AFRICAN DEVELOPMENT BANK
African Natural Resources Centre

ANALYSIS OF INPUT GOODS AND SERVICES IN ZAMBIA'S MINING INDUSTRY

Opportunities for Creating Domestic Linkages in the Short to Medium Term

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Contents

ACRONYMS

AfDB	African Development Bank
ANRC	African Natural Resources Centre
AU	African Union
AUC	African Union Commission
BDS	Business Development Services
BMGF	Bill and Melinda Gates Foundation
CEE	Citizens Economic Empowerment
CEEC	Citizens Economic Empowerment Commission
CIF	Cost, Insurance and Freight
CoMZ	Chamber of Mines of Zambia
DA	Development Agreement
DFID	Department for International Development
ECM	Engineering, Construction and Maintenance
E & T	Education and Training
EITI	Extractive Industries Transparency International
EIZ	Engineering Institution of Zambia
EPCI	Engineering, Procurement, Construction and Installation
FDI	Foreign Direct Investment
FQM	First Quantum Minerals
GDP	Gross Domestic Product
GVC	Global Value Chain
GRZ	Government of the Republic of Zambia
ICA	Impact Capital Africa
ICMM	International Council on Mining and Metals
IDC	Industrial Development Corporation
IFC	International Finance Corporation
ILO	International Labour Organization
KCM	Konkola Copper Mines
LC	Local Content
LCP	Local Content Policy
LME	London Metals Exchange
LPRM	Local Content Procurement Reporting Mechanism
MCTI	Ministry of Commerce, Trade and Industry
MDA	Mineral Development Agreement
MSME	Micro, Small and Medium Enterprises
MFEZ	Multi Facility Economic Zone
MMMD	Ministry of Mines and Mineral Development
MSME	Micro, Small, and Medium Enterprise
NAPSA	National Pensions Scheme Authority
NCC	National Council for Construction
NZC	Nitrogen Chemicals of Zambia
NDP	National Development Plan
OECD	Organisation for Economic Cooperation and Development
OEM	Original Equipment Manufacturer

PACRA	Patents and Companies Registration Agency
PEP	Private Enterprise Programme
R & D	Research and Development
RSA, SA	Republic of South Africa
SI	Statutory Instrument
S & T	Science and Technology
SME	Small and Medium Enterprise
ToR	Terms of Reference
UN	United Nations
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UN-WIDER	United Nations World Institute for Development and Economic Research
US $	United States Dollar
ZAM	Zambia Association of Manufacturers
ZAMEFA	Zambia Metal Fabricators
ZMLCI	Zambia Mining Local Content Initiative
ZCCM	Zambia Consolidated Copper Mines
ZDA	Zambia Development Agency
ZPPA	Zambia Public Procurement Authority

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The GRZ Team was led by Ms Bernadette Mwakacheya, Director of Policy and Planning at the Ministry of Mines and Minerals Development (MMMD), under the overall leadership of Mr Paul Chanda, Permanent Secretary in the Ministry. The Ministry supervised all data collection and field trips. Their support is gratefully acknowledged. Financial support from the African Development Bank and their oversight is fully valued.

EXECUTIVE SUMMARY

The background

Copper mining dominates Zambia's economy. It earns more than 70% of the foreign exchange and accounts for about 14% of national GDP. It procures between US $2 -4 billion annually in goods and services. But only about 10% of this originate from Zambia. Localizing a significant portion of mine procurement would therefore meaningfully add to economic growth.

The policy space for local content

The policy framework for local content is driven by Vision 2030, which targets a middle income industrial economy by 2030. The key aims are job creation, economic diversification and citizens' participation in a lattice of domestic industrial linkages between mining and other economic sectors. Whereas the policy framework generally supports these aspirations, the legal and regulatory framework does not and needs improved alignment to these ambitions.

Previous and current local content initiatives

Zambia has had a proliferation of initiatives to stimulate mining driven local content. The initiatives have, however, not yielded sustainable results. Procurement remains skewed in favor of foreign suppliers. The reasons include insufficient policy direction and convergence around common objectives, dominance by donor and industry programmes away from government policy, and the need to scale down localization ambitions to a few achievable targets at firm level.

The main report findings

Estimated annual consumption

The estimated annual consumption of the selected goods and services in the survey was about US $ 2.4 billion in 2017. The main components were about US $1.3 in core mining goods and US $ 942 million in core mining services. The two categories make up 93% of total annual procurement and are hence unavoidable targets for localization. The core mining goods are largely assembled components, consumables such as oil, metallic components, chemicals and explosives. The bulk of core mining services are mine development services, shaft sinking, drilling and maintenance.

Sources of goods and services, and suppliers

The bulk of goods and services (84%) are locally procured and only 16% directly imported. Assembled goods, chemicals and metallic components are the main direct imports from original equipment manufacturers and specialist supplier firms. The inputs procured locally are dominated by core mining services, by far, followed by oils and lubricants and explosives.

Although 84% of input goods and services are procured locally, this masks their value creation in the economy. Less than about 13% of local purchases are goods manufactured in Zambia or services provided by resident or Zambian-owned firms. These reflect "true local procurement". Thus 87% of goods and services are provided by locally domiciled foreign first tier companies

with little value added. Of the true local procurement, only about 2.5% of goods and services are supplied by Zambian-owned firms.

The main reasons for the low true local procurement are the high manufacturing costs, ring fencing of suppliers through tier 1 contractors, who have their preferred subcontractors, and unfair competition including dumping of finished goods. The reasons for the low Zambian procurement, in addition to the above, include lack of access to finance, technology and expertise; discriminatory practices, an opaque tender system and the lack of a supportive policy and regulatory environment.

Opportunities for localizing goods and services

The approach adopted prioritizes inputs which lower the cost of domestic manufacture, demonstrate market potential, diversifies linkages formation through clusters and is amenable to Zambian participation. Accordingly, 5 clusters have been identified and 12 opportunity profiles developed across them. The clusters are the metallic and assembled components; electrical goods; industrial minerals; chemicals and explosives and core and noncore services. The profiles have the potential to generate about US $1.2 billion annually for the economy. The market potential could easily double due to the wide use of the target goods and services outside the mining industry.

Recommendations and policy implications

The main recommendations proposed are:

a. *Reducing manufacturing costs* in the iron and steel cluster to diversify domestic intermediate inputs; the electrical goods cluster to support competitive components manufacture; the chemicals cluster to provide intermediate inputs into explosives and chemicals manufacture; and the non-metallic minerals to provide refractory goods
b. *Addressing unfair competition* by introducing margins of preference for locally manufactured goods and supplied services; preventing dumping through import tariffs and requiring all tier 1 contractors to reserve a proportion of procurement for local goods and services.
c. *Protecting Zambian manufactures and service providers against discrimination* by providing the same business terms to them as for foreign firms and Tier 1 contractors; making compliance to statutory terms for foreign firms mandatory as is the case for Zambian firms; reserving quotas specifically for Zambian-owned firms in Tier 1 contracts; and publishing annual procurement plans in advance.
d. *Providing support at firm level to Zambian SMEs* for some of the identified opportunities. Support includes access to finance through a structured SME loan and equity fund, and facilitated access to technology and expertise for Zambian entrepreneurs.
e. *Addressing policy and legislative weaknesses*, especially aligning the Mines and Minerals Act to the strategic intent of Vision 2030 and the mining policy; providing for tariffs and incentives to stimulate domestic manufacture of the identified goods and services; and strengthening Government leadership over the pace and direction of LC growth and procurement practices.

1 INTRODUCTION

Zambia's economy is dominated by copper mining. This accounts for more than 70% of the country's foreign exchange earnings and about 14% of the country's GDP. The mining sector is also a significant employer accounting for more than 82,000 people in 2014, the second largest after Government (GRZ 2017). Given the sector's dominance in Zambia's economy, it is not surprising that economic diversification and industrialization has dominated policy goals since independence in 1964. However, actual progress on the ground has been patchy and inconsistent.

The current planning and policy frameworks are driven by Vision 2030 (GRZ 2006a), which expresses the collective aspirations of Zambians to become a middle income industrial economy by 2030. In line with this, the seventh national development plan seeks to accelerate the achievement of industrialization and diversification, and mining is one of the key pillars, by creating downstream value added, and localizing upstream inputs.

The mining procurement value chain is worth between US $2 -4 billion annually in goods and services (Fessehaie et al. 2015). Most of this procurement, more than 80%, is from local sources. This, however, masks the contribution of local procurement to the economy. By far, the bulk of the goods consumed by the mines are infact imported into the country by foreign owned firms. Very few are manufactured in Zambia. The services too are mostly provided by foreign companies, rather than Zambian owned firms. This has led to contestations that more needs to be done to localize the rather large procurement value chain. This would support greater job creation, industrial growth and expand welfare gains.

Correspondingly, there has been a number of initiatives over the years to localize the mining procurement value chain. The initiatives have been largely fragmented and driven by donors and the private sector. It does not appear that these initiatives have had any sustainable impact, an outcome supported by the findings of this report. The input goods and services continue to be supplied almost exclusively by foreign owned firms that add little value to the imports, other than employment. Certainly, the initiatives have not added to the goals of industrialization and economic diversification, the main terminus for the country's development efforts. Partly, this appears to be due to weak policy and regulatory direction on the ground.

It is against the above backdrop that this study was commissioned by the African Development Bank. The main objective was to evaluate the mining procurement value chain with a view to identifying opportunities for localising input goods and services, in a manner that supports linkage formation with other economic sectors. The study follows an earlier Technical Assistance support programme to the Government of the Republic of Zambia, which developed a framework for designing and implementing a mining sector driven local content policy in Zambia (AfDB 2017). That study's findings were validated by a multi-stakeholder workshop which recommended, among other actions, that an inventory of local raw materials for inputs into manufacturing; and of local manufacturing opportunities, be undertaken in order to identify low hanging goods and services for which capacities can be strengthened, raw materials locally developed and technologies of production established in a reasonable time.

This report addresses the above call. It is structured as follows. Chapter 2 provides a detailed policy context which guides local content development in Zambia. The chapter submits that the main

purpose to be served by local content is job creation, industrialisation, economic diversification and citizens' participation through linkage development between mining and other economic sectors. The policy and legislative provisions supporting LC growth are fragmented and spread over several legislations, and are consequently ineffective.

Chapter 3 reviews previous and current LC initiatives in Zambia. These have not been successful due to the fact that key lessons have not been learned. The lessons include excessive donor dependence, private sector domination away from public policy, a lack of firm level support and the need for a supportive policy environment.

Chapter 4 presents the study's main findings. Core goods and services account for about 93% of input goods and services. Non-core goods and services form only a minor part of inputs. The bulk of the goods are imported, though domestically supplied, by predominantly foreign firms for both goods and services. Any localisation hence needs to target core goods and services. The chapter provides a summary of challenges to localisation and proposes 12 opportunities for localisation, favouring a cluster approach to support economic diversification.

Chapter 5 provides recommendations and policy proposals to support their implementation. The proposals include reducing the cost of locally manufactured goods to make them competitive, eliminating unfair competition and dumping, providing firm level support in respect of access to technology and finance, addressing policy and regulatory lapses and, importantly, exercising government leadership over the pace and direction of LC growth. A successful implementation of the opportunity profiles identified will require targeted government support including providing incentives for local manufacture and tariffs for competitor imports.

2 THE CONTEXT OF LOCAL CONTENT

2.1 National Development Vision and Public Policy

Zambia has a hierarchical public policy framework in respect of local Content (LC). This is depicted in Figure 1 in which Vision 2030 provides the overarching policy direction. This expresses the country's desire to become a *"Prosperous Middle Income Nation by 2030"*, based on an economy that is (GRZ 2006a):

a. Diversified with strong and cohesive industrial linkages, a modern agricultural sector and an efficient services sector;

b. Technologically proficient and innovative exploiting its human and natural resources; and

c. Developed socio-economic infrastructure.

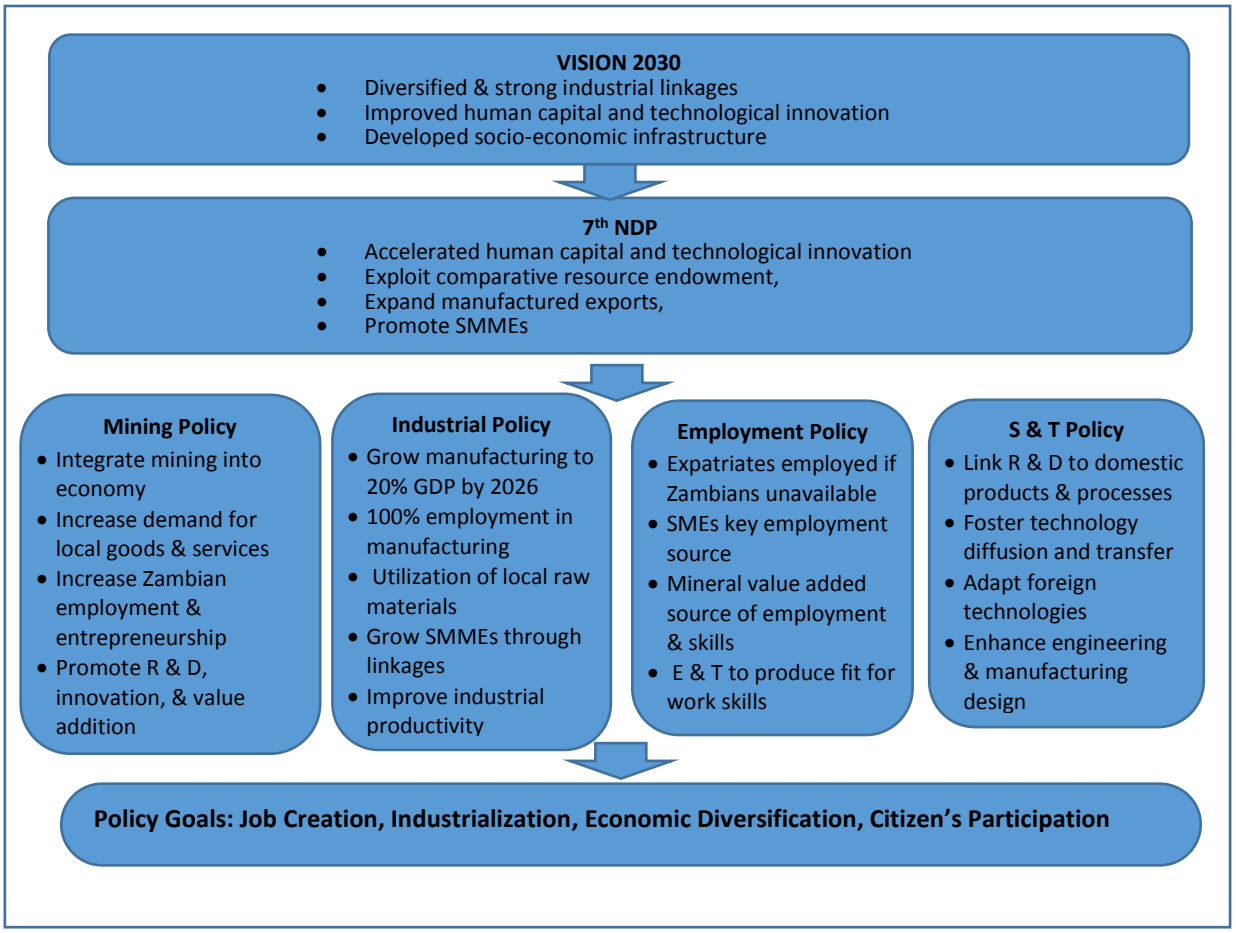
The Vision is implemented through five-year development plans, the current being the Seventh National Development Plan (7th NDP) approved in 2018 (GRZ 2017). This seeks to achieve greater alignment to the Vision in order to accelerate economic growth, diversification and industrialisation, through a fuller exploitation of Zambia's comparative resource endowments. It further seeks to create a strong export-oriented manufacturing and industrial base with, solid backward and forward linkages; supported by improved human capital development and technological innovation.

Vision 2030, and the five year plans, form the basis of all sectoral plans and policies. Figure 1 provides examples of several policies that pursue alignment to the Vision. For example, the 2013 Mineral Resources Development Policy (GRZ 2013) foresees *"a vibrant, well organised private sector led mining sector contributing in excess of 20 per cent towards GDP and sustainable economic development in the country by 2030".* This implies a sector that is fully integrated into other economic sectors, in which Zambians participate in both employment and ownership of assets, and in which skills development and R & D reinforce industry competitiveness.

From a manufacturing viewpoint, Vision 2030 seeks to '*Increase the share of general manufacturing contribution to GDP to 36 percent by 2030 and manufactures as a share of merchandise exports to 71% by 2030'* (GRZ 2006a). The 2018 Industrial Policy is more conservative and sets a target of 20% of GDP by 2026, driven by robust SME growth, full utilisation of domestic raw materials and high levels of productivity (GRZ 2018A). Ironically, recent data shows that the share of manufacturing in real GDP has continually declined from an average of 25.3% during the period 1991- 95 to 7.5% during 2010-15 (UN-WIDER 2018). This does not bode well for achieving Vision 2030.

Figure 1 suggests that there are several other policies that impact on LC development. These include, for example, the Employment Policy and the Science and Technology Policy. These, and others not included in the Figure, seek to strengthen the strategic intent of the policy framework, which revolves around ***Job Creation, Industrialization, Economic Diversification, and Citizen's Participation***

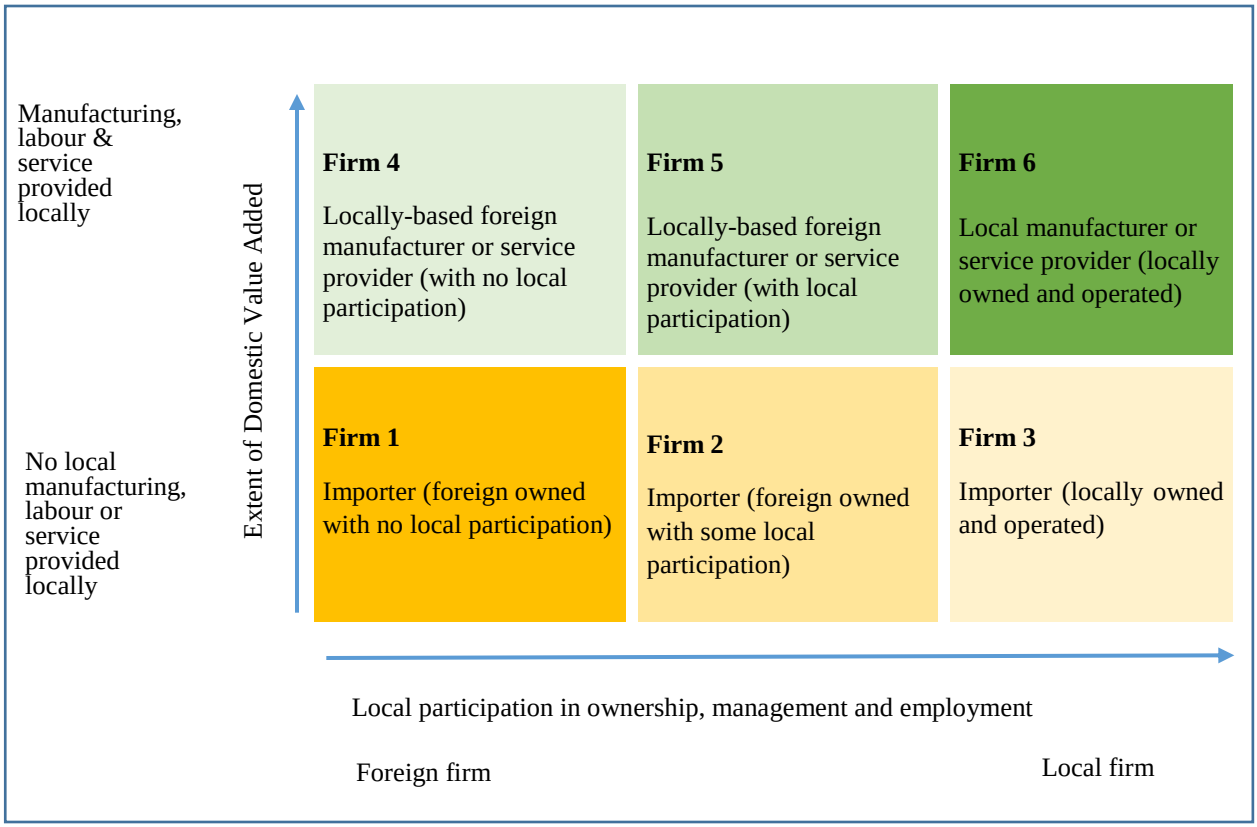
Figure 1: the policy framework for local content in Zambia



Source: author's compilation

From a public policy viewpoint, it is hence clear that LC in Zambia is embedded in a broad development leaning contextual framework, embracing economic and social linkages around the mining industry. Such a framework sees LC through the lens of aggregate economic value added to drive growth, development and industrialisation. This has led to a major school of thought that argues that LC is fully met when goods and services are provided by firms that are locally owned, employ Zambians and use Zambian raw materials and expertise to supply input goods and services into the industry. Conventional economic thinking posits that such firms are the major sources of aggregate economic output, industrialization and economic diversification. This is illustrated in Figure 2. In contradistinction, the least economic value is created by the foreign firm which imports all of its goods, and uses foreign expertise to provide its services. While this firm creates employment, it contributes little to aggregate output, industrialization and economic diversification.

Figure 2: Classification of local supplier firms of goods and services



Source - adapted from AfDB and BMGF (2014: 11)

However, the concept of economic linkages is much broader than implied by ownership (Morris et al. 2011). Both upstream and downstream production linkages are based on the notion of value added to raw materials or intermediate semi-manufactures by the firm. Clearly a foreign-owned domestic manufacturer that adds value to domestic raw materials or intermediates, and employs Zambians, contributes as much to production linkages and domestic value added. This supports the view that value added to intermediates or raw materials overrides local ownership in stimulating LC growth.

2.2 Local Content and Regulatory Challenges

Zambia does not have dedicated LC legislation, unlike South Africa, which has the Mining Charter or Ghana, which has well defined LC laws in its oil, petroleum and mining sectors. Infact, Zambia does not yet have a local content policy and did not have an industrial policy until March 2018. From Figure 1, it is evident that several of Zambia's sectoral policies are well aligned to Vision 2030, the main policy driver, and are supportive of LC growth, industrialisation and development. Figure 1, however, does not include the subordinate legislative provisions, which in effect are the main implementing instruments for policies and development plans. The African Development Bank has recently assessed how well the policy frameworks, and their subordinate legislations,

support LC growth in Zambia (AfDB 2017). The main conclusion of their work is that, generally, the underlying legislative provisions are not well aligned to the intentions of the policies they represent or to Vision 2030.

That report provides examples of misalignment (AfDB 2017). They include divergence between the 2013 Mineral Resources Development Policy intentions and its 2015 Mines and Minerals Development Act (GRZ 2015), both currently under implementation. The pillars of the policy are: citizen's economic empowerment; inter-sectoral integration; value addition and prioritising human resources development; innovation and research and development (R&D). These principles are not fully reflected in the Act. However, the Act does compel a mining right licence holder to give preference to:

a. Materials and products made in Zambia;

b. Contractors, suppliers and service agencies located in Zambia and owned by citizens or citizen-owned companies;

c. Give preference in employment to citizens with relevant qualifications or skills; and

d. Conduct training programmes for the transfer of technical and managerial skills to Zambians.

These preconditions are not only insufficient but are not complied with. There are neither metrics to monitor, nor a legal framework to enforce, their implementation.

Similarly, the Employment and Labour Market Policy, restricts the use of foreign labour to categories of skills not available among Zambians. Yet the Employment Act does not contain any provisions limiting the employment of expatriates not just in the mining industry but across all sectors. Further, the policy intention emphasises the principle of equal pay for equal work. Yet there is a proliferation of expatriate workers and contractors in the industry. These are disproportionally paid much higher than Zambians, and their qualifications and skill levels are neither scrutinised nor ascertained. These weaknesses in the Employment Act have led to a belief by some stakeholders that mining companies deliberately prefer hiring expatriates at the expense of local and cheaper labour, even for jobs which can be performed by Zambians.

The AfDB (AfDB 2017) report cites additional legislative lapses arising from the privatisation period. It argues that the Development Agreements (DAs) negotiated during privatisation have worked against LC growth in Zambia. The DA provisions included imports of capital equipment free of customs and exercise duty; capital write-off of any expenditure on imports of plant and machinery and reductions in corporate tax through such imports; and carry forward losses that limited corporate tax payments until profitability was regained (Simpasa et al. 2013). The waiver of customs and exercise duty on imports equipment and machinery extend to primary contractors, the so called Tier 1 suppliers.

These provisions are commonly a major source of tax leakages (Tordo et al. 2013). They provide cost accounting opportunities to legally circumvent tax payments through aggressive capital recovery, and asset creation to redeem costs that might constitute normal business losses. They further lead to a lack of transparency and inconsistency in production cost reporting. More

importantly, however, the provisions reward mine owners for importing their inputs rather than source goods from domestic manufacturers. The rewards occur through customs and exercise duty waivers, offsets in corporate tax, capital write offs and suspension of corporate tax until profitability is restored. These factors tend to limit the domestic manufacture of mining goods.

The AfDB report (AfDB 2017) does, however, point to the progressive legislative provisions in the Zambia Development Agency (ZDA) (GRZ 2006b) and the Citizens Economic Empowerment (CEE) (GRZ 2006c) Acts, which are reasonably supportive of the Industrial Policy, the 7th NDP and Vision 2030. These Acts target SME growth, increased R & D and innovation; broader employment creation and Zambian participation in economic assets. The CEEC Act, for example, empowers the Commission to determine thresholds to be prescribed for the participation of targeted citizens, citizen empowered companies, and citizen influenced companies in tenders for the procurement of goods and services (GRZ 2006c). If implemented, this could greatly boost LC growth. Both the ZDA and CEE Acts are, however, poorly implemented on account of persistent budget deficits.

3 PREVIOUS AND CURRENT LOCAL CONTENT INITIATIVES

3.1 Previous and Ongoing Initiatives

Inheriting a mono-economy, Zambia's economic diversification efforts began soon after independence. These accelerated during the nationalisation period which began in 1968 with the Mulungushi reforms.

3.1.1 Nationalisation Era LC Initiatives (1969 – 1991)

The literature (AfDB 2017, Lombe 2018 and UNDP 2016) is unanimous that the nationalisation era was probably Zambia's most successful in LC growth. Upstream of the mining value chain, a wide range of input goods were locally manufactured. These included: rubber products; a range of metallic inputs, including machined and cast crusher parts; assembled items such as rock drills, pumps and conveyor pulleys and idlers; and explosives. A significant part of this manufacturing capacity was lost during privatisation and many suppliers from that era have been largely replaced by foreign ones, as is later demonstrated.

3.1.2 Copperbelt SME Suppliers Development Program (CSSDP)

The programme was funded by the International Finance Company (IFC) from 2007 – 2010, and was probably the first significant post privatisation initiative (AfDB 2017). Its purpose was to integrate micro, small and medium enterprises (MSMEs) into mining supply chains by building their business and technical capacity to supply industry standard goods and services. The programme included training in technical, business, management and marketing aspects; and facilitating access to finance through local banks.

Programme evaluations suggest the programme's success was limited (Genesis 2014, ILO 2014). It has been criticised for: being bureaucratic and removed from the needs of the industry; the erroneous belief that facilitation and matchmaking was sufficient to unlock commercial finance; unwillingness by mining companies to share risks and the excessive focus on business

development services (BDS) rather than firm level interventions associated with improved product quality and capacity to produce.

3.1.3 Zambian Mining Local Content Initiative (ZMLCI)

This is a World Bank, Department for International Development (DFID) and IFC funded collaborative public-private initiative launched in 2012 (Genesis 2014, Fessehaie 2015). It comprises the mining industry, manufacturers, and SMEs and Government agencies. The programme has been operating under the joint leadership of the Chamber of Mines (CoM) and the Zambia Association of Manufacturers (ZAM). It aims to enhance the use of locally-manufactured inputs in the Zambian mining industry.

In 2012, ZMLCI commissioned a limited survey to capture baseline information on existing local supply linkages in the mining industry and to understand the key issues affecting both mining companies (buyers) and Zambian manufacturers and SME suppliers. That study found that:

a. Most mining input goods and services were supplied by Original Equipment Manufacturers (OEMs) either directly or through their agency offices registered in Zambia;

b. Zambian suppliers and manufacturers generally make up only a small proportion of suppliers, suffer from lack of access to finance and generally use outdated and inefficient plant;

c. Mining companies perceive Zambians as unable and unreliable suppliers;

d. Imported finished products by OEMs were tax exempt and this shut out Zambian produced goods.

That study recommended the establishment of a manufacturing mentorship programme that would provide technical support, access to finance and technology and access to contracts with mining companies on a preferential basis. A World Bank study (Genesis 2014) reached similar conclusions that an affiliative approach that addressed access to finance and market intervention; and technical assistance to suppliers was likely to succeed. That study recommended an impact investment model deliberately designed to inform policy and regulatory direction.

According to ZAM, the ZMLCI initiative has all but died without achieving its objectives. The main reason advanced is that the programme failed to grow supplier capacities in SMEs and match these to input requirements by the mines. Mining companies have been unwilling to assume risks associated with suppliers. Mining companies have also been unwilling to develop capacities of SMEs to supply, they argue that this is not their core business.

3.1.4 International Labour Organization (ILO) Initiative

Between 2013 and 2014 the International Labour Organization (ILO), orchestrated a consultative process with stakeholders to develop a technical cooperation programme to respond to the challenge of jobless growth in the Zambian mining sector (ILO 2014). This culminated in the survey report ‘More and Better Jobs in Zambian Mining Communities – Assessment of opportunities for job creation in Zambian mining communities’. The survey evaluated procurement practices to determine constraints to local MSME participation in mining value chains, their capacity building needs; and the potential for business development. The project

hoped to improve the quality and number of jobs in MSME supplier firms and enhance business linkages between them and mining companies.

The main procurement MSME constraints identified were high input costs which made local goods uncompetitive; lack of compliance to industry standards; opaqueness in bidding processes; lack of investment and operational capital; and poor technical skills and technology utilisation. The main recommendations of the study were to develop a segmented mining value chain capability model which would match mine suppliers with supply chain opportunities; promote clustering of local suppliers into mining value chains to achieve economies of scale; and promote compliance with standards to enhance quality and competitiveness. The ILO initiative recognised the need to integrate into other initiatives, and the need for public policy to guide procurement and LC growth.

The survey also established that mines were generally risk averse to exploring local content opportunities and indifferent to building business linkages with local suppliers. Particularly, expatriate mine procurement officers had little knowledge of domestic value chains due to bias that Zambia was unable to manufacture mining inputs.

3.1.5 Private Enterprise Programme (PEP - Zambia)

This is a 5 year programme funded by UKAID, under the Department for International Development (DFID), which expires in March 2019 (AfDB 2017). It operates across several sectors. The mining component seeks to strengthen linkages between mining companies and Zambian SMEs, in line with the broad programme goals of job creation and economic diversification. Mining activities have so far included:

a. An impact investment forum organized in October 2018 by the Musangu Foundation[1], Exigent Events[2] and Impact Capital Africa, through the Zambia Development Agency and the Ministry of Commerce Trade and Industry (MCTI) (ICA 2018);
b. A planned pilot supplier development programme at Mopani for 10 Zambian manufacturing and service companies;
c. A draft framework to strengthen LC in the mining sector. This includes establishing a private sector driven Steering Committee housed at the Chamber of Mines; and
d. Establishing a Local Procurement Reporting Mechanism (LPRM) housed at Zambia EITI to monitor procurement by mining companies.

The initiative is typically a top-down donor-driven design, which ignores many lessons to be learnt from prior initiatives. It has adopted a 'closed private sector approach' that limits Government to symbolic participation on the proposed LC Steering Committee (PEPZ 2018). Mining companies are full members with voting rights. A significant weakness is hence that the approach taken is unlikely to be rooted in any long term policy and regulatory objectives. It is unclear how the LPRM metrics for monitoring will relate to long term public policy goals described earlier. It is further

[1] Musangu Foundation is a UK social enterprise established to leverage private investment through the application of 'business thinking'. It uses collective capital from partners to fund and invest in entrepreneurs, social enterprises and NGO's with a focus on livelihood creation to 'deliver large-scale impact without a long-term reliance on charitable support'

[2] Exigent Events is a UK based global events management company

not clear how the initiative will address the non-financial constraints at the supplier firm level. These, for example, include tax incentives to the mines which discriminate against local suppliers, or firm-level weaknesses in manufacturing technologies and expertise among Zambian suppliers.

3.1.6 The African Development Bank (AfDB) Initiative

In 2017 the African Development Bank (AfDB) completed a study (AfDB 2017) to design a framework for LC development in the mining industry, in collaboration with the Ministry of Mines and Minerals Development (MMMD). The study assessed past and present LC initiatives, and the policy environment relative to Zambia's long term goals for industrial development and economic diversification. The study report was reviewed by a multi stakeholder workshop, which developed a consolidated framework for LC development in Zambia. Some of the key proposals in the framework were:

a. Addressing weaknesses in the policy and legislative environment that impede LC development, especially rationalizing the use of incentives and aligning policy and regulatory provisions to long term policy goals;
b. Improving capacities of SMEs to manufacture and supply quality goods by addressing specific firm-level challenges;
c. Improving industry, government and academic partnerships to align education and training outcomes to industry needs, as well as stimulate R & D and innovation; and
d. Addressing the institutional impediments and toxic environment that characterizes relationships between stakeholders in the sector.

To kick-start implementing the framework, the stakeholders suggested the development of a work plan with specific roles for stakeholders, donors and government; and reviewing the policy and legislative environment as a matter of urgency. They further suggested establishing a multi stakeholder forum to act as an advisory group for LC development. To address firm level weaknesses, they recommended that 'low hanging fruits' for which manufacturing capacities exist or can be built up in the short term be identified, along with an inventory of raw materials and SME manufacturing capabilities for the selected goods. This study responds to this call.

On account of its practical implication to LC growth in Zambia, the AfDB is currently providing technical support to the Ministry to implement the last recommendation. The AfDB LC development framework contains proposals which if integrally implemented would put LC development in the mining sector on a sustainable path. This requires Government's leadership to address the current fragmented approach that appears to retard LC growth in Zambia.

3.1.7 UNDP and MCTI Initiative

The Ministry of Commerce, Trade and Industry, supported by UNDP, launched in 2018 the National Local Content Strategy 2018 – 2022 (GRZ 2018b). The strategy cuts across all sectors and its goal is to support industrialization and economic diversification. The National Local Content Strategy aims to foster business linkages in growth sectors, as well as promote linkages between MSMEs and large enterprises. The strategy provides a framework for integrating sectoral strategies towards achieving Vision 2030. Among the strategies specific objectives are to promote:

a. the utilization of local products, raw materials and services in growth sectors;

b. the development of both human and institutional capacity of domestic firms through skills and technology transfer from foreign companies; and
c. Local ownership of firms and the employment of Zambian citizens.

The strategy sets a threshold of 35% local procurement[3] with implementation regulated by an Act yet to be promulgated. The Act will also specify punitive measures for erring firms while MCTI will conduct period monitoring and evaluation of the strategy.

The ability to supply quality goods locally depends on a number of parameters such as the competitiveness of manufacturing capabilities by local firms, availability of skills and technology, availability of raw materials at competitive input costs and levels of R & D to improve processes and the quality of intermediate inputs. It is not clear how such factors will be accommodated in the threshold. For the mining value chain, the 35% threshold is in all likelihood ambitious for the sophisticated and specialist machinery, such as underground loaders, dump trucks, and boom drill rigs. Yet for simpler inputs like mill balls, liners and metallic products such as bins and chutes, it is possible to specify much higher thresholds due to existing capabilities and availability of raw material inputs.

3.1.8 Industry Initiatives

Mining companies have their own LC initiatives. The following examples are abstracted from a survey of mining companies undertaken by the AfDB project in 2016 (AfDB 2017).

Konkola Copper Mines (KCM) has a Local Economic Development Strategy whose main objective is to increase LC in KCM's mining supply chain. The bulk of its procurement in 2016 (80 – 90%) was done through locally registered companies. As part of developing local vendors, KCM provided long term offtake agreements to several vendors. A range of products for possible local sourcing had been identified and discussed with industry associations, including ZAM, as part of the search for opportunities to increase Zambian content in its business. The company also runs the Kitwe Trades Training Institute.

Mopani provides training for SMEs through workshops and employs dedicated staff to help SMEs with tender procedures to improve the uptake of local goods. Mopani also funds trades training through a fully sponsored centre at Kitwe Trades Training Institute. In 2016 Mopani reported that shaft maintenance was done by a local company. This, however, contradicts current interview findings.

First Quantum Minerals (FQM) provides financial and teaching support to the Solwezi Trade Training Institute. Its procurement goal is to migrate as much of it as possible to Zambia and build capacities of SMEs to supply goods and services. It reported a supplier development programme that provided training in tendering and cost estimations. Between 2010 and 2015, US $7.8 billion was spent in Zambia (88% of total operational spend). With lobbying from FQM, Kalumbila has been declared a multi facility economic zone and a mill ball production facility has been installed to manufacture mill balls for its operations. The facility is understood to have Chilean and Chinese

[3] Defined as: Local Content % = (Total Value of Produce - imported content)/(Total Value of Produce) * 100

investors and was justified on account of poor quality balls from Zambia. This again contradicts the field interview findings for this report.

It can be observed that industry juxtaposes local procurement with LC irrespective of the origins of the goods and services. The bulk of goods and services are procured from locally registered subsidiaries of OEMs, which create little domestic value added. While industry paints a glossy picture of supplier development programmes, the AfDB field survey conducted in 2016 suggested that stakeholders, including government, saw industry's efforts as ad hoc and insufficient (AfDB 2017). The common view was that the programmes required regular audits of their effectiveness and alignment to public policy on industrialisation. Judged by the low and declining numbers of local suppliers participating in the mining supply chain demonstrated later, industry initiatives cannot be deemed as successful.

3.2 Lessons from Previous and Current Initiatives

It is clear that Zambia has had many LC initiatives over time, yet these have failed to ignite any meaningful local participation in the mining supply chain. The plight of the Zambian supplier appears to have infact gotten worse, rather than improved. This suggests the need to heed the following lessons:

- **Define Local Content more clearly:** Figure 2 suggested that public policy views LC from the perspective of domestic linkages and the notion of value added to the economy by mining supply chains. Mining companies, on the other hand, focus on aggregate domestic expenditure, and much less on manufacturing and supply capabilities among citizen owned supplier firms. There is need for a common understanding of the long term objective to be served by LC.

- **Need for a supportive policy environment**: Past and present LC initiatives have not addressed the critical role of policy in defining the pace and direction of local procurement in the mining value chain. The initiatives have typically been donor and industry driven away from policy ambitions. This has to be addressed.

- **Align the ambitions of mining companies to public policy:** Many of the initiatives have been private sector driven. While this is the right level of focus, the initiatives cannot succeed outside the remit of public policy. The design approach of the initiatives has been based more on fulfilling the interests of mining companies rather than attempts to satisfy developmental aspirations of the country. The two are not mutually exclusive as appears to have been the case

- **Focus on firm level challenges:** firm level challenges by Zambian companies are many, given the weak manufacturing environment in Zambia. Most of the interventions have focused on providing access to capital and markets, and providing business level services. The fact that this approach has not yielded sustainable results suggest that *deficiencies in production technologies, domestic supply of input feedstocks and sources of technical expertise* are equally, if not more, important. Successful interventions eg in South Africa have focused more on providing integrated solutions through mentorships and handholding to address the plethora of obstacles that prevent growth of citizen owned supplier firms.

- **Identify a few target goods and services:** the mining supply chain consumes a large array of goods and services, many of which are complex and sophisticated. Capacitating local supplier firms need to aim at relatively lower level goods and services for which capacities to supply either exist or can be cultivated in a reasonable time.

- **Monitoring and evaluation** is always a necessary part of any initiative, preferably with metrics that are rooted in policy objectives and agreed to by stakeholders. Supplier evaluation criteria that is part of a private sector developed initiative might justify internal company procedure but rarely would it be expected to fulfil public policy goals.

- **A dedicated unit to implement Local Content** would improve coordination of LC. The initiatives recognize this but suggest a private sector unit such as the Chamber of Mines. If the role of public policy in LC development is accepted, then such a unit needs to be affiliated to a public agency held to account by stakeholders.

- **Initiatives have been donor driven:** LC initiatives cannot be sustainable if they are not demand driven. Mining companies have a business interest and central role in developing local procurement capacities but this needs to combine with public initiatives for the SME sector if capacities to supply have to be permanently built up. Donor funds are transient and are sometimes designed to satisfy donor exigencies.

4 STUDY FINDINGS

It is recalled that the main objective of the assignment was to evaluate the mining procurement value chain with a view to identifying opportunities for localising input goods and services, in a manner that supports linkage formation with other economic sectors. This required establishing the main types and suppliers of goods and services procured and their values; assessing local suppliers' and manufacturers' capabilities; and identifying those goods and services which are amenable to localisation in the short to medium term. This chapter presents the main findings of the study.

4.1 Estimates of Consumption of Goods and Services

The study relied on procurement data collected from the mines. The sections that follow outline the data collection processes and the results of the data analysis undertaken.

4.1.1 Data Collection and Assumptions

Annex 2 provides an example template circulated to mining companies for a predetermined list of goods and services consumed by the mines. The goods and services were categorized into:

a. **Core mining goods and consumables**: These comprise equipment, spares and consumables that are critical to production operations. The group was further subdivided into rubber products (tyres, conveyor belts, rubber molded products, etc); metallic components comprising

fabricated products (tanks, chutes, thickeners, process piping, etc) and cast products (impellers, mill liners, crusher parts, etc); electrical components (motors, wires, transformers, etc); assembled products (pumps, drives and gear boxes, rock drills, off-highway trucks, etc); chemicals and reagents (collectors, frothers, flocculants, etc); and explosives.

b. **Core mining services:** These are services that critical to production operations (eg drilling, mine development, shaft sinking, etc).

c. **Non-core goods**: These are not essential to production (eg uniforms, food, medicines, stationary, etc).

d. **Non-core services:** these are also not essential to production (eg catering, gardening, security, transportation, etc).

It is important to understand that the list of goods and services included are those considered to constitute the main inputs, rather than the total value of goods and services consumed by the mining industry. The template was circulated to all copper mining companies, cement plants, emerald mining companies, and the sole coal mine.

Completed data templates were received from 4 mining companies, 1 cement producer and the coal mine. The templates were received only after extended follow-up phone calls by the Ministry of Mines and Mineral Development. For the mines where data was not received, estimates were made using production data from comparable operations. The estimates were based on calculating the intensity of use for each input item (ie input cost to produce a tonne of material) from similar operations. Thus data from cement production was used to estimate inputs for the two missing producers. Similarly, only data from underground operations was used to project data for other underground operations, while open cast datasets were used to estimate inputs for other open pit mines.

From a process viewpoint, similar operations should exhibit comparable cost structures of inputs. While the actual cost of inputs will vary from mine to mine, the above approach appeared justifiable and has been used in similar projections by other researchers (Genesis 2014, Fessehaie 2015). Production statistics used in the estimates were obtained from the 2017 Large Scale Mine Production Database housed at the Ministry of Mines and Minerals Development. The database has been established to track mine production and contains mine production for all mining operations in Zambia.

4.1.2 Estimated Consumption of Goods and Services

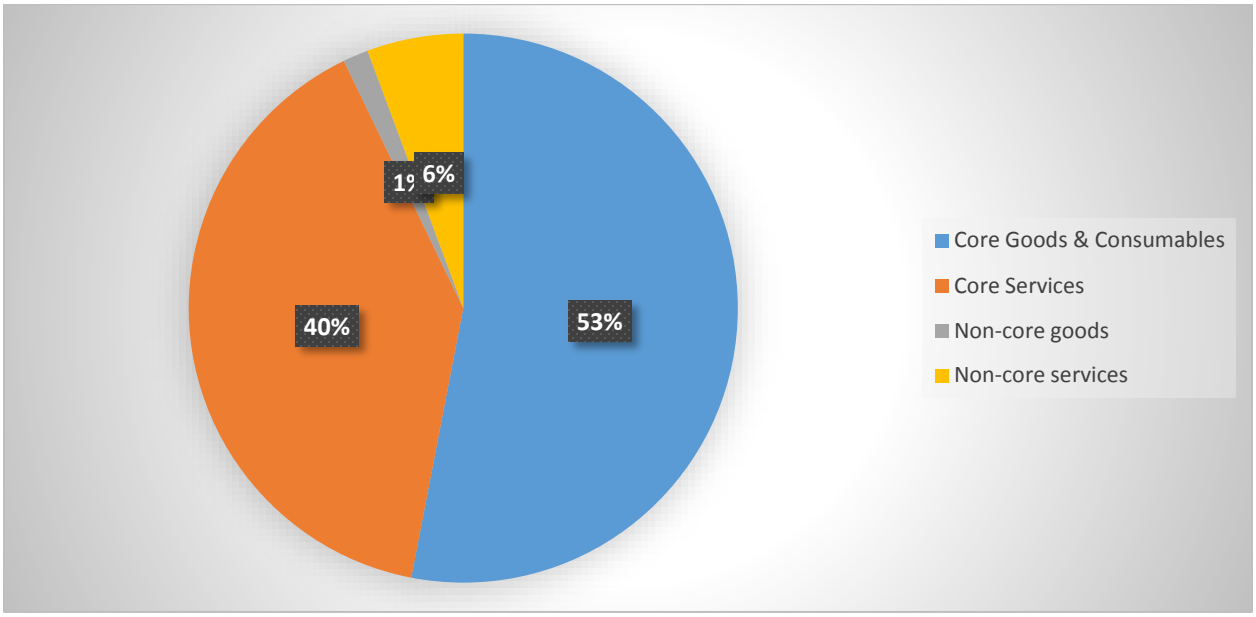
The total value of mining input goods and services consumed in 2017 was estimated at US $ 2,381,971,646. Detailed estimates are contained in Annex 3. This value is within the range of estimated consumption from other reports (Fessehaie 2015, ICMM 2014). The estimate probably represents lower bounds of consumption given that it did not include all input goods and services. Further, there was apparent resistance by some mines to provide full details through the Ministry for reasons which are not entirely clear but probably related to a sense of mistrust. The previous estimates were all undertaken through the Chamber of Mines and naturally did not appear to

encounter such difficulties. Notwithstanding these weaknesses the estimates provide a good basis for achieving the project's objectives.

4.1.3 Distribution of Consumption Across Categories

For the four categories of data defined earlier, the largest component of total consumption (of US $ 2,381,971,646) is represented by core mining goods at US $1,269,035,813. This represents 53% of the surveyed inputs, followed by core mining services at US $941,696,075 or 40% of all input goods and services. The remaining categories are small, particularly the none-core goods. It is clear therefore that any meaningful attempts at localization will need to particularly target core mining goods and services, which aggregately make up 93% of surveyed inputs. Figure 3 below provides a pictorial distribution of inputs across the four categories.

Figure 3 – Distribution of input goods and services across the major consumption categories



Source: Author's computations

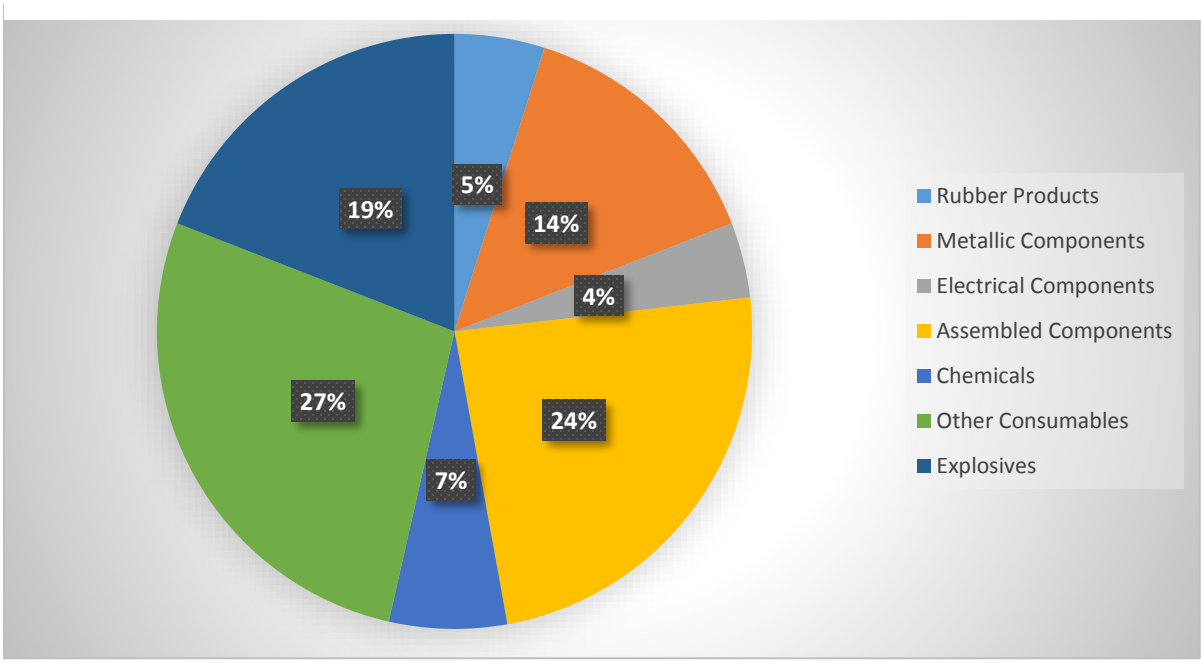
4.1.4 Distribution of Core Mining Goods and Consumables

Given the magnitude of core mining goods and consumables, it is worth disaggregating the category further to obtain insights into the main elements. This is shown in Figure 4 and described below.

Assembled Components – This component in core mining goods and consumables has an annual expenditure of US $304,057,427. This constitutes 24% of total core mining inputs and consumables. The assembled items sub-category is dominated by off-highway trucks at US $110,495,640 or 36% of the subgroup; drill rigs and rock drills at US $58,337,161 or 19% and underground loaders at US $33,900,958 or 11%. These three items make up 86% of the sub group

and are dominated by original equipment manufacturers (OEMs). Other notable items include pumps at US $26,116,620 or 8.6% of the sub-group; valves at US $17,154,247 or 5.6%, and bearings at US $16,831,031 or 5.5%. The subgroup also consists of a number of smaller items such as drives and gear boxes, vibrating screens, flotation cells and rolling stock.

Figure 4 – Distribution of core mining goods and consumables



Source: Author's computations

Other Consumables – This constitutes the largest component in core mining goods and consumables at US $347,184,401 or 27% of subcategory procurement. The bulk of the sub category is fuels oils and lubricants, which at US $271,487,168.79 constitutes 78% of the sub-category total value. Coal constitutes 10% at US $33,698,332 and refractory bricks 5% at US $18,548,894. The value of refractory bricks is probably much higher than that indicated, given the large number of foundries in the country whose estimates have not been included in the study. The consumption of refractories by Chambishi Copper Smelter, the largest smelter in Zambia, has also not been included. A significant value of silica, at US $13,682,105.43 or 4 %, is consumed as flux during smelting.

Metallic components – This subcategory, at US $179,949,737 constitutes 14% of the total value of core goods and consumables. The dominant item in this sub group are mill balls at US $74,181,005 or 41% of the total value of metallic items. There are now several producers of mill balls including Scaw Ltd, Yellow Stripe, and Sino Metals. A Chilean firm has installed a mill ball plant in the Kalumbila MFEZ in partnership with a Chinese firm. Other significant values of metallic products include pump impellers at US $20,813,067 or 11.6%, nuts and bolts at US $ 14,034,639 or 7.8% and feeder wear parts at US $8,756,572 or 4.9% of the subgroup. Similarly to

the assembled items, this subgroup also consists of a number of smaller items such as process piping, bins and chutes, wire ropes and rail track and fittings.

Explosives – This sub-category constitutes 19% of total goods and consumables at US $242,836,710. The subcategory is almost exclusively dominated by emulsion explosives made from prilled ammonium nitrate. The rest of the subcategory is made up of detonators and safety fuses at about 11%. Local manufacturing facilities exist at Africa Explosives Limited (AEL), but there are substantial imports of finished goods from South Africa and China.

Chemicals and reagents - Expenditure on this subcategory is estimated at US $81,136,453 or 7% of inputs goods and consumables. The largest expenditure, at US $36,863,269 or 45.4%, is on specialty chemicals covered by patents, such as collectors, frothers, flocculants and solvent extractants. The next largest component is 'Other chemicals' at US $28,851,213 or 35% of expenditure. This is mainly sodium hydrogen sulphide, used as a sulphudizer for oxide ores, which is imported from China. Lime, at US $13,248,758 or 16.3% is locally procured.

Rubber products- These run at US $62,421,220 per annum, and make up 5% of core goods and consumables. The biggest component in the subgroup at US $23,509,096 (37.7%) is tyres for mining vehicles. Hose pipes make up the next biggest item at US $16,642,082 (26.7%) and rubber seals and gaskets at US $8,754,646 (14%). Given the lack of a rubber industry, these items are imported into the country.

Electrical components - At US $51,449,864, this sub-category makes only 4% of core goods. This is probably understated. It comprises electric cables, by far the biggest component, at US $26,788,523 or 52.11% of the subgroup. It further consists of starters and switches at US $8,589,927 or 16.7%; light fittings at US $ 5,980,076 or 11.6% and motors at US $5,301,289 or 10.3%. Transformers only make up about 2.5% of expenditure, indicating that the mines are not major buyers of transformers. Electricity distribution to the mines is subcontracted. Electric cables, and starters and switches, are locally manufactured but there are also significant imports.

4.1.5 Distribution of Core Mining Services

After core mining goods and consumables, this is the second largest category of inputs by far at US $ 941,696,075 or 40% of the total value of goods and services. This is dominated by mine development services at US $535,340,942 or 57%, of the subcategory, and shaft sinking at US $147,302,967 or 16%. Drilling at US$110,150,806 and maintenance, at US $111,999,299 are both about 12% of expenditure of the subcategory. The large value services ie mine development and drilling are normally subcontracted to first tier companies which then subcontract other service providers, as necessary.

4.1.6 Non-core Services

These are valued at US $136,536,139 per annum or 6% of total expenditure on goods and services. The main subcategory expenditure is on bulk transportation at US $51,060,332 or 37.4% of the subcategory, and bus transport at US $36,784,807 or 26.9%. The remaining value chains are much

smaller comprising security, catering and gardening. These are localised while bulk transportation for evacuation of final products to ports is dominated by foreign firms.

4.1.7 Non-core Goods

This forms a very small part of goods and services at 1.5% and US $34,703,619. It is dominated by medicines at 30.8 % of subcategory expenditure, food items at 26.1% and safety wear at 24.5%. Office equipment and stationary make up the remaining 18.5%. Other than food, most of the items are imported although some safety wear is locally manufactured.

4.2 Profiling Suppliers of Goods and Services

4.2.1 A taxonomy of suppliers of goods and services

A large mining industry, such as Zambia's has a huge and diversified supply chain for goods and services.The literature generally reduces this to three main categories (Morris et al 2011; ILO 2014)). **Category 1** comprises international suppliers, mainly subsidiaries of Original Equipment Manufacturers (OEMs), distributors and agents, and specialised service providers (such as engineering companies, drilling companies) with a local presence. These have no domestic manufacturing facilities and hence create little local value added. According to Morris et al (2012), category 1 suppliers are typical of the "global-sourcing-follower-supply" model of supply chain management. Apparently, in jurisdictions like Zambia that have no local ownership in the lead commodity firms, the mine owners typically require first-tier suppliers to co-locate with the mines in order to respond swiftly to production challenges.

Category 2 comprises international suppliers with little or no local presence. These are set up to monitor tenders from small offices offshore and source directly from international suppliers. Typically, they do not maintain warehouses and have a very limited local presence. **Category 3** suppliers consists mostly of Zambian traders, commonly referred to as 'briefcase businessmen" (Morris et al 2011), and a number of domestic manufacturing and engineering firms providing a range of mining inputs and services.

The above taxonomy has given rise to a tier system as illustrated in Figure 5 in which OEMs, engineering-construction-maintenance (ECMs) companies, and engineering-procurement-construction-installation (EPCIs) firms form the first or primary tier, while traders and manufacturers form the second and subsequent tiers. These supply goods and services either directly to the mines or more commonly through Tier 1 firms.

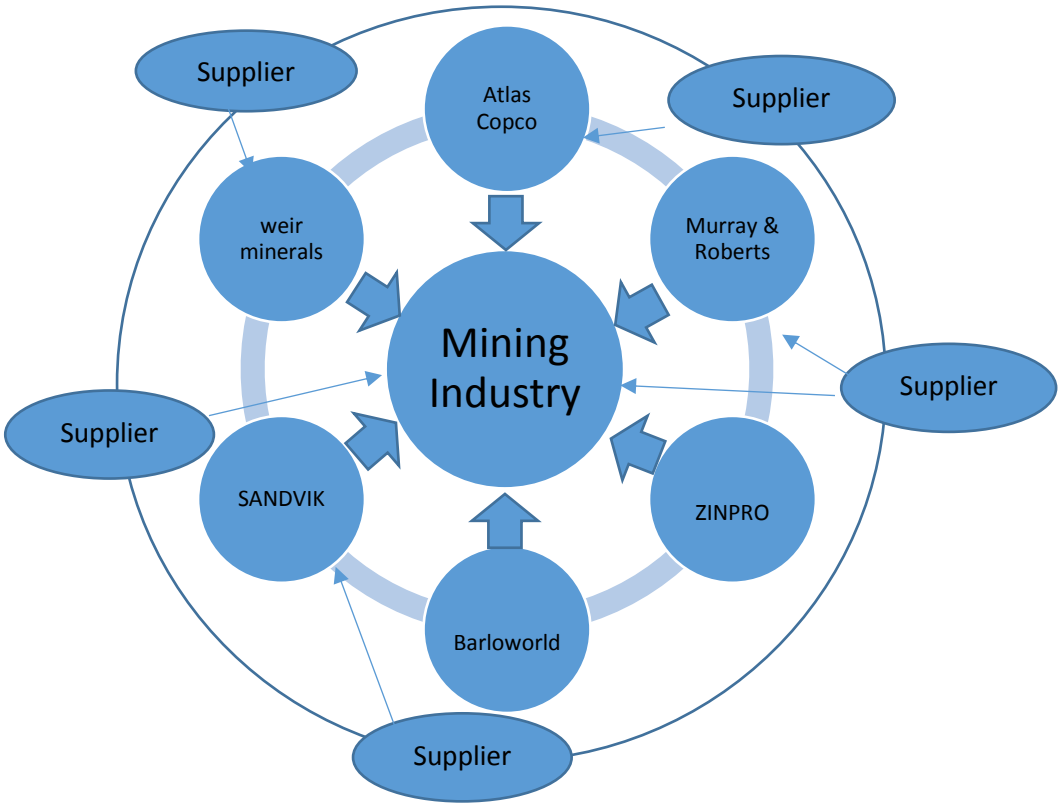
4.2.2 Data Sources and Assumptions

The information provided by the mining companies included names of suppliers and the origins of goods and services. This was used directly to profile the sources of goods and services and their suppliers. For the mines that did not complete the template, the approach outlined in 4.1 could not be used to profile suppliers and sources of goods and services. This is because the information provided was specific for each mine and sources and suppliers could not hence be assumed to be the same for all mines. This reduced the sample space to actual submissions.

Goods were classified as direct imports if both the sources and suppliers were foreign. Locally procured goods and services were those supplied by locally registered companies, irrespective of whether the goods were imported through OEMs or their local affiliates. Locally procured goods

and services also included those domestically manufactured, profiled as "True Procurement" and those supplied by Zambian-owned service providers and manufacturers. Zambian-owned was taken to imply firms in which Zambians had a majority shareholding (>50%) irrespective of their origins. Ownership records were obtained from the Patents and Company Registration Authority (PACRA), which also indicated the nature of business. Assistance from the Ministry of Mines and Minerals Development to access the large amounts of data from PACRA is gratefully acknowledged.

Figure 5 – Supply chain tiers in the Zambian mining industry

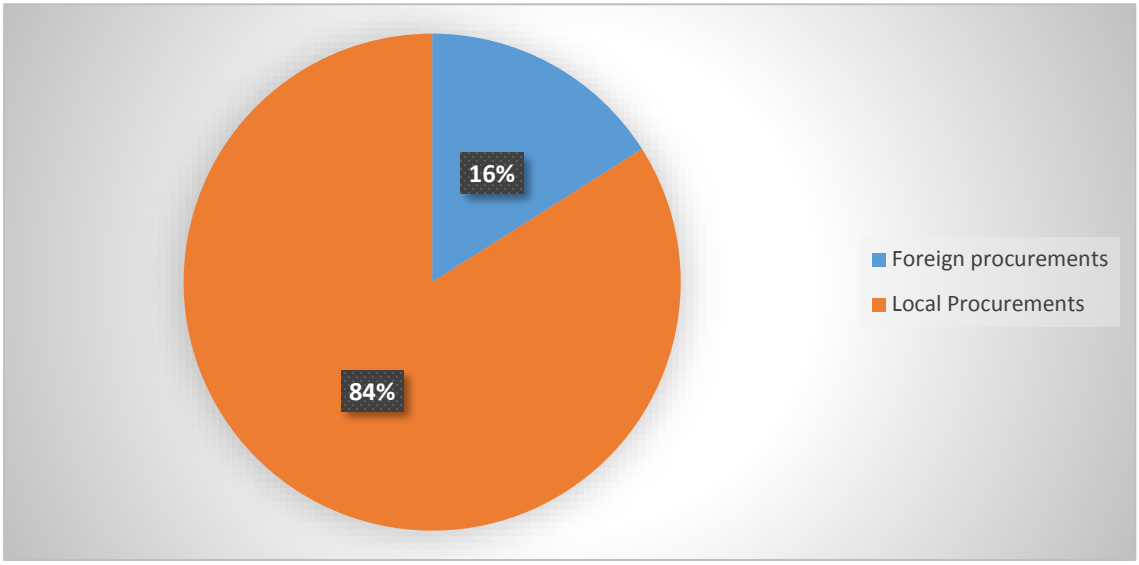


Source: Author's illustration

4.2.3 Sources and Suppliers of Goods and Services

This section focuses on the main sources and suppliers of goods and services. Figure 6 and Annexes 4 and 5 indicate that the bulk of goods and services (84%) consumed by the mining industry is sourced locally and only a much smaller proportion (16%) is imported. The magnitudes are consistent with other findings (Genesis 2014, Fessehaie et al. 2015, and ICMM 2014).

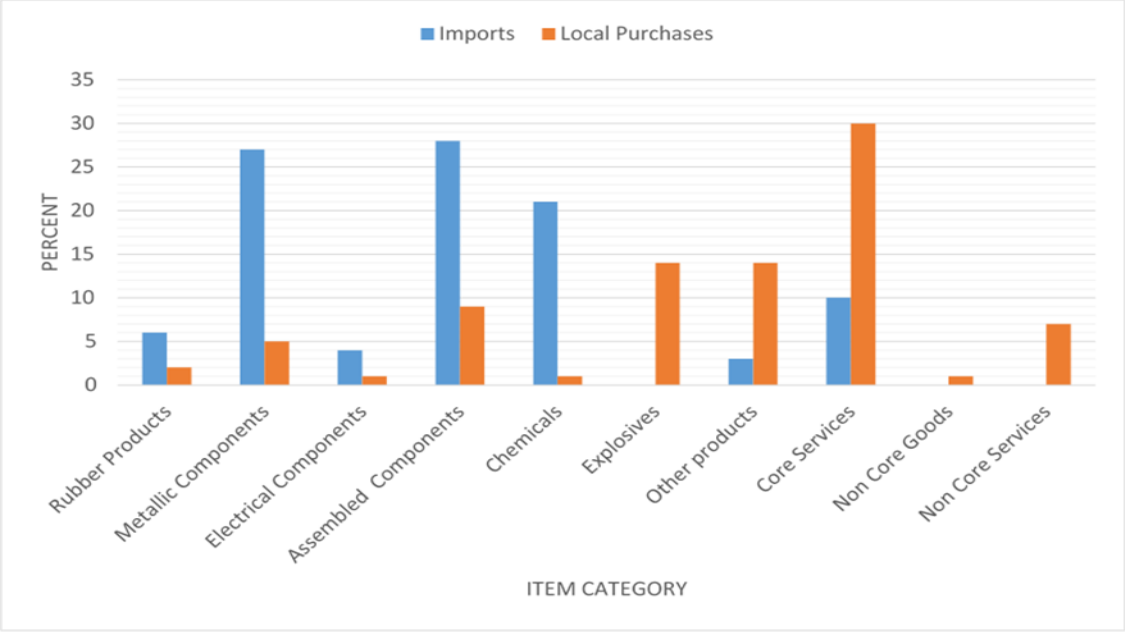
Figure 6 – Comparison between imported and locally procured goods and services



Source: Author's computations

Figure 7 decomposes both the imported and locally procured goods and services. It is observed that the main direct imports are specialized machinery (both metallic and assembled components) and specific chemicals supplied by chemical companies, these making up nearly 80% of direct imports (Annex 4).

Figure 7 – Composition of imported and locally procured goods and services



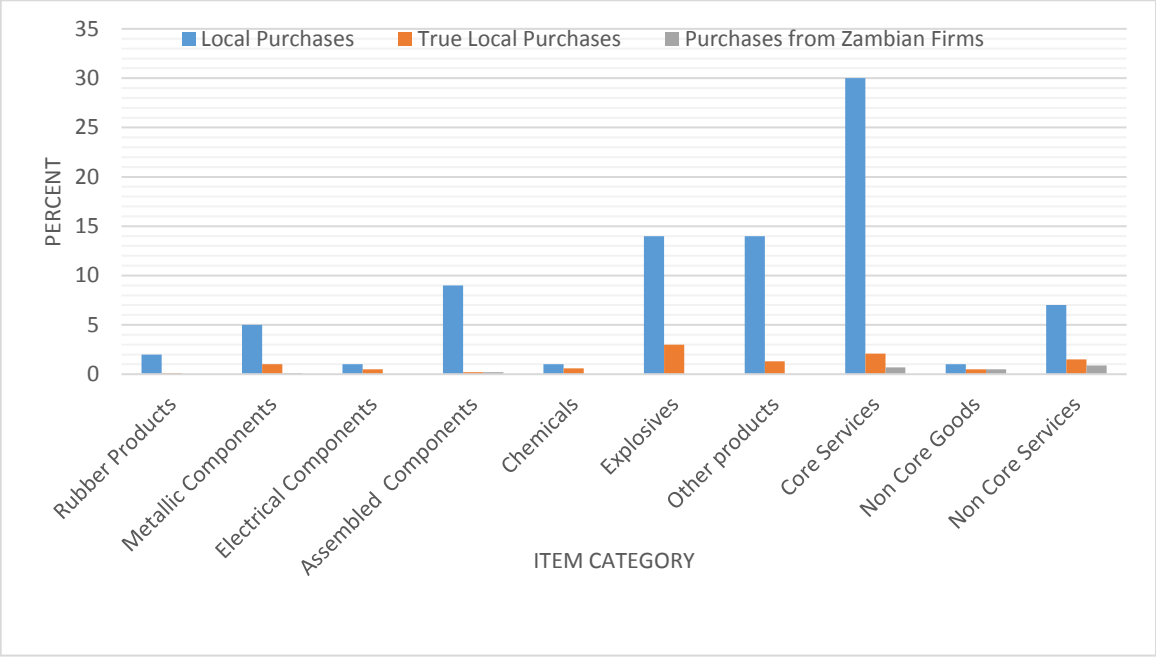
Source: Author's computations

Specialized machinery consists mainly of off-highway trucks, crusher wear plates, pumps and mill balls. Chemicals consists mainly of patented chemicals such as collectors, frothers and depressants. They also include sodium sulphide for the sulphudisation of oxide ores. The suppliers for the machinery are mainly category 1 OEMs and specialized overseas manufacturers. Figure 7 also shows that there are virtually no direct imports (other than through locally registered firms) of explosives, non-core goods and non-core services.

The main elements of local procurement are services, by far the largest, as well as explosives, 'other inputs' and assembled components. These make up nearly 70% of local purchases (see Annex 5). The core services category is dominated by resident specialist suppliers, mostly Tier 1 firms. Supplier firms for explosives include a domestic manufacturer and locally registered firms with no manufacturing capabilities. The assembled goods category is dominated by OEMs supplying equipment such as drill rigs and underground loaders. The 'other inputs' category is dominated by fuels, oils and lubricants supplied by several locally registered oil marketing firms. Significant values of mill balls are supplied by several domestic manufacturing firms.

Locally procured goods and services include imports by all locally registered firms, locally manufactured goods by both foreign and local firms, as well as services supplied by both. The high proportion of locally procured goods and services can hence be misleading. The goods and services have been further decomposed into 'True Local Procurement' defined as locally manufactured goods, irrespective of firm ownership, and services provided by resident firms, excluding multinational companies. The results are shown in Figure 8 and Table 1. Table 1 includes the proportion of Zambain owned manufacturers and service providers.

Figure 8 – Proportions of locally manufactured inputs and Zambian supplier firms



Source: Author's computations

Table 1 – Proportions of True Local Procurement of goods and services

Category	As % of Total Purchases	As % of Local Purchases	As % of True Local Purchases	% of Total Purchases from Zambian Firms
CORE MINING INPUTS AND CONSUMABLES				
Rubber Products	0.1	0.1	0.8	0.0
Metallic Components	1.0	1.2	9.2	0.1
Electrical Components	0.5	0.6	4.4	0.0
Assembled components	0.2	0.2	1.5	0.2
Chemicals and Reagents	0.6	0.7	5.7	0.0
Explosives	3.0	3.5	28.1	0.0
Others	1.3	1.5	11.9	0.0
CORE MINING SERVICES	2.1	2.5	19.9	0.7
NON-CORE GOODS	0.5	0.5	4.3	0.5
NON-CORE SERVICES	1.5	1.8	14.2	0.9
TOTAL TRUE LOCAL PURCHASES	**10.6**	**12.6**	**100.0**	**2.5**

Source: Author's computations

The combined proportion of locally manufactured goods (both local and foreign firms) and resident service providers forms only 10.6% of total purchases and 12.6% of local procurement. Whichever way, the blunt conclusion is unavoidable, that True local purchases are minor. The overwhelming volumes and values of locally procured goods and services are infact imported into the country by Tier 1 and foreign owned companies. The largest component in locally manufactured goods is explosives at about 28% of true locally procured goods. Figure 8 confirms that despite local facilities to manufacture explosives, the larger share (72%) is infact imported into the country.

About 20% of core mining services are provided by residents and Zambian owned companies. Here too, the lion's share (80%) of total procurement is provided by locally registered Tier 1 firms, such as Murray and Roberts Weir Minerals, etc. For non-core services, only14% is classified as 'True Local Purchases'. The bulk of this is transportation which is dominated by residents firms owned by non-Zambians. Despite domestic capabilities to manufacture metallic products, such as mill balls, only 9% of this category is classified as 'True Local Purchases. This is mainly due to imports of these and other metallic items like crusher wear plates, which can be locally manufactured. Cables, switch gear and transformers are also locally produced but the bulk of the items consumed by the mines are imported.

A worrying observation in Figure 8 and Table 1 is the low proportion of local purchases from Zambian owned firms. This is only 2.5% of domestic procurement and is mainly in non-core services, core mining services and non-core goods. Non-core goods are largely protective clothing part of which is locally manufactured but there are also significant imports by Zambian retail firms. The Zambian presence in non-core services is in areas like catering and security services. The conclusion is unavoidable that Zambian supplier firms are marginal suppliers. If, as Figure 2 suggested, that the campaign to industrialize and diversify the economy must deliberately promote the Zambian manufacturer or service provider, then this campaign is evidently struggling.

4.3 Summary of Supplier Interviews

4.3.1 Suppliers Interviewed and Rationale

Annex 8 provides a listing of the companies and industry associations visited, their nature of business and ownership. The main purpose of the visits was to obtain firsthand information on the range of goods and services supplied, capacities and capabilities to supply and more importantly the challenges faced by the suppliers, which impede their growth. In all, 16 suppliers of goods and services and 3 industry associations were interviewed. The companies interviewed included manufacturers of: electrical items, chemicals (mainly explosives), foundry products and machined components; and core service providers. The interviews followed a semi structured format around a suppliers/manufacturers questionnaire similar to that in Annex 2.

Detailed outcomes of the supplier interviews are given in Annex 9.

4.3.2 Main Outcome of the Interviews

The interviews suggest that a range of products are, or can readily be, manufactured in Zambia. In the metallic components subcategory, the two foundries visited manufactured mill balls and mill, chute and crusher liners; pump impellers, skip and break shoes. A Zambian owned company manufactured railway turnouts; forged items like roof bolts and nuts and bolts. Unfortunately, this company was in the process of closing down. In this category, the potential exists to manufacture crusher wear plates, screen decks, feeder wear parts and metallic process piping, which are imported at present.

In the electrical items subcategory, two companies manufactured low voltage electric cables while three manufactured low voltage transformers and low-medium voltage switch gear. The cables used in the manufacture of switch gear were imported, as was winding wire for transformers. The two cable manufacturers indicated a willingness to diversify into enamel wire for transformers and motors if market dynamics support a business case.

In the assembled items subcategory, rock drills are locally manufactured as are railway and rolling stock products, such as flat cars and railway turn outs. Impellers and pump casings are also locally manufactured, this hence makes the manufacture of complete pumps and motors possible.

The main explosives used by far are the slurry and emulsion forms and are locally manufactured by one company. The ammonium nitrate feedstock is, however, imported from South Africa due to an overcapacity at its parent company. A domestic chemical company is able to produce explosive grade ammonium nitrate despite the imports of ammonium nitrate and finished goods by locally registered subsidiaries of South African companies. The local explosives manufacturer suggested it might close the facility because it is cheaper for it to sell imported explosives.

For core services, several locally registered companies are providing mine development services, engineering maintenance, machining and fabrication services.

4.3.3 Main Challenges Faced by Local Suppliers

The interviews revealed a number of obstacles for domestic manufacturers generally, and Zambian suppliers, as a group. These include the following:

High costs of inputs and intermediates – a number of obstacles escalate costs of production. The complaints included:

a. The high cost of electricity tariffs, particularly for the foundries that have to run furnaces;
b. The shortage of scrap inputs for the foundries, which apparently is exported to China despite the existence of a scrap metal exports ban;
c. Imports of raw materials and intermediate feedstock by transformer and switch gear manufacturers, such as cables, enamel wire, ceramic insulators and panels. ZAMEFA cables are reported to be more expensive than imports. The machine and fabrication shops import all their specialty steels, steel plate and sheet; and
d. High copper input prices for cable manufacturers charged at LME prices on CIF basis.

Unfair competition practices – Many of the domestic manufactures complained about unfair competition from lower priced Chinese goods, often of questionable quality. This is abated by large public turnkey projects which lock in supply chains from China. Affected examples included:

a. local manufacturers of transformers, cables and switch gear;
b. A major foundry that lost business on castings to a trader from China who supplies at half the price;
c. A major explosives manufacturer being undercut by imports of finished goods from China and South Africa;
d. A cable manufacturer who cannot import compete with imports from china, especially on aluminum cables due to dumping; and
e. An ammonium nitrate manufacturer who is unable to sell to the explosives producer due to intra-firm imports from South Africa.

Monopolies between mines and Tier 1 suppliers – many manufacturers and suppliers complained about the 'cartel' nature of the relationship between mines and Tier 1 suppliers, exemplified by the following:

a. Tier 1 companies dominate all high value contracts and have their own supply chains. This has promoted the 'verticalisation' of supply chains, shutting out local subcontractors;
b. A Chinese Tier 1 company sources all its inputs from China and uses Chinese subcontractors, a similar practice among South African Tier 1 companies; and
c. The establishment of Multi Facility Economic Zones (MFEZs)[4] which has encouraged vertical supply chains. Based on the Chinese Chambishi MFEZ, South Africa's Department of Trade and Industry has recently undertaken a study to establish a capital goods and services MFEZ on the Copperbelt.

Discriminatory practices against small Zambian suppliers – Zambian suppliers cited many discriminatory practices, which have led to a number of them closing down. Examples cited were:

[4] There are two Chinese owned special multipurpose zones provided with specific incentives to encourage investment in manufacturing and services provision.

a. Subcontracts through Tier 1 companies, which in effect are competitor bidders and have their own supplier preferences. One machine workshop complained of blatant sabotage by a Tier 1 company to create the impression that it was an incapable supplier;
b. Preferentially much higher rates paid to Tier 1 service providers for the same service. A Zambian mine development firm providing services to a named major mine was forced into an inferior junior partnership with a Tier 1 service provider due to lower rates, paid in local currency. It could not service foreign payments for boom drill rigs from an OEM. Another firm in a similar situation with the same mine was forced to close down;
c. Mines provide favorable business terms to Tier 1 contractors and their subcontractors including duty free imports of inputs, advance payments on goods and services, guarantees for credit lines and sometimes even office space;
d. Zambian subcontractors pay duty on their imports; and have overheads which include statutory payments like NAPSA, Workers Compensation, Affiliation fees to EIZ and NCC, etc. Foreign companies are not subjected to these statutory payments;
e. Mines operate 'in a leave mode' and commonly invoke force majeure conditions (if there are changes in tax arrangements or commodity prices) to suspend payments to Zambian contractors some of whom have not been paid for more than 3 years;
f. Qualifications of foreign contractors which are not checked and many are unqualified to practice in Zambia; and
g. Lack of policy and regulations to level the playing field by Government.

Tender system remains opaque - Zambian suppliers complained that tender systems remain opaque although they are online. Incidences cited included:

a. Poor information flows about tenders with many superficially contacted at the eleventh hour and in cases of emergency; and
b. Numerous middlemen with no manufacturing facilities who win tenders despite bidding higher than manufacturers. Yet they still revert to the same manufactures to fabricate components.

Finance and technology are a problem – These are particularly acute for small Zambian suppliers and include:

a. Lack of access to working capital and inability to get guarantees to enable them access finance. The lack of long term financial markets and high interest rates prohibits commercial loans and many small suppliers have lost their properties because they borrowed commercially but were unable to repay on time due to delayed payments by the mines;
b. Antiquated technologies of production used by the foundries and machine shops which require modernization; and
c. Technology and financing challenges for the sole manufacturer of ammonium nitrate feedstock for explosives, which prevent plant rehabilitation and modernization.

Lack of a facilitative policy and regulatory regime – as earlier stated in 2.2, the policy and regulatory regime favors duty free imports of input goods, given the benefits to the mines. Coupled with incentives provided to suppliers operating from multi facility zones, it is not possible for domestic manufacturers to compete with foreign suppliers. A locally based multinational rock

drill manufacturer visited had closed down. The main explosives manufacturer is also contemplating closure due to cheap imports. Two of the Zambian companies visited were in the process of closing down. The regulatory regime does not simply enable domestic manufacturing activities, whether by Zambian or foreign companies.

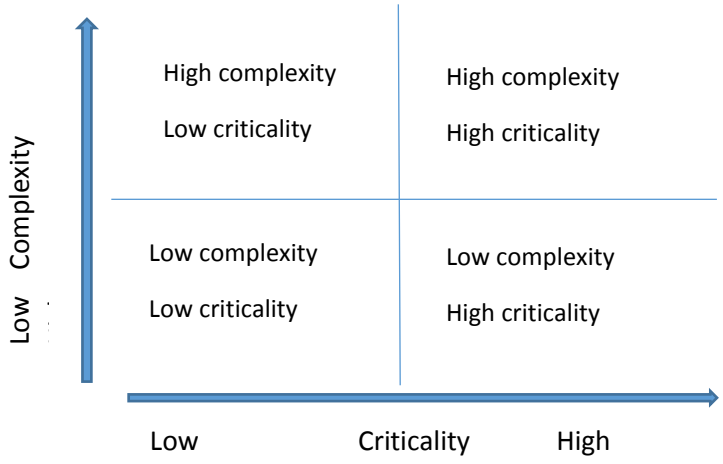
4.4 Target Goods and Services for Localization

4.4.1 Criteria and Rationale

The mining industry uses a wide variety of goods and services and even with the best efforts, it is not possible to localize all of them. Localization depends on several fundamental demand side factors. These revolve around the complexity of the goods and services and their criticality to production operations (see Figure 9). Generally the more complex and critical they are, the higher the cost of failure and the more stringent the standard and timeliness of supply. Complex goods and processes critical to production are normally contracted to Tier 1 OEMs and ECMs, who assume the risk of failure and are themselves unwilling to use local goods and services of unproven quality and reliability. This explains the presence of Zambian suppliers in the non-complex and non-critical goods such as uniforms and safety wear, and in services, such as gardening, and security. The first imperative to localization is hence to match technical quality factors, reliability and price competitiveness to imported goods. Localization is never about substituting imported goods or services with inferior local alternatives.

On the supply side, localization needs to take account of existing domestic capabilities to supply goods and services into the value chain. Generally, the manufacturing sector is poorly developed in Zambia (UNDP 2016). Localization hence needs to target simpler and less complex goods and services for which technical capabilities either exist or can be reasonably developed in the short to medium term. An important criterion has therefore been to choose those products and services demonstrating a substantial market share in the value chain and for which both local and foreign investment in technologies of production and expertise is attractive.

Figure 9 – Supply considerations for goods and services



Source: Author's illustration

A further consideration is to target the development of a limited number of goods and services in a cluster approach. A major revelation from the field survey is the high cost of inputs particularly raw materials and intermediate goods. The cluster approach should target the localization of raw materials and intermediate inputs to allow for the competitive domestic manufacture of goods. The cluster approach also allows for raw materials, intermediate and final goods to migrate across economic sectors, thus promoting sidestream linkages. This leads to greater diversification of the economy.

4.4.2 Suggested Goods and Services for Localization

Section 4.2 indicated that core mining goods and services aggregately make up 93% of surveyed inputs. Any meaningful attempts at localization will need to target these two categories. This and previous reports suggest that the two categories are almost exclusively dominated by foreign Tier 1 supplier firms.

Other Consumables – The bulk consists of fuels, oils and lubricants, dominated by international oil marketing companies. The only *entry point is probably in the inward transportation of fuels,* which is controlled by foreign truckers. Coal, limestone and silica flux are already locally mined and supplied. In this category, *refractory bricks hold the most promise for localization.*

Assembled Components are dominated by off-highway trucks, and underground loaders, supplied by Tier 1 firms like, Barloworld, Atlas Copco, Sandvik, etc. They are part of global value chains (GVCs) and localization is difficult partly due to their criticality in production operations. Rock drills and drill steels are locally manufactured using imported steels. There is also a range of assembled items that are imported but can be fabricated locally. These include conveyor belts pulleys and idlers, gear boxes, valves, pumps, flotation cells, scrubbers and conditioners. *Localization could target replacement of imports of steels for those already being manufactured. These include machine grade steels, such as EN19 for the fabrication of gears and shafts, as well as mild steel plate and sheet for fabricating thickeners, scrubbers, dust collectors, and flotation cells.*

Metallic components - The dominant item in this sub group are mill balls. There are several producers of mill balls based on scrap metal for feedstock. This always makes it difficult to control the composition and quality of steel balls. Among the more significant items in the subgroup are pump impellers, nuts and bolts and feeder wear parts. The group also contains a number of steel based products including process piping, bins and chutes, thickeners and tanks, wire ropes and rail track and fittings. Like the assembled goods sub category, this sub group holds great promise for *localizing steels for mill balls, crusher and feeder wear parts and sponge iron for use in the foundries, rather than scrap metal. Localization could also prioritize the domestic supply of steel inputs, such as mild steel sheet for bins and chutes; and pipes; high tensile steel for winding wire; steel for nuts and bolts; and castings for pump impellers.* The engineering sector currently imports input materials.

Explosives – The subcategory almost exclusively comprises prilled ammonium nitrate explosives, used in emulsion form. Local manufacturing facilities exist but ammonium nitrate feedstock is imported from South Africa. Packaged explosives are also imported through locally registered

South African subsidiary companies. A Zambian parastatal company Nitrogen Chemicals of Zambia (NCZ) can supply ammonium nitrate but is unable to due to technical challenges. NCZ itself imports ammonia for the manufacture of ammonium nitrate for fertilizers manufacture. *Localization needs to be directed at rehabilitating NCZ facilities to localize all feed stock of ammonium nitrate for explosives.*

Chemicals and reagents - The bulk of expenditure is on specialty chemicals covered by patents, such as collectors, frothers, flocculants and solvent extractants. Lime is locally produced. Of interest in this sub group is sodium hydrogen sulphide, used as a sulphudizer for oxide ores. This is imported from China. Hydrogen sulphide is a byproduct gas at NCZ. Hence *Localization should explore the domestic manufacture of sodium hydrogen sulphide either from hydrogen sulphide gas or from sulphuric acid which is abundant in Zambia*.

Electrical components - While there are two manufacturers of electric cables in Zambia, none makes enamel wire for motors and transformers**.** The domestic manufacturers of transformers and switch gear all import enamel wire, electric wire, sheet plate for making transformer panels, and ceramic insulators. Target goods for localization are hence w*inding wire for motors and transformers, sheet plate (already discussed) and ceramic insulators. Enamel wire would enable the local manufacture of electric motors*, thus opening up opportunities in the assembled goods category in respect of items like flotation cells, thickeners and agitator tanks. These require electric motors to function.

A summary of the above opportunities, or so called low hanging fruits, is given in Table 2. **The opportunities were discussed, and agreed for further investigation, with the Ministry of Mines and Minerals Development.**

4.5 Opportunity Profiles for Localizing Goods and Services

A local content approach rooted in a cluster approach offers attractive opportunities for economic growth, industrialization and diversification, as envisaged by the aspirations of Vision 2030 and the 7th NDP. Table 2 suggests five clusters on which localization should focus. These are:

a. *metallic and assembled components;*
b. *electrical goods;*
c. *industrial minerals;*
d. *chemicals and explosives; and*
e. *core and non-core services.*

Detailed opportunity profiles have been compiled for these clusters and are provided in Annex 10. Summaries are given in the next section. A total of twelve profiles have been suggested across the clusters. Estimates of expenditure in the profiles suggest that as much as US $ 1.2 billion of procurement could be localized. This would be about 50% of the total estimated annual consumption of US $ 2.4 billion of the identified goods and services. Opportunities for expanding markets into other economic sectors are suggested in the profiles. This could more than double the market potential of the goods and services, making a significant contribution to industrialization and economic diversification.

Table 2 – Summary of target opportunities for the localization of goods and services

CATEGORY & SUB CATEGORY	TARGET OPPORTUNITY
CORE MINING INPUTS & CONSUMABLES	
Other inputs	• Manufacture of refractory bricks • Transportation of oils and fuels
Assembled components	• Substitute imported steels in rock drills and drill steels • foundry manufacture of components such as conveyor belt pulleys and idlers, pumps (casings) and valves • Local manufacture of rolled mild steel plate and sheet to feed into the manufacture of components such as thickeners, flotation cells, scrubbers and conditioners, dust collectors, etc
Metallic components	• Manufacture of hard wearing steel alloys for use in mill balls, mill rods, crusher wear parts, feeder wear parts, pump impellers etc, and manufacture of components themselves. • Local manufacture of mild steel plate and sheet for bins, chutes and pipes and or the components themselves • Manufacture of specialty steels for gear cutting and gear boxes • Manufacture of high tensile steel for winding, normal wire and steel for nuts and bolts
Explosives	• Explore boosting operations at NCZ to meet domestic demand
Reagents and Chemicals	• Explore local manufacture of sodium hydrogen sulphide for sulphudisation of oxide ores
Electrical components	• Manufacture of winding wire for motors and transformers • Manufacture of special steels for motor and transformer components • Manufacture of electric motors • Manufacture of ceramic insulators
CORE MINING SERVICES	• Explore possibilities of Zambians becoming junior partner to tier 1 suppliers of these services
NON CORE SERVICES	• Limit transportation of copper to ports by foreign firms to provide space for Zambian companies.

Source: Author's compilation

4.5.1 The Metallic and Assembled Components Cluster

This revolves around manufacturing the right types and specifications of iron and steel to substitute imported intermediate feedstocks. This would reduce the cost of domestic manufacture of metallic components consumed by the mining industry, as well as other economic sectors. Five opportunities have been identified as follows:

1. **Diversify domestic manufacture of iron and steel intermediate inputs**

The mining industry consumes an aggregated amount of US $240 million per annum in different metallic components (bins and chutes, feeder wear parts, screen decks, mill liners, mill balls, crusher wear parts, mill liners, process pipes, thickeners and tanks, nuts and bolts, rail track and fittings, and wire ropes) and assembled items (pumps, drives and gear boxes, feeders, flotation cells, scrubbers and conditioners, rock drills, underground ground chains, roof bolts). The market

potential is in all likelihood much larger when considered that various steel materials are used in the manufacture of tools, implements and machinery in other economic sectors including agriculture, manufacturing, and transportation. Structural steel for construction eg beams is also imported. The domestic market potential for steel into these steel products could easily exceed US $400 million.

An iron and steel MFEZ has been declared in the 7th NDP in Kafue District to spur industrialization and diversification. This revolves around the current 250,000 tpy Universal Mining and Chemical Industries Limited (UMCIL) iron and steel plant. This currently uses scrap and directly reduced sponge iron to produce construction steel products. There are plans to diversify and expand iron and steel production to 1 million tpy over 5 years to include beams, plate and sheet products; and specialty steels for the engineering sector.

Technologies and expertise for current iron and steel production are sufficiently localized. Expansion will, however, require improvements in current process efficiencies as well as increased capacities in melting, rolling, DRI and gasification units. This will also require a new plant with improved continuous casting technologies in order to manufacture products that include beams, plate and sheet and specialty steels. Thin casting technologies from USA, Japan and Italy are being considered. Sufficient iron ore deposits exist to sustain mining for the foreseeable future. In-house mining expertise already exists.

Expansion of iron and steel production will need to be supported by public investment in infrastructure developments, including a railway line and utilities. Further policy support in tariffs to restrict imports will be required. Naturally full feasibility studies need to be undertaken. Developing intermediate iron and steel feedstocks cluster should unleash opportunities for growth in other economic sectors as steel products are used by all industrial sectors.

2. **Localize the Manufacture of Mill Balls and Rods, and Mill Liners; and Crusher and Feeder Wear Plates**.

The mining industry consumes an aggregate of US $ 115 million of the above products annually. Zambia has several scrap-based foundries and iron and steel melting plants that are currently manufacturing mill balls, and mill and feeder liners. Crusher liners are not being manufactured locally although the potential exists to do this. Despite local capabilities, a substantial portion of mill balls and liners; and crusher and feeder wear parts are currently imported mainly from China and South Africa.

The main properties required of material to manufacture these components materials are abrasion and impact resistance. They are hence made from abrasion resistant steels such as manganese steel, chrome steels and Ni-hard cast irons. Manganese is available locally but chrome is not mined in Zambia. Ferrochrome would have to be imported from Zimbabwe for chrome based balls and liners. It is therefore possible to localize the entire annual procurement for these components, if the Kafue steel plant diversifies the production of intermediate feedstocks.

Technologies for making mill balls and rods from steel billets, using a reheating furnace or kiln, forming or shaping through a rolling mill are already being used. Liners are made by casting processes and then subjected to heat treatment. These can also be produced by existing foundries although plant modernization is probably required. Feasibilities for modernization are required while tariffs on imported components and input materials would facilitate complete localization. The market potential is large enough to warrant investment in expansion and modernizing current facilities.

3. Localize the Manufacture of Nuts and Bolts (and wire and nails)

The mining industry consumes about US $14 million per year in nuts and bolts. Given that nuts and bolts are used in every industry, the market potential is probably much higher than this. The market can further be expanded if production is extended to nails and wires. Localization of the commonly used nuts and bolts in the mining industry, and other economic sectors, would stimulate industrial production processes.

Nuts and bolts and wire are normally made from mild steel wire coil or rod, within narrow limits of carbon, phosphorus, manganese and sulphur compositions, rather than scrap derived steel. It is hence likely that most consumption, probably all, is imported. Technologies of manufacture are relatively simple and amenable to small and medium scale production. They comprise a cold heading machine, threading on a rolling machine; and annealing and tempering for high tensile nuts and bolts. An expanded Kafue steel plant could produce the required mild steel rod and wire compositions as intermediate feed stock. Any manufacturing plant requires a feasibility and a market survey to establish consumption outside of the mining industry. Current consumption justifies investment into a plant.

4. Manufacture of Centrifugal Pumps

Pumps are used in a wide range of mineral processing applications including hydro-transport, grinding circuits, flotation circuits, thickening and tailings disposal. The most common one is the centrifugal pump. A market potential of US $ 26 million is indicated for the mining industry alone. It is highly likely that the actual figure is much larger because the use of pumps is infact much wider outside of the mining industry, particularly in water and waste water pumping, industrial application and buildings. The indicative potential is probably several magnitudes larger than the above figure. Pumps are not locally manufactured. They are therefore a good target given their many applications in the economy.

The centrifugal pump is a relatively simple piece of equipment. The main parts are the casing which is made of cast iron or cast steel. The impeller is the more critical component and is made from abrasion resistant steels such as manganese steel, chrome steels and Ni-hard (martensitic type of iron). Impeller manufacture is currently undertaken at the foundries visited. The shaft and bearing assembly must be strong enough to withstand the hydraulic load and is made from high tensile steel. Centrifugal pumps can hence be manufactured in current foundries and machine shops but would require the right steels to be locally viable. A feasibility study to map the range of pump applications and sizes for both the mining industry and other industrial applications would

be the logical first step. A technology partner would be useful to benefit from technology and expertise transfer while tariffs would be required to protect the domestic manufacturer.

5. Manufacture of Valves

Valves are used in the mining industry to regulate the flow of fluids and slurry. They are also used by other industries including water supply, waste water disposal, irrigation, process industries and in buildings. As a matter of fact, the number of valves used in mineral processing is far less than those in other economic sectors. A market potential of US $ 17 million is indicated for the mining industry alone. Given the large number of applications outside of the mining industry, the market potential is much larger than indicated. Currently all consumption is imported from China, Europe, USA and South Africa

The more commonly used valves are the ball and gate valves for slurry flow control, and butterfly for clear liquids. Valve casings are made by castings in foundries with subsequent machining of the ball or gate. The stem is made from extruded rod and also machined as is the spindle and checknut. A machine workshop is hence required as part of the foundry. The main raw materials are copper, lead and zinc. Tin is also required in small quantities. Copper is abundantly available. Lead and zinc mining no longer takes place in Zambia. However, some lead is currently being exported. There is also brass and bronze scrap available locally. It is likely that zinc may have to be imported if domestic supplies are insufficient. As in the case of pumps, a feasibility study is required to map the range of valves used and the most common targets for domestic manufacture for both the mines and other industrial applications. A technology source and partner would need to be identified to benefit from technology and expertise transfer

4.5.2 The Electrical Goods Cluster

One profile has been identified, which involves several components for localization.

Localize Inputs into the Manufacture of Electrical Components

Several electrical components, such as low voltage cables and transformers; starters and switches are locally manufactured. But all inputs for transformers, starters and switches are imported partly due to the high cost of locally manufactured copper cable, but also due to the fact that medium and high voltage cables, winding wire, silicon steel laminations, and ceramic insulators are all not made in Zambia. Expanding manufacturing facilities to cover these imports, and bringing the cost of copper feedstock down would enable the wider manufacture of electrical components. This would widen linkages into other economic sectors, including the electricity supply sector, thus supporting diversification and industrialization efforts. Motors are used in across a broad range of commercial, industrial, and residential applications. Furthermore the domestic manufacture of winding wire would enable the manufacture of inductors for induction furnaces and solenoids.

A market potential of US $ 51 million is indicated, mainly in cables for the mining industry. This figure is in all likelihood understated as the main consumers of electrical components, the power supply and distribution sectors were not included. Investment into production technologies for enamel wire and motors, to add to current production of transformers, starters and switches,

appears justified. Production technologies for enamel wire involve wire drawing, annealing stranding or bundling. The wire is then coated with a polymer, resin or vanish by a variety of methods including dipping, spraying or vacuum pressurized impregnation. The coated wire is then baked to harden the coating. The manufacture of medium and high voltage cables would not require significant upgrades to existing manufacturing technology. Market access and dumping are rather the limiting factors.

For electric motors, the copper rotor is cast using a set of laminated steel dies. The stator, which is the stationary part of the motor's electromagnetic circuit, is usually made of windings around laminated thin metal sheets. Modular stator assembly lines are available on the market. The housing is made from cast iron. Low cost modular units for the manufacture of the stator and rotor are available in the market. The main raw material for enamel wire is locally available copper wire. Silicon steel laminations and ceramic insulators could be made locally. Current foundries should be able to cast the housing for motors.

As in the other cases, feasibility studies into the manufacture of winding wire and motors would be required, including understanding the market dynamics. A regulatory process would be required to make copper inputs locally available at competitive prices and to protect manufacturers from external imports.

4.5.3 The Non-metallic Goods Cluster

Two profiles have been presented for this cluster for the manufacture of ceramic insulators and refractory bricks and mortar. The raw materials for these are similar and find use in other applications, such as tiles, tableware, sanitary ware, paint manufacture, etc. Industrial minerals are further used in the manufacture of consumer products such as toothpaste, powders, soaps, etc. This cluster hence offers a range of possibilities for providing intermediate feedstocks into the manufacture of consumer goods.

1. Manufacture of High and Low Tension Porcelain Ceramic Insulators

This was not part of the items included in the survey. However, in the course of interviews with transformer manufacturers, it became clear that all their ceramic insulators are imported. The larger consumption of insulators is in the electricity supply and distribution sector. Localizing the manufacture of ceramic insulators would make transformer manufacture competitive as well as provide input into the energy sector, which is key to industrialization and diversification.

The raw materials for body preparation are quartz or silica sand, feldspar, ball clay and china clay. These are available in Zambia and have previously been mined. The quality factors are satisfactory. The raw materials for glaze preparation are feldspar, quartz or silica sand, kaolin, talc, limestone and dolomite of satisfactory quality. The technology of production involves preparing the body and glaze materials by mixing and finely crushing or grinding. The body is formed from vacuum extruded material, dried and then glazed by spraying. The body is then fired at temperatures higher than 1300^{o}C prior to cooling and inserting metal fittings. Needless to say, feasibilities would be

required for any production. It would also be useful to identify a small or medium scale external technology partner to act also as source of technology and expertise.

2. Manufacture of Refractory Bricks and Cements

Refractories provide linings for high-temperature furnaces and other processing units involving heat, such as kilns and fireboxes to protect the shell of the furnace or kiln. They must be able to withstand physical wear, high temperatures, and corrosion by chemical agents, as well as possess low thermal conductivity for greater energy efficiency. The indicative market potential is US $20 million per annum by the mining industry alone. Some application, eg foundries were not included in the estimate. Hence the market potential is probably larger than this. All current consumption is imported mainly from Austria, Dubai, Germany, Spain, and South Africa.

There are several types of refractory bricks. Fireclays are produced from hydrated aluminosilicates such as kyanite, kaolin, and bentonite and ball clay. These materials are available in Zambia although not currently exploited. Non-clay refractories include alumina which is not available in Zambia. Common substitutes are kyanite, sillimanite, mullite and corundum. Kyanite, sillimanite and corundum are available in Zambia. Silica bricks contain at least 93% silica and can be made from silica sands which are available in the Kapiri Mposhi area. Magnesite refractories are made from magnesite and silica. Magnesite is available in Lusaka. For chrome-magnesite refractories, chrome is not available in Zambia but can be sourced from Zimbabwe. Silicon carbides refractories are made from the fusion of silica and coal, both locally available.

Production technologies involves four basic processes, amenable to small and medium scale production. Raw material processing consists of crushing and grinding raw materials; size classification, calcining and drying. Forming consists of mixing raw materials and forming them into shapes usually under wet or moist conditions. Firing involves heating the refractory material to high temperatures in a batch or continuous tunnel kiln to form ceramic bonds. Final processing involves milling, grinding, or sandblasting (in situ) to keep the product in correct shape and size after thermal expansion has occurred during use. Silicon carbide is made by the carbo-thermal synthesis of silica sand and coke or coal.

Detailed feasibility studies are required to ascertain the most common types of refractory bricks and mortar used and true market potential both within and outside of mining sector. A technology partner would be required as source of expertise and technology itself.

4.5.4 The Chemicals and Explosives Cluster

Two profiles have been provided. They revolve around localizing feedstock in locally manufactured explosives. The domestic manufacture of ammonium nitrate would support linkages into the manufacture of explosives and fertilizers for the agricultural sector. The cluster could also accommodate the manufacture of sodium hydrogen sulphide from hydrogen sulphide from the coal gasification process. This hence extends linkages into waste water treatment, pulp and paper manufacture, and leather tanning. At some stage, the cluster could extend into household chemicals,

such as sodium silicate and soda ash for the manufacture of detergents and sodium hypochlorite for bleaching and disinfectant use in water treatment. These are currently imported.

1. Manufacture of Ammonium Nitrate Feedstock for Explosives

The mining industry in Zambia uses prilled ammonium nitrate explosives. Explosive grade ammonium nitrate can be made at Nitrogen Chemicals of Zambia (NCZ) in Kafue. The process plant has over the years experienced deterioration and the ammonia production plant has been shut for some time. This has led NCZ to import ammonia for the limited manufacture of ammonium nitrate fertilizers. It has also led to the sole domestic manufacturer of explosives to import ammonium nitrate feedstock. In addition, there are significant imports of finished goods from China and South Africa. Zambia consumes between 250,000 and 300,000 mt (in 2013) of fertilizers, the bulk of which is imported. Localising all requirements of ammonium nitrate in fertilisers and explosives should support Zambia's industrialization and economic diversification efforts in the two most critical economic sectors – agriculture and mining.

The indicative market potential in ammonium nitrate based explosives is US $243 million for the mining industry alone. Ammonium nitrate consumption in fertilizers is much larger. Localizing only 100,000 tpy of fertilizer grade ammonium nitrate would add US $ 1.25 billion to the market potential for the agriculture sector alone. Localization of ammonium nitrate requirements for both explosive and agricultural use could channel at least US $ 1.5 billion per year into the economy.

The technology of production is known. This involves ammonia production using the Haber process through coal gasification (see profile for more details). Ammonia gas is then reacted with oxygen to produce nitric acid, which further reacts with ammonia to create the ammonium nitrate salt. NCZ urgently needs rehabilitation and modernization at an estimated cost of US $ 100 million. Raw materials for the manufacture of ammonium nitrate are not an issue since these are air and water for the Haber process route. Coal is locally available.

The benefits to the economy of a fully functioning NCZ are immense given the huge market potential. An evaluation of the plant needs to be undertaken and a full feasibility for a complete overhaul or new expanded plant needs to be done. A technology partner needs to be invited to take up equity. This would provide sustainable access to technology sources. Protective laws and tariffs will be required assuming production is expanded to meet domestic demand.

2. Manufacture of Sodium Hydrosulphide

Sodium hydrosulphide (NaHS) is used in the mining industry as a sulphudizer for oxide mineral particles to make them amenable for separation in conventional sulphide flotation circuits. It is also used in leather tanning to remove hairs, pulp and paper, and the manufacture of chemicals and dyes. A market potential of US $29 million per annum is consumed by two mines only. Use by

other mines and in other applications, especially in leather tanning, are likely to expand consumption. All current consumption in mining is imported from China.

NaHS can be made by reacting sulphuric acid and sodium chloride in a Mannheim furnace to produce sodium sulphate. This is then reduced with coal to sodium sulphide, which is reacted with hydrogen sulphide gas to produce sodium hydrosulphide. Mannheim furnaces are commercially available. Another route is by the reaction of sodium hydroxide with hydrogen sulphide gas. Sulphuric acid is abundantly available from sulphide copper smelting processes. Hydrogen sulphide is produced as a by-product by NCZ from the gasification of coal. Coal itself is locally mined.

Detailed data collection for purposes of a feasibility study is required to include non-mining uses. A small to medium scale technology partner would be required to act as source of technology and expertise.

4.5.5 Core and Non-core Services Cluster

The mines spend US $ 1.1 billion on core and non-core services annually. It is unavoidable that a significant portion of this need to be localized. Two profiles are proposed.

1. Empower Zambian Participation in Core Business Services

Core mining services is the second biggest category of mining inputs (after goods and services) and is almost exclusively dominated by Tier 1 contractors. Zambian owned companies have previously participated in core services but most had to close or are in the process of closing due to discriminatory procurement practices. These include preferentially lower rates for services, statutory payments that competitor foreign firms do not pay, incentives that are not extended to Zambian companies, etc. The Zambian owned machine and foundry workshops visited were struggling. Localization of steel raw materials and intermediate inputs would help them lower costs of production but would not remove the discriminatory tendencies. Regulatory procedures will be required to address these barriers, coupled with the provision of similar incentives to Zambians to those offered to foreign competitor companies

The market potential for core mining services is nearly US $ 1 billion per year. The biggest component by far is mine development services, followed by shaft sinking and maintenance; engineering maintenance and drilling services. Localization of even a third of core services would circulate more than US $ 300 million in the economy. Previous participation in core services by Zambians indicates that the capability is there if support structures are put in place. The main ones are access to technology, funding and a supportive regulatory regime. For mine development and drilling services, equipment would have to be obtained from OEMs. For Foundries, machining a fabrication workshops, Zambian owned facilities are outdated and will require modernization.

The recommended approach includes selective assistance to firms that offer prospects for Zambian growth and participation in the mining services value chain. Feasibility studies and business plans are inevitable. More important are mentorships and hand holding programmes to impart business skills, and partnerships with foreign firms, addressing funding challenges and eliminating discriminatory tendencies through supportive legislation.

2. Limit Foreign Participation in Non-core Services

These services are neither complex nor critical to mine production. They hence carry a much lower risk to disrupting production operations. The category is dominated by foreign transport haulers from outside Zambia (mainly Tanzania, South Africa and Zimbabwe). Some landlocked countries limit the participation of foreign haulers in both inward and outward cargo to a specified percentage. This is based on the sound reasoning that the landlocked country does not participate in the transport services of the coastal country. Zambia needs to consider instituting similar measures. This report also shows that Zambian participation in mining procurement is tilted towards catering and cleaning. But even in these areas, there is significant foreign company ownership. A deliberate policy is required that limits foreign participation in these non-complex services.

The indicative market potential for non-core services is about US $ 137 million per year. About US $ 90 million, is bulk and bus transportation. Added to non-mining related bulk transportation, such as inward fuel and machinery imports, the bulk transportation business is much larger than this. Catering, cleaning and security are worth about US $50 million annually. There is a reasonable presence of Zambian firms in transportation and in catering, cleaning, gardening and security services. Removing foreign dominance in these areas would circulate at least US $ 200 million in the economy and significantly push the industrialization agenda. This requires mainly legislative and regulatory measures to limit foreign participation, say to 40% of inward and outbound cargo movement, with 60% accruing to Zambian owned firms. Zambian firms would probably require access to funds to improve their fleet numbers.

5 RECOMMENDATIONS AND POLICY IMPLICATIONS

A detailed analysis of mining input goods and services has been undertaken with a view to identifying opportunities for increasing local procurement in Zambia's mining value chain. The study was undertaken against the backdrop of Vision 2030, whose main ambition is to create an industrial economy by that date. Accordingly, the principal guidelines observed by the study were raising the levels of manufacturing value added for local goods, creating domestic linkages to support the country's industrialisation and economic diversification goals, and increasing citizens' participation in what is a major value chain in the economy. The analysis permits the following recommendations to be made.

5.1 Reduce the Cost of Manufactured Goods

Zambia generally has a poor manufacturing environment. Locally manufactured goods constitute about 10% of total mine procurement. This is partly due to the high cost of inputs, which inhibit their price competitiveness. The challenges include imports of raw materials and intermediates, shortages of scrap iron, and high domestic copper prices. Due to high manufacturing costs, imports of finished goods tend to be cheaper than locally manufactured goods

It is recommended that localisation of goods for the mining value chain targets only a limited range of goods in a cluster approach to make current manufacturing competitive. These are the iron and steel cluster to diversify domestic intermediate inputs; the electrical goods cluster to support competitive components manufacture; the chemicals cluster to provide inputs into explosives and chemicals manufacture; and the non-metallic minerals mainly for refractory inputs. Ten manufacturing opportunities have been identified across the clusters.

Government will need to target investment growth in these clusters through:

a. Targeted incentives to attract investment;
b. Infrastructure provision, critical for iron ore mining to feed into the iron and steel cluster;
c. Competitive tariffs for high energy consumers like foundries; and
d. Competitively priced copper feedstock.

A range of incentives are possible and are used by other countries, as a matter of policy. They include reduced corporate tax, tax holidays, duty free imports on production machinery and tariffs on competitor goods to limit imports as long as capacity to produce competitively at the right quality is demonstrated. Policy measures will also be required to make a portion of copper locally available at a non-LME price copper price which excludes the transportation component. The new Kafue Iron and Steel MFEZ should be able to accommodate the identified clusters to enable the provision of services and infrastructure.

5.2 Address Unfair Competition Practices

The procurement of locally manufactured goods and domestic services suffers from unfair competition practices. These take several forms including dumping of cheaper goods and ring fencing procurement through Tier 1 suppliers. Almost all of the domestic manufacturers visited complained of unfair competition from lower priced Chinese goods, a practice exacerbated by large public turnkey projects executed by chinses companies. China keeps manufacturing costs artificially low to allow for “dumping” margins in global trade. The costs are kept low through a range of measures which include:

a. Large reductions in corporate tax for exporting firms;
b. Locating firms in numerous special economic zones to benefit from lower taxes;
c. Low tariffs on imports of intermediate inputs and machinery; and
d. Cash subsidies, discounted utility rates and easier access to finance.

Some developed economies, such as the EU and USA, have often instituted countervailing measures to protect their economies. Zambia has to institute margins of preference for locally manufactured goods or locally available services. Such measures need to be monitorable through

pre-agreed procurement plans and targets with the mines. All Tier 1 providers of goods and services should be required to include a pre-agreed proportion of local sources of goods and services determined by capacities to supply.

5.3 Protect Zambian Manufacturers and Service Providers Against Discrimination

Total procurement from Zambian owned firms constitutes only 2.5% of total annual procurement. Yet the ambitions of Vision 2030 and the policy frameworks are to include Zambians in the procurement value chain and ownership of assets. The report has highlighted a number of discriminatory tendencies against Zambian suppliers including preferentially lower rates for services, statutory payments that exclude foreign firms, favourable business terms and incentives for foreign firms, etc. Legislation or regulations will be required to:

a. Provide Zambians with the same business terms as foreign firms and Tier 1 contractors including duty free imports of import, same rates of payments, guarantees for credit, regular payments for goods and services supplied, etc;
b. Make compliance to statutory terms by foreign firms mandatory as is the case for Zambian firms;
c. Margins of preference specifically reserved for Zambian owned companies which have capacity to supply;
d. Quotas reserved specifically for Zambian-owned firms in Tier 1 contracts;
e. Elimination of contracts given to middlemen who have no capacity to supply; and
f. Addressing obscurity in procurement by publishing annual procurement plans by mining companies at the beginning of every year.

5.4 Provide Support at Firm Level to Zambian SMEs

Field visits suggested that Zambian owned foundries and machining workshops were operating old plants that need modernisation. Access to finance, expertise and technology is a particularly acute problem for them. More generally access to capital and technology prohibit Zambians entering the manufacturing sector. The profiles presented suggest that there are many opportunities which are amenable to participation by small and medium scale Zambian enterprises if the problems of access to capital, expertise and technology can be addressed. The opportunities include:

a. Manufacture of nuts and bolts, centrifugal pumps and valves;
b. Fabrication of metallic components including bins, chutes, pipes,;
c. Casting of feeder, mill and crusher wear parts
d. Manufacture of refractory bricks
e. Manufacture of low and high voltage ceramic insulators
f. Manufacture of sodium hydrosulphide
g. Participation in bulk haul of outward and inward cargo.

5.4.1 Establish a Specialised SME Equity Fund

Zambia's commercial banking sector does not generally lend to SMEs due to the high risk of default, lack of collateral and a poor repayment culture. The cost of capital is also prohibitive due to very high interest rates. There is need for structured finance to provide both working and capital

investment to SMEs. It is recommended to explore the establishment of a revolving loan and equity fund to invest in plant and equipment, as well as provide working capital. Multilateral funding agencies, such as the World Bank, IFC and the African Development Bank could spearhead raising US $100 million with the participation of willing donor agencies such as DFID, FMO, CDC, NORSAD, etc. The fund could be placed with a private equity firm for loan and equity financing to SMEs with a Zambian majority shareholding. The fund itself could take up a small equity with an exit strategy after the enterprise starts to operate profitably. The fund could also finance business development services to enable potential Zambian entrepreneur's access technical support.

Currently, there are several equity fund managers in Zambia and a small list of impact investors. CDC Impact Investment Fund has a Zambia country window, IFC provides enterprise development funds across Africa, PEP-Zambia plans to grow impact investment funds through Impact Africa while AfDB has a private sector development programme and a pan African guarantee fund for SMEs with a Zambia country window. Finland also has a private sector development programme in Zambia. Clearly, there are sufficient but fragmented private sector support programmes. A consolidated fund operating under the aegis of a private sector development programme appears feasible and should be investigated.

5.4.2 Facilitate Access to Technology and Expertise for Zambian Entrepreneurs

To actualise the above projects, potential Zambian entrepreneurs will require facilitated access to technology and expertise. At the very least, Zambian SME project promoters will need to be linked to international sources of technology and equipment to modernise existing plant facilities or venture into new production plants. Ideally manufacturers from abroad could be persuaded to co-invest in the above projects, thus providing a source of expertise as well. Embassies from advanced countries in Zambia could help match-make between overseas manufacturers and suppliers of plant and machinery with Zambia project promoters. A good and cheap source of handholding, mentorship and skills building is through retired overseas executive programmes. Canada and the Netherlands, for example have such programmes. A further avenue for imparting technical skills could be through establishing a technology park for technology demonstration in the newly created Kafue Industrial MFEZ.

5.5 Address Policy and Legislative Weaknesses

The report has revealed a number of areas where policy interventions will be required. Examples include:

a. misalignment between the ambitions of Vision 2030, the 7th NDP and policy, on the one hand, and legislative provisions relating to LC;
b. incentives that reward mines for imports but prevent growth in local manufacturing;
c. discriminatory statutory provision against Zambia supplier firms;
d. need for clarity about policy and regulatory direction on LC;
e. need for deliberate incentives to actualise identified target goods and services; and
f. Monitoring procurement and LC growth through a set of predefined metrics.

Clearly the above policy and regulatory huddles will need to be addressed. Some measures include the following:

5.5.1 Revise the Mines and Minerals Development Act

The Mines and Mineral Act will need to be reviewed to bring it in line with the development goals of Vision 2030, the 7th NDP and mining policy. Some countries like Ghana and South Africa have standalone legislation relating to local content. This may be the way to go. A revised Act should have clear definition of what constitutes local content. It should further be clear on the metrics for local content and pronounce itself on discriminatory tendencies and unfair competition practices. Further provision should be the requirement for annual submission by mining companies of procurement plans and the need to monitor compliance in local procurement. It may be that some of these requirements are contained in regulations rather than the Act itself.

5.5.2 Review the Use of Incentives

The current range of incentives to the mines and Tier 1 subcontractors are counterproductive to manufacturing and local procurement, much as they have led to a surge in private sector investment in the mines. It will be necessary to review how current incentives coexist with the need to stimulate local provision of goods and services. Currently goods are in effect procured below import parity due to waivers of import duty, reductions in corporate tax and capital write off clauses. It is not possible to manufacture domestic goods at below import parity!

At the same time incentives are not provided to Zambian manufacturers. It will be necessary to provide a range of incentives to Zambian manufacturers and service providers to stimulate competitive domestic procurement. It is recommended that the entire area of incentives be critically assessed through policy and regulatory impact assessments, and modelling their effect on a series of economic parameters, such as government revenue flows, growth on local industries, impact on GDP and economic growth, etc. The assessment should lead to a better targeting of incentives for both mines and domestic manufacturers.

5.5.3 Harmonise Existing Legislations

A major flaw in local content growth is the lack of harmony in different pieces of legislation. It will be necessary to harmonise the provisions relating to LC across key sectoral legislations particularly those relating to employment; science, technology and innovation; citizens economic empowerment; and Zambia Development Agency Act, among others.

5.6 Strengthen Government Leadership

The growth of LC requires a holistic approach where policy interacts with industry to achieve the aspirations for industrialisation and diversification. This will require government leadership to pull stakeholders, especially industry, around a clear framework for developing local content understood by all stakeholders. The last AfDB Technical Assistance programme to the Ministry delivered a local content development framework which was agreed to by stakeholders. Such a framework provides a roadmap around which government leadership in policy and regulatory authority can be exercised for local content growth. Institutionally, local content development will also require a coordination point for achieving the objectives of industrialisation.

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ANNEXES

Annex 1: Terms of Reference

The terms of reference (ToR) outlined the following tasks for the assignment:

1. Establish the main types and sources of goods procured by the mining industry in Zambia;
2. Identify goods that constitute the 'low hanging fruits' based on low technology barriers, local manufacture and availability of raw materials locally.
3. Evaluate the quality and standards for the manufacture of the identified set of goods
4. Map the raw material availability for the domestic manufacture of the identified goods
5. Assess the capacities and capability of local suppliers and manufacturers to competitively produce the defined input goods into the mining industry;
6. Recommend which goods can be produced competitively within the country; and
7. Recommend policy options for the domestic manufacture of mining inputs identified by the assignment.

The above ToRs were later amended to include mining services at the request of the Ministry of Mines and Minerals Development.

Annex 2: Template Used to Collect Data on Goods and Services Consumed by the Mines

Name of Mine/consumer:

ITEM CATEGORY	SUB-CATEGORY	QUANTITY USED pa	TOTAL COST US $	SUPPLIER)	SOURCE COUNTRY
CORE MINING INPUTS AND CONSUMABLES					
Rubber Products	Horse pipes (LP & HP)				
	Conveyor Belts				
	Vee Belts				
	Rubber lining				
	Rubber Seals and Gaskets				
Metallic Components	Bins and Chutes				
	Feeder wear parts				
	Mill rods				
	Mill Balls				
	Crusher wear plates				
	Mill liners				
	Pump impellers				
	Process piping				
	Thickeners and tanks				
	Wire ropes				
	Nuts and bolts				
Electrical Components	Motors				
	Electric wires				
	Transformers				
	Starters and switches				
	Control panels				
Assembled components	Conveyor Pulleys and idlers				
	Pumps				
	Drives and gear boxes				
	Bearings				
	Dust collectors				
	Flotation cells				
	Scrubbers & conditioners				
	Drill rigs and rock drills				
	Underground Chains				
	Rock drill steels				
	Roof bolts				

	Off high way trucks
	Underground loaders
Chemicals and Reagents	Collectors (specify)
	Frothers (specify)
	Flocculants (specify)
	Lime
	Cyanide,
	Ferrosilicon
	Solvent extractants
Explosives	Nitro-glycerin
	Anfo
	Slurry based
	Cortex
	Detonators/safety fuses
Others	Refractory bricks
	Fuel, Oils and lubricants
	Coal
CORE MINING SERVICES	Drilling services
	Mine development services
	Shaft sinking and lining
	Metal fabrication
	Machining services
	Engineering maintenance
	Geological services
NON-CORE GOODS	Safety wear
	Medicines
	Food
	Office equipment
	Stationary
NON-CORE SERVICES	Cleaning
	Catering
	Bulk transportation
	Security

Annex 3 - Summary of Input Goods and Services for 2017 in US $

COMPANY / CATEGORY	MINE A	MINE B (Est)	MINE C	MINE D (Est)	MINE E (Est)	MINE F	MINE G (Est)	MINE H (Est)	MINE I	MINE J	MINE K	MINE L (Est)	TOTAL
CORE MINING INPUTS AND CONSUMABLES													
Rubber Products	1,038,939	2,275,104	397,315	349,206	211,444	13,868,734	10,916,532	5,508,738	1,962,718	24,000,000	725,049	1,167,441	62,421,220
Metallic Components	931,654	2,586,707	827,950	727,696	440,620	15,768,224	12,411,682	6,263,226	34,533,791	84,900,000		20,540,987	179,949,737
Electrical Components	175,206	3,033,940	537,000	471,977	285,782	18,494,493	14,557,617	7,346,115	2,014,523	3,100,000	1,198,255	1,198,255	51,449,864
Assembled components	3,687,080	9,180,121	1,598,725	1,405,141	850,813	55,960,799	44,048,566	22,227,940	29,262,091	118,200,000	17,405,336	17,405,336	304,057,427
Chemicals and Reagents	169,751	834,917	500	439	266	8,585,156	6,757,656	3,410,072	19,886,204	30,800,000	8,019	10,683,474	81,136,453
Explosives	482,829	779,402	308,779	271,390	164,327	11,998,003	9,444,019	4,765,674	27,771,962	38,800,000	131,531,330	16,518,995	242,836,710
Others	236,142	1,024,260	25,241,450	22,185,052	13,433,052	10,458,892	8,232,534	4,154,330	109,173,512	74,500,000	3,129,406	75,415,771	347,184,401
CORE MINING SERVICES	30,433,727	51,482,934	2,001,874	1,759,474	1,065,362	313,833,126	247,028,268	124,656,258	29,492,605	120,100,000	2,300,000	17,542,448	941,696,075
NON-CORE GOODS	123,110	1,378,531	28,100	24,697	14,954	8,403,343	6,614,545	3,337,855	6,753,420	3,800,000	208,072	4,016,991	34,703,619
NON-CORE SERVICES	826,556	1,319,345	174,728	153,571	92,987	8,042,549	6,330,552	3,194,545	44,771,089	45,000,000	0	26,630,217	136,536,139
TOTAL, US $	**38,104,994**	**73,895,261**	**31,116,421**	**27,348,643**	**16,559,607**	**465,413,320**	**366,341,971**	**184,864,751**	**305,621,916**	**543,200,000**	**156,505,467**	**191,119,915**	**2,381,971,646**

Annex 4 – Directly Imported Goods and Services in 2017, US $

COMPANY / CATEGORY	MINE C	MINE A	MINE F	MINE I	MINE J	MINE K	TOTAL DIRECT IMPORTS	TOTAL PURCHASES	% OF TOTAL PURCHASES	% OF TOTAL IMPORTS
CORE MINING INPUTS AND CONSUMABLES										
Rubber Products	396,940	670,000	11,135,979	2,100,000	800,995	1,000	15,104,913	41,732,445	1	6
Metallic Components	779,150	302,632	4,514,612	42,290,000	14,934,993	12,200	62,833,587	136,759,837	4	27
Electrical Components	437,000	12,613	7,067,508	1,600,000	1,001,789	76,000	10,194,909	24,405,202	1	4
Assembled components	1,444,225	0	30,936,027	26,125,000	7,171,084	161,158	65,837,494	206,425,733	4	28
Chemicals and Reagents	0	155,139	3,920,194	28,600,000	17,661,204	7,741	50,344,278	59,449,629	3	21
Explosives	0	0	0	0	0	0	0	210,932,803	0	0
Others	530,900	0	4,215,137	0	3,362,725	0	8,108,762	223,015,519	1	3
CORE MINING SERVICES	282,000	0	20,058,144	0	0	2,300,000	22,640,144	468,043,164	2	10
NON-CORE GOODS	0	0	0	0	0	208,072	208,072	19,107,974	0	0
NON-CORE SERVICES	0	0	0	0	0	0	0	97,988,366	0	0
TOTAL PURCHASES, US $	**3,870,215**	**1,140,384**	**81,847,602**	**100,715,000**	**44,932,789**	**2,766,171**	**235,272,161**	**1,487,860,672**	16	100

Annex 5 – Locally Procured Goods and Services in 2017, US $

COMPANY / CATEGORY	MINE C	MINE A	MINE F	MINE I	MINE J	MINE K	TOTAL LOCALLY PROCURED	TOTAL PURCHASES	% OF TOTAL PURCHASES	% LOCAL PURCHASES
CORE MINING INPUTS AND CONSUMABLES										
Rubber Products	375	54,900	2,732,755	21,900,000	1,161,724	724,049	26,573,803	41,732,445	2	2
Metallic Components	48,800	410,040	11,253,611	42,610,000	19,604,015	5,000	73,931,467	136,759,837	5	6
Electrical Components	100,000	11,617	11,426,985	1,500,000	1,013,911	158,956	14,211,469	24,405,202	1	1
Assembled components	154,500	1,173,303	25,024,772	92,254,000	22,100,653	69,658	140,776,886	206,425,733	9	11
Chemicals and Reagents	500	14,612	4,664,962	2,200,000	2,225,000	277	9,105,351	59,449,629	1	1
Explosives	308,779	522,729	11,998,003	38,800,000	27,771,962	131,531,330	210,932,803	210,932,803	14	17
Others	24,710,550	236,142	6,243,755	74,500,000	105,810,787	23,883	211,525,117	223,015,519	14	17
CORE MINING SERVICES	1,719,874	407,486	293,774,982	120,100,000	29,492,605	69,357	445,564,304	468,043,164	30	36
NON-CORE GOODS	28,100	123,110	8,403,343	3,800,000	6,753,420	0	19,107,974	19,107,974	1	2
NON-CORE SERVICES	174,728	0	8,042,549	45,000,000	44,771,089	0	97,988,366	97,988,366	7	8
TOTAL LOCAL PURCHASES, US $	**27,246,206**	**2,953,939**	**383,565,717**	**442,664,000**	**260,705,167**	**132,582,511**	**1,249,717,540**	**1,487,860,672**	**84**	**100**

Annex 6 – True Locally Procured Goods and Services in 2017, US $

COMPANY / CATEGORY	MINE C	MINE A	MINE F	MINE I	MINE J	MINE K	TOTAL TRUE LOCAL PURCHASES	% OF TOTAL PURCHASES	% OF LOCAL PURCHASES	% OF TRUE LOCAL PURCHASES
CORE MINING INPUTS AND CONSUMABLES										
Rubber Products	**375**	**0**	**0**	**1,233,333**	**103,995**	**0**	**1,337,703**	0.1	0.1	0.8
Metallic Components	48,800	274,874	6,186,404	800,000	7,176,508	0	14,486,586	1.0	1.2	9.2
Electrical Components	100,000	4,572	5,046,772	723,333	896,275	124,000	6,894,953	0.5	0.6	4.4
Assembled components	36,900	0	1,547,278	825,000	0	0	2,409,178	0.2	0.2	1.5
Chemicals and Reagents	500	14,612	4,594,682	2,200,000	2,225,000	277	9,035,072	0.6	0.7	5.7
Explosives	308,779	0	5,210,641	38,800,000	0	0	44,319,420	3.0	3.5	28.1
Others	12,095,025	0	941,057	0	5,724,187	0	18,760,269	1.3	1.5	11.9
CORE MINING SERVICES	1,511,344	407,486	3,420,728	24,790,000	1,355,857	0	31,485,415	2.1	2.5	19.9
NON-CORE GOODS	28,100	0	1,262,095	1,980,000	3,503,184	0	6,773,379	0.5	0.5	4.3
NON-CORE SERVICES	174,728	0	8,042,549	5,200,000	9,041,152	0	22,458,429	1.5	1.8	14.2
TOTAL TRUE LOCAL PURCHASES, US $	**14,304,551**	**701,544**	**36,252,207**	**76,551,667**	**30,026,158**	**124,277**	**157,960,404**	**10.6**	**12.6**	**100.0**

Annex 7 – Locally Procured Goods and Services from Zambian Owned Companies in 2017, US $

COMPANY / CATEGORY	MINE C	MINE A	MINE F	MINE I	MINE J	MINE K	TOTAL TRUE LOCAL PURCHASES	TOTAL PURCHASES	% OF TOTAL PURCHASES	TOTAL LOCAL PURCHASES	% OF LOCAL PURCHASES
CORE MINING INPUTS AND CONSUMABLES											
Rubber Products	**375**	**0**	**0**	**0**	**0**	**0**	**375**	**41,732,445**	0.0	26,573,803	0.0
Metallic Components	48,800	283,912	615,797	0	0	0	948,510	136,759,837	0.1	73,931,467	0.1
Electrical Components	0	0	377,443	130,000	0	0	507,443	24,405,202	0.0	14,211,469	0.0
Assembled components	0	62,500	1,420,483	825,000	0	0	2,307,983	206,425,733	0.2	140,776,886	0.2
Chemicals and Reagents	500	14,612	0	0	150,000	277	165,389	59,449,629	0.0	9,105,351	0.0
Explosives	0	0	0	0	0	0	0	210,932,803	0.0	210,932,803	0.0
Others	0	0	0	0	0	0	0	223,015,519	0.0	211,525,117	0.0
CORE MINING SERVICES	1,182,000	66,320	3,420,728	3,900,000	677,929	0	9,246,977	468,043,164	0.6	445,564,304	0.7
NON-CORE GOODS	28,100	0	1,696,197	1,180,000	3,363,183	0	6,267,480	19,107,974	0.4	19,107,974	0.5
NON-CORE SERVICES	174,728	0	0	2,050,000	9,088,759	0	11,313,487	97,988,366	0.8	97,988,366	0.9
TOTAL PURCHASES FROM ZAMBIAN COMPANIES	**1,434,503**	**427,344**	**7,530,649**	**8,085,000**	**13,279,870**	**277**	**30,757,644**	**1,487,860,672**	**2.1**	**1,249,717,540**	**2.5**

Annex 8 - Supplier Companies Visited

Name of company	Nature of business	Person(s) interviewed	Company Ownership[5]
Non-ferrous Metals Ltd, Ndola	Ferrous and non-ferrous metals foundry	Mr Ronald R Bouverie, Director Mr Wayne R Bouverie, General Manager	Zambian
Boart International, Ndola	Manufacturers of rock drills and drill steels	Company has closed down	Foreign
Morganite Zambia ltd, Ndola	Manufacturers of carbon brushes and electrical switch boxes	Mr Samson Muyaule, Head Finance and Administration	Foreign
Elsewedy Electric Zambia ltd, Ndola	Manufacturer of outdoor distribution transformers	Mr Paul Mwanza, HR & Administration Manager Mr Mohamed Gamal, Production Manager	Majority Foreign owned
Neelkanth Cables, Ndola	Manufacturers of low voltage electric cables of up to 3.3 KVA.	Prakash Khumar, Production manager	Foreign
Perway industries Zambia ltd, Kitwe	Manufacturers of railway turnouts and accessories, bolts and nuts and forged products.	Mr Gavin Appel, CEO	Zambian
Galison and Capitom, Kitwe	Manufacturers of underground flat cars, explosive vehicle, drive shafts, gears, nuts and bolts	Mr Patrick Malenga, Sales Manager Mr James Ngala, Sales Executive	Foreign
Scaw Ltd, Kitwe	Iron and steel foundry & manufacturer of high chrome, low chrome and forged mill balls; mill, chute and crusher liners and industrial gases.	Mr Vivek Shrivastava, Chief Technical Officer Mr Umesh Shah, Deputy Chief Technical Officer Mr Lastone Lwando, Manager, Sales, Marketing & Business Development	Foreign
SKF, Kitwe	Sales of & repair of bearing housings and equipment	Mr Sean Kennedy, MD	Foreign
United Machining Works Ltd, Chingola	Heavy Duty Precision Engineering Company	Mr Mwenge Mulemba, MD Mr Humphrey Mulemba, Business , Development & Production Manager	Zambian

[5] A Zambian company was defined as one in which more than 50% of shares were owned by Zambian citizens

African Explosives Ltd, Mufulira	Manufacturer of explosives	Mr Henrik Van Rensburg, MD Mr Hanhula Mwanakasale, Manager Technical & Customer Service	Foreign
Redpath Rig Resources, Kitwe	Drilling and Mine development Contractors	Mr Anthony Kabaghe, Country Director	Majority foreign owned
Nitrogen Chemicals of Zambia LTD, Kafue	Manufacturers of fertilizers and explosives	Mr Muyapekwa Muyapekwa, Chief Operations Officer	Public
Universal Mining & Chemical Industries LTD, Kafue	Manufacturers of iron and steel products	Dr Julius Kaoma, Executive Techniucal Director	Zambian
Zambia Metal Fabricators Plc	Manufacturers of low voltage electric cables, copper rod and shapes	Ms. Roseta Mwape Chabala, MD	Majority foreign owned
Afrizam Electrical Equipment LTD	Manufacturers & suppliers of transformers & switch gear	Ms. Musata K Ndhlovu, Commercial Director	Majority foreign owned
Zambia Association of Manufacturers, Lusaka	Association of manufacturers	Ms. Roseta Mwape Chabala, President	N/A
Kitwe & District Chamber of Commerce & Industry	Association of industry and commerce businesses	Mr Anthony Kabaghe, President	N/A
Association of Mine Suppliers and Contractors, Kitwe	Association of suppliers and contractors	Mr Coster Mwaba, Vice President Mr George Jere, Secretary General	N/A

Annex 9 – Summary of Supplier Interviews

Name of Company	Products and Potential	Main Imports	Main Challenges
Non-ferrous Metals Ltd, Ndola	Pump impellers, slippers for cages, bronze bushes, skip shoes, brake shoes, crane wheels, couplings and nozzles. Potential: mill liners and crusher wear plates, pump parts, full pumps	Use local iron, bronze and brass scrap metals	• High electricity tariffs • Shortage of scrap • Unavailability of steel • Proliferation of middlemen with no facilities
Boart International, Ndola	Rock drills, drill bits and drill steels	Steel inputs	Closed down due to cheaper imports
Morganite Zambia ltd, Ndola	Carbon brushes and electrical switch boxes	• Carbon blocks • Electrical cables • Mild steel sheets	• High cost of domestic electric cables • Stopped making brushes; cheaper to import • Competition from Chinese suppliers • High cost of finance
Elsewedy Electric Zambia ltd, Ndola	Outdoor distribution transformers	• Copper wire for windings • Silicone coated steel • High tension insulators • Cold rolled steel for tanking • Mild steel plate (1-3mm)	Imports due to non-domestic manufacture of inputs
Neelkanth Cables, Ndola	Low voltage electric cables of up to 3.3 KVA. Would consider investing into winding wire	Insulation materials	• High cost of copper inputs • Cheaper Chinese imports eg on large government projects • Need to internationalize standards for wider market
Perway industries Zambia ltd, Kitwe	• Railway turnouts and accessories • Roof bolts and nuts • Forged and machined components		• Were in process of closing • Lack of policy support for small Zambian manufacturers • Lack of access to markets due to Tier 1 and Chinese suppliers
Galison and Capitom, Kitwe	• Underground flat cars & vehicles for moving explosives. • Jack hammers, drill bit & steels • Drive shaft, gears and nuts and bolts	• Drill bits • Mild steel for drill steels • Machine grade steels	• Preference by Chinese Tier 1 contractors for Chinese sources • Redundancy of stocks due to slow down in business
Scaw Ltd, Kitwe	• High chrome, low chrome and forged mill balls • Mill chutes & crusher liners	• Refractory bricks & materials • Ferrochrome • Bentonite clay	• Availability of scrap metal • Automation of furnaces to conserve energy • High electricity tariffs

	• Industrial gases		• Cheaper Chinese imports at half price
SKF, Kitwe	Installing new bearings in equipment such as pumps, shafts, bearing housing, etc Installing plant to make HDPE conveyor idlers	Bearings from China	• Competitors bring in assembled units • Increasing market share with the mines is a challenge • Some mines do not pay on time • Upskilling is major problem
United Machining Works Ltd, Chingola	• Cutting girth gears for large ball and rod mills • Refurbishing crusher and pump wear parts • Potential to make feeder wear parts, screen decks, crusher wear parts & pump impellers.	Steel imports	• Plant needs modernization • Preferentially lower rates for Zambian suppliers • Delayed payments from Mines • Compliance costs and duty raise costs of production for Zambian suppliers • Tier 1 contractors are both competitor and subcontractors to Zambian companies. • Tier 1 contractors have preferred subcontractors • Zambian suppliers are contacted at eleventh hour for window dressing.
African Explosives Ltd, Mufulira	Explosives and detonators	• Ammonium nitrate solution from SA • Detonator components	• Unfair competition from imports of finished goods • cheap Chinese imports by Chinse mines and contractors • Lack of policy protection for manufacturers
Redpath Rig Resources, Kitwe	Tier 1 mine development services provider	N/A	Uneven playing field and incentives to Zambians to enable them compete on an equal footing.
Nitrogen Chemicals of Zambia LTD, Kafue	• Ammonium nitrate. explosives • Ammonium nitrate fertilizers • Nitric acid • Compound fertilizers • Industrial gases.	• Ammonia • Components for compound fertilizer manufacturing	• Lack of working capital for plant maintenance and refurbishment • Preference for imports of explosives and ammonium nitrate feedstock • Imports of ammonia are a constraint. • The process plant modernization
Universal Mining & Chemical Industries LTD, Kafue	• Rebars, window sections & angle bars • Channels, flat and round bars	• refractory bricks and mortar • silicon carbide crucibles	• Scrap shortages • Lack of stability in electricity supply • Import cover ties up capital

	• Lime • Sponge iron • Unused facilities to manufacture wire bars, wire and nails. • Potential to diversify into steel intermediate products for industrial applications		• Imports of spares and use of expatriates • Lack of finance for plant expansion is a constraint.
Afrizam Electrical Equipment LTD	Low voltage transformers of up to 6 KVA	• Transformers and switch gears • Overhead transmission lines. • Factory to be commission March 2019	• Imports of ceramic insulators, steel sheet, winding wire, transformer oil, etc • Need off take agreements with ZESCO • Imports of Chinese products on government projects restricts participation by Zambian companies.
Zambia Metal Fabricators Plc	• Copper rod & copper shapes • Low voltage cables (< 3.5 KVA) • Aluminum conductors • Potential to medium & high voltage cables • Potential to manufacture transformer winding wire	• Insulating materials • Aluminum feedstock	• High LME copper prices price reductions are insignificant • Sales of low quality uncertified products by competitors. Need all products to be ISO certified. • Turnkey tender procedures shut out local manufacturers. • Some mines demand payment upfront
PRIVATE SECTOR ASSOCIATIONS			
Zambia Association of Manufacturers, Lusaka	Advancing interest of members	N/A	• Depersonalize institutions; institutions, not persons should drive public policy • Limit participation of politicians in supply contracts • Make effective use of tariffs • Bring down the cost of manufacturing • Support clusters rather than single industries
Association of Mine Suppliers and Contractors, Kitwe	Advancing interest of members		• Mine owners and Tier 1 companies operate like a cartel • Charge out rates are preferentially higher than those given to Zambians. • Zambians unable to get a letter of comfort or guarantee to enable borrowing.

			• KCM has not some contractors in over 3 years. • Zambian contractors subjected to statutory obligations; foreign suppliers are not. • Qualifications of foreign contractors and expatriates are not checked. • Government laws and regulations obsessed with FDI and not local content development • Create a statutory body to level playing field
Kitwe & District Chamber of Commerce & Industry Kitwe	Advancing interest of members	N/A	• Zambia's capacity to supply was lost during privatization • To industrialize government policy must support SME. Manufacturers have been reduced to traders. • Markets for SMEs need to be guaranteed and ring fenced for specific product • Currently, SMEs are subjected to worse conditions than outside investors. • MFEZ have been killing local industries as they promote external value chains • Address government officials' interference in obtaining contracts.

Annex 10 - Opportunity Profiles for Target Goods and Services

OPPORTUNITY 1: Diversify Manufacture of Iron and Steel Intermediate Inputs

Background

An iron and steel industry is central to industrialisation and economic diversification. It forms the base for the engineering industry to provide tools, implements and machinery for the economic sectors. Several reports suggest that Zambia's industrialisation has been held up by an absence of an integrated iron and steel industry capable of supporting industrial production. To accelerate Zambia's industrialisation and economic diversification agenda, an Iron and Steel Multi Facility Economic Zone has been declared in the 7th National Development Plan in order to expand the iron and steel value. At the core of the zone will be an iron and steel industry that produces various grades and types of steels that are required for various industrial applications in the economic sectors.

Indicative market potential

- A market potential of US $180 million per annum for different metallic components is indicated for the mining industry alone. This comprises items such as bins and chutes, feeder wear parts, screen decks, mill liners, mill balls, crusher wear parts, mill liners, process pipes, thickeners and tanks, nuts and bolts, rail track and fittings, and wire ropes. Some of these items are fabricated locally using imported steels (plate and sheet) but most of the items are imported. Capabilities exists to fabricate the items locally.
- This amount increases by more than US $ 60 million per year if assembled items, such as pumps, drives and gear boxes, feeders, flotation cells, scrubbers and conditioners, rock drills, underground ground chains, roof bolts, etc are included. The inclusion of starter switches, control panels and transformers further expands steel consumption.
- The market potential is in all likelihood huge when considered that various steel products are used in the manufacture of tools, implements and machinery in other economic sectors including agriculture, manufacturing, and transportation. Structural steel for construction eg beams is also imported. The domestic market potential could easily exceed US $400 million for the above steel products.

Current status

- Zambia has many scrap-based iron and steel melting plants all manufacturing construction steel, namely rebars, window sections, angle bars, channels and flat/round bars. There is only one iron and steel plant, the Universal Mining and Chemical Industries Limited (UMCIL), located at Kafue which is integrated into iron ore mining and production of sponge iron as feed into steel making
- The plant has an installed capacity of 250,000 tpy and currently uses scrap and sponge iron to produce construction steel products. There is no local manufacture of beams, plate and sheet products and specialty steels for the engineering sector. These are all imported.
- UMCIL has facilities to manufacture wire bars, wire drawing and nails. These are currently not used as the plant primarily operates on scrap inputs and metallic impurities do not permit wire drawing
- Plans are to completely replace the scrap iron raw material with directly reduced iron. This will greatly improve the quality of steels produced and allow for diversifying the steel value chain.

- Plans are to expand installed capacity to 500,000 tpy in about 2 -3 years and subsequently to 1 million tpy in about five years. Expansion plans will meet the wider needs of the country for iron and steel products as envisaged in the 7th NDP.

Production technologies

The integrated Kafue Iron and steel plant has the following facilities:

  - A 1000 tpd installed capacity iron ore mine and beneficiation plant
  - Lime making plant
  - A 120,000 per year Direct Reduction Plant
  - Coal gasification plant producing hydrogen and carbon monoxide
  - Electric arc furnace for iron melting
  - Ladle steel refining furnace
  - 3 strand Continuous casting machine
  - Rolling mills
- The planned expansion to 1 million tpy will require improvements in current process efficiencies as well as increased capacities in melting, rolling, DRI and gasification capacities.
- This will require an additional new plant with improved technologies especially in continuous casting in order to manufacture products that include beams, plate and sheet and specialty steels. Thin casting technologies from USA, Japan and Italy are being considered.
- Expansion will require up to $300 million in capital costs.

Raw materials and state of exploitation

- Currently Kafue steel exploits a 10 million tonnes iron ore deposit at Sanje Hill. This has a maximum lifespan of about 10 years of production.
- 200 million tonnes of Haematitic ironstone has been delineated at Nambala. Additional magnetite deposits exist at Pamba and Sonkwe. The Nambala, Pamba and Sonkwe deposits are sufficient for the planned expansion but are not being mined at present.
- Located about 150km from Kafue steel, the deposits will require a railway line and utilities to be brought into production. A further 230 million tonnes is available in the Kasempa Group that is not being exploited.

Recommended steps to be taken

- Iron ore mining capacity will need to be scaled up. Sufficient deposits are available.
- Infrastructure, including a railway line and utilities, will need to be developed. Government has implicitly recognised its responsibility for the infrastructure development.
- Current electricity supply to Kafue steel is 45 MW. This will need to be scaled up to 200 MW pa to meet the planned expansion. Low electricity tariffs will be required to offset the large base load consumption
- Tariffs on imports will probably be required to protect the domestic market from dumping and cheap steel imports
- The anticipated cost of expansion is the range of US $300 million. This will require part institutional investment.
- Full feasibility studies will need to be undertaken for the expansion

OPPORTUNITY 2: Localise Manufacture of Mill Balls and Rods, and Mill Liners; and Crusher and Feeder Wear Plates.

Background

The literature suggests that many of the iron and steel based components into the mining industry have often been imported due to an absence of an integrated iron and steel industry. This is no longer the case. Foundries and melting shops have always relied on scrap metal inputs. This has two disadvantages, the high cost of scrap iron inputs and the difficulties to control compositions of steel made from scarp. The presence of an integrated iron and steel provides opportunities for diversifying steel intermediate feedstocks to provide requisite steels for component manufacture, as outlined in profile 1. This hence provides an opportunity for the competitive manufacture of mill bails and liners, crusher and feeder wear plates and other components that require specialised steels for their manufacture.

Indicative Market potential

- The mining industry consumes upwards of US $74 million per year in mill balls alone.
- For mill liners, the annual consumption is more than US $ 15 million.
- If feeder wear parts, crusher wear plates, and mill rods are added, the combined total is more than US $115 million.
- The market potential is hence large enough to warrant complete localisation.

Current status

- Zambia has several foundries and scrap-based iron and steel melting plants that currently manufacture mill balls, and mill and feeder liners. Crusher liners are not being manufactured locally although the potential exists to manufacture these.
- Current crusher wear parts are being rebuilt at one of the machine shops.
- Despite local capabilities, a substantial portion of mill balls and liners, and crusher and feeder wear parts are currently imported mainly from China and South Africa.
- These products can completely be localised as they do not involve complex technologies.

Production technologies

- Mill balls and rods can be manufactured from forged steel billets.
- Main equipment would be a reheating furnace or kiln, forming or shaping through a rolling mill and heat treatment to impart specific surface properties.
- Liners are made by casting processes into a mould of the desired design. The cast products are then subjected to heat treatment.
- Mill balls, chute and crusher liners are currently produced, or can be produced, by existing foundries. Interviews suggest that plant modernisation of existing foundries is probably required.

Raw materials and state of exploitation

- The main properties required of liner materials are abrasion and impact resistance. Materials must combine hardness and toughness.

- Liner materials are hence made from abrasion resistant steels such as manganese steel, chrome steels and Ni-hard cast irons.
- Manganese is available locally, it can hence be assumed that the Kafue steel plant would able to produce manganese steels for liner manufacture
- Chrome is not mined in Zambia. Ferrochrome would have to be imported from Zimbabwe for chrome based liners.

Recommended steps to be taken

- Undertake a survey to determine type of mill balls and rods, as well as liners currently consumed and materials of manufacture.
- Undertake feasibilities for expanding and modernising existing capacities
- Identify sources of finance
- Develop legislative provisions that limit imports as long as quality, standards and supply factors can locally be met.

OPPORTUNITY 3: Manufacture of Nuts and Bolts (and wire and nails)

Background

Nuts and bolts are essentially part of the family of industrial fasteners and are used by every industry. Nuts and bolts are available in various shapes, designs and sizes and production can easily include wire and nails. Domestic production of nuts and bolts would stimulate the industrial sectors by making what are small but unavoidable inputs into every industry.

Indicative Market potential

- The mining industry consumes about US $14 million per year in nuts and bolts.
- Given that nuts and bolts are used in every industry, the market potential is probably much higher than this.
- The market can further be expanded if production is extended to nails and wires.
- The market potential hence warrants complete localisation.

Current status

- Most consumption of nuts and bolts is imported and stocked by a large variety of stockists, mostly hardware shops.
- It is not known how much local production is there, if any. It is unlikely that any local production would be significant, partly because raw material steel has to be imported.
- Scrap-based steel from current melting plants and foundries is not ideal for making nuts and bolts due to impurities and brittle physical properties.
- Domestic manufacture should hence aim at replacing imports of both raw materials and finished products.

Production technology

Mild steel bolts

- M.S. Rounds are drawn in a drawing machine.

- Cleaned rod is fed into a cold heading machine and one end is cut into the desired length. Simultaneously the head formation takes place at the other end.
- Threading is done in a thread rolling machine.
- A hexagonal rod of desired size is used for nuts. It is cut on an automatic nut-cutting machine.
- Cut blanks are drilled and tapped on a nut-tapping machine.
- Finished products are deburred and polished

High Tensile Bolts

- Mild steel rod is drawn and cut into bolts as above
- Bolts are forged on a hot forging press.
- After trimming and threading, the bolts are heated treated to between 800 – 900^{o}C and then tempered at between 400 – 500^{o}C
- Bolts are then plated if necessary

Raw materials

- The main raw material is mild steel wire coil or rod of required diameter. The composition of materials controls the quality of the bolts and nuts. The recommended composition for nuts and bolts raw material is mild steel with: Carbon 0.22 to 0.23%, Phosphorus 0.40%, Manganese 0.39 to 0.60% Sulphur 0.50%.

Recommended steps to be taken

- Undertake a survey to establish real demand outside of mining industry
- Undertake feasibility for establishing manufacturing plant
- Identify funding for the project
- Develop legislative provisions that limit imports as long as quality, standards and supply factors can locally be met.

OPPORTUNITY 4: Manufacture of Centrifugal Pumps

Background

There are many types of pumps for different applications of pumping needs and materials. The main ones used in slurry pumping on the mines is the centrifugal pump. The pump is used in a wide range of mineral processing applications including hydro-transport, grinding circuits, flotation circuits, thickening and tailings disposal. Away from the mining industry, pumps are used in a variety of applications including water transfer, sewage disposal, buildings and industrial waste disposal. The domestic manufacture of pumps hence ought to open up a range of applications beyond the mining industry.

Current status

- Pumps are not locally manufactured although there are a number of distributors for OEMs including Sulzer Zambia, Weir, Krebs, Metso and KSB.
- While there is no pump manufacturer, impellers are locally fabricated or refurbished once wear is excessive.
- Localizing the manufacture of pumps could open up applications in other economic sectors and. support linkage growth and economic diversification efforts.

Indicative market potential

- A market potential of US $ 26 million is indicated for the mining industry alone. It is likely that the actual figure is much higher as some mines did not indicate their annual purchases.
- The use of pumps is much wider outside of the mining industry particularly in water and waste water pumping, industrial application and buildings. The indicative potential is hence several magnitudes larger than the above figure.

Production technologies

- The centrifugal pump is a relatively simple piece of equipment. The main parts are the casing. This is made of cast iron or cast steel depending on the pressure rating and the possibility of shock during suction and discharge.
- The impeller is the more critical component with vane design important to pump performance and wear. Slurry pumps are made from abrasion resistant steels such as manganese steel, chrome steels and Ni-hard (martensitic type of iron). Elastomeric materials such as natural rubber, neoprene are sometime used to minimise corrosion and erosion of material.
- Impeller manufacture is currently undertaken at the foundries visited.
- The shaft and bearing assembly which must be strong enough to withstand the hydraulic load and is made from high tensile steel.

Raw materials

- Both cast iron and cast steel for the manufacture of pump casings can locally be manufactured by the current steel plant. The casing is made by sand casting in a foundry.
- Hard, abrasive resistance steels ie manganese and chrome steels can be produced produce by the current steel plant. Chrome would have to be imported either form SA or Zimbabwe. Zambia is reported to have small scale chrome depots but these are not worked.
- Rubber or neoprene lining is already undertake in Zambia by a local company using imported materials.
- High tensile steel for shaft fabrication could also be made locally depending on demand.

Recommended steps to be taken

- A feasibility study to map the range of pump applications and sizes for both the mining industry and other industrial applications would be the logical first step
- A technology partner would be useful to benefit from technology and expertise transfer
- Sources of funding would need to be identified. An impact fund could be used if this is established.
- Tariffs would be required to protect any nascent manufacturer.

OPPORTUNITY 5: Manufacture of Valves

Background

Valves are used in the mining industry to regulate the flow of fluids and slurry. They are also used by other industries including water supply, waste water disposal, irrigation, process industries and in buildings. As a matter of fact, the number of valves used in mineral processing is far less than in these other economic sectors. There is a number of different types of valves, although the ones used by the mines were not

specified, the more commonly used are ball and gate valves for slurry control and butterfly for clear liquids. Diaphragm and pinch valves are rubber lined and used for very abrasive slurries and corrosive fluids.

Current status

- Valves are imported mostly from China, Europe, USA and South Africa as they are not locally manufactured.
- Valves are uncomplicated to make and can be locally manufactured by foundries

Indicative market potential

- A market potential of US $ 17 million is indicated for the mining industry alone. It is likely that the actual figure is much higher as some mines did not indicate their annual purchases.
- Valves are used widely to regulate fluid and water flow. The market potential outside of the mining industry is therefore much large than the indicated figure.

Production technologies

- Valve casings are made by castings in foundries. Production hence starts with moulding for castings
- The cast body is machined as is the ball or gate. The stem is made from extruded rod and also machined as well as the spindle and checknut. A machine workshop is hence required as part of the foundry.
- The valve is then assembled, inspected and tested.

Raw materials

- The main raw materials are copper, lead and zinc. Tin is also required in small quantities.
- Copper is abundantly available. Lead and zinc mining no longer takes place in Zambia. However, there are still some lead exports presumably from batteries. There is also brass and bronze scrap available locally.
- Tin is available locally in Masuku, Choma. It is likely that zinc may have to be imported if domestic supplies are insufficient.

Recommended steps to be taken

- A feasibility study is required to map the range of valves used and the most common targets for domestic manufacture for both the mines and other industrial applications. Previous work suggest ball and gate valves are the most likely.
- A technology source and or partner would need to be identified to benefit from technology and expertise transfer
- Sources of funding would need to be identified. An impact fund could be used if this is established.

OPPORTUNITY 6: Manufacture of Refractory Bricks and Cements

Background

Refractories are materials that provide linings for high-temperature furnaces and other processing units involving heat, such as kilns and fireboxes. Refractories must be able to withstand physical wear, high temperatures, and corrosion by chemical agents. They should also have a low thermal conductivity for greater energy efficiency and to protect the shell of the furnace or kiln. Refractory bricks generally fall

into two categories, namely clay and non-clay. Fireclay refractories are produced from hydrated aluminum silicates. Non-clay bricks are produced from compositions of materials other than aluminosilicates.

Indicative market potential

- US $20 million per annum by the mining industry alone
- Figure is probably understated as some big users (eg Chambishi Copper Smelter, Universal Mining and Chemical industries, etc) were not surveyed.
- Applications in foundries were also not included.

Current status

- All current consumption is imported mainly from Austria, Dubai, Germany, Spain, and South Africa
- The types of refractory bricks, cements and mortar imported has not been specified

Refractory types and Resource base

Fireclays

- They are produced from hydrated aluminosilicates (alumina 25% - 45% and 50% - 80% silica) and small amounts of clay. Common raw materials are kyanite, kaolin, and bentonite and ball clay. Higher aluminium levels improve wear-resistance, durability, and abrasion and corrosion resistance.
- Kyanite is available in Lusaka area at Kafue (57.2% Al_2O_3), Leopards Hill (61% Al_2O_3) and Mwembeshi (61% Al_2O_3).
- Kaolin is reported in several areas including Choma, Twapia and Kapiri Mposhi. Bentonite (Luano)
- Ball clays are locally available at Loshi and Solwezi
- These minerals are currently not exploited. There are no provisional resource estimates

Non-clay refractories

- They are produced from compositions of alumina (<87.5%), mullite, chromite, magnesite, silica, silicon carbide, zircon, and other non-clays.
- **Alumina** is not available in Zambia. Other common sources are kyanite (61% Al_2O_3), sillimanite (61%), mullite (70 –85%) and corundum (99%). Kyanite, sillimanite and corundum are available in Kafue district. No information is given on extent of deposits.
- **Silica** bricks contain at least 93% silica, have excellent mechanical strength at high temperatures and find extensive use in the glass making and steel industry. Silica sands are available in the Kapiri Mposhi area.
- Magnesite refractories are used for iron and lime rich basic slags in steel making. They are made from magnesite (> 85% MgO) and Silica (SiO_2). Magnesite is available in Leopards Hill, Lusaka and as a byproduct in emerald washing processes.
- Chrome-magnesite refractories (15-35% Cr_2O_3 and 42-50% MgO) and magnesite-chromite refractories (>60% MgO and 8-18% Cr_2O_3) can withstand corrosive slags and are used for the most basic slags in steel melting. Chrome can be sourced from Zimbabwe while magnesite is available in Leopards Hills, Lusaka.
- Silicon carbides refractories are used in highly abrasive environments at extra-high temperatures, where enhanced durability is required. They give a longer service life than most fireplace liners. They are made from the fusion of silica and a coal, both locally available.

Production technologies

- Refractories are used as preformed bricks and shapes and unformed granulated compositions. Preformed products form the walls, arches, and floor tiles of various high-temperature process equipment. Unformed compositions include mortars, gunning mixes, refractory concretes, ramming mixes and are cured in place to form a monolithic internal structure after application.
- Refractory manufacturing involves four basic processes, amenable to small and medium scale production. Not all are necessarily required:
  - Raw material processing: consists of crushing and grinding raw materials; size classification and raw materials calcining and drying.
  - Forming consists of mixing raw materials and forming them into shapes usually under wet or moist conditions, firing and final processing.
  - Firing involves heating the refractory material to high temperatures in a batch or continuous tunnel kiln to form ceramic bonds
  - Final processing involves milling, grinding, or sandblasting (in situ) to keep the product in correct shape and size after thermal expansion has occurred during use.
- Silicon carbide is made by the carbo-thermal synthesis of silica sand and coke or coal.

Recommended steps to be taken

- Undertake a detailed feasibility study to ascertain most common types of refractory bricks and mortar used and true market potential both within and outside of mining sector;
- Establish quality factors for manufacturing and technologies of production;
- Identify a small to medium scale technology partner to act also as source of technology and expertise
- Establish financial viability and Identify sources of funding for the project investment opportunity

OPPORTUNITY 7: Localise Inputs into the Manufacture of Electrical Components

Background

Zambia has been a major copper mining country for nearly a century and will remain so in the foreseeable future. The main uses of copper are in electrical components and construction. Several electrical components, such as cables, transformers, starters and switches are locally manufactured. However, the electrical industry has yet to reach its full potential as higher value products such as electric motors are not manufactured. The value add in the manufacture of electric motors is about 20 times the cost of copper cathode per unit weight of contained copper. Furthermore, the cost of electric wire is higher than landed imports while all inputs for transformer manufacturers are imported. Expanding manufacturing facilities to cover the imports and diversify into motor manufacturing would promote linkages into other economic sectors and support diversification and industrialisation efforts. Motors are used across a broad range of commercial, industrial, and residential applications in elevators, refrigerators, compressors, pumps, and various other systems. The current switch of preferences to electric cars due to environmental considerations will most likely upsurge demand in the foreseeable future. The manufacture of winding wire would also bring transformer costs down and diversify into inductors used in the manufacture of induction furnaces and solenoids.

Current status

- While there are several manufacturers of electrical components, intermediate inputs are imported. This makes the cost of locally produced components expensive relative to imports. .
- For transformers, copper winding wire, silicon steel laminations and ceramic insulators are all imported. There is no domestic manufacture of copper winding wire despite several copper cable manufactures.
- For control panels, starters and switches, copper cable is imported because domestic cable is expensive. The manufacturer suggested during interviews that they are contemplating importing assembled goods as these are cheaper and offer better business margins.
- The cost of locally produced cable is high partly due to pricing and the high cost of copper cathode.
- Localizing the imported inputs and bringing the domestic cost of copper could make the cost of locally manufactured components more competitive and grow the industry to support economic diversification.

Indicative market potential

- A market potential of US $ 51 million is indicated, mainly in cables for the mining industry. This figure is in all likelihood understated as power supply and distribution to the mines is under CEC which was not surveyed.
- ZESCO the main consumer of electrical components, as well as retail cable outlets were also not surveyed.
- Domestic manufacture of enamel wire and motors would be a logical value added step. This would greatly expand the market into other economic sectors as motors, transformers and inductors are used in practically all economic sectors.

Production technologies

Enamel wire

- Manufacture of enamel wire is a simple process which involves wire drawing of copper rod to different wire gauges.
- The wire is then annealed to improve pliability prior to stranding or bundling. The wire is then coated with a polymer, resin or vanish to provide insulation. Coating is by a variety of methods including dipping, spraying or vacuum pressurised impregnation.
- The coated wire is baked to about 150^{o}C to harden the coating. Copper strips can also be coated for larger transformer applications.
- Low cost machines for these processes are available. ZAMEFA estimates that a process plant could cost about US $ 2 - 3 million.

Electric motors

- The electric motor comprises the rotor or armature, which turns the shaft to deliver the mechanical power. This has conductors to carry currents, which interact with the magnetic field of the stator. The copper rotor is cast using a set of laminated steel dies.
- The stator which is the stationary part of the motor's electromagnetic circuit, consisting of either windings or permanent magnets, is made up laminated of thin metal sheets. Modular stator assembly lines are available on the market
- The housing is normally cast with fins to provide cooling. Modular units for the manufacture of the stator and rotor are available in the market.

Raw materials

- For enamel wire, the main raw material is copper wire which is currently produced by several manufacturers. Insulating resins, vanishes and polymers would have to be imported.
- For transformers, steel sheet for the housing could be obtained from an expanded Iron and Steel mill at Kafue. Ceramic insulators can be locally manufured (see profile 8).
- Silicon steel, with a high silicon content of about 3.2 mass %, is used in transformers, motors and generators. This could be produced by the current steel plant in Kafue if demand is established.
- The housing for motors could be cast by any number of foundries.

Recommended steps to be taken

- Feasibility studies into the manufacture of winding wire are required, including gauges supported by market dynamics.
- Feasibilities into the manufacture of motor components are also required, including the type , sizes and specifications
- A regulatory process may be required to make copper inputs locally available at competitive prices and remove current predatory pricing at LME price.
- Diversification of steel products will be required as outlined in Opportunity 1.
- It will also be necessary to identify sources of technology, and technology partners
- It will be necessary to establish impact funds to provide business lending away from current banking and financial services which are tilted towards short term lending.

OPPORTUNITY 8: High and Low Tension Porcelain Ceramic Insulators

Background

This was not part of the items included in the survey. However, in the course of interviews with manufacturers, it became clear that all transformer manufacturers import their ceramic insulators. Ceramic insulators have been included to substitute for imported inputs and make transformer manufacture competitive.

Indicative market potential

- The potential was not surveyed. However it is thought to be large as imported insulators are not just consumed by transformer manufactures. The larger consumption is in the electricity transmission sector.
- Replacement of imports would localise a key input into the sector

Current status

- Current consumption, especially of HT insulators, is imported
- Expansion plans in rural electrification would add to market potential

Raw Materials

Body

- Raw materials for body preparation are: quartz or silica sand, feldspar, ball clay and china clay

- Silica sand is available in Kapiri. The required silica content in porcelain is about 98% SiO_2. Kapiri silica is about 96% and may need to be washed to upgrade the material.
- Feldspar is used as flux and has previously been mined in Serenje and Siavonga. This contains about 65% SiO_2 and 19% Al_2O_3.
- Ball clay is available in Mansa, Chalata near Mkushi, Loshi and Solwezi. The Chalata ball clay has been exploited before for ceramic ware production and has about 70% SiO_2 and 18% Al_2O_3. Aluminium content needs to be a bit higher and hence washing would probably be necessary.
- China Clay (kaolin) is available at Kapiri, Chalata, Masuku and Twapia in Ndola. Chalata has previously been mined for ceramic production and has good properties for porcelain production.

Glaze

- Raw materials are feldspar, quartz or silica sand, kaolin, talc, limestone and dolomite.
- Dolomite and talc are available at Lilayi near Lusaka. There are also deposits in Ndola, Kitwe on the Copperbelt and in Mkushi in central province. The quality factors have not been reported.
- While the deposit extent for the above minerals is not fully known, previous production for other use suggest the quantities are able to sustain porcelain insulator production.

Production technology

- Body preparation – raw materials are mixed, fine crushed and aged and dewatered
- Glaze preparation – raw materials are mixed, finely ground and mixed into slurry form
- Body forming – material is vacuum extruded, formed and dried. It is then glazed by eg spraying the glaze
- Firing - the body is fired at temperatures higher than 1300^oC
- Assembly – metal fittings are fitted to insulators
- The insulators are tested to meet specifications before despatch.

Recommended steps to be taken

- Undertake a detailed feasibility study to ascertain material availability and quality factors for manufacturing and technologies of production;
- Identify a small to medium scale technology partner to act also as source of technology and expertise
- Establish financial viability and Identify sources of funding for the project investment opportunity

OPPORTUNITY 9: Manufacture of Ammonium Nitrate Feedstock for Explosives

Background

The mining industry in Zambia essentially uses prilled ammonium nitrate explosives. Explosive grade ammonium nitrate can be made at Nitrogen Chemicals, Zambia Limited in Kafue. The process plant has an installed capacity of about 450 tonnes per day of ammonium nitrate products, including for fertilizer use. Explosive grade ammonium nitrate production comprises prilled porous grade ammonium nitrate (96%) and dense explosive grade ammonium nitrate (98%). The ammonium nitrate plant was commissioned in 1970 with a second phase later added in 1981. By the late 80's, however, the process plant began to struggle as sections required rehabilitation. NCZ has since undergone several plant

rehabilitations, notably between 1986 and 1991, and in 2013. These have, however, failed to secure sustainability of operations and the firm can neither fulfill explosive grade ammonium nitrate nor fertilizer requirements. Being the sole producer of ammonium nitrate for both the mining industry and agricultural sector, NCZ is an unquestionable strategic component of Zambia's industrialization and economic diversification efforts.

Current status

- Although most of the explosives consumed by the mines is locally procured, the bulk of consumption is imported and only a small proportion locally made.
- For locally made explosives, ammonium nitrate feedstock is imported from South Africa as are finished products, including imports from China.
- Fertiliser consumption in Zambia was estimated between 250,000 and 300,000 mt (in 2013) of this, 2000,000 was imported. Most of the imports are by fertilizer blending and distribution companies mostly sourced from South Africa. None has production plants in Zambia other than blending facilities.
- Even if NCZ were to operate at full production capacity, this would be insufficient to satisfy both the fertiliser and explosive markets in Zambia.

Indicative market potential

- US $243 million in ammonium nitrate based explosives alone.
- The market is probably several times larger than indicated if ammonium nitrate fertilizers are included in market potential.
- At the time of writing, a 50Kg bag of Compound or Ammonium Nitrate fertilizers was US $25. Assuming a potential of at least 100,000 mt of ammonium nitrate, the potential for the agriculture sector alone would be of the order of US $ 1.25 billion.
- A localization of ammonium nitrate needs for both explosive and agricultural use could channel at least US $ 1.5 billion into the economy.

Production technology

- First stage involves ammonia production using the Haber process. Coal gasification produces carbon monoxide (CO), carbon dioxide (CO_2) and hydrogen sulphide (H_2S). CO is reacted with water to produce CO_2 and H_2, and the latter reacted with nitrogen from the air to form ammonia.
- Ammonia gas is reacted with oxygen to produce nitric acid, which is then reacted with ammonia to create the ammonium nitrate salt.
- Currently, the ammonia plant is down and for the last few years, ammonia gas is imported from South Africa by rail transport.
- Estimates to rehabilitate and modernise the plant, and provide working capital, have been put at around US $ 100 million

Raw materials

- Raw materials for the manufacture of ammonium nitrate are not an issue since these are air and water for the Haber process route.
- Coal is locally available

Recommended steps to be taken

- The benefits to the economy of a fully functioning NCZ are immense. Given the huge market potential, a complete overhaul of the plant or even a new one at eg US $200 – 300 million, would pay back quite swiftly.
- A complete evaluation of the state of the current plant needs to be undertaken.
- A full feasibility for a complete overhaul or new expanded plant needs to be done.
- A technology partner needs to be invited to take up equity. This would provide sustainable access to technology sources. The original plant was by Kobe Industries of Japan, they should be approached as a first choice.
- Sources of funds need to be established
- Protective laws and tariffs would be required assuming production is expanded to meet domestic demand.

OPPORTUNITY 10: Manufacture of Sodium Hydrosulphide

Background

Sodium hydrosulphide, known by its chemical symbol NaHS is used in the mining industry as a sulphudizer for oxide mineral particles to make them amenable for separation in conventional sulphide flotation processes. It is also used in leather tanning to remove hairs, pulp and paper, and the manufacture of chemicals and dyes. NaHS is used as a solid (flake) or more commonly as a solution in water.

Indicative market potential

- US $29 million per annum by two mines
- Figure is potentially larger if some of oxide copper materials processed by leaching are routed through sulphide flotation processes.
- Other applications especially in leather tanning are likely to expand consumption.

Current status

- All current consumption in mining is imported from China
- Current sources of imports for use in leather tanning have not been established.

Production technologies

- NaHS can be made by reacting sulphuric acid and sodium chloride in a Mannheim furnace to produce sodium sulphate. This is then reduced with coal to sodium sulphide, which is then reacted with hydrogen sulphide gas to produce NaHS.
- Mannheim furnaces are commercially available.
- Another route for NaHS production is by the reaction of sodium hydroxide with hydrogen sulphide gas

Raw materials

- Sulphuric acid is abundantly available from sulphide copper smelting processes. Chambishi Copper smelter currently exports part of its production.
- Hydrogen sulphide is produced as a by-product by NCZ from the gasification of coal
- Coal itself is locally mined
- Brine or salt occurrences are reported in several locations including Kazungula where small scale extraction is undertaken for sodium chloride

Recommended steps to be taken

- Undertake a detailed data collection for purposes of a feasibility study.
- Establish quality factors for raw materials and manufacturing and technology of production;
- Identify a small to medium scale technology partner to act also as source of technology and expertise
- Establish market access, financial viability and Identify sources of funding for the project investment opportunity

OPPORTUNITY 11: Empower Zambian Participation in Core Business Services

Background

Core mining services is the second biggest category of mining inputs in which targeted localisation has to be made possible. Field interviews revealed that a few Zambian owned companies were forced to either close down or are in the process of closing due to discriminatory procurement practices. The challenges are fully outlined in the report and include preferentially lower rates for services, the need to go through first tier companies that have preferred suppliers, withheld payments to Zambian owned companies, statutory payments that competitor foreign companies do not pay, incentives that are not extended to Zambian companies, etc. Those that continue to survive are operating a shoe string business altogether. The Zambian owned machine and foundry workshops visited were struggling. Localisation of steel raw materials and intermediate inputs would help them lower costs of production but would not remove all discriminatory tendencies. Regulatory procedures will be required to completely remove the discriminatory barriers, coupled with provision of similar incentives to those offered to foreign competitor companies

Current status

- Core mining services are currently dominated by Tier 1 suppliers. In mine development services, the biggest component, and in drilling services, several Zambians have previously participated in the value chain, indicating a latent capability.
- Field interviews confirmed the latent capability to participate in core services but this would require a level playing field and access to capital
- Similarly there are several Zambian companies in foundry, forging, machining and fabrication services, indicating latent capabilities to manufacture mill liners, mill balls, crusher wear parts, mill liners, process pipes, thickeners and tanks, nuts and bolts, rail track and fittings. These firms are struggling due to a lack of access to mine procurement. A few need modernisation of workshops but need access to procurement markets to make the investment viable.
- Geological services is another area where there are many well qualified Zambians but the area is dominated by foreign geologists.
- The most likely scenario is that many more Zambian owned facilities in this category are likely to close if nothing is done to improve their access to mien procurement.

Indicative market potential

- Core mining services are worth nearly US $ 1 billion
- US $535 million of this is in mine development services, the biggest component; US $147 million in shaft sinking and maintenance; US $112 million in engineering maintenance and US $110 million in

drilling service. Smaller but significant amounts are spread in metal fabrication, workshop services and geological services.

- Localisation of even a third of core services would circulate more than US $ 300 million in the economy.

Production technology

- For mine development and drilling services, equipment would have to be obtained from OEMs, as has happened before.
- Zambian owned facilities are outdated and will require= modernization. Workshop technologies are liberally available from global markets.
- There will be need, however, to facilitate access to both funding, assuming positive feasibility outcomes, and to mine procurement.

Raw materials

- For foundries; machine forging and fabrication shops, raw materials, mostly iron and steel products are imported.
- As outlined above, localisation of the intermediate steel products would improve the competitiveness of products.
- Coal, electricity and foundry clays are available locally.

Recommended steps to be taken

- Increasing Zambian involvement in the mining value chain is a process that will require several actions.
- Starting point always is feasibility of establishing a new firm or expansion/modernisation of current operations at Zambian firms.
- It will be necessary to evaluate specific targets that offer prospects for Zambian growth and participation in the mining value chain
- It will also be necessary to identify sources of technology, technical expertise and technology partners, or mentorships at the very least.
- Government will need to address or eliminate discriminatory practices via regulatory authority
- It will also be necessary to establish impact funds to provide business lending away from current banking and financial services which are tilted towards short term lending.

OPPORTUNITY 12: Limit Foreign Participation in Non-core Services

Background

Aggregately, non-core services procurement is significant though much less than the other categories. These services are neither complex nor critical to production services. They hence carry a much lower risk to disrupting production operations. The category is dominated by foreign transport hauliers from outside Zambia (mainly Tanzania, South Africa and Zimbabwe). Some landlocked countries limit the participation of foreign hauliers in both inward and outward cargo to a specified percentage. This is based on the sound reasoning that the landlocked country does not participate in the transport services of the coastal country through which the goods are imported. The coastal country hence always enjoys an unfair advantage considering that its port services are used by several other landlocked countries. Zambia needs to consider

instituting similar arrangements that would tilt the ground in favour of Zambian transport companies. This report also shows that Zambian participation in the mining procurement is tilted towards catering and cleaning. But even in these areas, there is significant foreign company ownership. A deliberate policy that limits participation in these services would promote Zambian ownership and ensure that a significant part of the non-core services value chain accrues in Zambia

Current status

- Outward bulk transportation of copper products is currently dominated by foreign firms. Yet Zambian hauliers exist and are capable of replacing foreign hauliers.
- Similarly, inward transportation of goods and services, including fuel, is dominated by foreign firms at the expense of Zambians.
- There is a reasonable presence of Zambian firms in catering, cleaning, gardening and security services. Even in these areas, there is a significant presence of locally registered firms belonging to foreigners.

Indicative market potential

- Non-core mining services are worth about US $ 137 million
- Most of this, about US $ 90 million, is bulk and bus transportation. Bulk transportation market is much bigger than this considering the dominant role of inward fuel transportation into the country.
- Catering, cleaning and security are worth about US $50 million annually
- Added to non-mining related bulk transportation, such as inward fuel imports, the bulk transportation business is quite large.

Production technology

- This does not apply to services

Raw materials

- This does not generally apply except for the case of catering where the food items are locally procured.

Recommended steps to be taken

- Increasing Zambian involvement in non-core mining services require mainly legislative and regulatory measures
- Government would have to pass an SI limiting foreign participation in these value chains.
- Zambian firms in the value chains already exist and may require expansion of services in which case a business case needs to be made for the expansion.
- This should include feasibility for borrowing for expansion of current operations
- Borrowing should be facilitated through impact funds to provide business lending away from current banking and financial services which are tilted towards short term lending