMEWORK

This section highlights the main elements of the policy and legal framework for Development Minerals in Zambia. It outlines the existing policy and legal framework for Zambia's mining sector in general and its relevance to Development Minerals in particular. The relevant policy and legal frameworks include: the Minerals Development Policy of 2013; the Mines and Minerals Development Act No.11 of 2015; the Mines and Minerals Development (General) Regulations of 2016 and other Regulations; the Seventh National Development Plans (2017-2021); and other Government strategies and policies that have an impact on the mining sector. This section also highlights the extent to which other regional and global initiatives focusing on the growth of the mining sector have addressed the Development Minerals sector.

6.1 Policy Framework

6.1.1 National Development Plans

A commendable aspect of the Zambian regulatory regime in relation to mining is that policies and the legal framework are rooted in two overarching documents – the Zambia Vision 2030 and the Seventh National Development Plan.

The *Vision* 2030 is the country's long term national development plan. It outlines the country's broad and long-term approach to becoming a middle-income country by 2030. The Vision states that despite Zambia's endowment with a diverse range of minerals including gemstones, and industrial minerals, the mining sector was dominated by copper production.

Vision 2030 visualizes a well organised private sector-led minerals resource exploration and extraction sector that contributes to socio-economic development by 2030. Mining in this case referred to both copper and non-traditional minerals. However, the achievement of the Vision was premised on the good performance of copper production as a result of a projected increase of copper prices on the international market. The development of the gemstone and non-traditional mining sector (quarrying) lagged due to lack of financial and technical capacity. This demonstrates the recognition of the relevance of Development Minerals in the achievement of Zambia's economic development during the drafting of Vision 2030.

The importance of Development Minerals had, however, also been highlighted in previous medium term national development plans. For instance, in the Fifth and Sixth National Development Plans, programmes aimed at promoting Development Minerals

were crafted as promotion of small-scale mining. This is because most players in the Development Minerals sector are small-scale. However, the focus on small-scale was a key limitation of the Plans because Development Minerals are mined by large-scale, small-scale and artisanal enterprises. Because of the peculiarities of Development Minerals in relation to the mining sector and artisanal and small scale mining in particular, the Seventh National Development Plan elaborates strategies for the promotion of Development Minerals that are aimed at achieving economic diversification and increase job creation.

Although the term “Development Minerals” has not been expressly mentioned in the Vision 2030, the minerals and materials are provided for in the medium-term plans, particularly, the Seventh National Development. This allows for programmes at national level to promote extraction and processing of Development Minerals for the sustainable development of the country. A key gap identified in the development plans, is the fact that the interventions are not broad enough to cover all aspects along the Development Minerals value chain.

6.1.2 Mineral Resources Development Policy

The Mineral Resource Development Policy was promulgated in 2013 and draws on the Vision 2030. The vision in the Policy is “to have a vibrant, well organised public-private partnership led mining sector, contributing in excess of 20% towards Gross Domestic Product (GDP) and sustainable economic development of the country by 2030.” To realise the vision, a number of policy strategies are included which are relevant for promoting Development Minerals. These are:

i. Promotion of exploration of industrial minerals for industrial development. Industrial minerals are classified as Development Minerals; therefore, this strategy is intended to promote them;
ii. Maintenance of a legal framework that is non-discretionary and which deters sterilization of mineral development; and
iii. Facilitation of small-scale miners’ access to finance for the development of the sector. Since most small-scale miners are involved in the mining of Development Minerals, improved access to finance will promote growth of the sector.

The above examples demonstrate that the Policy framework broadly provides for the promotion of Development Minerals.

6.2 The Legal Framework

The Mines and Minerals Development Act No.11 of 2015 and the Mines and Minerals Development (General) Regulations are the principal laws governing regulation of the mining industry in Zambia. The Act provides for:

i. **Licensing**: two types of mining rights at three levels are provided for as follows:
   a) Artisanal mining: issued to Zambians only over an area not exceeding six point six eight (6.68) hectares.
   b) Small scale: issued over an area not exceeding one thousand hectares and four hundred hectares for exploration and mining respectively.
   c) Large scale: issued over an area not exceeding two hundred thousand hectares and twenty-five thousand hectares for exploration and mining respectively.

   No distinction is made at licensing for the peculiarity of minerals except for gemstones, diamonds and radioactive materials. Due to the nature of the commodity, exploration licenses for gemstones and diamonds are non-renewable while exploration and mining of radioactive materials is restricted to large scale level. The lack of distinction of the various minerals at licensing stage is a gap that can hinder the extraction of Development Minerals. Most Development Minerals do not require long periods of exploration as is the case with gemstones.

ii. **Regulation of exploration**; **mining and mineral processing**: Exploration, mining and mineral processing activities are regulated based on the conditions of grant and regulations issued from time to time. The conditions of grant do not in most cases take into account the peculiarity of different minerals. For instance, license holders are required to pay the same area charges regardless of the differences in the values of minerals being extracted. In addition, the mineral production returns and mineral sales and export returns appear to be designed mainly for metals. This creates room for non-compliance by players in the Development Minerals sector.

Policy and Legal Frameworks

1. **Mineral Resources Development Policy**
2. **Mines and Minerals Development Act No.11 of 2015**
3. **Explosives Act No.10 and Regulations of 1974**
4. **Mining Regulations, 1971**
5. **Mines and Minerals (Environmental) Regulations, 1997**
6. **Mines and Minerals (Environmental Protection Fund), 1998**

iii. **Mineral royalty payment**: Although the Act provides for different rates of mineral royalty payments for different categories of minerals, not all minerals are adequately catered for. Mineral royalty is most suited for high value minerals which are in most cases exported. For industrial minerals which are consumed locally, another type levy would be appropriate both for ease of collection and affordability by the miner.

Further, unlike gemstones, there is no provision in the Act for the Minister to prescribe regulation particularly for Development Minerals, (Industrial Minerals) in this case.

Although the Act recognizes the different categories of minerals extracted in Zambia, there are no provisions to address their peculiarities. In this regard, the Act does not adequately cater for Development Minerals. The Act is more tailored to minerals such as copper, cobalt and gemstones.

The other pieces of legislation governing Development Minerals include:

i. Environmental Management Act No.12 of 2011: The Act provides for integrated environmental management and protection; conservation of the environment and sustainable management and use of natural resources among others;
ii. Mines and Minerals (Environmental) Regulations, 1997: They provide for regulation of the environment in the mines;
iii. The Mines and Minerals (Environmental Protection Fund), 1998: Provides the establishment, contributions to and management of the Environmental Protection Fund;
iv. Mining Regulations, 1971: Provides for regulation of safety and health in the mines. The Regulations are currently under review; and
v. Explosives Act No. 10 of 1974 and Regulations: Provides for control of manufacturing, use, possession, storage, importation, exportation, transportation, and destruction of civil explosives. The Act and regulations are currently under review.

6.3 International frameworks addressing Development Minerals

This section identifies useful and relevant international as well as sub-regional guidelines and frameworks. Some of these resources, including the extensive work carried out by the Africa Mining Vision, are outlined in the bibliography in Annex 1. It should be noted that the overwhelming majority of guidelines and national level policy and legislation in the ASM space are developed for metallics and minerals such as

gold and gemstones, meaning that they do not address the nuances of the key issues impacting on Development Minerals.

A starting point for assessing Zambia's management of Development Minerals vis-à-vis relevant international and sub-regional frameworks is still necessary. Accordingly, we have provided different ASM frameworks in Table 18 below, along with some brief commentary on how Zambia is perceived to perform in each area. Those frameworks are:

- The "Success Factors in Small Scale Mining Development" in UNECA's *Compendium of Best Practices in Small-Scale Mining in Africa*. This framework provides a useful breakdown of potential interventions in ASM management.[24]

- "Pillar 4" of the Africa Mining Vision, which relates to ASM management.[25]

- The IGF's guide on managing ASM. This guide is primarily focused on how to develop a strategy for ASM management.[26]

- The Southern African Development Community (SADC) Mining Protocol. This framework underpins the SADC's programme on mining.[27]

Table 18 summarises these frameworks and key provisions. The table groups interventions into the categories used in the UNECA compendium, which invariably results in some aspects of frameworks being slightly mis-aligned. The table however, provides a starting point for considering multiple aspects of the Development Minerals framework in Zambia. There are brief comments on Zambia's performance in each area in this table.

Finally, it is important to note that because these frameworks are generic and influenced by considerations for the metallics and gemstones, there are some aspects that are less applicable in the Development Minerals space. For example, some

[24] UNECA (2002), *Compendium of Best Practices in Small-Scale Mining in Africa,* accessible at http://www.africaminingvision.org/amv_resources/AMV/Compendium%20on_best_practices_in_%20smallsacle%20.pdf

[25] See the long report at UNECA (2011), *Minerals and Africa's Development* accessible at https://www.uneca.org/sites/default/files/PublicationFiles/mineral_africa_development_report_eng.pdf and the short bulletin / policy note – Africa Mining Vision (undated), *Bulletin 4: Boosting Artisanal and Small-Scale Mining*, accessible at http://www.africaminingvision.org/amv_resources/ISGbulletin4.pdf

[26] Inter-governmental Forum on Mining, Minerals, Metals and Sustainable Development (2017), *Managing artisanal and small-scale mining,* accessible at http://igfmining.org/resources/asm-guidance-document/

[27] Protocol On Mining in The Southern African Development Community (SADC) (1997), accessible at http://www.sadc.int/files/3313/5292/8366/Protocol_on_Mining.pdf.

frameworks suggest that the legislative framework should be consistent irrespective of the size of the operation. This makes sense when dealing with resources which could be extracted by either large-scale and mechanized means, or by ASM methods. When it comes to many Development Minerals resources, however, their low price as a function of their weight, and their relatively low value to international commodity markets means that extraction will be carried out by an ASM operator, therefore having provisions for a more specific ASM license might be appropriate. Accordingly, on these issues, the recommendations of this Study differ, somewhat, from the frameworks presented.

6.1.3 Africa Mining Vision

The Africa Mining Vision was adopted by African Union Heads of State in 2009 in an effort to broaden and make more holistic, the Africa regional approach to mining governance issues which had previously been more focused on fiscal impacts and flows, rather than tangible impacts of mining on development. Because of this, the Africa Mining Vision is highly complementary to the focus on Development Minerals, precisely because the primary benefits of Development Minerals are: inputs and linkages to other industries and sectors; and local employment. They are not a common source of direct government revenue in the form of Foreign Direct Investment (FDI) as is commonly the case with large scale mining. The key thrust of the AMV is summarised in Box 1.

The Africa Mining Vision is highly complementary to the Development Minerals agenda because of the:

i. focus on building mining's downstream linkages into other industries, rather than the simple export of raw materials;
ii. focus on linkages to building infrastructure;
iii. explicit mention of minerals with lower prices as a function of their weight "lower value minerals"; and
iv. focus on artisanal and small-scale mining and its link to local community development.

Box 1: The Africa Mining Vision[28]

"Transparent, equitable and optimal exploitation of minerals resources to underpin broad-based sustainable growth and socio-economic development"

This shared vision will comprise:
A knowledge-driven African mining sector that catalyses and contributes to the broad-based growth and development of, and is fully integrated into, a single African market though:
- Down-stream linkages into mineral beneficiation and manufacturing
- Up-stream linkages into mining capital goods, consumables and services industries
- Side-stream linkages into infrastructure (power, logistics, communications and water) and skills and technology development (HRD and R&D)
- Mutually beneficial partnerships between the state, the private sector, civil society, local communities and other stakeholders; and
- A comprehensive knowledge of its mineral endowment.

A sustainable and well-governed mining sector that effectively garners and deploys resource rents and that is safe, healthy, gender and ethnically inclusive, environmentally friendly, socially responsible and appreciated by surrounding communities.
A mining sector that has become a key component of a diversified, vibrant and globally competitive industrializing African economy.
A mining sector that has helped establish a competitive African infrastructure platform, through the maximization of its propulsive local and regional economic linkages.
A mining sector that optimizes and husbands Africa's finite mineral resource endowments and that is diversified, incorporating both high value metals and lower value industrial minerals at both commercial and small-scale levels.
A mining sector that harnesses the potential of artisanal and small-scale mining to stimulate local/national entrepreneurship, improve livelihoods and advance integrated rural social and economic development.
A mining sector that is a major player in vibrant and competitive national, continental and international capital and commodity markets.

[28] See UNECA (2009), *Africa Mining Vision*, accessible at https://www.uneca.org/sites/default/files/PublicationFiles/africa_mining_vision_english.pdf

Table 18: Comparison of Africa/Regional ASM Management Frameworks with Zambia's Legal Framework.

Area	UNECA's ASM Compendium	AMV Pillar 4 of Africa Mining Vision	IGF	SADC Protocol on Mining	Zambia's Policy, Legal and Regulatory Frameworks
Policy	Simple transparent licensing system Applications for licenses managed at district / regional level Licensing system for minerals trading at regional level Simple environmental regulations specific to ASM	Regularising informal ASM Simplifying and decentralising procedures for acquiring ASM rights	Develop an ASM vision Develop an ASM strategy	Develop SSM through technical extension services and marketing Enhance technological capacity of the sector Promote policies that will encourage and assist small scale mining.	The overall minerals development policy is well developed and has holistic objectives – from the Africa Mining Vision; to Zambia 2030; to the Mineral Resources Development Policy. While the aspirations of those frameworks are highly complementary to the Development Minerals agenda, they are not Development Minerals *specific*. Policy has no explicit statement on licensing, however it encourages and facilitates orderly and sustainable development of the ASM
Mining Legislation	Licenses issued on first-come-first-served basis Mining Right application process takes 2-4 weeks Single administrative system / cadastre System allow for sale and transfer of minerals rights Designation of specific areas for ASM Decentralisation of minerals rights administration	A legal regime that gives ASM rights-holders enough land, duration of rights and security of tenure	Integrate informal ASM operations into the legal system Provide property rights and obligations for ASM operators License and regulate ASM operations	Harmonisation of Mining Policies, Standards, Legislative and Regulatory Framework for Southern Africa.	The Mines and Minerals Development Act No. 11 of 2015, read together with amendment No. 14 of 2016 and backed by the Minerals Resources Development Policy. This law governs mining in Zambia and regulates the exploration and exploitation of minerals for large and small scale purposes and granting of licenses. Artisanal mining rights are granted to local people for an area not exceeding 5 hectares. The application process takes 30 days.

	Local government participates in administration				
Environmental management, health and safety	Control the distribution of dangerous chemicals Legislation promotes compliance with HSE regulations Data on chemicals entering country Legislation that promotes safe mining methods and reduction of HSE risks Locally enforced safety systems Regulations that improve working conditions HSE regulations specific to ASM		Training to safeguard the environment Disseminate and enforce regulations that safeguard water resources, reduce deforestation, end or reduce mercury use and other toxic substances, promotion of safe working conditions and access to healthcare. National minimum standards of health and education for ASM workers and their families	Promote sustainable development using a regional approach, encompassing consideration of cross border environmental effects Collaborating to train environmental scientists in the mining sector Sharing information on environmental protection and rehabilitation Health and Safety General commitments to improve practice and standards in occupational health and safety	The Environmental Management Act (EMA) of 2011 gives Zambia Environmental Management Authority (ZEMA) the mandate to issue environmental permits and monitor compliance of extractives and processing industries, including the small scale miners in Development Minerals. ZEMA enforces such while educating the general public on matters of environmental and public health. For proposed Development Minerals project by ASM, the EMA also requires carrying out environmental impact assessments. Water Resources Management Act, 2011 regulates domestic and commercial water use. The Mining regulations enforced by Mines Safety Department to ensure compliance to OHSE at ASM sites.
Institutional capacity	Offices are close to mining areas, and are well staffed and funded, can collect revenues and provide services Small scale miners' organisations exist to advocate for ASMs	Realistic implementation plans for enhancing institutional capacity Decentralisation of administration of ASM rights Accessible institutional, technical and financial support	Strengthen policies and systems for collection of ASM revenue		Currently the MMMD does not have adequate capacity to monitor and regulate ASMs in general and operators engaged in the extraction of Development Minerals in particular. This is evidenced by the many informal activities across the country. The government has taken services closer to areas of operation through the establishment of Regional Mining Bureaux. However, the granting of mining rights is still centralised

Gender in mining	Policies address any limitation on women working in mining Women miners organisations established and organised	Put in place measures to redress discrimination against women, both in law and in practice.	Strengthen the role and security of women in ASM	General principle that members shall promote economic empowerment of the 'historically disadvantaged' in the mining sector: defined as disabled people, women and indigenous people.	The country has a Gender Policy and a Ministry responsible for gender The country enacted the Gender Equity and Equality Act in 2015 The Mineral Resources Development Policy provides for gender mainstreaming in the mining sector Zambia has associations and cooperatives championing advocacy and rights of women in mining.
Child labour	Mining policies support eradication of child labour in mining	Prohibition of child labour	Significant and verifiable reduction of children in ASM. Strengthening and monitoring of laws on child labour in ASM areas		Zambia is a signatory of Worst Forms of Child Labour (WFCL), as presented in the 1999 ILO Convention No. 182. Employment of Young Persons and Children Act of 1994 prohibits employment of young persons below the age 16

6.4 Assessment of Zambia's Legal and Regulatory Framework

6.4.1 Policy

The *Vision* 2030 is premised on increase in economic growth driven mainly by mining. The impetus for mineral-led development is further articulated in the 7NDP. The objectives of Zambia's Vision 2030 on mining are aligned to the objectives of AMV.

Both AMV Pillar 4, which focuses on ASM management, and the Zambian Mining Policy aspire for the development of the ASM and the Development Minerals sector.
The current Mineral Resources Development Policy is well articulated and adequately addresses the ASM sector in general. One of the objectives of the current policy is to promote exploration and exploitation of Development Minerals for Industrial development.

The AMV Pillar 4 emphasises the regularisation of the informal ASM. The Zambian Industrial Policy seeks to promote the growth of cooperatives and of micro and small to medium-sized enterprises, including ASMs, through development of the framework for formalisation.

The government has put in place a computerised cadastre system which is clear and transparent with efficient procedures for granting of mineral rights. However, applications for mineral rights can only be lodged at the MMMD in Lusaka. To enhance service delivery, the Mining Policy has measures that seek to enhance capacity of the Regional Mining offices whose role include providing technical extension services to ASM in Development Minerals among others.

6.4.2 Mining Legislation

AMV Pillar 4 provides for the development of a legal framework that ensures that ASM rights-holders have adequate land, duration of rights and security of tenure. The current Mines and Minerals Development Act governs the exploration and exploitation of minerals by large, small scale and artisanal miners. Artisan mining rights are granted to local people for an area not exceeding 5 hectares for 2 years; while small scale mining rights are granted to citizen owned, controlled and influenced companies for an area not exceeding 400 hectares for 10 years and renewable. Although under the law, the mining right application process must not exceed 30 days, in practice this may take longer depending on the frequency of the sittings of the Mining Licencing Committee.

Security of tenure of all mining rights, including artisanal and small scale operators in the Development Minerals sector, is guaranteed by law.

6.4.3 Environmental management, health and safety

The SADC Protocol on Mining provides general guidelines on the promotion of sustainable development using a regional approach in conducting Environmental Impact Assessments, especially in relation to shared systems on cross border and environmental effects. Furthermore, the Protocol encourages collaboration in training environmental scientists in the mining sector and information sharing on environmental protection and rehabilitation. However, like AMV Pillar 4, the SADC Protocol does not provide specific guidance on environmental management, health and safety in relation to ASMs.

The Environmental Management Act (EMA) of 2011 gives Zambia Environmental Management Agency (ZEMA) the mandate to issue environmental permits and monitor compliance of extractives and processing industries, including the small-scale miners in Development Minerals. ZEMA enforces this, while educating the general public on matters of environmental and public health. For proposed Development Minerals projects by ASM, the EMA also requires carrying out environmental impact assessments.

The SADC Protocol on Mining encourages member states to cooperate in improving practices and standards in occupational health and safety in the mining sector. It further encourages the sharing of training and promotional facilities related to OHS. Occupational Health and Safety Act of 2010 provides for the following: (i) establishment of Occupational Health and Safety Institute and its functions; (ii) establishment of health and safety committees at places of work; (iii) health, safety and welfare of persons at work; (iv) duties of manufacturers, importers and suppliers of articles, devices, items and substances for use at work; and (v) protection of persons, other than persons at work, against risks to health or safety arising from or in connection with the activities of persons at work. In addition, the Mining regulations enforced by Mines Safety Department ensure compliance to OHSE at ASM sites.

6.4.4 Gender in mining

AMV Pillar 4 encourages African countries to put in place measures to redress discrimination against women, both in law and in practice in relation to ASM. Zambia's National Gender Policy is aimed at "…ensuring the attainment of gender equality in the development process by redressing the existing gender imbalances. It also provides for equal opportunities for women and men to actively participate

and contribute to their fullest ability and equitably benefit from national development…". The policy has very clear guiding principles for gender equity and equality, which include rights-based approach, gender mainstreaming, transparency and affirmative action[29]. Despite these Policy provisions, there is no detailed implementation plan with a monitoring and evaluation framework.

The Gender Equity and Equality Act of 2015 provides for the protection and promotion of gender equality and women's empowerment in Zambia. However, there is no mention of mining or minerals in the Act.

The Minerals Resources Development Policy has sufficient measures for the sustainable development of small-scale mining (SSM) and gender equality. The Policy does not specifically address artisanal mining. Also missing in the Policy is the detailed implementation plan, with a framework to monitor and evaluate progress in achieving the objectives of the policy. In terms of legal framework for mining, the Mines and Minerals Development Act of 2015 provides for equitable gender representation on the Mining Licensing Committee. While the Policy has specified areas of gender mainstreaming in the mining sector, the Act does not have such provisions.

6.4.5 Child Labour

The 1999 ILO Convention No. 182, to which Zambia is a signatory, promotes the elimination of the participation of children in any work which "by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of children". Equally under Pillar 4 of the AMV, child labour is prohibited. In Zambia, the Employment of Young Persons and Children Act of 1994 prohibits employment of young persons below the age 16.

6.5 Observations and Recommendations

The overall policy and legislative framework with regards to mining in Zambia has a clear vision, objectives and implementation strategies for the Development Minerals sector. This vision is broadly aligned to international frameworks such as the Africa Mining Vision and SADC Protocol. This very strong focus on strategy is commendable, especially since in some countries the reverse is true – i.e. that the operational apparatus is very detailed, but their overall purpose is less so.

[29] Artisanal and Small-Scale Mining, Gender Equality and Women's Empowerment: Gap Analysis of the Provisions of the National Regimes of Malawi and Zambia against the Africa Mining Vision, 2017

The current Mines and Minerals Development Act does not reflect the different capacities and needs of different types of mining operations. This lack of differentiation has the potential to severely hinder formalization of the ASM Development Minerals sector. It is also worth noting, for example, that adherence to different legislation is not always consistent i.e. that mine operators are either compliant with everything or nothing. The field work carried out for this study, for example, found that ASM operators were often legally formed enterprises, but did not hold a mining license (and therefore were mining outside the legal framework) due to the perceived high mining license fees.

Two of the recurring and interlinked themes and recommendations of this report concern the need to achieve higher levels of formalization, which can be achieved, in part, through greater decentralization. Individuals, communities and companies are often operating without a formal license, and as a result do not pay license fees or royalties, nor provide regular reporting to MMMD.

There are several factors in the legislative framework, that discourage formalization. They include the:

- very short tenure of 2 years for an artisanal license which is non- renewable;
- very high obligations and reporting requirements under section 35 of the Mines and Minerals Development Act (2015), irrespective of the size of an operation;
- need for an Environment Project Brief approval from ZEMA; and
- Licensing function is still centralized.

It is recommended that MMMD considers formulation of a legal framework for Development Minerals which would incorporate, but not be limited to, the following aspects:

i) Licensing;
ii) Monitoring and regulation;
iii) Fiscal regime; and
iv) Gender.

7. ASSESSMENT OF INSTITUTIONAL AND TECHNICAL OPERATING CONTEXT

On the back of minimal contribution of mining and quarrying to GDP (i.e. standing at 12.9% at the time of conducting the present baseline), government elaborated a strategy pertaining to the promotion of extraction and processing of gemstones and industrial minerals in the 7th National Development Plan which runs from 2017 to 2021. 7NDP emphasizes a diversification agenda within the mining sector to other minerals especially industrial /Development Minerals. The plan emphasizes increased exploration, mining, processing and promoting use of industrial minerals and gemstone products, to increase contribution to the growth of other sectors.

The following are the programmes outlined for intervention during the period of implementation of the 7th National Development Plan:

i. Geological information generation and provision;
ii. Mineral processing technology development;
iii. Small-scale miners' empowerment;
iv. Small-scale mines regulatory framework enforcement;
v. Market linkages development;
vi. Strategic environmental assessment and risk management; and,
vii. Mineral exploration promotion.

More specifically, the Mineral Resources Development Policy of 2013 provides for:

i. Restructuring, streamlining and strengthening of the administrative and organizational framework necessary to properly and effectively administer, promote and service the mining sector;
ii. Developing capacities on the operational inadequacies of the Geological Survey, Mines Development and Mines Safety Departments; and
iii. Establishing a monitoring department in the Ministry.

The following section situates the present institutional and operating context within the foregoing broader development planning context in relation to mining and quarrying.

7.1 Institutional Context

7.1.1 Key institutional players, roles and responsibilities

At present, there is no institutional arrangement that is specific to the promotion of Development Minerals. However, Development Minerals are managed as part of

other minerals under the Ministry of Mines and Minerals Development. As stated above, the national development plan recognises and refers to industrial minerals and quarrying.
Additionally, some of the programmes laid out in relation to small scale mining are of relevance to the promotion of Development Minerals.

Whereas there is currently no specific Development Minerals department or unit within the MMMD, [30] the Mines Development Department hosts the Small-Scale Mining Development section, which includes a Survey Unit as well as the regional bureaux. This section at present provides support to the Development Minerals sector.

7.2 Analysis of institutional capacity and service delivery capability

The following sub-section subjects the Ministry of Mines and Minerals Development technical departments and other relevant institutions to an analysis of their institutional capacity and service delivery capability and relate these aspects, to the Development Minerals sector. This will be done for national and subnational institutions respectively.

7.2.1 National Institutions

The main institutions that are of relevance to the promotion of Development Minerals are as follows; Ministry of Mines and Minerals Development (MMMD), Patents and Companies Registration Agency (PACRA), Zambia Development Agency (ZDA), Zambia Environmental Management Agency (ZEMA), Ministry of Labour and Social Security, Ministry of Commerce, Citizens Economic Empowerment Commission (CEEC), Ministry of Lands and Natural Resources, Ministry of Water Development, Sanitation and Environmental Protection, Federation of Small Scale Mining Associations of Zambia (FESSMAZ), Zambia Revenue Authority (ZRA), National Council for Construction (NCC), Roads Development Agency (RDA), Water Resources Management Authority (WARMA) and the Technical Education, Vocational, and Entrepreneurship Training Authority (TEVETA).

7.2.1.1 Ministry of Mines and Minerals Development (MMMD)

The Ministry of Mines and Minerals Development is the line Ministry that provides oversight for all exploration, mining, and mineral processing operations in the

[30] See Annex 6 for the Ministry of Mines and Minerals Development's organisational charts

country. It enforces and administers the Mines and Minerals Development Act of 2015 and its subsidiary legislation. The entire legal framework is guided by the Mineral Resources Development Policy of 2013.

In order to execute its mandate, the Ministry is divided into the following technical departments[30]:

I. Geological Survey Department (GSD)

The mandate of the Geological Survey Department (GSD) is to carry out regional mapping, exploration and earthquake monitoring around the entire country and to act as the main advisor to the Minister of Mines and Minerals Development on all geological matters. This means that the department is the main repository for geological data and information in the country.

Institutional capacity

At present a database is maintained on Development Minerals which is based on data acquired between the 1960s and 1980s. Continued collection of data has been hampered by human resource constraints. For example, the Department has not had geologists specialised in Development Minerals and areas such as reserve estimation.

Recent interventions have been made to build the necessary capacity through institutions and programmes such as PanAfGeo, Japan Oil, Gas and Metals National Corporation (JOGMEC) and the ACP-EU Development Minerals Programme. They have provided training in various areas such as geo-data digitization and mapping of Development Minerals, reserve estimation and remote sensing and also procured state of the art laboratory equipment for the GSD. The ACP-EU Development Minerals Programme geodata digitization training programme has resulted in an expansion of the geodatabase for Development Minerals arising from reserve estimates undertaken in four districts as follows: salt (Kasempa District), limestone (Masaiti District), sand (Kitwe District) and feldspar in Kabwe.

Support services

The range of services offered by GSD include data gathering, advisory services, geo-technical advice and commodity evaluation to resource level. These services are also available to the Development Minerals sector. More specifically, GSD undertakes chemical analysis for evaluating cement grade limestone, determination of clay quality, gemstone valuation and mapping and resource evaluation.

The ACP-EU Development Minerals Programme, in collaboration PanAfriGeo, also supported the Ministry of Ministry of Mines and Minerals Development through GSD to develop the ASM handbook. This ASM Handbook provides, among other key components; a guide to exploration, licensing procedures and the basic geology of Zambia.

Mining sector promotion

The Department participates in various fora in order to show-case geological information available on Zambia's mining sector for purposes of attracting investment into the sector. At international level, GSD participates at the Africa Down Under Mining Conference in Perth, Australia; Mining Indaba in Cape Town, South Africa; China Mining Conference and the International Conference on Geology, Mining, Metallurgy and Ground Water Resources in Livingstone, Zambia. Local promotional engagements include Copperbelt Mining, Industrial and Networking Expo (CAMINEX); Zambia International Trade Fair (ZITF) in Ndola; Association of Zambian Mining and Exploration Companies (AZMEC); Zambia International Mining and Energy Conference and Exhibition (ZIMEC); Explorers Forum; National Conference on Geology, Mining, Metallurgy and Ground Water Resources; and the Provincial investment exposition.

Relationship with Operators and ASM

The relationship with operators and ASM is governed by the existing legal framework. As part of its mandate, GSD disseminates geo-data and carries out inspections in exploration and mining sites where on-the-spot technical advice is offered. This is also done for purposes of regulations and compliance monitoring. The snap survey conducted in the fourth quarter of 2016 on Development Minerals indicated that out of 109 sites visited, 41 were operating informally. Therefore, it is important that these operators who are operating outside of the formal legal framework are supported to regularise their activities so that they can be regulated by Government to meaningfully integrate into the national economy.

Capacity gaps and training needs

Existing gaps include: inadequate reserve estimation; inadequate gemstone valuation capacities and centres; scanty mineral processing capacities; inadequate geodata management and research, all of which are relevant to the growth of the Development Minerals sector. A significant lack of laboratory and drilling equipment to support exploration was also noted.

II. Mining Cadastre Department

The Mining Cadastre Department is mandated to efficiently administer the licensing function of the Ministry of Mines and Minerals Development for the purpose of attracting investment into the mining sector. Licensing is performed by the Mining Licensing Committee whose membership is drawn from various institutions to promote transparency. The Department has made the cadastre map available online and accessible worldwide. Therefore, areas that are available for licensing are visible to everyone around the world at the same time. In administering the licensing function, the Department follows the first-come-first-service principles. As

such, the Mining Cadastre Department promotes transparency in mining sector governance in Zambia, particularly from the perspective of licensing.

The flexi cadastre software used by the Department is based on sound and tested technology. For instance, the software cannot allow overlapping licensing on the same piece of land. In this regard, another key function of the Department worth highlighting is the delineation of mining rights boundaries.

Institutional capacity and gaps

Mining Cadastre Department lacks the required number of staff and the skills to executive its statutory mandate effectively. The current organizational structure is inadequate and requires restructuring of the whole Department to ensure the recruitment of personnel whose skills are aligned with the prevailing functions.

Other gaps identified include human resource constraints in terms of capacity and capability, inadequate financial resources to implement work plans and training programmes, as well as inadequate vehicles to undertake regulatory inspections and other duties.

Mining sector promotion

By making information available online and enabling online applications for mining rights, the Department contributes significantly to the promotion of Zambia's mining sector, including Development Minerals. Like the GSD, the Mining Cadastre Department takes part in various local and international fora to explain licensing procedures and provide assurance to prospective investors and operators on aspects such as security of tenure of mining rights, including associated legal provisions in support of the license issued. Key among the fora are Africa Down Under in Perth Australia, Mining Indaba in Cape Town and the China Mining Conference together with local shows and investment expos.

Support Services

In the event of disputes pertaining to license boundaries, the Mining Cadastre Department provides accurate official license coordinates for the resolution of such disputes.

III. Mines Development Department (MDD)

MMD is a statutory institution whose main functions involve the promotion of the development of new mines around the country whilst monitoring and regulating existing mining operations. From time to time, officers of the Department conduct inspections to ensure that operators are in compliance with the Mines and Minerals Development Act in executing their mining operations. Apart from the general regulatory functions, the Department monitors the production and export of mineral products from the country to ensure that accurate figures are published, and that

Government receives appropriate mineral royalties and taxes into the treasury. In this regard, the Department also issues mineral export permits. Furthermore, MDD is currently collaborating with the Zambia Revenue Authority (ZRA) through the Mineral Value Chain Monitoring Project (MVCMP) and the Mineral Production Monitoring Support Project (MPMSP). The two projects, having begun mainly with a focus on large scale mines, are gradually extending to incorporate statistics generated by small scale mining operations.

As such, quarrying operations of Development Minerals fall under the supervision of the Mines Development Department.

Institutional capacity

The Department is headed by the Director of Mines, a public officer, who has and may exercise and perform the powers and functions conferred or imposed upon the Director under the Act or any other written law, and who generally supervises the proper and effectual carrying out of the provisions of the Act (Mines and Minerals Development Act).

At the time of the compilation of this Baseline Report, the Department had a total of seventy-two (72) officers comprising mining engineers, metallurgists, mineral economists, surveyors, mining technicians, cartographers, general administration staff and classified daily employees. At the time of writing this report, there were seven (7) vacant positions in the department that still required to be filled.

In a bid to decentralise its services, the Department established six (6) Regional Mining Bureaux to serve provincial regions. The offices are located in Choma, Chipata, Mkushi, Kitwe, Solwezi and Mansa. The role of these bureaux is to inspect mining activities in their respective region. Information and reports gathered in each regional office is submitted to the ministry through the office of the Director of Mines. Each mining bureau is responsible for all mining operations in the region, including Development Minerals operations. The bureaux focus on inspections and technical assessments, with no wardens or community engagement officers in the regional centres.

To operate effectively, the proposed structure must be fully operationalised. The mineral economic section awaits Treasury authorization to be operationalised. To further illustrate existing capacity and gaps of the MDD, Annex 7 provides additional information pertaining to the proposed establishment.

Support services

Like other technical departments, MDD provides advisory services to miners during routine inspections.

Mining sector promotion

MDD provides statistics on the state of mining investment in the country. These statistics may include the number of operating mines, mining projects under development, expansion projects for existing mines and mine production data. Additionally, the department highlights the fiscal regime that is in place in Zambia's mining sector.

In order to provide the above information, MDD participates in the same international and local fora that have been highlighted above under the Geological Survey Department and the Mining Cadastre Department.

Relationship with operators and ASM miners

As stated under the mandate, MDD monitors operations of artisanal and small scale miners through carrying out inspections at mine sites to ascertain the state of each project. Additionally, MDD demands reports such as production levels/amounts which must be submitted to the Department on a regular basis as required by the law.

Wherever a mining license is issued, it is the mandate of the Department to ensure that the license is productive and not being held for speculative reasons. During inspections, MDD also provides technical support to the operators and miners to enhance compliance with existing regulations and to enhance productivity.

IV. Mines Safety Department (MSD)

The mandate of the Mines Safety Department is to monitor and regulate the mining industry with regards to safety, occupational health and environmental issues. It is the only department that is located away from Lusaka. The Department is found in Kitwe, near large scale mining operations so as to closely monitor and regulate large scale mining operations.

Institutional capacity

For a long time, MSD has aspired to have institutional capacity where the Department is decentralised to all areas where mining is taking place. For example, there is no physical presence in areas such as North-Western, Central, Lusaka, Luapula and Southern Provinces where a lot of mining operations are already underway. When accidents and incidences occur in these places, officers must be dispatched all the way from the Copperbelt Office. This makes it difficult to carry out satisfactory investigations into accidents and incidences as some of the evidence may not be available by the time the officers arrive on the scene.

The lack of physical presence in the areas mentioned above, particularly where significant mining is taking place, implies that the department must have a robust and well-funded programme to execute its mandate.

Capacity gaps

At present, the number of professional staff is not commensurate with the number of mining operations in the country. The shortage of staff hampers proper oversight for environmental, health and safety regulations. In addition, the absence of laboratory equipment and consumables, as well as lack of skills training in modern laboratory techniques, present additional capacity challenges in the functioning of MSD.

In the area of certification of equipment used by the mining industry, MSD lacks skills and equipment to undertake the necessary equipment tests and certification. These statutory tests are currently being conducted by accredited institutions with necessary skills and equipment as and when required. There is need for the Department to build capacity in this area so that this important statutory mandate is carried out by its own officers.

Support services

The MSD conducts sensitisation campaigns and activities to educate mine operators and miners on safety, environment and health issues to ensure compliance with the Mines and Minerals Development Act. These campaigns take the format of lectures on selected topics that are most relevant at a given time. In addition, regular mine inspections are conducted to ensure adherence to existing safety, environmental, occupational health and mining regulations.

Relationship with operators and ASM miners

The legal mandate of the MSD is not limited to large scale mining alone. Officers of the Department also conduct inspections -albeit in an adhoc manner- at small-scale mine sites of Development Minerals to ensure that extraction of the same is conducted in a safe and environmentally friendly manner and in keeping with occupational health regulations.

V. Institutional Collaboration

In recognizing the institutional limitation to address all the issues pertinent to a growing ASM sector, the department collaborates with other Government Departments and agencies, non-governmental organisations, and faith-based organisations. A key collaborator is the Zambia Environmental Management Agency (ZEMA).

Situated in the Ministry of Water Development, Sanitation and Environmental Protection, the ZEMA has overarching authority over environmental issues in the country. This mandate is drawn from the Environmental Management Act and its subsidiary legislation. In addition, for every mining project that is undertaken, the Mines and Minerals Development (Environmental) Regulations of 1997, demand that the developer prepares an environmental management plan which must be approved by ZEMA before operations can begin. This is to ensure that the environment is adequately protected during the life of the mining project.

To provide decentralised operations, ZEMA has set up regional offices, particularly in Ndola and Livingstone. The Agency plans to set up similar regional offices the remaining provinces in future.

7.2.2 Sub-national Institutions

The key sub-national level institutions are mainly local councils. Other important ones include regional mining bureaux under the Mines Development Department and the ZEMA regional offices, both of which have been highlighted earlier in this section.

7.2.2.1 Local Authorities

The extraction of Development Minerals quite often takes place under the jurisdiction of a local authority. Any mining project that has been licensed in a particular location is required to have consulted with the local authority of that area. This is to avoid a situation where proposals to establish Development Minerals operations compete with existing development plans of the local authority, especially as they relate to land use.

In view of the ambitions of most local authorities to upgrade their status (e.g. from town to city status) Development Minerals offer an opportunity to raise revenue as shown in Table 19.

Table 19: Potential for revenue from Development Minerals operations.

#	Type of fee	Amount paid per year	Receiving Authority
1	Council levy	Unknown	Council
2	Income tax	Depends on how much product is sold	ZRA, Council
3	Toilet levy	Unknown	Council
4	Water levy	Unknown	Council
5	Trading license	K750	ZRA, Council
6	Transport levy	Per load/trip	Council

The snap shot interviews conducted with selected operators and miners revealed that local authorities receive revenue from activities in Development Minerals operations. For example, all the 28 operators interviewed at their respective points of sale declared having paid one or a combination of the following fees, levies or taxes: toilet levy, water levy, council levy, income tax, trading license and transport levy.

A key observation however is that operators captured in the survey conducted their businesses in a manner that did not demonstrate long-term viability under present circumstances; due to their lack of business and enterprise development skills. This

was evident in the inability of many of the interviewed to give full account of the quantum of fees and levies remitted to councils and other authorities in a given year.

Other than revenue collection, the councils also see opportunity from Development Minerals to realise key infrastructural projects and installations that are required for that upgrade. In terms of employment, nearly every local authority is concerned about the high level of youth unemployment in their areas. Therefore, the extraction and processing of Development Minerals in their localities offers a very good opportunity for job creation, particularly for the youth, and for reducing the rate of unemployment.

However, from the perspective of environmental protection, where operations are closer to residential areas, sources of water and public infrastructure such as roads, local authorities take keen interest in the environmental impacts of such operations. There is therefore need for adequate consultations with the local authority and affected communities before a mining project is undertaken. To this extent, the local authorities are co-regulators with ZEMA and the Ministry of Mines and Minerals Development.

7.3 Operating context and business environment for Development Minerals operators

Key extension support service providers identified include: the technical departments of MMMD, PACRA, ZEMA, Financial Institutions, Councils and Training and Skills Development providers (e.g. universities, NCC, TEVETA, GPLTC, international organisations and NGOs, ZDA). The business environment under which the Development Minerals sector operates is discussed below.

7.3.1 Availability of geo-data

As stated above, existing geo-data on Development Minerals was acquired between the 1960s and 1980s. Available data is fairly robust as it indicates the quantity of reserves of industrial minerals and their locations. With the help of the ACP-EU Development Minerals Programme implemented by UNDP, the Geological Survey Department (GSD) compiled the data into a database in 2017 using MapInfo and Access softwares. This database is called Mineral Occurrence Database. The Mineral Occurrence Database has about 321 Development Minerals entries out of a total of 2,700 records.

The data is available to the general public at a fee. Prescribed fees depend on the services, type of information, level of detail and format required (see schedule in Table 20). To further enhance access to the data, the Development Minerals database has become part of the GSD's information package disseminated at investment promotion fora.

Table 20: Fee Schedule

INFORMATION	PROPOSED RATE (ZMW)	US $ DOLLARS
Data search fee	**360**	**70.00**
DIGITAL DATA		
Database of all the Mineral Occurrences of Zambia in GIS	**4500**	**950.00**
Geological Report	**100**	**20.00**
Geological Map	**300**	**60.00**
Memoir #1	**100**	**20.00**
Memoir #2	**100**	**20.00**
Memoir #3	**100**	**20.00**
Memoir #4	**100**	**20.00**
Memoir #5	**500**	**60.00**
Stream Sediments Geochemistry	**500**	**60.00**
Memoir #6	**300**	**60.00**
Geochemical Data	**5000**	**1000.00**
Geophysical Data (Magnetic) Scale 1:5 000,000	**5000**	**1000.00**
Geophysical Data (Seismic Data) Scale 1:5 000,000	**5000**	**1000.00**
Geophysical Data (Magnetic) Scale 1:50,000(Sheet)	**250**	**50.00**
Geophysical Data (Seismic Data) Scale 1:50,000(per Sheet)	**250**	**50.00**
Radiometric Data Scale 1:50,000(per Sheet)	**250**	**50.00**
Limestone package	**1500**	
Manganese Package	**1500**	
Gold package	**1500**	
Coal Package	**1500**	
HARDCOPY		
Annual Report	**100**	**20.00**
Technical Report	**100**	**20.00**
Occasional Paper	**100**	**20.00**
Bulletin	**100**	**20.00**
Economic Report	**100**	**20.00**
Special Publications	**300**	**60.00**
HARDCOPY PUBLICATIONS		
Annual Report	**100**	**18.00**

Technical Report	**100**	**18.00**
Occasional Paper	**100**	**18.00**
Memoir #1	**100**	**11.60**
Memoir #2	**100**	**11.60**
Memoir #3	**100**	**11.60**
Memoir #4	**100**	**11.60**
Memoir #5	**200**	**40.00**
Memoir #6	**200**	**40.00**
Bulletin	**100**	**11.60**
Economic Report	**58**	

However, in recent years, efforts to identify more occurrences and deposits of Development Minerals have been constrained by inadequate budget support to the GSD, compounded by high staff turnover and lack of specialised skills in Development Minerals at the institution.

The situation can be redressed by the short-term training interventions that are underway in the Ministry, with support mainly from cooperation partners including the ACP-EU Development Minerals Programme implemented by UNDP, that trained 20 geo-specialists on geo-data mapping, digitization and resource estimation of Development Minerals. However, the Department has capacity to carry out regional mapping and geo-chemical survey activities in the field. The equipment available is sufficient to carry out the work required.

The Technical Records Unit, which is the custodian of geo-data in the Department, has adequate human resources but lacks proper equipment such as A0 scanners and photocopiers. The Unit has a map and report sales office which is open to the public. Services available include searching, referencing and vending of maps and reports. Reports, maps and bulletins are accessible at a fee. Confidential information regarding active mining sites cannot be given to the public unless under legal instructions.

Most of the players involved in the extraction of Development Minerals are local informal small scale miners. Hence, access to data is a challenge because they are spread out throughout the country. However, data on Development Minerals can also be accessed from local authorities and research institutions such as the University of Zambia (UNZA) and Copperbelt University (CBU). Other providers include ZCCM-IH Library in Kalulushi, Zambia Chamber of Mines and the mining and exploration companies. For example, consultancy and laboratory services provided by UNZA attract a fee.

7.3.2 Mines and quarry management

Prior to 2016, the majority of ASM operators in Development Minerals lacked mining and quarry management skills. These skills are very important because they

have a direct bearing on the compliance levels of quarrying operations. For instance, the levels of production, the rate of accidents, incidence of occupational diseases and environmental hazards, will all reflect on the quality of management at the mine site.

The existing legal requirements for sound and acceptable occupational health and safety measures in Zambia applicable to large scale mining operations also extend to small scale mining.

The prevailing standards for mine safety are guided by a new initiative birthed at multilateral level which is called the Vision Zero Fund initiative (VZF). It aims to prevent work-related deaths, injuries and diseases in global supply chains by 2030. Zambia, together with the rest of the international community, is working to formulate and implement programmes in line with this vision. Furthermore, the initiative stems from the premise that all accidents are avoidable. Zambia's occupational health and safety laws are, in part, inspired by this understanding.

Therefore, with regard to mine accidents, no single fatality is acceptable, i.e. the fatality target is zero. However, historical circumstances in terms of occurrence of accidents are such that there are on average not less than ten (10) fatalities per year. This implies that arriving at zero fatalities would require fundamental steps. However, gradual steps can be made which are dependent on the following critical factors, among others:

- Automation, which leads to reduction of interface between humans and machines, thereby reducing accidents (automation is not politically attractive due to its negative impact on employment);
- Education for employers and employees;
- Promotion of workers' rights. For example, a worker should be protected by the law not to be compelled to work in environments that are not conducive; and
- Strengthening Zambia's legal framework.

In terms of injuries, the ambition similarly remains that they should be reduced to zero. This is because injuries are potential sources of reduced productivity and even fatalities.

Other than non-compliance, however, a key challenge is that national strategies to achieve the Zero Vision initiative require resources to be implemented.

In view of the foregoing frameworks and standards, the study revealed evidence of poor quarry management in several of the operations captured in site assessments undertaken as illustrated in figure. 26 below.

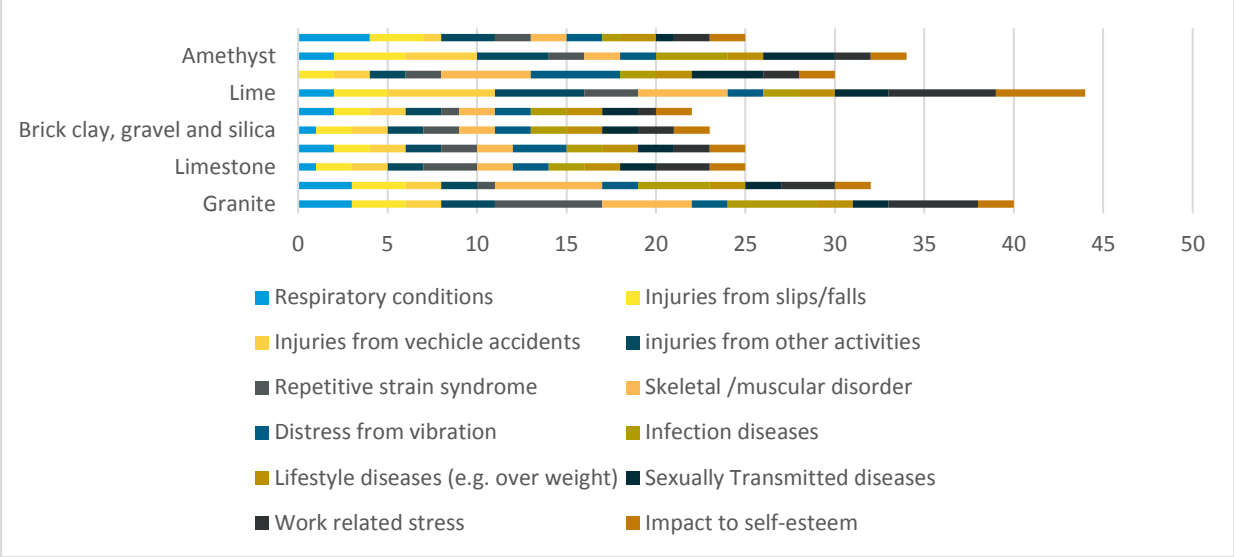


Fig. 26: Poor Quarry Management

In relating the overall occurrence of injuries and health problems with the type of material extracted, the Baseline Report revealed that lime and granite had the highest occurrence. The most notable problems associated with lime included: injuries from vehicle accidents and work-related stress; whilst for granite, the problems were: repetitive strain syndrome, work related stress and infectious diseases. These challenges were, in part, due to the absence of, or adherence to OHSEC management plans.

7.3.3 Environmental Management Skills

The environment, health and safety, and socio-economic impact questionnaire (Annex 5) was administered to collect additional data from 10 out of the 24 sites investigated. The additional data collected substantiated/confirmed the findings across the formal and informal operators in the Development Minerals sector summarised from pages 16-19 of the first field study report.

Overall, relatively poor occupational health, safety and environmental management practices were observed across all informal Development Minerals sites. Safety standards were poor with no personal protective equipment (PPE) such as safety goggles and dust masks being used by miners. Hazards such as land slips and craters created through poor mining practices were also observed across many sites.

Other occupational and community health issues included noise and vibration from blasting and motor vehicles, particularly from access roads and mining machinery. Environmental management was also relatively poor. Water pollution and poor waste and waste rock disposal ranked highest, accounting for 57.38 percent of the environmental impacts categories recorded.

On the upside, positive social impacts were reported in stakeholder interviews in relation to informal job creation and revenue streams to chiefs and local councils. The negative social impacts reported in stakeholder interviews included: increased alcohol consumption, gender-based violence, social conflicts over benefits distribution, and economic in-migration to mining project areas.

Child labour was observed or reported at three informal sites. An informal sand quarrying, an informal granite mine, and an informal basalt mine. Reasons given for child labour included: saving money for school expenses (for instance, school girls engaged in sand quarrying at Katuba); and helping out with family expenses (for instance, workers at the Ngwenya Community Cooperative in Livingstone District). In addition to child labour there were numerous examples of infants with their mothers at informal Development Minerals sites, pointing to a lack of affordable child care facilities.

In comparison to the informal sector, environmental and safety management standards in formal and larger mining operations were generally acceptable or good. Although the site team did not conduct a detailed Occupational Health, Safety, Environment and Community (OHSEC) audit at formal sites, general adherence to industry practices around safety and environmental management were observed. Examples of good safety management practices included wearing of PPE, traffic management, proper benching, hazard identification and pre-start briefing meetings. Examples of good environmental management included dust suppression, green energy, stagnant water management, rehabilitation of mined areas and air pollution control. Examples of good social responsibility practices included community projects carried out by larger operators and the employment of people from local communities. It is important to note, however, that there were still examples of OHSEC risks and performance issues noted by the project team. Examples included injuries caused by hammers, backaches, bruises, cuts and blisters, and a reported fatality arising from earth moving equipment. The finding implies the need for improvement in OHSEC performance in the Development Minerals sector.

7.3.4 Community Relations and Conflict Prevention

Good community relations are very critical for the viability of the mining projects. A project, even by a large mining company, can fail if it is not well-received by the community.

In Zambia, Development Minerals operations generally occur within close proximity to areas where people reside. This tends to lend the activities to possibilities of social tension and even conflict triggered by several factors. Field visits to selected sights revealed the prevalence of some forms of disputes between various interested parties (i.e. between miners and surrounding communities and between

some mining communities and the local authority). To manage conflicts, some mining operators have tended to turn to the local chiefs or police to intervene.

Fieldwork for this Baseline Report has revealed that operators found it easier to deal with conflicts arising from differences among workers, managers and other parties within the mining operations and operators as compared to conflicts between the mine and surrounding communities. Examples of disputes pertaining to the former scenario included the point of sale (POS) disputes emanating from competition over customers or buyers and salary increments for employees. With regards to the latter scenario, an example involved conflict arising from the relocation of people from the mining site by the local authority. It was apparent that whereas some efforts were put in place by large scale mining companies to manage community relations and secure a social license to operate, this was not the case for many ASM operators of Development Minerals. Lack of skills in community and social relations management, lack of dedicated staff and specialized units to deal with community relations, unreasonable demands by community members and lack of funds to meet more complex development needs of surrounding communities were cited as contributing factors impeding the miners from managing the conflicts that arise.

Women and Youth

There were fewer females in management as compared to men at the mine sites that were visited. Positions such as Projects Manager, Safety Manager, Managing Director, Site Manager, Supervisor, Director, Chairman, Production Manager/Engineer were held mainly by men. On the other hand, women occupied positions that included administrator, association member, sand miner, stone crusher, cleaners and canteen workers.

There were more men working on mine sites than women. Of the 13 sites visited and where gender disaggregated data was provided, it was discovered that 1030 workers were men while women were 699. However, there were some sites where the proportion of women employees was more than that of the men. For example, Ngwenya had 70 women compared to 35 while men; while at Lesa Wamaka there were 17 women and 9 men respectively.

Some of the prominent feedback received from miners during site visits which are of relevance to gender analysis, were the following:

- There was acknowledgement that mining tended to separate families for prolonged periods of time;
- It was self-reported by the interviewees, that when communities from other regions migrated to work at a given mine, there were increased levels of promiscuity resulting in sexually transmitted diseases;

- Although there was a significantly large number of women engaged in mining activities, there were still difficulties in responding to the unique needs of women. For example, some efforts were underway by some mines to ensure that women work only during day time shifts;
- Numerous differences and even disputes were reported among men and women mining workers regarding appropriate workload for women;
- Mines allowed both men and women to sell their mineral products at the mine site;
- There was a reported positive outcome for youth in terms of employment.

More specifically, reported impacts of the mining of Development Minerals on women and girls were as follows:

- Contrary to common perceptions that they were confined to the kitchen, women had entered a sector largely perceived as a preserve for men;
- Development minerals had created employment for women providing much needed income. Women miners educated their children, built homes and sustained their households from the income. This is particularly the case for single women and widows;
- With the exception of one mine site, all other sites visited reported positive impacts on their operations because of employing women.

It is clear from the foregoing that male dominance is not as pronounced in ASM of Development Minerals as it is in large scale mining operations. Some of the challenges that are associated with women's involvement in Development Minerals operations pertain to protection of rights of women, finding more appropriate work schedules that address women's productive and reproductive roles at household level and making the work place more conducive for women. There was little evidence of deliberate efforts aimed at enhancing the mine site environment (in the case of smaller, rural-based operators) to make them more conducive for women and girls (e.g. lack of gender-segregated sanitation and hygiene facilities). In addition to making provisions for women to work only during day shifts, other efforts are necessary to address the differential impacts a mining site has on men and women. The involvement of women in managerial and other senior positions was also a gap which some of the training programmes under the ACP-EU Development Minerals Programme are trying to address.

The foregoing observations and impacts also point to limited application of, or awareness of the provision of the Gender Equity and Equality Act No 22 of 2015. The law states, in part, that:

"31. (1) A woman has, on an equal basis with a man, the same right to access employment opportunities and work in all sectors of the economy, in particular the same right to—(d) receive vocational training and retraining, including

apprenticeship, advanced vocational training and recurrent training; g) protection of conditions of work, accessibility of work place and occupational health and safety"

It further states that an employer shall not discriminate against a woman—(c) in the terms and conditions on which employment is offered; (d) when making promotions, selection for training, retraining, vocational training, apprenticeship or access to other opportunities for advancement; (f) in the provision of facilities related to, or connected with, employment; and (g) in conditions of work or occupational health and safety. Adding that (4) A person, public body or private body shall not— (a) create artificial barriers to equal access to employment opportunities by using discriminating recruitment and selection procedures.

The law even goes on to provide for social protection by stipulating that *"(5) An employer shall — (a) take appropriate measures to eliminate discrimination against women in the workplace; and (c) provide special protection to women during pregnancy from harmful work"*

In supporting the implementation of the cited legal framework on gender equality, the ACP-EU Development Minerals Programme implemented by UNDP in Zambia has trained more than 200 SMEs and business development actors on Enterprise Skills, Market Analysis, Investment Promotion & Value-addition providing needed skills to thrive and to ensure better access to finance. The capacity building activities had been targeted in areas where most artisanal and small-scale mining is prevalent, namely in the Copperbelt, Lusaka, Eastern and Southern provinces. Mining of building materials has been active in urban areas where artisans extract and crush minerals for the available markets.

UNDP has taken the lead and engaged 3000 stakeholders, 43% women, from public and private sectors and community-based organisations in knowledge sharing activities.

In-country training workshops, the programme has reached 525 beneficiaries - 225 women (43%) and 300 men (57%) - and has resulted in enhanced knowledge and skills in the development of business plans, and adoption of business planning processes to access finance and business development services.

To complement the capacity building efforts, UNDP through the ACP-EU Development Minerals Programme competitively provided eight small grants to the small-scale miners to improve productivity, resulting in increased incomes through improved business management.

Six regional and national mining associations with a combined membership of 2,000 small scale miners have been engaged in capacity development interventions, supported to formalise and linked to market and investment

opportunities. This intervention contributed to the formation and support to 15 mining cooperatives.

7.3.5 Entrepreneurship Skills and Market Analysis Capabilities

Entrepreneurship entails the ability of individuals to establish and run a new business (often a small business) and absorbing associated financial and other risks in the hope of realising a profit. Closely linked to it is the need for the entrepreneur to have skills to analyse market fundamentals in order for the business products to have a ready market. Market analysis requires access to and interpretation of current information pertaining to conditions affecting the market place to inform the business decisions.

The survey revealed a huge gap in entrepreneurial skills among Development Minerals operators, particularly from the perspective of business planning, documentation and market information acquisition and usage. For instance, there were few mining sites visited where the operators had sound information on the market, largely because majority were price takers for the commodities sold. Additionally, most miners had no means of transporting the products far from their sites and the only customers they depended on are those who approach them at the mine site. Nevertheless, some miners and traders interviewed showed some knowledge pertaining to market issues. For example, 48 percent of operators interviewed reported that they knew who the buyers of their commodities were, where they came from and in some cases who the buyers in turn sold the materials to afterwards.

In recognition of the gap in entrepreneurship and market analysis skills, the ACP-EU Development Minerals Programme in collaboration with the Zambia Development Agency (ZDA) undertook targeted training programs intended to impart the skills. Notably, four (4) training workshops were held in Copperbelt, Siavonga, Chipata and Lusaka, benefitting 200 participants in the Development Minerals sector. The newly acquired knowledge, skills and competencies resulted in, increased confidence by the Development Minerals operators which enabled them to attract more customers and obtain new contracts, increasing their production and revenue.

7.3.6 Value chain development Skills

Zambia's policy framework has for a long time supported the development of skills for value addition. In fact, successive governments have each made policy pronouncements on value addition.

In relation to the mining sector, the Mineral Resources Development Policy of 2013 clearly provides for value addition in section 7.10. The policy states that

Government will promote and facilitate the development of downstream processing capacities for minerals by:

i. Providing an appropriate legal and fiscal regime;
ii. Exploring opportunities to expand the local metallurgical plant capacity in the country; and
iii. Identifying market potential for national and regional consumption of value-added products.

Pursuant to the 2018 National Industrial Policy Objective to increase the growth of the manufacturing sector from an average of 5 percent to 20 percent, and its contribution to GDP from 8 percent to 15 percent by 2027, the Government seeks to identify and support value chains that represent the most competitive prospects for value addition in priority sectors. Arguably, Development Minerals respond to this criterion as they have a direct impact on the domestic economy, through their massive contribution to infrastructure development.

Key institutions vital for the development of value addition skills in Development Minerals are Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA), the Gemstone Processing and Lapidary Training Centre (GPLTC) and the National Council for Construction (NCC).

Based on the findings of the Baseline Report and other reviewed reports, it is evident that Zambia requires investment in Development Minerals value addition in order to set up industries in flat glass manufacturing (for doors and window panes), tiles manufacturing, gypsum products, fertiliser, explosives and other products which can be manufactured/ produced from the abundant Development Minerals available in the country.

There was virtually no evidence of research and development (R&D) on Development Minerals in Zambia. This implies that future efforts to promote the sector should prioritise this aspect. Therefore, there is urgent need to invest in R&D in order to realize the full potential from Development Minerals, particularly from the perspective of expanding the range of Development Minerals products and innovating around them.

7.3.7 Availability and Accessibility of Finance

Mining is a capital-intensive activity. Most artisanal and small scale miners are negatively affected by lack of affordable capital to finance their operations. This is an issue which has been highlighted at a lot of fora within the SADC region. The issue is compounded by the inability of the majority small scale miners to prepare bankable documents required to access finance for their operations.

The need for working capital ranked highest among Development Minerals operators and miners interviewed at selected sites. Access to equipment was ranked as the second priority while the need for business and entrepreneurship training was ranked third.

In terms of the type of financing required, equipment purchase ranked the highest. In relation to access to existing financing options, only 2 of the 12 mining site operators indicated having previously benefitted from a loan for their operations. Additionally, none of those who responded in the affirmative had benefitted from services offered by a financial institution. This provided insight into the existing gap between financial institutions and the Development Minerals sector in terms of provision of affordable loans and other financial services necessary to grow the sector.

At policy level, the baseline highlighted the need to establish facilities to provide financing for Development Minerals operators and small scale miners. For example, the CEEC ought to have a facility dedicated to supporting Development Minerals sector.

To gain more insight into the prevailing situation with regards to access to financial services, the study obtained perceptions from interviewees that are summarised as below:

- Banks have laid out conditions that are difficult to meet that prevent access to loans;
- Banks have a lot of demands, including collateral and bulky documentation, that cannot be met;
- Financial services provided need restructuring in order to meet different needs;
- Existing financial services met the expectations of the few beneficiary interviewees; however, some found the processes too slow whereas some were happy with the process;
- Miners produce a lot and yet customer base in financial institutions is low.

The picture presented above speaks to a mixed result in terms of efficiency and appropriateness of existing financial services.

7.4 Conclusions

In Zambia, the line ministry that is responsible for the Development Minerals sector is the Ministry of Mines and Minerals Development (MMMD). In this regard, the Ministry has four (04) technical departments that perform specific monitoring and regulatory functions as discussed previously in this report. These departments are:

i. Geological Survey Department;
ii. Mining Cadastre Department;

iii. Mines Development Department; and
iv. Mines Safety Department.

Other relevant national institutions include Patents and Companies Registration Agency (PACRA), Zambia Development Agency (ZDA), Zambia Environmental Management Agency (ZEMA), Ministry of Labour and Social Security; Ministry of Commerce, Citizens Economic Empowerment Commission (CEEC), Ministry of Water Development, Sanitation and Environmental Protection, Zambia Revenue Authority (ZRA), National Council for Construction (NCC), Road Development Agency (RDA), Water Resources Management Authority (WARMA) and the Technical Education, Vocational, Entrepreneurship Training Authority (TEVETA) and the Federation of Small Scale Mining Associations of Zambia (FESSMAZ).

However, results from this Baseline study indicate that institutional capacity to support extraction and value addition to Development Minerals is currently lacking, especially within the MMMD. For instance, the Geological Survey Department does not have geologists with adequate technical expertise on Development Minerals and the Department has inadequate capacity to carry out reserve estimation. This situation complicates and worsens the plight of most of the artisanal and small scale miners involved in Development Minerals operations.

Additionally, stronger and more deliberate institutional arrangements to foster joint and more cost-effective interventions between actors such as TEVETA, NCC, Ministry of Mines and Minerals Development, the Gemstone Processing and Lapidary Training Centre, ZEMA, industry and business associations, among others, are needed. For this to be realised, the existing policy and legal framework needs to be enhanced to be more supportive and provide clearer roles and responsibilities responsive to the full extraction and utilisation of Development Minerals.

At the moment, the geo-data available in Zambia on Development Minerals was collected by the Geological Survey Department between the 1960s and the 1980s. With the help of the ACP-EU Programme on Development Minerals, the Geological Survey Department (GSD) compiled the data into a database in 2017 and it is available in MapInfo and Microsoft Access softwares.

Investment promotion of Development Minerals is mainly carried out through participation of MMMD officers and members of the artisanal and small scale mining associations in both local and international events. Furthermore, the profile of Development Minerals has been significantly raised with the involvement of institutions such as the PanAfGeo and the National Council for Construction (NCC).

To build institutional capacity through impartation of skills, the ACP-EU Development Minerals Programme organised a number of workshops where skills

training in Entrepreneurship, Mine and Quarry Management, Mineral Processing and Value-addition, Mine Safety, Environmental Management, Geological Mapping, among others, were extensively provided. In addition, in areas such as reserve estimation and other geology and environmental management courses, training programs have been conducted under a partnership of ACP-EU Development Minerals Programme and PanAfGeo. Box 2 below, illustrates the impact of the training programmes on a beneficiary.

Therefore, the future of the Development Minerals sector in Zambia currently looks bright. The above interventions have certainly caught the attention of policy makers, to support the Development Minerals sector for employment creation, and for boosting the much-needed economic diversification and development agenda of the country.

Box 2: Testimonial from a Training Programme Beneficiary.

"Sylvia Bubala Mang'ola is a 46-year old artisanal miner in Siavonga district.
Single but with the huge responsibility of taking care of her siblings and other relatives, she ventured into artisanal mining to meet the needs of her family.
"I was into fashion designing and interior decoration, but I did not have the kind of market to have a breakthrough. That's how I stopped the fashion business and now I am in full-time mining," Ms Mang'ola said.
When Ms Mang'ola started fashion designing, she saw it as a lucrative business, therefore her aim was to become one of the best-known designers in Zambia. However, when the business failed to pay her bills and put food on her table, she opted for a career change. She says the fashion industry faces great competition from relatively cheaper Chinese garments.

"I decided to look for something well-paying that would bring in money in thousands" she recalls.
The desperation she saw in people who needed good building materials is what motivated her to enter the male-dominated mining sector. Prompted by her instincts, Ms Mang'ola opted to start dealing in Development Minerals, and she just knew that she would hit her goal. (Development Minerals refer to materials and minerals as granite, gravel and sand – that are mined, processed, manufactured and used locally in such industries as construction, manufacturing and agriculture).

When she came across a shiny flat stone in Siavonga five years ago, that marked the beginning of her mining business. Now Ms Mang'ola cuts and polishes stones into tiles.

She obtained a mining licence in September 2014 and started the actual mining two months later. Currently, she has two mining licences; one in small scale mining prospecting and another in artisanal mining. The prospecting mining licence allows one to look for materials underground, while the artisan license is for actual mining.
Ms Mang'ola mines sandy flat stones commonly known as Siavonga stone tiles, black granite, green flat stones, quarry crushing stone which is graded number one by geologists in the Ministry of Mines. She is also involved in the crushing of stones that are used to make blocks and mines granite used for making kitchen units and tomb stones. Her mine sits on a four kilometre square piece of land under Chief Sikongo's area. With no mining equipment to talk of, Ms Mang'ola and her 12 workers depend on small tools such as hammers, grinders and a table cutting machine.

She owns a small truck which helps her to transport stones from the pit to the factory.
"I am able to make good money from individual customers, but my target is to graduate and become a supplier to commercial construction companies," Ms Mang'ola says.

Currently, she supplies 50 to 100 square metres of stone tiles while production is as low as 25 squares metres daily. On a good day, it goes to 50 meter squares. To upscale her profit margin, she needs modern equipment to raise production to 150 square metres per day.
As a member of the Association of Women in Mining (AWM), Ms Mang'ola has been trained in mine management through the ACP-EU Development Minerals Programme implemented by UNDP.

On site, she is not just a boss, she does the actual mining with her workers. "Mining stones is a very hard business, but I really enjoy it. I get really tired, but I always look forward to what I will get out of the ground whenever we are mining. So, it gives me motivation," she says.

The business is sometimes prone to occupational hazards and the workers have occasionally been injured, but none of the incidents have been fatal. The biggest threat to the workers' safety comes from wildlife because the mine is located in the bush.

Ms Mang'ola feels Government needs to do something to support women involved in artisanal and small-scale mining by making it easier for them to acquire concessions.

At the moment, the Ministry of Mines and Minerals Development has been providing extension services to small-scale miners like Ms Mang'ola. So far, officers from the ministry have visited her mine severally.
In addition, Government through partners such as United Nations Development Programme (UNDP) is supporting small-scale miners through training programmes. The UNDP is implementing a €13.1 million capacity building programme co-funded by the European Union (EU) and initiated by African Caribbean and the Pacific (ACP) Group of State that aims to boost small-scale mining of Development Minerals.
Ms Mang'ola has taken advantage of this opportunity to build the capacity of her mine through training. Two of her employees have also been trained under the cobblestone training programme implemented by the Development Minerals Programme.

8. ENVIRONMENTAL, HEALTH AND SAFETY, AND SOCIO-ECONOMIC IMPACT ANALYSES

8.1 Introduction

There is a general lack of available data quantifying the environmental, health and safety, and socio-economic impacts of the Development Minerals sector in Zambia. The reasons for this include the lack of a fit-for-purpose OHSEC regulatory framework for Development Minerals; the informality of many operations within the sector as well as poor reporting practices at some formal sites, and the majority (if not all) of informal sites.

The assessment on the Environment, Health & Safety and Socio-Economic Impact was based on site assessment questionnaire, observations made by the field team during site visits and focus group discussions.

Out of the sites visited only Oriental Quarries and Ndola Lime which are larger scale producers of Development Minerals met the provisions of the Regulations on safety such as annual health checks of workers, safety statutory appointments and reporting. In order to enhance mine safety compliance and enforcement, the Government is reviewing the regulations to deliver an all-inclusive regulatory framework that will also be relevant to the artisanal and small-scale miners of Development Minerals.

8.2 Environmental, Community Health and Safety Impact Analysis

8.2.1 Environmental Impact Analysis, mitigation hierarchy and capability

Impact analysis

The Baseline Report's field visits on environment, health and safety observed negative impacts at the Development Minerals sites which were corroborated with the findings from focus group discussions.

The main local-scale environmental impacts identified at 10 project sites include[31]:

i. Air quality/dust;
ii. Water quality;
iii. Degradation of soil and landscapes;
iv. Deforestation and land clearing;
v. Loss of agricultural land;
vi. Loss of biodiversity;
vii. Noise pollution; and
viii. Aesthetic degradation of local landscapes.

The number of mine sites that reported each of these impacts is shown in Fig. 27. The most common aspects were degradation of soil and landscapes, deforestation and land clearing, and loss of biodiversity, each with 9 of the 10 sites reporting these impacts.

[31] This information was acquired through the responses of operational site managers.

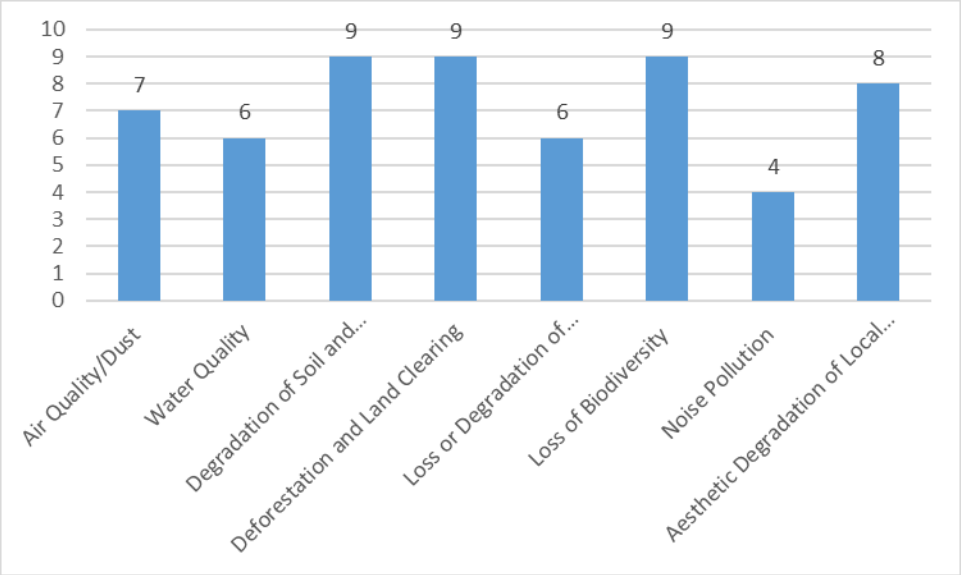


Fig. 27: Number of project sites reporting each environmental impact.

Poor environmental management practices were observed across all informal Development Minerals project sites visited and included the following: indiscriminate clearing of vegetation at the initial stages of the mining activity; incorrect quarry and bench slope management during extraction; and failure to rehabilitate mined areas after mine closure. Despite these impacts, only 4 of the 10 mine sites visited indicated that they have environmental management systems in place. These environmental management systems included the following practices:

- working with an environmental consultant to assess and mitigate dust pollution;
- replanting trees;
- diversion of the flow of water away from the pit; and
- covering pits with the debris from clearing activities.

Although adherence to industry practices around environmental management is generally expected in large-scale formal operations, data is limited as only two formal mine sites were assessed for environmental management.

Four (4) of the ten (10) Development Minerals mine sites visited have evidence of good practices on environmental management. However, the practices were insufficient to address the range of environmental impacts. Operational managers suggested the need to include environmental education to raise awareness, implement dust suppression practices and ensure rehabilitation post mine closure.

Although respondents had suggestions to improve mitigation, they were very limited in scope, indicating that there is lack of knowledge. Therefore, raising awareness could be crucial to facilitate sustainable mitigation strategies.

Caption: Mined pit at Chongwe sand quarry.	**Caption:** A pool of stagnant water at Kachangwa Sand Quarry which has become a mosquito breeding site	**Caption:** Land degradation at Talc Open Pit along Kasama Road, Lusaka
		

Fig 28: Negative environmental impacts at Development Minerals extraction sites.

Mitigation Options

Arising from the above analysis the following are recommendations to minimize environmental impacts:

i. Formalization of the informal operators in the Development Minerals sector so that enforcement of the environmental management law is applied;
ii. Introducing regulations specific to the realities of the Development Minerals sector;
iii. Raising awareness and education regarding best mining practices; and
iv. Decentralization of monitoring and evaluation functions to the local level.

8.2.2 Occupational Health and Safety Impact Analysis

Impact analysis

Poor Occupational Health and Safety practices that were observed across all informal Development Minerals sites included: lack of safety training, lack of traffic control procedures, and inadequate PPE such as protective eyewear or dust masks. Hazards such as land slips and pits created through poor mining practices were also observed across many sites, particularly for commodities such as talc, basalt and amethyst. Other occupational health and safety issues included dust, noise and vibration from mining operations.

As discussed earlier in this report, formal large-scale operations generally adhered to OHS practices. Examples of good health and safety management practices observed included: inductions, pre-start meetings, wearing of PPE, traffic management, proper benching, and hazard identification. However, some OHS risks and performance issues were observed at some of the formal sites.

Three (3) out of the ten (10) mine sites visited had no safety management

measures in place. These include 1 formal operation and 2 informal operations. Those that responded that they had safety management measures included 4 formal operations and 3 informal operations. The safety measures were focused on the following:

i. project manager trained in first aid;
ii. alcohol screening;
iii. employee conflict resolution;
iv. restricting access to mine site to children under ten years; and
v. PPE distribution.

Operational site managers indicated that the most common health impacts of the mine are coughs and respiratory problems caused by dust. At 6 of the sites visited, operational managers indicated that mining had resulted in respiratory problems among workers. Other health impacts reported at the sites included: [32]repetitive strain syndrome (5/10 sites), skeletal /muscular disorders (4/10 sites) and work related stress (3/10 sites). Fig. 29 shows the most common health impacts, the site, the number and the percentage of the workforce affected at each mine site visited.

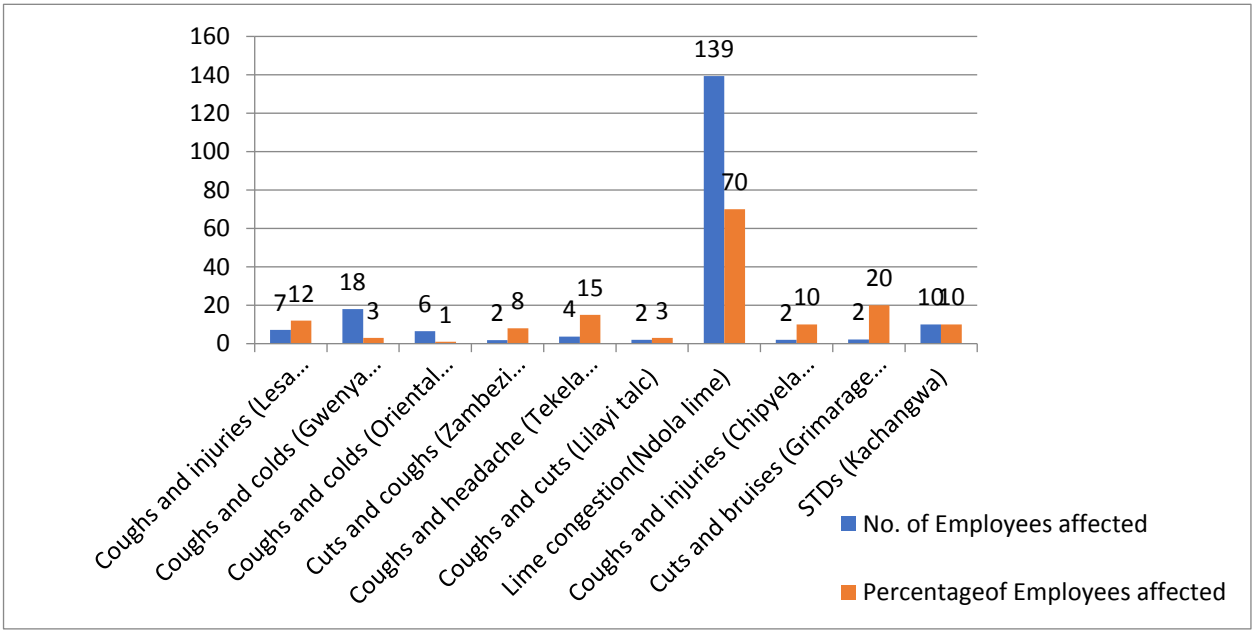


Fig. 29: Most common health impacts at each visited mine site, the number and the percentage of the workforce affected.

Most of the health impacts are related to respiratory problems because of dust from the operations. Ndola Lime experienced the most widespread health impacts with

[32] The pain felt in muscles, nerves and tendons caused by repetitive movements and over use.

70 percent of their workforce affected by congestion. Across all 10 visited sites, an average of 15 percent of the workforce was affected by health impacts resulting from mine activity.

The number of serious injuries, such as permanent disability, dismemberment, and death, reported and expressed as a percentage of the workforce between 2014 and 2016 based on the responses of operational site managers is shown in Fig. 30 below.

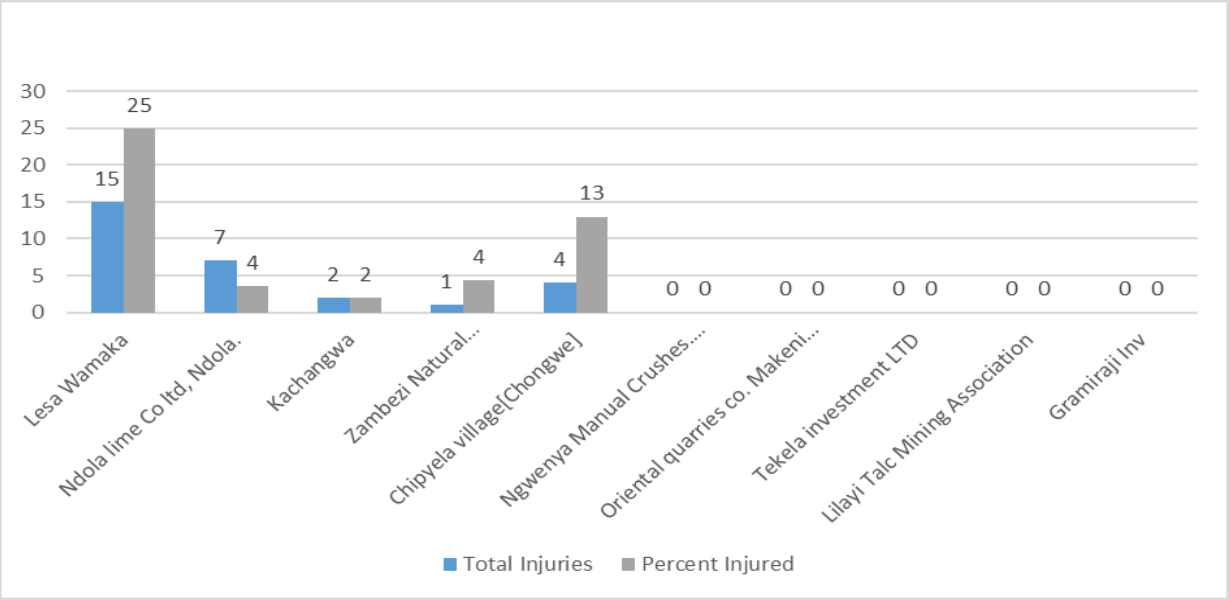


Fig. 30: Number and percentage of serious injuries occurring at project sites over the past 3 years.

Half of the 10 sites assessed indicated that they experienced serious injuries between 2014 and 2016 (Fig. 30). Kachangwa and Zambezi each reported a fatality while at Ndola Lime a case of dismemberment was reported. Out of the five (5) sites reporting serious injuries, Lesa Wamaka reported 15 cases, representing 25% of the affected workforce at the mine. This was the highest of the reported cases.

The number of minor injuries reported and expressed as percentage of the workforce in 2016 based on the responses of operational site managers in Fig. 31.

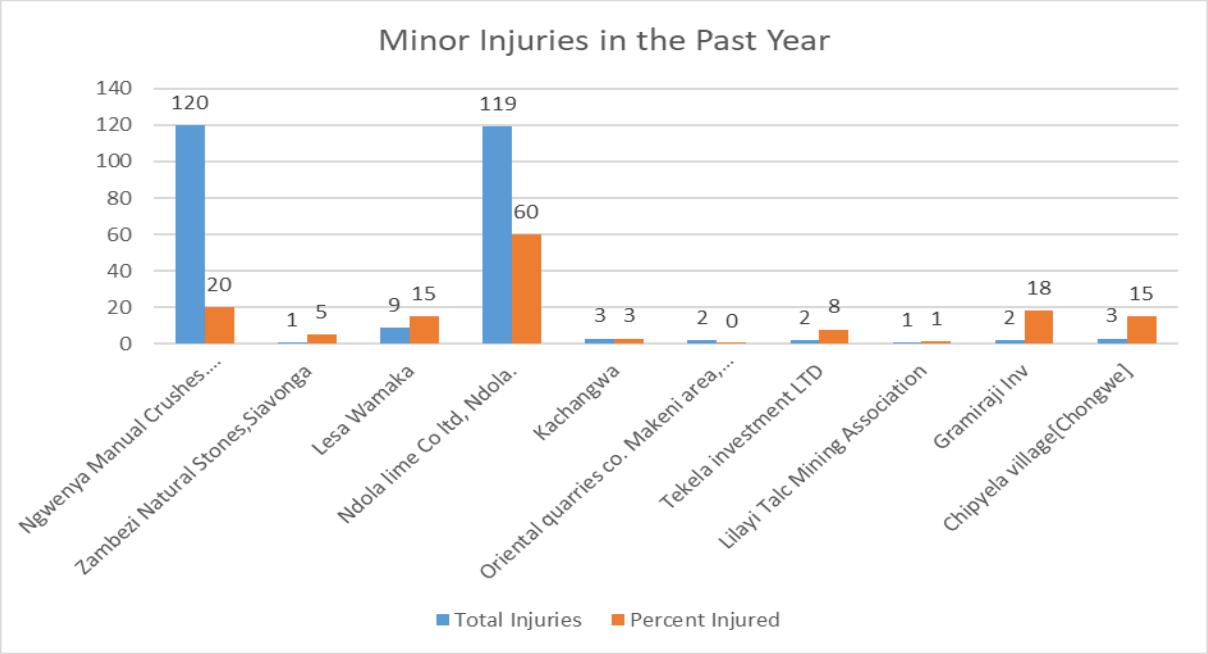


Fig. 31: Number and percentage of minor injuries occurring at project sites in 2016.

Minor injuries were more common than serious injuries in 2016. Ngwenya Manual Crushers had the highest number of minor injuries while the highest percentage of workforce suffering minor injuries occurred at Ndola lime Co ltd. The variation in the number of minor injuries may be attributed to several factors including: size of workforce, reporting systems, compliance levels and levels of mechanisation and sophistication of the operation. Operational site managers indicated that common minor injuries included: cuts, sores, bruises, and snakebites.

All the sites except one (Oriental Quarries) did not have an emergency healthcare facility within the operational premises. The distance between the mining site and the nearest health facility ranged from 0.4 to 20 km (Fig. 32).

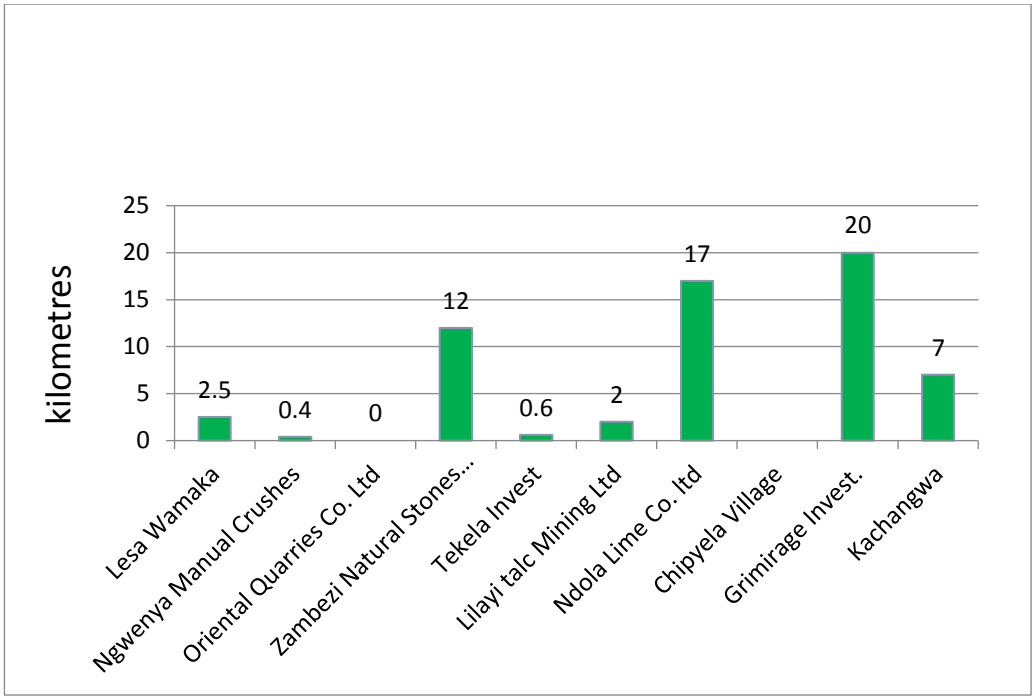


Fig. 32: Distance to the nearest emergency healthcare facility.

Majority of operational managers interviewed indicated that the nearest healthcare facility was reliable.

Mitigation Options

Similar to the mitigation strategies for environmental impacts, the key strategies for mitigating the negative health impacts in the Development Minerals sector include:

i. Formalization of the informal Development Minerals operators so that enforcement of the OHSEC laws is undertaken adequately;
ii. Introducing OHSEC regulations specific to the realities of the Development Minerals sector;
iii. Raising awareness and education regarding best OHSEC practices in mine sites; and
iv. Decentralization of OHSEC monitoring and evaluation functions to the local level.

8.2.2.1 Community Health and Safety Impact Analysis and Mitigation Options

Impacts Analysis

Currently governments, civil society organizations, and communities require that mining companies, including those in the Development Minerals sector, develop systems to prevent and mitigate health impacts, including on communities in the vicinity of the mine site.

Communities within Development Minerals mine sites were affected by one or more of the following health impacts:

- Air borne contaminants, dust and primarily carbon monoxides from kilns in clay-bricks manufacturing;
- Waterborne contaminants;
- Noise;
- Hazardous materials;
- Infectious disease; and
- Physical Injuries.

These impacts are elevated in mine operations where there was high concentration of people as observed at Lesa Wamaka in Kalulushi and Ngwenya site in Livingstone. These two sites had 105 and 600 people respectively working in a relatively small site. Similar high impacts on community health occurred at larger operations of Development Minerals. Ndola Lime is a case in point, where the operation releases hazardous pollutants into the atmosphere thus endangering the health of people living around the site. The Operations Manager at Oriental Quarries Co. indicated that dust was affecting the community in the vicinity, causing cases of tuberculosis and chest congestion.

Due to the low extraction levels by the 8 smaller informal sites, the impact on health of the community is minimal compared to large operations and is confined to physical injuries from uncontrolled excavations.

Mitigation Options

The key strategies for mitigating the negative health impacts on communities in the vicinity of Development Minerals mine sites include the following:

i. Provision of safe crossing points and reduction of traffic speed near settlements;
ii. Implementation of pollution controls to reduce emissions from the kilns;
iii. Sinking of boreholes for provision of water to the community;
iv. Prevention of stagnant water pools where mosquitoes can breed;
v. Medical treatment for chemical spillage;
vi. Dust suppression e.g. through wetting, enclosing conveyors;
vii. Capture of fugitive dust;
viii. Scheduling of blasting according to wind direction;
ix. Putting in place surface water diversion systems;
x. Treatment of water;
xi. Establishment of appropriate operational hours and suitable timing of blasting;
xii. Waste minimisation and dumping only in designated areas.

8.3 Socio-Economic Impact Analysis

8.3.1 National Level

The Development Minerals sector provides revenue flows to the national, provincial, local council, chiefdom and community levels of governance in Zambia through corporate income tax, import and export duties levies, mineral royalties, as well as local council levies. However, contributions to Government revenue, formal employment, local consumption and export volumes of minerals, is not disaggregated by mineral categories. Disaggregating data according to mineral type could have a positive impact, as it would clearly show the contributions of the Development Minerals sector to the national economy. Although there is an attempt to disaggregate data on contribution of different mineral commodities to government revenue in Extractive Industry Transparent Initiative (EITI) reconciliation reports, most of the Development Minerals are not captured because of materiality threshold. The individual Development Minerals operators' contribution to government revenue is less in value and therefore not captured in the EITI reconciliation report as disaggregated data. The 2016 EITI report shows that the mining sector contribution to GDP is 10.5% out of which only 0.1% is attributed to quarrying. In terms of exports the mining sector accounted for 72.84% of export revenue with copper accounting for 67.63%. In relation to Development Minerals only gemstones are captured and account for 0.44% of export revenue.

Development Minerals provide both formal and informal employment in Zambia. Most of the informal jobs are in ASM while the formal jobs are in the large scale operations. The total employment figures for the informal ASM is difficult to estimate due to the large number of unregistered operations. Poor compliance by the formal ASM to report job figures makes it equally difficult to quantify the total number of jobs created in the sector. An attempt was made to estimate the employment figures through a snap survey that covered 139 sites across the country. The survey showed a total workforce of 6 815 in the sector out of which 2 821, were female (equivalent to 41%). The estimate of the total employees and workers from the 26 sites visited during the field work for this Baseline Study was 3 525.

In addition to providing government revenue and employment creation, the Development Minerals sector in Zambia also plays a significant role in supplying the materials required for the construction and infrastructure sectors. In particular, locally mined construction materials (e.g., limestone and sand), industrial minerals (e.g., clay and silica), and dimension stones (e.g., marble, granite and sandstone) are used widely across the country in the construction of roads, pathways, shopping centres, domestic and commercial buildings. Some of these commodities are widely used in other sectors as well. For instance, large quantities of limestone are inputs in the production of agriculture lime used in neutralising acidic soils and in the manufacture of cement used in the construction sector respectively. The

country is currently undertaking multi-million dollar construction projects such Kazungula bridge, three international airports, Pave 2000 and Link Zambia 8000 projects that are high consumers of Development Minerals.

The Development Minerals sector provides a platform for commercial partnerships between government, the private sector and local communities. In addition to employment creation, the Development Minerals operators sponsor infrastructure projects for health, education and safe drinking water through Cooperate Social Responsibilities within their impact communities. These Cooperate Social Responsibility (CSR) projects appear to be outside of any formal community investment agreements under licensing requirements. Overall, where Development Minerals operations are engaged in CSR projects, these typically occur in neighbouring communities within the impact areas of their operations. This is not confined to large scale operators as CSR initiatives were also observed across informal operations.

8.3.2 Community Level

Both positive and negative impacts of Development Minerals operations in the communities they operate in, were reported.

Positive social impacts at mine sites include: establishment of community projects, good working conditions and application of rights, adherence to law and order, provision of education opportunities, and in-migration. However, the results of social impact assessments were generally inconsistent across the 10 mine sites. While some sites may demonstrate a positive impact on a certain aspect, another site could have a negative impact on the same aspect. This indicates that there is a considerable amount of variability among the mine sites in terms of their social impacts. The number of responses indicating positive social impacts on the aspects mentioned above is shown in Fig. 33.

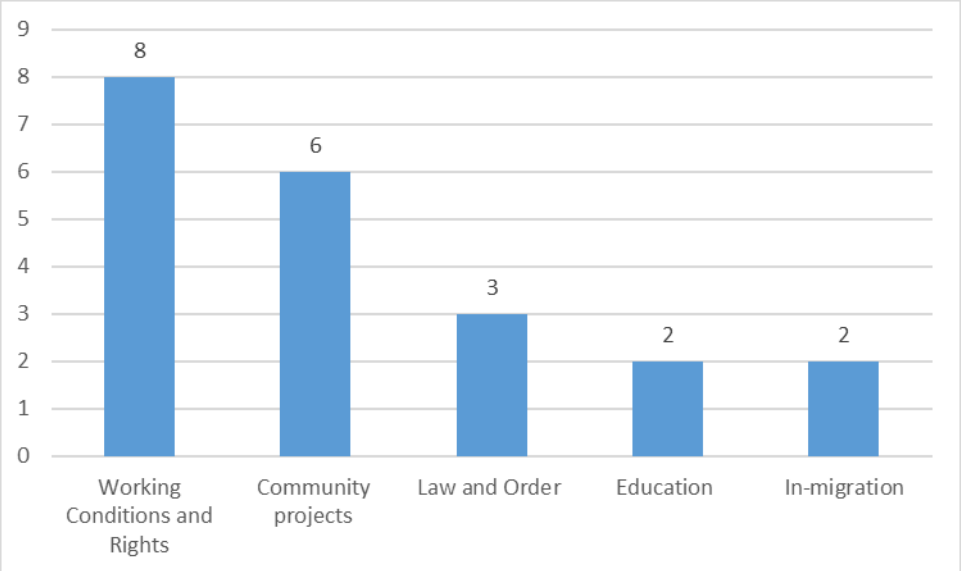


Fig. 33: Number of positive responses to social impact aspects.

Negative social impacts reported at mine sites include: social conflict, prolonged separation from families, inadequate water and sanitation facilities, inadequate housing, gender-based violence, and youth social conflicts which tend to relate to arguments over digging spots and customers. The number of responses from mine sites indicating negative social impacts on these aspects is shown in Fig. 34.

Five (5) of the ten (10) mine sites visited indicated that they did not have any programs in place to manage the social impacts of the mine. For those that had programs in place, they included the following: provision of employment for both women and men in the community, provision of agricultural land for farming to the community, access to third-party education programmes, provision of compensation to displaced community members and construction of standard houses for them.

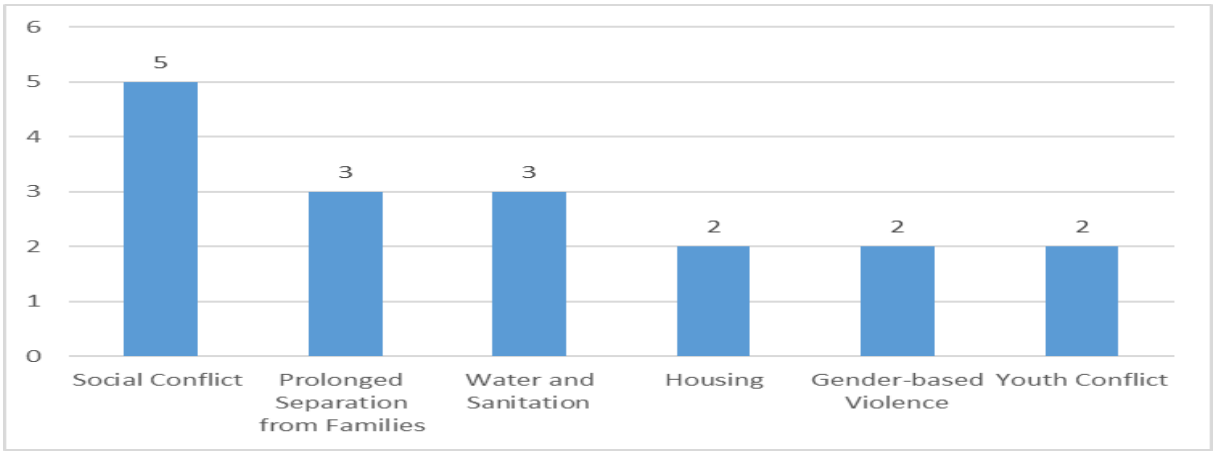


Fig. 34: Number of negative responses to social impact aspects.

Grievances and conflict across the mining lifecycle. The major sources of grievances and conflict reported include: conflict over access to land; the amount of benefits received from mining projects; the distribution of benefits between stakeholder groups; and the environmental degradation resulting from mining and processing activities. There was also dissatisfaction expressed about the payments that go to headmen at a number of quarries. At two sites, community complaints included impacts to water quality and effects from blasting. Only larger Development Minerals sites had formal grievance-handling mechanisms in place to manage stakeholder grievances.

Gender-based impacts associated with the Development Minerals sector in Zambia. Two of the ten mine sites visited indicated that there had been incidences of gender-based violence at the operation site. In addition, four sites responded

that sexually transmitted diseases, affecting both men and women, were a negative health impact at the Development Minerals project sites. Another negative social impact of the mine that was reported is the increased promiscuity by both men and women.

Other impacts that were raised or observed include: increase in the consumption of alcohol and use of drugs; increase in incidences of domestic violence; conflicts over the distribution of cash within a family; increased marital conflict and breakdowns; and impacts to the environment that differentially impact the gender roles of women, including impacts to water sources and loss of agricultural land.

8.3.3 Child Labour

Zambia is a signatory to the, 1999 ILO Convention No. 182 on the Worst Forms of Child Labour (WFCL). The Convention promotes the elimination of the participation of children in any work which “by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of children”.

Employment of Young Persons and Children Act (Amendment), 2004. In Zambia, the law defines a child as a person of less than 14 years and "young person" as a person who has ceased to be a child and who is under the age of 18 years. The law prohibits employment of any child in any public or private industrial undertaking or in any branch thereof, other than an undertaking in which only members of the same family are employed. The law equally prohibits employment of a young person at night in any industrial undertaking or in any branch thereof, other than an undertaking in which only members of the same family are employed. A young person aged between 16 years and 18years can be employed during the night in exceptional industrial undertakings. However, employment of a young person is prohibited in any type of employment or work which, by its nature or the circumstances in which it is carried out, is likely to jeopardise the health, safety or morals of that young person.

Despite Zambia being a signatory to the 1999 ILO Convention No. 182 on Worst Forms of Child Labour (WFCL), and the enactment of national laws prohibiting child labour, more than one out of every three children aged 7-14 years were at work in economic activity in 2008[1] in Zambia, according to an Inter-Agency Research Cooperation Project Report of September 2012 by ILO, UNICEF and World Bank.

In this study, two categories of child involvement in the Development Minerals sector were identified:

i) children who were at the mine site not as employees or workers but accompanying someone; and
ii) children who were at the mine site as employees or workers.

The ages and the status of children at the mine sites were not determined. A total of 68 children were reported or visually confirmed as working at the mine sites, representing 3.9% of the total workforce across the assessed project sites. However, actual numbers are likely to be significantly higher considering that respondents in 4 out of the 10 mine sites assessed and a number of other mine sites reported child labour at their mine sites. In addition to child labour there were numerous infants at Development Minerals site locations accompanying their parents as shown in Fig 35.

Caption: children engaged in sand quarrying at a Sand Quarry site	**Caption:** Children helping crushing stones at mine site	**Caption:** infants accompanying someone within mine sites
		

Fig 35: Children at DMs operation sites either as workers or accompanying someone.

8.3.4 Job Creation and Employment Opportunities

Development Minerals provide opportunities for formal and informal employment across all provinces in Zambia[33]. As indicated earlier in this report, the total employment figures for formal and informal operations are difficult to estimate due to the large number of unregistered operations. However, a snap survey suggests a total of 6, 815 direct employees in this sector.

Employment in the formal Development Minerals sector generally conforms to relevant employment and labour laws and standards[34]. In general, most formal Development Minerals operations offer year-round work based on regular rosters and shifts. However, seasonal employment was observed at one site where about 150 people were employed during production of bricks for about 4 months each year.

Work arrangements are more ad hoc in the informal sector, with different governance models for ASM operations including: (a) informal cooperatives where

[33] A distinction is made here between 'employment', where wages or payment is received for labour, and 'work', which may take place in the informal sector but is not necessarily subject to standard wages or payments (but might be subject to other reciprocity arrangements).

a group of families or individuals work together under an agreed set of terms, (b) 'owner-operator' models where a family or individual(s) is not associated with a broader cooperative, and; (c) contractor models where individuals contract their labour for an agreed payment or in-kind benefit. Each of these informal models offer both paid and unpaid work to individuals.

Rates of pay, labour standards and OHS practices are generally low or very low across all types of informal sector employment and work. Although reliable statistics are generally unavailable regarding the Development Minerals sector, The Economist reports that miners in Zambia (across multiple minerals) make up to 1,000 USD per month[35] (9,518 Kwacha). However, not all miners work for formal operations. The ASM in Development Minerals often employ individuals who would otherwise live in extreme poverty, therefore, enhancing livelihoods and creating opportunities that would otherwise not exist for these people.

Site assessment data indicates that the typical pay for a miner ranges between ZMW1,000 and ZMW3,600 per month, and averages ZMW1,855 per month in both formal and informal operations. A typical monthly pay from 10 Development Minerals operations is shown in Fig. 36.

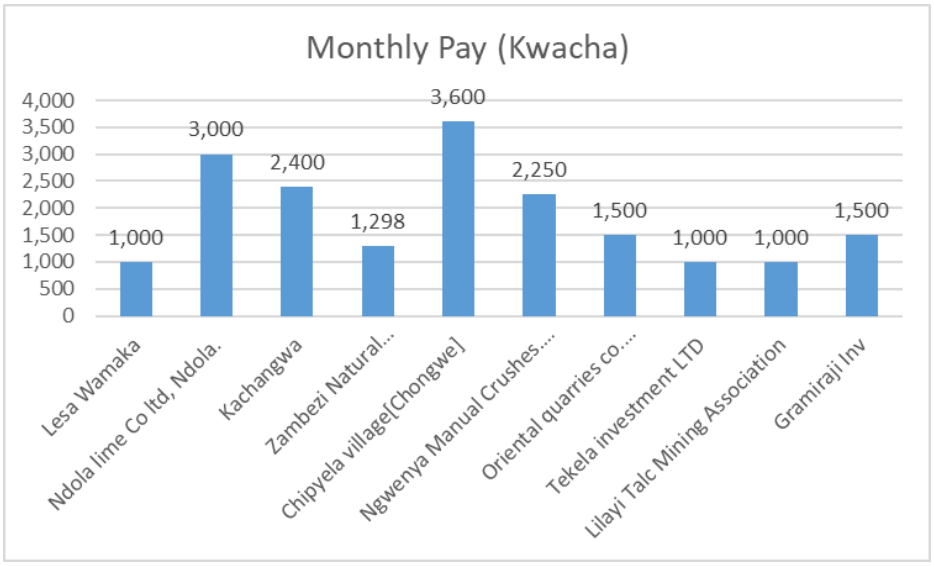


Fig 36: Typical monthly pay (Zambian Kwacha) in Development Minerals operations

Although data is limited, it is somewhat consistent with the view that informal mine sites pay their workers less than formal operations. The average pay among formal sites was ZMW 2, 250 or US$225/month, compared to ZMW 1,756 or US$175.60/month amongst informal sites. However, the site with the highest

[35] Statistics in Zambia (The Economist, 2010) https://www.economist.com/blogs/baobab/2010/12/statistics_zambia

reported compensation rate was Chipyela (ZMW 3,600 or US$360/month), an informal site with 30 workers.

A breakdown of the mine activities that the workforce is engaged in at each of the 10 mine sites is shown in Fig. 37. Three of the mine sites reported having 100% of their total workforce engaged in mining activities. Oriental Quarries and Gramiraji Ltd have the lowest percentages of their workforce engaged in mining activities i.e. 10 and 0 %, respectively.

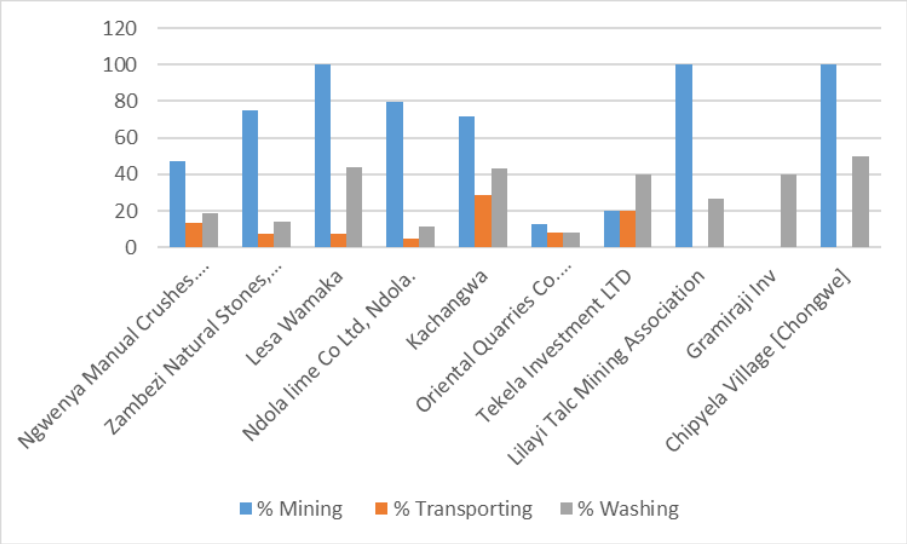


Fig. 37: Breakdown of the mine workforce activities at the 10 mine sites.

Caption: Informal workers loading sand manually at Kachangwa Sand Quarry	**Caption:** A group of women engaged in sand mining at Kachangwa Sand Quarry	**Caption:** Lilayi Talc Miners near Lusaka
		

Fig. 38: Sample photos of the Development Minerals workforce.

Both the formal and informal segments of the Development Minerals sector in Zambia have positive impacts on the development of the knowledge, skills and abilities of employees and workers. Operational managers from 8 out of 10 mine sites responded that their mine has positive impact by providing on-job-job-

training[36], skills transfer across basic exploration, mining and processing techniques despite their lack of formal education. Two of the sites (both informal operations) reported only neutral impacts on the development of the knowledge, skills and abilities (Lesa Wamaka and Tekela investment LTD). While having neutral impacts in this aspect is not ideal, the operations manager at Lesa Wamaka mentioned that their workforce is very skilled and knowledgeable, despite a lack of formal education and qualifications. These impacts are more pronounced in the formal sector, where training and development opportunities are significantly greater than the informal sector, and on-the-job learning is more likely to be based on good mining practices and methods. Nonetheless, the informal sector does provide opportunities for on the job-training[37] and skills transfer across basic exploration, mining and processing techniques, as well as peer-to-peer sharing of small business management skills.

8.3.5 Women and Youth

The percentages of the workforce represented by women and youth at 10 mine sites are shown in Fig. 39. Overall, 33 % of the entire workforce across the 10 sites consisted of women. This average is lower than, but still comparable to, the Snap survey results which reports 41.4 % representation of women in the Zambian Development Mineral workforce and is likely to be a more accurate representation. The numbers in Fig. 39, as explained earlier, are distorted by the over-representation of the larger formalised companies.
According to the World Bank, the Zambian national labour force was 47.8% female in 2017.[38] However, jobs for females are often limited to the agricultural sector in Zambia, with females making up only about 22% of the non-agricultural work force[39]. Therefore, the Development Minerals sector employs more women in Zambia than the national female labour force participation rate in non-agricultural work. In addition, one of the mine sites visited has a female project manager, indicating that the mine sites have positive impacts on creating additional employment options for women with greater advancement potential.

Both the formal and informal segments of the Development Minerals sector provide the opportunity for employment and income generation for women and youth. However, informal sites tend to have a higher percent of their workforce

[36] On occasion there is also the opportunity for formal training in the informal Development Minerals sector, such as the training provided by UNDP in Southern Province as part of implementation of the ACP-EU Development Minerals Programme.

[37] For instance, through the ACP-EU Development Minerals Programme implemented by UNDP.

[38] https://data.worldbank.org/indicator/SL.TLF.TOTL.FE.ZS

[39] http://datatopics.worldbank.org/gender/country/zambia

represented by women. Three informal Development Minerals sites had women making up two thirds of their total workforces.

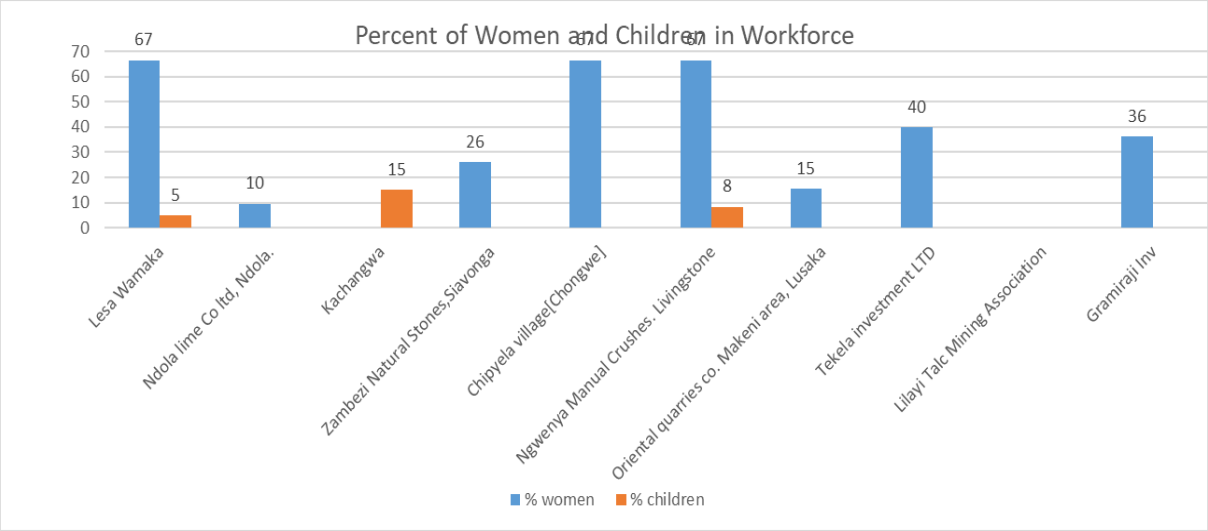


Fig. 39: Percentage of women and youth in the workforce of 10 mine sites visited.

A female Development Minerals operator owns Tip Top Mining and Construction Limited (TTCML), which has 8 employees, most of whom are male. Ngwenya Community Cooperative is equally led by a woman. The cooperative includes approximately 105 residents who are involved in the crushing of basalt at a pit very close to the Ngwenya residential community. Out of the 105 miners, about 70 are women (67%) and 35 are men (33%). Majority of the workers at Gramiraji Investments Limited (GIL) amethyst operation are women.

Overall, the profile of female employees at larger, formal operations ranged from approximately 4% to approximately 60%. Compared to men, women were more often observed in sorting activities or using small hand tools, as opposed to manual digging activities. Women were also more often observed undertaking ancillary work associated with mining, such as cooking and preparing food.

Youth employment is prominent in the Development Minerals sector. Although it was difficult to obtain statistics on levels of employment and work disaggregated by age, the study team's observations indicated relatively proportionate employment of youth compared to other age groups. For instance, from one site majority of the informal miners were aged between 18 and 30 years. At BBM/Kyulu Trust mines near Solwezi, youth from the local area are employed by the company, with some being promoted to senior roles based on aptitude and experience with the operation. Fig. 40 shows the women and youth employees at some of the Development Minerals Operations.

Caption: Study team members with owner and workers of Tip Top Mine displaying their certificate of incorporation	**Caption:** Female leader of the Ngwenya Community Cooperative	**Caption:** Woman sorting amethyst at Gramiraji Mine
		
Caption: Study team with a machine operator at BBM and Kyulu Development Trust	**Caption:** Mr Webby Simwayi conducting awareness about development minerals with youths at Lilayi Talc Miners	**Caption:** Female worker with male workers at Mine Campsite at Giramiraji Mine
		

Fig 40: Women and youth employees at various Development Minerals operations

The opportunities to enhance employment and income generation for women and youth include:

- Working with the Central Statistical Office of Zambia and relevant ministries to better track and report the employment profile of the Development Minerals sector in Zambia, including the profile for women and youth;
- Promotion of practices that enhance meaningful work for women and youth such as use of appropriate technology;
- Implementation of education programs on employment and labour regulations, human rights and basic OHS management, particularly for micro and small operators of Development Minerals; and
- Market development and promotion of formal employment for women and youth, including in the formal segment of the Development Minerals sector.

8.3.6 Development Linkages

In addition to the creation of formal and informal employment opportunities, Development Minerals generate other revenues for local stakeholders and facilitate

livelihood diversification for local families[40]. Ancillary revenues reported in the field work for this Baseline Study include: payments to local pit owners; payments to local councils and ward development councils; and revenue generated from ancillary support activities, businesses and industries. The net result of this local income generation is that rural families can create a more diverse portfolio of income generating activities and social protection support capabilities that improve their standards of living. It should be noted that the impacts on this aspect are quite different for formal and informal operations. In general, formal operations have a higher impact on income generation, job and livelihood diversification. Formal operations generally have higher wages, a larger number of employees, and they procure more inputs.

The Baseline Study collected data on the participation of the mine sites in local markets and the procurement/production of local inputs. For example, 6 out of the 10 mine sites visited had identified small traders around the site for supply of diverse commodities. They mostly consisted of local vendors who sell food to the mine workers, but Oriental Quarry had identified traders for the supply of explosives. These traders are not formally part of the mines' operations. Nevertheless, they certainly benefit financially from the mines' operations. The mine sites also contribute to local markets through the procurement of inputs and the production of minerals. Seven (7) of the 10 mine sites indicated that they procure inputs such as pick handles, timber and consumables locally, thereby, directly benefiting local markets by creating demand. All 10 sites indicated that they sell their products locally, thereby increasing the supply of locally produced construction materials that would otherwise be more expensive to procure via import. This benefits the livelihoods of local real estate developers by reducing building costs. In summary, the benefits to local income generation and livelihood diversification extend beyond the operations of the mine, to also benefit the livelihoods of local food vendors, input providers – upstream -, and those who rely on Development Minerals to conduct business. The percentage of the 10 sites that participate in local input markets is shown in Fig. 41.

[40] Operational managers at 8 out of the 10 project sites claim that their mines have a positive impact on livelihoods.

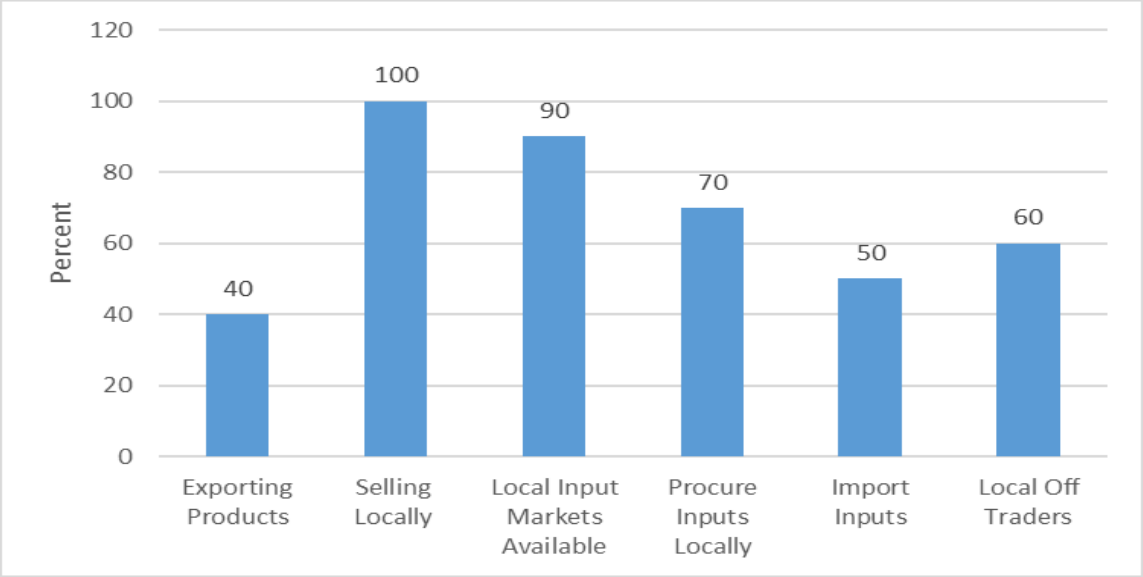


Fig. 41: Percentage of sites participating in local markets.

8.4 Conclusion and Recommendations

8.4.1 Conclusions

Most of the operators in the Development Minerals sector are informal and lack environmental management plans, occupational health and safety, and community health and safety management plans. This has resulted in a lack of mitigation measures for the various negative environmental impacts, poor practices in occupational health, community health and safety at informal sites.

In general, the formal operators implement good mining practices and overall have mitigation systems. However, some of the operators have environmental health and safety systems that are insufficient to address the range of environmental impacts at their sites.

The Development Minerals sector contributes revenue to the government through royalties, taxes, and levies at local, regional and national levels. The sector is the major source of construction materials used in infrastructure development in the country, agricultural lime used in the agricultural sector, as well as a wide range of industrial and semi-precious stones. Additionally, it provides significant employment (including in rural areas), for women and youth resulting in enhanced livelihoods and poverty reduction at house-hold and community levels.

8.4.2 Recommendations

Highlighted below are some of the recommendations arising from the analysis in this section:

i. There is need to formalize operators in the informal Development Minerals sector so that appropriate laws and regulations are enforced in the sector;
ii. The Development Minerals sector should have fit-for purpose policies and regulations that take into account nuances such as type and level of operations as well as the commodity being extracted and processed;
iii. Awareness raising and education programs on best practices in the reduction and mitigation of environmental impacts of Development Mineral operations need to be developed and implemented;
iv. Need to establish and implement education programs on employment and labour regulations, human rights and basic OHS management, particularly for ASM Development Minerals operators; and
v. Enhanced market development and promotion of the Development Minerals sector to increase formal income generation and livelihood diversification opportunities.

9.MARKET AND VALUE CHAIN ANALYSIS

9.1 Market Analysis

9.1.1 Overview of Current National and Sub-national Market Profile

Zambia has a wide spectrum of Development Minerals such as: limestone, clay, sulphur, silica sand, feldspars, talc, barite, phosphate, dimension stone, graphite, gypsum, kyanite, and fluorite. These minerals are used in a variety of products for domestic consumption and export, contributing to growth in the mining, construction, manufacturing and agricultural sectors. To complement the existing economic data, the study attempted to sketch a bottom-up view of the Development Minerals market and value chain for clay, limestone, sand and amethyst, by focussing on four case studies drawn from the site visits.

The Demand Profile

The major lucrative economic sectors that are driven by Development Minerals are infrastructure, manufacturing, construction, and housing, and agriculture.

Construction and housing sectors are flourishing with the construction sector growing at an average rate of 17.5% per annum over the past 12 years. Government through the Zambia Development Agency (ZDA), estimates that there is a backlog of 2 million units across the country, and recommends an annual delivery rate of 200 000 units to meet demand over the next 10 years. The $82.6 million budget allocated to the housing sector in 2017 by Zambian Government was aimed at closing the housing deficit while catalysing poverty alleviation and employment creation.

Investing in sustainable and resilient infrastructure is a pre-requisite for achieving Zambia's 7NDP objective of improving infrastructure development in the transport and energy sectors. In 2011 the country embarked on an ambitious road construction program under the link Zambia 8000 and pave Zambia 2000 projects. These projects, officially known as Accelerated National Roads Construction Program, required upgrading of 8000km of roads to bituminous standards and paving of 2000km of township roads countrywide. Additionally, the government embarked on establishment of Multi Facility Economic Zones (MFEZ) and Industrial Parks, construction and rehabilitation of three international airports and hydro power stations. Such investments will not only help boost economic growth, increase demand and create jobs in the short-term, but also lay the foundation for long-term growth.

Before 1999, agricultural lime production was below 20,000 tons per annum. The lime sector performance improved after the year 2000 due to new agricultural lime

production operations that opened in Mkushi and Kabwe, including Uniturtle Industries Limited in Lusaka and Mazabuka. Production levels rose to 150,000 tons per annum by 2002. Other production operations have been established in many parts of the country and the sector has seen increased financial investment, resulting in production rising significantly to beyond 1,000,000 tonnes per annum by 2012. The increase in agricultural lime production is largely attributed to heightened commercial agricultural activities. This far outstrips imports of 534 tonnes of the commodity imported.

Limestone is the major raw material for cement manufacturing. There are three major companies manufacturing cement for both local and export markets. There are also smaller manufacturers for the local market. Cement manufacturing sector has recorded steady growth as evidenced from the number of cement manufacturing plants constructed in the last twenty years. According to CSO, the total cement production increased from 1,515,010 tonnes in 2014 to 2,235,550 tonnes in 2017. Cement production is expected to increase in view of the fact that a US$500 million cement manufacturing plant was under construction, south of Lusaka during the period of the study.

It is anticipated that all the above sectors will continue in their expansion in the future as Zambia pursues its vision of becoming a middle income country by 2030. This will result in increasing demand for Development Minerals to fuel growth in the key sectors highlighted in this section.

The supply profile

Although the country produces sufficient quantities of Development Minerals used in key economic sectors in Zambia, there have been imports of both Development Minerals and mineral products as highlighted in Table 21 and 22 below. The imports are in part attributed to the fact that some local Development Minerals products do not meet the required specifications for application in some sectors. Nevertheless, the trend during the period 2013 to 2016 shows a notable decline in imports across most of the reviewed commodities.

Although only four products are listed in Table 21 and 22, the country is still a net importer of finished Development Minerals products such as ceramics, tiles, glass, fertiliser and gypsum products. The data on these commodities is not indicated due to lack of sufficient secondary data.

Table 21: Import Trends of Development Minerals and Products (in tonnes).

Commodity	Year				Total
	2013	**2014**	**2015**	**2016**	
Limestone	11	174	46	543	**765**
Clay	3265	2784	1644	1321	**9014**

Cement	59834	57201	39813	4397	**161245**
Sand	502	669	406	338	**1915**
Quartz	151	70	70	115	**406**

Table 22: The value of selected Imports of Development Minerals and Products ('000 US$).

Commodity	Year				Total
	2013	**2014**	**2015**	**2016**	
Limestone	7	92	35	188	**322**
Clay	1727	1818	687	612	**4844**
Cement	12767	9190	5292	1534	**28783**
Sand	304	305	198	110	**917**
Quartz	159	93	52	73	**377**

Data captured from the International Trade Centre[41] (ITC) indicated that Zambia exported Development Mineral products. Out of four Development Minerals commodities analysed, the country earned a total of USD 340,069,000 between 2013 and 2017. However, over the last three years the exports have averaged USD 43, 400,000 per year. The reduction in exports has been as a result of increased local demand for the commodities in the construction sector arising from ongoing massive Infrastructure development projects such as creation of new 25 administrative districts, the construction of the 900m Kazungula Bridge Project, Link Zambia Projects and the New International airport in Lusaka.

There have been exports reported in limestone, clay, sand and quartz. As with imports there was insufficient data to support conclusions on the wider list of exports.

Table 23: Exports of selected Development Minerals and Products ('000 US$).

Commodity	Year				Total
	2013	**2014**	**2015**	**2016**	
Limestone	174	817	202	424	**1617**
Clay	416	104	87	10	**617**
Cement	209811	68514	25280	36464	**340069**
Sand	27	236	205	18	**486**
Quartz	45	58	225	175	**503**

[41] http://www.trademap.org/tradestat/Country List of supplying markets for a product imported by Zambia

9.1.2 Sectoral Value of Development Minerals

The overall sectoral value of Development Minerals is determined by the overall production volume and the value realised from the sales of unprocessed material and products in the value chain. These are likely to be relatively stable for Development Minerals where trading relationships and product categories are well established.

Regardless of the category, it should be noted that value addition begins immediately after the mining activity for many commodities (e.g. amethyst, dimension stones, stone aggregate, sand), but varies according to commodity. This will be further established in the case studies below.
The study revealed that, for all Development Minerals categories, a significant proportion of mine operators faced a challenge of access to finance and this was linked to the scale and efficiency of production and access to markets.

The location of the point of sale impacted on the value of products. For example, sand, aggregate stone and amethyst sold at road sides fetched nearly double the price when compared to the same quantity of the commodities sold at production sites. This 'geographical disadvantage' resulted in heavy reliance on transporters and middlemen. The situation is compounded by the often limited negotiation capacity amongst the operators.

The prices of selected Development Minerals or products at production-site and point of sale are shown in Table 24.

Table 24: Trading Value of Development Minerals and Products at production site and point of sale.

Commodity/Product	Size (mm)	Price/tonne at Production Site (ZMW)	Price/tonne at Production Site (US$)	Price/tonne at Point of Sale (ZMW)	Price/tonne at Point of Sale (US$)
Coarse aggregate	5 - 10	100	10	1^{30}	13
	10 – 13	100	10	130	13
	13 – 19	100	10	130	13
	20 – 37.5	110	11	150	15
Fine aggregate	0 - 5	80	8	120	12
River or building sand		120	12	150	15
Dimension stone		350	35	1250	125
Clay bricks (per brick)		4	0.4	4.5	0.45

9.1.3 Factors influencing Development Minerals Price

The pricing of Development Minerals is influenced by several factors, which can be inferred from field observations. These include distance from source, quality of the commodity, product size and demand.

Distance from Source

The price differs between the production area (mine site) and point of sale for some Development Minerals like sand, talc, aggregates and amethyst. For example, sand at Kasisi and Kachangwa is priced at ZMW200 or US$20 per 20 tonne truck load. This price covered small payments to the land owner (traditional leader), workers loading the truck and the owner of the sand. The price for a 20 tonne truck load increased to K1,500 or US$150 at points of sale depending on distance, such as in Chelston Market, west of Kasisi, and Bauleni, about 45km from Kasisi on the southern side. Other points of sale are in New Kasama or Chalala area. At the points of sale there is a mark-up for transportation and market demand. Similarly, the price for aggregate stones ranged from ZMW 1,200 to 1,500 or US$120 to 150 per 20 tonne truck load at the production site in Kalulushi (Lesa Wamaka) but the price rises to between ZMW2,500 to 3,500 or US$250 to 350 at points of sale in Kitwe.

The standard pricing as collected from National Council for Construction and Central Statistics Office were found to be ZMW840 or US84 for a 20 tonne truck load at the point of production and averaging ZMW 1,300 or US$130 at a point of sale away from the production site.

A kilogram of amethyst attracts a price as low as ZMW 1 or US$0.1 at the production areas. Even without any semblance of processing, the same quantity is priced at a minimum of ZMW 40 or US$4 in Lusaka.

In the case of aggregates, the price at Ngwenya mine site in Livingstone, which was both a production site and point of sale, took a slightly different twist as it includes grading and packaging. The aggregate stones of different sizes were priced in several categories or packages: a heap of only one wheelbarrow; a heap of three wheelbarrows; a heap of six wheelbarrows, and a 10-ton truck. This was meant to cater for different consumer needs. A heap of six wheel barrows was priced at ZMW 500 or US$50, while a heap of one wheelbarrow was ZMW 65 to 100 or US$6.5 to US$10. A 10-ton truck was ZMW 2,400 or US$240. Most of the buyers were actual consumers.

Quality of the Commodity

Quality of products also explained the pricing especially in the case of dimension stones and amethyst. Once the mineral rocks are broken into small pieces, the dimension stones are hauled to the processing plant for calibration into different sizes and finish (e.g. mosaic, smooth and rough cast). These were sold according to dimensions, ranging in price from ZMW 155 to 185 or US$15.5 to US$18.5 at

the processing plant or indeed in Lusaka. It is the traders that added a mark-up for further profits and sold these above ZMW 200 or US$20. As already discussed above, amethyst is also priced according to its quality – depending on whether it is low or high grade.

Product Size

The size of the product was another factor influencing the price. Tekela Clay Bricks priced the bricks according to their size: a 4 inches brick was ZMW 1.5 or US$0.15 per brick, a 6-inch brick was ZMW 1 or US$0.1 per brick and an 8 inch one was ZMW 2 or US$0.2 per brick. A brick was a unit priced with its own specifications. However, the demand for the 6 inch and 8 inches bricks was not as high compared to the 4 inches bricks. The 6 and 8 inch bricks are mainly order-based purchases. At the point of sale, the price increases slightly: a 4-inch clay brick costs ZMW 2 or US$0.2, a 6-inch clay brick is ZMW 1.5 or US$0.15, and an 8-inch clay brick is ZMW 3 or US$0.3.

Demand

The demand for products explained most of the price considerations already discussed above. However, high demand has often led to increased prices for agriculture lime as the rainy season approaches. In the case of agriculture lime, it is worth noting that seasonality is a factor explaining price differentials.

9.2 Development Minerals Value Chain Analysis

The value chain is a system that describes the different stages by which the full value of the product is managed and ultimately realized. When applied to the extractive industries in general and Development Minerals in particular, value chain will describe the stages from the extraction of mineral resources, to processing and sale and up to the ultimate use of the realized sales.

9.2.1 Value Chain Stages

The main stages of a generic Development Mineral value chain include: exploration, extraction, processing, sales, and distribution. In this study, four (4) Development Mineral commodities were selected for market and mineral value chain analysis, namely: limestone, sand, amethyst and clay. Data was collected from sites involved in extraction and mining of these four Development Minerals.

The sites and commodities are highlighted in Table A5.3 in Annex 5. The selection of the sites and commodities was agreed up in consultation with the TWC based on the level of extraction, utilization and impacts on regional and local job creation as well as livelihood enhancement. The illustrations below show value chains for the 4 selected Development Mineral commodities i.e. limestone, sand, amethyst and clay.

Fig. 42: Limestone value chain

Main stages in the value chain for limestone are summarized as follows:

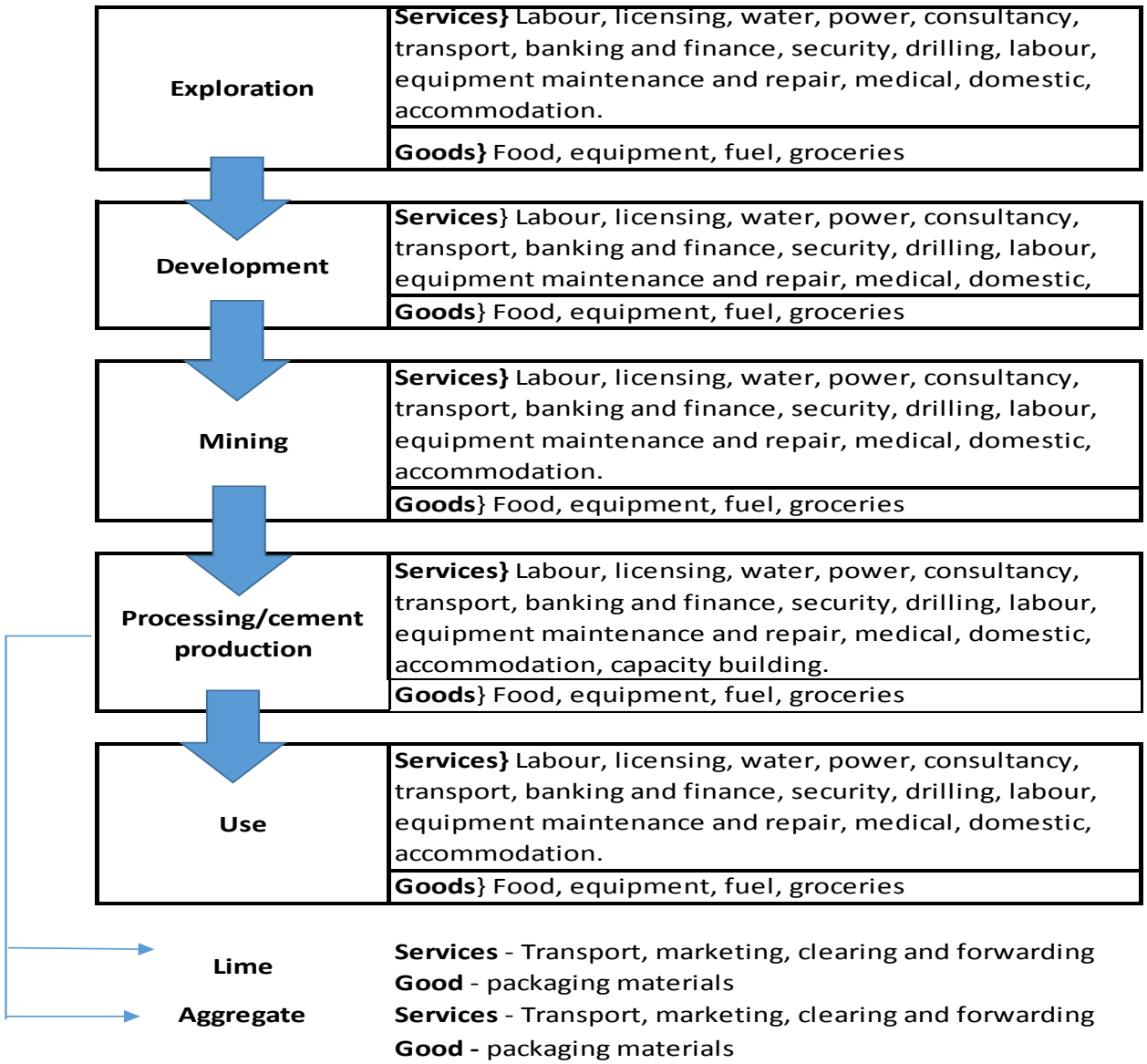


Fig. 43: Sand value chain

Fig. 44: Amethyst Value Chain

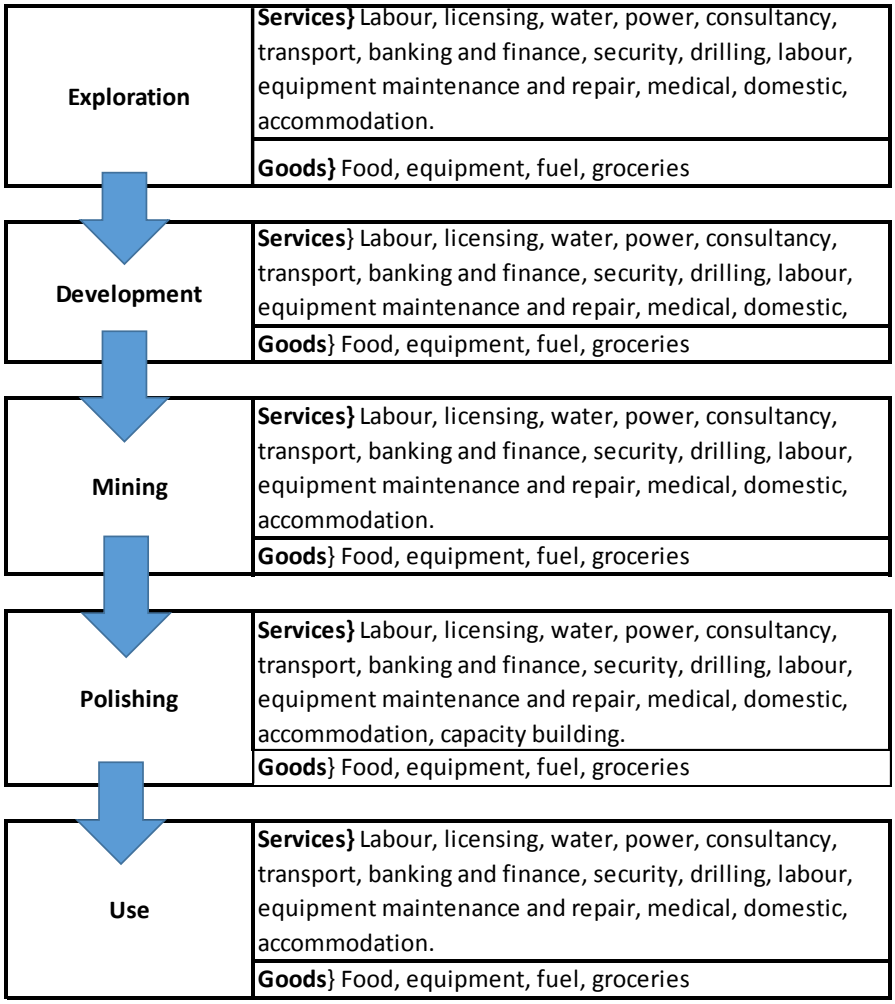
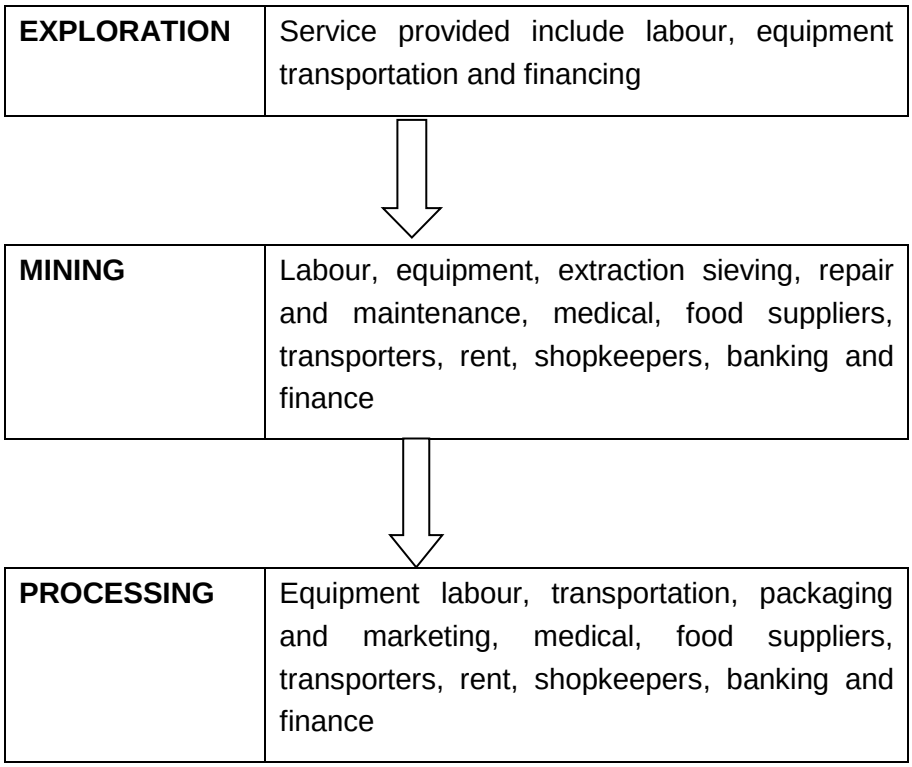


Fig. 45: Clay Value Chain



9.2.2 Roles, Constraints and Opportunities in the Development Minerals Value Chain.

The main stakeholders in the value chain for selected Development Minerals (limestone, sand, amethyst, and clay) were identified based on the stages consisting of exploration, development, mining/production, processing, distribution, marketing, and usage. The roles of the different stakeholders at each stage in the Development Minerals value chain is shown in Table 25. The table also highlights the constraints and opportunities in the value chain.

Some of the main stakeholders are listed below:

i. Mine workers (performing specific or all jobs across the production system depending on the commodity and site);
ii. Mining Right holders (Companies, Individuals and Co-operatives)
iii. Commodity traders (owners of mines and their workers doing on-site trade. There were also owners of kiosks or small stands selling fast foods
iv. Transporters (e.g. truck owners and operators/drivers transporting products off-site);
v. Landowners;
vi. Point of sale owners and traders/distributors;
vii. Consumers, i.e. individuals, government and businesses;
viii. Mining Associations of Zambia;

ix. Regulatory agencies (Zambia Revenue Authority, Local Authorities, MMMD, Zambia Development Agency, Ministry of Commerce, Ministry of Water Development, Water Resources Management Agency (WARMA), Energy Regulation Board (ERB), Zambia Environmental Management Agency);
x. Service providers (Utility Companies, ZESCO Ltd, Water utility companies)
xi. Financial Institutions
xii. Manufacturers

Table 25: Roles, Constraints and Opportunities in the Development Minerals Value Chain.

Stages	Key Stakeholders	Roles	Constraints	Opportunities
Exploration	Exploration Cos	Carry out exploration	-Lack of capacity of clients to pay -Inadequate infrastructure e.g. roads	Limited number of Exploration. Co.
	Mining Right holders	Mobilise resources	Skills, cost of exploration Land rights versus mining rights	Vast occurrence of Development Mineral resources
	Regulators	Issue permits and monitor compliance	-General lack of capacity in developing requisite plans e.g. Environmental Project Brief (EPB). -Limited human resources capacity e.g. staffing levels	-Awareness raising -Decentralisation of regulatory functions e.g. Engage other government institutions especially at local level
	Equipment suppliers	Supply equipment	Lack of financial capacity of clients to procure the equipment	Equipment suppliers and financial institutions working together in developing appropriate financing tools.
	Financial Institutions	Financing and insurance	Perceived elevated risk	Creating awareness and capacity building targeting financial institutions on value & return on investment in investing in exploration. Design an appropriate insurance product.
	Mining Contractors.	Develop the mine	-Lack of access to finance by operators	Harmonisation of the land rights and mining rights Over 1000 Small Scale licences issued, mostly to ASMEs of Development Minerals

Development			-General lack of capacity in developing requisite plans e.g. Environmental Project Brief (EPB). especially ASM	Availability of mine workers
	Regulators	Issue permits, monitor and regulate	Limited human and financial capacity e.g. low staffing levels, financial resources, transport	-Decentralisation of regulatory functions e.g. Engage other government institutions especially at local government level
	Equipment Suppliers	Supply of appropriate equipment	Lack of appropriate and affordable equipment to market to the ASMEs.	Equipment suppliers and financial institutions working together in developing appropriate financing products to enable ASMEs procure equipment.
	Service Suppliers	Provision of services	Lack of appropriate and affordable services to market to the ASMEs	-Awareness raising and capacity development about the sector -Collaborative partnerships with mining related institutions
	Financial Institutions	Investment finance and insurance	Inadequate understanding of ASM sector, e.g. lack of mining sector expertise	-Awareness raising and capacity development about the sector -Collaborative partnerships with public, private and mining related institutions to increase sector knowledge including on value-chain and markets analyses
Mining and production	Mining Co.	Exploitation	Lack of technical expertise especially among ASMs	Local institutions, e.g. UNZA, Ministry of Mines and Minerals development to provide required geological consultancy, sample analysis and feasibility studies
	Regulators	Issue permits, monitor and regulate	Limited human resources capacity e.g. low staffing levels	Decentralisation of regulatory functions e.g. Engage other government institutions especially at local government level

	Equipment Suppliers	Supply of appropriate equipment	Lack of appropriate and affordable equipment to market to the ASMEs.	Equipment suppliers and financial institutions working together in developing appropriate financing products to enable ASMs procure equipment.
	Service Suppliers	Provision of services	Lack of appropriate and affordable services to market to the ASMEs	- Awareness raising and capacity development about the sector - Collaborative partnerships with mining related institutions
	Financial Institutions	Investment finance and insurance	Inadequate understanding of ASM sector ,e.g. lack of mining sector expertise	-Awareness raising and capacity development about the sector -Collaborative partnerships with public, private and mining related institutions to increase sector knowledge including on value-chain and markets analyses
Processing	Mining Co.	Mineral processing	General lack of technical know-how, especially ASM	Provision of training by local institutions, e.g. UNZA, Ministry of Mines and Minerals Development
	Regulators	Issue permits, monitor and regulate	Limited human capacity e.g. low staffing levels	-Decentralisation of regulatory functions e.g. Engage other government institutions especially at local government level
	Equipment Suppliers	Supply of appropriate equipment	Lack of appropriate and affordable equipment to market to the ASMEs	Equipment suppliers and financial institutions working together in developing appropriate financing products to enable ASMs procure equipment.
	Service Suppliers	Provision of services	Lack of appropriate and affordable services to market to the ASMEs	Collaborative partnerships with the public and private sector to extend affordable services to ASMEs
	Financial Institutions	Investment finance and insurance	Inadequate understanding of ASM sector, e.g. lack of mining sector expertise	-Awareness raising and capacity development about the sector - Collaborative partnerships with public, private and mining related institutions to develop appropriate financial products and facilities for ASM operators

Secondary Production	Mining Co.	Mineral processing	-General lack of technical know-how, especially by ASM	Provision of training by local institutions, e.g. UNZA, Ministry of Mines and Minerals Development
	Regulators	Issue permits, monitor, regulate and promote use of standards	-Limited human resources capacity e.g. low staffing levels	-Decentralisation of regulatory functions e.g. Engage other government institutions especially at local government level
	Equipment Suppliers	Supply of appropriate equipment	Lack of appropriate and affordable equipment to market to the ASMEs	Equipment suppliers and financial institutions working together in developing appropriate financing tools and facilities to enable ASMs procure equipment.
	Service Suppliers	Provision of services	- Lack of appropriate and affordable services to market to the ASMEs	- Awareness raising and capacity development about the sector Collaborative partnerships with the public and private sector to extend affordable services to ASMEs
	Financial Institutions	Investment finance and insurance	Inadequate understanding of ASM sector, e.g. lack of mining sector expertise	Collaborative partnerships with public, private and mining related institutions to develop appropriate financial products and facilities for ASM operators
	Local Manufacturers	Manufacture products from Development Minerals	Access to markets and market information; access to affordable energy	Abundant deposits of Development Minerals
Distribution	Regulators	Issue permits, monitor, regulate and promote use of standards	Limited human resources capacity e.g. low staffing levels	Decentralisation of regulatory functions to the local authorities
	Transporters	Movement from producer to market	Infrastructure, e.g. roads and telecommunication networks	Increased extraction and processing of Development Minerals; Increased demand for Development Minerals in housing, construction, infrastructure and agricultural sectors

	Financial Institutions	Insurance	Lack of appreciation of insurance particularly by small scale distributors	Awareness raising targeting the distributors about the importance of insurance Development of affordable and appropriate insurance products for the small-scale distributors
Marketing	Producers	Product supply Selling, pricing and branding	- ASM Lack of know-how and access to affordable transport for product distribution -Poor quality control of products to meet consumer requirements. Poor quality control of minerals in terms of product grade consistency by the ASM players.	-Awareness raising about the importance of targeted marketing -Availability of huge marketing potential
	Regulators	Monitor competition, regulate, promote product standards and consumer protection,	Limited human resources capacity e.g. low staffing levels	Opportunity to decentralise functions and sector-specific extension services to the local authorities' level
	Advertisers	Branding and advertising	Lack of appreciation of advertising particularly by small operators.	Growing demand for Development Minerals and products Awareness raising targeting ASMEs on importance of branding and advertising Establishment of national and local campaigns to promote Development Minerals products such as "Buy Zambia Build Zambia"

	Wholesalers	Product supply Selling, and pricing	None apparent	Growing demand for Development Minerals and products Increased demand for Development Minerals in housing, construction, infrastructure and agricultural sectors
	Retailers	Pricing and selling	None apparent	Increased demand for Development Minerals in housing, construction, infrastructure and agricultural sectors
Use	Consumer	Utilise the product	-Product quality inconsistence especially among ASM producers -Limited capacity among the consumers to understand the specifications	Wide range of application in the construction, agro-processing, and manufacturing industries

9.2.3 Revenue Distribution Among the Main Actors in the Mineral Value Chain

Revenue and revenue distribution among actors in the Development Minerals sector is based on data collected from the field sites and is in relation to sand, amethyst, clay and aggregate.

Sand

According to the data obtained from the National Council for Construction (NCC) the cost of sand is ZMW 6 (US$0.6) per wheel barrow (a wheel barrow is equal to 0.1446 tonnes). A 20 tonne truckload translates to approximately 140 wheel barrows which would then ideally cost ZMW 840 (US$84). Councils charge K10 (US$1) per truckload of sand.

At Kasisi and Kachangwa sites a 20 tonne truckload costs K200 (US$20). On average, each of the two sites sells 80 tons of sand per day translating into 2,400 tons per month from each site at a value of ZMW 24,000 or US$2400. At Kachangwa the council collects a ZMW 10 or US$1 levy per truckload. At Kasisi site where sand is sold at ZMW 30 (US$3) per 20 tons truckload, there is no council control point for collection of sand levies. A group of men loading a truck is paid ZMW 60 (US$6) reducing the earnings of the owners of the sand to ZMW 110 (US$11) and ZMW 100 (US$10) per truck at Kasisi and Kachangwa respectively. There may be slight variations not accounted for in this estimate, as is always the case with linear progression models, due to weather related market access challenges.

Another important stakeholder is the transporter, who may be an end user or a trader. The trader sells sand from the two sites at ZMW 2,500 or US$250 per 20 tonne truck load in Lusaka after having paid ZMW 1800 or US$180 for hire of the truck and ZMW 200 or US$20 for the purchase of the sand. The trader therefore earned ZMW 500 or US$50 from the transaction.

Table 26 shows how much each player makes in the value chain, at Kachangwa extraction site 43km from the central business district.

Table 26: Earnings of stakeholders at Kachangwa site

PLAYER IN THE VALUE CHAIN	AMOUNT (ZMW)	AMOUNT (US$)
SELLER	200 per 20ton of sand	20
LOADERS	60	6
TRANSPORTER	1,800	180
COUNCIL	10	1

The amount used in the hiring of trucks by the buyer of the commodity is mainly dependant on the size and the distance from the site to the final destination. The levy collected by the council varies from one council to the other and is according to the formulated by-law.

In conclusion, the foregoing demonstrates the value distribution between producers and traders. The most significant value increase was evident between the mine and the second point of sale. Given the means to directly access a higher value market, earnings for sand producers would significantly increase.

Amethyst

The ASM operators at Mapatizya averaging 30 men and women from nearby villages who worked on a commission basis were paid ZMW 1 or US$0.1 per kilogram of run-off mine amethyst. Individual miners indicated that they earn an average of ZMW 800 or US$80 per month, which is equivalent to less than US$3/day.

The price of amethyst is influenced by quality and grade. The price increases from ZMW 1 or US$0.1 to ZMW 15 or US$1.5 per kg at the site after knocking. This represents a significant 1,400% increase in value after knocking. In Lusaka the knocked amethyst is sold at ZMW 70 or US$7 per kg, representing a 6,900% increase in value. High-grade amethyst was sold for over ZMW100 or US$10 per kg at the production site and for as much as ZMW400 or US$40 per kg or more in Lusaka. This represents 300% increase in value.

There exists a significant local market for amethyst end products such as earrings, rings and bracelets and other ornamental products that are sold at open markets known as Saturday and Sunday markets. During the study period, the earrings, rings and bracelets were sold at between ZMW 800 or US$80 and ZMW2,000 or US$200, depending on design. At the Jewellery store in a Cosmopolitan mall in Lusaka, a ring with a small piece of amethyst was selling at ZMW5,000 or US$500. The value is significant, but the value addition

process is influenced by different factors, including specialized labour costs and cost of the base. Therefore, it is not possible to infer the value increase.

Table 27: Amethyst price information at different stages of the value chain

Description	*Unit in price (ZMW/Kg)*		*Per cent increase of rough)*	
	Low Grade	***High Grade***	***(Low Grade***	***High Grade)***
Run off mine Amethyst	1			
Knocked Amethyst at Mine site	15	100	1400	-
Knocked Amethyst at Lusaka	70	400	6900	300
Beading ie bracelets	800	-	-	-
Faceted i.e on rings	-	5000		4900

The study demonstrates that there was a significant increase in value between runoff and knocked amethyst sold at production site and the point of sale as indicated in Table 27. Furthermore, access to capital to facilitate processing, marketing and value addition, contributed significantly to the increase in value of amethyst.

Clay

Tekela Clay Bricks in Kalulushi, Copperbelt Province, uses silica and clay for manufacturing burnt and clay bricks. Clay bricks are in demand on the Copperbelt and in many parts of Zambia as they are used in construction of housing and business entities. This economic activity provides employment opportunities to youths of Chibote and Chibuluma townships of Kalulushi.

At the production sites in the two townships, 26 young men and women (40% women and 60% young men) are employed by the company in mining of silica and clay and the selling of bricks. Eight women and four men are involved in mining of clay and silica.

The miners received ZMW 20 or US$2 for a day's work equating to K480 or US$48 per month. The income is equivalent to just under US$ 2 per day, which is the lowest of incomes recorded during this study.

At production level, eight men and two women are employed to pack clay bricks in rows of 200 each and kilning. The bricks produced are sold by two women

and two men who are paid K30 per person per day, amounting to ZMW 720 or US$72 per month for each person.

Three sizes of bricks are produced, 4 inch, 6 inch and 8 inch and sold at ZMW 1.50 or US$0.15, ZMW 1.00 or US$0.1 and ZMW 2.00 or US$0.2 per brick respectively. The demand for the 4 inch bricks was higher compared to the 6 and 8 inch bricks. The 6 and 8 inches bricks were often sold on a contract basis and customers include large mining companies like Mopani and Chibuluma that constitute about 20% of Tekela's business sales.

The transporters were hired by the traders to move bricks from the site to several points of sale. To haul 10,000 bricks of 4 inches within Kalulushi, the transporter charges ZMW 250 or US$25. The hire charge for moving the similar amounts of bricks to Kitwe increases to ZMW400 or US$40.

The traders sell bricks at roadsides in Gapp Township in Kalulushi and Nakadoli market in Kitwe. At these points of sale, the prices increased by 33% across all the brick sizes. The bricks were sold at ZMW2.00 or US$0.2, ZMW1.50 or US$0.15 and ZMW3.00 or US$0.3 per brick for a 4, 6 and 8 inch bricks respectively.

The data gathered as represented in Table 28 at site does not allow us to make inferences over relative earnings at company and trade level, as there is no information over the total volume of bricks sold by brick type per day, week or month.

Table 28: Clay income and price information at different stages of the value chain

Value Chain Actor	Price per 6" brick (ZMW)	Income (ZMW)
ASM molded at site		480/month
ASM kilned bricks	1.00	720/month
Transporter within Kalulushi		250/load
Transporter to Kitwe		400/load
Traders at Kalulushi and Kitwe	1.50	

Aggregate

Basalt is exploited for aggregate by the ASM of Ngwenya Stone Crushers Association in Livingstone. Membership in the association is approximately 600 miners. The Association only managed to acquire a mining license in 2017 after undergoing a capacity building programme from the Ministry of Mines and Minerals Development with support from the ACP-EU Development Minerals Programme implemented by UNDP in 2016.

The miners extract the basalt and manually crush it using hammers to break stones into different sizes of aggregate products such as 19 mm, 13 mm, and 10 mm. Other products include soak away stones and quarry dust. On average, a worker earned ZMW 100 or US$10 per day or ZMW 1,600 or US$160 per month.

The 19 mm aggregate stones are sold at ZMW150 per tonne (15 wheelbarrows are equivalent to 1 tonne) at the selling point. The 13 mm and 10 mm aggregates are sold for ZMW 187.50 or US$18.75 and ZMW 225 or US$22.50 per tonne respectively because the process is more labour intensive for smaller sizes.

Furthermore, a 10 tonne heap of quarry dust and soak away stone were sold for ZMW 3,000 or US$300 and ZMW 2,000 or US$200 respectively.

An average of 130 tonnes of aggregate products per day or 3,600 tonnes per month were sold. This translates to earning amounting to ZMW 860,000 or US$ 86,000 per month. The price for the products has not changed in the past three years. Furthermore, the market share for miners of aggregates in Livingstone has reduced in the same period largely due to increased competition arising from entry of new players.

Transporters are hired by the buyers to move the purchased aggregate stones to different destinations. The cost of hiring a 20 tonne and 10 tonne truck load ranged from ZMW 1,200 to 1,600 or US$120 to US$160 per trip within Livingstone respectively. The hire of small vans varies from ZMW 500 or US$50 and ZMW 800 or US$80 within Livingstone. The actual price and income in the ASM basalt value chain tabulated in Table 29

The buyers are mainly private individuals and companies. The buyers purchase the aggregate stones for construction of houses, apartments, and institutional facilities like clinics, hospitals, bus stop, lodges/hotels and roads.

The local municipality council representatives collect levies from each association member at the rate of ZMW 10 or US$1 per day on site.

Other stakeholders found on site included operators of restaurants/small food stands and traders selling clothes, suggesting there was an infant secondary economy developing around the mine.

The stone aggregate site is a successful model of co-ownership, with organized production and trade structures and a stable set of buyers. The value distribution is more dispersed across a greater number of beneficiaries by virtue of the Association membership and by member worker pool. This means the benefits accruing to those involved in the cooperatives are more equitably distributed compared to ASM working in companies

Table 29: Aggregates income and price information at different stages of the value chain

Value Chain Actor	Price (ZMW)	Income (ZMW)
ASM aggregate at crushing site 10mm, 13mm and 19mm	150-225/ton	1600/month
Other Products-quarry dust, soaker way rock	200-300/ton	
Transporter within Livingstone		1200 -1600 /load
Transporter within Livingstone small vans		500/load
Local council		10/day

10. RECOMMENDATIONS

The analysis in the previous sections can be summarised into a series of ten recommendations.

10.1 Government Ownership

The Government of Zambia should take ownership of the Development Minerals sector and coordinate a multi-institutional approach that focuses on enhancing the value-chain. The draft Cabinet note can include a substantive section on Development Minerals (in line with adopting the Africa Mining Vision) and the need for a multi-institutional approach (Table 30).

The critical success factor here is the need for leadership at Cabinet Office level, with effective coordination among institutions. Key institutions include:

i. Ministry of Mines and Minerals Development;
ii. Ministry of Commerce (Cooperatives Department);
iii. CEEC;
iv. ZEMA; and
v. ZDA.

In addition, the following institutions may also need to be involved in the task force:

i. Bureau of Standards;
ii. Ministry of Labour and Social Security;
iii. Ministry of Gender;
iv. Ministry of Development Planning;
v. Ministry of Traditional Affairs; and
vi. Ministry of Local Government.

The key outcome of this intervention should be a more coordinated approach by the above institutions to improve the Development Minerals sector's contribution to the national economy. Failure to develop a multi-institutional approach will result in continued lack of effective Government leadership in the development of the Development Minerals sector.

Extraction and mining of Development minerals is often carried out by local communities without permits from the MMMD. This is, in part, is due to distance from the capital city-Lusaka, lack of sensitization, inadequacies in the enforcement of regulations, among others. A decentralised approach to mining rights administration is therefore important for two reasons. The first reason is to bring regulatory and other services much closer to operators in ASM of Development Minerals. Doing this has the potential to reduce the cost to operators and in doing so, to reduce barriers to formalisation. Other aspects of Development Minerals administration, such as fee collection and inspections, also need to be decentralised or devolved.

The second reason for considering decentralized management of mining rights is taking services closer to the people. With regards to ASM, the operations are small and presumably contribute small amounts of mineral levies and royalties. Therefore, this sector is not prioritised by Central Government compared to the prioritization of the needs and impacts of large-scale mining companies.

Local government, however, is likely to have a far greater interest in the day-to-day regulation of the Development Minerals sector because the impacts are more evident at the local level.

Under this kind of model, central government would, however, continue to be responsible for:

i. The overall legislative framework;
ii. Any sector specific strategies or initiatives; and
iii. Ensuring that all minerals rights are recorded in the Flexi-cadastre system.

Table 30: Multi-Institutional Approach to Governance of Development Minerals sector.

Agency/Department	Role
Cabinet Office	The Cabinet Office would oversee overall coordination of Development Minerals policy and implementation and be the focal point between the different ministries and agencies participating in sector governance.
MMMD	The MMMD plays an essential role in decentralised (and simplified) licensing and monitoring of the development minerals sector. The ministry's Geological Survey Department will also play a key role in advancing the knowledge of the distribution and resource estimates of Development Minerals through geological surveys.
Citizens Economic Empowerment Commission (CEEC)	The CEEC's mandate is to uplift marginalised communities and citizens to participate in the national economy, especially women, youth and persons with disabilities. This includes those participating in in the Development Minerals sector
Cooperatives Department, Ministry of Commerce	The Cooperatives Department is responsible for setting out the policy direction for formalising sectors of the Zambian economy. The Department role is crucial because it will provide the suitable environment to promote formalisation of the informal sector including Development Minerals sector
ZDA	The ZDA has four core functions: • Promoting and facilitating investments • Export promotions • Enterprise development (SMEs) • Policy and research The Enterprise development department would play a key role in providing business training to formalising cooperatives.
ZEMA	ZEMA's approach to smaller scale mining impact analysis through the "Environmental Project Brief" is of critical importance, to ensure that the current poor practices in the informal aspect of Development Minerals are improved.

10.2 Traditional Leadership

The buy-in from traditional authority structures (Paramount Chiefs, Chiefs and Headmen) is vital for community coordination, transparency and accountability. A critical success factor is that all support projects must involve the traditional authority structures. The outcome from this intervention should be a transparent and accountable cooperative management. The risk associated with lack of this intervention is that there will be no local support from traditional

authority structures. This can be mitigated by effective communications with traditional authority structures.

10.3 Policy, Legislation and Institutional Development

The Ministry of Mines and Minerals Development is currently developing a new policy. This policy must include a substantive section on Development Minerals and guide amendments to the current Mines and Minerals Development Act. The MMMD must consider a dedicated Development Minerals unit to spearhead the development of the sector. A critical success factor here is that the policy must be accompanied by amendments to the current Mines and Minerals Development Act which differentiates between Development Minerals and other mineral types (base metals, precious stones etc.)

The role of municipalities is key. Local Government councils should enact by-laws to compel construction firms to buy sand, aggregates etc only from licensed cooperatives and entrepreneurs.

The outcome from policy intervention is the establishment of clearly defined roles and responsibilities facilitating a better coordinated multi-institutional approach in the sector. The risks associated with any such intervention is that there may be delays to the development of the policy and legal amendments. This risk can be mitigated by issuing a relevant Statutory Instrument and/or municipal by-law to pilot a Development Minerals regime focused on enhanced value chains.

10.4 Market Development and Formalisation

ASM operators in Development Minerals are often unaware of the value chain for their own product, including market pricing information, leading to exploitation from middlemen and other traders. Additional studies should be commissioned to investigate the potential economic upsides of developing each category of mineral in the Development Minerals sector, which build on the high-level value chain analyses in this report.

A study should be commissioned on the economic benefits of locally beneficiated amethyst, including a scenario where there is a ban on the export of rough stones.

Government has facilitated the establishment of Cooperatives by the transfer of regulatory functions from the Ministry of Agriculture to the Ministry of

Commerce, Trade and Industry providing an opportunity to ASM to easily formalise. The outcome of this intervention is that there is a buy-in from ASM in the formation of cooperatives in the Development Minerals sector. Outputs that support this outcome include targeted value chain and linkages studies (on specific areas/minerals). The risk, for government empowerment funds such as the youth development fund, is that because of increased awareness of the benefits of formalisation and development, cooperatives access finance, buy equipment etc. without a clear and sustainable business plan. A mitigation for this risk is that the Government of Zambia makes it a condition that cooperatives accessing government funds are assessed in terms of their business plan and management structure.

10.5 Occupational Health and Safety

Most ASM Development Minerals operations have poor health and safety practices. The primary recommendation is to develop a 'fit-for-purpose' regulation on Occupational Health and Safety based on the scale of the operation and on commodities mined. In addition to the development of fit-for-purpose health & safety regulations, appropriate awareness and training should be provided for all Development Minerals companies and operators. The outcome of this intervention should be a widespread compliance with health & safety regulations resulting in improved health and safety working conditions for the workers in Development Minerals operations. The critical success factor here is that training is effectively communicated (in local languages) and that follow-on support/inspections are timely. Due to the size of the Zambian mining sector a risk associated with any such intervention is that health & safety inspections for Development Minerals prove too onerous for the Ministry of Mines and Minerals Development. This is exacerbated by the fact that the Ministry faces challenges such as human and financial capacities to effectively implement its mandate in health and Safety. To mitigate this, one option is to create a 'community inspectors' framework, whereby local people are trained by the Ministry of Mines and Minerals Development to carry out Inspections at ASM sites. The operating procedures of the Community Inspectors can be developed in similar lines as those of the honorary inspectors, which is provided in the mining law.

10.6 Sustainability

Currently, programmes enhancing capacity of ASM in the Development Minerals sector in Zambia are donor-driven. The business model for private enterprise cooperatives needs to be grounded in economically sustainable solutions. It is critical here that cooperatives must formalise based on a

sustainable business plan and accountable leadership. The desired outcome here is for a high number of ASM cooperatives with scaled up businesses.

10.7 Human Rights

Human rights issues are common in the ASM Development Minerals sector, in terms of working conditions and child labour. It is critical that there is a more coordinated approach within government, including the Ministry of Labour, the Human Rights Commission as well as support from the ILO. The goal of any intervention should be to improve working conditions and reduce incidences of child labour in ASM Development Minerals operations within a multi-sectoral approach. Personnel from the Ministries of Mines & Children's affairs should support families to phase out presence of children/child labour in mines as part of livelihood and business improvement. The risk attached to any such intervention is that non-compliance on acceptable working conditions and use of child labour remain un-reported. It is therefore key that traditional authority structures have buy-in into the strategy, and further communicate it to headmen and the cooperatives.

10.8 Data

There is currently scant data on geological information, markets, production, employment, revenue, safety and environmental data in the Development Minerals sector. It will therefore be necessary that a follow-up in-depth study is commissioned, that prioritises data collection on Development Minerals in terms of economic and employment opportunities. The results of the study would feed into policy formulation for the Development Minerals sector. The risk for non-implementation is the continued lack of data to inform policy and developmental initiatives. The mitigation strategy is the need for Development partners continued engagement with the Government of Zambia on the importance of the Development Minerals sector.

10.9 Environment

The Environmental Management Act should be amended to be more responsive to the needs of the ASM in general and the Development Minerals sector in particular. For example, there is need to consider the lowering of the fees for submission of EIA/EPB in order to make them more affordable to ASM operators.

Strategic Environmental Assessments are important to better plan and regulate the ASM players in the Development Minerals sector and to reduce the cost burden on individual players. In addition, provisions for strategic environmental impact assessment that are appropriate for ASM players in the Development

Minerals sector should be put in place in the legislation of the Environmental Management Act

The Environmental Management Act of 2011 allows the decisions of ZEMA on EIA/EPB to be overturned by the Minister. This discretionary power weakens the legislation. Therefore, the Environmental Management Act must be updated to reduce discretionary decision making on approvals by the Minister. The risk is that continued discretionary decision-making ensures that there is ongoing harm to the environment (soil, water and air pollution, lack of reclamation etc.), with large scale Development Minerals operators. To mitigate this risk, it will be important that there is robust civil society engagement with the Government of Zambia on the risks associated with discretionary decision making on environmental issues.

The Environmental Protection Fund (EPF) should be restructured to encourage compliance, so that ASM players in the Development Minerals sector meet their obligations to the Fund as provided for under the EMA.

10.10 Access to Finance and Equipment

Access to finance for ASM players in the Development Minerals sector is a challenge. This is because it is wrongly perceived as a high-risk sector, resulting in high cost of borrowing. The government should have a deliberate policy to ensure that financing agencies such as the Citizens Economic Empowerment Commission (CEEC) and Development Bank of Zambia (DBZ) provide financial products to ASMEs of Development Minerals. This has the potential for the creation of the much needed employment for the youth and wealth creation to boost the Zambian economy.

The licence holders in the Development Minerals sector should be encouraged to partner with organisations and individual investors who have capital to inject into the Development Minerals operations. In this regard the line ministry and the Zambia Development Agency could play a strong facilitatory role as well as build the capacity of ASMEs on contract negotiations with investors, alongside other key stakeholders.

Most Development Minerals operators lack appropriate equipment to conduct their operations. A proposed solution is for a Memorandum of Agreement (MoA) be signed with mining and industrial equipment suppliers to provide the required equipment at concessionary rates. This model has been used by small scale operators engaged in silica mining at BBM/Kyulu development trust mine in Solwezi and could be replicated elsewhere.

There is also potential for Development Minerals players to access finance through the UNDP facilitated partnership between African Guarantee Fund and local financial institutions. The government, in collaboration with development partners such as UNDP and Oxfam, should facilitate avenues for sustained dialogue between ASM operators and their representatives and financial institutions to identify opportunities and develop financing models suitable for the Development Minerals sector.

10.11 General

The over-arching recommendation of this report in terms of the ACP-EU Development Minerals Programme is that once the six individual country reports (Uganda, Guinea, Zambia, Cameroon, Jamaica and Fiji) have been completed it would be useful to develop a broad guidance for best practice in the ASM extraction of Development Minerals.

ANNEXES

Annex 1: Literature Review & Bibliography

References and Bibliography

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http://www.trademap.org/tradestat/Country List of supplying markets for a product imported by Zambia

Literature Review

Publications

EITI Zambia 2015 Report (2016)
This report contains summary of licensing and fiscal regime for mining. Most usefully it also contains a list of the major mining companies, including a number who are involved in development minerals. Reports on all companies making more than 2m kwacha (approx. US$214k) in payments. Reports that 7.28% of mining revenues come from cement, and 6.5% from 'other minerals' (lime, emeralds, quarrying). The relevant development minerals companies captured by the report are:

- Zambia Consolidated Copper Mines Investment Holdings (ZCCM-IH) is the 87% government owned investment company that holds stakes in most of Zambia's mines. This includes 100% ownership of Ndola Cement, 25% of Kagem Emerald Mine, and 50% of Kariba Amethyst Mine. See http://www.zccm-ih.com.zm/
- Lafarge Cement Company – see http://www.lafarge.co.zm/ - 575m kwacha in payments to government.
- Kagem Mining Ltd (emeralds) – see http://corporate.gemfields.co.uk/assets/kagem-emerald-mine-zambia - 261m in payments to government.
- Grizzly Mining Ltd (gemstones) – no website available – 21.3m kwacha in payments.
- Ndola Lime Company (ZCCM-IH subsidiary) – see http://www.ndolalime.co.zm/ - 8.8m kwacha in payments.
- Lions Group Quarries Ltd – no website – some media articles on the web – 8.5m kwacha in payments
- Neelkanth Lime - http://neelkanthlime.com/ - 6.4m kwacha in payments
- Kariba Amethyst Mine - http://corporate.gemfields.co.uk/assets/kariba-amethyst-mine-zambia - 13.6m in payments.
- Synite Quarries Zambia - http://www.synitequarrieslimited.com/about/ - 5.3m kwacha in payments.
- Kalulushi Clay Bricks - http://www.kcbricks.com/ - 3.7m kwacha in payments
- Calcite Ltd Zambia – no website – 2.8m kwacha in payments
- Scirocco Enterprises Limited - http://sciroccozm.com/ - 6.3m kwacha in payments

Accessible at https://eiti.org/document/2015-zambia-eiti-report

Zambia – Selected Issues, International Monetary Fund (2015).
This report reviews the mining sector taxation regime at the start but most use is probably at p.23 which mentions poor road infrastructure (to which development minerals are a key input) as being a constraint on more inclusive growth.
Accessible at https://www.imf.org/external/pubs/cat/longres.aspx?sk=43000.0

The Potential of Mineral Exploration in Zambia by Kasumba, E. and Chifwepa, C. (2016).

A presentation of Geological Survey Department, accessible at http://www.cgs.gov.cn/ddztt/kydh/2016kydh/gjhzcgxz/201609/P020160924530230536301.pdf
This presentation provides a good general geology and investment overview. In particular see slides on limestone (15), granite (16), silica sands (17), phosphate (18), list of key investment advantages (19), low-value mineral potential (22).

Zambia Mining Investment and Governance Review, World Bank (2016).
This provides a good overview of the general strengths and weaknesses of sector governance as a whole, including ASM (under which a lot of development minerals could be counted) on pages 18-19. That said, not much of a sector overview is provided so the results will inevitably be significantly influenced by the copper sector. The table on p. 19 shows particularly poor (or no) practice in the following areas:

- To what extent are there detailed laws and regulations to settle disputes between ASM and other mining activities?
- Is there a dedicated unit within the Ministry dealing with artisanal and small scale mining?
- To what extent is the government effectively using a dispute resolution system dedicated to ASM to tackle disputes between artisanal and small scale mining and other mining activities?
- Does the government have a simplified tax collection system for ASM? (
- To what extent is the government monitoring compliance with environmental requirements for artisanal and small-scale miners?

Accessible at:http://documents.worldbank.org/curated/en/305921468198529463/pdf/105820-REVISED-PUBLIC-Zambia-Report-ONLINE.pdf

Doing Business 2017 – Zambia Country Report, World Bank (2017).
No mining sector commentary but a good general background.
Accessible at: http://documents.worldbank.org/curated/en/928981478701375425/pdf/WP-DB17-PUBLIC-Zambia.pdf

Making Mining work for Zambia, World Bank (2015).
There is very little mention of development minerals – macro-economic and copper focused but some good commentary on regulatory and tax settings.
Accessible at:
http://documents.worldbank.org/curated/en/305141468189249424/pdf/97390-Zambia-Economic-Brief-5-web-version.pdf

General Development Minerals Resources

US Geological Survey resources on industrial minerals / aggregates.
Available at: https://minerals.cr.usgs.gov/projects/industrial_minerals/products.html

Specification Aggregate Quarry Expansion – A Case Study Demonstrating Sustainable Management of Natural Aggregate Resources, Langer, W.H. and Tucker, M.L. (2003),
The abstract notes the same problem facing this project: "Many countries, provinces, territories, or states in the European Union, Australia, Canada, the United States, and elsewhere have begun implementing sustainability programs, but most of those programs stop short of sustainable management of aggregate resources. Sustainable practices do not always have to be conducted under the title of sustainability. This case study describes how Lafarge, a large multinational construction materials supplier, implemented the principles of sustainability even though there was an absence of existing local government policies or procedures addressing sustainable resource management." Possibly useful case study in that it involves a company that also has a major presence in Zambia.
USGS Open File Report 03-121, accessible at https://pubs.usgs.gov/of/2003/ofr-03-121/OFR-03-121-508.pdf

Managing and Protecting Aggregate Resources, Langer, W.H. (2002)
USGS Open File Report 02-415, accessible at https://pubs.usgs.gov/of/2002/ofr-02-415/ofr-02-415_508.pdf

Sustainability Report: 2016, LafargeHolcim
It is worth looking at LafargeHolcim in greater detail because (i) they are present in Zambia; and (ii) they are (unusually) a multinational cement and aggregates producer (there are others but they are predominantly Chinese and Indian companies) with recognisable standards around many of the issues that this report will focus on – e.g. environmental impact evaluation, GRI reporting, Global Compact reporting, etc. – see http://www.lafargeholcim.com/reports-publications

Compendium of Best Practices in Small-Scale Mining in Africa, UN Economic Commission for Africa (2002)
While many of the best practice documents in this report are dated (many of the mining policy and legislation references are from the 1990s), it is nonetheless a useful collection. It also proposes a useful framework for ASM management and reform across a broad range of issues. Accessible at:
http://www.africaminingvision.org/amv_resources/AMV/Compendium%20on_best_practices_in_%20smallsacle%20.pdf

IGF Guidance for Governments – Managing Artisanal and Small-Scale Mining, Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (2017), accessible at http://igfmining.org/resources/asm-guidance-document/

UNDP-Specific documentation

Development Minerals in Africa, the Caribbean and the Pacific: Background Study 2016
Key background paper, including literature research, as assessment of the development minerals sector in African, Caribbean and Pacific countries, a review

policy treatment for the sector and pointers on leading practice to formalise the sector.
The report accessible at
http://developmentminerals.org/themes/acpeu/images/Background%20Study_EN.pdf

ACP-EU Development Minerals Programme (2015), East Africa Regional Training Workshop on Environment, Community and Health and Safety, training workshop.
The report has a summary of training event and discussion.
The report accessible at http://developmentminerals.org/node/43

Zambia National Consultation Workshop on Development Minerals held on 14-15 July 2016
There is no documentation available online but it would be very useful to ask for all information related to the workshop as this seems to have been the key starting event for Zambia.
See http://developmentminerals.org/node/68

Zambia Training for Trainers for Countrywide Impacts 10-28 October 2016 – training on H&S, labour rights, etc. in the sector
Again, there is no documentation available online, but it would be useful to obtain and review.
See http://developmentminerals.org/node/59

Africa Mining Vision Sources

Bulletin 4: Boosting Artisanal and Small-Scale Mining, Africa Mining Vision (undated), accessible at http://www.africaminingvision.org/amv_resources/ISGbulletin4.pdf
Short (3 pages) summary of the Africa Mining Vision approach to ASM.

Minerals and Africa's Development – the International Study Group Report on Africa's Mineral Regimes, UN Economic Commission for Africa (2011), accessible at http://www.africaminingvision.org/amv_resources/AMV/ISG%20Report_eng.pdf
This very long (230 pages) document is the core document of the Africa Mining Vision. It provides a useful history of mining in Africa and an overview of the sector, though the latter is somewhat coloured when the report was published at the height of the so-called 'minerals super cycle'. The report nonetheless goes on to outline the Africa Mining Vision's approach and recommendations on key areas including managing impacts, artisanal and small-scale mining, corporate social responsibility, revenue management, linkages, trade and investment, institutional arrangements, and regional strategies and harmonisation.

From Aspiration to Reality – Unpacking the Africa Mining Vision, Oxfam International (2017), accessible at
https://www.oxfam.org/sites/www.oxfam.org/files/bp-africa-mining-vision-090317-en.pdf

Provides a good and current summary of the background, approach and key developments in the Africa Mining Vision, as well as recommendations on how it might be improved as individual Country Mining Vision documents are developed.

Diamond beneficiation in Botswana

Some like them rough: the future of diamond beneficiation in Botswana, Grynberg, R. (2013), , European Centre for Development Policy Management Discussion Paper 142, accessible at http://ecdpm.org/publications/future-of-diamond-benefication-in-botswana/

"What Namibia and Botswana need to do to make diamond beneficiation work", Grynberg, R. (2015), PowerPoint presentation at International Diamond Conference, accessible at https://www.africa-newsroom.com/files/download/41a8efa83a86e3a

"The way forward for Botswana's Diamond Beneficiation", Jefferis, K. (2011), PowerPoint presentation, accessible at http://www.econsult.co.bw/econsult-content.php?cid=12

Skills implications of Botswana's Diamond Beneficiation Strategy, World Bank (2014), accessible at https://openknowledge.worldbank.org/handle/10986/21082

Annex 2: Key Site Visit Data

	Site	District	Mineral	Production	Legal Status	Men	Women	Total
1	Chongwe Sand Quarry	Chongwe	Sand	2 x 30 tonnes per person per week	Unregistered	47	26	73
2	Kachangwa Quarry	Chongwe	Sand	30tonnes/week/pit	Unregistered	85	65	150
3	Kalimansenga Quarry	Chisamba	Sand	40tonnes/week/pit	Unregistered	60	70	130
4	Katuba Quarry	Katuba-Chibombo	Sand	50tonnes/week/pit	Unregistered	70	40	110
5	United Quarries Ltd	Chongwe	Aggregate	2500-2600tonnes/day	Licensed	87	2	89
6	Liyayi Talc Mine Association	Lusaka	Talc	1tonne/week/group	Unregistered	65	2	67
7	Larfage Zambia Plc	Chilanga	Limestone	4200tonnes/day	Licensed	735	35	800
8	Oriental Quarries Limited	Chilanga	Limestone/Dolomite/Granite	800-1000tonnes/day	Licensed	13	134	147
9	Kandabwe Small Scale Miners	Kitwe	Granite	?	Unregistered	10	70	80
10	BBM/KYULU Trust Sand Washing Plant	Solwezi	Silica	2450 tonnes/day	Licensed	37	2	39
11	Kalulushi Clay Bricks Limited	Kalulushi	Clay	2million burnt bricks/month	Licensed	30	67	97
12	Kagem Mine Limited	Lufwanyama	Beryl (Emerald)	Over 1million Carats/year	Licensed	347	3	350
13	Kanyafimbolo Mine	Lufwanyama	Quartz & Amethyst	40 tonnes / month	Unregistered	16	7	23
14	Lesa Wamaka Club	Kalulushi	Granite	400-500tonnes/month	Unregistered	9	17	26
15	Atlantis Mine Ltd T/A Lunga Resources	Kitwe	Silica	1850 tonnes/day	Not known	167	13	180
16	Nizam Crushers Limited	Luanshya	Granite	2350tones/day	Not known	74	2	76

17	Ngwenya Community Cooperative	Livingstone	Basalt	20tonnes/month/family	Unregistered	35	70	105
18	Kariba Minerals Limited	Kalomo	Amethyst	Over 1million Carats/year	Licensed	141	9	150
19	Gramiraji Investments Limited	Kalomo	Amethyst	1-2tonnes/month	Unregistered	5	2	7
20	Tip Top Mining & Construction Limited	Siavonga	Green Tourmaline, Red Garnet Kariba Flat Stones, Calcite, Granite,Limestone, Sand stone	*10-12tonnes/month*	Unregistered	7	1	8
21	Uniturtle Industries Ltd	Lusaka	Limestone, dolomite, granite, calcite	1200-1600tones\day	Licensed	67	13	80
22	Ndola Lime Plc	Ndola	Limestone & granite	1,500tons\day- Finished Products(quick and hydrated lime) 9,000tons\day- limestone mined	Licensed	577	123	700
23	Reycus Supplies(Z) Limited	Kalulushi	Sand, Sandstone	500-600tons\day Sand 200-250tons\sandstone	Licensed	23	4	27
24	Dickson Sinyangwe General Dealers	Kalulushi	Sandstone	400-550tons\day	Licensed	15	2	17
25	Moyo Farm Limited		Sand\laterite	*1300--1600tons\day*	Licensed	57	10	67
26	Roads Development Agency	Kafue	Granite	*1400-1600tons\day*	Licensed	46	12	58
	TOTAL							**3525**

Annex 3: Roads Development Agency Quarries

No.	QUARRY NAME	LICENCE No.	DISTRICT	PROVINCE	SURFACE RIGHTS OWNERSHIP	STATUS/TENANT
1	Kafue Quarry	15651-HQ-SEL	Kafue	Lusaka	Kafue District Council	Active/AVIC
2	Kaole Quarry	18348-HQ-SEL	Mpika	Muchinga	Tradition land	Active/CHICO
3	Mukosokela Quarry	18347HQ-SEL	Mpika	Muchinga	Tradition land	Active/CHICO
4	Lundu Quarry	19238-HQ-SEL	Matumbo	Muchinga	Chief Lundu	Active/China Jiangxi
5	Chadiza 2	19905-HQ-SEL	Chadiza	Eastern	Chief Zingalume	Active/Avex Technical Works
6	Machenje Quarry	19984-HQ-SEL	Kazungula	Southern	Chief Sekute	Active/Deawoo
7	Vubwi	19491-HQ-SEL	Vubwi	Eastern	Private land (Cooperative)	Active/China Jiangxi
8	Chirundu	Mining Permit	Chirundu	Southern	Chirundu D.Council	Inactive
9	Luombe Quarry	7724-HQ-SML	Kasama	Northern	Chief Nondo	Inactive
10	Kafue National Park Quarry	15777-HQ-SEL	Mumbwa	Central	Zambia Wildlife Authority	Inactive
11	Sinjela, Chongwe	15648-HQ-SEL	Chongwe	Lusaka	Chief Bunda- Bunda	Inactive
12	Senkobo Quarry	16316-HQ-SEL	Kazungula	Southern	Chief Musokotwane	Inactive
13	Kazungula/Chilibwe Quarry	19585-HQ-LEL	Kazungula	Southern	Chief Sekute	Inactive
14	Mangango II Quarry	18647-HQ-SEL	Kaoma	Western	Chief Mwenemutondo	Inactive
15	Chamilala Quarry	18346-HQ-SEL	Luangwa	Lusaka	Chief Nyalugwe	Inactive
16	Kafunka Quarry	18344-HQ-SEL	Katete	Eastern	Chief Mbangombe	Inactive
17	Madzimoyo Quarry	18342HQ-SEL	Chipata	Eastern	Chief Nzamani	Inactive
18	Musaya Quarry	18769-HQ-SEL	Siavonga	Southern	Chief Sikongo	Inactive
19	Mangango I Quarry	19237-HQ-SEL	Kaoma	Western	Chief Mwenemutondo	Inactive
20	Mangango 3 Quarry	19079-HQ-SEL	Kaoma	Western	Chief Mwenemutondo	Inactive
21	Sioma/ Maziba	Mining Permit	Senanga	Western	Litunga	Inactive
22	Chadiza Quarry 1	19256-HQ-SEL	Chadiza	Eastern	Chief Zingalume	Inactive
23	Luchinka Quarry	19360-HQ-SEL	Chipili	Luapula	Chief Chipili	Inactive

24	Mova Quarry	19954-HQ-SEL	Nakonde	Muchinga	Nakonde District Council	Inactive
25	Munganga	19828-HQ-SEL	Chipili	Luapula	Chief Chipili	Inactive
26	Katombora Quarry 2	19983-HQ-SEL	Kazungula	Southern	Chief Sekute	Inactive
27	Lupososhi	19492-HQ-SEL	Luwingu	Luapula	Chief Mwenda	Inactive
28	Ngwenya	19492-HQ-SEL	Petauke	Eastern	Traditional land	Inactive
29	Chinsali	19731-HQ-SEL	Chinsali	Muchinga	Chinsali D. Council	Inactive
30	Chiawa	21118-HQ-SEL	Chongwe	Lusaka	Chieftenance Chiawa	Inactive

Annex 4: Field Visit Implementation Schedule

Date	Team activity
9th January	• Travel to Kalulushi
10th January	• Field visit to Lesa Wamaka Association, Shaft No 7 old Chibuluma mine, in Kalulushi. • Site assessments (finance, site, on-site trade, environment, health and safety and socio-economic impacts) • Focus Group Discussion (FGD) • Observations and pictures • Field visit to Kalulushi and Kitwe town centres • Point of sale assessment • Observations and photography
11th January	• Field visit to Tekela clay bricks, in Kalulushi • Site assessments (finance, site, on-site trade, environment, health and safety and socio-economic impacts) • FGD • Observations and pictures • Field visit to Kitwe town centre • Point of sale assessment • Observations and photography • Consolidation of data and team review
12th January	• Field visit to Ndola Lime, in Masaiti • Site assessments (finance, site, on-site trade, environment, health and safety and socio-economic impacts) • FGD • Observations and pictures • Field visit to Ndola and Kitwe town centre • Point of sale assessments • Observations and photography • Consolidation of data and team review
13th January	• Travel to Siavonga, via Lusaka
14th January	• Review and analyse data for summary report
15th January	• Field visit to Zambezi Natural Stones production office and mine, in Siavonga • Site assessments (finance, site, on-site trade, environment, health and safety and socio-economic impacts) • FGD • Observations and photography

16th January	• Travel to Livingstone, via the Bottom Rd (Gwembe)
17th January	• Field visit to Ngwenya Crushed Stones, in Livingstone • Site assessments (finance, site, on-site trade, environment, health and safety and socio-economic impacts) • FGD • Point of sale assessment at the mine site • Observations and pictures • Field visit to Kalomo town centre for buyers out of town • Point of sale assessment • Observations and photography • Consolidation of data and team review
18th January	• Field visit to Grimiraj Investments and Kariba Minerals Mapatizya, in Kalomo • Site assessments (finance, site, on-site trade, environment, health and safety and socio-economic impacts) • FGD • Observations and photography
19th January	• Travel to Lusaka from Kalomo
20th January	• Entry of data into excel data sheet • Review and analyse data for summary report
21st January	• Entry of data into excel data sheet • Review and analyse data for summary report
22nd January	• Field visit to Kachangwa Sand, in Chisamba • Site assessments (finance, site, on-site trade, environment, health and safety and socio-economic impacts) • FGD • Observations and photography • Field visit to Mutumbi and Kalingalinga areas • Point of sale assessment • Observations and pictures • Consolidation of data and team review
23rd January	• Field visit to Kasisi Sand, in Chongwe • Site assessments (finance, site, on-site trade, environment, health and safety and socio-economic impacts) • FGD • Observations and pictures • Field visit to Chalala and Bauleni on Leopards Hill Rd • Point of sale assessment • Observations and photography

	• Consolidation of data and team review
24th January	• Field visit to Oriental Quarries, in Makeni Konga, Lusaka • Site assessments (finance, site, on-site trade, environment, health and safety and socio-economic impacts) • FGD • Point of sale assessment at the mine site • Observations and pictures • Field visit to Makeni on Kafue Rd • Point of sale assessment • Observations and photography • Consolidation of data and team review
25th January	• Meeting with National Technical Committee
25th January	• Field visit to Talc Association, in Lilayi, Kasama Rd, Lusaka • Site assessments (finance, site, on-site trade, environment, health and safety and socio-economic impacts) • FGD • Observations and photography • Field visit to Industrial area • Point of sale assessment • Observations and pictures • Consolidation of data and team review
26th January	• Field visits to Kalingalinga, Makeni, Livestock services and Town centre within Lusaka for • Point of sale assessments for Zambezi Natural Stones, Ndola lime, and Grimaraj Investments • Observations and photography • Consolidation of data and team review
29-30th January	• Meeting Representatives of Government Ministries and Departments

Annex 5: First Field Research Methodology

Our approach to this project involved three stages. Firstly, in advance of our mission to Zambia, our team conducted initial fact finding interviews, through a combination of our local consultant in face-to-face inception meetings with core stakeholders, as well as via conference calls. Apart from communicating the project and its requirements and expected outputs and outcomes to key stakeholders in advance, this d the team to build and review a document library.[42] These initial consultations were for the purpose of gathering preliminary insights into the Development Minerals sector in Zambia, as well as to build a first draft of a stakeholder mapping framework, in order to develop a consultation/field trip schedule.[43]

As well as quantitative data along the lines noted above (number of formal/informal operators, investment data, employment data, ancillary services data, size of potential import substitution market and so on).

Secondly, during the mission to Zambia, the team spent the first two days together, to finalise plans for the stakeholder consultations and for joint meetings in Lusaka. Then, for the remainder of the mission, two consultants proceeded to visit mine sites across the country, with the aim of covering all key development mineral types, a variety of mine sizes, as well as cover the formal and informal aspects of the sector. The other two consultants focused on meetings with a variety of stakeholders in Lusaka, across government, the private sector and civil society. The schedule was revised and updated prior to the mission. Despite the time constraints, it was possible to meet with most planned stakeholders (26 in all), with a wide range of views on the development minerals sector captured. Lusaka-based meetings were conducted by Brian Kapilikisha and Dr. Jeremy Weate between 5th – 15th June, using a semi-structured questionnaire approach (as outlined in the Inception Report).
The meetings are listed in chronological order below:

Table A5.1: Lusaka-Based Meetings

• **Extractive Industry Transparency Alliance** • **ZACSMBA** • **Human Rights Commission** • **Asc. of Zam Women in Mining** • **UNZA School of Mines** • **Ministry of Water Development, Sanitation and Environmental Protection** • **ZEMA**	• **Zambia Land Alliance** • **Centre for Environment Justice** • **UNDP** • **Technical Working Committee** • **Cooperatives Department, Ministry of Commerce** • **Centre for Trade Policy & Development** • **ZDA (Enterprise Department)** • **Chamber of Mines** • **Economics Association**

[42] See the literature review in Annex 1.

[43] See section 4 below.

• **Roads Development Agency** • **Council of Churches** • **Zambia Development Agency (ZDA) - Business Development Department** • **Federation of Small-Scale Mines** • **Ministry of Commerce** • **Oxfam**	• **MMMD** • **Zambia Chamber of Commerce** • **Jesuit Centre for Theological Reflection** • **National Construction Council**

Thirdly, the team then wrote up the mission into a Field Study Report, which was delivered to the technical committee on July 10th. This report included an initial assessment of key issues in the Development Minerals sector in Zambia, which enabled the technical committee to provide further guidance ahead of the development and finalisation of the main baseline report.

The Inception Report to this project set the goal of covering all key Development Mineral types during the mission to Zambia – construction and industrial minerals, dimension stones and semi-precious stones. Although better classified as a precious stone, it was agreed with the UNDP to also include emeralds as part of the study, with the understanding that the overall focus of assessment of gemstones should be on semi-precious stones. In detailed planning preparation for the field trip, the team developed five criteria which would enable a holistic perspective on the development minerals sector from the perspective of sites visited. These criteria are outlined below.

The first sampling criterion was to cover the widest possible range of commodities in the available time-period for the field trips. The breakdown of Development Minerals and commodities inspected across the site visits is provided below.

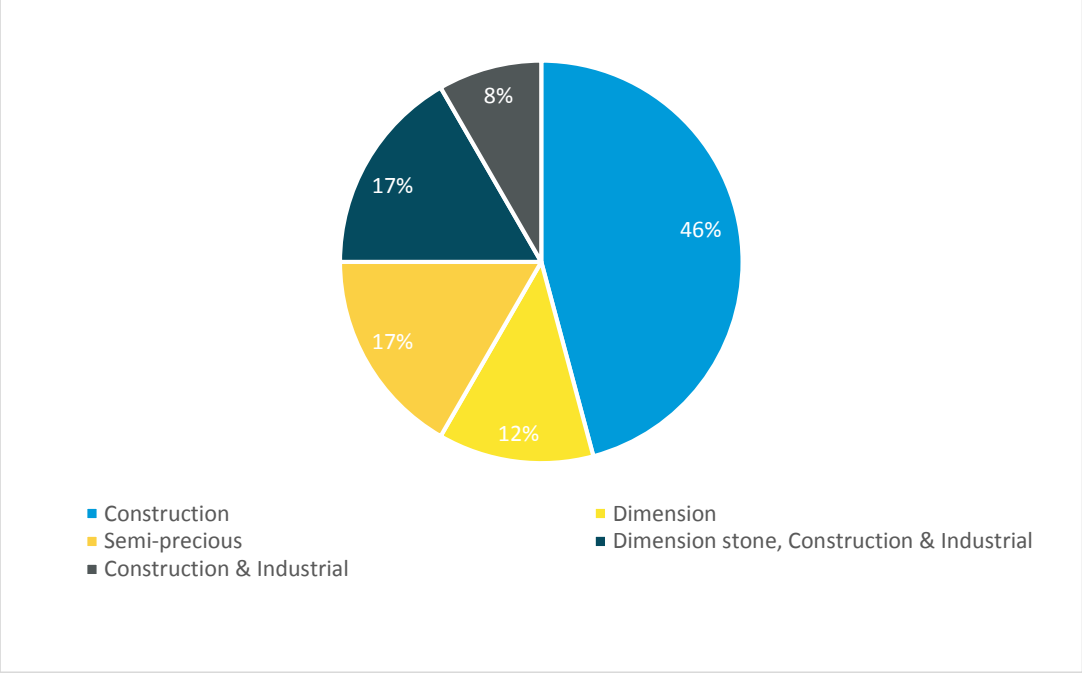


Fig. A5.1: Development Minerals Inspected

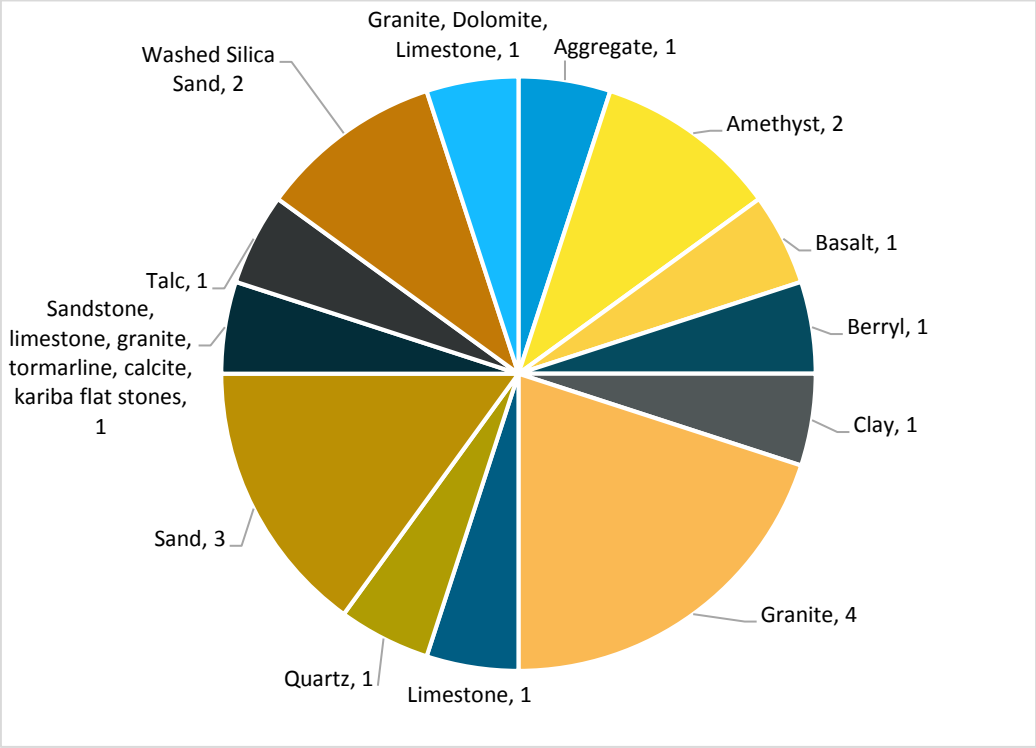


Fig. A5.2: Commodities Inspected

The second criterion used to select sites was size or scale of the operations. The goal was to achieve a relatively balanced mix of small, medium and large operations, with a slight bias towards small and medium operations due to the overall focus of the Development Minerals programme.

The third criterion was to achieve a mix across the formal and informal components of the Development Minerals sector. Sites were classified in four categories of licensing status: (a) No observed licences (informal); (b) Cooperative formed and registered with the Patents and Companies Registration Agency (PACRA); (c) Cooperative formed, registered with PACRA and mining licence obtained; and (d) Compliance to licensing requirements. The figure below shows the size of the operations by the licensing status of operations visited. Not surprisingly, informal operations identified and visited were exclusively operating at a small-scale.

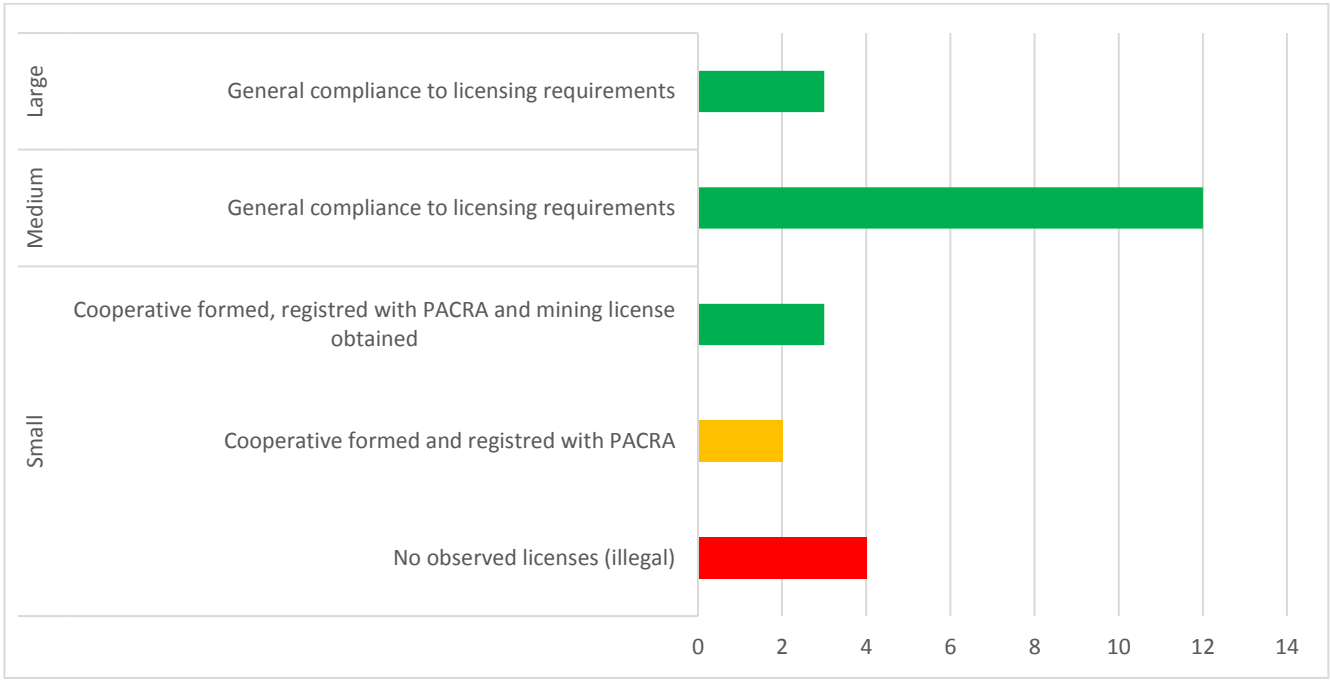


Fig. A5.3: Size and Licensing Status of Sites Inspected

The fourth criterion used to guide the selection of sites for the fields visits was to focus on operations that were illustrative of specific issues important to the Development Minerals agenda in Zambia. These included operations that were known to have both positive and negative impacts in the areas of environmental management, social performance and occupational health and safety. In addition, specific sites were chosen to highlight issues such as child labour[44]; gender[45]; community-private partnerships[46]; government-private partnerships[47]; follow-up of UNDP Development Minerals training participants[48]; and opportunities for supply chain integration[49].

The fifth and final criterion was geographical and transport considerations. Sites visits were planned around the following geographical groupings, where the field team worked extended working hours to ensure adequate site sampling in each location. The planned schedule of site

[44] For instance, Gramiraji Investments Limited in Mapatizya.

[45] Tip Top Mining for female ownership and other sites for gender issues.

[46] BBM Sand Washing in Solwezi.

[47] Ndola Lime and Kariba Minerals.

[48] Tip Top Mining.

[49] For instance, by Luanga Atlantis Mine Limited.

visits was reviewed by the ACP-EU Development Minerals Programme Technical Working Committee for Zambia ("the technical committee") in response to the draft inception report and then again, a few days into the mission (on 9th June). The schedule was revised each time to ensure the technical committee agreed with the approach and specifics of the site visits. At the June meeting with the technical committee, it was also agreed that the selected minerals for Component 5 of the baseline report will be as follows:

- **Industrial minerals:** clay & silica
- **Construction minerals:** limestone & sand
- **Dimension stones:** marble and granite
- **Semi-precious stones:** amethyst

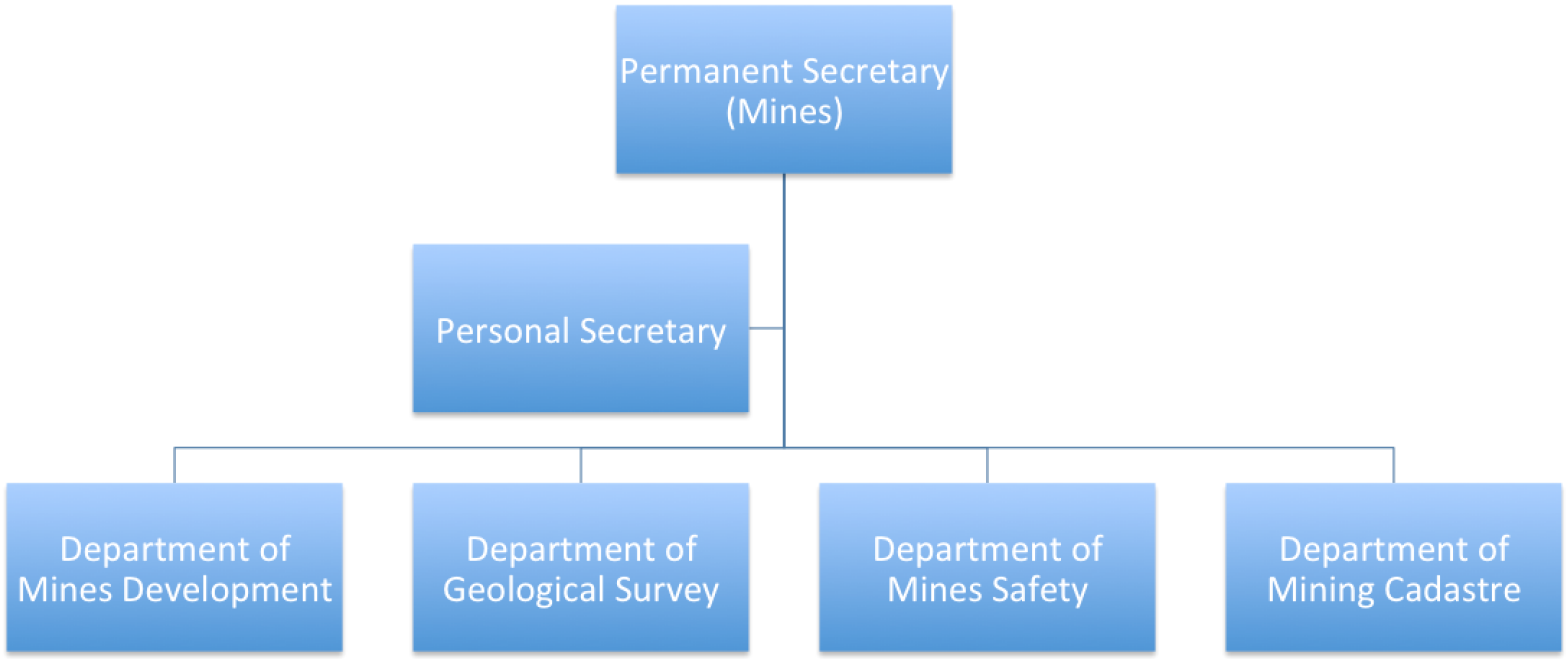
The site inspection team visited 26 project sites and included all these minerals (marble is used by Uniturtle for polished surfaces). For the purposes of classificatory simplicity, construction and industrial minerals were combined into one category, meaning there are effectively three types of development mineral (construction & industrial, dimension stones and semi-precious stones). The completed full site visit schedule is found in Annex 2 of this report.

Table A5.2: Site Visits

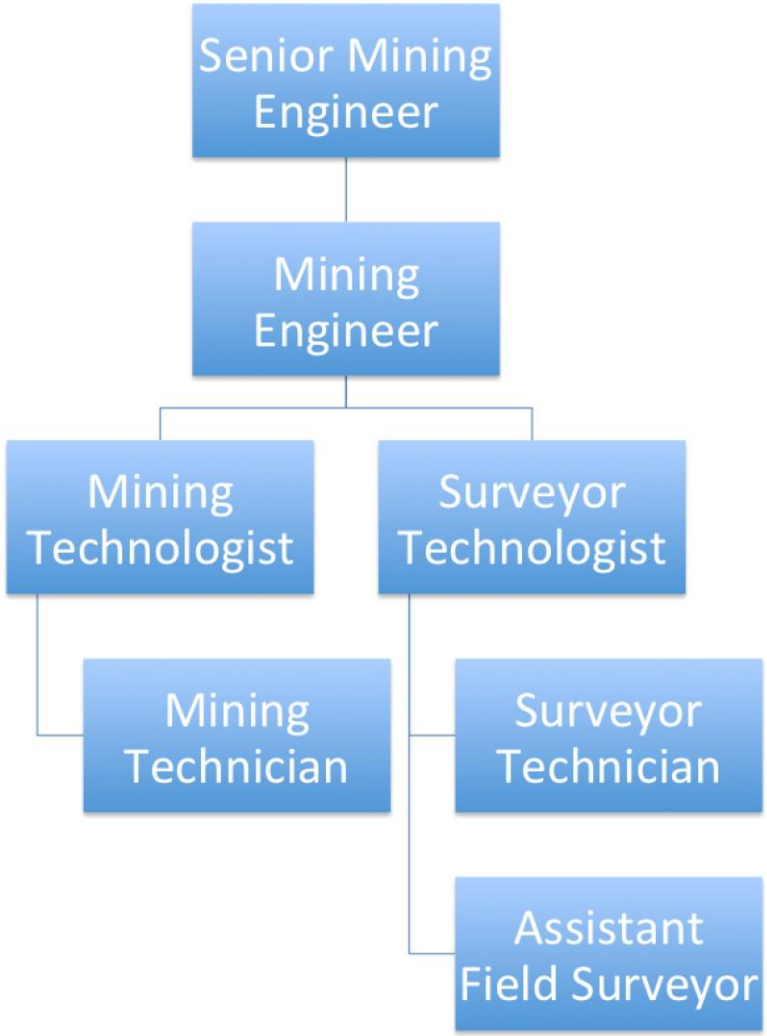
Areas / region	Commodities Visited	Sites Visited	Special Focus Areas
Lusaka Province – Lusaka, Chongwe, Chilanga	**Sand**	**Chongwe, Kachangwa and Kalimansenga Sand Quarries**	**Informal sand mining, environmental degradation and social impacts, approach to revenue collection by Chisamba District Council**
	Talc	**Talc Mining Limited**	**Informal talc mining and male youths trying to start a cooperative.**
	Aggregate, limestone, granite and dolomite operations.	**United Quarries, Oriental Quarries and Lafarge**	**Formalised and medium- to large-sized aggregate, limestone, granite and dolomite operations.**
North Western Province-Solwezi	**Washed silica sand**	**BBM Sand Washing**	**Formalised sand mining and community-private partnership that started with informal mining.**
Copperbelt Province-Kalulushi, Ndola, Lufwanyama, Kitwe, Luanshya	**Clay**	**Kalulush Clay Bricks (KCB)**	**Medium-sized clay miner and clay brick manufacturer. Green energy.**

	Beryl	**Kagem**	**Large trans-national precious and semi-precious gemstones in vicinity of informal operations.**
	Amethyst	**Kanyafimbolo Quartz Mine**	**Small-scale amethyst.**
	Granite	**Lesa Wamaka Cooperative**	**Small-scale granite.**
	Washed silica sand	**Atlantis Investment Ltd**	**Medium scale silica sand. Supply chain integration: potential link from informal to formal**
	Granite	**Nizam Crushers Ltd**	**Medium scale granite. Supply chain integration.**
	Sand, sandstone	**Reycus Suppliers(Z)Ltd**	**Medium Scale sand Mining**
	Sand, laterite	**Celsan Contractors Ltd**	**Medium Scale sand and laterite Mining**
	Sand, sandstone	**Dickson Sinyangwe General Dealers Ltd**	**Medium Scale sand Mining**
	Lime	**Ndola Lime**	**100% GRZ large scale limestone and granite mining and processing plant**
Southern Province-Livingstone, Kalomo and Siavonga	**Basalt**	**Ngwenya Stone Crushers**	**Small-scale basalt with child labour issues.**
	Amethyst	**Kariba Minerals**	**Medium-scale amethyst.**
	Amethyst	**Gramiraji Investments Limited**	**Small-scale amethyst.**
	Sandstone, limestone, granite, tourmaline, calcite, kariba flat stones	**Tip Top Mining**	**UNDP Development Minerals trainee, female owner and good mix of commodities**
Central Province –Kabwe, Chibombo	**Sand, laterite**	**Moyo Farm**	**Large scale sand and laterite mining**
	Sand	**Katuba Sand Quarries**	**Informal sand mining, environmental degradation and social impacts, approach to revenue collection by Chisamba District Council**

Annex 6: Ministry of Mines and Minerals Development Organisation Chart (High Level)



Annex 7: Regional Mining Bureau Organisation Chart



Annex 8: Development Mineral Licences

Sand, Gravel & Silica Licences

Code	Parties		Type	Commodities	Status	Application Date	Grant Date	Expiry Date	Area	Map Reference
7972-HQ-SML	Musanya Quarries Limited		SML	SDG	Active	19/03/03 14:30	01/08/03	31/07/18	397.5914 ha	North Western, Solwezi
14884-HQ-SML	Joseph Shabaya Moyo (100%)		SML	SDG	Active	02/07/10 15:45	23/08/10	22/08/20	398.2700 ha	Central, Kapiri Mposhi
19224-HQ-SML	Kitanikwa Trading Enterprises Limited		SML	SDG, SIL	Active	10/09/13 13:07	05/03/15	04/03/25	10.0012 ha	Copperbelt, Kalulushi
19862-HQ-SML	Kovichi Contractors and Suppliers Limited (100%)		SML	SDG, SIL	Active	25/07/14 09:51	04/12/14	03/12/24	26.6990 ha	Copperbelt, Mufulira
19863-HQ-SML	Kovichi Contractors and Suppliers Limited (100%)		SML	SDG, SIL	Active	25/07/14 09:56	04/12/14	03/12/24	20.0265 ha	Copperbelt, Mufulira
21020-HQ-SML	Bendu Transport Limited (100%)		SML	SDG, SIL	Active	07/03/16 12:53	28/06/16	27/06/26	66.6746 ha	Copperbelt, Ndola
16239-HQ-SML	Synite Quarries Zambia Limited (100%)		SML	SDG, STN	Active	01/06/11 11:04	25/07/11	24/07/21	340.4095 ha	North Western, Solwezi
19523-HQ-SML	Peggy Zulu (100%)		SML	SDG, STN	Active	17/02/14 10:18	24/07/14	23/07/24	362.9819 ha	Central, Chibombo; Lusaka, Kafue
14712-HQ-SML	Tekela Engineering & Supplies Ltd (100%)		SML	SAM, SIL	Active	13/05/10 14:22	19/07/11	18/07/21	33.3419 ha	Copperbelt, Kalulushi

Dimension Stones Licences

Code	Parties	Type	Commodities	Status	Application Date	Grant Date	Expiry Date	Area	Map Reference
7683-HQ-SML	Katima Stones Limited (100%)	SML	STN	Active	05/12/99 10:08	08/12/00	07/12/20	108.0004 ha	Western, Sesheke
7695-HQ-SML	Sable Transport Limited (100%)	SML	STN	Active	14/07/00 00:00	28/09/00	27/09/20	392.9348 ha	Eastern, Chama
7746-HQ-SML	Sable Transport Limited (100%)	SML	STN	Active	06/09/00 00:00	26/02/01	25/02/21	398.6700 ha	Eastern, Chipata
7838-HQ-SML	Tanzania Zambia Railways Authority (100%)	SML	STN	Active	20/01/99 09:31	23/10/01	22/10/21	520.9415 ha	Northern, Mpika
8024-HQ-SML	Turtle Agro Mining Limited (100%)	SML	STN	Active	11/02/03 16:45	18/03/03	14/08/18	42.6797 ha	Southern, Mazabuka
8091-HQ-SML	Zambezi Natural Stone Company Limited (100%)	SML	STN	Active	30/06/04 12:07	01/11/04	31/10/19	347.9600 ha	Southern, Siavonga
8166-HQ-SML	Zambezi Natural Stone Company Limited (100%)	SML	STN	Active	29/06/04 10:10	06/10/04	05/10/19	3.8409 km^2	Southern, Siavonga
18231-HQ-SML	BRENDA KUNDA (100%)	SML	STN	Active	25/10/12 10:14	19/08/13	18/08/23	50.1500 ha	North Western, Solwezi
18919-HQ-SML	Point & Line Technology Ltd (100%)	SML	STN	Active	13/05/13 09:48	01/08/13	31/07/23	29.6832 ha	Lusaka, Kafue
20293-HQ-SML	Kabula Exploration Limited (100%)	SML	STN	Active	09/02/15 11:55	13/04/15	12/04/25	29.4972 ha	Western, Sesheke

Silica-only licences

Code	Parties	Type	Commodities	Status	Application Date	Grant Date	Expiry Date	Area	Map Reference
8492-HQ-SML	P.L. Nyimbili Enterprises (100%)	SML	SIL	Active	19/09/06 11:45	23/04/07	22/04/22	36.6825 ha	Copperbelt, Kitwe
8552-HQ-SML	Dickson Sinyangwe (100%)	SML	SIL	Active	01/02/07 10:17	27/08/07	26/08/22	13.3312 ha	Copperbelt, Kalulushi, Chibuluma Forest
14706-HQ-SML	Samtrade Limited (100%)	SML	SIL	Active	12/05/10 11:45	22/07/10	21/07/20	160.2200 ha	Copperbelt, Mufulira
14707-HQ-SML	Samtrade Limited (100%)	SML	SIL	Active	12/05/10 11:46	21/07/10	20/07/20	83.4400 ha	Copperbelt, Mufulira
14708-HQ-SML	Samtrade Limited (100%)	SML	SIL	Active	12/05/10 11:48	21/07/10	20/07/20	133.5100 ha	Copperbelt, Mufulira
14709-HQ-SML	Samtrade Limited (100%)	SML	SIL	Active	12/05/10 11:47	22/07/10	21/07/20	260.3500 ha	Copperbelt, Mufulira
16858-HQ-SML	Drew Invetsments Limited (100%)	SML	SIL	Active	03/10/11 11:14	03/10/16	02/10/26	90.0100 ha	Copperbelt, Kitwe
19305-HQ-SML	Daniel Chola Ponde (100%)	SML	SIL	Active	22/10/13 10:45	06/08/14	05/08/24	6.6685 ha	Copperbelt, Kalulushi

Limestone-only Licences

Code	Parties	Type	Commodities	Status	Application Date	Grant Date	Expiry Date	Area	Map Reference
7359-HQ-SML	Chilanga Cement Plc	SML	LST	Active	18/07/96 00:00	20/01/98	23/06/18	260.0588 ha	Copperbelt, Ndola
7363-HQ-SML	Lafarge Zambia PLC	SML	LST	Active	24/02/97 00:00	20/01/98	19/01/27	140.0209 ha	Copperbelt, Ndola
7715-HQ-SML	Hi- Qualime Mining Limited (100%)	SML	LST	Active	29/04/98 09:00	29/11/00	28/11/20	392.9072 ha	Central, Mkushi
7729-HQ-SML	United Quarries Limited (100%)	SML	LST	Active	21/12/00 00:00	27/09/13	26/09/23	95.6688 ha	Lusaka, Chongwe
7744-HQ-SML	Eastern Quarry Limited (100%)	SML	LST	Active	15/11/00 00:00	06/02/01	05/02/21	79.1000 ha	Lusaka, Lusaka
7854-HQ-SML	Kamwachi General dealers (100%)	SML	LST	Active	10/10/01 10:25	20/12/01	19/12/21	53.3268 ha	Copperbelt, Luanshya
8048-HQ-SML	Prime Marble Ltd (100%)	SML	LST	Active	13/10/03 12:02	28/07/03	27/07/18	138.4934 ha	Lusaka, Lusaka
8275-HQ-SML	Scirocco Enterprises Limited (100%)	SML	LST	Active	17/03/05 10:00	14/07/05	26/04/20	398.8170 ha	Lusaka, Kafue
14462-HQ-SML	Calcite Limited (100%)	SML	LST	Active	10/03/10 11:34	05/10/10	04/10/20	3.2983 ha	Lusaka, Kafue
16876-HQ-SML	Classic Lime Limetsone (100%)	SML	LST	Active	05/10/11 14:24	06/02/13	05/02/23	313.3300 ha	Lusaka, Kafue
17950-HQ-SML	Zamastone Ltd (100%)	SML	LST	Active	22/08/12 12:13	04/01/13	03/01/23	26.3872 ha	Lusaka, Kafue
18868-HQ-SML	Ameys Property Developers Limited (100%)	SML	LST	Active	19/04/13 12:55	24/03/14	23/03/24	385.8800 ha	Lusaka, Kafue

19281-HQ-SML	Lilume E.K.M Investment Limited	SML	LST	Active	10/10/13 11:55	19/03/15	18/03/25	161.4200 ha	Lusaka, Kafue
19329-HQ-SML	Nizam minerals Limited (100%)	SML	LST	Active	07/11/13 12:47	19/03/14	18/03/24	3.5344 km^2	Copperbelt, Masaiti, Ndola
21280-HQ-SML	Simmer Enterprises Limited	SML	LST	Active	22/07/16 11:40	28/11/16	27/11/26	342.9618 ha	Central, Mumbwa; Lusaka, Kafue

Dolomite, Limestone & Granite Licences

Code	Parties	Type	Commodities	Status	Application Date	Grant Date	Expiry Date	Area	Map Reference
8363-HQ-SML	Zambezi Portland Cement Limited (100%)	SML	DOL	Active	18/10/05 12:00	08/02/06	07/02/26	396.8002 ha	Copperbelt, Ndola, Mpata Hills
15431-HQ-SML	Aggregates Limited (100%)	SML	DOL	Active	11/11/10 09:41	16/05/11	15/05/21	29.6866 ha	Lusaka, Kafue
15517-HQ-SML	Viking Investments Group Limited (100%)	SML	DOL, GRT	Active	01/12/10 13:00	11/04/11	10/04/21	0.3628 ha	Lusaka, Kafue
20058-HQ-SML	Blue Dream Investment Limited (100%)	SML	DOL, GRT, LAT, LST	Active	09/10/14 11:55	28/11/14	27/11/24	2.2430 km^2	Lusaka, Kafue
19342-HQ-SML	Mercury Lines Limited (100%)	SML	DOL, GRT, LST	Active	15/11/13 10:48	06/03/14	05/03/24	39.5300 ha	Lusaka, Kafue
20035-HQ-SML	Princica Chabanga (100%)	SML	DOL, GRT, LST, LWA	Active	03/10/14 09:14	07/01/15	06/01/25	360.1863 ha	Central, Serenje
20014-HQ-SML	Joint Mining Limited	SML	DOL, GRT, LST, STN	Active	26/09/14 10:08	28/11/14	27/11/24	177.9927 ha	Lusaka, Kafue
19304-HQ-SML	Nisco Industries Ltd (100%)	SML	DOL, GRT, LST, STN1	Active	21/10/13 10:53	10/02/14	09/02/24	326.7500 ha	Central, Chibombo
8364-HQ-SML	Zambezi Portland Cement Limited (100%)	SML	DOL, LST	Active	18/10/05 12:40	08/02/06	07/02/26	373.4173 ha	Copperbelt, Ndola

17668-HQ-SML	Steven Chilufya (100%)	SML	DOL, LST	Active	28/06/12 09:53	03/01/13	02/01/23	366.3200 ha	Central, Chibombo
19423-HQ-SML	Uniturtle Industries Zambia Limited (100%)	SML	DOL, LST	Active	23/12/13 11:20	17/03/14	16/03/24	247.4110 ha	Lusaka, Kafue
19699-HQ-SML	Charizma Enterprises Limited (100%)	SML	DOL, LST	Active	16/05/14 12:18	04/06/14	03/06/24	0.4617 km^2	Lusaka, Kafue
7041-HQ-SML	Mindeco Small Mines Limited (100%)	SML	DOL, LST, MBL	Active	09/11/97 09:38	09/12/97	29/12/19	32.9835 ha	Lusaka, Lusaka, Muchinga South Quarries

Granite, Laterite & Crushed Stone Licences

Code	Parties	Type	Commodities	Status	Application Date	Grant Date	Expiry Date	Area	Map Reference
7724-HQ-SML	Roads Development Agency (100%)	SML	GRT	Active	03/01/01 00:00	30/01/01	29/01/21	242.3856 ha	Northern, Kasama
8049-HQ-SML	Prime Marble Products (100%)	SML	GRT	Active	14/10/03 12:41	28/07/03	27/07/18	29.6595 ha	Lusaka, Kafue
8401-HQ-SML	DENNIS NGANDWE (100%)	SML	GRT	Active	22/06/07 15:53	13/01/06	12/01/21	426.8602 ha	North Western, Kabompo
12544-HQ-SML	Synite Quarries Zambia Limited (100%)	SML	GRT	Active	12/06/08 16:38	15/01/09	14/01/19	351.1573 ha	North Western, Solwezi
19114-HQ-SML	Ascent Stone Industry Ltd (100%)	SML	GRT	Active	01/08/13 09:58	02/09/13	01/09/23	98.9799 ha	Lusaka, Kafue
20212-HQ-SML	Make Makweja Farming and Construction Limited. (100%)	SML	GRT	Active	09/12/14 11:56	17/02/15	16/02/25	13.0345 ha	Southern, Kazungula
21819-HQ-SML	Roads Development Agency (100%)	SML	GRT	Active	07/04/17 11:02	01/09/17	31/08/27	211.7586 ha	Luapula, Mansa, Mwense
21820-HQ-SML	Roads Development Agency (100%)	SML	GRT	Active	07/04/17 11:04	18/12/17	17/12/27	115.8820 ha	Eastern, Nyimba
21822-HQ-SML	Roads Development Agency (100%)	SML	GRT	Active	07/04/17 11:09	18/12/17	17/12/27	6.7453 ha	Northern, Nakonde
21826-HQ-SML	Roads Development Agency (100%)	SML	GRT	Active	07/04/17 12:18	18/12/17	17/12/27	80.6411 ha	Northern, Chinsali

21828-HQ-SML	Roads Development Agency (100%)	SML	GRT	Active	07/04/17 11:25	18/12/17	17/12/27	9.9101 ha	Lusaka, Chongwe
21829-HQ-SML	Roads Development Agency (100%)	SML	GRT	Active	07/04/17 11:27	18/12/17	17/12/27	58.6921 ha	Southern, Kazungula
20372-HQ-SML	Supremacy Investment Limited (100%)	SML	GRT, LAT, STN, STN1	Active	18/03/15 09:32	17/04/15	16/04/25	216.9522 ha	Copperbelt, Chingola
19577-HQ-SML	Zamstone Quarries Ltd (100%)	SML	GRT, LST	Active	17/03/14 12:08	13/06/14	12/06/24	393.4000 ha	Southern, Choma
19578-HQ-SML	Zamstone Quarries Ltd (100%)	SML	GRT, LST	Active	17/03/14 12:11	11/06/14	10/06/24	393.4200 ha	Southern, Choma
21536-HQ-SML	Jayline Investments Limited	SML	GRT, LST, MBL	Active	24/11/16 11:46	21/12/16	20/12/26	293.9598 ha	North Western, Solwezi
20247-HQ-SML	Shen Zhou Investment Company Limited (100%)	SML	GRT, LST, STN1	Active	07/01/15 09:58	20/02/15	19/02/25	39.6017 ha	Central, Chibombo
12638-HQ-SML	Best Quarry Limited (100%)	SML	GRT, MBL, STN1, TLC	Active	02/07/08 09:29	03/12/08	02/12/18	171.5291 ha	
15465-HQ-SML	Raphael Mbao (100%)	SML	GRT, SAM, STN1	Active	22/11/10 15:33	04/08/11	03/08/21	169.7400 ha	Central, Mkushi
22681-HQ-SML	Synite Quarries Zambia Limited	SML	GRT, SDG, SST	Active	25/01/18 12:25	05/02/18	04/02/28	396.8763 ha	Central, Chibombo

Laterite Licences

Code	Parties	Type	Commodities	Status	Application Date	Grant Date	Expiry Date	Area	Map Reference
19661-HQ-SML	Kasompe Mining Limited (100%)	SML	LAT	Active	23/04/14 09:54	05/06/14	04/06/24	10.0150 ha	Copperbelt, Chingola

Tourmaline Licences

Code	Parties	Type	Commodities	Status	Application Date	Grant Date	Expiry Date	Area	Map Reference
7030-HQ-SML	Jamii Investments Ltd (100%)	SML	TML	Active	06/09/96 00:00	12/01/00	02/12/19	193.6501 ha	Eastern, Lundazi
16935-HQ-SML	Chibuyu Gemstone Mine (100%)	SML	TML	Active	18/10/11 16:05	03/11/12	02/11/22	342.8956 ha	Southern, Kalomo, Kazungula

Amethyst, Quartz & Tourmaline Licences

Code	Parties	Type	Commodities	Status	Application Date	Grant Date	Expiry Date	Area	Map Reference
7610-HQ-SML	Jonas Enterprises Limited	SML	AMT	Active	22/08/12 09:39	08/06/17	07/06/27	254.6100 ha	North Western, Mwinilunga
7679-HQ-SML	Kabeya Bilolo Mining Ltd (100%)	SML	AMT	Active	23/03/99 12:48	17/07/00	16/07/20	101.3092 ha	Southern, Kalomo
13607-HQ-SML	Kampas Kanda Kashala (0%)	SML	AMT	Active	14/04/04 09:16	13/04/04	12/04/24	200.0000 ha	Southern, Kalomo
15933-HQ-SML	Mweko Enterprises (100%)	SML	AMT	Active	23/03/11 12:46	19/08/13	18/08/23	330.9500 ha	Central, Mumbwa
8081-HQ-SML	Kaindulaki Gemstone Mining Limited (100%)	SML	AMT, AQM	Active	08/04/03 16:00	02/05/03	01/05/20	29.6598 ha	Southern, Itezhi Tezhi
12523-HQ-SML	Husa Mines Limited (100%)	SML	AMT, AQM, Be3Al2(SiO3)6	Active	05/06/08 15:19	01/11/10	31/10/20	3.3422 km^2	Eastern, Lundazi
15405-HQ-SML	Godfrey Mulenga (100%)	SML	AMT, AQM, EM, GAR, TML	Active	10/11/10 09:49	06/05/11	05/05/21	45.0824 ha	Copperbelt, Lufwanyama
20411-HQ-SML	African Pearl Estates Limited (100%)	SML	AMT, AQM, EM, QTZ, TML	Active	01/04/15 12:09	26/05/15	25/05/25	297.8873 ha	North Western, Mwinilunga

16433-HQ-SML	BigHope Mining Ltd (100%)	SML	AMT, AQM, EM, TML	Active	28/07/11 10:15	07/10/13	06/10/23	335.0600 ha	Eastern, Chama
19738-HQ-SML	Patrick Kangoma (0%)	SML	AMT, AQM, GAR, QTZ, TML	Active	04/06/14 12:50	17/07/14	16/07/24	213.7888 ha	Eastern, Lundazi
20634-HQ-SML	Chilufya Mulenga	SML	AMT, AQM, QTZ	Active	10/07/15 12:40	07/09/15	06/09/25	367.4700 ha	Eastern, Lundazi
17837-HQ-SML	Kameta Mining Ltd (100%)	SML	AMT, AQM, TML	Active	31/07/12 11:36	23/05/13	22/05/23	298.1900 ha	Eastern, Katete
13421-HQ-SML	Kabelu Belu Minerals Limited (100%)	SML	AMT, Be3Al2(SiO3)6, GAR, TML	Active	31/03/09 17:46	28/12/10	27/12/20	303.8400 ha	Eastern, Lundazi
19111-HQ-SML	Maliche Corporation Limited (100%)	SML	AMT, EM, GAR	Active	31/07/13 11:04	03/09/13	02/09/23	52.5131 ha	Southern, Kazungula; Western, Sesheke
8235-HQ-SML	Mwenya Alfred Kambikambi (100%)	SML	AMT, EM, TML	Active	21/07/04 12:45	18/03/05	17/03/20	239.6055 ha	Copperbelt, Mpongwe
19779-HQ-SML	MWEKO Industries Limited (100%)	SML	AMT, FLD, GAR, QTZ, TML	Active	18/06/14 12:05	22/07/14	21/07/24	1.6407 km^2	Northern, Mpika
19991-HQ-SML	Lwanda Mulwanda Simfukwe (100%)	SML	AMT, GAR, QTZ, TML	Active	19/09/14 11:35	20/10/14	19/10/24	371.2789 ha	Northern, Mbala

20102-HQ-SML	Nchimunya Mooba (100%)	SML	AMT, GAR, QTZ, TML	Active	23/10/14 09:47	23/12/14	22/12/24	399.4924 ha	Central, Chibombo
19307-HQ-SML	MWEKO Industries Limited (100%)	SML	AMT, QTZ	Active	22/10/13 12:21	09/01/14	08/01/24	358.2269 ha	Northern, Mpika
19915-HQ-SML	Anyikenu Mining Company Limted (100%)	SML	AMT, QTZ	Active	19/08/14 09:11	17/10/14	16/10/24	23.0588 ha	Southern, Itezhi Tezhi
20437-HQ-SML	Anyikenu Mining Company Limited (100%)	SML	AMT, QTZ	Active	15/04/15 11:37	02/06/15	01/06/25	23.0835 ha	Southern, Itezhi Tezhi

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