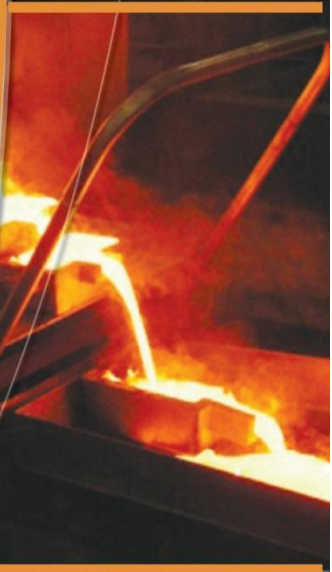
MINING QUALIFICATIONS AUTHORITY



Sector Skills Plan for the Mining and Minerals Sector Submitted by the Mining Qualifications Authority (MQA) to the Department of Higher Education and Training

Update 2019-2020

FINAL SUBMISSION

01 AUGUST 2018

FOREWORD

The Mining Qualifications Authority (MQA) prides itself in ensuring that the Mining and Mineral Sector (MMS) remains at the cutting edge of skills development. In keeping up with this progression, the MQA Board submits to the Department of Higher Education and Training (DHET) the Sector Skills Plan (SSP) update for the MMS for the period 2019-20.

The SSP has been prepared in such a way that its responds to the National Skills Development Strategy (NSDS) III and policies for driving the skills transformation agenda, aligned to the expectations of the DHET. This SSP has been presented to the Skills Research and Planning Committee and the MQA Board. The improvement of the skills of the MMS workforce is imperative for the economic development of our sector, improvement of our health and safety records and for the growth and wellbeing of all employees.

The main purpose of this SSP is to determine skills development priorities after an analysis of the skills demand and trends, as well as supply issues within the sector, with the aim of developing strategies that will inform interventions addressing skills development in the sector. This takes into account competencies that are fit for purpose, industry specific aligned to broader national development priorities. This was informed by a rigorous research process entailing a mixed methods research design, using both quantitative and qualitative research paradigms. The usage of a mixed methods research design aimed at ensuring credible research findings that are realisable, specific and generalizable, leading to manageable recommendations that will address skills development in the sector.

.....

Mr Mthokozisi Zondi
Chairperson: MQA Board

30/07/2018

Date

STAKEHOLDER ENDORSEMENT

This is the Sector Skills Plan update prepared by the Mining Qualifications Authority (MQA) for the Mining and Minerals Sector (2019/20). It is submitted to the Minister of Higher Education and Training in partial compliance with the requirements of the Skills Development Act of 1998 as amended. The MQA was registered as a Sector Education and Training Authority for this sector on 20 March 2000. The Sector Skills Plan update is hereby endorsed by duly authorized representatives of the state, employer organisations and organised labour in this national economic sector.

Endorsed by	For	Title	Signature	Date
Mr Mthokozisi Zondi	State: Department of Mineral Resources, Trevenna Campus, Building 2 C, Cnr Meintjes and Schoeman Street Sunnyside Pretoria. Private Bag X59 Arcadia 0007	MQA Board: Chairperson Regional Operations Coal - DMR		30/07/2018
Mr Amon Teteme	Organised Labour: National Union of Mineworkers (NUM) 7 Rissik Street Johannesburg. P O Box 2424 Johannesburg 2000	MQA Board: Convener – Organised Labour		27/07/18
Mr Mustak Ally	Employers: Minerals Council South Africa 5 Hollard Street, Marshalltown. P O Box 61809 Marshalltown 2107	MQA Board: Convener – Employers	M.A.Ally	27/07/2018
Mr Tebogo Mmotla	MQA: 7 Anerley Road Parktown Johannesburg Private Bag X118 Marshalltown, 2017	Acting Chief Executive Officer of the MQA		27/07/2018

ACRONYMS

Acronym	Description	Acronym	Description
ABET	Adult Basic Education and Training	MQA	Mining Qualifications Authority
AET	Adult Education and Training	Mt	Metric ton
AIDS	Acquired Immune Deficiency Syndrome	MTSF	Mid Term Strategic Framework
APP	Annual Performance Plan	NC	Northern Cape
APR	Annual Performance Report	NCV	National Certificate Vocational
ATR	Annual Training Report	NDP	National Development Plan
BEE	Black Economic Empowerment	NGP	National Growth Path
BER	Bureau of Economic Research	NMBLP	Nelson Mandela Bay Logistics Park
Bn	Billion	NQF	National Qualifications Framework
CAD	Computer-Aided Design	NRF	National Research Fund
CAGR	Compound Annual Growth Rate	NSA	National Skills Accord
CETA	Construction Education and Training Authority	NSSP	National Sector Skills Plan
CGS	Council of Geoscience	NSDS	National Skills Development Strategy
CHIETA	Chemical Industries Education and Training Authority	NUM	National Union of Mine Workers
CLAS	Cement, Lime, Aggregates and Sand	NYP	National Youth Policy
COM	Certificate of Minerals	NGP	National Growth Path
CSIR	Council for Scientific & Industrial Research	NW	North West
Ct	Carat	OFO	Organising Framework for Occupations
DEA	Department of Environmental Affairs	OHS	Occupational Health and Safety
DHET	Department of Higher Education and Training	OECD	Organisation for Economic Cooperation & Development
DMR	Department of Mineral Resources	PGDP	Provincial Gross Domestic Product
DoE	Department of Energy	PDP	Provincial Development Plan
DoL	Department of Labour	PGMs	Platinum Group Metals
DST	Department of Science and Technology	PICC	Presidential Infrastructure Coordinating Commission
EC	Eastern Cape	PIVOTAL	Professional, Vocational, Technical and Academic Learning
ECSA	Engineering Council of South Africa	PSET	Post School Education Training
EMIS	Education Management Information System	PSDF	Provincial Skills Development Forum
ESETA	Energy Sector Education and Training Authority	QLFS	Quarterly Labour Force Survey
FASSET	Financial & Accounting Sector Education and Training Authority	R&D	Research and Development
FDI	Foreign Direct Investment	RSSP	Regional Sector Skills Plan
FET	Further Education and Training	SARB	South Africa Reserve Bank
FS	Free State	SANEDI	South African Energy Development Institute
GCC	Government Certificate of Competency	SAMDA	South African Mining Development
GDP	Gross Domestic Product	SDA	Skills Development Act
GDP	Gross Domestic Product	SERO	Socio-Economic Review and Outlook
GES	General Engineering Supervisor	SETA	Sector Education and Training Authority
GET	General Education and Training	SEZ	Special Economic Zone
GGS	General Government Services	SHEQ	Safety Health Environment & Quality

ACRONYMS (Cont.)

GP	Gauteng Province	SIC	Standard Industrial Classification
GVA	Gross Value Added	SDA	Skills Development Act
GWM&E	Government- Wide Monitoring and Evaluation	SIP	Strategic Infrastructure Project
HDSA	Historically Disadvantaged South African	SLA	Service Level Agreement
HET	Higher Education and Training	SMME	Small, Medium and Micro Enterprise
HIV	Human Immunodeficiency Virus	SOE	State Owned Enterprise
HR	Human Resources	SSP	Sector Skills Plan
HEMIS	Higher Education Management Information System	SIP	Strategic Infrastructure Project
HRDS-SA	Human Resources Development Strategy for South Africa	Stats SA	Statistics South Africa
IDP	Integrated Development Plan	STEM	Science Technology Engineering & Maths
IMF	International Monetary Fund	TETA	Transport Education and Training Authority
INSETA	Insurance Sector Education and Training Authority	TIMSS	Trends International Mathematics & Science Study
IRM	Industrial Raw Materials	WSP	Workplace Skills Plan
IPAP	Industrial Policy Action Plan	TVET	Technical and Vocational Education and Training
KZN	KwaZulu-Natal	UASA	United Association of South Africa
LDEDAT	Limpopo Department for Economic Development and Tourism	UCS	Underhill Corporate Solutions
LMI	Labour Market Intelligence	UoT	University of Technology
LP	Limpopo Province	WBL	Work Based Learning
M&E	Monitoring and Evaluation	WC	Western Cape
MBAP	Mineral Beneficiation Action Plan	WIL	Work Integrated Learning
MCSA	Mineral Council South Africa	WP-PSET	White Paper - Post School Education and Training
MBS	Mineral Beneficiation Strategy	YEA	Youth Employment Accord
Mct	Metric carat		
MDP	Management Development Programme		
MHS	Mine Health and Safety		
MOU	Memoranda of Understanding		
MOA	Memoranda of Agreement		
MMP	Mandela Mining Precinct		
MMCC	Mine Manager Certificate of Competency		
MMS	Mining and Minerals Sector		
MPRDA	Minerals and Petroleum Resources Development Act		

TABLE OF CONTENTS

FOREWORD ii
ACRONYMS iv
ACRONYMS (Cont.) v
EXECUTIVE SUMMARY viii
RESEARCH PROCESS AND METHODS xi
1. SECTOR PROFILE 1
1.1 Introduction 1
1.2 Scope of Coverage 1
1.3 Key Role Players 1
1.4 Economic Performance 4
1.5 MMS Future Outlook 8
1.6 Employer Profile 9
1.7 Labour Market Profile 10
1.8 Summary and Conclusion 17
2. KEY SKILLS ISSUES 18
2.1 Introduction 18
2.2 Change Drivers 18
2.3 Alignment with National Strategies and Plans 21
2.4 Conclusions 25
3. OCCUPATIONAL SHORTAGES AND SKILLS GAPS 26
3.1 Introduction 26
3.2 Occupational shortages and skills gaps 26
3.3 Extent and Nature of Supply 30
3.4 Summary of skills gaps 43
3.5 PIVOTAL list 44
3.6 Conclusions 46
4. SECTOR PARTNERSHIPS 47
4.1 Introduction 47
4.2 State of Existing Partnerships 47
4.3 Proposed New Partnerships 52
4.4 Conclusions 54
5. SKILLS PRIORITY ACTIONS 55
5.1 Key research findings 55
5.2 Conclusions 58
REFERENCE LIST 59

LIST OF FIGURES

Figure 1: Research Process....xii
Figure 1.1: Mining and Minerals Sector Value Chain 5
Figure 1.2: Value of sales of total minerals 7
Figure 1.3: Management levels by race 12
Figure 1.4: Employment by education level 13
Figure 2.1: Industry Fatalities trends (2007-2018)....20
Figure 3.1: MQA Learnerships (excluding apprenticeship): Target vs. Actual 2017-18 33
Figure 3.2: Top 10 Learnerships completed in 2017-18 (excluding apprenticeships) 33
Figure 3.3: MQA Learnerships (Apprenticeship): Target vs. Actual 2017-18 34
Figure 3.4: Apprenticeship qualifications completed (6-year trend) 35
Figure 3.5: Summary of supply-side concerns.... 43
Figure 4.1: Model for successful partnership....54

LIST OF TABLES

Table 1-1: National Government Departments.... 1
Table 1-2: MMS State-Owned Enterprises and their Roles.... 2
Table 1-3: Industry Stakeholders.... 3
Table 1-4: Sector contribution to national GDP 7
Table 1-5: Number of companies submitting WSPs.... 9
Table 1-6: Geographical location of MMS companies 10
Table 1-7: Profile of MQA registered companies (SETA 16) by subsector 10
Table 1-8: Composition of MMS employees by gender and race 11
Table 1-9: Management Levels by race and gender 12
Table 1-10: Employment trends in the MMS 14
Table 1-11: Employment trends in the MMS....13
Table 2-1: Alignment of the MQA Strategic Plan to Government National Policies and Strategies. 21
Table 3-1: Hard-to-fill vacancies.... 26
Table 3-2: Hard-to-fill Vacancies from Stakeholders Engagement 27
Table 3-3: Occupational shortages by vacancy intensity rate.... 28
Table 3-4: Occupational vacancies by category 29
Table 3-5: Apprenticeship learnerships entered and completed (Updated but to be verified) 35
Table 3-6: Certificates issued by Minerals Council South Africa 41
Table 3-7: Graduate numbers in MMS-related qualifications 37
Table 3-8: Graduate numbers in MMS-related qualifications, by gender and race, *2016 38
Table 3-9: Non-employee bursaries funded by employers.... 38
Table 3-10: Employee study-assistance programmes funded by employers 39
Table 3-11: MQA-funded bursars.... 40
Table 3-12: Certificates of Competency issued by DMR (5-year analysis).... 41
Table 3-13: Primary skills concerns in the MMS 43
Table 3-14: MQAs' OFO Code Pivotal List (2018-19).... 45
Table 4-1: Partnerships with TVET colleges....48
Table 4-2: Community Colleges with partnerships with MQA....49
Table 4-3: Successes, Failures and Improvement areas for TVET and Community Colleges....50
Table 4-4: Partnership with universities....51

EXECUTIVE SUMMARY

1. Introduction and Background

The Sector Education and Training Authority (SETA) for the Mining and Minerals Sector (MMS); the Mining Qualifications Authority (MQA) prepared this Sector Skills Plan (SSP) update in accordance with the Department of Higher Education and Training (DHET). The main purpose of this SSP is to inform and support skills development initiatives in the sector.

2. Research methodology

A mixed methods research design, encompassing desk research, quantitative and qualitative methods were used to develop the SSP. The study focused on the nine subsectors within the MMS to gather both primary and secondary data.

The study was initiated by desk research where secondary data was collected using different data sources. These data sources comprised of but not limited to, data sets such as the MQA's WSP/ATR and Annual Performance Report (APR), the Department of Mineral Resources' (DMR) employer statistics, public labour report, report on fatalities and injuries as well as government certificates of competence report, DHET's Higher Education Management Information System (HEMIS) and Occupations in high demand, the Department of Basic Education's (DBE) Education Management Information System (EMIS) and certificates issued by the Minerals Council South Africa.

Quantitative research entailed the analysis of secondary data mentioned above to highlight the sector's economic performance, the MMS contribution to the economy, employer profile by province and subsector as well as employment trends by subsector and province. Findings related to occupational shortages and skills gaps in the sector are informed by quantitative and qualitative data analysis.

Furthermore, to gain a nuanced understanding of the nature of demand and supply in the sector as well as to illuminate on the quantitative research findings, a qualitative method was used to reflect on the macro and micro factors affecting skills development in the MMS. In this context, views were elicited through stakeholder engagement sessions as well as in-depth interviews with the sector's key role players. The nature of this data enabled delving deeper into factors affecting skills development in the sector.

The focus in all nine subsectors of the MMS, the chosen research methodology, the usage of different data sources as well as data collection techniques were all intended to meet triangulation requirements. This increased validity, reliability and generalizability (applicable or replicable at least across the sector) of the research findings and conclusions. The mixed methods research design was able to minimise research bias and enhance validity by capturing a more comprehensive, holistic and contextual portrayal of the sector that revealed various dimensions of the subsectors in the MMS.

Below are the key findings of the research.

3. Sector Profile

A seven year analysis of the sector reveals a decline in the number of employees from a peak of 628750 in 2012 to 493 471 in 2018, except for 2016 -2017, where the sector recorded a 5.9% increase. Cement, Lime, Aggregates and Sand (CLAS) (-14%), Services Incidental to Mining (-11%) and Gold (-6%) declined the most on average over the 7 year period between 2012 and 2018. As a result, on average over this period there has also been a decrease in the reported number of

employees by occupational categories, with the most significant comprising Elementary Occupations (-5%). Provincially, employment levels have been declining steadily in most provinces with Free State (-13%), Eastern Cape (-8%) having the worst hit between 2012 and 2018 whilst growth in employment has been recorded only in Gauteng with an average rate of 4%. The Learners and Trades categories are the only occupations to have shown growth in average employee numbers over the period, with a 5% and 2% increase respectively. The MMS remains a male dominated sector employing 84.9% of males. The proportion of females has been increasing gradually, from 11% in 2012, to 15.2% in 2018 whilst males have decreased from 89% to 84.9% over the same period. It is important to note that the average growth rate of females employed within the sector over the 7 year period is 1.1%. Africans continue to be the dominant racial group in the MMS with an 86% overall representation. The equity profile of Managers depicts that from a total of 13455 managers in 2018, majority (52%) are represented by Whites followed by Africans at 41%. The average annual growth rate over the 7 years for Africans in management is 0.2%. The disability figures in the sector remain a concern, showing minimal change in numbers employed during the 7 year, with an average growth rate of -1%.

4. Key Skills Issues

Through the use of the PESTEL analysis, the report identified macro and micro factors that continue to shape the skills development landscape within the MMS. Low commodity demand, sluggish investment growth and the ever-changing exchange rate play a critical role in the economic growth and contribution of the sector against the GDP. The integration of new and advanced technological applications in mining process and operations is transforming the landscape of the skills demand within MMS. This change places a new demand on the type, level and mix of skills and qualifications required by the sector. To meet this emerging demand, it is becoming imperative for employers to equip employees with relevant emerging skills to ensure that they are well versed with the digital and technologically advanced space brought by the fourth industrial revolution. A focus, for example, could be starting to train plant operators and elementary workers to operate new machinery and coordinate new processes that support their progression towards technical occupations.

The section also took cognisance of key drivers such as enterprise development and its impact on job creation, community unrests and the impact of HIV/AIDS given the burden that comes with loss of key skills and replacement costs. Another driver relates to environmental sustainability. The MMS is becoming more conscious of the growing need to protect the environment by mining in an environmentally sustainable way. Energy and water efficiency, as well as the reduction of pollution, are increasing imperatives resulting in the need for skilled workers to source 'green' products and services and manage 'green' supply chains. This raises a need to focus on conservation of natural resources, preservation and restoration of the environment. Essentially, these drivers constantly change, they bring opportunities to be capitalised on and threats to be mitigated as they require skills development efforts to be responsive and flexible to adjust accordingly.

5. Occupational Shortages and Skills Gaps

The methodology that was used to ascertain the hard-to-fill vacancy list was determined by conducting a frequency run of the top 10 mostly identified occupations by organisations. This was then cross-tabulated by provinces, subsectors and the top 100 occupations in high demand through identifying the number of occurrences between the 3 variables. Thereafter, the sum of provinces and subsectors was used to rank the top 10 occupations in demand within the MMS.

This information was then corroborated with the findings from the expert interviews which revealed the top 10 hard-to-fill vacancies as:

Engineering Manager, Mining Operations/Production Manager, Mining Engineer, SHE&Q Practitioner, Mining Production Supervisor, Engineering Supervisor, Boilermaker, Diesel Mechanic, Millwright and Rigger. The reasons accounting for these vacancies ranged from individual, organisational and supply side levels. At individual level, reasons include lack of skills, relevant qualifications, experience, high salary expectations and lack of career awareness. At organisational level, a recurring reason for most of the hard-to-fill vacancies identified by industry experts is the lack of competitive compensation structures to attract potential employees. Additionally, the lack of experience due to a lack of succession planning and lack of knowledge about career options that lead people into specialised positions contribute to hard-to-fill vacancies. At supply level, reasons include the lack of accredited training providers as well as the provision of generic, but not vocationally orientated qualifications with subject specialisation.

All these factors intersect and reinforce one another to create the challenge of hard-to-fill vacancies in the labour market. What is clear is that efforts to address the challenge should not be isolated but well-coordinated and integrated to develop a holistic approach that involves a wide range of social partners.

6. Sector Partnerships

Between 2016 and 2018, the MQA entered into partnerships with TVET and Community colleges to provide support by funding bursaries to students and lecturers as well as to train lecturers in assessment and moderation. The support of colleges was also in the form training in corporate governance as well as monitoring and evaluation. There is also a workplace experience programme which intends to place lecturers in mines to gain industry knowledge and learners to undergo experiential training. Information with regard to these interventions is reflected in the report.

Furthermore, between 2012 and 2017, there was another initiative that involved eight universities where 69 historically disadvantaged deserving and qualified persons were placed as junior lecturers within the mining and geology departments across various universities. The purpose was to take them through a mentorship programme to gain more experience with possible permanent absorption. Out of 69 lecturers who were placed, 20 were absorbed in the universities they were mentored. More engagement with universities is critical to scale up the number and also identify challenges for corrective action. Against this backdrop of information, a new model for sector partnership is hereby proposed to approach partnerships in a strategic manner and thus, ensuring that skills development efforts are well integrated and coordinated with a holistic approach to maximise the value of partnerships.

7. Skills Priority Actions

As a result of the findings in this SSP, the following skills priorities are recommended:

- Priority 1: Facilitate transformation of the sector through skills development
- Priority 2: Continue to support interventions to improve mine health and safety through skills development
- Priority 3: Continue to monitor and provide support to interventions responding to technological changes
- Priority 4: Monitor and support interventions aimed at developing the skills required for minerals beneficiation
- Priority 5: Focus on increasing support to address the hard-to-fill vacancies in the MMS.

RESEARCH PROCESS AND METHODS

I. Introduction

The purpose of this section is to outline the research methods and the rationale, research tools, sampling, data collection techniques as well as data analysis techniques used in this report. The research design was guided by the 2016-18 Sector Skills Plan framework.

II. Research Paradigm - Mixed Methods Research Design

A sequential mixed methods research design, encompassing desk research, quantitative and qualitative methods were used to develop this SSP. The usage of both quantitative and qualitative research enabled the researchers to acquire extensive and depth understanding of the MMS, while offsetting the weaknesses inherent to using each approach solely. An additional advantageous characteristic of using mixed methods in research is the possibility of triangulation (the use of several means of methods and data sources to examine the same phenomenon). Through the triangulation of data, findings are intended to ensure that conclusions meet the methodology and procedural requirements of *reliability* and thus, ensuring that the same conclusions can be made by using the same methods- *validity*. This then ensures that decision making with regard to skills planning is well informed by empirical evidence which brings to the surface skills development matters that are relevant, significant and could be *generalizable* (Yin, 2010) to have cross contextual application as well as informing future research.

III. Objectives of the Study

The research aims to cover the following objectives:

- Provide an overview of the profile of the Minerals and Mining Sector.
- Highlight any skills mismatches between demand and supply in the sector.
- Investigate the primary reasons for the skills mismatches.
- Determine the key change drivers impacting the sector where skills development is concerned.
- Discuss existing partnerships and define a model for future partnerships.
- Identify priority areas for skills development within the MMS.

IV. Research Question

It was from the above objectives that the SSP pursued an answer to the following primary question: “What are the key issues influencing the Mining and Minerals Sector which are either currently or have the potential to impact skills supply and demand, as well as skills development?”

V. Research Limitations

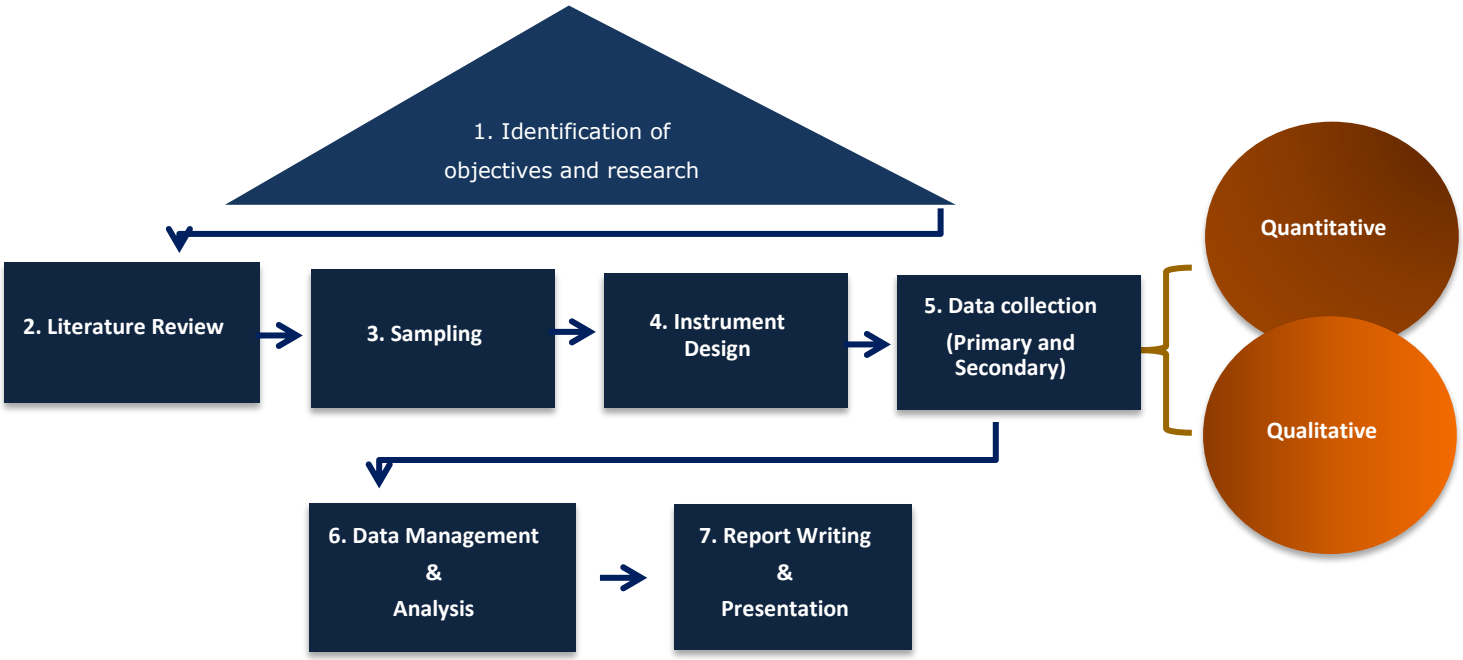
In terms of analysis of data, the focus was on companies that submitted WSP-ATRs as required by the Skills Development Act 97 of 1998 as well as Skills Development Levies Act 9 of 1999. For the current financial year, 759 companies out of 2157 registered companies in the MMS submitted WSP-ATRs. The Mine Health and Safety Act of 1996 requires that all mine licenced companies, regardless of size, submit their WSP-ATRs to the MQA. However, the current WSP-ATR submission numbers indicate that not all companies registered against SETA 16 are submitting. This presents a challenge in ensuring reliability of data as it limits the scope of analysis. As indicated earlier, data triangulation and analysis allows the researchers to identify correlating concepts and findings for generalisation. The development of significant relationships as the key findings might not include the views of companies that did not submit the WSP/ATR. In addition, in-depth interviews conducted with industry experts and key role players covered 7 out of 9 subsectors of the MMS, with no participation from Diamond Processing and CLAS.

To address issues pertaining to data limitation, quantitative data was weighted using MQA WSP/ATR dataset, DHET's levy file and DMR's Public Labour data to provide a representative outlook of the sector. On the other hand, the non-representation of industry experts for the Diamond Processing and CLAS subsector in the in-depth interviews was addressed by the stakeholder engagement workshops which had full representation of all subsectors, organised Labour and the State.

VI. Research Process overview

The diagram below illustrates a step by step process undertaken to conduct the research commencing with the identification of the objectives and research question, how the research question informed the research paradigm, data collection process and subsequently, the analysis and report writing.

Figure 1: Research Process



Research was initiated by desk research (literature review) which entailed the collection of secondary data to inform or add value to other research methods used in the SSP.

VII. Desk Research (Literature Review)

A thorough search of literature was an imperative element of this research. Desk research consists of critically reading, evaluating and organising literature related to the research topic and assessing the state of knowledge in the area (Schirmer and McGough, 2005). Desk research involved gathering and analysing data from sources within MQA such as the WSP-ATR, APR and external reports from various institutions such as the DMR, DHET, DBE, and Minerals Council South Africa.

VIII. Sampling

For quantitative research, no sampling was applied as the entire population (companies that submitted WSP-ATRs) formed part of the study. In contrast, considering the need to obtain in-depth views of factors affecting skills development in the sector, qualitative research required the capturing of knowledge that is rooted in a particular form of expertise, and thus, the purposive expert sampling technique was used to develop a sample of industry experts to be interviewed.

Purposive expert sampling is a non-probability sample that is selected based on characteristics of a population and the objectives of the study (Crossman, 2018). The main objective of a purposive sample is to produce a sample that can be representative of the population by applying expert knowledge of the population to select in a non-random manner, a sample of elements that represents a cross-section of the population that will best enable the researcher to answer specific research questions (Lavrakas, 2008 & Palinkas et al., 2013).

Following DHET's proposal for each SETA to conduct at least 10 interviews for the 2017-2018 training year, the targeted sample size for the in-depth interviews was 10, with the aim of having at least 1 key-informant out of each of the 9 MMS subsectors. A total of 11 interviews were conducted comprising the Coal, Diamond, Gold, Other Mining, Services Incidental to Mining, Platinum Group Metals (PGM) and Jewellery Manufacturing subsectors representing medium and large companies across all nine South African provinces. In addition, interviews were conducted with Labour representatives and academics in the sector. Above the in-depth interviews, a total of 9 stakeholder engagements in the form of focus group discussions were conducted in all nine provinces of South Africa. The focus group participants followed the same selection criterion as the in-depth interviews' respondents.

IX. Research Instruments

To achieve the objectives of the research, data collection was guided by research instruments. Two discussion guides were used to collect qualitative data, one designed by the MQA for the stakeholder engagements and another by the DHET for the in-depth interviews. The WSP-ATR template on the other hand, was used to collect the quantitative data.

X. Reliability, Validity and Ethical Consideration

The reliability of measuring research instrument(s) demonstrates the consistency of the measurements (Eiselen, Uys & Potgieter, 2005). A measuring instrument is consistent if it produces equivalent results for repeated measurements (Eiselen, Uys & Potgieter, 2005). Additionally, the quality of a measuring instrument is also determined by looking at its validity. According to Eiselen, Uys & Potgieter (2005) validity refers to the degree to which the measuring instrument measures what is supposed to measure. Therefore, to ensure validity and reliability of data, a standardised screening tool was adopted for the selection of stakeholders and industry experts according to their subsectors and expertise of the sector. This ensured that the relevant profile of respondents were chosen. Prior to their participation in the research, permission was obtained from respondents after they were thoroughly informed about the purpose of the research. With that, respondents were assured that their participation in the study was completely voluntary. In addition, all interviews were recorded and supplementary notes were taken during interviews and stakeholder engagement workshops.

XI. Data Collection

a) Quantitative Data Collection

Quantitative data was mainly secondary with the use of data obtained from the WSP-ATR, SA's Quarterly Labour Force Survey (QLFS) and Quantec data on mineral sales and exports as well as Minerals Council South Africa's facts and figures data. Data utilised highlighted the sector's economic performance, the MMS contribution to the economy, employer profile by province and subsector, employment trends by subsector and by province and employer profile with particular focus on the demographic composition of the MMS workforce as well as occupational shortages and gaps in the sector.

b) Qualitative Data Collection (Stakeholder engagements and In-depth Interviews)

Qualitative data was collected through stakeholder engagement workshops and in-depth interviews with key role players/industry experts in the sector. These were conducted in January and June 2018. Stakeholder engagement workshops and in-depth interviews aimed at reflecting the macro and micro issues within the MMS to gain nuanced insightful understanding of matters pertaining to the demand and supply of skills in the sector. This was done to enable triangulation of data to determine factors such as hard-to-fill vacancies, skills gaps, change drivers and priority actions to be considered for the sustainability and growth of the sector.

XII. Data Management and Analysis

The first step of data management for quantitative data involved outlining all variables of interest that were going to be used for the analysis, e.g. variables pertaining to employee and labour profile, training interventions (planned and achieved), hard-to-fill vacancies etc. Once all variables were identified, the data was transferred into Excel files where the researchers cleaned it through addressing missing data (identifying and labelling them) and recoding some variables. The data was then weighted to make it more representative of the MMS.

The analysis used for quantitative data consisted mostly of descriptive statistics (frequency tables and cross-tabulations) which described the features of the data in the study. Mean comparisons were also conducted to identify the number of training interventions and the sections related to hard-to-fill occupations.

For qualitative research, all recordings were transcribed following the DHET's interview template and MQA's stakeholder discussion guide. The MQA's Board sub-committee (Skills Planning and Research Committee) provided input, guidance and oversight throughout the SSP development. In addition, interview notes were also used to check transcripts for accuracy and assist in interpretation. Content analysis was used to analyse qualitative data. This entailed reading over transcripts to identify sub-themes and key themes that emerged from the different participants. The purpose of content analysis is to organise and elicit meaning from the data collected and to draw realistic conclusions from it (Bengtsson, 2016). From that, the researchers were able to decide on which themes made meaningful contributions to understanding the data (Braun & Clarke, 2013).

XIII. Report Writing and Presentation

Report writing entailed the incorporation of evidence supported by the analysis of literature reviewed, quantitative and qualitative data. The report is stratified into different chapters as guided by the 2016-18 SSP framework and covers all the 9 subsectors of the MMS.

Upon completion of report writing, the report was disseminated and presented to the MQA's sub-Board Committee which comprise representatives from Employers, Labour and the State for inputs.

1. SECTOR PROFILE

1.1 Introduction

The purpose of this chapter is to provide an overview of the MMS in South Africa. The section details: 1) Scope of coverage; 2) Key role-players; 3) Economic performance of the sector; 4) Employer profile; and 5) Labour market profile of the MMS.

1.2 Scope of Coverage

The MMS is categorised into the following 9 subsectors which will be analysed throughout the Sector Skills Plan and a breakdown of their relevant Standard Industrial Classification (SIC) codes are reflected as per below table 1-1:

Table 1-1: Scope of coverage

Subsector	SIC Codes
Coal Mining	21000, 22100
Gold Mining	23000, 23001, 23002, 23003
Platinum Group Metals (PGM)	24240
Diamond Mining	25200, 25201, 25202
Other Mining*	24000, 24100, 24200, 24210, 24220, 24230, 24290, 25000, 25102, 25103, 25300, 25310, 25311, 25319, 25320, 25390, 25391, 25392, 25399
Cement, Lime, Aggregates and Sand (CLAS)	34240, 25100, 25110, 25101, 25120, 25190
Services Incidental to Mining	92004, 87000, 29000, 85291
Diamond Processing	39212, 39219
Jewellery Manufacturing	39210, 39211, 37601

*Other Mining includes the mining of iron ore, chrome, manganese, copper, phosphates and salt.

1.3 Key Role Players

The MMS is a highly regulated industry with key role players inclusive of government and state-owned enterprises, employer representatives and labour unions. The following tables set out the broad contributions that each of the below-mentioned stakeholders make to the MMS. It should be noted that the entities identified are not exhaustive but provides an overview of nature and mix of stakeholders involved in the MMS.

1.3.1 National Government Departments

Table 1-2 shows the government departments which are interlinked with the MMS.

Table 1-2: National Government Departments

Department	Role	Function in relation to MMS and skills development
Department of Mineral Resources (DMR)	Mineral policy and regulation	• Mineral policy and promotion • Administer the Minerals and Petroleum Resources Development Act No. 28 of 2002 (MPRDA) • Mine health and safety and enforcement and monitoring implementation of the Mining Charter.
Department of Energy (DoE)	Energy minerals policy, regulation, & energy supply	• Promoting energy minerals. The main relevant commodity for MMS is coal.

Department	Role	Function in relation to MMS and skills development
Department of Higher Education and Training (DHET)	TVET, HET, Skills Development, School of Mines	• Planning for higher education provision to the mining sector • Setting up national skills development agenda via the regulation of SETAs, including MQA • Career awareness
Department of Science and Technology (DST)	Promotion of the development of science and technology	• Research and development programmes focusing on mineral beneficiation through the development of technologies specifically related to the MMS
Department of Labour (DoL)	Transformation and Employment Equity measures	• Promotion of transformation in the sector
Department of Environmental Affairs (DEA)	Provision of leadership in environmental management, conservation and protection of the environment	• Support for research and innovation related to environmental affairs in the sector.

1.3.2 State owned enterprises that play a role in the MMS

Table 1-3 below lists some of the main state-owned enterprises (SOEs) which are involved in the MMS.

Table 1-3: MMS State-Owned Enterprises and their Roles

State-Owned Enterprises	Role	Function in relation to MMS and Skills Development
Mine Health and Safety Council	Occupational Health and Safety	• Improving and promoting occupational health and safety in the mining industry • Liaise with MQA about MHS and skills development
Mintek	Mineral processing and Metallurgy	• R & D expertise; intellectual capital-engineers, scientists and technologists • Provide integrated infrastructure of modern laboratories, pilot plant and workshops which can be used by MQA in skills development
Engineering Council of South Africa (ECSA)	Regulation of the engineering profession	• Accreditation of engineering programmes • Registration of persons as professionals • Regulation of the practice of registered persons
South African Diamond and Precious Metals Regulator	Diamond and Precious metals regulation	• Regulation of diamond, gold and PGMs • Skills transfer • Business development support • Local beneficiation
State Diamond Trader	Buying and selling of rough diamonds	• Promote equitable access to beneficiation of diamonds • Develop South Africa's diamond cutting and polishing skills
CSIR	Mining Phakisa	• Research and Development in mining • Supporting increased exploration activities • Improving upstream linkages between mines and equipment manufacturers

1.3.3 MMS industry stakeholders

Table 1-4 provides some of the industry stakeholders which are involved in advocacy, promotion and other industry development initiatives.

Table 1-4: Industry Stakeholders

Industry Stakeholder	Role	Function in relation to MMS and Skills Development
Minerals Council South Africa	Creating partnerships within the sector	• Establish conducive policy, legislative and operating environment
Copper Development Association (Pty) Ltd	Copper industry representation	• Promote and expand the use of copper and copper alloys • Marketing and promoting skills which can be adopted in MQA learning materials
Federation of SA Gem & Mineralogical Societies	Earth science clubs	• Assist in formation of earth science clubs and societies • Marketing and promoting skills which can be used in MQA training materials
South African Mining Development Association (SAMDA)	Lobbying to government and organised labour	• Junior mining[1] initiative by SA junior mining investor • Create enabling environment for raising finance • Develop technical and other skills • Practice responsible environmental management
Jewellery Council of South Africa	Promotion of the jewellery industry	• Facilitate local beneficiation of precious metals, gemstones and precious stones • Facilitate local sales and exports of jewellery in the country
Council for Geoscience (CGS)	Rendering of geoscience knowledge service	• Research of all geoscience, particularly the geological, geophysical, geochemical and engineering-geologic • Regulation of science and technology • Contribute to the assessment and sustainable management of minerals, geohydrological and geo-environmental resources

1.3.4 MMS Worker Representatives

The mining sector is highly unionised with a great number of employees represented or affiliated to a union. Unions in mines are amongst the most active unions in South Africa. Their activities have a significant bearing on the productivity in the MMS. Labour relations has changed in recent years with the emergence of new unions in the MMS.

The National Union of Mineworkers (NUM) and United Association of South Africa (UASA) are currently the recognised unions within the MQA governance structure.

[1] Junior mines have an asset base of between R50 million and R7 billion. Those above these thresholds are referred to as 'majors' and below these are 'small scale miners'.

1.4 Economic Performance

This section provides an overview of the economic performance and contribution of the sector to the country as a whole.

1.4.1 Overview of the MMS

South Africa accounts for 96% of known global reserves of the platinum group metals (PGMs), 74% of chrome, 26% manganese and 11% of gold reserves (GCIS, n.d.). As a leading producer and supplier of a range of minerals, the country is in a position to offer a highly competitive investment destination which ensures that it meets specific trade and investment requirements of prospective investors and business people as well as the developmental needs of its populace (DMR, 2016).

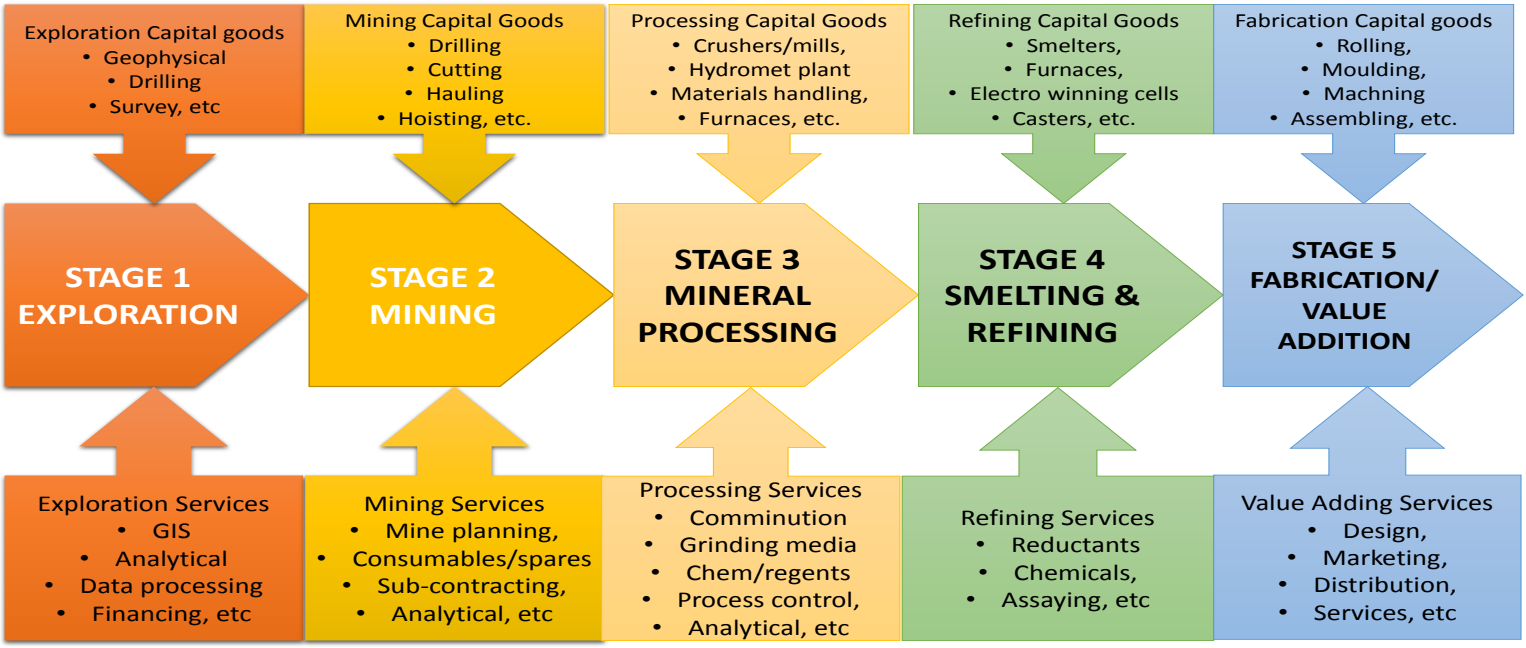
South Africa remains one of the largest net exporters of minerals and metals. The economy earns about 40% of export earnings from mining (DMR, 2016). South Africa is an important global mining industry hub with deep vertical integration and a fully-fledged supply industry serving both South African and foreign companies (ibid). The MMS has played a key role in the country's economic development, which has transformed South Africa into one of the most industrialised countries in Africa. The MMS employs about 3% of 16.2 million employees in the country whose annual earnings is R116.7 billion. Those employed in the sector support about 4.5 million dependents. In 2017-18, the sector paid R5.8 billion royalties up from R3.7 billion giving a 56.7% increase whilst taxes paid to government increased by 28% to R16 billion from R12.5 billion. The large increase in royalties' payments were largely driven by the depreciation of Rand to the US dollar over the period reported. The MMS has also been the principal driver of the current integrated network which now underpins jobs in many other sectors. The New Development Plan and New Growth Path both recognise the critical role that mining contributes to growing investments, exports, GDP and job creation.

Mining production decreased 8.4% year-on-year in March 2018. The decline was largely driven by downfall in the production of diamond by 245.1%, gold by 18%, iron ore by 8.9% and PGMs by 6.1%. During the same period mineral sales increased by 0.1% and the increase was driven by manganese, coal and other metallic minerals. In terms of employment year on year covering December 2016 and December 2017, mining and quarrying has shed off about 0.7% of its total employees.

1.4.2 Value Chain of the MMS

Figure 1.1 below shows the MMS value chain system of the industry from primary activities of exploration to minerals value addition and the support activities in each stage of the value chain. A value chain is a set of activities that companies operating in a specific industry perform in order to deliver a valuable product or service for the market.

Figure 1.1: Mining and Minerals Sector Value Chain



Source: MQA (2016)

As illustrated in the Figure above, the majority of the companies in Stage 2 are involved in primary production while Stages 3-5 depict secondary production, with increasing degrees of processing, beneficiation and value addition.

1.4.3 Overview of the MMS Subsectors

1.4.3.1 PGM mining

PGMs (Platinum Group Metals) includes; platinum, palladium, rhodium, ruthenium, iridium and osmium mining commodities. South Africa's reserves constitute 87% of the global reserve base and the country contributes around 58.7% to global production, ranking 1st in both categories. PGM Mining produced 275.5 tonnes of platinum during 2016 with 88% of it being exported. The country realised R94.14 billion from the sales.

1.4.3.2 Gold mining

The South African gold mining industry is ranked 1st in the world in terms of gold reserves and 7th in production, contributing 5.6% to global production (Minerals Council South Africa, 2012). Gauteng dominates in gold mining accounting for 51.6% of South Africa's production followed by Free State at (21.6%); North West (20.6%); Mpumalanga (4.6%) and then Limpopo (1.6%). Approximately 5% of South Africa's gold production is beneficiated locally to coins and jewellery. About 141.4 tonnes of gold was produced in 2016; 88% of it was exported. The country realised R62.7billion in sales.

1.4.3.3 Coal mining

The South African coal mining industry is ranked 6th in the world in terms of production and 6th in terms of reserves, contributing 3.5% to global output (Minerals Council South Africa, n.d.). Coal reserves, and coal mining activity, are predominant in Mpumalanga and Limpopo and production is largely concentrated by five largest mining groups who produce about 80%. In 2016, South Africa produced 293Mt of coal with 54.8 % sold locally (amounting to a sales value of R65.54 billion) with the remaining 45.2% exported (amounting R50.6billion).

1.4.3.4 Diamond mining

In 2015; South Africa was ranked 7th in the world on diamond production. These deposits are concentrated in Northern Cape, Free State and Limpopo provinces. During 2016 South Africa produced 8.12Mct of diamonds realising total sales value of R14.4 billion and 40.3% of diamonds were exported. Local diamond sales totalled R8.6 billion while foreign export sales amounted to R5.8 billion.

1.4.3.5 Cement, lime, aggregates and sand (CLAS)

The CLAS subsector is dominated by small and medium-sized mining companies. The vast majority of small-scale mining applications (90%) also fall into this group of industrial commodities. In October 2015 CLAS group minerals had recorded a decrease of -4,8% year on year for non-metallic mineral production, and continued to decline to -11.4% as of March 2016. Large firms in this subsector include cement manufacturers, phosphates, vermiculate and dimension stone producers. Dimension stone is also exported in bulk.

1.4.3.6 Other mining

Other mining subsector includes producers of uranium, phosphates, copper, chrome, iron ore, manganese and salt. South Africa's copper deposits lie mainly in Limpopo. In terms of production, 16.3 million tons of chrome were produced in 2016. The production of iron and manganese was 73.2 million tons and 15 million tons respectively. South African iron ore is ranked 13th in the world for reserves; 6th for production and 5th for exports. Manganese is ranked 1st in the world in terms of reserves, 2nd in production and 2nd for exports. Iron ore and manganese deposits are concentrated in Northern Cape.

1.4.3.7 Services incidental to mining

The Services Incidental to Mining category consists of companies providing services incidental and closely related to the MMS. These includes research and development in the mining and mineral extraction, training, catering, payroll services, manufacturing, distribution, hiring and maintenance of machinery and equipment, consulting services, shaft sinking, transportation and logistics.

1.4.3.8 Diamond processing and jewellery manufacturing

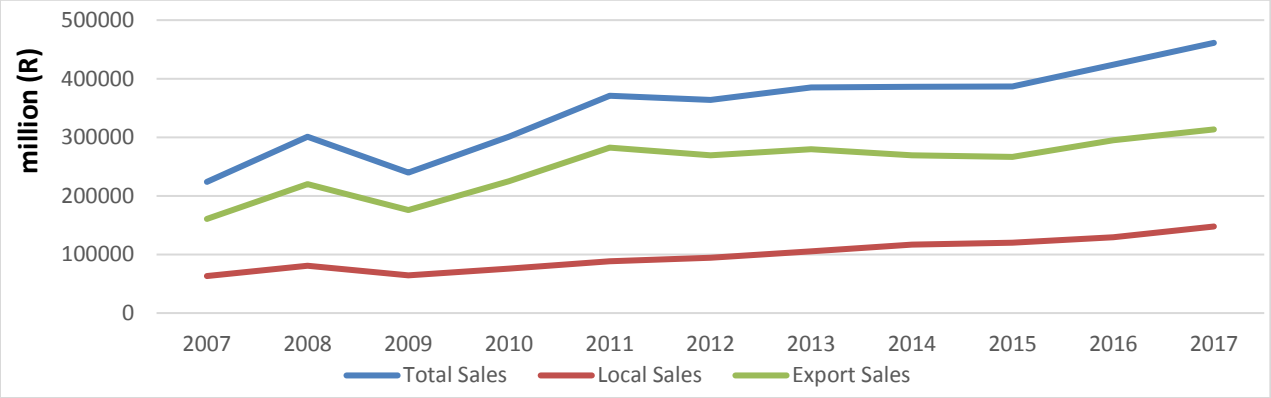
The South African diamond processing industry consists of 221 licenced diamond manufacturers. De Beers is the major supplier of rough diamonds in South Africa. The Master Diamond Cutters' Association has 80 registered members employing 95% of the employees in this subsector. South Africa's State Diamond Trader was launched in February 2008 and is mandated to purchase 10% of South Africa's rough diamond production to sell to local beneficiates. Companies in the jewellery manufacturing subsector beneficiate mining outputs such as gold, platinum, silver and diamonds to manufacture jewellery for both the domestic and export markets. The majority of companies in this subsector are small and located in Gauteng, Western Cape and KwaZulu-Natal.

1.4.4 Mineral Sales and Exports

The trends for the demand of South African minerals is shown in Figure 1.2 below for the period 2007-2017. The figure shows an upward trend of both local and export of minerals. However, the proportion of local sales has been increasing slowly hence the call for beneficiation of minerals rather than exporting them in their unprocessed state. Local sales increased by 14.4%, whilst export sales increased by 6.3% between 2016 and 2017. Total sales and exports increased from 2009 to 2011 after the global financial crisis and thereafter have been on a sluggish trend because of the

global economic slowdown particularly from China which is the major consumer of most of minerals which are exported.

Figure 1.2: Value of sales of total minerals



Source: Quantec (2018)

1.4.5 MMS contribution to GDP and comparison with other economic sectors

Table 1-5 below shows the economic sector contributions to the national GDP for the past 7 years (2011-2017). As shown in the table, the MMS' contribution to South Africa's GDP has decreased from 8.1% in 2011 to 6.8% in 2017. The Finance, real estate and business services has always been the highest individual contributor to the national GDP, with 20.3% in 2017, General Government Services coming up 2nd with 15.3% over the same period, whilst the Mining and quarrying was the 7th highest contributor to GDP at 6.8%in 2017. According to the Minerals Council South Africa (2017), albeit the mining GDP is marginally down from the 7% of overall gross domestic product (GDP) in the previous years, in real terms, the industry is estimated to have expanded by 3.7% in 2017, contributing R312 billion to GDP.

Table 1-5: Sector contribution to national GDP

Economic Sector	2011	2012	2013	2014	2015	2016	2017
Finance, real estate and business services	19.1	19.2	19.4	19.6	19.6	20.1	20.3
General government services	14.7	14.9	15.1	15.2	15.4	15.4	15.3
Wholesale, retail and motor trade; catering and accommodation	13.5	13.6	13.7	13.7	13.7	13.9	13.7
Manufacturing	13.1	13.0	13.0	12.8	12.6	12.5	12.3
Transport, storage and communication	8.4	8.3	8.4	8.3	8.4	8.5	8.6
Mining and quarrying	***8.1***	***7.7***	***7.8***	***7.5***	***7.7***	***7.3***	***6.8***
Personal services	5.4	5.4	5.4	5.3	5.3	5.4	5.4
Construction	3.5	3.4	3.4	3.4	3.4	3.6	3.5
Agriculture, forestry and fishing	2.4	2.3	2.3	2.3	2.4	2.1	2.4
Electricity, gas and water	2.5	2.4	2.4	2.3	2.3	2.1	2.1
Total value added	**90,7**	**90,2**	**90,9**	**90,4**	**90,8**	**90,9**	**90,4**
Taxes less subsidies on products	9,3	9,8	9,1	9,6	9,2	9,1	9,6
GDP at market prices	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Stats SA in Minerals Council South Africa 2016, SARB, StatsSA & DMR (2018)

1.5 MMS Future Outlook

1.5.1 Mining Charter

The Mining Charter 2 revised in 2010 is currently in effect. It is a government instrument designed to achieve sustainable growth, broad based and meaningful transformation of the mining and minerals sector. To this end, the Charter aims at addressing past inequalities by dealing with specifics on reporting ownership which are set at 26%, employment equity representing a minimum of 40% of HDSA demographics in every mining company. Of these demographics, 60% of black employees should be in senior management positions, and 30% should be female. Middle management must have a minimum of 75% black employees of which 38% should be female, 88% blacks in junior management of which 44% must be female. In addition, there is a 5% target of companies' payroll, excluding the 1% skills levy for human resource development aimed in essential skills development. The Charter also has a target to develop mine communities with companies expected to invest in community development initiatives that are in line with IDPs, housing and living conditions which sets out to upgrade hostels into family units, achieve occupancy rate of one person per room and facilitate other housing options for employees. In addition, companies are expected to procure a minimum of 40% of capital goods, 70% of services and 50% of consumer goods from BEE entities. Companies are required to promote sustainable development and growth by improving the sector's environmental management as well as health and safety. This should be accompanied by ensuring the local beneficiation of mineral commodities by adhering to the Mineral Beneficiation Strategy.

Currently, a comprehensive review process is being initiated to strengthen the efficacy of the Mining Charter as a transformation instrument. The Mining Charter III was published on the 15 June 2018 for public inputs due by the end of August 2018.

1.5.2 Global Demand for commodities

Commodity prices have rebounded over the past year. In response to increased global demand from China and India and declining inventories, oil and non-oil commodity prices have recovered from the low reached at the end of 2015. Responding to higher demand, coal prices rose 45.1% in 2017 compared with the previous year, reaching US$95/ton at the end of December 2017. Iron ore prices rose 20.4%, from US$58/ton in 2016 to US$71/ton, also supported by stronger demand from Asia. Precious metals prices were mixed in 2017 compared with the prior year, platinum prices declined 3.8%, while gold remained stable. These trends have resulted in an improved near-term outlook for commodity exporters such as South Africa in 2017 and has to be continually monitored and forecasted.

1.5.3 Improved economic growth prospects

South Africa's economy is projected to grow at 1.5% in 2018 and at 1.8% in 2019 mainly due to an expected increase in private investment because of improved business and consumer confidence. The government has made a commitment to translate the cyclical upturn and improved investor sentiment into more rapid economic growth. The government is finalising many outstanding policy and administrative reforms, particularly in sectors with high growth potential such as mining sector policies that support investment and transformation.

1.5.4 Mandela Mining Precinct

The Mandela Mining Precinct, initiative of the Presidency (funded by the department of Science and Technology (DST) with CSIR being the legal conduit) is aims to develop holistic and people-centric systems and technologies for the sector. The new systems and technology are safer and healthier to use; facilitate the mining of low-grade reefs that are currently not economical to mine;

facilitate access to resources that are currently too deep to mine, thereby extending the lifespan of some of the existing and established mines; as well as technologies which reinforce pillars underground. It is believed that the innovations will result in job retention and growth in the sector, up to the year 2046. It is important for the MQA to forge a formal partnership with the Mandela Mining Precinct, as these developments may require reskilling training drives for MMS related occupations such as technical, artisans, supervisors and managers. Collaboration will allow the MQA to forecast necessary skills development programmes, plans and initiatives.

1.5.5 Mineral beneficiation

Beneficiation refers to the transformation of a mineral (or a combination of minerals) to a higher value product, which can either be consumed locally or exported. The term is used interchangeably with "value-addition" (DMR, 2011). The Minerals Beneficiation Strategy (DMR, 2011) is aimed at encouraging the country to move from the sale of commodities from mining stage to fabrication and value adding stage of the MMS. Mineral beneficiation is a key priority of the Industrial Policy Action Plan (IPAP) 2016/17-2018/19 and vital for economic linkages between the primary agriculture, mining and manufacturing sectors of the economy to secure much greater downstream beneficiation and maximise upstream linkages.

1.6 Employer Profile

The employer profile is obtained primarily from the MQA WSP/ATR dataset, the DHET levy file and DMR's Public Labour data. Weighting of the data has been applied to provide as close to a realistic outlook on the sector as possible. An assessment of the proportion of companies submitting WSPs is illustrated in Table 1-6 below. The table shows a steady increase in the number of mining entities submitting WSPs during the period 2013-2018 from 585 to 759 reflecting an increase of 29.7%. Table 1-6 also shows the weighted total employment figures from 2013 to 2018.

Table 1-6: Number of companies submitting WSPs

	WSPs Submitted	WSP employment
2013	585	572 498
2014	573	579 038
2015	609	525 248
2016	634	520 003
2017	719	550 905
2018	759	493 471

Source: MQA Weighted WSP/ATR (31 May 2018)

1.6.1 Geographical location of companies in the MMS

Table 1-7 shows the geographic location of companies in the sector indicating that Gauteng has the majority of mining companies (44.8%) followed by North West and Mpumalanga with 12.4% each. Eastern Cape has the least number of mining companies with only 1.8%. While the number of companies for some of the provinces is very high, for example Western Cape (216), employment coverage is very low, with only 1.2% of total employment as a result of the presence of a high number of small companies which are mainly in the jewellery manufacturing and design subsector. Conversely, Limpopo has a relatively low number of companies (5%) but has the fourth highest percentage of MMS employment in the country (15.2%), after Gauteng, North West and Mpumalanga which employs 31.9%, 26.92% and 16% respectively.

Table 1-7: Geographical location of MMS companies

Province	Total Companies	% of MMS employers	% of MMS employment
Gauteng	1019	44,8%	31,9%
North West	281	12,4%	26,9%
Mpumalanga	281	12,4%	16%
Western Cape	216	9,5%	1,2%
Northern Cape	166	7,3%	4,1%
Limpopo	114	5,0%	15,2%
KwaZulu-Natal	98	4,3%	1,6%
Free state	58	2,6%	3,2%
Eastern Cape	41	1,8%	0,1%
Total	**2274**	**100%**	**100%**

Source: DHET levy payer file (May 2018) and MQA Weighted WSP/ATR (31 May 2018)

1.6.2 Size and number of companies represented in the MMS

Table 1-8 shows the number of companies registered with the MQA by subsector and size. The table shows that the majority of registered companies are small companies (76.7%) with medium and large companies sharing the balance almost equally. Other Mining subsector has the highest number of companies (41%), followed by Services Incidental to Mining (22.2%) with PGM having the least number of companies (1.4%). However, in terms of employment, the PGM subsector is the largest employer with about 34.5% of employees followed by Gold Mining (20.2%). Diamond Processing and Jewellery Manufacturing are the subsectors employing the least number of employees in the MMS sector.

Table 1-8: Profile of MQA registered companies (SETA 16) by subsector

Sector	Size of Mining firms			Total per subsector		
	Small	Medium	Large	Total number of companies	% of companies to Total	% of Employees
CLAS	102	25	20	147	6,5%	1,9%
Coal Mining	148	27	55	230	10,1%	17,8%
Diamond Mining	38	6	18	62	2,7%	3,6%
Diamond Processing	59	4	4	67	2,9%	0,4%
Gold Mining	80	11	28	119	5,2%	20,2%
Jewellery Manufacturing	173	8	-	181	8,0%	0,4%
Other Mining	729	96	107	932	41,0%	13,7%
PGM Mining	6	3	23	32	1,4%	34,5%
Services Incidental to Mining	409	50	45	504	22,2%	7,6%
Total	**1744**	**230**	**300**	2274	**100%**	**100%**
Percentages (%)	**76,7%**	**10,1%**	**13,2%**	**100%**		

Source: DHET levy payer file (May 2018) and MQA Weighted WSP/ATR (31 May 2018)

1.7 Labour Market Profile

This section highlights the profile of the MMS labour market in terms of total employment, provincial distribution, gender and other equity indicators.

1.7.1 Gender and Race

The MMS remains a male dominated sector with a female representation of only 15% compared to 85% of their male counterparts. What is interesting to note is that the lowest proportion of females in the sector are found in Plant and Machine Operators (8%) and the majority occupy Clerical Support Worker occupations (52%). Further research probing factors that attribute to female entry and career progression within the core, technical, professional and managerial occupations within the MMS.

Table 1-9: Composition of MMS employees by gender and race

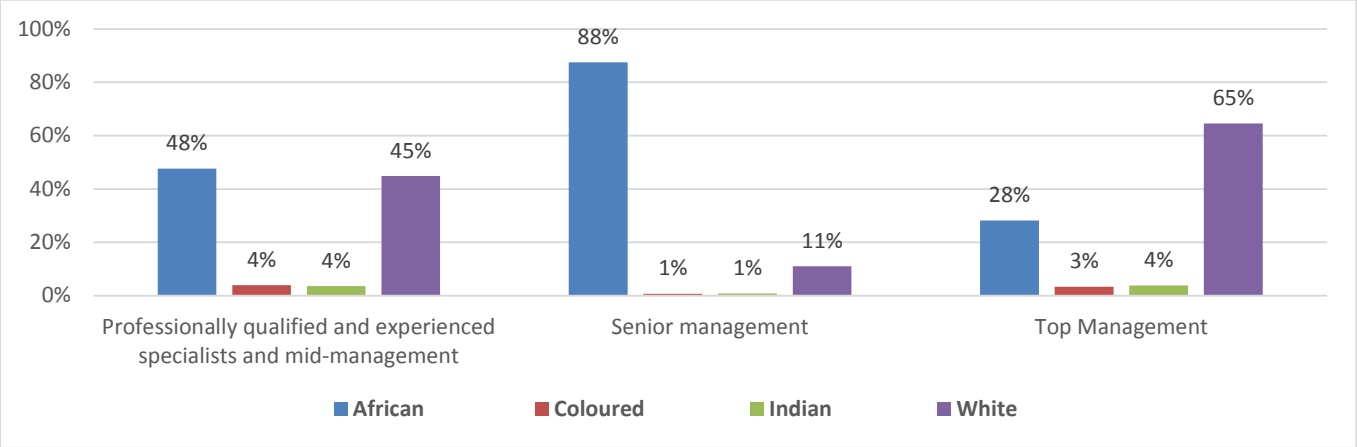
Occupational Categories	Gender		Race				Total
	Female	Male	African	Coloured	Indian	White	
Managers	2582	10873	5453	518	550	6933	**13455**
	19%	81%	41%	4%	4%	52%	3%
Professionals	7880	15507	13683	1022	670	8012	**23387**
	34%	66%	59%	4%	3%	34%	5%
Technicians and Associate Professionals	8309	44820	36229	1899	480	14520	**53128**
	16%	84%	68%	4%	1%	27%	11%
Clerical Support Workers	11105	10185	14756	1303	329	4902	**21290**
	52%	48%	69%	6%	2%	23%	4%
Service and Sales Workers	1829	4376	5241	244	29	692	**6205**
	29%	71%	84%	4%	0.5%	11%	1%
Skilled Agricultural, Forestry, Fishery, Craft and Related Trades Workers (Artisan category)	3663	36826	26367	1846	213	12063	**40489**
	9%	91%	65%	5%	1%	30%	8%
Plant and Machine Operators and Assemblers	15966	190515	199352	3780	216	3133	**206481**
	8%	92%	97%	2%	0.1%	2%	42%
Elementary Occupations	19506	98930	114074	1966	69	2327	**118436**
	16%	84%	96%	2%	0.1%	2%	24%
Learners	4182	6418	9383	493	73	651	**10600**
	39%	61%	89%	5%	1%	6%	2%
Total	**75023**	**418449**	**424537**	**13070**	**2629**	**53235**	**493471**
	15%	85%	86,0%	2,6%	0,5%	10,8%	**100%**

Source: Weighted MQA WSP/ATR (31 May 2018)

Table 1-9 also shows that race composition in the sector is dominated by Africans constituting 86% of the sector's employees followed by Whites (10.8%), Colored's (2.6%) and Indians (0.5%).

A closer analysis of the different management levels in Figure 1.3 reveals that Whites comprise 65% of top management, 11% of senior management and 45% of lower to mid management. Africans comprise only 28% of top management however 88% are represented in senior management.

Figure 1.3: Management levels by race



Source: MQA Weighted WSP/ATR Submissions (31 May 2018)

Table 1-10 shows that at top management level, White and African females account for 48% and 43% respectively within the gender group, whereas Africans males account for 25% whilst Whites males are at 68%. It is noted that only 17% of employees in top management are represented by females.

Table 1-10: Management Levels by race and gender

Management Level	Gender	Race	Number of employees per race	Percentages
Top management	**Female**	African	89	43%
		Coloured	11	5%
		Indian	8	4%
		White	100	48%
	Male	African	251	25%
		Coloured	30	3%
		Indian	38	4%
		White	679	68%
Senior management	**Female**	African	3866	83%
		Coloured	70	2%
		Indian	99	2%
		White	617	13%
	Male	African	32253	88%
		Coloured	218	1%
		Indian	222	1%
		White	3922	11%
Professionally qualified and experienced specialists and mid-management	**Female**	African	3049	53%
		Coloured	249	4%
		Indian	287	5%
		White	2137	37%

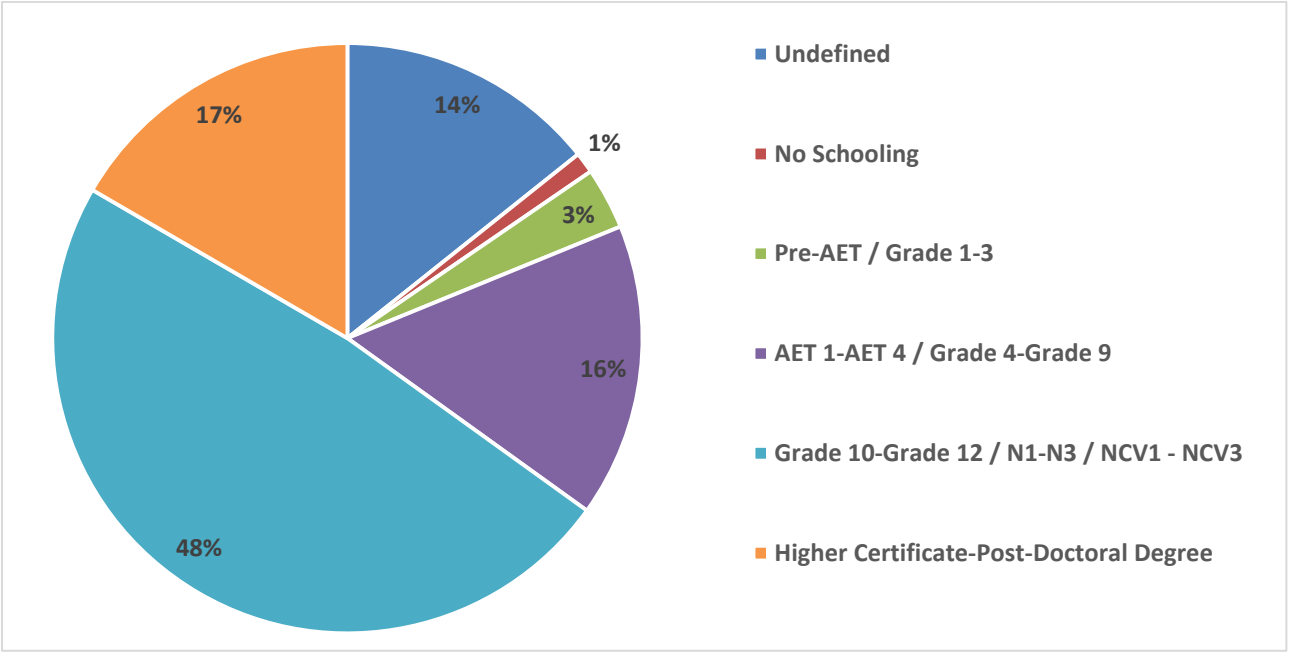
Management Level	Gender	Race	Number of employees per race	Percentages
	Male	African	7737	46%
		Coloured	634	4%
		Indian	527	3%
		White	8008	47%

Source: MQA Weighted WSP/ATR (31 May 2018)

1.7.2 Education and skills levels

Analysis of qualifications reported in the WSP-ATR submissions reveals that the highest proportion of employees (48%) in the sector have achieved between Grade 10 (including N1 and NCV1) and Grade 12 (including up to N3 and NCV3). This is followed by those employees who fall in the bracket between a Higher Certificate and Post-Doctoral Degree accounting for 17% whilst those who have achieved between Grade 4 (including AET1) and Grade 9 (including up to AET 4) constitute 16%. Approximately 1% of the sector's employees have no schooling at all. The "Undefined" category represents the employees whose education levels were not specified in the WSP-ATR submissions. This is a concern for the sector posing a risk to the sector skills development.

Figure 1.4: Employment by education level



Source: MQA Weighted WSP/ATR (31 May 2018)

1.7.3 The status and trends of employment in the MMS

Table 1-11 provides a 7-year trend analysis of employment in the MMS for the period 2012-2018. The column labelled "CAGR" represents the 'Compound Annual Growth Rate' over this period and makes adjustments for the spikes and drops in employment over the 7 year period thereby depicting an annual average picture of the rise or decline in employment figures.

Table 1-11: Employment trends in the MMS

Total employment in MMS		2012	2013	2014	2015	2016	2017	2018	CAGR
Provincial Distribution	Eastern Cape	1160	2023	2 647	2 170	1 889	2 204	647	-8%
		0,2%	0,4%	0,5%	0,4%	0,4%	0,4%	0,1%	
	Free State	42485	46037	44316	40545	36378	39 665	15684	-13%
		6,8%	8,0%	7,7%	7,7%	7,0%	7,2%	3,2%	
	Gauteng	119330	145456	123795	96802	84559	87 043	157275	4%
		19,0%	25,4%	21,5%	18,4%	16,3%	15,8%	31,9%	
	KwaZulu-Natal	12771	10382	11079	11616	10669	12 120	7718	-7%
		2,0%	1,8%	1,9%	2,2%	2,1%	2,2%	1,6%	
	Limpopo	91648	77121	90425	82373	86680	75 474	74790	-3%
		14,6%	13,5%	15,7%	15,7%	16,7%	13,7%	15,2%	
	Mpumalanga	103234	70535	74309	90289	63219	70 516	78801	-4%
		16,4%	12,3%	12,9%	17,2%	12,2%	12,8%	16%	
	North West	220527	190601	195840	165213	185352	225 320	132660	-7%
		35,1%	33,3%	34,0%	31,5%	35,6%	40,9%	26,9%	
	Northern Cape	31555	24672	27698	31126	44329	33 605	20015	-6%
		5,0%	4,3%	4,8%	5,9%	8,5%	6,1%	4,1%	
	Western Cape	6040	5581	5658	5114	6928	5 509	5882	-0,4%
		1,0%	1,0%	1,0%	1,0%	1,3%	1,0%	1,2%	
	Totals	**628750**	**572 498**	**575 768**	**525 248**	**520 003**	**550 905**	**493471**	-3%
Subsector Distribution	CLAS	45780	17256	14298	13449	13162	14424	15637	-14%
		7,3%	3,0%	3%	2,6%	2,5%	2,6%	3,2%	
	Coal mining	76912	62864	62913	87389	56930	26610	86235	2%
		12,2%	11,0%	11,2%	16,6%	10,9%	4,8%	17,5%	
	Diamond mining	11963	11216	9900	16286	8974	8743	16714	5%
		1,9%	2,0%	1,8%	3,1%	1,7%	1,6%	3,4%	
	Diamond Processing	1965	1372	6557	989	1849	1758	1790	-1%
		0,3%	0,2%	1,2%	0,2%	0,4%	0,3%	0,4%	
	Gold mining	151382	156771	138237	118235	91357	238245	98965	-6%
		24,1%	27,4%	24,6%	22,5%	17,6%	43,2%	20,1%	
	Jewellery Manufacturing	2589	1104	902	1074	2802	1631	1902	-4%
		0,4%	0,2%	0,2%	0,2%	0,5%	0,3%	0,4%	
	Other mining	68225	101871	108277	107969	129829	153057	68580	0%
		10,9%	17,8%	19,2%	20,6%	25,0%	27,8%	13,9%	
	PGM mining	189437	175579	185339	144690	173529	87404	167794	-2%

Total employment in MMS		2012	2013	2014	2015	2016	2017	2018	CAGR
		30,1%	30,7%	32,9%	27,5%	33,4%	15,9%	34,0%	
	Services incidental to mining	80497	44485	36571	35117	41509	19034	35854	-11%
		12,8%	7,8%	6,5%	6,7%	8,0%	3,5%	7,3%	
	Totals	**628750**	**572 518**	**562 994**	**525248**	**520 003**	**550 905**	**493471**	**-3%**
Gender Distribution	Male	559470	503974	506676	454663	444553	474217	418449	-4%
		89,0%	88,0%	88,0%	86,6%	85,5%	86,1%	84,8%	
	Female	69280	68544	89092	70585	75450	76688	75023	1,1%
		11,0%	12,0%	15,5%	13,4%	14,5%	13,9%	15,2%	
	Totals	**628750**	**572518**	**595768**	**525248**	**520003**	**550905**	**493471**	**-3%**
Equity Distribution	African	529635	485210	486524	441699	435100	474189	424537	-3%
		84,2%	84,8%	84,5%	84,1%	83,7%	86,1%	86,0%	
	Coloured	14997	13763	11515	15352	19582	17349	13070	-2%
		2,4%	2,4%	2,0%	2,9%	3,8%	3,1%	2,6%	
	Indian	3167	2855	2879	2832	3907	2701	2629	-3%
		0,5%	0,5%	0,5%	0,5%	0,8%	0,5%	0,5%	
	White	80951	70690	69092	65365	61414	56666	53235	-6%
		12,9%	12,3%	12,0%	12,4%	11,8%	10,3%	10,8%	
	Totals	**628750**	**572 518**	**575 768**	**525248**	**520 003**	**550 905**	**493471**	**-3%**
Occupational Group Distribution	Managers	17643	14677	13359	14165	13397	11871	13455	-4%
		2,8%	2,6%	2,3%	2,7%	2,6%	2,2%	2,7%	
	Professionals	26852	26379	25749	26601	25591	22960	23387	-2%
		4,3%	4,6%	4,5%	5,1%	4,9%	4,2%	4,7%	
	Technicians & Associate Professionals	70254	60864	68688	61145	57877	62986	53128	-4%
		11,2%	10,6%	11,9%	11,6%	11,1%	11,4%	10,8%	
	Clerical Support Workers	27299	23152	23596	22315	21582	22435	21290	-3%
		4,3%	4,0%	4,1%	4,2%	4,2%	4,1%	4,3%	
	Service & Sales Workers	7125	6322	6488	6419	6885	7100	6205	-2%
		1,1%	1,1%	1,1%	1,2%	1,3%	1,3%	1,3%	
	Trades category	34315	36985	38238	39678	39949	37320	40489	2%
		5,5%	6,5%	6,6%	7,6%	7,7%	6,8%	8,2%	
	Plant & Machine Operators & Assemblers	264952	244335	238765	213412	216245	236402	206481	-3%
		42,1%	42,7%	41,5%	40,6%	41,6%	42,9%	41,8%	
	Elementary occupations	172669	150614	150201	131172	127534	140632	118436	-5%
		27,5%	26,3%	26,1%	25,0%	24,5%	25,5%	24,0%	

Total employment in MMS		2012	2013	2014	2015	2016	2017	2018	CAGR
	Learners	7611	9191	10684	10341	10841	9122	10600	5%
		1,2%	1,6%	1,9%	2,0%	2,1%	1,7%	2,2%	
	Total	**628750**	**572 518**	**575 768**	**525248**	**520 003**	**550 905**	**493471**	**-3%**
Disability Distribution	**Disabled Employees**	4843	4450	4924	3815	4864	4575	4639	-1%
		0,8%	0,8%	0,9%	0,7%	0,9%	0,8%	0,9%	
Management by Equity	**African**	5377	4005	3913	4315	4340	9018	5453	0,2%
		30,5%	37,0%	29,4%	30,5%	32,4%	36,0%	40,5%	
	Coloured	692	299	490	586	649	1311	518	-4%
		3,9%	2,8%	3,7%	4,1%	4,8%	5,2%	3,9%	
	Indian	595	288	591	649	704	1071	550	-1%
		3,4%	2,7%	4,4%	4,6%	5,3%	4,3%	4,1%	
	White	10979	6235	8315	8614	7704	13656	6933	-6%
		62,2%	57,6%	62,5%	60,8%	57,5%	54,5%	51,5%	
	Total in management	**17643**	**10827**	**13306**	**14164**	**13397**	**25057**	**13455**	-4%
	Percentage of Management to total employment	**2,80%**	**1,90%**	**2,30%**	**2,70%**	**2,60%**	**4,50%**	**2,7%**	**-0,4%**

Source: MQA Weighted WSP/ATR (31 May 2012-2018)

Table 1-11 shows the trends over a 7 year period and some highlights are provided below:

- The total employment in the MMS has declined from a peak of 628750 in 2012 to 493 471 in 2018, a -3% annual average decrease in overall employment figures during the 7 year period.
- At provincial level, employment levels have been declining steadily in most provinces with Free State (-13%), Eastern Cape (-8%) having the worst hit between 2012 and 2018 whilst growth in employment has been recorded only in Gauteng with an annual average rate of 4%.
- A review of subsectors reveals that between 2012 and 2018 most subsectors have been declining in terms of employment levels with CLAS (-14%), Services Incidental to Mining (-11%) and Gold (-6%) declining the most on average respectively. Only the Diamond Mining (5%) and Coal Mining (2%) subsectors has seen an annual average increase in the percentage of employees over this seven year period.
- A review of employment by occupational categories shows that, since 2012, there has been a decrease in employment numbers across most occupational categories, with the most significant in the Elementary occupations (-5%). The Learners and Trades categories are the only occupations to have shown growth in average numbers over the period, with a 5% and 2% increase respectively.
- The MMS remains a male dominated sector. The proportion of females has been increasing gradually, from 11% in 2012, to 15.2% in 2018 whilst males have decreased from 89% to 84.9%

over the same period. It is important to note that the average growth rate in females over the 7 year period is 1.1%.

- Equity composition of employees shows that Africans continue to be the dominant racial group in the MMS with an 86% overall representation. The equity profile of Managers depicts that from a total of 13455 managers in 2018, majority (51.5%) are represented by Whites followed by Africans at 40.5% however the average annual growth rate over the 7 years for Africans in management has been a mere 0.2%
- The disability figures in the sector remain a concern, there has been minimal change in percentages employed during the 7 year showing an average annual decline of -1%.

1.7.4 Implications of Findings for Skills Development

The main implications for skills development in the sector are summarised below:

- The sector has seen a decrease in employment figures over the last few years, with an exception of 2017 where there was an increase of 30 902 (2016 moving into 2017). Though there was an increase in employment over the one-year period; retrenchments remained a foreseeable reality. Key role players in the sector need to prioritise the reskilling, up skilling and training of portable skills so that employees can be absorbed into other sectors of the formal labour market. A study being conducted by the MQA on how programmes aimed at re-skilling Ex-Mineworkers in the mining and minerals sector impact their socio-economic status could, provide insight into skills development interventions for ex-mine workers.
- There is an urgent need to monitor development and initiatives driven by the Mandela Mining Precinct, the 3 SIPs projects related to the MMS as well as mineral beneficiation as they present potential to create employement. Initiatives such as these require the development of the relevant and required skills.
- Racial and gender disparities remain within the demographic composition of the industry signalling the need to continue addressing workforce imbalances. Strategic studies with outcomes based on skills development and aligned to transformation of the sector is proposed for the MQA research agenda.

1.8 Summary and Conclusion

This chapter revealed that South Africa remains a key role player in the global mining economy. However, the sector is currently facing critical challenges which include:

- The sector's contribution to GDP has been decreasing over the last few years, from 8.1% in 2011 to 6.8% in 2017 with employment also decreasing from a peak of 628 750 in 2012 to 493 471 in 2018.
- The short to long term outlook of the sector could be improved should the sector monitor and forge partnerships in the developments of the Mandela Mining Precinct and mineral beneficiation initiatives.
- The implementation of the Industrial Policy Action Plan (IPAP) 2016/17-2018/19 which places mineral beneficiation as one of its key priority areas as well as the SIPs projects are expected to lead to increased economic activities in the sector.
- Re-skilling of retrenched workers is an area that requires attention from a skills development perspective to facilitate their absorption into other sectors of the formal labour market and entrepreneurship endeavours.
- Demographic disparities in the gender and management by equity compositions of the industry signals the need for the MMS to continue addressing workforce imbalances through skills development. This is to ensure the absorption of females in MMS core occupations and create management pipeline for transformation.

2. KEY SKILLS ISSUES

2.1 Introduction

This chapter identifies factors that drive change as well as impact on skills demand and supply within MMS. Literature review, inputs from stakeholder engagements and in-depth interviews informed the findings of the chapter. The chapter identifies macro and micro, internal and external factors that continue to shape the skills development landscape within the MMS. This was done through the use of PESTEL analysis that assists in systematically identifying and evaluating political, economic, social, technological, legal and environmental factors that play a role in influencing the sector (Viljoen, 2018).

2.2 Change Drivers

Numerous factors that impact on skills development in the MMS have political, economic, social, technological, environmental and legislative implications. Therefore, understanding how these drivers intersect with skills development in the sector is imperative. Some of the change drivers are non-sector specific, meaning they are not directly related to the sector but exert change in the broader environment in which the sector operates. All change drivers discussed have direct implications for skills development in the MMS and are listed in no particular order.

2.2.1 Global influence

Due to the globalisation of markets and their interconnectedness across the globe, the demand and supply of commodities are influenced by many factors outside the control of host countries. Many subsectors in the MMS are experiencing a significant decline in growth owing to decreased global demand for their commodities (in particular, platinum, iron ore, chrome and manganese) and sluggish investment growth. The MMS' operations are downscaling or closing down as a result despite the positive outlook demonstrated by the improved Rand-Dollar exchange rate. The implications of this is retrenchments being an ongoing reality, requiring retrenchees' skills to be absorbed into an already constrained job market. Re-skilling, upskilling and portable skills training are some of the ways to assist retrenched employees to gain access to the job markets outside mining. Experts argue that with financial markets in volatile conditions, companies are forced to shift their training priorities to focus mainly on technical or very basic training for continued operations.

2.2.2 Legislative Instruments

Chapter one indicated that there has been slow progress in terms of achieving outcomes aimed at redressing past inequalities within the MMS. There are several legislative instruments that are intended to address various aspects of transformation in the MMS. The Mineral and Petroleum Resources Development Act (MPRDA) is aimed at creating conditions that are conducive for equitable access and sustainable exploitation of petroleum and mineral resources in the country.

To give effect to the MPRDA, the Mining Charter 2 (revised in 2010) which is currently under review aims to accelerate transformation to ensure the sustainable growth and development of the mining industry. As mentioned in Chapter one, targets are set in the area of ownership, human resource development, procurement supplier, enterprise development, employment equity (amplified by the Employment Equity Act that sets targets in terms of employment of HDSA to address past inequalities) as well as sustainable development and growth.

The implications of the legislative instruments on skills development include the promotion of opportunities leading to transformation and the career growth of those involved in the sector.

2.2.3 Technology

Technological change remains at the forefront of the sector's ability to become as safe, efficient and sustainable as possible. The integration of new technological applications into operations in mining is transforming the landscape of the MMS as it places a new demand on the type, level and mix of skills and qualifications required. Technological innovation and moving into the digital space influences how work is organised, the materials and tools of trade to be utilised which create a new work paradigm. The technical complexity and communicative competences that come with emerging technology increases the need for communication skills that require medium to high level literacy competencies, ICT expertise and social communication in the workplace (Meyer & Wildschut, 2017). There is a critical need to upskill the workforce in the MMS through a range of skills in the context of lifelong learning as well as development and innovation systems to fit well in a fast paced technological economy. As a result of technology, stakeholders mentioned that the industry is forced to look at alternative mining methods and technologically advanced methods of mining to ensure continuous profitable production and possibly increase the lifespan of existing mines. This comes with inherent job requirements and at times may result in job losses. With the use of the new machinery, methods of operations have shifted from owner/operator model to owner/outsourced operator model wherein outsourced businesses take a short view with small investment in skills development. To alleviate this challenge, it will be imperative for employers to equip employees with emerging skills to ensure that they are well versed with the digital and technologically advanced space brought by the fourth industrial revolution. A focus for example, could be starting to train plant operators and elementary workers to operate new machinery and coordinate new processes that support their progression towards technical employees.

2.2.4 Mineral beneficiation

The mining industry value chain has been prioritised as an economic growth node in the New Growth Path, which highlights a path for the MMS out of its depression until 2020. The Minerals Beneficiation Strategy is aimed at encouraging the country to move from the sale of commodities to value-added products. The government is currently drafting the Mineral Beneficiation Action Plan, which seeks to advance "local value-addition across five mineral value-chains, namely; iron-ore and steel, platinum-group metals, polymers, titanium and mining inputs". The implementation of the strategy is expected to create and retain much needed jobs in the MMS. The MQA needs to maintain strong relationships with government departments involved in this, to understand its role in responding to any resulting skills needs. Research could also be conducted to understand the R&D currently taking place in mineral beneficiation to determine whether there are current and future skills needs to influence training interventions.

2.2.5 Small enterprise development

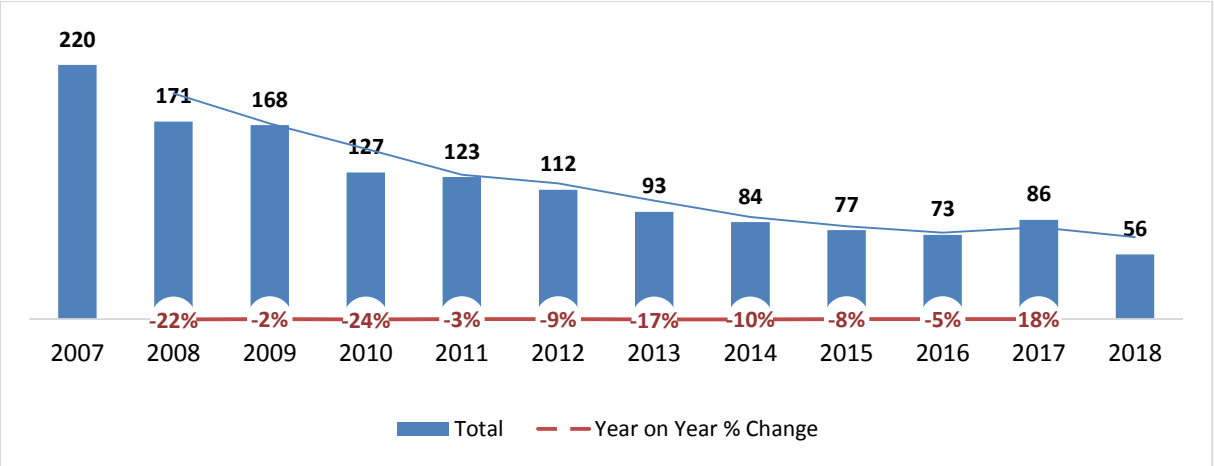
Many mining companies that are SMMEs require skills. Start up and small training companies that operate in the MMS are provided with assistance and support by the MQA through partnerships with government and training providers. In order for mining companies to comply with BBBEE and Charter requirements, small enterprises that can supply and meet the requirements of the mining industry with products and services could be developed and assisted, possibly by the MQA.

2.2.6 Mine health and safety

Mining operations come with inherent risks that can impact the health and safety of employees. Mining companies, government and trade unions need to continue to place importance on employee safety since continued fatalities, injuries and occupational diseases jeopardise a company's licence to operate. For the first time in a decade, an increase was observed in the number of fatalities in 2017. This was the first increase since 2007 where 220 fatalities were

recorded. In 2018, fatality rates remain a great concern as 56 fatalities have already been recorded to date (July). These are 12 fatalities higher than 2017's 44 recorded at the same time (DMR, 2018). There is a need for further research to be conducted on ways and means of attaining a "zero harm" goal in the MMS. The research should be able to provide knowledge that will assist the sector on developing relevant interventions that can be implemented to alleviate this challenge.

Figure 2-1 Industry Fatalities trends (2007-2018)



Source: DMR (2017 & 2018)
**2018 figures are as of 23 July 2018*

Furthermore, an additional concern has been raised in the number of accidents related to seismic activity as a result of rock bursts and rock falls leading to injuries and in some instances fatalities. Besides the MQA supporting the training of OHS representatives, other initiatives to incorporate safety into learning programmes could be investigated. While there is a need for more rock engineers, there is also a need to look at developing qualifications and learning programmes in the area of seismology.

2.2.7 Environmental sustainability

Mining operations poses environmental risks in air quality, water quality and quantity, biodiversity and waste management. The industry is becoming more conscious of the growing need to protect the environment by mining in an environmentally sustainable way. Energy and water efficiency, as well as the reduction of pollution, are increasing imperatives resulting in the need for skilled workers to source 'green' products and services and manage 'green' supply chains. R&D efforts in the Mining Phakisa initiative include a focus on conservation of natural resources, preservation and restoration of the environment. Therefore, the MQA should keep abreast of developments which may require employee capacitation. The findings of the MQA's research on current and future green skills to be prioritised in the MMS would be critical to inform any allocation of resources as well as the development of qualifications and learning programmes in the sector.

2.2.8 Community and youth development

Community unrest in mining communities is becoming more prevalent with unemployment and service delivery often being the main causes. Ideally, mines should be recruiting unemployed youth from the surrounding communities. With mechanisation becoming a reality, prospective new entrants into the MMS are required to specialise in Science, Technology, Engineering and Maths (STEM) subjects as well as Geography. According to the stakeholders, many schools surrounding mining companies have expressed challenges in producing learners with STEM subjects for entry into the mining sector. This is reflected in the matric pass rates that shows a small number of learners passing those relevant subjects. The MQA has a Mine Community Project in place, which

includes partnering with TVET colleges in mining areas that will train unemployed youth in mine communities. It includes a focus on supporting Maths and Science in schools to address skills shortages in the long term. These initiatives are discussed in great detail in Chapter 3.

2.2.9 HIV and AIDS

The impact of HIV and AIDS in the workplace is usually in the form of high labour turnover owing to either deaths or sicknesses. A research study conducted by George e al. (2013), showed that the estimated cost of HIV and AIDS death rate was R2.8 million per annum and the total loss for all sectors was estimated to be almost R10 million. It is important to continue increasing awareness programmes to minimise loss of productivity, key skills and replacement costs due to HIV and AIDS.

2.2.10 Industrial Relations

The dynamic role of trade unions in the current political landscape bears the potential of influencing skills issues. The role of trade unions is broader to include not only internal factors of bread and butter, but other external issues such as policy developments and amendments in addressing a wide range of matters such as the NDP, beneficiation strategies and other policies and programmes that affect communities. In the absence of cordial industrial relations, protest may occur. Labour unrests and lengthy periods of wage negotiations can cause disruptions to mine operations, resulting in losses in production. In some cases, mines have chosen to downscale operations. The skills development implication is that there may be an increase in retrenchments, meaning that skills will re-enter the market, thus increasing unemployment. Reskilling in portable skills has become a necessity for those who are not re-absorbed in the MMS.

2.3 Alignment with National Strategies and Plans

Each SETA is required to develop an SSP update within the framework of the National Skills Development Strategy (NSDS) III as prescribed by the Skills Development Act of 1998, Section 10 as amended (2008). Sector skills planning in South Africa must consider a wide range of national policy imperatives that seek to support inclusive sector growth paths which advance economic growth and the social development and transformation agenda. Table 2-1 summarises the national policies which guide the strategy and operations of the MQA.

Table 2-1: Alignment of the MQA Strategic Plan with Government National Policies and Strategies

POLICY / ACT	Policy alignment to the MMS	
	Policy input Relevant to the MMS (Policy Objective)	**Policy implications on Skills Planning (MQA response to policy imperatives)**
National Skills Development Strategy III (NSDS) 2011-2016 Published in (2011)	• Establish a credible institutional mechanism for skills planning • Increase access to occupationally-directed programmes. • Address the low-level youth and adult numeracy skills to enable additional training. • Encourage better use of workplace-based skills development. • Promote the growth of a public TVET college system that is	The MQA: • Uses SSPs and other research projects to inform skills planning and decision-making. • Increases access to workplace experience for learners. • Increases access to internships in the MMS for university graduates. • Has conducted research into the training of small mining enterprises. • Has partnerships in place with 23 TVET Colleges for capacitation and accreditation purposes. • Facilitates workplace experience for TVET College lecturers.

POLICY / ACT	Policy alignment to the MMS	
	Policy input Relevant to the MMS (Policy Objective)	**Policy implications on Skills Planning (MQA response to policy imperatives)**
	responsive to sectorial, local, regional and national skills needs and priorities • Encourage and support small enterprises, worker initiatives, NGO and community training initiatives • Build career guidance and vocational guidance	• Facilitates and funds HDSA Lecturer development. • Provides mentorship programmes for small businesses. • Provides career guidance by convening events at regional career expos and high schools. • Funds Maths and Science interventions for grade 10, 11 and 12 learners.
National Development Plan (NDP) 2014 (Published 2014)	• Improve education and training • Expand skills base through better education and vocational training.	• The MQA funds learnerships, workplace placement and internships, rural development, bursaries – aimed at creating a pool of HET graduates to pursue careers in the MMS and collaborates with TVET colleges.
Revised Human Resources Development Strategy for South Africa (HRDS-SA) (Published 2018)	• Expand access to quality post-schooling education and training. • Strengthen basic education and foundation programmes in Science, Technology, and Engineering in increasing the numbers of pupils leaving school with university entry level, Science, Technology and Maths. • Establish partnerships for the development of quality higher level occupational skills; expansion of postgraduate study with a particular focus on masters and PhDs, and research and innovation; building linkages between further education and training and higher education. • Build linkages between colleges and employers; building the capacity of TVET college educators and strengthening TVET college leadership. • Expand in the provision of workplace training in priority skills needs.	• The MQA has the following projects/programmes aligned to the HRDSSA: ○ TVET collaboration, Artisan development, Bursaries, Internships ○ Career and Pathway Guidance Project ○ Mathematics and Science Project ○ AET Grant, Foundational Learning Competency Grant Incentive ○ HDSA Lecturer development Programme ○ Practical training and workplace exposure Programme
Industrial Policy Action Plan (IPAP) 2013-2016 (Published 2013)	• IPAP has identified several growth sectors which will address the high rate of unemployment in the country.	• Mineral beneficiation, diamond processing and jewellery manufacturing as one of the MMS segments which will address the high rate of unemployment in the country. Funding for learnerships made available in this regard.

POLICY / ACT	Policy alignment to the MMS	
	Policy input Relevant to the MMS (Policy Objective)	**Policy implications on Skills Planning (MQA response to policy imperatives)**
National Growth Path (NGP) 2010 (Published 2010) &National Skills Accord (Published 2010)	• Improve job creation. Key targets set at the NGP launch 140 000 additional direct jobs in mining only, by 2020 • Increase funding for and quality of training • Align training to the New Growth Path and improve SSPs • Improve the role and performance of TVET colleges	• Rural development programmes • Partnerships in place with 23 TVET Colleges for capacitation and accreditation purposes. • Workplace experience for TVET College lecturers. • Workplace experience funded for learners.
White Paper-Post School Education Training (WP-PSET) (Published 2013)	• Improve the capacity of post-school education and training system to meet SA's needs.	• Partnerships in place with 23 TVET Colleges for capacitation and accreditation purposes. • Workplace experience for TVET College lecturers. • Workplace experience funded for learners
Youth Employment Accord (YEA) 2013 (Published 2013) & National Youth Policy (NYP) 2015-2020 (Published 2015)	• Improve education and training opportunities for the gap between school-leaving and first employment. • Connect young people with employment opportunities, through job placement schemes and work readiness promotion programmes for young school leavers.	• Rural development projects • Support learners on core learnerships (non-artisan development) for the MMS. • The MQA partners with the private sector to increase access to workplace experience • The career guidance initiatives by the MQA in schools and colleges will provide leverage for an informed youth prepared to enter the workforce.
Mid-Term Strategic Framework (MTSF) 2014-2019 (Published 2014)	• Improve the quality of and access to education and training • Ensure quality healthcare and social security for all citizens. • Encourage and support cooperatives, small enterprises, workers initiated, NGO and community training initiatives.	• Train 40 000 Occupational Health Safety Representatives over five years starting in 2008 (recent data unavailable) • Facilitate the development of scarce artisan occupational skills in the MMS. • Develop learning packs, learning materials for TVET and HET programmes • Support learners on core learnerships (non-artisan development) for the MMS.
Skills Development Act (SDA) (Published 1998)	• Increase the quality and quantity of artisans	• Facilitates the development of scarce or hard-to-fill artisan occupational skills in the MMS.
Mineral and Petroleum Resources Development Act (MPRDA) (Published 2002)	• Promote employment and advance the social and economic welfare of all South Africans and production operations; • Ensure holders of mining and production rights contribute to the socio-economic development of their areas	• The MQA provides learnerships and workplace placement for unemployed youth. • Rural Development • Bursaries –aimed at creating a pool of HET graduates to pursue careers in the MMS. • Collaboration with TVETs and HETs.

POLICY / ACT	Policy alignment to the MMS	
	Policy input Relevant to the MMS (Policy Objective)	**Policy implications on Skills Planning (MQA response to policy imperatives)**
Mine Health & Safety Act (MHSA) (Published 1996)	• To promote training in mine health and safety	• The MQA funds and supports training programmes for mine Health and Safety • The MQA regulates and accredits curricula on Mining Health and Safety programmes. • Supports the Mine Health and Safety's objectives through transformative skills development initiatives.
Mining Charter (Published 2010)	• Meaningfully expand opportunities for HDSAs. • Utilise and expand the skills base of HDSAs. • Promote employment and advance the social and economic welfare of mining communities and labour-sending areas • Promote beneficiation of South Africa's mineral commodities.	• The MQA provides learnerships and workplace placement for unemployed youth. • Rural Development –including Maths & Science and literacy programmes • Career guidance • Bursaries –aimed at creating a pool of HET graduates to pursue careers in the MMS. • Artisan development – the MQA has in place initiatives to develop artisans and other trades
Strategic Integrated Project 1	• Unlock the northern mineral belt endowed with coal reserves as catalyst in the Waterberg Region. According to Presidential Integrated Coordinating Commission (PICC, 2012)[2] SIP 1 is the largest of the 18 SIPs by project value and is estimated at around R803 billion.	• Identify future skills, develop funding mechanism to increase the scale of providing MMS skills including green skills
Strategic Integrated Project 4	• Facilitate of development of the MMS by opening up beneficiation opportunities in the North West	• Funding of learnerships focussing on mineral beneficiation and mineral processing • Facilitate ways of developing entrepreneurial skills within the SMMEs
Strategic Integrated Project 5	• Expand the rail and port integrated in the Saldanha area, construction of industrial capacity at the back of these ports (including a possible industrial development zone), strengthening maritime support for the gas and oil activities along the West Coast, and expansion of iron ore mining production	• Funding of learnerships focusing on relevant and significant qualifications in iron ore mining.

Source: MQA Strategic Plan 2017-2018

[2] PICC (2012) A Summary of the South African National Integrated Plan. http://www.gov.za/sites/www.gov.za/files/PICC_Final.pdf

Of the 18 Strategic Integrated Projects (SIPs), the three mentioned on the table above have a direct bearing on the MMS because:

- SIP 1: involves unlocking the northern mineral belt with Waterberg as the catalyst. According to Presidential Integrated Coordinating Commission (PICC, 2012) SIP 1 is the largest of the 18 SIPs by project value and is estimated at around R803 billion. The Waterberg Coal Complex in Lephalale is amongst the richest untapped mineral resources in the country and is a source for future coal reserves both for local and international use. The focus of SIP 1 is to unlock mineral resources which will generate thousands of direct jobs across the areas unlocked. Primary minerals on SIP 1 include coal (18 billion tons), chromite (5.5bn tons), platinum (6.3bn tons) and palladium (3.6bn tons).
- SIP 4: is linked to mineral beneficiation as it involves the facilitation of development of the MMS by opening up beneficiation opportunities in the North West (PICC, 2012).
- SIP 5: entails the expansion of the rail and port infrastructure in the Saldanha area, construction of industrial capacity at the back of these ports (including a possible industrial development zone), strengthening maritime support for the gas and oil activities along the West Coast, and expansion of iron ore mining production.

Following the launch of these projects by the Presidential Integrated Coordinating Commission, the DHET developed a skills plan for SIPs to address the demand, supply and skills shortages and identified the following MMS related occupations:

- Elementary and non-Production workers including Earthmoving workers and Survey Assistants, Plant Machine Operators such as excavator, crane or hoist operators, Trades such as Electrician, Millwright, Boiler maker, Welder, Rigger, Pipe Fitter and Industry Machinery Mechanic, Professional and non-Professionals including Electrical Engineering, Land Surveyor, Engineering Surveyor, Mechanical engineering Technicians as well as Mechanical Engineers.

As will be seen in Chapter 3, some of these occupations are considered to be hard to fill vacancies in the MMS and to this effect the MQA addresses these imperatives through funding of learnerships in the various programmes linked to SIPs such as mineral processing, beneficiation, entrepreneurship and iron mining.

2.4 Conclusions

This chapter demonstrated different change drivers that could influence skills development within the MMS. These include but are not limited to changing technology, the effects of globalisation, mine health and safety, mineral beneficiation, environmental sustainability, community and youth development as well as small enterprise development. All these factors influence and shape the skills development landscape in their own distinct way. Therefore, understanding how these factors impact and intersect with skills in the sector is imperative. To this effect, it becomes possible to seize the opportunities and mitigate the negative effects.

The chapter also spelt out legislative and strategies that drive the skills development and how the MQA responds to these directives. Continuous engagements with the MMS stakeholders is required to assist in providing relevant strategies for responding to the impact of these change drivers on skills supply and development. Furthermore, this should be supported by constant assessments of the impact of the MQA programmes for purposes of implementing proactive interventions. Research is also required to understand the R&D currently taking place in the area of mineral beneficiation to determine any skills training needs which may be required in the future.

3. OCCUPATIONAL SHORTAGES AND SKILLS GAPS

3.1 Introduction

This chapter focuses primarily on understanding the occupational shortages and skills gaps, the extent and nature of skills supply, as well as the pivotal list for the MQA.

3.2 Occupational shortages and skills gaps

3.2.1 Hard-to-fill Vacancies

Hard-to-fill occupations refer to occupations which employers struggle to find candidates for a sustained period of 6 to 12 months. They are informed by the Hard-to-fill Vacancy section of the submitted WSP-ATRs during the 2018 submission period and interviews with industry experts. Employers are required to indicate reasons for the hard-to-fill vacancies for each occupation identified on the list.

Table 3-1 below shows the top ten occupations which employers identified as hard-to-fill in the WSP- ATR submissions by OFO Code order, with the accompanying reasons. The main reasons for all hard-to-fill vacancies were attributed to the lack of relevant experience and qualifications.

Table 3-1: Hard-to-fill vacancies

Occupation name	OFO Code	Reasons
Engineering Manager	2017-132104	Lack of relevant experience & Lack of relevant qualifications
Mining Operations Manager	2017-132201	Lack of relevant experience & Lack of relevant qualifications
Mining Engineer	2017-214601	Lack of relevant qualifications
Safety, Health, Environment and Quality (SHE&Q) Practitioner	2017-226302	Lack of relevant experience & Lack of relevant qualifications
Mining Production Supervisor	2017-312101	Lack of relevant experience & Lack of relevant qualifications
Engineering Supervisor	2017-312103	Lack of relevant qualifications
Rigger	2017-651501	Lack of relevant experience, Lack of relevant qualifications & Unsuitable job location
Boiler Maker	2017-651302	Lack of relevant experience & Lack of relevant qualifications
Diesel Mechanic	2017-653306	Lack of relevant qualifications
Millwright	2017-671202	Lack of relevant experience

Source: MQA Weighted WSP/ATR (31 May 2018)

The top 10 hard-to-fill vacancies identified above corroborates with occupations that are identified as national priorities as 6 of them, i.e. Mining Engineering, Millwright, Boiler Maker, Diesel Mechanic, SHE&Q and Engineering Manager appeared on the DHET's 2018 national list of occupations in high demand. Occupations in High Demand refer to those occupations that have shown relatively strong employment growth, and/or are experiencing shortages in the labour market or which are expected to be in demand in the future (DHET, 2018).

Furthermore, a comparative exercise between the WSP-ATR data (3-1 above) and hard-to-fill vacancies list collected through in-depth interviews (3-2 below) correlates with each other and highlights the similar occupations as hard-to-fill. This confirms challenges employers face in finding

suitable candidates to fill the Engineering Manager, Mining Engineer, Mining Operations Manager, Millwright, and Diesel Mechanic vacancies within the sector. In addition to the reasons provided in the WSP-ATR submissions, a recurring reason for most of the hard-to-fill vacancies identified by industry experts is the lack of competitive compensation structures to attract potential employees. Additionally, the lack of experience due to lack of succession planning and lack of knowledge about career options that lead people into specialised positions contribute to hard-to-fill vacancies. Lack of people with relevant qualifications in areas such as Mining Production Supervisor, SHE&Q and Millwright remains a critical area to address through skills development programmes.

Table 3-2: Hard-to-fill Vacancies from the in-depth interviews

Hard-to-fill	OFO Code	Reason/s for Challenge
Mine Manager	2017-132201	Competitive compensation structures and limited pool of suitably qualified and experienced candidates
Safety, Health, Environment and Quality (SHE&Q) Practitioner	2017-226302	Geographical location of workplace, relevant qualification and study direction & lack of internal training for HDSA
Mining Engineer	2017-214601	Lack of succession planning from companies and MMCC difficult to pass & Employment equity, especially affirmative action candidates therefore it is skill related for HDSA candidates.
Instrumentation Technicians and Trainers	2017-311401	The ones trained in the basic trade are not trained as trainers & lack of qualified people (training and curriculum don't focus on new skills needed)
Mine Planner/ Super Superintendent Mine Planning	2017-311701	Competitive compensation structures and limited pool of suitably qualified and experienced candidates
Strata Control Officer and Supervisor	2017-311701	Competitive compensation structures and limited pool of suitably qualified and experienced candidates
Engineering Supervisor	2017-312103	Competitive compensation structures and limited pool of suitably qualified and experienced candidates
Electrical and Electronics Trades Workers	2017-662317	Competitive compensation structures and limited pool of suitably qualified and experienced candidates
Millwright	2017-671202	Employment Equity-availability of African female candidates & Lack of experience
Diesel Mechanic	2017-653306	Not enough persons trained in the basic trade & lack of interest from learners

Source: In-depth interviews (2018)

The occupational shortages have been extracted from the hard-to-fill vacancies in the 2018 WSP-ATR submissions and are shown in Table 3-3. All occupations with a vacancy intensity rate of 5% or higher are the generally-accepted level at which concern regarding possible scarcity is raised. Vacancy intensity rate refers to the number of vacancies as a percentage of the total employment within the occupational category, i.e. demand versus supply. The two columns highlighted in green put the vacancy intensity rates in perspective by referring to the number of companies that employ these skills and their corresponding number of vacancies.

Table 3-3: Occupational shortages by vacancy intensity rate

OCCUPATION	Occupation Name	Alternative title/s	Total hard-to-fill-vacancies	Number of companies specifying hard-to-fill-vacancies	Total Employed	Number of companies who employ these skills	Vacancy intensity rate (%)
2017-132104	Engineering Manager	Section Engineer / Engineering Manager	*169	206	1332	247	12,7%
2017-132201	Mining Operations Manager	Mine Manager/Production Manager/ Quarry Manager	192	174	1430	298	13,4%
2017-214601	Mining Engineer	Mining Engineer/ Rock Engineer	132	121	828	131	15,9%
2017-226302	Safety, Health, Environment and Quality (SHE&Q) Practitioner	Safety, Health, Environment and Quality (SHE&Q) Practitioner/ Occupational Health and Safety Advisor/Chief Safety Officer	132	108	3007	379	4,4%
2017-312101	Mining Production Supervisor	Pit Foreman/Shift Supervisor/Mine Overseer (Production) /Maintenance Superintendent	582	264	12784	381	4,6%
2017-312103	Engineering Supervisor	General Engineering Supervisor (GES)/ Engineering Foreman/ Mechanical Foreman	132	114	3604	214	3,7%
2017-651501	Rigger	Rigger (Metal Engineering) / Rigger Ropesman	*90	114	1474	145	6,1%
2017-651302	Boiler Maker	Boiler Maker	240	114	5240	313	4,6%
2017-653306	Diesel Mechanic	Diesel Mechanic	402	126	4801	247	8,4%
2017-671202	Millwright	Millwright/Winder Technician	358	106	3391	145	10,6%

Source: MQA Weighted WSP/ATR (31 May 2018).

**Vacancies are lower than the number of company counts as not all companies specified the number of vacancies available in their organisation and some had no available vacancies at the time of reporting.*

According to the occupational shortages by vacancy intensity rate demonstrated in the above table, all occupations identified as hard-to-fill vacancies, except Engineering Supervisor as well as

Safety, Health, Environment and Quality (SHE&Q) Practitioner are a cause for concern given that their vacancy intensity rate is 5% and above.

3.2.2 Hard-to-fill vacancies by occupational category

Considering the industry-accepted norm of a 5% vacancy intensity rate triggering a cause for concern, the data indicates that there are no serious shortages on aggregated data, however the rate of hard-to-fill vacancies at occupational level shows a concern. The categories that have among the highest number of vacancies are trade related occupations at technical and artisans level.

Table 3-4: Occupational vacancies by major occupational level

Occupational category (OFO)		Number of vacancies	Number employed	Vacancy intensity rate (%)	Major Reasons/ Challenges
Group	Title				
1	Managers	361	13455	2,7%	Lack of relevant experience & Lack of relevant qualifications
2	Professionals	264	23387	1,1%	Lack of relevant experience & Lack of relevant qualifications
3	Technicians and Associate Professionals	714	53128	1,3%	Lack of relevant experience & Lack of relevant qualifications
4	Clerical Support Workers	0	21290	0,0%	N/A
5	Service and Sales Workers	0	6205	0,0%	N/A
6	Skilled Agricultural, Forestry, Fishery, Craft and Related Trades Workers (Artisan category)	1090	40489	2,7%	Lack of relevant experience, Lack of relevant qualifications & Unsuitable job location
7	Plant and Machine Operators and Assemblers	0	206481	0,0%	N/A
8	Elementary Occupations	0	118436	0,0%	N/A
9	Learners	0	10600	0,0%	N/A
Total		**2429**	**493471**		

Source: MQA Weighted WSP/ATR (31 May 2018)

3.2.3 Skills Gaps by Major OFO Group

Skills gaps refers to skills deficiencies in employees or lack of specific competencies by employees to undertake job tasks successfully to required industry standards. Skills gaps may arise due to lack of training, new job tasks, technological changes, or new production processes. According to the DHET, the term “top up skills” also refers to skills gaps. It usually requires a short training intervention (DHET, 2017).

Findings revealed that the most common skills gaps according to industry experts for senior managers are related to leadership and managerial skills, whilst technicians and artisans experience skills gaps in people, supervisory and communication skills as well as knowledge and application of new technology. Managers are expected to understand the process of influencing staff members and agreements should be made on factors that impact the facilitation of processes that influence individual and collective efforts to accomplish shared objectives. On the other hand, lower-level employees, i.e. plant operators and elementary workers lack computer and numeracy skills. Knowledge and ability to utilise computers and related technology specific to areas of work is imperative for the development of these employees in the sector.

3.3 Extent and Nature of Supply

The future growth prospects of a sector is dependent on the availability of appropriate and affordable skills, therefore an analysis of the supply-side is necessary. Data received from the MQA, DMR, DHET and Minerals Council South Africa on education and training was analysed. Findings from the stakeholder engagements as well as desk research were analysed and included for this section.

3.3.1 Current state of education and training provision

Skills development has a biased dependence on basic education as a foundation phase to enable people to move into other areas of education and training. Similarly to other economic sectors; skills required for the MMS are produced at basic education level, TVET colleges, through private training providers, universities of technology, universities as well as workplaces.

3.3.1.1 Basic education

3.3.1.1.1 Overview of the basic education

The skills available to the sector consist of people currently employed, as well as those that are unemployed but available for work. Chapter one's labour market profile showed that the biggest proportion of workers (48%) have achieved the equivalent of Grades 10 - 12 as their highest level of education. However, stakeholders expressed concerns with the quality of basic education in the country. Many occupations within the MMS require a foundation of good quality Maths and Science subjects and to some extent Geography. However, according to the stakeholders, the majority of the population is lacking backgrounds with such subjects, even when Grade 12 has been completed.

South Africa has one of the highest rates of public investment in education in the world. At about 7% of gross domestic product and 20% of total state expenditure, the government spends more on education than on any other sector (StatsSA, 2015). School integration has been a persistent challenge for many rural provinces and a fair portion of the Department of Basic Education's budget is channeled to rural school integration (ibid). The NDP calls for 450 000 Grade 12 learners to achieve university entrance passes with Maths and Physical Science by 2030. However, the intake for these subjects at high school has been slow (ibid). Although the national Grade 12 pass rate has improved somewhat in recent years, questions remain about the quality of the Grade 12 certificate, especially considering that learners need to score only 30% to pass some subjects. National and regional stakeholders believe that many learners struggle with the National Certificate Vocational (NCV) subjects at TVET colleges because their basic education has been poor. It is believed that when this has been resolved, much of the current training requirements which employers and the MQA have to fund will become unnecessary.

3.3.1.1.2 MQA interventions to address challenges at basic education level

The MQA, in consultation with stakeholders in the MMS, have been developing skills interventions over the years to meet the skills needs of the sector at various levels of education.

Employees whose highest level of education is between Grades 4 and 9 constitute 16% of the sector. This range includes AET levels 1 – 4. As discussed in chapter two, given the influence of technology in the sector, there is a need for reskilling some of the current and future employees in areas such as machine operations and maintenance. Thus, it will be important for stakeholders in the sector to prioritise funding for AET training, including level 4, also taking into account that numeracy and literacy skills that were identified by experts as skills that need to be topped up for elementary workers. This will help develop adequate literacy and numeracy levels for industry's emerging new skills requirements. The MQA's WSP/ATR submissions show that employers in the sector offer training on AET 1 – 4 for their employees. In 2017-18 a total of 2 891 employees received one or more levels of AET training.

3.3.1.1.3 MQA interventions in basic education: Maths and Science programmes

Maths and Science, alongside other STEM subjects are imperative to the MMS as they are used daily in many areas of mining operations. According to the Organisation for Economic Co-operation and Development (2015), South Africa was ranked 75th out of 76 countries, with the Trends in International Mathematics and Science Study (TIMSS) ranking South Africa near the bottom of various rankings for its Maths and Science performance. South African learners are reported to be behind those in poorer parts of the African continent. It was mentioned that 27% of pupils who have attended school for six years could not read, compared with 4% in Tanzania and 19% in Zimbabwe. After five years of school, about half could not work out simple maths such as division (Writer, 2015).

The MQA has recognised the state of Mathematics and Science as a national challenge and have thus, taken active steps to improve the situation. The MQA's Maths and Science Project was established with the objective to support Grades 10, 11, 12 Maths and Science learners to achieve results that will allow them access to HET and TVET institutions to enroll for mining and minerals related qualifications. In 2017-18, the MQA committed to support 1 200 learners, to which 1 484 learners were assisted, thus contributing to a 124% achievement above the target. This was attributed to the organisation's willingness to support more learners.

The MQA is therefore, encouraged to continue supporting such initiatives to address the national aim of improving Maths and Science in schools. In addition, stakeholders suggested that these programmes should be monitored for impact, and that the lessons learnt be incorporated into the programme to ensure effectiveness. A popular suggestion from stakeholders was to also focus efforts on the development of teachers to ensure improvement of pass rates and quality of the subjects.

Further to the Maths and Science project, career awareness events are held across the country to encourage learners to pursue careers in the MMS.

3.3.1.1.4 MQA interventions in basic education: Career awareness

A key function of secondary education is to prepare learners to transition successfully towards a future career path. This involves providing curriculum opportunities to build learners' general capabilities, support their interests and aspirations, and enable them to make informed decisions about their subject choices and pathways (CiCA, n: d). This can be done through career awareness

and guidance. Career awareness and guidance plays a critical role in one understanding a variety of career options and career progression opportunities available. In 2017-18, the MQA made a commitment to undertake 60 career awareness events to increase awareness of occupations within the MMS. The aim of this programme is to provide comprehensive information to learners and young adults on careers and pathways in the sector. The programme is also targeted at correcting misperceptions about the mining and minerals sector not being an attractive industry to work in. This target was exceeded - a total of 67 events were conducted.

Stakeholders have emphasised the role of career guidance in creating awareness and knowledge around the diverse mining career options available as well as in providing information on the importance of pursuing Maths and Science until Grade 12 (including the consequences on future career prospects if not pursued). Additionally, stakeholders widely held the notion that career guidance initiatives should be taking place before Grade 10 when learners need to decide their subjects, including whether or not to drop Maths and replace it with Maths Literacy. Career awareness events should therefore, provide sufficient details of the MMS related occupations so that learners will be empowered to make informed decisions regarding whether or not careers in the sector might be suited for them or not, and whether or not the mining industry is attractive to them, thus potentially avoiding career changes and unnecessary training expenditure at a later stage. Stakeholders suggested that this initiative should also be monitored for impact, and that an increase in events of this nature at high school level should continue to be supported.

3.3.1.2 TVET college sector

TVET colleges form a critical component of the current training capacity of skills for the sector. Their programmes include NCV, Nated (mainly for artisan development), skills programmes, learnerships and short courses. Many MMS-related skills are developed at this level of education, covering a variety of mining operations including Blasting, Excavations, Metallurgy and Engineering. Practical training at college workshops and on-the-job workplace experience are an important component of this level.

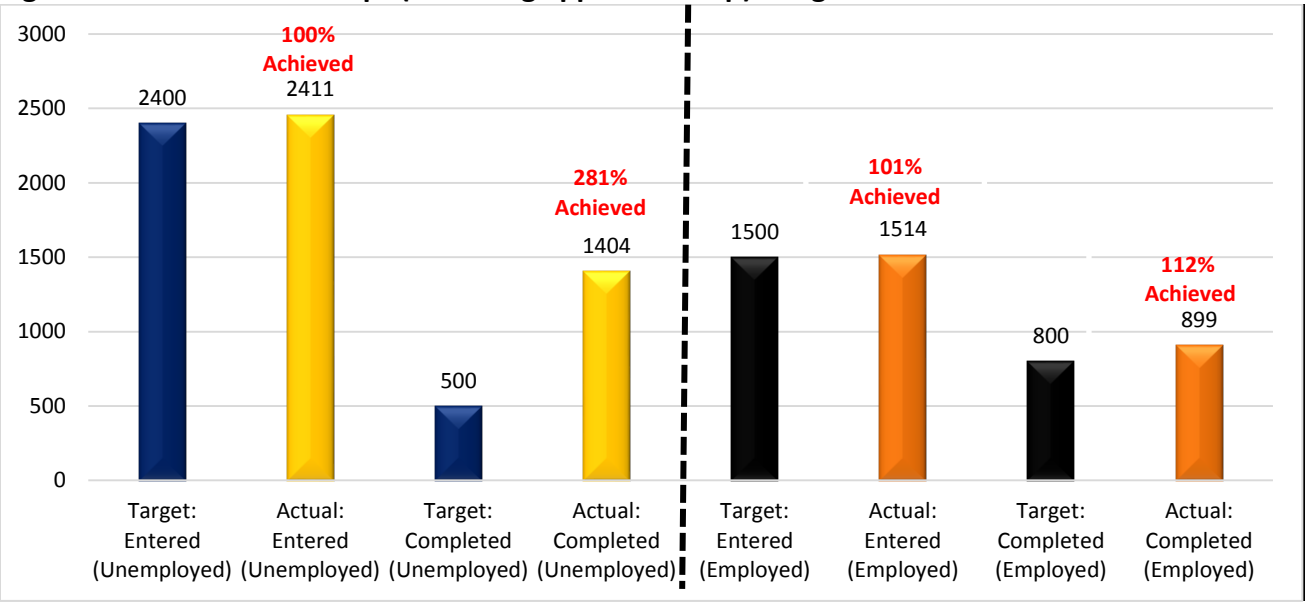
The main concern at this level was stated by stakeholders as being that many learners are not adequately work-ready upon graduating, particularly artisans. While employers in the sector appreciate the need to carry a measure of responsibility for the training of graduates to develop company-specific skills. This emanates from the notion that many college workshops are not equipped enough to provide adequate practical training required for the completion of qualifications; and curricula are for the most part not believed to be updated with the latest technologies being used in the sector.

Below is a summary of the MQA's skills development interventions at the TVET college sector level to assist the industry in meeting its skills requirements.

3.3.1.2.1 MQA interventions at TVET College: Learnerships

Figure 3.1 shows the annual targets versus actual achievements for 2017-18 where learnerships are concerned, excluding apprenticeships. A total of 3925 learners registered for MQA-funded non-artisan development learnerships (both unemployed and employed community members). About 1 404 unemployed learners completed non-artisan development learnerships during the year, thus achieving its target; and 899 employed learners completed their learnerships, thereby meeting the target at 112%. All the targets were exceeded due to learners from previous years completing their programmes in 2017/18 financial year.

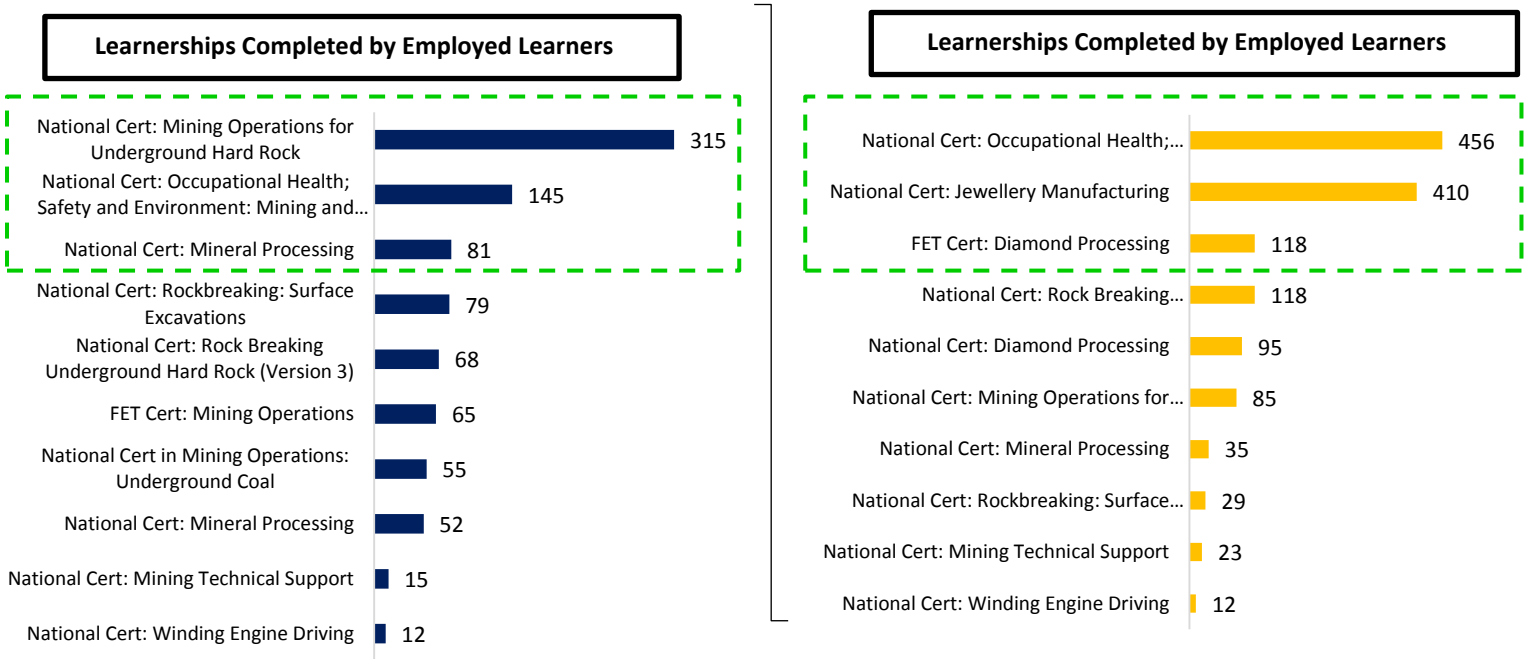
Figure 3.1: MQA Learnerships (excluding apprenticeship): Target vs. Actual 2017-18



Source: MQA APR (2018)

Figure 3.2 shows the top ten learnerships (excluding artisan development) completed by employed and unemployed learners in 2017-18. For both learnerships, the top three concern core mining skills at stage one of the mining activities, which are mining operations for underground hard rock, jewellery manufacturing, together with occupational health, safety and environment, as well as diamond and mineral processing.

Figure 3.2: Top 10 Learnerships completed in 2017-18 (excluding artisan development)



Source: MQA APR (2018)

Figure 3.3 shows the annual targets versus actual achievements for 2017-18 where apprenticeship learnerships are concerned. A total of 1 535 learners entered MQA-funded apprenticeship learnerships, which is 102% of MQA's target. A total of 1 478 learners completed apprenticeship learnerships during the same year, which is 82% of MQA's target. The shortfall was believed to be due to an insufficient pipeline of learners created in the previous years.

3.3.1.2.2 MQA interventions at TVET College: Practical training and workplace exposure

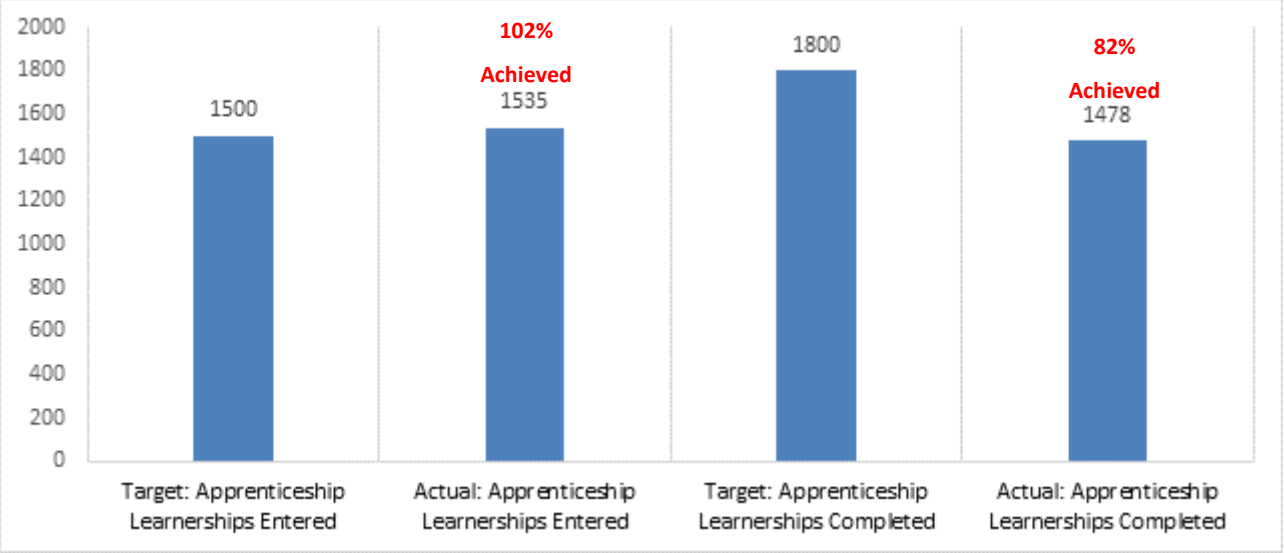
According to the National Skills Accord between industry and government, SETAs need to facilitate the placement of TVET college and university students into the industry. In 2017-18 the target was to place 250 TVET NCV learners with host employers (an increase from 200 in 2016-17), with 250 being successfully placed. The target for completed workplace programmes at TVET colleges was 200, but 132 completed – this is said to be owing to an insufficient number of learners in the pipeline created in previous years. However, the targets for undergraduate students were successfully achieved, with 360 completions out of a target of 340. Furthermore, the targets for graduates that completed internships was also achieved, with the target of 275 exceeded by 9 with a 103% achievement rate (284).

To help alleviate the burden on employers to mentor learners, an initiative has been introduced to place coaches within workplaces to support employers with on-the-job mentoring and coaching activities. The target for 2017-18 was to place 50 coaches in companies for this purpose and this was successfully achieved as 53 coaches were placed.

Recommendations from stakeholders included that the focus on TVET colleges should be on lecturer development. These suggestions are currently being addressed as there is a programme that places lecturers in companies for workplace exposure. In 2017-18, the target was to place 30 lecturers in the programme and a commendable 64 lecturers were placed. The target was exceeded due to a high demand in MQA interventions in the TVET colleges.

3.3.2 MQA Learnerships (Apprenticeship): Target vs. Actual 2017-18

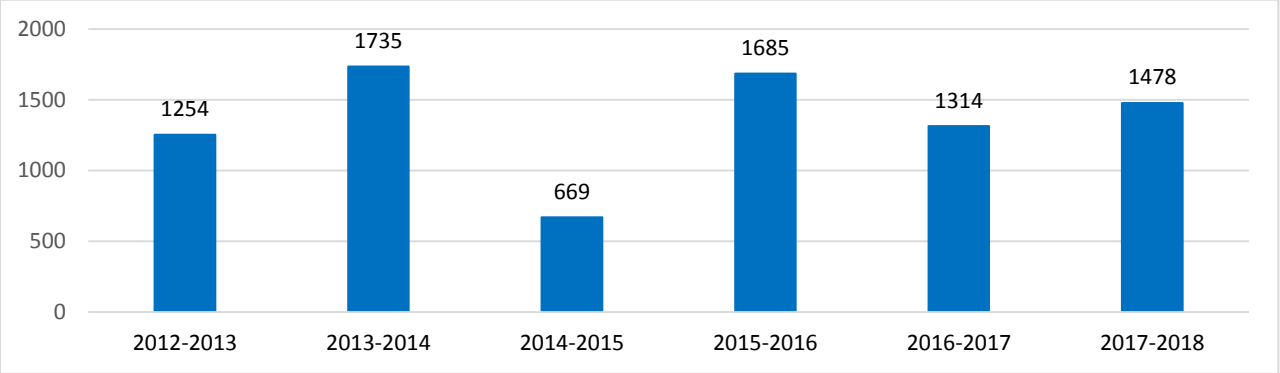
Figure 3.3: MQA apprenticeship development programme



Source: MQA APR (2018)

Figure 3.4 shows a six-year analysis of the number of learners who completed apprenticeship learnerships. In 2012-13 and 2013-14 the numbers remained over 1 000, but in 2014-15 there was a significant drop to below 700 in 2014-15. Upon analysis of previous enrolment figures, it was found that a significant drop in enrolment occurred in 2011, and then recovered to over 2 000 enrolments for subsequent years. This decrease may help to explain the reason for the low completion numbers in 2014-15. Completions in the most recent two years returned to pre-2014-15 levels of between 1300 to 1500 learnerships.

Figure 3.4: Apprenticeship qualifications completed (6-year trend)



Source: MQA APR (2018)

Table 3-5 shows a breakdown of apprenticeship learnerships entered and completed in 2017-18 and compares these figures to the total number employed in the sector and number of hard-to-fill vacancies.

Table 3-5: Apprenticeship learnerships entered and completed by vacancy rate

OFO Code	OFO Description	Number of learners entered 2017-18	Number of learners completed 2017-18	Total employed (current) in the sector	Number of hard-to-fill vacancies	Vacancy intensity rate (%)
2017 - 651302	Boilermaker	103	120	5240	240	4,6%
2017 - 653306	Diesel Mechanic	132	188	4801	402	8,4%
2017 - 671101	Electrician	372	441	7217	90	1,2%
2017 - 653303	Fitter	218	311	7065	294	4,2%
2017 - 652302	Fitter and Turner	56	36	1891	42	2,2%
2017 - 672105	Instrument Mechanician	46	62	1174	60	5,1%
2017 - 671202	Millwright	85	70	3391	358	10,6%
2017 - 651501	Rigger	43	73	1474	90	6,1%
2017 - 651202	Welder	127	106	678	42	6,2%
2017 - 661302	Diamond & Gemstone Setter	64	11	94	372	395,7%
2017 - 661301	Goldsmith	238	29	393	3758	956,2%
2017 - 216303	Jewellery Designer	0	4	14	0	0,0%
2017 - 711203	Diamond Cutter	0	27	611	0	0,0%
2017 - 733208	Earth Moving Mechanic	51	0	5594	12	0,2%
	Total	**1535**	**1478**	**39637**	**5748**	

Source: MQA APR (2018)

The number of learnerships entered and completed varies across occupations owing to variation in length of course or late completions. Out of the 14 occupations supported by the MQA's artisan development programme, 4 appear on the hard-to-fill list, i.e. Millwright, Rigger, Diesel Mechanic and Boiler Maker. These occupations have also revealed to have had higher numbers of vacancies than completions, which indicate a call for concern in addressing the skills gap. However, above and beyond the hard-to-fill vacancies, it is encouraging to note that the MQA's support in artisan development is in line with the national demand as 9 (64%) out of 14 of its apprenticeship

learnerships appeared on the DHET's 2018 national list of occupation in high demand. Caution, should however, be taken into consideration for occupations that report high number of vacancies that are above the number of people they employ in their respective subsectors, i.e. Goldsmith as well as Diamond and Gemstone Setter.

Furthermore, occupations that have number of completions that are higher than the number of vacancies in the sector indicates progress in addressing the need for artisans in the sector. However, competition with other sectors for artisans; as well as an uncertainty of job attainment in the MMS after completion means that not all artisans developed within MMS will be absorbed in the sector. In addition, as reported in Chapter 2, technology continues to play a role in shaping the skills sets in the sector. With this accounted for, stakeholders mentioned that there is a shortage of artisans with specialised knowledge and experience in updated and new technology. Therefore, learnerships need to incorporate changes in technology within occupations and include work experience at suppliers of new technology to the mines as much as possible.

3.3.3 MQA-accredited Training Providers

A total of 123 training providers were accredited by the MQA. This ensures that there is a pull of accredited training providers to offer MMS related qualifications. It also confirms the level of proficiency and quality of training undertaken for current and future employers. Improvement in the time it takes to finalise accreditation has been suggested by stakeholders as concerns were raised regarding the lengthy process of gaining accreditation which then impedes the speed at which skills can be developed in the sector.

3.3.4 Employer funded training reported on WSP-ATR

Companies in the sector contribute much to the development of skills for employees. About 612 757, excluding induction, ex-leave training and refresher course training programmes were completed by employees in 2017-18. These varied greatly in type, with the top 3 being short courses (346999), job specific development programmes (102017) and operator licence/renewal (97618) programmes.

Upon deeper analysis of the different types of short courses completed, it was found that while many of them were not specified in the WSPs, among the highest were engineering core, mining core, safety and supervisory and management skills, and soft skills.

Given the ongoing retrenchment drives prevailing in the sector, it is noteworthy that a total of 5519 short courses were completed on portable skills. Specifically, they were: Licences: 1647 courses, Engineering: 1329 courses, Construction: 166 courses, Business: 315 courses, Agriculture: 24 courses and other (not specified 2038 courses. Through portable skills, employees can commence new careers, whether it is in entrepreneurship or working for a new employer that could be outside the MMS. Subsequently, employees can use these skills to benefit themselves, their families, and even their communities.

3.3.5 Higher Education and Training

Higher education and training or tertiary education, includes education for undergraduate and postgraduate degrees, certificates and diplomas up to the level of the doctoral degree. In recent years, more school-leavers have been obtaining marks that enable them to enrol for studies at

university level – however, owing to the poor Maths and Science pass marks in the country, the uptake for the sector itself remains relatively low.

3.3.5.1 Universities' qualification enrolment and completions

With regard to universities, some of the fields of study relevant to the sector are mining engineering, mine surveying, metallurgy, chemical engineering, geology, electrical engineering, mechanical engineering, as well as jewellery design and manufacturing. Mining engineering is offered at the University of the Witwatersrand, the University of Pretoria, the University of Johannesburg, and UNISA, while Mine Surveying is offered at the University of Johannesburg. Jewellery design and manufacturing is offered at Stellenbosch University and at four other Universities of Technology. The other fields of study are each offered at a number of institutions.
The table below demonstrates a 6 year trend of the number of graduates enrolled and completed qualifications related to the MMS. There was an increase in the enrolment and completions of qualifications in Electrical, Mechanical, Metallurgical and Mining Engineering. However, although Metallurgical and Mining Engineering have had an increase in enrolments and completions since 2011-2015, a decrease was observed in 2016 for both qualifications. The completion rates for these qualifications is 21% (Metallurgical Engineering) and 16% (Mining Engineering). This indicates the need for continuous support (be it in the form of mentoring or financial support) to be provided to students enrolled in these qualifications as they have the potential to address hard-to-fill occupations once they attain their qualifications.

Table 3-6: Student enrolment and qualification completion numbers in MMS-related qualifications

Qualification	Year											
	2011		2012		2013		2014		2015		2016	
	Enrolments	Completions	Enrolments	Completions	Enrolments	Completions	Enrolments	Completions	Enrolments	Completions	Enrolments	Completions
Chemical Engineering	8 423	1 170	8 578	1 352	8 905	1 468	8 727	1 619	8 669	1 658	8 630	1 583
Electrical Engineering	19 768	2 567	19 742	2 579	20 846	2 888	21 049	3 269	21 277	3 269	21 333	3 360
Geology	3 356	906	3 463	993	3 256	890	3 419	978	3 758	1 070	3 775	1 078
Mechanical Engineering	13 613	1 893	14 206	2 064	14 646	2 259	14 642	2 469	15 104	2 609	15 371	2 722
Metallurgical Engineering	1 783	376	1 890	335	2 066	509	2 171	477	2 083	504	2 055	410
Mining Engineering	2 626	418	2 788	431	2 986	474	2 998	441	2 979	430	2 721	487

Source: DHET (2018) Most recent data available from DHET. The 2017 figures are not released yet.*
** It should be noted that completion rates are not always related to enrolments as enrolment of a particular qualification could have been at different periods for different students.*

Table 3-7 shows the breakdown of the MMS-related qualifications by gender and race for 2016. The number of females enrolled in electrical engineering, mechanical engineering and mining engineering have historically been, and continue to be lower than that of males with Mechanical Engineering being the worst. However, females have surpassed their male counterparts in Geology

which is a positive step towards reaching gender equality. For all disciplines, Africans constitute a substantially higher proportion of graduates than other race groups.

Table 3-7: Graduate numbers in MMS-related qualifications, by gender and race, *2016

	Chemical Engineering		Electrical Engineering		Geology		Mechanical Engineering		Metallurgical Engineering		Mining Engineering	
	M	F	M	F	M	F	M	F	M	F	M	F
White	171	102	507	50	173	91	906	104	27	8	31	6
Indian	70	83	142	30	12	27	212	34	4	3	5	1
Coloured	37	41	79	11	27	25	97	19	3	4	7	0
African	542	512	1850	663	311	402	1076	244	192	169	272	165
Not specified	14	11	25	5	9	2	26	6	N/A	N/A	N/A	N/A
Gender Total	834	749	2602	758	531	546	2316	406	226	184	315	172
(%)	52.7	47.3	77.4	22.6	49.3	50.7	85.1	14.9	55.1	44.9	64.7	35.3
Total*	1583		3360		1078		2722		410		487	

Source: DHET (2017) 2016 is the most recent data from DHET available. The 2017 figures are not released yet.*

3.3.5.2 Industry-funded bursaries (non-employee and employee)

Table 3-8 shows the number of bursaries for non-employees funded by the sector's employers who also contribute to skills development. The majority of the funded bursaries are non-mining related, with approximately a third of the programmes related to mining. With the hard-to-fill occupations consisting of mostly high level occupations, there is a need for the sector to channel their investments in programmes that will address the state of occupational demands in the sector.

Table 3-8: Non-employee bursaries funded by employers

Bursary Type	Number of bursaries	% contribution in relation to total number of bursaries
Other (Programmes that are not mining related)	2229	64,20%
Jewellery Design	521	15,01%
Mining Engineering	173	4,98%
Chemical Engineering	87	2,51%
Electrical Engineering	80	2,30%
Metallurgy	79	2,28%
Mechanical Engineering	75	2,16%
Electro Mechanical	53	1,53%
Geology	51	1,47%
Environmental Health	50	1,44%
Mine Survey	17	0,49%
Industrial Engineering	16	0,46%
Extraction Metallurgy	7	0,20%
Accounting	4	0,12%
Analytical Chemist	4	0,12%
B Com Accounting	6	0,17%
Nursing	3	0,09%
Bachelor of Arts	2	0,06%
Human Resource	3	0,09%
Business Management	3	0,09%

Civil Engineering	1	0,03%
Computer Science	1	0,03%
Hospitality	1	0,03%
Law	1	0,03%
Mechanical Fitter	1	0,03%
Partial B Com Commerce	1	0,03%
Physical Mining	1	0,03%
Teaching	1	0,03%
Tourism	1	0,03%
Total	3472	100%

Source: MQA Weighted WSP/ATR (31 May 2018)

Table 3-9 shows the number of study-assistance programmes funded by the sector's employers for their employees. Study assistance programmes in mines aim at supporting and encouraging the development of employees through providing them with financial assistance that enables them to study further for National Certificates, Diplomas, Undergraduate and Post-graduate degrees. Similarly to bursaries awarded to non-employees, great concern is in the number of study assistance offered to employees that are non-mining related. This indicates a mismatch in the sector's supply versus the demand identified by the hard-to-fill vacancies. In addition, the support of non-mining related study assistance by employers could place the sector at risk of having employees exit the industry upon attainment of their qualifications. For example, while other engineering programmes are occupations which can be used in the MMS, the sector competes with other sectors for these skills sets.

Table 3-9: Employee study-assistance programmes funded by employers

Bursary Type	Number of study assistance	% contribution in relation to total number of bursaries
Other (Programmes that are not mining related)	2553	82,6%
Environmental Health and Management	154	5,0%
Electrical Engineering (Heavy Current Only)	83	2,7%
Mechanical Engineering	82	2,7%
Mining Engineering	78	2,5%
Chemical Engineering (Mineral Processing)	24	0,8%
Industrial Engineering	23	0,7%
Chemical Engineering	22	0,7%
Metallurgy	17	0,5%
Geology	14	0,5%
Electro Mechanical Engineering	14	0,5%
Mine Survey	10	0,3%
Analytical Chemistry	8	0,3%
Extraction Metallurgy	4	0,1%
Jewellery Design Manufacturing	5	0,2%
Grand Total	**3091**	**100%**

Source: MQA WSP/ATR 2018

3.3.5.3 MQA interventions at HET level

The MQA has a bursary scheme for tertiary studies. In 2017-18, the MQA set a target of 1000 bursaries for unemployed learners for MMS-related qualifications. This target was achieved and exceeded as 1421 students were awarded bursaries. This was due to a new streamlined approach

to the implementation of the project and an increase in the uptake of TVET learners. The annual target of 600 for completed bursary learners was also exceeded, with 606 learners completing their studies. The MQA benchmarks its target throughput rate against educational institutions, which is said to be between 15% and 20%. Table 3-10 shows the total number MQA-funded bursars currently in the system.

Table 3-10: MQA-funded bursars

Qualification	Year of Study				Total
	1st year	2nd Year	3rd Year	4th Year	
Hydrology	1	1			2
Occupational Hygiene	1				1
Accounting		1			1
Analytical Chemistry	6	32	46	29	113
Bachelor of Science	10	8	12	11	41
Chemical Engineering	42	40	45	48	175
Civil Engineering	1			1	2
Consumer science		1			1
Education		3	3	3	9
Electrical Engineering	58	108	61	51	278
Engineering Metallurgy	8	17	12	1	38
Environmental Health/Science	26	87	119	175	288
Extraction Metallurgy	5	7	4	3	19
Geology	24	48	60	22	154
Industrial Engineering	29	24	25	20	98
Jewellery Design And Manufacture	2	4	11		17
Jewellery Design and Manufacturing		11	6	1	18
Mechanical Engineering	64	71	59	31	225
Mechatronics	4	6		1	11
Metallurgical Engineering	4	14	14	15	47
Mine Surveying		3	1		4
Mineral Resource Management	2				2
Mineral Surveying	2		4	2	8
Mining/Mining Engineering	23	65	90	72	250
Psychology			1		1
Quality	2				3
Grand Total	**314**	**551**	**573**	**368**	**1806**

*Source: MQA APR (2018) *This table excludes interventions such as NCV and B. Tech courses and is inclusive of learners that were funded before financial year 2017-18*

Table 3-10 shows that two of the occupations on the hard-to-fill list have bursars currently in the system: Mining engineering and Environmental Health/Science. It is encouraging that the majority of the learners pursuing these disciplines are towards their final year.

3.3.6 Other supply-side considerations in the MMS

The following two sections provide detail on other supply-side concerns, which do not fall neatly into any of the afore-mentioned education levels, namely Government Certificates of Competency and management skills.

3.3.6.1 Government Certificates of Competency

Certain core occupations within the MMS, such as Mine Engineer and Mine Manager can only operate upon attainment of a Government Certificate of Competency (GCC) by the DMR, which confirms that the employee has the necessary skill-set required to perform the job. There are stringent qualification criteria, which include years of experience and passing of examinations to qualify for a GCC. Table 3-11 shows the number of certificates which the DMR has issued in the past six years. The decreasing numbers of GCCs issued for Mine Engineers may be a concern as it is on the hard-to-fill list. With the exception of Winding Engine Driver, there are significantly fewer females qualifying for all of these certificates. The decreasing numbers such as low representation of females and the attainment of a GCC is a concern as it affects the availability of competent skilled personnel and transformation of the sector.

Table 3-11: Certificates of Competency issued by DMR (6-year analysis)

Year	Mine Engineer (Elec & Mech			Mine Manager (Coal & Metal)			Mine Overseer (Coal & Metal)			Mine Supervisor			Winding Engine Driver		
	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F
2012-2013	72	71	1	62	49	13	165	157	8	12	12	0	18	14	4
2013-2014	115	100	15	73	57	16	177	168	9	10	10	0	58	34	24
2014-2015	121	102	19	15	12	3	103	93	10	10	8	2	33	15	18
2015-2016	98	80	18	29	22	7	105	99	6	9	8	1	35	19	16
2016-2017	70	57	13	29	24	5	77	67	10	15	9	6	28	12	16
2017-2018	47	39	8	27	22	5	76	65	11	11	9	2	20	11	9
Total	**523**	**449**	**74**	**235**	**186**	**49**	**703**	**649**	**59**	**67**	**56**	**11**	**192**	**105**	**87**
Percentage (%)	**100**	**85.8**	**14.1**	**100**	**79.1**	**20.9**	**100**	**92.3**	**7.7**	**100**	**83.6**	**16.4**	**100**	**54.7**	**45.3**

Source: DMR (2018)

3.3.6.2 Minerals Council South Africa certificates

Table 3-12 shows the number of certificates in MMS-related qualifications which the Minerals Council South Africa has issued since 2012. The numbers have declined significantly for most certificates, with the exception of intermediate certificate in mine environmental control and certificate in elementary mine sampling which have shown overall growth. The July 2017 figures show a significant decrease while the numbers in December 2017 show an increase. However, when compared to 2016, they are still approximately a quarter of the 2014 numbers.

Table 3-12: Certificates issued by Minerals Council South Africa

Certificate	As at July 2012	As at July 2013	As at Dec 2014	As at July 2015	As at Dec 2015	As at July 2016	As at Dec 2016	As at July 2017	As at Dec 2017
Certificate in Advanced Mine Surveying	70	58	91	57	6	54	19	19	17
Certificate in Advanced Mine Valuation	102	66	75	38	16	38	10	29	8
Certificate in Advanced Rock Engineering	11	3	4	4	3	5	1	3	0
Certificate in Basic Mine Sampling	141	63	164	80	43	73	26	50	28

Certificate	As at July 2012	As at July 2013	As at Dec 2014	As at July 2015	As at Dec 2015	As at July 2016	As at Dec 2016	As at July 2017	As at Dec 2017
Certificate in Basic Mine Surveying	130	142	156	77	66	120	14	42	19
Certificate in Elementary Mine Sampling	90	73	64	52	35	31	26	24	92
Certificate in Elementary Mine Surveying	130	88	141	95	25	46	46	24	9
Certificate in Mine Environmental Control	19	8	29	8	4	15	6	10	9
Certificate in Radiation Protection Monitoring Screening	125	109	181	61	41	108	37	63	32
Certificate in Rock Mechanics	27	25	25	16	2	12	14	11	6
Certificate in Strata Control	79	64	96	61	10	50	49	29	67
Intermediate Certificate in Mine Environmental Control	32	48	51	59	1	51	13	40	72
Certificate in Mine Survey Draughting	22	40	30	12	1	15	11	8	7
TOTAL	**978**	**787**	**1 107**	**559**	**253**	**618**	**272**	**352**	**366**

Source: Minerals Council South Africa (2018)

3.3.6.3 Management skills

Technical individuals, often Engineers, are promoted to managerial positions as there is a need for managers of mines to have a strong technical understanding of the operations they are managing. The sector lacks employees with a combination of senior technical knowledge and strong management skills which can negatively affect productivity and internal relations. National experts believe that the best place to develop these skills is experientially at the workplace, which takes at least eight years. Numerous stakeholders suggested that opportunities need to be created at early career stages, for example managing small tasks as well as attending management development courses.

The MQA has a management development programme in place which aims to address this challenge. The target of 250 HDSA employees who entered this programme was achieved and exceeded by one owing to greater awareness of the programme, while the target of 150 for those who completed the programme was successfully met and exceeded by 16.

3.3.7 Summary of Skills Supply

Figure 3.5 shows a summary of the supply-side issues discussed above which are currently faced by the sector's employers.

Figure 3.5: Summary of supply-side concerns

3.4 Summary of skills gaps

3.4.1 Skills areas in the sector that need improving

Table 3-13 lists the main skills issues which emerged through analysis of stakeholder engagements.

Table 3-13: Primary skills concerns in the MMS

Skills issue	Reason for concern
Maths and Science	The poor quality of basic education results in poor levels of Maths and Science subjects intake and pass rates which are critical to the MMS. Currently this is a concern in mine communities as unemployed youth seek to find employment at the mines.
Career awareness	It is believed by stakeholders that a lack of early career awareness could be responsible for the shortage in specialised MMS-related occupations. Career awareness should provide sufficient details that will enable a person to be empowered to make an informed decisions regarding whether or not the career might be suited to them or not. This will potentially avoid career changes and unnecessary training expenditure at a later stage.
Practical training and work integrated learning (WIL)	TVET college workshops should be equipped with modern mining technologies in order to prepare students to be work-ready upon graduating as current workshops are criticized to be not equipped with relevant machineries.
Work experience	Among the reasons provided by employers and stakeholders for the hard-to-fill occupations is a lack of high-level experience needed in senior positions.
Government Certificates of Competency	Stakeholders expressed concerns over the decreasing number of people achieving a GCC. Research has been underway to unpack the reasons. Once understood, the MQA will appropriate resources accordingly to address them.
Management skills	Technical people, often engineers, are promoted to managerial positions as there is a need for managers of mines to have a strong technical understanding of the operations they are managing. The sector lacks people with a combination of senior technical knowledge and strong management skills which can negatively affect productivity and internal relations. National experts believe that the best place to develop these skills is experientially at the workplace, which takes at least 8 years. Stakeholders suggested that opportunities need to be created at early career stages, for example managing small tasks, as well as attending management development courses.
Lack of training providers	There is a lack of accredited training providers in some provinces such as Western Cape and Eastern Cape due to low demand of training due to minimal mining activities to warranty full scale training focusing on MMS qualifications

Skills issue	Reason for concern
Lack of interest from youths	There is a decline in interest from youth in pursuing qualifications for Rigger, Boilermaker, Diesel Mechanic, Rock Drill Operators and Mechanical Loader Operator preferring for office jobs

3.4.2 Impact of skills shortages on employers

Stakeholders advised that the impact of these skills gaps include:

- The lack of high quality Maths and Science performance in learners make training more challenging to employers as many of the MMS-related occupations require these subjects as a foundation to do the jobs well.
- Changing technology in the MMS has affected the skills required within certain occupations, particularly artisans. Colleges for the most part have not adapted accordingly, which is an increased training cost to employers.
- Funding of non-mining related study assistance to employees and community members does not address the skills gaps in the sector. This also poses risks to the sector as employees can choose to work outside the MMS upon attainment of qualifications.
- Employers located in rural areas need to incentivise skilled people to relocate from other parts of the country, with additional incentives to retain them, which is a high cost to company.
- The lack of management skills can cause tension between employees within companies, and a lack of planning ability within the management skill can disrupt operations and jeopardise productivity.
- Individuals in non-core occupations are generally not attracted to working in the MMS, thus companies need to incentivise them with high salaries. This is also an increased cost to company.

3.4.3 Employability of graduates

- Graduates who complete apprenticeship qualifications are not perceived to be work-ready as they lack knowledge of and experience in new technology, which can be caused by inadequate practical training at college, as well as workplace experience which is too generic in nature. The responsibility then becomes the employers to undertake further training for them. The MQA's work-integrated learning programmes aims to address this issue.
- Graduates of non-mining engineering qualifications usually lack MMS-related experience. Companies generally prefer to recruit engineers with some sector-related experience. The MQA's internship programmes for engineering graduates aims to address this issue.
- An impact assessment of bursary, internship, work placement and apprenticeship qualifications is being undertaken as well as a tracer study of bursars to determine the impact these programmes have in contributing to skills development in the sector.

3.5 PIVOTAL list

The research study was designed to be as interactive as possible in the facilitation of the entire research process. Therefore, a consultative participatory approach with stakeholders and the sub-Board Committee was used to inform and finalise the most appropriate methodology to develop the MQA Pivotal list. Once all parties were in agreement with the methodology, the PIVOTAL list was sent to the Board where endorsement was made in favour of it.

Through the consultation process, the MQA's OFO Code PIVOTAL Skills List in Table 3.14 was determined by considering the hard-to-fill vacancies reported in the WSP-ATRs. The analysis entailed a frequency run of the top 10 most identified occupations by companies through the WSP-ATR submissions. This was then cross- tabbed by provinces and subsectors to identify the number of occurrences per occupations within 2 variables (province and subsector). Thereafter, the sum of province and subsector was calculated to develop the top 10 pivotal occupations for the MMS.

It is important to note that since the PIVOTAL list is OFO code-based, it is not possible to reflect other critical priorities within the occupation due to the limitations with the reporting framework. For example, AET, MDP, as well as skills related to mineral beneficiation and sustainability are blanket priorities in the sector and required to be developed within many occupations and at different NQF levels. Therefore, highlighting some of these occupations in the PIVOTAL list would be excluding many others which are as applicable. Considering this, as well as that PIVOTAL skills is also required to address scarce and critical skills, the research team chose to focus its PIVOTAL list on those occupations which are hard-to-fill vacancies only.

The interventions listed in the PIVOTAL list were informed by understanding the unique reasons for the challenges faced by employers where each of the occupations are concerned. The PIVOTAL list is ranked in order of OFO code according to advice by key stakeholders in the sector, including representatives of the industry, labour and government.

Table 3-14: MQAs' OFO Code Pivotal List (2019-20)

OFO Code	Occupation name	Companies Specifying Occupation	No. of hard-to-fill vacancies
2017-132104	Engineering Manager	206	*169
2017-132201	Mining Operations Manager	174	192
2017-214601	Mining Engineer	121	132
2017-226302	Safety, Health, Environment and Quality (SHE&Q) Practitioner	108	132
2017-312101	Mining Production Supervisor	264	582
2017-312103	Engineering Supervisor	114	132
2017-651501	Rigger	114	*90
2017-651302	Boiler Maker	114	240
2017-653306	Diesel Mechanic	126	402
2017-671202	Millwright	106	358

*Source: MQA WSP ATR (2018) *Vacancies are lower than the number of company counts as not all companies specified the number of vacancies available in their organisation and some had no available vacancies at the time of reporting.*

3.6 Conclusions

Analysis of the MQA's WSP/ATR submissions and discussions with stakeholders indicated that the hard-to-fill occupations are as follows: Engineering Manager, Mining Operations Manager, Mining Engineer, Safety, Health, Environment and Quality (SHE&Q) Practitioner, Mining Production Supervisor, Engineering Supervisor, Boiler Maker, Diesel Mechanic, Millwright and Rigger. The primary reasons underlying the challenges were found to be related to a lack of relevant experience and qualification, lack of succession planning and lack of competitive compensation structures.

The main supply-side concerns were found to be as follows:

- Basic education: low Maths and Science levels; and lack of early access to career awareness.
- TVET college sector: lack of practical training and workplace experience at colleges; outdated machinery at college workshops; and low throughput rates.
- HET sector: sector still lagging behind in attracting females to critical mining qualifications.
- Other (not specific to a level of education): lack of specialised knowledge and experience in updated and new technology; lack of work experience; lack of interest from youth; lack of management and project management skills; and declining GCC and MMCC achievement numbers for core MMS-related occupations.

4. SECTOR PARTNERSHIPS

4.1 Introduction

The MQA partners with and has relationships with numerous key role-players in the industry such as government departments, labour unions, industry representatives and training providers. The purpose of this chapter is to assess the effectiveness of existing partnerships in the sector. The chapter identifies challenges in maintaining and developing partnerships and proposes measures for addressing them. The chapter will also indicate new partnerships that the MQA has identified that will be addressed and considered during the cycle of this SSP update.

4.2 State of Existing Partnerships

4.2.1 TVET and Community college partnerships

In its mission to build linkages with TVET and Community colleges, the MQA entered into several partnerships with TVET and Community colleges to provide support highlighted in Chapter 3. The nature of partnerships as well as the successes, failures and areas of improvement are identified in the section below.

4.2.1.1 TVET Colleges

The MQA has established official partnerships, through Memoranda of Understanding (MOUs) and Service Level Agreements (SLA) with 23 TVET colleges in all the provinces where qualifications related to the MMS are offered, save for KwaZulu-Natal. One of the primary aims of these partnerships is to support TVET colleges in attaining accreditation status of the qualifications that they offer.

The following partnerships are in place for the provision of internship programmes, bursaries and lecturer training in governance programmes.

Table 4-1: Partnerships with TVET colleges

<table>
<tr><th>Name of Partners</th><th colspan="2">Purpose of Partnerships</th></tr>
<tr><td rowspan="2">1. Eastern Cape: Buffalo TVET College
2. Eastern Cape: King Sabata Dalindyebo TVET College
3. Eastern Cape: Ingwe TVET College

1. Free State: Maluti TVET College
2. Free State: Gold fields TVET College
3. Free State: Motheo TVET College
4. Free State: Flavius Mareka TVET College

1. Limpopo: Vhembe TVET College
2. Limpopo: Mopani South East TVET College
3. Limpopo: Sekhukhune TVET College
4. Limpopo: Capricorn TVET College</td><td colspan="2">The purpose of these partnerships includes the training of TVET employees and unemployed youths, as well as funding or providing learners with on-the-job work exposure. The objective is to also fund engineering students undertaking Nated courses and Maths programmes. In addition to this, one TVET college had a partnership with the MQA to train council members on corporate governance.</td></tr>
<tr><td>Nature of partnerships</td><td>SLA/MoA</td></tr>
</table>

1. Gauteng: Central Johannesburg TVET College 2. Gauteng: Ekurhuleni East TVET College 1. Northern Cape: Northern Cape Urban TVET College 2. Northern Cape: Northern Cape Rural TVET College 1. North West: Taletso TVET College 2. North West: Vuselela TVET College 3. North West: Orbit TVET College 1. KwaZulu-Natal: Majuba College 2. KwaZulu-Natal: Mthashane TVET College 1. Mpumalanga: Nkangala TVET College 2. Mpumalanga: Gert Sibande TVET College 1. Western Cape: West Coast TVET College	

4.2.1.2 Community college partnerships

Official partnerships have been established through Memoranda of Understanding with nine community colleges, one in each of the nine provinces. This project is in line with the DHET's mandate to capacitate community colleges. The purpose of this partnership is to assist colleges in policies and legislation training, marketing and advocacy, corporate governance, financial management, *student leadership, organisational development, curriculum training, subject specialist training,* assessor and moderator training, and the methodology required when teaching adults. All the partnerships have achieved their purposes and it has been learnt that these partnerships have enhanced the provision of training and skills development at these colleges. Table 4-2 shows community colleges who are in partnership with the MQA.

Table 4-2: Community Colleges with partnerships with MQA

Province	College
Eastern Cape	Eastern Cape Community Education and Training College
Free State	Free State Community Education and Training College
Gauteng	Gauteng Community Education and Training College
Limpopo	Limpopo Education and Training College
Mpumalanga	Mpumalanga Community Education and Training College
North West	North West Community Education Training
Northern Cape	Northern Cape Community Education Training
Western Cape	Western Cape Community Education and Training College
KwaZulu-Natal	KwaZulu-Natal Community Education and Training College

Source: MQA (2018)

4.2.1.3 Successes, Failures and Improvement areas for TVET and Community Colleges

Table 4-3: Successes, Failures and Improvement areas for TVET and Community Colleges

Successes
1. Most of the partnerships whose purpose was to train assessors and moderators, unemployed youths, funding maths programmes, and placing 100 learners on-the-job for work exposure have achieved their targets. 2. Early identification of training allowed proper planning and reporting. 3. The availability of additional funds from the MQA Bursary Project made provision for N1 and N2 Engineering Courses. 4. Constant monitoring and evaluation of the partnerships ensured that the service providers' target was suitable for beneficiaries and delivered interventions on time.
Failures
1. The planning and the implementation stages with some of the colleges were poor which resulted in project delays. 2. The release of lecturers' schedule was problematic as replacement lecturers could not be found on time, which in turn affected project deliverables.
Improvement Areas (Lessons Learnt)
1. There is a need to ensure that continuous project management and monitoring systems are in place to eliminate delays in the implementation of the projects with relevant colleges. This is to ensure that all the objectives are realised and met during the planned period. 2. Another lesson learnt is to ensure that the selection of beneficiaries by TVET colleges is aligned to the project that is being implemented. This means that there needs to be a thorough recruitment process in terms of the qualifications required for the project. 3. Most of the performance indicators are target driven. Therefore there is a great need for the MQA to measure the impact of most these programmes by conducting relevant tracer studies.

4.2.2 University partnerships

Official partnerships have been established through Memoranda of Understanding with the following universities: Rhodes University, the University of Cape Town, the University of Fort Hare, the University of Johannesburg, the University of Limpopo, the University of Pretoria, the University of South Africa, the University of Venda and the University of the Witwatersrand. The objective of the partnership with the universities identified is for these institutions to employ historically disadvantaged lecturers to lecture mining-related disciplines. They begin as junior lecturers who are mentored by senior lecturers and are encouraged to complete PhDs. The MQA funds the salaries of these lecturers. The aim is that they are eventually absorbed by the universities as permanent employees. In the 2017-18 financial year, 31 HDSA lecturers entered into the lecturer development programme and this is slightly above the target of 30.

Table 4-4 shows the list of universities that participates in this partnership and the number of HDSAs who have been supported by the partnership. A total of 69 HDSA lecturers have been supported across all universities which are in partnership with the MQA since the partnerships' commencement in 2012. Fifty-one lecturers have completed the programme and 20 have been

successfully absorbed as employees of the universities. This represents an absorption rate of 29%. UNISA and the University of Venda managed to absorb the majority of their lecturers, with the University of Johannesburg not able to place any lecturer at all.

Table 4-4: Partnership with universities

University	Supported	Completed	Not yet completed	Absorbed
UNISA	3	3	-	3
University of Pretoria	18	18	-	3
Wits University	18	13	4	4
University of Johannesburg	13	4	1	0
University of Venda	6	6	-	5
University of Limpopo	4	2	-	2
University of Cape Town	4	2	-	2
University of Fort-Hare	3	3	-	1
Total	**69**	**51**	**5**	**20**

Source: MQA APR (2018)

In terms of successes, despite not reaching over 50% targets in terms of absorption rate the universities display willingness to accommodate HDSA lecturers and therefore, the partnerships begin to address the issue of workplace experience as well as unemployment. In addition some lecturers experience career and academic progression, such as obtaining Masters and PhD degrees as well as becoming senior lecturers and Head of Departments (HODs). This is worth the investment going forward.

Failures include low absorption rates as a result of non-availability of readily available positions to absorb lecturers at the universities as well as low turnover from existing lecturers. Consequently, it will likely be a lengthy period of time that the same lecturers will require financial support to remain employed in their respective universities before being considered for permanent employment.

Lessons learnt consist of the inclusion of other universities (including universities of technology) as well as lecturers from TVET colleges from across the country. Also, the MQA should begin to gain insight into the support that is provided to lecturers in terms of coaching and mentoring in order to influence the space for improvement of such support. More insight is needed to understand factors that hinder absorption as well as more engagement with universities to fine-tune the interventions. The agreements between the MQA and universities should emphasize the need to submit documents timeously to avoid late payment

4.2.3 Partnerships with the DMR, Minerals Council South Africa and Organised Labour

There is an ongoing and close relationship with the three strategic tripartite partners: the DMR, the Minerals Council South Africa and Organised Labour. All parties involved in this partnership convene regularly to discuss challenges facing skills development in the MMS. It is considered a successful partnership by the individual parties as it enables the appropriate response to skills gaps with support from its key stakeholders.

Successes include making inputs into the conceptualisation of the MQA annual research agenda and facilitating easy access to data which is pertinent to the development of the SSP and other

research projects (These include but are not limited to employment, certificates and fatalities/injuries statistics). The partners also provide well informed feedback into the MQA research process to improve the quality of the SSP update. Lessons learnt include involving strategic partners during the first stage of research conceptualization through the suggestion of research topics to form the research agenda.

4.2.4 Inter-SETA partnerships

In alignment with the Minister of Higher Education and Training's call for increased inter-SETA collaboration, involvement in inter-SETA meetings have increased, with meetings often being chaired in Limpopo, Mpumalanga and North West. These meetings involve sharing skills development progress reports and focus on possible areas of collaboration. The SETAs also share costs and platforms for career awareness. However, obtaining formal agreements that are proposed is an ongoing challenge. The Inter-SETA forums are an extension of the Provincial Skills Development Forum (PSDF) and therefore exist as a plenary phase before the PSDF. Documents are tabled at the inter-seta for inputs and then presented at the PSDF meetings where they are finalised.

4.2.5 Provincial Skills Development Provincial Forum partnerships

There are working relationships with the Provincial Skills Development Forums in Limpopo, Free State, Mpumalanga, Northern Cape, KwaZulu-Natal and the Eastern Cape. While most partnerships have not been formalised, there is an agreement that this needs to take place. This agreement should be about bringing on board different role players and departments to constitute skills development forums in which matters of skills development are identified, discussed and developed with a way forward to address province specific skills demand and supply, job creation, as well as job placement challenges. In the Eastern Cape, there is a proposal with the Provincial Skills Development Forum under discussion involving the training of ex-mine workers in short courses. All skills development efforts by the MQA are reported to the Provincial Skills Development Forum chaired by the Premiers, who in turn are engaged for assistance in the removal of blockages to implement them. A challenge is that turnaround time for the implementation of agreements is sometimes long. In the North West, the regional office is currently collaborating with the Premier's Office to establish a Provincial Skills Development Forum.

With regard to Inter-Seta and PSDFs, successes include creation of a suitable platform that allows for sharing of skills development matters of common interest at particular area and provincial level and thus create enabling conditions for developing of a common approach to skills development. Collaboration with other SETAs avoids duplication of implementation of programmes. Programme reports provided at the inter-seta assists with keeping track of progress on projects being implemented. The TVET/HEI and SETA collaboration allows for monitoring and impact assessment of partnerships. Lastly, the partnership enables easy identification/implementation of provincial youth outreach from members of the forum

Failures include not having formal inter-SETA agreement to guide and inform development of a common approach to collaboration to address cross-cutting issues within the scope of skills development. Poor communication with regard to implementation of programmes leads to a duplication of efforts. Submission of inaccurate and unreliable data leads to poor planning and interventions that are not fit to purpose. Lack of inputs on documents such as the HRD strategy

which contributes to deliverables that need to be met by the province leads to the misalignment between the partnership strategies and provincial goals.
Improvements should include preparing of terms of reference to outline roles, responsibilities, deliverables and timeframes. The reporting template should be standard, clear and cover all required fields in order to provide relevant and critical information that is needed. The importance of partnerships needs to be emphasized as there is always a necessity for organisational specific information regarding interventions. More creative ways need to be developed to encourage employers to respond to placement requests.

All these matters within the scope of partnership have skills development implications and should therefore provide informed intelligence to guide the research agenda that cuts across.

4.3 Proposed New Partnerships

4.3.1 Minerals beneficiation

Owing to the size of South Africa's untapped minerals, the country has significant potential to increase mineral beneficiation. Stakeholders in every province expressed the importance of implementing efforts to beneficiate the country's minerals and metals, especially during an economic downturn and significantly reduced global demand. The DTI completed a research project in 2013 that analysed backward and forward beneficiation potential in four key value-chains (ferrous metals; polymers; titanium, PGMs) and developed strategies to increase the localisation of mining inputs. The next phase was to unpack the high-level analysis and identify key projects in the selected value chains that can be taken forward. Collaboration with the DTI and DMR needs to be created and formalised to ensure adequate timeous response of skills development requirements.

4.3.2 Mandela Mining Precinct

As mentioned in Chapter 2, the Mandela Mining Precinct initiative is aiming to develop systems and technologies for the sector which are holistic and people-centric; which are safer and healthier to use; which facilitate the mining of low-grade reefs that are currently not economical to mine; which facilitate access to resources that are currently too deep to mine, thereby extending the lifespan of some of the existing and established mines; as well as technologies which reinforce pillars underground. It is believed that the innovations will result in job retention and growth in the sector, up to the year 2046. It is important to partner formally with the Mandela Mining Precinct that drives the Mining Phakisa as these developments may require reskilling training drives for some occupations in the sector, including managers and supervisors. Collaboration will allow forward planning accordingly.

4.3.3 Green skills partnerships

Chapter 2 highlighted the growing need to protect the environment by mining in an environmentally sustainable way. Two types of partnerships are proposed to this end:

4.3.3.1 Government partnerships

Rhodes University's report on Green Skills for the Mining Sector report recommended the support of the Department of Water and Sanitation in strengthening the capacity of its regulatory function with regard to mining, with a range of skills from demand determination to regulatory roles in the

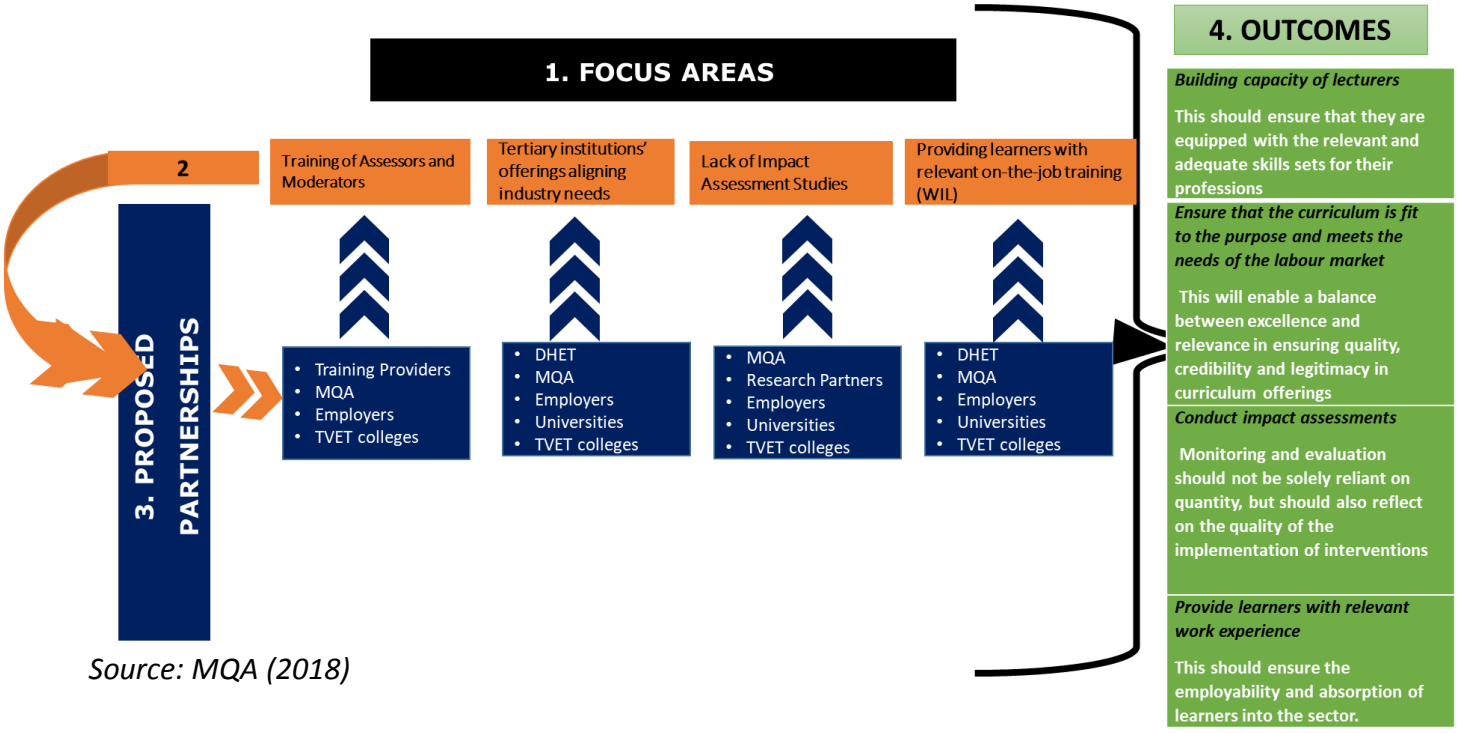
approval and enforcement of water use licences. It is also proposed that a partnership with the Department of Environmental Affairs be formalised for the research projects being undertaken on ways to develop cleaner production and processes.

4.3.3.2 Research institutions

The Green Skills for the Mining Sector report also recommended that partnerships be formed with industry including Eskom, the Fossil Fuel Foundation, Mintek, SANEDI, DST and the NRF to complement their funding for cleaner production research in clean technology and processes, and in the effective remediation of the impacts of mining on air, soil and water quality. Currently, the MQA is undertaking a research study that probes the green skills that can be prioritised in the mining and minerals sector. The purpose of the study is to investigate the status of essential 'green skills' in eight mining and minerals sectorial value chains (i.e. Gold mining, Platinum Group Mining, Diamond Mining, Diamond Processing, Jewellery Manufacturing, Cement, Lime, Aggregates and Sand, Services Incidental to Mining, and Other Mining) to inform plans to develop these skills in the industry.

Taking into account the challenges and success factors indicated in Table 4.1, the MQA proposes the following as an example of a successful partnership:

Figure 4.1: Model for successful partnership



Source: MQA (2018)

The model focusses on four areas of research collaboration, i.e.:

- Capacity building which seeks to provide support for colleges (TVET and community) to improve institutional performance, to assist them to deliver on their business strategy and to respond to their conceptualised mandate
- Course offering alignment that aims at ensuring that the curriculum is in sync with labour market needs as well as national development priorities
- Impact studies that aim to ensure that performance measurements of interventions provide empirical evidence to guide planning, priority alignment and streamlining
- Work based learning (WBL) that seeks to develop an effective working model that addresses issues of access, quality to ensure work readiness and employability of learners

4.4 Conclusions

Formal partnerships exist with 23 TVET colleges. It was highlighted that an increase in more effective collaboration is needed between the MQA, TVET colleges and the industry for the purposes of responding relevantly to the industry's needs and preparing learners accordingly.

Official partnerships have also been established with nine community colleges, one in each of the nine South African provinces. This is a project that is in line with DHET's mandate to capacitate community colleges. These partnerships have achieved their purposes and it has been learnt that they have also enhanced the provision of training and skills development at these colleges.

With regards to the HDSA lecturer development programme, 31 lecturers have entered into a lecturer development program. However, the concern remains in the non-absorption of lecturers who complete their program due to the low turnover of lecturers at the universities as well as non-availability of open positions for them. It is important to partner formally with the Mandela Mining Precinct as their developments may require reskilling training drives for some occupations in the sector.

With regard to mineral beneficiation, collaboration with the DTI and DST needs to be formalised to ensure adequate timeous response of skills development requirements. In addition, the MQA needs to partner with the Department of Water and Sanitation and the Department of Environmental Affairs to mitigate the challenge of significantly reducing water levels to combine strengths in promoting green skills in the sector. It is also recommended that partnerships be formed with companies' R&D departments that focus on cleaner production research in clean technology and processes, and in the effective remediation of the impacts of mining on air, soil and water quality.

5. SKILLS PRIORITY ACTIONS

5.1 Key research findings

The purpose of this chapter is to consolidate and present key findings from the previous chapters to influence prioritisation and inform recommendations that are specific, measurable, realistic and time bound in line with the national strategic plans as well priorities. The chapter identifies the top five key priority actions for the MMS going forward.

The key findings of this report are as follows:

- **Chapter 1** reflected on the employer profile. Findings revealed that although black employees constitute a large proportion of the labour force, their representation at the different echelons of management (with exception of the senior management) is not equitable with the black employee population within the sector. In addition, the gender distribution is skewed towards males, with women representing only 15.2% of the MMS workforce. This is against the backdrop of the Mining Charter (sets equity targets of 60% of blacks in senior management positions, of 30 % should be female, middle management must have a minimum of 75% black employees of which 38% should be female, 88% blacks in junior management of which 44% must be female) and the Employment Equity Act that is intended to transform the profile of the workforce to reflect the national dynamics. Additionally, the Charter sets the target of employment of people with disabilities at 3%. However, findings revealed that only 1% of disabled individuals are employed in the MMS. Monitoring and evaluation of the effectiveness, efficiency and efficacy of initiatives aimed at redressing past inequalities is critical to provide key learning points to inform strategies to add impetus into the transformation agenda.

- **Chapter 2** examined the macro and micro factors that influence the skills development space. External and internal factors such as globalisation effects, slow demand of commodities, sluggish investment growth, concomitant downscaling of operations as well as job shedding, the Dollar/Rand exchange, changing technology in the mines, small enterprise development, transformation legislation instruments, environmental sustainability to give attention green skills were identified as change drivers that influence the development of the MMS. All these drivers influence change and they interlock and reinforce one another to shape the skills development landscape. There is a need for understanding opportunities and mitigating factors that could present threats by the change drivers in order to influence skills supply and demand in the sector.

- **Chapter 3** stated that according to the WSP-ATR the most hard-to-fill vacancies are Engineering Manager, Mining Operations/Production Manager, Mining Engineer, SHE&Q Practitioner, Mining Production Supervisor, Engineering Supervisor, Boilermaker, Diesel Mechanic, Millwright and Rigger. These hard-to-fill occupations were also corroborated during the stakeholder engagement sessions and in-depth interviews. The reasons provided accounting for the hard-to-fill vacancies are attributed to a lack of relevant work experience; low levels of completion of MMCC and GCC; lack of provision of relevant qualifications and lack of succession planning. The hard-to-fill vacancies were determined by conducting a frequency run of the top 10 mostly identified occupations by organisations. This was then cross-tabulated by provinces and subsectors through identifying the number of occurrences between the 2 variables (province and subsector). Thereafter, the sum of provinces and subsectors were used to rank the top 10 occupation in demand within the MMS. The top 10

hard-to-fill vacancies identified corroborates with occupations that are deemed as national priorities as 6 of them appeared on the DHET's 2018 national list of occupations in high demand.

- **Chapter 4** focused on existing partnerships within provinces facilitated through the MQA regional offices. The chapter outlines both success stories and lessons learnt for interventions that were implemented. TVET colleges were assisted with getting their courses accredited and capacity building was also provided in the form of assessor and moderator training. Similarly as TVET colleges, the MQA is also in partnership with community colleges to assist them with capacity building in a wide range of issues such as accreditation, assessor moderator training, marketing, and issues around curriculum design, development and delivery. In addition, the MQA's partnerships also involved funding bursaries and learnerships to learners studying towards mining related qualifications. Furthermore, the partnership with universities to place HDSA lectures in universities has revealed a low absorption rate at 29%. Also at embryonic stage, is the partnership with the Provincial Skills Development Forums. The idea is to forge a close relation to focus on province specific skills development priorities. Key learning points should be extrapolated from these partnerships to inform development of a working sector partnership model which indicates the focal areas, usually the areas where challenges are, the partnership mix, and the goals of such partnerships.

5.1.1. Recommended Priority 1: Facilitate transformation of the sector through skills development

As indicated in chapter 2, the purpose of the NSDS III is to increase access to training and skills development including workplace learning and experience by addressing past inequities. The National Growth Path & National Skills Accord also intends to create an inclusive economic growth and development path through creation of jobs in the mining sector. In this respect, among others, Employment Equity plays a key role in South Africa's transformation agenda. In order to support this national priority, the MQA should continue to prioritise skills development to Historically-Disadvantaged South Africans (HDSAs) in order to drive transformation of the sector. These include, and are not limited to undertaking skills development interventions to capacitate more females and disabled people to be represented in the sector.

To address the issues of inequities echelons of management in the MMS, the MQA should continue to support HDSAs in and for management roles in its Management Development Programme. It is also recommended that management programmes should also target engineering students for support to pre-empt their advancement to managerial positions at mining operations at later stages of their careers.

Furthermore, although there is an increasing number of graduate output with mine related qualifications, workplace experience still remains a critical issue. Therefore, priority should continue be given to the facilitation of workplace experience and the placement of graduates into the MMS. The SETA should also conduct an impact study on the effectiveness of its programmes to gather intelligence which could be useful to address graduate development.

Low pass rates with of STEM subjects is recorded in this report. These subjects are a prerequisite for entry into the PSET system for mining related qualifications. More interventions are needed at basic education level for teachers with STEM subjects to improve both their pedagogical subject matter knowledge as well as the transmission (the ability to teach) capabilities to improve learner

performance and ensure better school output. Learners with a background of these subjects can be prioritised for funding or provision of bursaries.

5.1.2. Recommended Priority 2: Continue to support interventions to improve Mine Health and Safety through skills development

As stated in Chapter 2, the MHSA makes provision for the protection of the health and safety of all employees and persons in the mines through the promotion of training in mine health and safety. Mining is an activity with inherent risks that can impact on the health and safety of employees. Additionally, a company's licence to operate is jeopardised when there are fatalities and injuries. The government has put in place legislation and associated processes to ensure that safety of workers is paramount as a key feature for the sustainability of the mining sector. In this respect, MQA should continue to prioritise support for training in mine health and safety as one of its legislative mandates to improve the health and safety standards of the sector.

5.1.3. Recommended Priority 3: Continue to monitor and provide support to interventions responding to technological changes through skills development

Technological change remains at the forefront of the sector's ability to become as safe, efficient and sustainable as possible. New technologies are transforming the sector's operations. As a result, the type, level and mix of skills required is starting to change, resulting in a need for reskilling programmes so that employees are trained in new mining processes and in operating and maintaining new equipment. The use of new technology in training, particularly during workplace experience, should receive attention. To this end, a focus on AET programmes will be important to prepare existing and potential employees to operate new machinery and coordinate new processes.

5.1.4. Recommended Priority 4: Monitor and support interventions aimed at developing the skills required for minerals beneficiation

South Africa's Minerals Beneficiation Strategy is planning to transform the industry from being largely resource-based to knowledge-based. The IPAP places mineral beneficiation as one of its key priority areas and has identified several growth sectors including mineral beneficiation, jewellery manufacturing as critical areas to create jobs. In order for this to succeed, greater collaboration with industry councils and jewellery manufacturers needs to be implemented and official partnerships formed and sustained with mutual firm commitments to chart the way forward to revive the industry. Qualifications will need to be carefully scoped against industry requirements with a longer-term view of the type of workforce in mind.

To this effect, greater collaboration is also needed with the DTI's department that is working on the implementation of the Mineral Beneficiation Implementation Plan, to understand in advance what the skills requirements will be in order to respond accordingly and timeously.

5.1.5. Recommendation 5: Focus on increasing support to address the hard-to-fill occupations in terms of skills development in the MMS

There is a need to support interventions aimed at addressing hard-to-fill occupations. By so doing, this will fill skills gaps and eliminate issues of supply and demand mismatches.

Though some of the reasons cited for hard-to-fill vacancies are beyond the scope of the MQA, the SETA can still play an active role by continuing to fund workplace experience programmes as well as career guidance and awareness programmes.

5.2 Conclusions

Taking into consideration the findings in this SSP, the following skills priority actions are recommended:

- Priority 1: Facilitate transformation of the sector through skills development.
- Priority 2: Continue to support interventions to improve mine health and safety through skills development.
- Priority 3: Continue to monitor and provide support to interventions responding to technological changes.
- Priority 4: Monitor and support interventions aimed at developing the skills required for minerals beneficiation.
- Priority 5: Focus on increasing support to address the hard-to-fill vacancies in terms of skills development in the MMS.

REFERENCE LIST

African Development Bank (ADB). 2014. African Economic Outlook. Available from: http://www.afdb.org/en/knowledge/publications/african-economic-outlook/ Retrieved 05 May 2016.

Bengtsson, M. 2016. How to plan and perform a qualitative study using content analysis: Nursing Plus. pp. 2: 8–14. Available from: https://doi.org/10.1016/j.npls.2016.01.001. Retrieved 20 June 2018.

Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3 (2). pp. 77-101. ISSN 1478-0887 Available from: http://eprints.uwe.ac.uk/11735. Retrieved 20 June 2018.

Minerals Council South Africa, Facts and Figures. 2014. Available from: http://www.chamberofmines.org.za/sa Retrieved 10 May 2016.

Department of Mineral Resources (DMR). 2011. A Beneficiation Strategy for the Minerals Industry of South Africa. Available from: http://www.gov.za/sites/www.gov.za/files/Beneficiation%20Strategy%20June%202011%20final%20 (3) _0.pdf. Retrieved 14 April 2016.

Department of Mineral Resources (DMR). 2016. South Africa's Mineral Industry: 2014/15. Available from: http://www.dmr.gov.za/LinkClick.aspx?fileticket=z2XyeVTH7RE%3D&portalid=0. Retrieved 14 April 2016.

Department of Trade and Industry (DTI) is leading the drafting process, which also involves the National Treasury, the Economic Development Department, the Department of Mineral Resources (DMR) and the Department of Science and Technology (Mining Weekly, Nov 2014): Available from: http://www.miningweekly.com/article/five-mineral-value-chains-prioritised-in-south-africas-draft-beneficiation-plan-2014-11-21 Retrieved 19 April 2016.

Department of Trade and Industry (DTI). Trade and Industry on Special Economic Zones in Limpopo. Available from:
http://www.gov.za/speeches/special-economic-zones-boost-economy-limpopo-2015-06-28-28-jun-2015-0000.
Retrieved 13 September 2015.

Government Communication Information System (GCIS). Mineral Resources. Available from: https://www.gcis.gov.za/sites/default/files/MineralResources.pdf. Retrieved 19 April 2016.

Government Communications and Information System. (n.d.). Mineral Resources Pocket Guide. Available from:
http://www.gcis.gov.za/sites/www.gcis.gov.za/files/docs/resourcecentre/pocketguide/2012/15%20Mineral%20Resources.pdf.
Retrieved 13 May 2016.
Lavrakas, Paul J. 2008. Encyclopaedia of survey research methods. Thousand Oaks, Calif: SAGE Publications. http://www.credoreference.com/book/sagesurveyr.
Harvard (18th Ed).

Meyer, T and Wildschut, a: Work and Qualifications Futures for Artisans and Technicians: A Research Guide, 2017, LIMP.

Mineral energy complex on the beneficiation policy through the lens of network analysis. Available from:
http://www.ecopartners.co.za/docs/Wits%20University%20Mineral%20Economics%20Value%20Chain%20Analysis%20February%202011.pdf. Retrieved 19 April 2016.

Mwape P., Roberts M.J., Mokwena E., Musi L., Tjatjie T., Mnguni M., Mashaba P., Kwata P.G. 2007/ 2008. South Africa's Mineral Industry – General Review. Department of Minerals and Energy, South Africa's Mineral Industry.

National Treasury (2016). 2016 Budget Review. Available from: http://www.treasury.gov.za/documents/national%20budget/2016/review/chapter%202.pdf.
Retrieved 13 May 2016.

Mining Qualification Authority (2015) Regional Sector Skills Plan meetings: SAMI 2014-2015. Available from:
http://www.dmr.gov.za/publications/south-africas-mineral-industry-sami.html
Retrieved 18 April 2016.

MQA-CSMI, Small Scale Mining Colloquium, Johannesburg, South Africa – Report and Analysis of Outputs, September 2010.

Palinkas, Lawrence & M Horwitz, Sarah & Green, Carla & Wisdom, Jennifer & Duan, Naihua & Hoagwood, Kimberly. (2013). Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. Administration and policy in mental health. 42. 10.1007/s10488-013-0528-y.

PICC. 2012. Summary of South Africa National Integrated Plan. Available from: http://www.gov.za/sites/www.gov.za/files/PICC_Final.pdf
Retrieved 13 May 2016.

Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York. Simon and Schuster. Retrieved 13 May 2016.

South Africa Government. 2014. Info. Available from: http://www.gov.za/. Retrieved 13 May 2016.

Statistics South Africa (StatsSA). 2016. Mineral Production and Sales- March. Available from: http://www.statssa.gov.za/publications/P2041/P2041March2016.pdf
Retrieved 19 March 2016.

Viljoen, L. (2018). Understanding PESTLE analysis. http://www.wallrich.co.za/index.php/8-newsletter-articles/9-understanding-pestle-analysis. Retrieved 05 May 2018.

Writer, S. (2015). South African mathematics, science education ranked worst in the world. My Broadband. Available from: https://mybroadband.co.za/news/government/124024-south-african-mathematics-science-education-ranked-worst-in-the-world.ht.

Physical Address:
7 Anerley Road,
Parktown

Email: info@mqa.org.za
Tel: 011 547 2600