



Zimbabwe Economic
Policy Analysis and
Research Unit



IN-DEPTH TRAINING NEEDS ASSESSMENT SURVEY IN THE ZIMBABWE MINING SECTOR

OCTOBER 2016



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ACRONYMS

AfDB	African Development Bank
BUST	Bindura University of Science and Technology
CoMZ	Chamber of Mines of Zimbabwe
ENRC	Eurasian National Resources Corporation
FPR	Fidelity Printers and Refiners
IMR	Institute of Mining Research
KRAs	Key Result Areas
KSFs	Key Success Factors
GDP	Gross Domestic Product
Geo-Survey	Geological Survey of Zimbabwe
GSZ	Geological Society of Zimbabwe
MEC	Minerals Exploration Company
MetLab	Government Department of Metallurgy
MIDF	Mining Industry Development Fund
MMCZ	Minerals Marketing Corporation of Zimbabwe
MMMD	Ministry of Mines and Mining Development
MLD	Mining Law and Administration
MOU	Memorandum of Understanding
MPD	Mining Promotion and Development
MSU	Midlands State University
PAMUST	Pan African Minerals University of Science & Technology
SDERU	Standards Development and Research Unit
SME	Small and Medium Enterprises
SOM	School of Mines Zimbabwe
TNA	Training Needs Assessment
TOR	Terms of Reference
UZ	University of Zimbabwe
ZEPARU	Zimbabwe Economic Policy Analysis and Research Unit
ZimAsset	Zimbabwe Agenda for Sustainable Socio-Economic Transformation
ZILS	Zimbabwe Institute of Legal Studies
ZMDC	Zimbabwe Mining Development Corporation
ZDEC	Zimbabwe Diamond Education College



MINISTER'S FOREWORD

Zimbabwe is a highly literate country and it is ranked amongst the best in Africa. The Government of Zimbabwe after independence in 1980 took a deliberate stance to invest in human capital development and this led to a huge skills base in the country.

The mining sector is critical to Zimbabwe's economy , contributing over 50% of the country's exports over the past 5 years. The mining sector is poised to underpin the growth of the economy through exploitation, beneficiation and value addition of minerals. For this growth to be realised, adequate human resources with the requisite skills are required.

The Government of Zimbabwe commissioned this study on assessment of training needs in Zimbabwe's minerals sector in order to transform the human skills base which is critical to its development .

This study took an assessment on the training needs of the mining sector with the objective to identify existing skills and knowledge gaps amongst mining institutions both in Government and private sector. The study does not only identify skills and knowledge gaps, but it also proffers possible solutions to the policy makers. It is my hope that this study will draw the attention of policy makers to invest in capacity building and research and development in order to sharpen Zimbabwe's skills and knowledge base to the highest standard and robustly transform our mining industry to world class standards.

Finally, I want to pay tribute to the ZEPARU research team that undertook this study and to the African Development Bank that supported this very important exercise. My sincere gratitude also goes to the policy makers, miners,



industrialists and development partners who participated in this study. In this regard, I commend this very important study to all of you and I remain confident that you will assist in the implementation of the recommendations in this study.

HON. W. K. CHIDAKWA (MP)

MINISTER OF MINES AND MINING DEVELOPMENT



EXECUTIVE SUMMARY

Zimbabwe has a diverse and well-developed mineral sector, which is steadily recovering from an economic low and has immense potential to anchor inclusive economic growth and development. The mining sector has been identified in the economic blueprint, the Zimbabwe Agenda for Socio-Economic Transformation (ZimAsset), as one of the engines for growth and transformation of the economy alongside the agriculture sector. In line with the African vision, implementation of value addition and beneficiation are viewed as key success factors to the projected growth and transformation of the economy.

The mining sector of Zimbabwe is a major foreign currency earner and has potential to become the pillar for economic growth through value addition and beneficiation. There is however a general view that its current contribution to the economic growth is well below expected targets in the absence of requisite resources for mineral extraction and value addition. ZimAsset forecasts the contribution of the mining sector to Gross Domestic Product (GDP) during the period 2013- 2018 to range from 6.5% in 2013 to 12.6% in 2018. Use of mineral resources to underpin growth and development is however, premised on adequate institutional capacities; skills and knowledge of all stakeholders across the whole mining sector value chain to effectively perform their roles and obligations.

The Zimbabwe minerals sector tends to be knowledge-intensive and accordingly needs 'priming' through investment in human resource development and research & development. This study undertook an in-depth training needs assessment of all the key stakeholders and institutions, in the mineral sector with a view to understand the existing skill and knowledge gaps among key institutions and stakeholders. Literature review, workshops, extensive interviews and questionnaires were used to collect data across the value chain. The study was undertaken on the broad minerals industry whilst taking cognisance of the

key minerals deemed important. The importance was based on contribution to government revenue, export earnings, linkages with other sectors of the economy, poverty reduction, local and foreign investment and development of the country's infrastructure. Such minerals include gold, platinum, diamonds, coal, nickel, iron ore, tin, slate, chrome and tantalite. Consultations were made from the following key institutions and stakeholders in the minerals sector: government departments; parastatals; tertiary institutions; private organisations; mining companies, among others. Ultimately the findings are envisaged to inform the design and implementation of comprehensive capacity building and training programmes in the sector.

From the survey carried out, it is evident that the minerals industry of Zimbabwe has vast skills (artisans, technicians explorers, geologists, processors, metallurgists and mining engineers among others) and knowledge. For example, in one department in the Ministry of Mines and Mining Development, all technical people are degreed. Moreso, numerous certificates, diplomas and B.Sc degrees are produced in the mining related disciplines at tertiary institutions. The Zimbabwean skills list compares well with those of some of the world's known mining countries like Canada, Australia and South Africa. Thus it can be concluded that the mining industry possesses sufficient knowledge which is the basis of competence.

However, further analysis of the Zimbabwean skills and knowledge in relation to those of other countries revealed that most of the Zimbabwean skills and knowledge belong to the knowledge tier. The current level of skills in Zimbabwe (knowledge tier) in itself fosters an operative level but lacks provision of an integration that would infer further knowledge. The skills gaps exist in adaptability, analytical skills, business knowledge/acumen, global perspective, innovation, persuasion and influence and problem solving. The current skills and knowledge are not sufficient to propel the country to the required levels. The ultimate goal is for minerals industry to move from knowledge tier to understanding tier and finally inhabit the wisdom tier.

The understanding tier entails putting knowledge together to solve problems. In this tier new knowledge and new information is synthesized from what is currently known and understood. In the minerals industry, this tier would imply synthesising the current knowledge to suit the Zimbabwean industry. The research at this level addresses issues on the ground. In the case of Zimbabwe, this is not happening due to over reliance on external expertise which inhibits research interest among the local industry.



The understanding tier can be achieved through comprehensive taught masters (MSc), masters by research (MPhil) and Master of Technology (MTech).

Zimbabwe currently over relies on external expertise but there is little knowledge transfers to the local experts. Strategies on ensuring such transfer could be one of the training methods useful in closing off the identified gaps. Further, there is weak interface between mining houses and training institutions, resulting in additional resources needed to ensure that the technicians meet industry expectations. This is largely caused by lack of hands-on equipment at training institutions, which is similar to what they would be expected to use in the mining industry. Although technical skills are available at operations level, it is quite evident that exploratory skills are lacking as most of the exploration for the mining houses was last done decades ago. Such inadequacies inhibit mining houses from venturing into new explorations as they face financial challenges to invest in such skills at organization level.

Skills gap that can be addressed by training include business knowledge/ acumen, adaptability, analytical skills, innovation, persuasion and problem solving, specialised skills in value addition and beneficiation. Lack of skills in value addition and beneficiation may require investment in new training institutions and/ or upgrading and expansion of mandates of existing institution which need to be adequately staffed.

Some of the strategies Zimbabwe can use to address skills, knowledge and capacity needs include partnership between government departments with private players/ investors under the Public Private Partnerships (PPPs); increased investment in research and development (R&D); localisation of expertise for mining equipment use; modification of the current mining sector training curricular; strengthening of Zimbabwe information systems; giving prominence to soft skills; and embarking on refresher and upgrading courses among others.

This study concluded that training needs exist in all segments of the value chain of the minerals industry. Further, the skills that need to be imparted are those that are transferrable. In addition, nearly all employees need to be trained and this training is required immediately. Moreso, critical support institutions and stakeholders do not have the tools of trade that are adequate to provide the needed results. They even lack the basic tools of trade. Mining related policies are also a challenge to the industry.

The study recommends development of human capital, provision of tools of trade, policy development and establishment of centres of excellence as a way forward. The existing gaps can be addressed by availing training that shifts the skills from the knowledge tier to wisdom tier through understanding tier. This entails moving the certificates, diplomas, degrees to Masters and Doctorates. The ideal training place would be on site and at centres of excellence preferably in Zimbabwe. The lacking skills can be imparted through a combination of online/ internet-based methods, correspondence, distance learning, video conferencing and in classrooms.



CHAPTER I

INTRODUCTION AND BACKGROUND

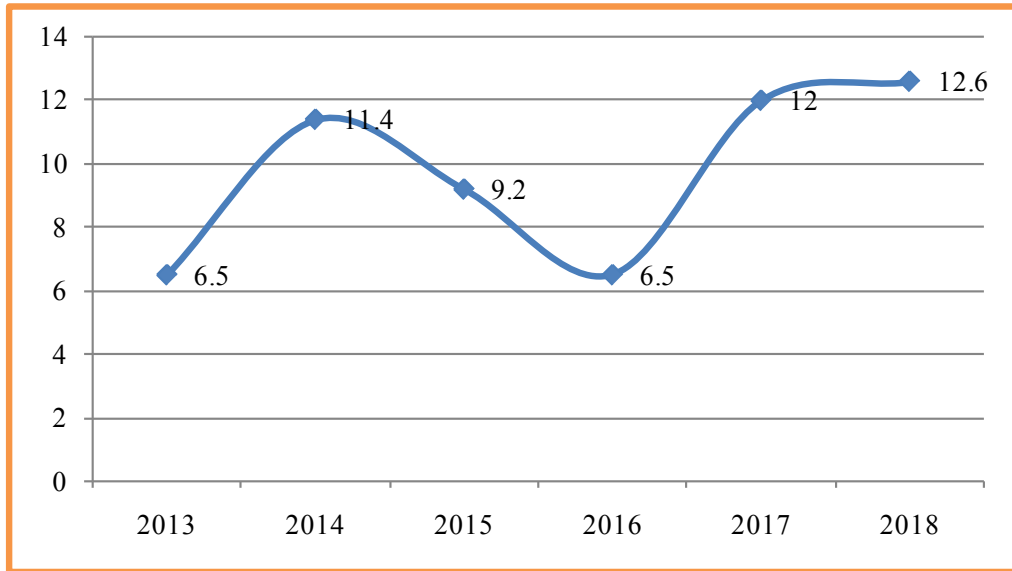
1.1 Background

Zimbabwe has a diverse and well-developed mineral sector, which is steadily recovering and has immense potential to anchor inclusive economic growth and development. The mining sector has been identified as one of the engines of growth alongside the agriculture sector. Under the recently launched economic blueprint, the Zimbabwe Agenda for Socio-Economic Transformation (ZimAsset), the key drivers for growth and employment creation will be accelerated development through value addition processes in the mining sector, among others.

The mining sector of Zimbabwe is a major foreign currency earner and has potential to become the pillar for economic growth through value addition and beneficiation. The country expects improved revenue collection from the mining industry. The general view is that the mining sector's contribution to the overall development of the country is still below the potential that it could achieve if it is adequately resourced to extract and value-add the mineral resources. In this regard the ZimAsset forecasts the contribution of the mining sector to Gross Domestic Product (GDP) during the period to range from 6.5% in 2013 to 12.6% in 2018 (Figure 1).



Figure 1: ZimAsset projected mining sector contribution to GDP, 2013-2018



Source: ZimAsset

Among other sectors, mining is expected to underpin the expected growth and transformation of the Zimbabwean economy. Implementation of value addition and beneficiation in the mining sector in line with the Africa mining vision are viewed as key success factors to the projected growth and transformation of the economy.

Use of mineral resources to underpin growth and development is premised on inadequate institutional capacities; skills and knowledge of all stakeholders across the whole mining sector value chain for them to effectively perform their roles and obligations. In order to ascertain these capacities it is necessary to map the capacity gaps with a view to design a training programme to bridge the identified skills; competences and knowledge gaps.

It is within this context that this study was undertaken. The study focused on undertaking an in-depth training needs assessment of all the key stakeholders and institutions, in the mineral sector. The findings of this study are envisaged to inform the design and implementation of comprehensive capacity building and training programmes in the sector. In this regard an understanding of the existing skill and knowledge gaps among key institutions that have a role to play in the



mining sector is important not only for the identification capacity gaps but also appropriate intervention levels. The findings would also help in determining the amount of resources required to implement the capacity building and training programmes alluded to above. Furthermore, the findings are expected to inform training institutions on the areas to focus on in their curricular.

1.2 Objectives of the study

The ultimate objective of the study was to provide analysis and advice on training activities that can strengthen mining sector policies and governance arrangements for the country's economic growth. The immediate objectives of the study, however, were to:

- Identify the skills and knowledge gaps that can be addressed by training;
- Evaluate capacity challenges and skills levels of critical support institutions and stakeholders of the minerals industry and
- Suggest strategies to redress the identified skills, knowledge and capacity needs.

1.3 Methodology

This study is generally a skills and knowledge gaps assessment, which is expected to assist in identifying opportunities for skills creation in the broader private sector and designing of targeted training and capacity building programmes to reinforce linkages in the minerals industry of Zimbabwe. The scope of the study is limited to identification and recommendation of training needs, thus it does not include actual designing of targeted training and capacity building programmes.

The focus area of the study was the minerals industry, which include quarrying, beneficiation and value addition institutions and companies. Although artisanal and small scale mining are also relevant for training needs assessment, this study has not focused on that sector given that there is a concurrent study being done by ZEPARU, specifically focusing on artisanal and small scale mining which also addresses the issue.

On 7 May 2015, an inception workshop was organized with stakeholders in the industry across the whole value and supply chain, which include the players, regulatory institutions and government. The meeting was very instrumental as it informed the mapping out of key institutions and stakeholders involved in

training and skills development for the mining sector. A review of the literature was also undertaken to understand the critical issues that should be taken into consideration when undertaking a training needs analysis in general and for the minerals industry in particular. Literature review also involved establishing the status quo with respect to training needs in the Zimbabwe minerals industry and other country experiences to inform the strategies that can be adopted to close the identified skills and knowledge gaps.

Extensive interviews with the stakeholders across the value chain in the minerals industry were also undertaken. Those interviewed included the miners, equipment suppliers, training institutions, government institutions that either participate as players or as regulators. The players were chosen based on their roles in the production of the key minerals, which were deemed important based on both contributions to government revenue as well as their roles in establishing linkages with other sectors of the economy. The comprehensive list of all the individuals and institutions that were interviewed during the study is given in the Annexure.

A structured questionnaire was used as a data collection tool, which was structured mostly to get qualitative rather than quantitative responses. Thus, a total number of 73 respondents across the whole minerals sector supply chain between May and July 2015, were interviewed under the study. These were drawn from the institutions given in the Annexure, thus this was simply a purposive sampling. It is important to note, however, that the number interviewed was not intended to give statistically representative views of all the players in the industry. The questionnaire was intended to capture the existing levels of skills and how adequate they are with respect to the expected roles of the stakeholders. It also revealed the general capacity challenges they possess in applying the knowledge and skills. The capacity building needs for these institutions was generally assessed within the context of their readiness to deliver their mandate.



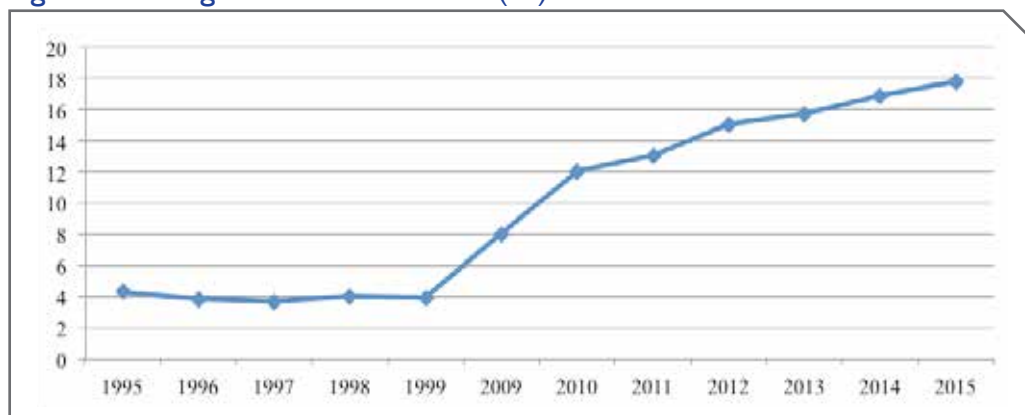
CHAPTER 2

OVERVIEW OF THE ROLE OF MINING INDUSTRY TO THE ECONOMY OF ZIMBABWE

2.1 General Overview

The Chamber of Mines projected the mining sector contribution to GDP to increase to about 17.8% by 2015 (Figure 1). The Zimbabwe mining sector employs around 45,000 people excluding the informal sector and contributes more than 50% of the country's foreign direct investment (Mhembere, 2014).

Figure 2: Mining contribution to GDP (%)



Source: Chamber of Mines¹

The mining sector has been the main pillar of economic recovery since 2009, accounting for 50.2% of the country's total exports between 2009 and 2014 with a peak of 57% in 2012 (Table I).

¹At website www.zimminingindaba.com/wp-content/uploads/2013/10/Chamber-of-Mines.pptx

Table 1: Zimbabwe's Mineral & Total Export Earnings (USD Millions): 2009-2014

	2009	2010	2011	2012	2013	2014
Mineral Exports	659.60	1,568.80	2,126.80	2,189.10	2,055.80	1,905.50
Total Exports	1,613.30	3,243.70	4,416.30	3,808.20	3,694.20	3,621.30
Mineral Exports/Total Exports	41%	48%	48%	57%	56%	53%

Source: Reserve Bank of Zimbabwe (2015) Monetary Policy Statement

Top contributors to mineral exports were diamond, platinum and gold, constituting about 77.6% and 79.9% of the country's mineral export earnings in 2013 and 2014 respectively. Gold had an export value of US\$563.8 million in 2014, whilst platinum and diamonds were US\$561.8 million and US\$396.1 million respectively (Table 2).

Table 2: Major Mineral Exports (USD millions)

	2013	2014
Gold	566.2	563.8
Platinum	573.2	561.8
Diamonds	455.9	396.1

Source: Reserve Bank of Zimbabwe (2015) Monetary Policy Statement

Mineral production has potential of stimulating the local economy through its forward, backward; spatial; knowledge and fiscal linkages in the economy². It acts as a source of raw materials to sectors such as manufacturing and agriculture. Some of the export revenue earned from this sector can be spent on domestically produced goods and services. A moderate growth of 3.5% is expected in the mineral output in 2015³, driven by nickel, gold, chrome and coal, up from -2.1% in 2014 (Table 3).

There was remarkable increase in mineral production between 2009 and 2011 (Table 3). However, continued growth is constrained by lack of capital investment in mineral development and exploration. The sector's potential is also hampered

³Jourdan.P; G. Chigumira; I. Kwesu and E. Chipumho (2012) provide a detailed analysis on maximising the mineral resources economic linkages.



by power outages, slackening of international mineral prices on the backdrop of the slowdown in global economic activity, lack of medium to long term funding, outdated equipment in an era when technological advancement is dictating the success of the mining sector, high costs of doing business and poor infrastructure.

Table 3: Mineral Sector Output Trend

Mineral	2009 Actual	2010 Actual	2011 Actual	2012 Actual	2013 Actual	2014 Estimated	2015 Projected
Gold (kgs)	4,966	9,620	13,000	14,800	14,000	14,500	16,000
Coal (tons)	1,667,346	2,668	2,922,000	1,785,000	4,980,000	6,450,000	7,800,000
Nickel (metric tons)	4,857	6,133	8,000	7,900	14,000	14,232	16,760
Platinum (kgs)	6,848	8,639	10,827	10,524	13,000	12,500	12,000
Chrome Ore (tons)	193,674	516,776	599,000	408,575	450,000	650,000	
Palladium (kgs)	5,354	6,916	8,400	8,100	10,200	8,800	
Diamonds (tons)	1,306,000	3,000,000	8,719,000	12,014,802	10,528,000	8,000,000	
Overall Growth	18.9%	37.4%	24.4%	8.0%	6.5%	-2.1%	3.1%

Source: Chamber of Mines, GoZ (2014) and GoZ (2015a)

The sector is expected to rebound in the medium term following the envisaged successful completion of mergers and consolidation exercise in the diamond sector as well as finalisation of the amendments to the Mines and Minerals Act and the new mining fiscal regime. Further, it is anticipated that investments from China and Russia among others, will support the growth of the mining sector (GoZ,2015a). The projected low international mineral and metal prices (Table 4) are expected to have a negative impact on the growth of not only the mining sector but also of the whole economy. This is likely to further weaken the organisational capacities to invest in human resource development as well as acquisition of state of the art capital equipment.

This in turn may undermine the productivity and contribution of the sector to the country's transformative development agenda as spelt out in ZimAsset.

Table 4: World Bank Metal and Mineral Price Forecast (nominal US Dollars)

Metals	Unit	2013	2014	2015	2016	2017	2018
Gold	US\$/toz	1380	1360	1350	1345	1340	1335
Platinum	US\$/toz	1480	1450	1400	1384	1369	1353
Copper	US\$/ton	7100	7050	7000	6980	6960	6939
Coal	US\$/ton	76	73	73	73	73	73
Aluminium	US\$/ton	1800	1850	1900	1928	1957	1985
Iron Ore	US\$/ton	134	135	137	138	139	139
Nickel	US\$/ton	1400	1500	1600	16190	16381	16575

Source:GoZ (2013) The 2014 National Budget Statement

The potential of main export minerals can be harnessed if challenges alluded to above are addressed. In particular there is potential in gold mining, which is currently estimated to be operating at 50% capacity utilisation. A recent World Bank study estimated that output could reach 28.5 tons only if the country secures capital of at least \$420 million (Mhembere, 2014).

The country experienced phenomenal growth in platinum between 2001 and 2013 from a production of less than 1,000kg to over 13,000kg. Platinum production however declined to 12,482.73 kg in 2014 owing to the depressed international prices as well as closure of the Bimha Mine. Zimbabwe is endowed with the second largest known PGM resource in the world along the Great Dyke. Increased platinum growth lies in potential of new projects such as Eurasian National Resources Corporation (ENRC), Ruschrome (Rostec), Global Platinum Resources and Zimari Platinum, all of which are listed as Joint Venture projects under the Zimbabwe Mining Development Corporation (ZMDC).

The Chamber of Mines estimates coal production to be currently around 5 million tonnes per year and the World Bank forecasts that production can reach 9.8 million tonnes per year by 2018 if the sub sector secures capital to the tune of USD3 billion (Mhembere, 2014). Further, over 29 coal localities are known with estimated resources of approximately 12 billion tonnes (Mhembere, 2014).



Zimbabwe is rich in iron deposits estimated to be about 30 billion tonnes of reserves (Mhembere, 2014). Iron production peaked in 1992, where production was 1.46 mt and fell to zero in 2008 with the closure of ZISCO Steel. Current production is very low despite huge potential. Nickel production went on a downward trend between 2004 and 2010. In the last four years, the mineral has been produced by platinum mines as a by-product since the primary producer, Bindura Nickel Mine was under maintenance and care.

2.2 Revenue Contribution of the Different Commodities

Mining taxation is part of management of mineral resources and it provides revenue to government. Various taxes are charged to mining companies in Zimbabwe and these include royalties, income tax (corporate tax), Pay As You Earn (PAYE), non-residents tax, Additional Profit Tax, Value Added Tax (VAT), marketing commission, customs duty, presumptive tax for small scale miners, capital gains tax, withholding tax, licensing fees, environmental charges and in some cases, charges by local authorities among others (ZELA, 2012). The mining sector contributes about 13% of the fiscal revenue, which is critical for financing education, health care, roads, electricity supply and other growth enhancing infrastructure development. A look at the mining sector contribution to the country's fiscal revenue by tax head in 2014 shows that diamonds contributed the most (Table 2.5), followed by platinum and gold, contributing 45%, 36.1% and 15% respectively.

Table 5: Mining Sector Revenue contributions in 2014 (USD)

	US\$ Thousands							
	Royalties	Corporate Tax	VAT on Local Sales	PAYE	Withholding Tax	Customs Duty	VAT on Imports	Totals
Diamond	96,896	24,537	-4,338	15,279	15,994	483.0	1,460	150,311
Gold	33,799	5,684	-12,537	13,938	2,471	1,097	4,280	48,733
Platinum	56,635	28,051	-37,633	39,594	8,219	6,729	19,595	121,191
Chrome	2,715	75.2	-7,022	4,726	988.1	114.5	787.6	2,385
Coal	221.2	7.3	4,388	652.1	21.8	122.9	771.7	6,185
Emerald	0.024	0	-0.7	6.8	0	0	0	6.2
Granite	144.8	1.7	-30.3	341.7	17.5	34.9	75.8	586.2
Lithium	190.2	0	-603.7	198.4	19.0	29.3	46.0	-120.8
Magnesium	26.6	2.3	14.3	58.0	13.4	0.6	0.8	115.9
Nickel	1,221	26.1	-953.1	2,813	470.5	752.3	1,542	5,873
Phosphates	0	0	-28.9	7.8	0	0	0	-21.1
Vermiculite	27.7	0	-57.5	99.0	18.1	1.4	2.5	91.1
Iron	9.1	53.2	337.6	130.4	18.5	0.02	0.4	549.2

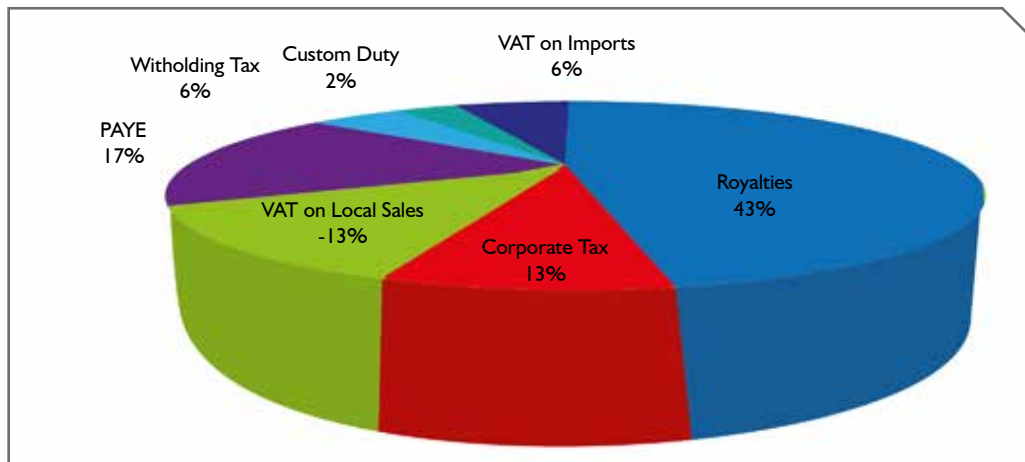
Source: Ministry of Finance

Major contributors for the corporate tax were platinum, diamond and gold with respective shares of 48%, 42% and 10%. The mining sector's contribution to government revenue through customs duties is quite minimal as the bulk of capital equipment of the sectors enters the country duty free. Again, given the capital intensive nature of the mining industry, the country does not reap much revenue through PAYE as the sector can only absorb a low number of employees.

Royalties, PAYE and corporate tax are chief contributors to the total revenue (Figure 3). In 2014 alone, diamonds contributed to 50% of the royalties followed by platinum and gold with 30% and 18% respectively.



Figure 3: Total Tax Revenue By Tax Head In 2014



Source: Ministry of Finance



CHAPTER 3

KEY INSTITUTIONS AND STAKEHOLDERS IN THE MINERALS SECTOR

This study identified key institutions and stakeholders and categorised them into six groups namely: government departments; parastatals; tertiary institutions; private organizations; mining companies and other stakeholders. These are described in turn as follows:

3.1 Government Departments

Several government departments and parastatals are key in the minerals industry. Most of the government departments and parastatals that are directly related to mining fall under the Ministry of Mines and Mining Development (MMMD). The departments are responsible for regulating the minerals sector, administering mining laws, providing mining related services and information on the mining industry. The departments are also responsible for the safety and health inspectorate function as well as reviewing license applications. Some of the government departments and parastatals are discussed below.

Department of Metallurgy

The Department of Metallurgy, popularly known as the Government Metallurgical Laboratory, monitors and audits mineral processing operations in Zimbabwe. Some of the services provided by the department include extractive metallurgy, physical metallurgy, ceramic metallurgy, analytical metallurgy, monitoring of mineral exports, pollution abatement in the mining and metallurgical industries and applied research in extractive, physical and ceramic metallurgy.



Department of Mining Engineering

This department is entrusted with providing engineering related services to the mining sector. The Department's roles include monitoring of mining operations; enforcement of mining explosives regulations; mechanical and electrical engineering; ventilation and environmental control; mine survey; and mine engineering. The department is also expected to empower small-scale miners through provision of appropriate technologies and loan facilities. It manages the Mining Industry Development Fund (MIDF) and conducts statutory examinations for the mining industry.

Department of Mining Promotion and Mining Development

The major functions of the department include coordinating mineral policy planning and development, promoting investment in the mining industry from both local and foreign investors, monitoring and supervising the performance of mining parastatals and state companies. The department is also expected to compile and analyse national mineral production statistics, monitor marketing of minerals (including imports of minerals and minerals bearing products into the country). The other tasks for the department include keeping an up to date record of new and old mines about their production levels, employment and revenue trends as well as evaluating possibilities for the development of value added processing of minerals. This department is also responsible for the development of small-scale mining into medium or large-scale mining enterprises.

Department of Mining Law and Administration

The Department of Mining Law and Administration is also referred to as the legal services department. Its major role is to enforce the provisions of the Mines and Minerals Act (Chapter 21:05) and other appropriate legislations. It is also responsible for granting mining rights, registration of custom millers, initiating legislation and recommending amendments, presiding over miner/ farmer and miner/ miner disputes and keeping an accurate database for all registration, cancellation and production. Curbing of leakages of gold/ precious stones is also one of this department's mandates. The department also offers legal services to the Ministry.

Department of Geological Survey

Mapping the geology of the country and generating information on mineral resources potential of the country are the major tasks of the Department of

Geological Survey. However, this department also provides technical, consultative and advisory services on mining geology and mineral exploration to the industry and small-scale miners. It also provides the public with information on mineral exploration and exploitation, collates and archives national geological information, and maintains current and potential mineral deposit databases.

3.2 Parastatals

The three parastatals regarded as stakeholders for the minerals industry are Zimbabwe Mining Development Corporation (ZMDC), Minerals Marketing Corporation of Zimbabwe (MMCZ) and Fidelity Printers and Refiners. The first two falls under MMMD whilst the last falls under the Reserve Bank of Zimbabwe.

Mineral Marketing Corporation of Zimbabwe

Minerals Marketing Corporation of Zimbabwe (MMCZ) was established in 1983 and is an exclusive agent for marketing and selling of all minerals produced in Zimbabwe except silver and gold. It also provides advisory services, promotion of investments in mining related activities and national mineral resource accounting. The Corporation searches for markets on behalf of producers, negotiates, enters and administers the implementation of sales agreements on behalf of the customers. It is also responsible for the physical movement of the product from the mine location to the point of sale. The mineral resource accounting throughout the value chain, that is, from extraction of ore up to the final sale of the product is conducted by the MMCZ inspectorate division. MMCZ also has projects, which include chrome ore claims, gold project, gold roasting plant, granite claims and a diamond cutting and polishing factory.

Zimbabwe Mining Development Corporation

Zimbabwe Mining Development Corporation (ZMDC) was established in 1982 by an Act of Parliament to engage in prospecting, exploration and mining on behalf of the Government. Through its ownership of various mines around the country, it is involved in mining of diamonds, gold, platinum, graphite, emeralds, tin, copper and asbestos. It also has joint ventures with other mining houses for diamond, platinum, uranium and graphite mining.

Fidelity Printers and Refinery

Fidelity Printers and Refinery is a security printing and gold refinery company wholly owned by the Reserve Bank of Zimbabwe. It produces all security



documents including currency, passports, examination papers, travellers' cheques, Commercial Bank cheques, passbooks and a wide range of other government security documents. The mining related aspect of Fidelity Printers and Refinery is the refining of gold and silver. Whilst all the other minerals are sold through MMCZ, Fidelity Printers and Refinery is the sole authorised buyer and exporter of gold in Zimbabwe.

3.3 Tertiary institutions

There are several tertiary institutes offering training for the minerals industry and these include universities, polytechnic colleges, government institutes and independent institutions.

Universities

Among the universities that offer tertiary education relevant to minerals industry are Midlands State University, University of Zimbabwe, and Bindura University of Science and Technology. Midlands State University offers degrees in Chemical and Processing Engineering, Mining and Mineral Processing Engineering, Surveying and Geomatics. The departments that offer mining related degrees at the University of Zimbabwe are Mining Engineering, Metallurgy, Geoinformatics and Geology. At the Bindura University of Science and Technology, the Earth Science Department offers mining related degrees.

Institute of Mining Research

The role of the institution is to enable the sustainable development of mining and related sectors in Zimbabwe through innovative and responsive research, further education, training and consultancy services. The mining community may also obtain advice and assistance by utilising the extensive facilities of the Institute of Mining Research, which is partially funded by government. The institution carries out research in mineral economics, mineralogy and metallurgy.

The Zimbabwe School of Mines

This training institution was established by a Presidential Charter in 1994 although its existence dates back to 1926. Its mandate is to provide technical education and practical training for people who wish to enter the mining industry. The school provides in-house training services for professional mining personnel, mining related information and consultancy services to industry. It also offers distance learning and assists Government in manpower planning and development as is

related to mining and related industries. The school is a regional institution that serves the SADC mining industry. It offers competency-based training and hands-on mining courses and support services. Several stakeholders among them the University of Zimbabwe, Chamber of Mines and Geological society are involved in the curriculum development and quality of training at the institute. In 2014, the School had a total of 694 students as compared to 634 in 2013. The increase in enrolment was explained by the introduction of the new Mine Ventilation National Certificate course.

Zimbabwe Institute of Legal Studies

The Zimbabwe Institute of Legal Studies (ZILS) is an independent institution offering skilled manpower and vocational training for the law and forensic science. Their one year certificates and three year diplomas in Mineral law and Policy are mining related thus making the institution a stakeholder for minerals sector.

The Zimbabwe Diamond Education College

The Zimbabwe Diamond Education College, which was established in 2010 as a direct response to the discovery of diamonds in Zimbabwe, provides knowledge and skills to enter the diamond industry. Its mission is to impart skills for the diamond industry, add value to the diamond industry, encourage investment, empower Zimbabweans and reduce unemployment. It is also involved in defining unit standards for evaluating proficiency in the various aspects of the diamond industry as well as make links with the outside world. The college also organises workshops for various stakeholders on awareness and aims to influence policy.

Polytechnics

The polytechnic colleges dotted around the country offer engineering courses that are relevant to mining. The Kwekwe Polytechnic, which is located in Midlands, one of Zimbabwe's richest provinces in terms of minerals, has tailor-made courses which are designed to help small scale and artisanal miners who constitute the bulk of this gold mining province.

3.4 Private organizations

Chamber of Mines of Zimbabwe

The Chamber of Mines of Zimbabwe (CoMZ) is a private sector voluntary organization established in 1939 by an Act of Parliament. Its primary objectives



are to advocate and lobby in order to promote, encourage and protect the interests of the players in the mining industry in Zimbabwe. They are involved in diverse activities which include economic policy, mining sector policy, investment promotion, labour and industrial relations management.

Geological Society of Zimbabwe

The Society is a body corporate under the common law of Zimbabwe. Its objectives are to promote the science and practice of geology and execute all issues conducive to the advancement of earth science. It thus promotes geological research, teaching, exploration and mining in Zimbabwe. It acts as a forum to exchange knowledge and practices on geological issues.

Association of Mine Surveyors of Zimbabwe

The association provides professional representation to government, industry and educational organisations on mine surveying issues. Some of its objectives are to promote interest in mine surveying, advance the science and practice of mine surveying, establish a system of grading of mine surveyors in relation to their qualifications and promote mutual interest with allied disciplines. The association is affiliated to the Chamber of Mines of Zimbabwe.

The Association of Mine Managers of Zimbabwe

This is an association of qualified people who are, or have been, employed in senior operational positions in the mining industry. The association discusses matters of common interests, and its members attend and participate in technical seminars to maintain competencies, provide support to peers and influence industry outcomes. It promotes the study of mining and allied disciplines and has representation in Zimbabwe School of Mines Academic Board, Chamber of Mines of Zimbabwe and the Board of Examiners for the Full Blasting Licenses and Mine Manager's Certificate of Competences.

3.5 Mining Companies

Zimbabwe is noted for its unique geology which is host to a variety of economic minerals. The number of mining companies in Zimbabwe is estimated at between 800 and 900 (Jourdan et al, 2012) while the number of artisanal and small scale miners is estimated to be 500,000 (Kahwai, 2013). Most of the mining companies are members of the Chamber of Mines. However, many companies are small and artisanal companies owing to the nature of the deposits they exploit, which in

most cases are small. These are also members of small scale miners associations, which include Zimbabwe Artisanal and Small Scale for Sustainable Mining Council (ZASMC), Zimbabwe Women in Mining, Gold Miners Association of Zimbabwe (GMAZ) and the Zimbabwe Miners Federation.

3.6 Other Stakeholders

There are other stakeholders whose operations directly affect or are directly related to the mining industry. These include the Zimbabwe National Water Authority (ZINWA), Environmental Management Agency (EMA), Parliamentary Portfolio Committee on Mines and Energy, Rural District Councils (RDC), Standard Association of Zimbabwe (SAZ) and suppliers of mining equipment and consumables. Mining activities are also required to commence with the knowledge and approval of RDCs. Revenue from mining sector supports Rural District Councils who have responsibilities to develop communities out of taxes and royalties remitted to them by mining companies. EMA is a statutory body responsible for ensuring the sustainable management of natural resources and protection of the environment. Parliamentary Portfolio Committee on Mines and Energy through its oversight role examines the expenditure, administration and policies of government departments and other matters affecting mining. SAZ facilitates the development and use of standards in order to enhance Zimbabwe's competitiveness and safeguard the welfare of communities. The other players in the industry include jewellers, suppliers of machinery, spare parts, and chemicals as well as service providers who include banks, insurance companies, consulting engineers, and various mining related professional bodies and individuals.



CHAPTER 4

THE RATIONALE OF TRAINING NEEDS ASSESSMENT

4.1 Theoretical and Historical Background of training needs assessment

A training needs assessment provides a detailed investigation of the apparent performance problems so as to establish real performance gaps and to determine which of these problems can be addressed through training (Jinabhai, 2002). It is a process in which the human resource development needs of both the employee and the organisation are identified in order to address the gap between the employee's abilities and performance and the organisation's requirements (Abdullah, 2009).

Salas and Cannon-Bowers (2001), note that one of the most important aspects of training and development is conducting a training needs assessment as it determines where training is needed, what needs to be taught and who needs to be trained. In principle, only those employees who are deficient in their skills, knowledge and abilities and whose performances are affected because of this deficiency are qualified to be sent for training.

Miller and Osinski (2002) describe the training needs assessment as a process of identifying a gap between what is currently in place and what is needed, now and in the future. Gaps include discrepancies or differences between:

- what the organisation expects to happen and what actually happens;
- current and desired job performances; and
- existing and desired competencies and skills.

Needs assessment can be done at different levels (Opperman and Meyer, 2008). At a macro level, it comprises identification of key skills shortages and assessment of relative importance of identified shortages in the sector. At a meso-level, it entails examining company-wide goals and problems to determine where training is needed. At a micro level it involves examining tasks performed and the knowledge, skills, attitudes and other behavioural aspects required to determine what employees must do to perform successfully.

Most contemporary training needs assessment models are a result of the seminal efforts of the US Air Force in trying to determine the most effective ways to train service personnel (Stetar, 2005). Thus most of the TNA models are rooted in the Instructional Systems Design (ISD) which was introduced by the US Air Force in the mid-1960s when the ISD practitioners realised that training could not resolve some of the problems they were asked to fix and therefore began to promote proactive organisational approaches to uncover both training and non-training needs.

In general, there are three steps in conducting a basic TNA (Watkins et al, 2012), which include:

- **Identifying needs:** The first step in needs assessment is to identify needs (that is, gaps between desired and current results). Needs must not be mistaken for the potential solutions (i.e. activities or resources). Incomplete projects, low client satisfaction and missed deadlines are some of the examples of performance gaps or needs (i.e. need to complete projects on time, need to satisfy clients and need to meet deadlines). In cases where the optimal exceeds the actual, then there is an opportunity to reallocate resources towards improving performance.
- **Analyze the needs:** The analysis step links needs with the information required to make decisions about what actions should be taken to meet the needs. The step involves establishing an initial prioritization of needs. Needs are prioritized on the basis of size, scope, distinguishing characteristics and relative importance. A needs analysis is then an attempt to better understand what is working, what is not working, and what systemic relationships exist among needs. Information is then collected on the root causes associated with what is not working, leading to prioritisation of the needs. At this point, many ideas for solutions or activities to improve results/ performance are



offered but emphasis should be on understanding the difference between current and desired results/ performance.

- Decide: this step involves making a decision on what should happen in order to reduce the performance gap. Making a decision is complex because of competing interests, difficulties in agreeing to the criteria to use in making the decisions, and typical realities for negotiation and compromise. However, information gathered under identification and analysis steps helps to increase the potential for making a justifiable decision that will lead to desired results.

These three steps ensure that a TNA focuses first on results before focusing on solutions; the needs are studied before decisions are made and the decisions are informed and justified.

4.2 Collating the desired skills, knowledge and capacity for the minerals industry

The Canadian Mining Industry Human Resources Council outlines the skills required at different stages of the mining industry as follows:

- Exploration: at this stage the skills required include prospectors, line cutters, drillers, geologists, environmental coordinators, geographic information systems (GIS) technicians, geophysical/geological technicians, and geochemists.
- Mining development stage: the skills required include surveyors, mining engineers, mechanical engineers, mining technicians, machinists, millwrights and geological engineers.
- Mining operations stage: the required skills include health and safety coordinators, material handlers, warehouse workers, blasters, heavy equipment operators, lab technicians, metallurgical engineers and electrical engineers.
- Mining closure/rehabilitation stage: human resources managers, civil engineers, labourers, water samplers and environmental monitors, among other skills required,

Smith and Kruger (2008) state that, apart from being skilled in the sense of having the required knowledge in a specific discipline and having the up-to-date technical skills required in a profession, graduates also need generic skills. They extensively reviewed lists of generic skills and identified seven categories, namely

- basic skills (such as literacy and numeracy);
- communication skills (such as negotiation and conflict management), management skills (such as planning, organising and decision-making);
- environmental awareness skills (such as business awareness);
- intellectual skills (such as analysis, critical and creative thinking, and problem solving);
- self- and career management skills (such as personal drive, resilience and self-awareness); and
- Interpersonal skills (such as teamwork and networking).

Jackson and Hancock (2010) concur by highlighting the need to foster non-technical skills essentially because the industry calls for job ready entry-level graduates who have both the technical expertise and soft skills necessary to add immediate value in the workplace.

The objectives behind conducting a needs assessment prove useful in identifying the organisational goals and the effectiveness of training in achieving these goals, the gaps or discrepancies between employee skills and the skills required for effective job performance and problems that may or may not be solved by training (Brown, 2002).

The information that is collected from the TNA study assists in determining optimal performance or knowledge required, actual performance or knowledge at the present time, attitudes of stakeholders, causes of the performance or knowledge deficiencies or needs and solutions to the deficiencies or problems (Table 5). There are several techniques that can be used to collect the data on each of the elements mentioned above. The best technique to use is determined by the purpose of the analysis.



Table 6: Techniques of data collection

Purpose	Techniques
Optimal	Needs Analysis Subject Matter Analysis Task Analysis
Actuals	Needs Analysis Extant Data Analysis
Attitudes	Needs Analysis
Causes	Needs Analysis
Solutions	Needs Analysis

Source: US Air Force Handbook, 2003

There are four basic causes of performance gaps; lack of skills, lack of incentive or improper incentive, lack of environmental support and lack of motivation. Performance is affected when people lack the necessary abilities (i.e. skills) and the concepts and facts (i.e. knowledge) needed to do their jobs. If people have the requisite skills and knowledge of the job they would perform better. However, if there is lack of incentive or there is improper incentive, they might not perform. Individuals normally perform better if the results of their actions are known to them and their actual performance is linked or associated to the optimal performance. Appraisals, feedback, rewards and policies form part of the incentives that may affect performance. Incentives must be known to the workforce and applied religiously by management. The workforce should also know the consequences of performing or not performing their jobs.

Environmental support refers to the issues that surround the workers as they do their jobs. Environmental factors are beyond the direct control of the worker. To determine if the environment is affecting performance, there are three basic elements that can be examined and these are: personnel, policies & procedures, and tools of the trade. The performance problem might be a result of either the worker's physical and mental inability to do the job or the inability of the people that the worker must depend on when performing the job, e.g. the supervisor. Policies & procedures also need to be examined to determine if they are not interfering with performance. Tools are what the worker uses to perform the job and if they lack the tools performance may be compromised. Motivation is based



on the benefit that individuals see in what they need to learn to do the job and the belief that they will be able to perform the job. In other words, motivation is the product of value and expectancy, where value is the worth that individuals attach to things or outcomes as evidenced by the choice of options. Expectancy is the confidence that the individual has that they can successfully perform the job or task. Thus, if individuals do not want to be trained and doubt that they will be able to perform the job, their motivation will be low.

In literature, two broad categories of solutions to the causes of performance gaps or needs have been identified as:

- **Training:** it teaches individuals to do something that they were never taught or never learnt or they had forgotten how it is done through presentations, examples, practice, and feedback. However, Marsick and Watkins (1990) acknowledge that only around 17% of learning can be traced to formal instruction and the remainder is incidental and acquired through interactions with co-workers. The best learning experiences occur through personal experience, group support, and mentoring.
- **Reporting and restructuring:** include adapting new policies, developing a new appraisal system, changing work schedules, providing adequate tools, rewarding desired performance, implementing other managerial actions deemed as appropriate resolutions to the problem.

Training addresses causes of performance gaps associated with lack of skills or knowledge and lack of motivation (Table 6), while other causes call for different interventions.



Table 7: Causes of performance gaps and potential solutions

Kind of cause of performance gap	Typical solution
Lack of skill or knowledge	<ul style="list-style-type: none"> • Provide skill or knowledge training • Develop job aids
Lack of incentive or improper incentive	<ul style="list-style-type: none"> • Provide feedback • Establish new policies • Provide training for supervisors and managers
Lack of environmental support	<ul style="list-style-type: none"> • Match individuals to the job • Redesign job • Improve interactivity between workers • Develop new policies and procedures • Provide adequate tools
Lack of motivation	<ul style="list-style-type: none"> • Train so individuals can see benefits • Train so individuals believe they have the ability to learn to perform the job

Source: US Air Force Handbook, 2003

4.3 Justification for Zimbabwean Minerals Sector training needs assessment

The Zimbabwe minerals sector tends to be knowledge-intensive and accordingly needs 'priming' through investment in human resource development and research & development (R&D) (Jordan et al, 2012). To ensure that relevant training and capacity building programmes are conducted, it is important to have an understanding of the existing skill and knowledge gaps among key institutions that have a role to play in the minerals sector. It is within this context that an in-depth TNA of all the key stakeholders and institutions is needed. This would make it easier to supply necessary inputs to use in capacity building and training programmes.



CHAPTER 5

SURVEY RESULTS AND ANALYSIS

5.1 Skills Currently Available in the Mining Industry

The Zimbabwean mining sector has skills and knowledge that range from artisans, technicians explorers, geologists, processors, metallurgists and mining engineers among others (Figure 4). Such professionals are found at different levels of the mining sector value chain. These professionals constituted some of the key informants for the study.

Figure 4: Different levels of skills in the mining industry

Primary Mining Activities	Secondary Mining Activities	Mining Support Services
<ul style="list-style-type: none">• Blasters• Drillers• Electrical Engineers• Electrical Inspectors• Geologists• Geological Technicians• Geophysicists• Inspector of mines• Inspector of explosives• Mechanical Engineers• Mechanical Inspectors• Mechanical Technicians• Mine surveyors• Mining Engineers	<ul style="list-style-type: none">• Laboratory Technicians• Cartographers• Diamond evaluators• Fire Assayers• Gemologists• Metallurgical Technicians• Metallurgists• Mineral Dressers	<ul style="list-style-type: none">• Lecturers• Legal Advisors• Legal Officers• Minerals Development Officers• Teaching Assistants• Technical Trainers• Trainers

Knowledge/Skills Gap in the Minerals Industry

It is a generally accepted view that knowledge and skills gaps do exist in the minerals industry value chain in Zimbabwe. About 78% of those interviewed



indicated that they felt that there were skills gaps in the minerals industry, with only 13% indicating that there were no skills gaps⁴. The latter group felt so because some mining firms are closing down, while others are scaling down, and this releases a lot of skills into the economy which can be tapped into. Those who felt that there were skills gaps pointed at several factors as justifications to their opinions and these include:

- The country still has many areas that are yet to be fully explored to ascertain mineral deposits. This happens at a time when there is a general belief that Zimbabwe has a lot of undiscovered deposits. Some respondents estimated that about 60% of the minerals currently being mined have been mapped in the 1980s and those mappings are still being used today. No new mineral exploration has been done to determine mineral occurrence, and investors depend on explorations that were done long ago using less sophisticated technologies compared to those that are modern. The geologists that are there are less experienced and have limited/ no knowledge of and experience with the modern exploration technologies;
- Some key positions in mining ventures continue to be occupied by foreigners, which could reflect that local expertise is deemed lacking, signifying skills gaps. The country also lost a generation of experts to the diaspora, due to economic hardships. This left the country with a skeletal workforce which is less/ not experienced;
- A lot of machine repairs in the minerals sector are still being done by expatriates and foreign companies, demonstrating that such skills are lacking locally; and
- Most of the mineral products continue to be exported as raw or as semi-refined. This demonstrates the unavailability of value addition capacity/ skills in Zimbabwe.

Interviewees who acknowledged existence of skills gap, indicated that this existed throughout the value chain (i.e. Exploration, Extraction, Processing, Marketing and Policy).

Respondents were also asked their opinion with respect to skills gap existing in their own organizations. About 85% of the respondents indicated that there are skills gaps in their company/organization/institution industry whilst 13%

⁴The rest indicated that they were not sure

thought otherwise. Those who indicated that there are no gaps felt that the non performance of their organizations was due to other reasons not related to skills and knowledge.

Analysis of the skills cited as lacking shows that these can be classified under technical, transferrable and personal trait. However, the majority of the skills mentioned were non-technical and belong to the transferrable category of skills. Among the skills that were cited as currently lacking in the mining industry include procurement, some competencies of engineering geo-physics (aero-magnetics), safety, health, environment and quality (SHEQ). The SHEQ skills are vital because the mining business is very risky. Training on supervision skills, technical skills and industrial relations skills was noted as relevant to the line of management that drives organizational results. Loss control skills in the area of accounting, procurement were also regarded by the interviewees as lacking in the industry. Mining related industries cited quarrying, drilling expertise, mine planning and optimization skills as lacking in the industry. In addition interviewees also cited the need for environmental expertise.

Government departments and institutions in the mining industry shared their views regarding the skills they are currently lacking (Box 1). The non-availability of such skills in critical institutions that have a role to play in developing the industry could also explain why the mining sector is not operating optimally.

Box 1: Skills and competencies lacking in government mining institutions and departments

Geological mapping and survey skills
 Basic Computer and data management skills
 Mineral Evaluation, marketing, assaying and geological skills
 Research and analytical skills, contract negotiation skills, legal drafting skills
 Mining survey skills, mineral resource estimation and evaluation skills
 Physical and powder metallurgical skills, Ceramic laboratory skills
 Mineral skills, including financial and human resource
 Rock mechanics skills, accident investigation skills
 Gemological skills
 Laboratory analysis



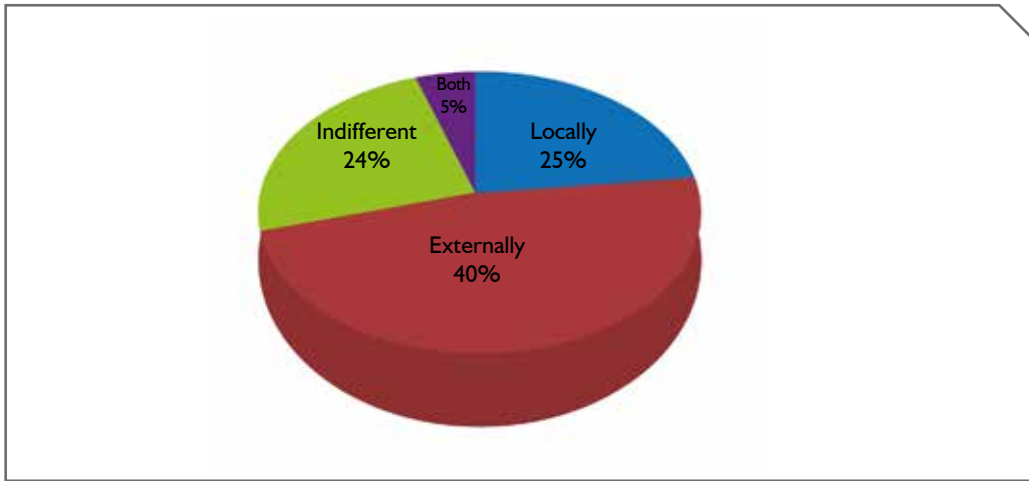
The mining houses together with their main input suppliers also identified areas which they felt were more characterized by skills gaps. The observed diamond evaluation, remote sensing, international standardisation, mineral economics, exploration, negotiating and soft skills as areas of critical importance to the industry. In all cases there was a general agreement from the respondents that training was necessary across the board. It was also apparent that soft skills need to be imparted to the technical people. Most of the people in the managerial level were technical people who were promoted to these levels but did not undergo training to equip them with the soft skills to augment their technical training.

It was also noted that most technical skills within mining are likely to present hiring challenges in the next five years, if the country does not revamp training to meet the changes taking place. The training should provide skills that can operate in a large and complex corporate environment. The skills training should take into consideration the rapid change in technology, the unique operating environment and the dynamic nature of the industry. From the responses it appears all skills need continuous upgrading and/ or refreshing.

Training needs

There was generally an acknowledgement that training is needed to close these gaps across all categories of respondents. About 46% of them indicated that they preferred to be trained outside the country whilst 24% preferred to be trained locally (Figure 5). The general preference for external institutions includes the availability of state of the art facilities, most of which are not locally available. In addition, training needs for mining firms are generally centred on equipment use and handling. The original equipment manufacturer is generally preferred for such kind of training. Given that most original equipment suppliers are external, this influences the choice of external trainers. Those who preferred being trained locally cited that it is economical and the training would be more relevant as training would be tailor made for their specific needs. Localised training would thus be important since the Zimbabwean geology is unique with its mining needs being also unique. Local training, especially on-site training, has an advantage of bringing in better and relevant understanding.

Figure 5: Preferences of Training Location



The respondents were also asked to identify the institutions which they believe were better positioned to provide them with training to close off their identified training needs (Figure 6). These institutions include both the equipment suppliers and training institutions such as universities and colleges. Thus, once a decision has been made regarding the conducting of the training, training programmes can be made in consultations with such institutions.

Figure 6: Institutions identified as having capacity to provide training

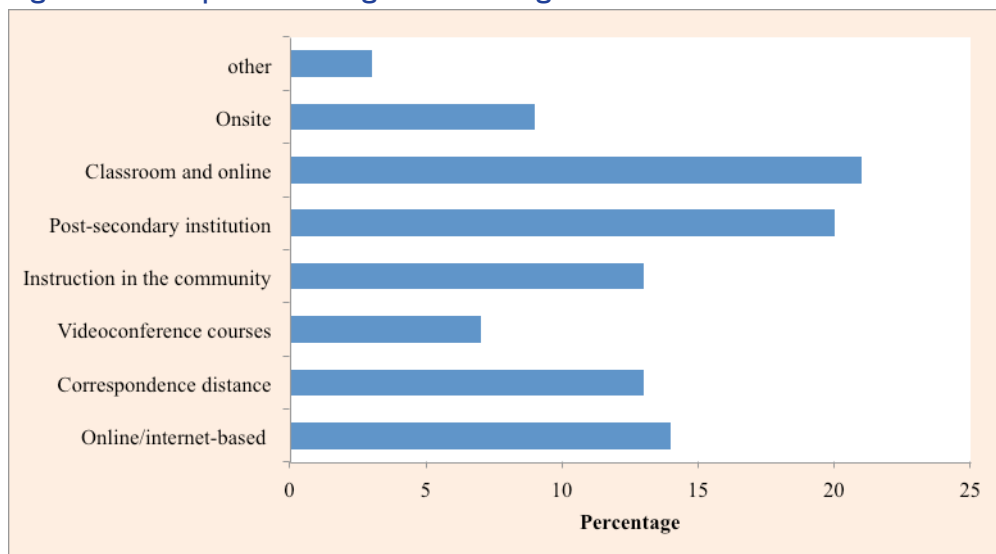
Outside Zimbabwe	Within Zimbabwe
<ul style="list-style-type: none"> • HRD Antiwep Belgium • Gemmological Institute of America • Indian Diamond Institute • Taproot Investigation USA • University of Dundee UK • University of Calgary Canada • University of Queensland Canada • Curtin University Australia • Japan Oil Gas Metals Corporation • Council for Geoscientists South Africa • University of Columbia • London School of Economics • Colorado University • Canadian Royal School of Mines • Polysius- Dutch • Clinker Coder- German • Killem- Danish • Mintek 	<ul style="list-style-type: none"> • Standards Association of Zimbabwe • Domboshava Training School • Harare Polytechnic College • Speciss College • University of Zimbabwe • Midlands State University • Zimbabwe School of Mines • Atlas Lopin • Sandvik • Hilmarks • Cockrain • Hoggie Rent • Hognuts • Masimba • Schinder • Alstrom • R mine- France • SAIMMM • GVW • Mine elect • Mining Companies • PPC Technical Sevices



Preferred Mode of Training

The respondents were also asked about the best mode of training they believe would be able to close the current skill gaps they have. The results show that a combination of classroom and online is the most preferred method, followed by enrolment for a course through a post-secondary institutions (Figure 7). Thus, training to be organised based on the respondents' preferences can take various forms, as the preferences are fairly distributed over a range of possible modes. The 'other' category includes internships in other organisations and countries where one can get hands on experience. It also includes training workshops and technical conferences.

Figure 7: Workplace Training Ideal for Organization



5.2 Capacity Challenges for Training Institutions

The country lost a lot of skilled and experienced personnel during the hyperinflation era to other countries. These could not be easily replaced by University graduates as they lacked the necessary skills and experience needed in the industry. Under the Medium Term Plan (MTP) 2011, it was recommended that the government offer competitive remuneration packages in order to attract and retain key skills for the mining sector like geologists, engineers, technicians and managers. To address skills shortages the MTP suggested the capacitating of training institutions, especially the Zimbabwe School of Mines (ZSM) and also



setting up training programmes by the Ministry of Mines and Mining Development at affordable fees. Most of these measures, however, were not implemented, therefore implying that such gaps could still be in existence.

ZimAsset also acknowledges skills development as crucial in achieving sustainable development under the value addition and beneficiation cluster. The mining industry also acknowledges the importance of skills development. In his annual speech of 2014, the President of Chamber of Mines acknowledged that mines need suitable skills at all levels and that it is important to ensure that Zimbabwe universities and colleges produce graduates whose skills are aligned to national requirements.

Respondents were further asked about their opinion on the alignment of the mining training programmes to the requirements from the industry. Industry sentiments show some level of dissatisfaction with the calibre of graduates being churned out by local training institutions. From the industry point of view local training institutions go through a lot of theory with very limited scope for the application of the knowledge gained once employed. Nonetheless, there are capacity challenges being faced by training institutions which also hamper their ability to deliver on industry expectations. Interviewees from the training institutions cited the following challenges:

- Lack of funding for academic research;
- Lack of laboratories and laboratory equipment which is critical for developing competencies ;
- Shortages of teaching facilities and modern reading materials and other technologies;
- The new equipment in the mining industry is highly computerized and is constantly evolving; hence the need for local institutions to keep abreast with technological changes; and
- Skeletal staff in the University Departments (Geology, Mining Engineering, Geoinformatics, Metallurgy and Institute of Mining Research) which makes it difficult to administer some important courses.

The industry players interviewed also noted capacity challenges, which makes it difficult for optimal performance. These include:



- Servicing of equipment as most of the imported equipment require expertise of the original manufacturer;
- Lack of soft skills for technical staff who land managerial positions;
- Lack of supportive policies by the Government intended to boost and incentivise production;
- The general high cost of doing business (High bank lending interest rates, Debt overhang, limited cash-flow, high power tariffs);
- Outdated equipment and infrastructure; and
- Lack of spares.

The Government is also faced with a tight fiscal space, with revenues being generated failing to meet expenditure. This has affected performance of key institutions, including those related to mining sector. Consequently the following were highlighted as capacity issues within Government departments;

- Lack of modern technologies, which result in reliance on manual procedures and use of outdated machinery and methods, making systems inefficient;
- Lack of critical skills due to high staff turnover due to low remuneration;
- Inadequate funding;
- Lack of Standards Certification for services rendered to clients, which affects consumer confidence and perceptions of the organisations' ability to deliver.



CHAPTER 6

TRAINING NEEDS ASSESSEMENT

As explained in Chapter 4, training needs assessment generally encompasses three stages; identifying the needs, analysing the needs and deciding which needs can be closed through training. Thus, the assessment can be done for the Zimbabwe mining industry as follows:

6.1 Identifying skills gaps that can be closed by training

Identifying needs generally involves identifying the gap between the desired and the current skills. Expectations of knowledge, skills and abilities of employees at different levels vary and so do their training needs. For Government institutions, the desired skills are generally summed up within their mandates, as described in Chapter 3. Based on the mandates and expected roles in the mining industry, a list of skills which would be expected can be drawn (Box 2).

Box 2: Ideal skills needed for Government institutions in Zimbabwe

Mineral marketing skills	Mining promotion skills	Managerial skills
Mineral prospecting skills	Mineral exploration skills	Mining development skills
Geological skills	Mining engineering skills	Mineral refining skills
Metallurgical skills	Mining research skills	Fire assaying skills
Laboratory technical skills	Legal enforcement skills	Surveying skills
Cartographic skills	Mineral dressing skills	General soft skills

For the private sector, the required skills are those mostly at primary stage as well as secondary stages described in Figure 4 in Chapter 6. There are also significant overlaps with those for Government institutions given in Box 2.



From the findings, it is evident that the minerals industry has some vast skills and knowledge. Numerous certificates, diplomas and BSc degrees are produced in the mining related disciplines. In one department in the Ministry of Mines and Mining Development, all technical people are degreed. This can explain why a fraction of the respondents felt that there are no skill/ knowledge gaps in the mining industry since there is a whole list of skills that span the professions required in the industry. The mining industry possesses knowledge which is the basis of competence in sufficient quantities. By simply going through the industry it is clear that the useful knowledge and skills are there. Nevertheless as observed in the survey the industry is not performing optimally. There are several factors behind this, including some which are not related to skills but general macroeconomic challenges.

Analysis of the current skills shows that most of the skills and knowledge in the minerals industry of Zimbabwe belong to the knowledge tier. This in itself fosters an operative level but the current knowledge by itself is not sufficient to propel the country to the required levels. A provision of an integration that would infer further knowledge is required. There must be an understanding of what is currently known and evaluation of the understanding in order to achieve the expected outcome. There is need for mining industry to move from knowledge tier to an understanding tier and finally the wisdom tier.

The understanding tier entails putting knowledge together to solve problems. Understanding is an interpolative and probabilistic process that is cognitive and analytical. In this tier new knowledge and new information is synthesised from what is currently known and understood. In the minerals industry, this tier would imply synthesis of current knowledge to suit the Zimbabwean industry by moving from a theoretical to a practical level using the Zimbabwean space as the laboratory. The wisdom tier is what adds value to our commodities through product formulation and component manufacture. There is considerable knowledge (application of data and information) in the mining sector but that knowledge needs to be further developed into understanding (appreciation of “why) and wisdom (evaluated understanding).

However, knowledge gaps exist in the industry as already described in Chapter 6. A look at the current knowledge gaps for Government institutions, as given in Box 1, generally reveals that while there are some skills available, there are

gaps at all technical and managerial levels in the key institutions. Given that there was an acknowledgement on knowledge deficit to such high levels, it can be concluded that the gap between the ideal and current is currently high in government institutions. A look at what current training institutions can offer generally reflects that the gaps mostly lie at the practical implementation stage rather than at theoretical stages. Thus, given that colleges and universities are still churning out technicians every year but the skills gap continues to be felt in institutions, these skills cannot be closed through enhanced theoretical platforms such as taught masters (MSc), masters by research (MPhil) and Master of Technology (MTech). Skills from current graduates who are still unemployed can be utilized if hiring challenges are resolved.

However, extensive programmes where officials in Government institutions and departments are exposed to practical platforms can go a long way in closing the current skills gap. This can also include modification of the current curriculum to ensure that practical hands-on experience is given more prominence to prepare the students for mining industry requirements. This also includes constant refresher courses and exposure to some latest technologies in the industry, to ensure that government officials get a better understanding of the mining environment for better regulation and discharge of their duties. The current situation, where there are a lot of skill gaps among the key Government mining institutions does not generally augur well with government policy objectives.

In Zimbabwe, there is currently an over reliance on external expertise. The challenge with this is that there is little knowledge transfer to the local experts from the external experts. Strategies on ensuring such transfer could be viable training methods useful in closing off the identified gaps.

Among the mining firms themselves, all the categories of the necessary skills are generally available in the industry. However, there are some few challenges that limit the quality of the skills available. The interface between mining houses and training institutions is currently very weak, resulting in additional resources needed to ensure that the technicians meet industry expectations. One reason for this is lack of hands-on equipment at training institutions, which is similar to what they would be expected to use in the mining industry.



However, there are some glaring skills that were identified as lacking during the study. These include exploratory skills. Although technical skills are available at operations level, most of the exploration for the mining houses was done decades ago. New explorations by the mining houses are being curtailed by lack of exploration skills. This is also due to financial challenges to invest in such skills at organisation level.

As already mentioned, SHEQ skills were also found to be lacking among most mining houses during the study. Most of the mining houses are struggling to go for over five years without a fatality, and investing on SHEQ skills is often curtailed by financial challenges. The mining industry is also worried that the bulk of their products are exported in raw form. They also point out at the non-availability of value addition and beneficiation skills as one of the major challenges towards enhanced value addition as espoused under ZimAsset.

There is a generally accepted notion among mining houses that due to the availability of technicians, at the technical level, skills are generally available while at management level, the skills are generally weak. This is due to the fact that most people performing managerial roles are technicians who were promoted over the years without undergoing training for the supervision skills, business management, industrial relation skills and even the general soft skills required at managerial levels such as financial management. This also affects production, as decisions which require soft skills are often not done on best practices.

These are generally the identified skills gap that can be addressed by training. They range from business knowledge/ acumen, adaptability, analytical skills, innovation, persuasion and problem solving. The new area of beneficiation and value addition as articulated in government policy also calls for specialised skills in value addition and beneficiation, such as jewellery design and gemology. This inevitably may require investment in new training institutions and/ or upgrading and expansion of mandates of existing institution which need to be adequately staffed.

6.2 Strategies to address skills, knowledge and capacity needs

Local training institutions need to broaden their scope and introduce new courses targeting deficient areas as well as develop/outsourcing skilled personnel to deliver these programmes. Some of the ways that the study identified as possible ways of addressing the skills, knowledge and capacity needs include the following:

- Partnership of government departments with private players/ investors under the Public Private Partnerships (PPPs) envisaged in ZimAsset.
- There is a wide information gap between the industry players and the technicians in Government who are supposed to be promoting a conducive environment for the players. This may undermine the designing of policy interventions that are not responsive to the needs of industry players. Furthermore, the well-intended policy proposals may fail to be implemented if there is no buy-in from the stakeholders whose needs are not adequately addressed by the policy measures. In this regard exposing Government officials to the complexities of mining sector operations would give them hands-on experience that will better inform their thinking and diagnosis of the challenges being faced by mining sector operators on the ground. Enhancing of partnerships as well as information and knowledge sharing between Government and private mining sector firms will ensure the elimination of knowledge and skills gaps. Industry players can also contribute through supporting research and training the decision and policy making processes that influence developments in the minerals sector.

- **Getting more industry involvement in funding research and training**
Research skills are currently lacking among key government officials involved in policy making. Such skills need to be very relevant to industry performance, which calls for collaboration of industry and Government in conducting research. Industry can also fund research to assess the impact on industry of various policies as well as the implications of various mining methods to inform responsive policy interventions. The adoption of practical policies and enactment of user friendly legislations will further promote the growth of the mining sector. Consequently this will result in win-win outcomes where mining sector players enjoy growth in their mining operations and higher profits while government objectives of creating decent and secure jobs and mobilising more revenues are also met.

- **Localising expertise for mining equipment use**
A significant level of skill gaps exists due to lack of knowledge on operation systems for equipment which uses latest technology that would be supplied from outside. There is need to explore methods of ensuring that there is some significant level of expertise within Zimbabwe. This can be done by ensuring that incentives are put in place to encourage the setting up of equipment manufacturing units in Zimbabwe, where knowledge would be easily transmitted. Secondly, efforts



can be made to finance training of trainers workshops in Zimbabwe, where the original equipment manufacturers would be constantly training users about equipment use and management at one-off platforms in the country. Such training can make use of existing institutions, such as the School of mines.

- **Modification of the current mining sector curricular**

Given the failure of training institutions to produce technicians who are ready for mining firms' requirements, efforts should be made to modify the current learning system to make it more hands-on. This calls for greater collaboration between mining firms and learning institutions, aimed at ensuring that the students are exposed to all the equipment and tools used in the mining industry during training. Provision of attachments during the course of training should be intensified, which can be a win-win situation for both mining industry players (reduced labour costs and tapping into raw talent which be moulded through training to meet requirements) and the training institutions (who produce technicians who are fit for purpose). As the employability of graduates from these institutions increases so does their reputation which may further enhance their chances to mobilise more resources through partnering with the players in the mining sector. This may lead to further capacitating and equipping of tertiary institutions with the requisite infrastructure and equipment, which can be donated by the mining industry. Structuring of such win-win partnerships would go a long way in eliminating some of the identified skills gaps.

- **Strengthening of Zimbabwe information systems**

Although poor access to information, especially for legal issues in the mining industry can be due to non-availability of some critical information, in general most of the information already exist in Zimbabwe. However, access is difficult due to overreliance on manual systems rather than electronic platforms. Correct archiving of information can go a long way in solving some of the current challenges. There is need for mining sector information centres for dissemination and sharing of the available information, which include electronic libraries. This will expedite decision making; reduce transaction costs and unnecessary human interface which facilitate corruption.

- **Giving prominence to soft skills**

Skill gaps in the mining industry are also emanating from giving more prominence to technical skills and very little attention to the general soft skills that are necessary

for enhanced industry performance. This problem occurs for the mining sector firms as well as government institutions and departments. There is need for more courses designed to ensure that department heads possess all the necessary skills on general administration, which include human resource management, financial management skills, project management and Information Technology skills to enhance performance. This can be done through short, medium and long term courses specifically designed for mining sector practitioners.

- **Refresher and upgrading courses**

All the mining sector skills require regular upgrading in line with the changing sector requirements and expectations. It is therefore important that refresher course programmes are intensified aimed at addressing the capacity challenges identified in Chapter 6. Given that there is a general preference of classroom based courses as well as online courses, short courses can be negotiated for officials to participate while still employed. This would be crucial in closing off some of the skill gaps being identified at the workplaces.



CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

This study concludes that training needs exist in all segments of the value chain of the minerals industry. The skills that are needed include adaptability, analytical, innovation, persuasion and problem solving. Thus the skills can be categorised as transferrable skills. Most of the employees in the industry need to be trained. The existing gaps can be addressed by availing training that shifts the skills from the knowledge based to systems where practical and hands-on training is made central to human capacity development. Ideal training places thus would be on site and at centres of excellence, preferably in Zimbabwe. External training is preferred mostly due to the quest to locate original equipment manufacturers. In this regard is being recommended that mechanisms be put in place to facilitate that mining equipment suppliers offer in-country courses to support the proper use and uptake of their equipment. The more people are trained the greater the scope of knowledge and technology transfer. A combination of classroom based training; online/ internet-training; distance learning and video-conferencing can be used to skills.

Whilst Zimbabwe generally has the basic required technical skills needed for the minerals industry, there is need to develop the professionals so that their skills and knowledge moves to a higher tier and remains relevant to the market requirements. Human capital that understands and can evaluate knowledge need to be developed. In developing the human capital further it should be noted that administration in a technical industry needs a technical person with management skills. A management qualification without technical skills is not adequate while at the same time technical skills without management skills are not also

adequate. There is need for training programmes that are designed to ensure that management and technical skills exist jointly among both government and private mining sector institutions.

Once developed, the human capital can exercise their tasks only if they have appropriate state of the art tools of trade. The survey shows that most training institutions, organisations and some companies lack fundamental equipment. In some cases even the basic equipment is not available. Mining is capital intensive and so funding should be availed to facilitate implementation of bankable projects. There is need to develop geochemical laboratories in the country as the current dependence on outsourcing is not good for the growth of the industry. The procedure for sending samples out for testing requires a bureaucratic clearance process which, in some cases, causes leakages of minerals.

Many respondents in the mining industry indicated that they are not clear on government policy for the industry. This is due to lack of clear understanding of government goals stemming from lack of extensive consultation and consistency in policies. Policies need to be clear for the industry to know what is expected of them so that they quickly communicate challenges to Government. It was highlighted that the procedures for licensing are not very clear, which could also be due to lack of the legal analysis and interpretation skills which were noted by the study. The level of interaction between the industry and the legal services unit in the ministry needs to be increased.

A one stop shop minerals centre of excellence could also address some of the apparent knowledge/ skills gaps identified by the study. Such centres can be used to improve linkages among different players such as tertiary education, research institutions, industries and government.

A good example is the KPMG International's Mining Centres of Excellence dedicated to supporting companies in the mining industry to anticipate and meet business challenges. Located around the world, these centres comprise professionals from member firms with practical, in-depth industry experience. The centres draw on KPMG International's wider global network of practitioners to provide each member firm's clients with immediate access to some of the latest industry knowledge, skills, resources, and technical developments.



Given that mineral resources are not renewable, there is need to invest more in exploration skills to ensure that more minerals are discovered. This includes both at existing claims (by the mining houses) and in areas yet to be pegged to ensure that the production bases are expanded. There is need to learn modern exploration techniques such as high resolution geo-sensing, geophysics and chemistry and remote sensing. There is also need to learn GIS for manipulating data from the field. Mineral reserve estimation is also required as it was noted that there is very few mineral reserve data available.



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ANNEXURE: List of Institutions from which respondents were drawn for interviews

1. Chinhoyi University of Technology
2. Bindura Nickel Corporation
3. Mining Engineering Dept (MMMD)
4. Mining Engineering Dept (MMMD)
5. Drilling resources Zimbabwe -KW Blasting
6. Trojan Nickel Mine
7. Mining Promotion and Development (MMD)
8. Sandvick
9. Metallurgy Department (MMMD)
10. Chamber of Mines
11. MMCZ
12. Chemplex
13. Freda Rebecca
14. ZIMASCO
15. Zimbabwe Geological Survey
16. University of Zimbabwe Metallurgy Department
17. University of Zimbabwe Mining Engineering Department
18. Department of Legal Services (MMMD)
19. MIMOSA Mine
20. University of Zimbabwe Geology
21. Essar
22. University of Zimbabwe Geology Department
23. Institute of Mining Research
24. University of Zimbabwe
25. Sino-Zim Cement Company
26. Zimbabwe School of Mines
27. Met Solutions
28. PPC Cement Company
29. Kwekwe Polytechnic
30. Globe and Phoenix
31. National University of Science and Technology
32. Gwanda University College





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