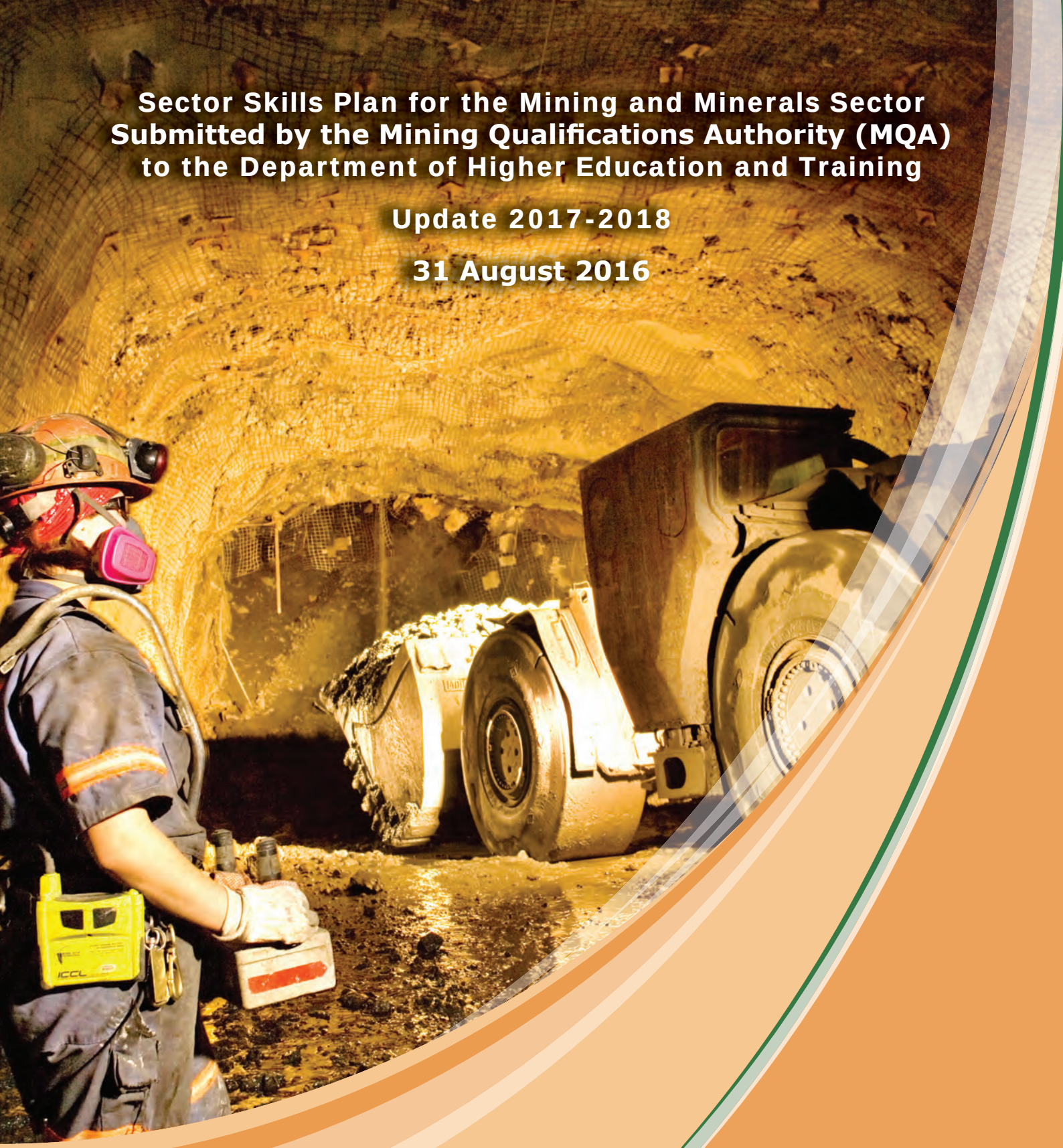
Sector Skills Plan for the Mining and Minerals Sector
Submitted by the Mining Qualifications Authority (MQA) to the Department of Higher Education and Training

Update 2017-2018

31 August 2016



MINING QUALIFICATIONS AUTHORITY

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 first draft of the Sector Skills Plan (SSP) update for the mining and minerals sector for the period 2017-18.

The Sector Skills Plan has been prepared in accordance with the National Skills Development Strategy (NSDS) III, in line with the expectations of the DHET. This SSP has been presented to the Skills Research and Planning Committee. The improvement of the skills of the workforce in the mining industry is imperative for the economic development of the sector. Moreover, skills development are important for the improvement of the health and safety record and as well as growth and wellbeing of all employees. The main purpose of this SSP annual update is to guide and inform skills development initiatives in the sector. It is the result of not only a thorough research process, but also of extensive data triangulation from primary and secondary data sources. The MQA held stakeholder consultative sessions between June 2015 and May 2016. Through these sessions, the stakeholders take ownership of this plan and are urged to work together to address the skills development priorities and to achieve the goals and objectives set in this SSP.

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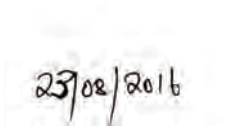
Mr Mthokozisi Zondi
Chairperson: MQA Board



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ABBREVIATIONS AND ACRONYMS

Acronym	Description	Acronym	Description	Acronym	Description
AET	Adult Education and Training	HR	Human Resources	NW	North West
AIDS	Acquired Immune Deficiency Syndrome	HRDS-SA	Human Resources Development Strategy for South Africa	OFO	Organising Framework for Occupations
APP	Annual Performance Plan	IMF	International Monetary Fund	OHS	Occupational Health and Safety
ATR	Annual Training Report	INSETA	Insurance Sector Education and Training Authority	PDP	Provincial Development Plan
ABET	Adult Basic Education and Training	IPAP	Industrial Policy Action Plan	PGMs	Platinum Group Metals
BEE	Black Economic Empowerment	IRM	Industrial Raw Materials	PGDP	Provincial Gross Domestic Product
BER	Bureau of Economic Research	KZN	KwaZulu-Natal	PICC	Presidential Infrastructure Coordinating Commission
Bn	Billion	LDEDAT	Limpopo Department for Economic Development and Tourism	PIVOTAL	Professional, Vocational, Technical and Academic Learning
CAD	Computer-Aided Design	LMI	Labour Market Intelligence	R&D	Research and Development
CETA	Construction Education and Training Authority	LP	Limpopo Province	RSSP	Regional Sector Skills Plan
CHIETA	Chemical Industries Education and Training Authority	M&E	Monitoring and Evaluation	SA	South Africa
CLAS	Cement, Lime, Aggregates and Sand	MBAP	Mineral Beneficiation Action Plan	SAMDA	South African Mining Development
Ct	Carat	Mct	Metric carat	SARB	South Africa Reserve Bank
DHET	Department of Higher Education and Training	MDP	Management Development Programme	SDA	Skills Development Act
DMR	Department of Mineral Resources	merSETA	Manufacturing, Engineering and Related Services SETA	SDL	Skills Development Levy
DoE	Department of Energy	MHS	Mine Health and Safety	SERO	Socio-Economic Review and Outlook
DST	Department of Science and Technology	MMS	Mining and Minerals Sector	SETA	Sector Education and Training Authority
EC	Eastern Cape	MP	Mpumalanga Province	SEZ	Special Economic Zone
ECSA	Engineering Council of South Africa	MPRDA	Minerals and Petroleum Resources Development Act	SIC	Standard Industrial Classification
ESETA	Energy Sector Education and Training Authority	MQA	Mining Qualifications Authority	SIP	Strategic Infrastructure Project
FASSET	Financial & Accounting Sector Education and Training Authority	Mt	Metric ton	SMME	Small, Medium and Micro Enterprise
FDI	Foreign Direct Investment	MTSF	Mid Term Strategic Framework	SOE	State- Owned Enterprise
FET	Further Education and Training	NC	Northern Cape	SSP	Sector Skills Plan
FS	Free State	NCV	National Certificate Vocational	Stats SA	Statistics South Africa
GCC	Government Certificate of Competency	NDP	National Development Plan	TETA	Transport Education and Training Authority
GDP	Gross Domestic Product	NGP	National Growth Path	TVET	Technical and Vocational Education and Training
GET	General Education and Training	NMBLP	Nelson Mandela Bay Logistics Park	UCS	Underhill Corporate Solutions
GP	Gauteng Province	NQF	National Qualifications Framework	UoT	University of Technology
GVA	Gross Value Added	NRF	National Research Fund	WC	Western Cape
GWM&E	Government- Wide Monitoring and Evaluation	NSA	National Skills Accord	WP-PSET	White Paper - Post School Education and Training
HDSA	Historically Disadvantaged South African	NSSP	National Sector Skills Plan	WSP	Workplace Skills Plan
HET	Higher Education and Training	NSDS	National Skills Development Strategy	YEA	Youth Employment Accord
HIV	Human Immunodeficiency Virus	NUM	National Union of Mine Workers		

STAKEHOLDER ENDORSEMENT

This is the Sector Skills Plan update by the Mining Qualifications Authority (MQA) for the mining and minerals sector (2017 - 2018). 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 the sector on 20 March 2000. The Sector Skills Plan update is hereby endorsed by duly authorised representatives of the state, employer organisations and organised labour in this national economic sector.

Powered by	For	Title	Signature	Date
Mr Mthokozisi	State: Department of Mineral Resources, Trevena Campus, Building 2 C, Cnr Meintjies and Schoeman Street. Sunnyside Pretoria, Private Bag X59, Arcadia 0007	MQA Board: Chairperson Regional Operations Coal - DMR		23/08/2016
Mr Amon Teteme	Organised Labour: National Union of Mineworkers (NUM) 7 Rissik Str Johannesburg. P O Box 2424 Johannesburg 2000	MQA Board: Converner - Organised Labour Skills Development Officer - NUM		22/08/2016
Mr Vusi Mabena	Employers: Chamber of Mines (COM) 5 Hollard Street Marshalltown. P O Box 61809 Marshalltown 2107	MQA Board: Convener - Employers Senior Executive: Stakeholder Relations - COM		22/08/2016
Mr Samuel Seepei	MQA: 7 Anerly Road Parktown, Johannesburg Private Bag X118, Marshalltown, 2017	Chief Executive Officer of the MQA		23/08/2016

EXECUTIVE SUMMARY

1. Introduction and Background

The Sector Education and Training Authority (SETA) for the Mining and Minerals Sector (MMS) and the Mining Qualifications Authority (MQA) prepared this Sector Skills Plan (SSP) Update in accordance with new guidelines of 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

The research methodology used for this SSP Update included both quantitative and qualitative research methods. Secondary (desktop) research was conducted on economic, social and development status and strategies. The MQA Workplace Skills Plans (WSPs) and Annual Training Reports (ATRs) complemented these sources but also allowed for an analysis of the size and nature of the sector. Extensive national and regional stakeholder workshops and consultations were undertaken between June 2015 and May 2016 to enable triangulation of this data and provide deeper insight into change drivers, skills demand and supply, and skills gaps. Stakeholders included employers, labour unions and training providers, as well as representatives from the Department of Mineral Resources (DMR), the Chamber of Mines, the National Union of Mineworkers (NUM) and the Department of Higher Education and Training (DHET).

3. Sector Profile

The MMS is an important sector to South Africa but is currently facing challenges, which include:

- Its contribution to GDP has been decreasing gradually, from 8.5% in 2009 to 7.6% in 2016.
- The declining global demand for mining commodities and retrenchments have led to a decrease in the number of people employed, from a peak of 628 750 in 2012 to 520 003 in 2016.
- However, the outlook of the MMS would be improved if the sector monitors the developments of Mining Phakisa and prepares existing and potential employees accordingly; and takes advantage of the implementation of the Mineral Beneficiation Action Plan (MBAP) and the SIPs projects, which are expected to increase economic activity and create new jobs.

Additionally, analysis of the MMS revealed the following:

- MMS employment is mainly concentrated in North West, Limpopo, Gauteng and Mpumalanga provinces; together constituting 80.8% of the total employment in the MMS.
- Mpumalanga, Gauteng, North West and Free State's employment numbers have been declining steadily, by 38.8%, 29.1%, 16% and 14.4% respectively between 2012 and 2016. The biggest growth has been seen in the Northern Cape, where employment numbers have been increasing steadily, by 40.5% in the same 5-year period.
- The Platinum Group Metals (PGM) sector employs the most people in the MMS, accounting for 33.4% of employees within the sector.
- Employment numbers in the Cement, Lime, Aggregates and Sand (CLAS), Coal, Diamond, Gold and Services Incidental to Mining sectors have all been on the decline since 2012.
- Although the sector is historically male-dominated, the proportion of females has been increasing gradually, from 11% in 2012 to 14.5% in 2016.
- There has been an overall increase in management of Africans, Coloureds and Indians. These three race groups together constituted 37.7% of total management in 2012, to 42.65% in 2016. When breaking management levels down, whites comprise 71.1% of top management, 64.9% of senior management, and 50% of mid management. Africans comprise the second highest in all three categories, the highest proportion (38%) being in midmanagement.
- The highest proportion of the sector's employees (47%) have achieved an equivalent of upper high school levels (grades 10-12), followed by 22% of the sector with grades 4 to 9.

4. Key Skills Issues

The key change drivers, which are influencing the MMS, are technology (including Mining Phakisa developments); declining global demand; Mining Charter and Employment Equity; Occupational Health and Safety (OHS) and Mineral Beneficiation. In particular, technology affects skills planning as learners need to graduate with knowledge of, and experience in the latest technology being used in the sector. Furthermore, the widespread downscaling of operations across the sector has led to large-scale retrenchment drives, resulting in the need to prioritise portable skills training. The MQA also needs to continue focusing on the transformational targets contained in the Mining Charter.

5. Extent of Skills Mismatches

Analysis of 2015-16 MQA WSP-ATR submissions and comments from extensive national and regional engagements over a 1-year period revealed the following:

- There are recruitment challenges where a few of the core mining occupations are concerned. The 10 most hard-to-fill occupations which need to be addressed by the MQA were found to be Mining Manager, Mining Planner, Mining Engineer, Rock Engineer, Surveyor, Rigger Ropesman, Diesel Mechanic, Boilermaker, Instrumentation Mechanician and Fitter. Stakeholders believe that the most concerning are Mining Manager, Rock Engineer, Diesel Mechanic and Rigger Ropesman. The occupation, Rock Engineering Manager, has one of the highest scarce intensity rates and may also need to be addressed.
- Main supply-side concerns were found to be as follows:
  - Basic education: Low levels of Maths and Science; and insufficient access to career awareness.
  - Technical and Vocational Education and Training (TVET) College sector: Lack of practical training and outdated curricula at colleges.
  - Higher Education and Training (HET): Lack of career awareness for Rock Engineering, a specialisation of Mining Engineering; and a probable over-supply of Geologists.
- Other (not specific to a level of education): Declining Government Certificate of Competency (GCC) achievement numbers for core MMS-related occupations and lack of management skills.
- The MQA funds numerous programmes aimed at addressing the supply of skills to the sector as well as transformational imperatives. These include practical training and experience; P1 and P2 training; graduate internships; bursaries to unemployed youths; Maths and Science programmes to the unemployed; and career awareness events. The targets for all of these interventions were successfully achieved and in most cases, exceeded.
- Given the importance of Maths and Science as building blocks for the majority of occupations in the sector, stakeholders suggested that these programmes be monitored for impact, as well as focus efforts on the development of teachers and on fewer beneficiaries, to ensure impact. Funding could also be directed at those who are applying for bursaries and as a condition before commencement of studies.
- As the role of career awareness is to disseminate accurate information and draw the right skills and potential to the sector, stakeholders proposed that events should provide greater detail so that a person is empowered to make an informed decision regarding whether or not a particular career might be suited to them or not, thus potentially avoiding career changes and unnecessary training expenditure at a later stage. It is important that stakeholders in the sector continue to partner effectively to increase access of high school learners to Maths and Science as well as emphasising the positive effects on future job prospects of pursuing these subjects until grade 12.
- The MQA's artisan development initiatives will be important for the successful throughput of learners in the following programmes as they are on the hard-to-fill list: Diesel Mechanic, Boilermaker, Instrument Mechanician and Rigger Ropesman. Furthermore, these learnerships need to incorporate changes in technology and include work experience at suppliers of new

technology to the mines. The number of MQA-funded artisan graduates is currently higher than the number of vacancies in the sector, so it appears that enough MQA-funded artisans are being developed in the system. However, the MQA competes with other sectors for artisans, and an uncertainty with the completed numbers is that the number of graduates who do seek and find employment in the MMS after studying is unknown.

- Two of the MQA's bursary-funded disciplines are on the hard-to-fill list: Mining Engineering and Mining Surveying. With regard to Mining Engineering, it will be important for the MQA to create awareness about the specialisation of Rock Engineering among those pursuing this qualification, as a lack of career awareness is believed to be the main reason for a shortage of Rock Engineers in the sector. The number of Mining Surveying bursars is low and may need to be addressed by the MQA. In contrast, the high number of Geology bursars in the system, the majority being in first or second year of studies, may need to be addressed by the MQA owing to stakeholder concerns over the past two to three years that large numbers of Geology graduates fail to secure employment.
- The primary reasons for skills gaps are outdated technology at colleges; insufficient and irrelevant workplace experience; low levels of Maths and Science; insufficient high quality career guidance; lack of GCC; employment equity; lack of management experience; lack of interest from youths; geographic location; and industry attractiveness.

6. Sector Partnerships

The MQA currently has formal partnerships with five TVET colleges. Most are in very early stages, but it was highlighted that better collaboration is needed between the MQA, TVET colleges and the industry for the purposes of improving access to workplace experience. Other recommendations include ongoing development programmes for lecturers of MMS-related subjects; and the continuation of TVET college support to enable eventual accreditation of programmes.

The MQA has a very strong and effective partnership with its three tripartite partners: the Department of Mineral Resources (DMR), the Chamber of Mines and Organised Labour, who convene regularly to discuss challenges facing skills development in the MMS, which enables the MQA to respond accordingly to address them. Additionally, the MQA is becoming increasingly involved in inter-SETA meetings, which involve the sharing of skills development progress reports and a focus on possible areas of collaboration. Green skills, a partnership with the Department of Water and Sanitation is recommended to mitigate the challenge of significantly reducing water levels, to combine strengths and avoid any duplication of work. Furthermore, partnerships should be formed with the research and development departments of companies that focus on cleaner production and remediation research.

7. Skills Priority Actions

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

- Priority 1: Support transformation of the sector through skills development
- Priority 2: Core mining skills must continue to be developed through skills programmes
- Priority 3: Monitor and develop the skills for minerals beneficiation
- Priority 4: Continue to improve health and safety standards
- Priority 5: Develop skills for sustainability

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RESEARCH PROCESS AND METHODS

INTRODUCTION

SETAs are expected to facilitate the delivery of sector-specific skills interventions that help to achieve the goals of the NSDS III. It is therefore a core mandate for the SETA to develop Sector Skills Plans (SSPs). The SSP must outline current and projected needs of the sector and sector employers, as well as the current and future training and qualification needs of the sector. These qualification needs should be agreed to by stakeholders and are aimed at improving the match between education and training supply and demand. The SSP must also highlight suitable interventions that will address the skills needs of the sector.

The MQA therefore aims to support objective and informed decision making for skills development through research in the MMS. The MQA intends to contribute to the body of skills development both nationally and within the provinces through collaboration with relevant bodies within the MMS and to then disseminate the research reports and findings.

The purpose of this section is to provide details regarding the research process and methodology employed by the research team in order to complete an SSP for the MQA, which is both factual and analytical, and therefore informative, useful and actionable for the SETA.

Research Process and Methods

Research Topic

The SSP research process pursued an answer to the following primary question: "What are the key issues influencing the mining and minerals sector (MMS) which are either currently or have the potential to impact skills supply and demand, as well as skills development?"

Nature of the Study

The research study used both quantitative and qualitative research methodologies. It was important to include qualitative methods due to the limitations of quantitative methods in providing insight to data and statistics. Insight was important to achieve as the sector is complex and subject to significant internal and external pressures which must be understood for their implications on skills development.

Objectives of the Study

The objectives of the research study were to:

- Determine the key change drivers impacting the sector where skills development is concerned
- Highlight any skills mismatches between demand and supply in the sector
- Investigate the primary reasons for the skills mismatches
- Understand stakeholders' experiences of, and beliefs regarding the effectiveness and impact of the MQA's skills development interventions for the sector
- Determine whether there is any potential for growth and the creation of much-needed jobs in the sector, which would influence skills development initiatives for the MQA.

Data Collection Tools

Much of the qualitative research that was completed was in the form of two large workshops undertaken in each of the nine provinces (i.e. 18 workshops in total) as well as two smaller focus groups in each of the nine provinces (i.e. 18 focus groups overall), a total of 36 engagements around the country. The large workshops were effective in bringing together numerous stakeholders from industry, labour and government to discuss the research topic. The focus groups were attended by a smaller number of regional experts who were able to provide deeper insight and greater detail into issues that cannot be adequately covered in the time allocated for the large workshops. The last set of workshops and focus groups held early in 2016 were used to involve stakeholders in the sector in the assessment process of the findings, to ensure that all key skills issues had been identified and addressed. Discussion guides

were used at both the workshop and task teams meetings to ensure that attention was maintained on the important issues of the research.

Additionally, personal interviews were conducted with a small sample of regional employers, labour and government around the country between June 2015 and March 2016, as well as with national experts in Gauteng during May 2016.

Sample Size and Scope

Two large regional consultation sessions were held in each of the nine regions (i.e. 18 workshops in total), where an approximate average of 45 stakeholders attended per workshop. An average of 20 people attended each of the two smaller focus groups in each of the nine provinces (i.e. 18 focus groups in total), attended per focus group.

During personal interviews, five employers were consulted (one representing each of the main subsectors), two DMR officials, two artisan development experts, an industry skills development specialist and a labour representative.

The MQA Board, MQA's EXCO as well as MQA's SRP Committee were all engaged during May 2016 for their expertise on and assessment of the research findings. All outstanding matters that required clarity were discussed fully and resolved during these high-level engagements.

It is widely accepted that the Workplace Skills Planning (WSP) and Annual Training Reports (ATR) database entries submitted by employers in the MMS provide an employment coverage of as much as 95% of the sector. Therefore, the sample size of this particular quantitative data type is statistically very high.

The scope of the project involved covering the following areas:

- Reviewing the economic landscape and performance of the sector, the employer and labour profiles, as well as outlook of the sector
- Outlining key change drivers influencing the sector, with particular attention to those which impact skills development
- Analysing the 2015-16 WSP data submitted, to understand the emerging trends in the sector as well as possible limitations of the data
- Analysing the state of education institutions providing the skills needed by the sector.
- Identifying the key skills mismatches in the sector, and the primary reasons thereof
- Seeking assessment of the findings, by both key national and regional stakeholders
- Analysing the MQA's partnerships at a national level as well as around the country
- Determining the key research findings
- Recommending five key priority areas for the MQA

Data Sources and Data Sets

The quantitative data used was sourced mainly from the MQA's weighted WSP/ATR submissions and the MQA's programme interventions databases, as well as through literature and document review of relevant policies and previous SSPs. Other substantial information sources included DMR, DHET, Stats SA, Quantec and Chamber of Mines reports. One of the main challenges in using data from different sources is the methodologies and purposes for which this data was collected, which sometimes provides results based on their particular foci. For example, data from the MQA includes a sector referred to as 'Services Incidental to Mining' which has important skills development implications for the remit of the SETA, which is not usually included in other data sources, for example the DMR.

Furthermore, qualitative data was sourced in the form of regional workshops and one-on-one consultations with expert stakeholders in the sector, including representatives from the DMR, the Chamber of Mines, the National Union of Mineworkers (NUM) and the Department of Higher Education and Training (DHET). This information provided rich insight into the quantitative data and statistics, and

facilitated understanding of the change drivers impacting the sector, skills demand and supply, the current and emerging skills gaps and potential solutions to the complexities and challenges in providing skills development for the sector.

Time Frame of the Study

One year was taken to fully research the topic. The research commenced in June 2015 with the first set of nine regional workshops, and ended in May 2016 with the Board, EXCO and SRP Committee meetings.

Key Findings

The key findings of this report, which are aligned to the objectives of the research, are as follows:

- The main change drivers currently impacting the MMS are:
  - Technology, as it impacts skills planning and the need to ensure that learners graduate with knowledge of, and experience in the latest technology being used in the sector
  - Retrenchments, as the widespread downscaling of operations across the sector has led to large-scale retrenchment drives, resulting in the need to prioritise portable skills training
  - Transformation, as targets contained in the Mining Charter are designed to redress historical imbalances
- The 10 most hard-to-fill occupations were found to be Mining Manager, Mine Planner, Mining Engineer, Rock Engineer, Surveyor, Rigger Ropesman, Diesel Mechanic, Boilermaker, Instrumentation Mechanician and Fitter. Experts believe that the most concerning are Mining Manager, Rock Engineer, Diesel Mechanic and Rigger Ropesman.
- The primary reasons for skills gaps are outdated technology at colleges; insufficient and irrelevant workplace experience; low levels of Maths and Science; insufficient access to high quality career guidance; geographic location; employment equity; lack of succession planning; lack of management skills; lack of interest from youth in certain occupations; and industry attractiveness.
- Maths and Science and career awareness events should be monitored for impact given the importance of the subjects as building blocks for the majority of occupations in the sector, and with career awareness' potential to disseminate accurate information as well as draw the right skills and potential to the sector.
- Successful implementation of Mining Phakisa, the Minerals Beneficiation Action Plan and three of the 18 SIPs projects have the potential to create and sustain jobs in the MMS. Greater collaboration between the MQA and the key role players involved in these initiatives is needed in order to understand what the skills requirements will be and to respond accordingly.

1. SECTOR PROFILE

SECTOR PROFILE

1.1. Introduction

The purpose of this chapter is to provide an overview of the Mining and Minerals Sector (MMS) in South Africa to enable understanding of the: 1) Scope of coverage; 2) Key role players; 3) Sector contribution to the broader South African economy; 4) Employer profile; and 5) Labour profile.

1.2. Scope of Coverage

The MMS is currenty demarcated on the basis of the three-digit Standard Industrial Classification (SIC) codes that are used in capturing the data for the National Accounts. These mining activities are covered by the SIC codes 21000 to 29000, as well as a small component of manufacturing – namely the manufacturing of Cement, Lime and Plaster (SIC code 34240), Jewellery Manufacturing and Related Articles (SIC code 39210), the Cutting and Polishing of Diamonds (SIC code 39212) Jewellery and Related Articles (composed of precious metals, precious and semi-precious stones and pearls) (SIC code 39211) and Other Precious and Semi-precious Stones Precious and Semi-precious Stone Cutting and Polishing (SIC code 39219).

Based on the MQA SSP Update 2014/15 - 2020, the analysis of data covering the MMS SIC codes requires that the organisations in the sector be categorised into the following nine subsectors: 1) Coal Mining; 2) Gold Mining; 3) Platinum Group Metals (PGM) Mining; 4) Diamond Mining; 5) Other Mining, which includes the mining of iron ore, chrome, manganese, copper, phosphates and salt; 6) Cement, Lime, Aggregates and Sand (CLAS); 7) Services Incidental to Mining; 8) Diamond Processing; and 9) Jewellery Manufacturing.

1.3. Key Role Players

The MMS is a regulated industry and has several key role players, ranging from government regulatory institutions, employer representatives to workers' unions. The following tables set out the broad contributions that each is making to the MMS.

1.3.1. National Government Departments

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

Table 1: 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 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 the MQA • Career awareness

1.3.2. State-owned enterprises that play a role in the MMS

Table 2 below lists some of the main state owned enterprises (SOEs) which are involved in MMS research, compliancy monitoring, skills development and promotion of minerals among others.

Table 2: 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 the MQA about MHS and skills development
Mintek	Mineral processing and Metallurgy	• R & D expertise; intellectual capital-engineers, scientists and technologists • Provide infrastructure of modern laboratories, pilot plant and workshops which can be used by the 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

1.3.3. MMS key industry stakeholders

Table 3 shows some of the key industry stakeholders which are involved in advocacy, promotion and other industry development initiatives.

Table 3: Key industry stakeholders

Industry Stakeholder	Role	Function in relation to MMS and Skills Development
Chamber of Mines of South Africa	Creating partnerships with key stakeholders	• 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 the 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 the 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

1.3.4. MMS worker representatives

The mining sector is highly unionised with a great number of employees represented or affiliated to a union. Mine unions are amongst the most active and vocal unions in South Africa and their activities have a significant bearing on the productivity in the MMS. NUM and UASA are the two unions, which form part of the tripartite alliance within the MQA's structures.

1.4 Economic Performance

This section provides an overview of the importance and contribution of the sector to the country.

1.4.1. Overview of the MMS

South Africa accounts for 96%[2] of known global reserves of the Platinum Group Metals (PGMs), 74% of chrome, 26% manganese and 11% of gold reserves[3]. As a leading producer and supplier of a range of minerals, the country should be in a position to offer a highly competitive investment location and ensure that it can meet specific trade and investment requirements of prospective investors and business people, whilst also meeting the development needs of its populace.

(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'. | (2) http://www.gov.za/about-sa/minerals | (3) http://www.gcis.gov.za/sites/www.gcis.gov.za/files/docs/resourcecentre/pocketguide/2012/15%20Mineral%20Resources.pdf

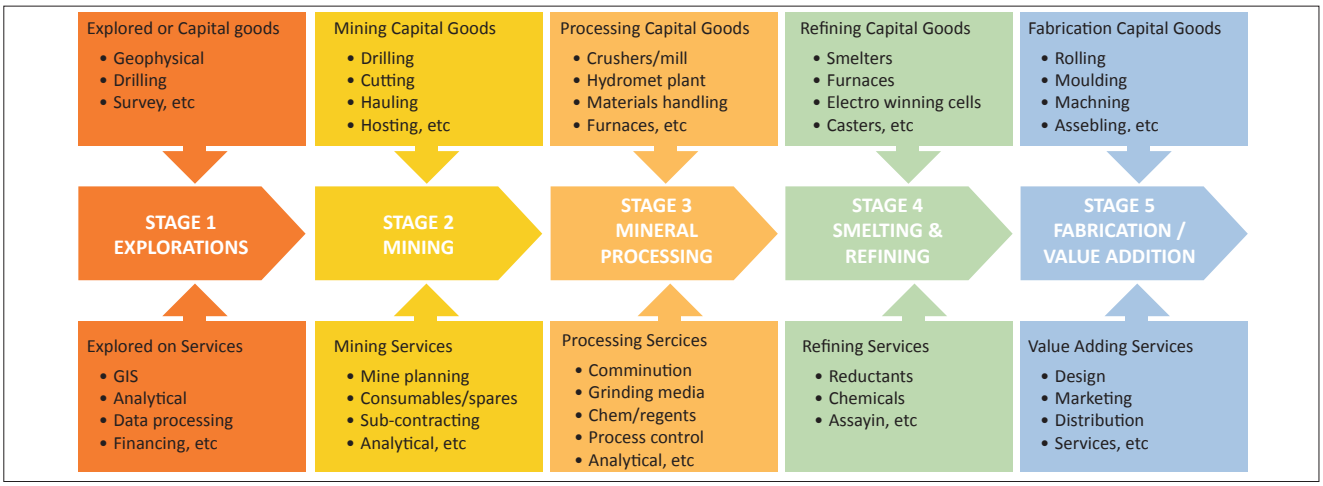
South Africa remains one of the largest net exporters of minerals and metals. In the mining industry, South Africa is an important global hub with deep backward vertical integration and a fully-fledged supply industry serving both South African and foreign companies[4]. The MMS has played a key role in the country's economic development, which has transformed South Africa into the most industrialised country in Africa. It has also been the principal driver of the current infrastructure 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.

Given the sector's importance to the economy, a concern is that mining production marked a significant decline in March 2016, falling by a record 18% year on year in March, accelerating from an 8.3% fall year on year in February[5], with a particularly sharp fall in output of PGMs. The main contributors to the decline in mining output were PGMs, coal, iron ore, manganese ore and gold. Output was negatively affected by lower global commodity prices and slowing demand from China[6], among others. Seasonally adjusted mining production fell by 5.2% in the first quarter of 2016 compared with the previous quarter, again mainly due to lower PGMs and iron ore production[7].

1.4.2. Value chain of the MMS

Figure 1 below explains the MMS value chain, showing the industry's primary activities from 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[8]. As illustrated in Figure 1, the majority of the companies in Stage 2 are involved in primary production while Stages 3 to 5 depict secondary production, with increasing degrees of processing, beneficiation and value addition.

Figure 1: Mining and Minerals Sector Value Chain



Source: Underhill Corporate Solutions illustration based on Ecopartners[9]

1.4.3. Overview of the MMS Subsectors

1.4.3.1. Cement, lime, aggregates and sand (CLAS)

Small and medium-sized mining companies dominate the CLAS subsector. The vast majority of small-scale mining applications (90%)[10] also fall into this group of industrial commodities. In October 2015, CLAS group minerals 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[11]. Large firms in this subsector include cement manufacturers, phosphates, vermiculate and dimension stone producers. Dimension stone is also exported in bulk.

(4) African Economic Outlook, 2014. | (5) http://www.statssa.gov.za/publications/P2041/P2041March2016.pdf | (6) http://www.statssa.gov.za/publications/P2041/P2041March2016.pdf | (7) http://www.statssa.gov.za/?page_id=1856&PPN=P2041&SCH=6459 | (8) Porter, Michael E. (1985). Competitive Advantage: Creating and Sustaining Superior Performance. New York.: Simon and Schuster. Retrieved 13 May 2016. | (9) http://www.ecopartners.co.za/docs/Wits%20University%20Mineral%20Economics%20Value%20Chain%20Analysis%20February%202011.pdf | (10) http://www.statssa.gov.za/publications/P2041/P2041March2015.pdf (11) http://www.statssa.gov.za/publications/P2041/P2041March2016.pdf

1.4.3.2. Coal mining

The South African coal mining industry is the sixth producer in the world and the sixth in reserves, contributing 3.5% to global output. [12]In 2014, South Africa produced 260Mt of coal with 70.3% being sold locally (amounting to a sales value of R54.7 billion) with the remaining 29.7% exported (amounting R46.7 billion). South Africa exports coal to 34 countries, with the European Union being the primary market (84.5%). Over 80% of the country's saleable coal is supplied by the five largest mining groups. Coal reserves and coal mining are predominantly in Mpumalanga and Limpopo provinces[13].

1.4.3.3. Diamond mining

In 2015, South Africa was ranked the seventh producer of diamond in the world. [14]The country's, deposits are concentrated in Northern Cape, Free State and Limpopo provinces. In 2014, South Africa produced 8.12Mct of diamonds, of which 7.79Mct were Kimberlite, 308 121ct alluvial and 27 302ct marine. Local diamond sales totalled R8.8 billion, while foreign export sales amounted to R7.73 billion[15]. Although there was a marginal decrease in the carats mined between 2013-14 and 2014-15 the total sales rose significantly.[16]

1.4.3.4. Gold mining

The South African gold reserves are ranked first globally and the country's gold mining industry is seventh in production[17], contributing 5.6% to global production[18]. Three of the world's 10 largest gold mining companies have headquarters in South Africa and are multinational corporations with operations in Australia, West Africa and South America. Gauteng dominates in gold mining, accounting for 51.6% of South Africa's production. Free State follows (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[19]. The total weight of gold production has been decreasing sharply over the years. Total monthly production fell from around 25 00kgs in 2005 to less than 10 000kgs in 2016, a 60% decrease in 10 years.

1.4.3.5. PGM mining

PGMs (Platinum Group Metals) consists of six chemically similar elements: platinum, palladium, rhodium, ruthenium, iridium and osmium. South Africa's reserves constitute 87% of the global reserve base and the country contributes around 58.7% to global production, ranking first in both production and reserves. South Africa's bushveld (North West province and a smaller part of Limpopo province) hosts approximately 80% of PGM-bearing ore[20]. From March 2015 to March 2016 PGMs registered the largest negative contribution in mining production year-on-year: -23, 7% decrease in mining production to -4.5% percentage points[21] on mining production and sales[22].

1.4.3.6. Other mining commodities

Included in the bracket of other mining commodities are producers of uranium, copper, chrome, iron ore, manganese and salt. Uranium production is a by-product of gold mining and distribution of the sector mirrors that of gold mining. South Africa's copper deposits lie mainly in Limpopo province with copper being mainly mined by one large company. The chrome and iron ore subsector was significantly and negatively impacted from the massive decline in global demand, particularly from China. Widespread downscaling and retrenchment drives characterised the subsector for much of 2015. South Africa iron ore reserves are 13th in the world, sixth for production and fifth for exports. Further, the country's manganese is ranked first in the world, second in production as well as exports. Iron ore and manganese deposits are concentrated in Northern Cape Province.[23]

[12] http://www.chamberofmines.org.za/sa-mining/coal | [13] Mwape P, Roberts MJ, Mokwena E, Musi L, Tjatjie T, Mnguni M, Mashaba P, Kwata PG. Part One: South Africa's Mineral Industry – General Review. Department of Minerals and Energy, South Africa's Mineral Industry, 2007/2008. | [14] http://www.gov.za/about-sa/minerals | [15] Chamber of Mines, Facts and Figures, 2014 | [16] SAMI 2014-2015 | [17] http://www.mineweb.com/regions/
[18] Chamber of Mines. Facts and Figures booklet, 2012. | [19] http://www.dmr.gov.za/publications/south-africas-mineral-industry-sami.html
[20] http://www.chamberofmines.org.za/sa-mining/platinum | [21] http://www.statssa.gov.za/publications/P2041/P2041March2016.pdf
[22] http://www.statssa.gov.za/publications/P2041/P2041March2016.pdf | [23] Chamber of Mines, Facts and Figures

1.4.3.7. Services incidental to mining

The Services Incidental to Mining category consists of a large group of relatively smaller companies providing services to the MMS. This 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

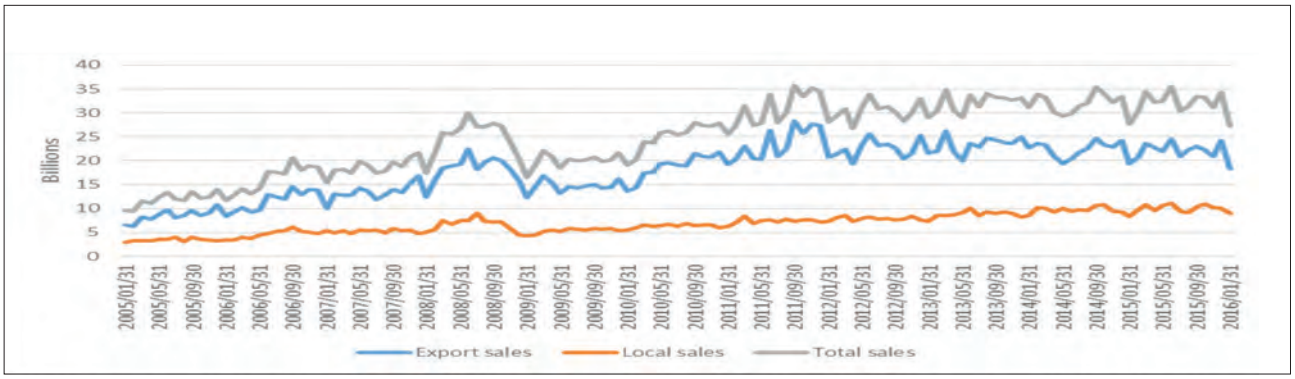
The South African diamond processing industry consists of 221 licenced diamond manufacturers. The diamond trading company of De Beers is the major supplier of rough diamonds to the sector although some are sourced from local independent mines and others imported from Belgium, a major global diamonds buyer of rough diamonds. The Master Diamond Cutters' Association has 80 members, which employ 95% of the employees in this subsector. [24]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.

Firms in the jewellery manufacturing subsector beneficiate mining outputs such as precious metals (gold, platinum and silver) and diamonds in the manufacture of 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

Figure 2 shows the local, export and total sales for all minerals. The trends for the demand of South African minerals as shown by the total sales for the period 2005 - 2016 shows an annual average of R378.5 billion. Revenue increased by only 0.1% in 2015 from 2014 total sales. Total sales peaked around 2011 and have been decreasing gradually. The decrease is attributed to the decrease in exports, since local sales have been increasing steadily.

Figure 2: Value of sales of total minerals



Source: Quantec/DMR (2016)

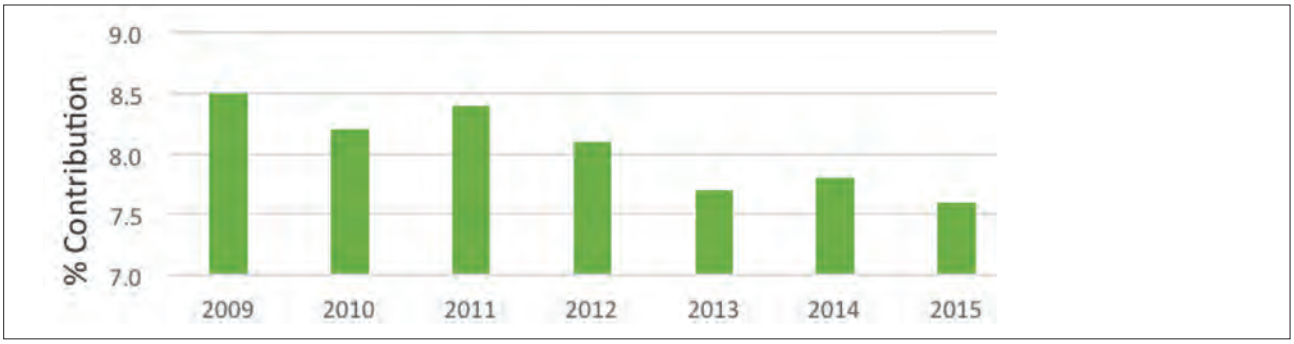
Export sales were over R1.3 trillion, representing around 72% of the total mineral sales for the period 2011 - 2015. Local sales have also been on an upward trend with sales of R31 billion, which is 26% more than 2011 sales. This growth can be partly explained by the emergence of the 'middle class'.

[24] http://www.essentialsjewelry.com/southafrica-gem-jewelry/south-africa-rough-diamond.html

1.4.5. Sector contribution to GDP

Figure 3: shows the MMS' contribution to national GDP over the years.

Figure 3: MMS contribution to GDP growth



Source: Stats SA, 2016

As shown in Figure 3, the MMS' contribution to South Africa's GDP has decreased by 0.9% from 2009 to 2015. The decline in global commodity demand, downscaling and closing down of mines compounded the decline in 2015, resulting in a decline in mining activity in the second quarter (-6.4%) and third quarter (-9.8% decline) in 2015. The National Treasury reported that the global outlook for economic growth is subdued, weighed down by a prolonged slump in commodity prices and slower growth in China. Prices are not expected to recover soon. Low global growth means fewer exports for South Africa, thus impacting mineral sales.

1.4.6. Comparison of economic sector contribution to GDP

Table 4 below shows the economic sector contributions to the national GDP for the past six years (2010 - 2015)[25]. In 2015, finance, real estate and business services was the highest individual contributor to the national GDP, with 19.63%, General Government Services second with 15.45%. The MMS[26] was the sixth highest contributor to GDP in 2015. The MMS has experienced the biggest decline in GDP contribution of all sectors (from 8.2% in 2010 to 7.6% in 2015).

Table 4: Sector contribution to national GDP

Economic Sector	2010	2011	2012	2013	2014	2015
Agriculture, forestry and fishing	2.5	2.4	2.3	2.3	2.3	2.4
Mining and quarrying	**8.2**	**8.4**	**8.1**	**7.7**	**7.8**	**7.6**
Manufacturing	12.7	13.1	13.0	13.0	12.8	12.6
Electricity, gas and water	2.5	2.5	2.4	2.4	2.3	2.3
Construction	3.6	3.5	3.4	3.4	3.4	3.4
Wholesale, retail and motor trade; catering and accommodation	13.3	13.5	13.6	13.7	13.7	13.7
Transport, storage and communication	8.5	8.4	8.3	8.4	8.3	8.4
Finance, real estate and business services	19.4	19.1	19.2	19.4	19.6	19.6
General government services	14.8	14.7	14.9	15.1	15.2	15.4
Personal services	5.5	5.4	5.4	5.4	5.3	5.3
Total value added	90.9	90.8	90.6	90.6	90.7	90.7
Taxes less subsidies on products	9.1	9.2	9.4	9.4	9.3	9.3
GDP at market prices	**100**	**100**	**100**	**100**	**100**	**100**

Source: Stats SA, 2016

[25] The national accounts data only covers mining & quarrying and not the total MMS. No separate information is available on the performance of the beneficiation components of the MMS (the diamond processing and jewellery manufacturing subsectors) and the services incidental to mining subsector. This economic overview thus focuses on the mining & quarrying sector. | [26] The national accounts data only covers mining & quarrying and not the total MMS. No separate information is available on the performance of the beneficiation components of the MMS (the diamond processing and jewellery manufacturing subsectors) and the services incidental to mining subsector. This economic overview thus focuses on the mining & quarrying sector.

1.5 MMS Future Outlook

1.5.1. Mining Phakisa

The Mining Phakisa, an initiative of the Presidency, aims to expand the lifespan of the mines by locally developing the machinery required to mine narrow, hard rock reefs, which is where the majority of platinum and gold resources lie in South Africa. These resources are currently unviable to mine due to safety, health and economic reasons. Job sustainability is a high priority area, with the intention that jobs in mining will be sustained through access to currently 'unmineable' resources. Upskilling training drives will be required for all skills levels of workers, including managers and supervisors, to ensure a smooth transition to mechanisation. A focus on Adult Education and Training (AET) programmes up to level 4 as a way of improving literacy and numeracy levels will be important as a way of preparing existing and potential employees to operate new machinery and coordinate new processes.

1.5.2. 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). Mineral beneficiation is premised on the proposition that 'opportunities exist along the mining value chain from extraction, processing to shipping and beneficiation of minerals such as diamonds, copper, lead, zinc and manganese are some of the potential investment areas in the sector' (Underhill Corporate Solutions, 2013)[27]. 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 from stage two to stage five (Figure 1). The government is currently drafting the Mineral Beneficiation Action Plan (MBAP), 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'[28]. The implementation of the Minerals Beneficiation Strategy and MBAP is expected to create and retain much-needed jobs in the MMS. Processing of minerals locally has the potential to boost the manufacturing industry and create much-needed jobs along the MMS value chain.

1.5.3. Strategic Infrastructure Projects

There are 3 of 18 strategic infrastructure projects (SIPs) which have a direct bearing on the MMS:

- SIP 1: Unlocking the northern mineral belt with Waterberg as the catalyst. According to Presidential Infrastructure Coordinating Commission (PICC, 2012)[29] 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 (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: this 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.

[27] http://www.merseta.org.za/Portals/0/merSETA%20Regional%20Sector%20Skills%20Plan_%20Free%20State%20%20Northern%20Cape%2004092013.pdf | [28] 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): http://www.miningweekly.com/article/five-mineral-value-chains-prioritised-in-south-africas-draft-beneficiation-plan-2014-11-21. Retrieved 13 May 2016.
[29] PICC (2012) A Summary of the South African National Infrastructure Plan. http://www.gov.za/sites/www.gov.za/files/PICC_Final.pdf

SIPs 1, 4 and 5 will require new skills and there is potential for the creation of additional MMS-related jobs. The major occupational categories likely to be in demand include artisans, project managers and 'green'-related skills. The MMS therefore needs to start preparing for the expected increase in demand for skills.

1.6. Employer Profile

The employer profile is obtained primarily from the weighted[30] MQA WSP/ATR dataset. An assessment of the proportion of companies submitting WSPs is illustrated in Table 5 below. It reflects a steadily increasing number of submissions from 2007 to 2015. As of 31 May 2016, 634 WSPs were received by the MQA.

Table 5 also shows the number of MQA/SDL-registered companies over the last 4 years. While the number appears to be low in comparison to the number of WSP submissions, the registered companies include 1 342 small companies, and it is believed by stakeholders that employment coverage (a better indication) is very high. It is impossible to determine the total employment in the MMS by using WSP data (as not all companies submit); therefore the DMR data was used to get a sense of total employment coverage. Important to note is that the DMR collects information on the sector in a different way to the MQA and does not include the categories Services Incidental to Mining, Diamond Processing and Jewellery Manufacturing, thus their respective total employment numbers will not be equal[31]. Table 5 shows that based on the DMR's data, WSPs cover over 100% of total employment in the country – while this is obviously impossible in reality, it does show that most large and medium companies in the MMS are submitting WSPs, with a statistical analysis revealing that the probability of employment coverage being as high as 95%.

Table 5: No of companies submitting WSPs

	MQA/SDL-registered companies (incl. small companies)	WSPs Submitted	Total employment (based on DMR employment data)	WSP employment	WSP employment coverage
2013-14	1 539	585	524 873*	572 498	109%
2014-15	1 564	573	509 914*	579 038	113%
2015-16	1 682	609	492 936*	525 248	106%
2016-17	1 775	634	455 130**	520 003	114%

Source: DMR, MQA and DHET (31st May 2016)
* 2012, 2013 and 2014 Annual data, respectively
** Quarter 1 2016 data. The DMR data does not include the categories Services Incidental to Mining, Diamond Processing and Jewellery Manufacturing, so their total employment number does not equal the total in the WSPs.

1.6.1. Size and number of companies represented in the MMS

Table 6 shows the number of companies paying levies in the MMS by size.

Table 6: Profile of MMS companies by subsector

Subsector	Large	Medium	Small	Total per subsector		Percentage of employment coverage
				Total number of companies	Percentage of companies to total	
CLAS	20	21	79	120	7%	2.5%
Coal Mining	42	17	88	147	8%	10.9%
Diamond Mining	15	4	12	31	2%	1.7%
Diamond Processing	1	5	6	12	1%	0.4%
Gold Mining	26	6	60	92	5%	17.6%
Jewellery Manufacturing		7	140	147	8%	0.5%
Other Mining	96	86	691	873	49%	25.0%
PGM Mining	20	5	6	31	2%	33.4%
Services Incidental to Mining	30	32	260	322	18%	8.0%
Total	**250**	**183**	**1 342**	**1 775**	**100%**	**100%**
Percentage	14%	10%	76%	100%		

Source: DHET (2016)

[30] The detailed explanation of the weighted data formula is contained in Annexure A.
[31] The MQA scope of coverage is includes other mining and services incidental to mining which is not covered by DMR.

Table 6 shows that the greatest proportion (76%) of MMS companies are small-sized companies with less than 50 employees, followed by large companies (>5 000 employees), with 14%. The highest number of large companies are involved in 'Other Mining' (49%), followed by Services Incidental to Mining (18%). PGMs companies employ the most people, with 33.4% employment coverage, followed by 'Other Mining' (25%), and Gold mining (17.6%).

1.6.2. Geographical location of companies in the MMS

Table 7 indicates the geographic location of companies in the sector. While the number of companies for some of the provinces is very high, the employment coverage is very low. For example, the Western Cape province has a high number of small companies, many of which are in jewellery manufacturing and design, but accounts for only 1.3% of total employment in the sector. Conversely, Limpopo has a relatively low number of companies (3.5%) but the majority are large companies and employ the second highest number of people in the country's MMS (16.7%), after North West.

Table 7: Geographical location of MMS companies

Province	Total	% of MMS employers	% of MMS employment
Eastern Cape	37	2.1%	0.4%
Free Sstate	46	2.6%	7.0%
Gauteng	843	47.5%	16.3%
KwaZulu-Natal	73	4.1%	2.0%
Limpopo	62	3.5%	16.7%
Mpumalanga	274	15.4%	12.2%
North West	151	8.5%	35.6%
Northern Cape	100	5.6%	8.5%
Western Cape	189	10.6%	1.3%
Total	1 775	100%	100%

Source: DHET (March 2016) and MQA WSP/ATR submission 2015-16

1.6.3. Mining start-ups and closures

In the MMS, most mining operations are large but small-scale mining also forms an important part of the sector. However, it is mainly small-scale mining entities, which experience challenges with sustainability, attributed to the capital-intensive nature of the industry as well as broader market dynamics. Entrepreneurs in the small, medium and artisanal mining, therefore, need to be supported so that they perform efficiently and within the codes and regulations of the sector at large. In order to mitigate these challenges, the MMS has prioritised the beneficiation of mineral resources into commercial products to try to ensure long-term sustainability for small-scale mining. During stakeholder engagement sessions conducted by the MQA in 2015-16, key stakeholder participants identified 4 major areas that impede sustainability: 1) Finance-related issues: obtaining finance, obtaining equipment, etc; 2) Labour issues: health and safety and working conditions; 3) Legal and market constraints: obtaining permits, transport, tax regimes and selling arrangements; and 4) Difficulty and high cost of attracting and retaining suitably skilled people. Small companies, especially those in more rural areas, are affected the most.

1.7. Labour Market Profile

1.7.1. Introduction

This section is based on information in the weighted WSP/ATR submissions provided to the MQA by levy-paying companies. A total of 634 companies submitted their WSPs by 31 May 2016. The section highlights the profile of the MMS labour market in terms of total employment, provincial distribution, gender and other equity indicators.

1.7.2. Gender and race

Table 8 shows that 14.5% of the sector's employees are female. It also indicates that females constitute the majority of employees in the Clerical Support Workers category (55%), and comprise a relatively high percentage in the Professionals (33%) and Service and Sales Workers (32.6%) categories.

Table 8 also shows the composition of the 4 race groups in the sector. Overall, Africans constitute the majority (83.7%) of the sector's employees followed by Whites (11.8%), Coloureds (3.8%) and Indians (0.8%). Africans constitute the majority of employees in most occupational categories, including Professionals and Technical and Associate Professionals. The one exception is the Managers category, where Africans comprise the second highest after Whites, with 32.5%.

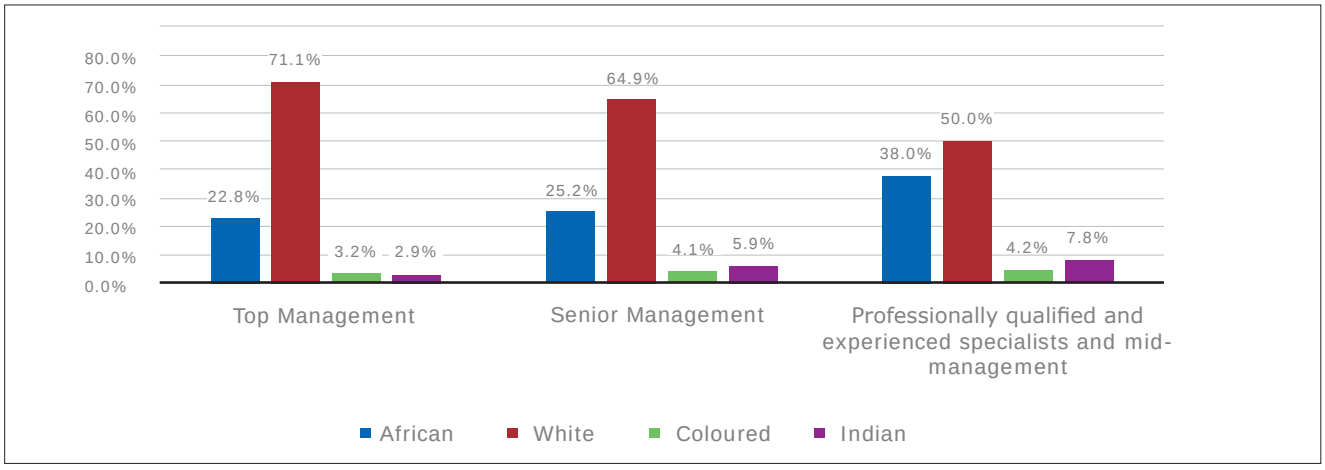
Table 8: Geographical location of MMS companies

Occupational Categories	Gender		Race			
	Female	Male	African	White	Coloured	Indian
Managers	2 477 (18.5%)	10 920 (81.5%)	4 340	120	7%	2.5%
Professionals	8 490 (33.0%)	17 201 (67.0%)	14 020 (54.6%)	9 486 (36.9%)	1 351 (5.3%)	833 (3.2%)
Technicians and Associate Professionals	8 479 (14.6%)	49 398 (85.4%)	37 922 (65.5%)	16 892 (29.2%)	2 448 (4.2%)	615 (1.1%)
Clerical Support Workers	11 880 (55.0%)	9 702 (45.0%)	13 564 (62.8%)	5 843 (27.1%)	1 711 (7.9%)	465 (2.2%)
Service and Sales Workers	2 244 (32.6%)	4 642 (67.4%)	5 861 (85.1%)	729 (10.6%)	263 (3.8%)	33 (0.5%)
Skilled Agricultural, Forestry, Fishery, Craft and Related Trades Workers (Artisan category)	3 326 (8.3%)	36 623 (91.7%)	22 633 (56.7%)	13 559 (33.9%)	3 422 (8.6%)	335 (0.8%)
Plant and Machine Operators and Assemblers	14 575 (6.7%)	201 670 (93.3%)	205 078 (94.8%)	3 839 (1.8%)	6 801 (3.1%)	526 (0.2%)
Elementary Occupations	20 202 (15.8%)	107 333 (84.2%)	122 628 (96.2%)	2 409 (1.9%)	2 160 (1.7%)	337 (0.3%)
Learners	3 777 (34.8%)	7 064 (65.2%)	9 054 (83.5%)	952 (8.8%)	777 (7.2%)	58 (0.5%)
Total	**75 450 (14.5%)**	**444 553 (85.5%)**	**435 100 (83.7%)**	**61 414 (11.8%)**	**19 582 (3.8%)**	**3 907 (0.8%)**

Source: Calculated from Weighted MQA WSP/ATR Submission (2016)

Upon closer analysis of the different management levels, Figure 4 reveals that whites comprise 71.1% of top management, 64.9% of senior management, and half (50%) of mid management. Africans comprise the second highest in all three categories, the highest proportion (38%) being in mid management.

Figure 4: Management levels by race

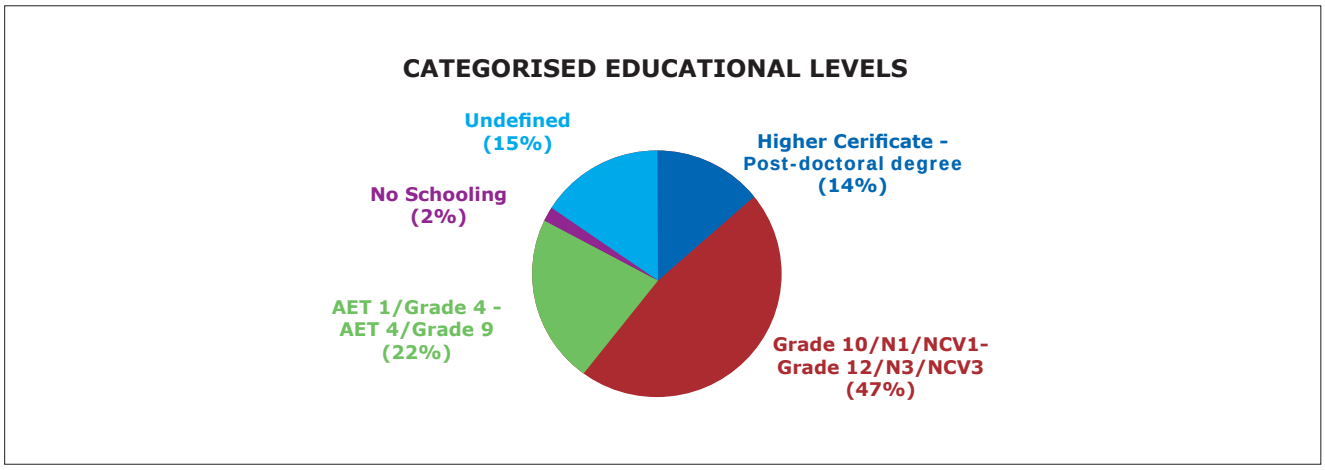


Source: Calculated from Weighted MQA WSP/ATR Submission (2016)

1.7.3. Education and skills levels

An analysis of the weighted WSP submissions revealed that the highest proportion of employees (29.9%) in the sector have achieved the equivalent of grade 12 (including Nated 3 and NCV 3), followed by grade 11 (10.8%). Grouping the many educational levels into 4 broad categories showed that the highest proportion of the sector's employees (47%) have achieved the equivalent of upper high school levels (grades 10 to 12), depicted in Figure 5, followed by 22% of the sector with grades 4 to 9 as their highest level of education. Of the 1.8% of the sector's employees who have no schooling at all, 73.8% are South African citizens and 90.5% fall into the categories Plant and Machine Operators and Assemblers and Elementary Occupations.Figure 5: Employment by education level

Figure 5: Employment by education level



Source: Calculated from Weighted MQA WSP/ATR Submission (2016)

1.7.4. The status, evolution and trends of employment in the MMS

Table 9 provides a 5-year trend analysis of employment in the MMS for the period 2012-2016.

Table 9: Employment trends in the MMS

Total employment in MMS		2012	2013	2014	2015	2016	Percentage change from 2012 to 2016
Total Employment		628 750	572 518	575 768	525 247	520 003	-17.3%
Provincial Distribution	Province	2012	2013	2014	2015	2016	2012 -2016
	Eastern Cape	1 160 (0.2%)	2 023 (0.4%)	2 647 (0.5%)	2 170 (0.4%)	1 889 (0.4%)	+62.8%
	Free State	42 485 (6.8%)	46 037 (8.0%)	44 316 (7.7%)	40 545 (7.7%)	36 378 (7.0%)	-14.4%
	Gauteng	119 330 (19.0%)	145 546 (25.4%)	123 795 (21.5%)	96 802 (18.4%)	84 559 (16.3%)	-29.1%
	KwaZulu-Natal	12 771 (2.0%)	10 382 (1.8%)	11 079 (1.9%)	11 616 (2.2%)	10 669 (2.1%)	-16.5%
	Limpopo	91 648 (14.6%)	77 121 (13.5%)	90 425 (15.7%)	82 373 (15.7%)	86 680 (16.7%)	-5.4%
	Mpumalanga	103 234 (16.4%)	70 535 (12.3%)	74 309 (12.9%)	90 289 (17.2%)	63 219 (12.2%)	-38.8%
	North West	220 527 (35.1%)	190 601 (33.3%)	195 840 (34.0%)	165 213 (31.5%)	185 352 (35.6%)	-16.0%
	Northern Cape	31 555 (5.0%)	24 672 (4.3%)	27 698 (4.8%)	31 126 (5.9%)	44 329 (8.5%)	+40.5%
	Western Cape	6 040 (1.0%)	5 581 (1.0%)	5 658 (1.0%)	5 114 (1.0%)	6 928 (1.3%)	+14.7%

Total employment in MMS		2012	2013	2014	2015	2016	Percentage change from 2012 to 2016
Subsector Distribution	CLAS	45 780 (7.3%)	17 256 (3.0%)	14 298 (2.5%)	13 449 (2.6%)	13 162 (2.5%)	-71.2%
	Coal mining	76 912 (12.1%)	62 864 (11.0%)	62 913 (10.9%)	87 389 (16.6%)	56 930 (10.9%)	-26.0%
	Diamond mining	11 963 (1.9%)	11 216 (2.0%)	9 900 (1.7%)	16 286 (3.1%)	8 974 (1.7%)	-25.0%
	Diamond Processing	1 965 (0.3%)	1 372 (0.2%)	6 557 (1.1%)	989 (0.2%)	1 849 (0.4%)	-5.9%
	Gold mining	151 382 (24.1%)	156 771 (27.4%)	138 237 (23.9%)	118 285 (22.5%)	91 357 (17.6%)	-39.7%
	Jewellery Manufacturing	2 589 (0.4%)	1 104 (0.2%)	902 (0.2%)	1 074 (0.2%)	2 802 (0.5%)	+8.2%
	Other mining	68 225 (10.9%)	101 871 (17.8%)	108 277 (18.7%)	107 969 (20.6%)	129 829 (25.0%)	+90.3%
	PGM mining	189 437 (30.1%)	175 579 (30.7%)	185 339 (32.0%)	144 690 (27.5%)	173 592 (33.4%)	-8.4%
	Services incidental to mining	80 497 (12.8%)	44 485 (7.8%)	36 571 (6.3%)	35 117 (6.7%)	41 509 (8.0%)	-48.4%
	Totals	628 750	572 518	562 994*	525 248	520 003	
Total Employment		628 750	572 518	575 768	525 247	520 003	-17.3%
Gender Distribution	Gender	2012	2013	2014	2015	2016	
	Male	559 470 (89.0%)	503 974 (88.0%)	506 676 (88.0%)	454 663 (86.6%)	444 553 (85.5%)	-20.5%
	Female	69 280 (11.0%)	68 544 (12.0%)	89 092 (12.0%)	70 585 (13.4%)	75 450 (14.5%)	+8.9%
	Totals	628 750	572 518	575 768	525 248	520 003	
Equity Distribution	Equity	2012	2013	2014	2015	2016	
	African	529 635 (84.2%)	485 210 (84.8%)	486 524 (84.5%)	441 699 (84.1%)	435 100 (83.7%)	-17.8%
	Coloured	14 997 (2.4%)	13 763 (2.4%)	11 515 (2.0%)	15 352 (2.9%)	19 582 (3.8%)	+30.6%
	Indian	3 167 (0.5%)	2 855 (0.5%)	2 879 (0.5%)	2 832 (0.5%)	3 907 (0.8%)	+23.4%
	White	80 951 (12.9%)	70 690 (12.3%)	69 092 (12.0%)	65 365 (12.4%)	61 414 (11.8%)	-24.1%
	Totals	628 750	572 518	575 768	525 248	520 003	

Total employment in MMS		2012	2013	2014	2015	2016	Percentage change from 2012 to 2016
Occupational Group Distribution	Managers	17 643 (2.8%)	14 677 (2.6%)	13 359 (2.3%)	14 165 (2.7%)	13 397 (2.6%)	-24.1%
	Professionals	26 852 (4.3%)	26 379 (4.6%)	25 749 (4.5%)	26 601 (5.1%)	25 691 (4.9%)	-4.3%
	Technicians & Associate Professionals	70 254 (11.2%)	60 864 (10.6%)	68 688 (11.9%)	57 877 (11.1%)	8 974 (1.7%)	-17.6%
	Clerical Support Workers	27 299 (4.3%)	23 152 (4.0%)	23 596 (4.1%)	22 315 (4.2%)	21 582 (4.2%)	-20.9%
	Service & Sales Workers	7 125 (1.1%)	6 322 (1.1%)	6 488 (1.1%)	6 419 (1.2%)	6 885 (1.3%)	-3.4%
	Trades category	34 315 (5.5%)	36 985 (6.5%)	38 238 (6.6%)	39 678 (7.6%)	39 949 (7.7%)	+16.4%
	Plant & Machine Operators & Assemblers	264 952 (42.1%)	244 335 (42.7%)	238 765 (41.5%)	213 412 (40.6%)	216 245 (41.6%)	-18.4%
	Elementary occupations	172 699 (27.5%)	150 614 (26.3%)	150 201 (26.1%)	131 172 (25.0%)	127 534 (24.5%)	-26.2%
	Leaners	7 611 (1.2%)	9 190 (1.6%)	10 684 (1.9%)	10 341 (2.0%)	10 841 (2.1%)	+42.4%
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	Totals	**628 750**	**572 518**	**575 768**	**525 248**	**520 003**	
Disability Distribution		4 843 (0.8%)	4 450 (0.8%)	4 924 (0.9%)	3 815 (0.7%)	4 864 (0.9%)	+0.4%
Management by Equity Distribution	Management by equity	**2012**	**2013**	**2014**	**2015**	**2016**	
	African	5 377 (30.5%)	4 005 (37.0%)	3 913 (29.4%)	4 315 (30.5%)	4 340 (32.4%)	-19.3%
	Coloured	692 (3.9%)	299 (2.8%)	490 (3.7%)	586 (4.1%)	649 (4.8%)	-6.2%
	Indian	595 (3.4%)	288 (2.7%)	591 (4.4%)	649 (4.6%)	704 (5.3%)	+18.3%
	White	10 979 (62.2%)	6 235 (57.6%)	8 312 (62.5%)	8 614 (60.8%)	7 704 (57.5%)	-29.8%
	Total in management	17 643	10 827	13 306	14 164	13 397	

Source: Calculated from Weighted MQA WSP/ATR Submission (2012-2016)
* In the 2014 report, the subsector field was left blank for 12 774 employees, thus why the subsector employment total does not equal total employment in the sector for that year (575 768).

Table 9 shows that the most significant changes and trends over the past 5 years occurred in the following categories:

- Total employment in the MMS has been declining over the years. As of 31 May 2016, the MMS employs an estimated 520 003, which is a 1% decrease from 2015, and a 17.3% drop since 2012.
- Mpumalanga, Gauteng, North West and Free State provinces' employment numbers have been declining steadily, by 38.8%, 29.1%, 16% and 14.4% respectively between 2012 and 2016. The biggest growth has been seen in Northern Cape, whose employment numbers have been increasing steadily, by 40.5% in the same 5-year period.
- In subsector employment, most subsectors have experienced significant declines in employment numbers since 2012, the biggest being CLAS with a 71.2% drop between 2012 and 2016, followed by Services Incidental to Mining with a 48.4% drop and Gold with a 39.7% drop. Other Mining has shown a relatively large increase, growing by 90.3% in the same 5-year period.

- A review of employment by occupational categories shows that the three biggest decreases in employment numbers are found in the Elementary occupations, with a 26% decrease since 2012, Managers, with a 24.1% decrease, and Plant and Machine Operators & Assemblers, with an 18.4% decrease between 2012 and 2016.
- Although the sector is historically male-dominated, the proportion of females has been increasing gradually, from 11% in 2012, to 14.5% in 2016.
- The overall composition of employees by race shows that Africans have been, and continue to be, the dominant group in the MMS. In 2016 the total employment number of Africans decreased by 1.5% from 2015, with the biggest decline being in the Service and Sales Workers category, with a 7.46% drop. There was a 6% decrease in White employment, with the biggest decline being in the Managers category, with a 10.56% drop between 2015 and 2016. Coloured employment experienced a large jump in numbers from 2015 to 2016 compared to the previous 4 years, with the largest increase being in the Artisan category, at 62.7%. The Indian group is consistently the least represented in the MMS constituting less than 1%, although the numbers increased by 38% from 2015 to 2016.
- Management by equity of the sector reflects that there has been an overall increase in management of Africans, Coloureds and Indians. In 2012, these three race groups together constituted 37.7% of management, to the highest proportion across the five years in 2016, with 42.5% of management.
- People with disabilities have consistently represented less than 1% of the total MMS sector labour force since 2012.

1.7.5. Implications of Findings for Skills Development

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

- There has been a decrease in employment figures over the last few years, with retrenchments remaining a foreseeable reality. The MQA and other role players need to prioritise the reskilling of retrenched workers so that they can be absorbed into other sectors of the formal labour market.
- There is an urgent need to monitor and implement Mining Phakisa, the three SIPs projects related to the MMS as well as mineral beneficiation as they each have great potential to create much-needed jobs. Relevant skills for these initiatives need to be developed.
- There are still racial and gender disparities in the demographic composition of the industry signalling the need for role players to continue to address workforce imbalances. The MQA might need to consider a reallocation of the discretionary grant to support industry to increase the uptake and throughput of historically disadvantaged South Africans (HDSAs), particularly women and HDSAs in top and senior management levels, in their training and skills development pipeline.

1.8. Summary and Conclusion

This chapter revealed that South Africa is an important hub in the global mining value chain. However, the sector is currently facing some challenges, which include:

- The sector's contribution to GDP has been decreasing over the last few years, from 8.5% in 2009 to 7.6% in 2016.
- There has been a decrease in number of people employed from a peak of 628 750 in 2012 to 520 003 in 2016.

- It has been concluded that the short to long term outlook of the sector would be improved if the sector monitors the developments of Mining Phakisa and prepares existing and potential employees accordingly; as well as takes advantage of the implementation of the Mineral Beneficiation Action Plan (MBAP) and the SIPs projects, which are expected to lead to increased economic activity and the creation of new jobs in South Africa.
- The MQA and other role players need to pay special attention to the reskilling of retrenched workers so that they can be absorbed into other sectors of the formal labour market.
- There are still demographic disparities in the gender and management by equity compositions of the industry signalling the need for the MQA and other role players to continue to address workforce imbalances.

2. KEY SKILLS ISSUES

2.1. Introduction

This chapter is concerned with identifying factors that are driving change in the MMS and which affect skills demand and supply. It offers an analysis of their implications for skills development. Secondly, the chapter provides an analysis of the alignment of the MQA's SSP to national strategies and plans such as the National Skills Development Strategy as well as those specific to the MMS such as the Minerals and Petroleum Resources Development Act.

2.2. Change Drivers

There are numerous factors that impact on skills development in the MMS, including economic, social, technological, environmental and legislative factors. The influence of the drivers on the sector is important, particularly their impact on skills development. 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. Technology

Technological change remains at the forefront of the sector's ability to become as safe, healthy efficient and sustainable as possible. New, sophisticated technologies are transforming the sector's operations. As a result, the type, level and mix of skills required is starting to change, affecting occupations including Rock Drill Operator, Blaster, Drill Rig Operator as well as most of the artisan trades. Upskilling and re-skilling programmes are needed so that employees are trained in new mining processes that will extend the lifespans of mines. TVET colleges are for the most part not up-to-date with latest technology therefore many skills may need to be developed on the job.

As mentioned in Chapter 1, the Mining Phakisa initiative aims to expand the lifespan of some of the mines by developing locally the machinery required to mine narrow, hard rock reefs, which is where the majority of platinum and gold resources lie in South Africa but which are currently unviable to mine due to safety, health and economic reasons. Job sustainability is a high priority of the initiative, with the intention that jobs in mining will be sustained through access to currently 'unmineable' resources. Research and development is currently underway to develop the machinery locally, and it will be crucial for the MQA to stay abreast of these developments as the time frame goals are relatively short: five years for remote drill-and-blast mechanisation and 10 years for 24/7 mechanisation. Upskilling training drives will be required for all skills levels of workers, including managers and supervisors, to ensure a smooth transition to mechanisation. A focus on AET programmes up to level 4 as a way of improving literacy and numeracy levels will be important to prepare existing and potential employees to operate new machinery and coordinate new processes. Research still needs to be conducted on the potential impact of new mechanised methods on various skills, and the training that will be required for each to adapt accordingly.

2.2.2. Global demand

Many subsectors in the MMS are experiencing significant decline in growth owing to decreased global demand for their commodities (in particular, platinum, iron ore, chrome and manganese), with many operations downscaling or closing down as a result. Retrenchments are an ongoing reality leading to skills are re-entering the job market. Portable skills training has become a necessity for those who are not re-absorbed in the MMS and must be made a priority by the MQA.

2.2.3. Occupational health and safety

Mining operations come with inherent risks that can affect the health and safety of employees. There has been a decrease in mining injuries and fatalities, with total fatalities

decreasing sharply from a peak of 744 per annum in 1989 to 77 in 2015. Mining companies, government and unions need to continue to place importance on employee safety since continued fatalities, injuries and occupational diseases jeopardise a company's licence to operate. The MQA must also continue its support of OHS skills development by increasing human resources supply in areas critical to OHS.

2.2.4. Mining Charter and employment equity

The Mining Charter stipulates that mining companies must be at least 26% black-owned to qualify for mining and prospecting rights. Companies are required to comply with social, labour and community objectives such as procurement spend with BEE entities. Failure to comply with the Charter could result in permits or mining rights being revoked. Companies situated in remote areas find it difficult to comply owing to their locations. The stakeholder engagements revealed the need for training and support to small businesses in remote areas, which can service the mines. The MQA's response is to continue to prioritise mentorship and entrepreneurship development.

Employment equity (HDSAs, women and people with disabilities) is another high priority change driver. The current Mining Charter (2010) stipulates that there should be at least 40% participation in HDSAs in management positions. While Chapter 1's labour market profile indicates that this target is being met (42.65%), stakeholders in most provinces stated that HDSAs are under represented at senior management levels. However, it was also advised that HDSAs with senior management experience are hard to find. Internal development is often challenging as it takes a long time and an investment in costs, with headhunting and/or migration to other provinces/sectors being a common eventuality. The MQA supports programmes such as the Management Development Programme (MDP), which is aimed at addressing this challenge.

In April 2016, a draft new Mining Charter with new targets was gazetted by the DMR. The proposed targets are considerably higher, in particular where black females in senior management are concerned. Owing to the nature of the sector, regional stakeholders around the country consistently emphasised the difficulties, which mining companies have always faced where the employment of females is concerned. While these targets are currently still being discussed among stakeholders at the highest levels, and therefore are not yet finalised, it will be important for the MQA to begin strategic discussions and planning around possible outcomes, in order to support industry to achieve any new transformation targets when it happens.

2.2.5. 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 (MBAP), 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. However, while mineral beneficiation has the potential to transform the industry, regional stakeholders believe that not much is being done to implement numerous undertakings in the past few years. Regional stakeholders expressed the importance of implementing efforts to beneficiate the country's minerals and metals, especially during an economic downturn. The MQA needs to maintain strong relationships with government departments involved in this, to understand its role in responding to any resulting skills needs.

2.2.6. Environmental sustainability

The industry is becoming more conscious of the growing need to protect the environment, with increased enforcement of legislation and consumer pressure driving the demand for eco-compliance. Skilled workers will be required in energy efficiency and sourcing of 'green' products and services and managing 'green' supply chains. Alternative sources of energy are also being prioritised owing to the increasing costs of electricity, which impact production and profitability.

2.2.7. Community and youth development

Community unrest occurs in mining communities when local skills are not being used for jobs, and when the youth cannot find jobs elsewhere. Unrest can lead to disruptions in business operations and a resulting decline in productivity. Regional stakeholders in all provinces advised that training of local skills in communities is hindered by the low levels of Maths and Science, and general basic education. The MMS particularly in Limpopo, Mpumalanga, Free State and Eastern Cape provinces has recently faced rising community unrest and disruption to production. The MQA has been encouraged by stakeholders to include community leaders at all regional engagements, and to increase access to Maths, Science and bridging programmes.

2.2.8. Labour market (supply of skills)

Regional stakeholders in most provinces advised that certain occupations in the MMS are not attracting as much interest from the youth as in the past. A large factor is understood to be the unattractive shift hours. This relates to Boilermaker, Rigger, Diesel Mechanic, Rock Drill Operator, Drill Rig Operator and Mechanical Loader Operator. There is also a concern that career awareness initiatives do not adequately portray some of the MMS occupations, leading to misperceptions and/or disinterest from potential learners. This may lead to a situation whereby some or all of these occupations become scarce to employers. The MQA's career awareness initiatives have the potential to address these concerns.

2.2.9. Small enterprise development

Enterprise development supports the notion that Small, Medium and Micro-sized Enterprises (SMMEs) should build sustainable business models given that the gestation period for success in the MMS is long. Enterprise development creates employment growth opportunities. The MQA Funding Policy for 2016-17 calls for the grant allocations to take into account SMMEs (companies employing less than 50 employees). The MQA will assist SMMEs with research and development of appropriate technologies, and by providing training and support so that development is sustainable. There is potential for the smaller mining provinces to grow given the mineral deposits that have been discovered and the prospective and mining rights applications, which have been lodged with the DMR in recent months. Some of these companies may require development in business management skills to ensure sustainability.

2.3. Alignment of 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 1988, Section 10 as amended (2008). Sector skills planning in South Africa must take into account a wide range of national policy imperatives that seek to support inclusive sector growth paths that advance economic growth and the social development and transformation agenda. Table 10 summarises the national policies, which guide the strategy and operations of the MQA.

Table 10: Alignment of the MQA Strategic Plan to Government National Policies and Strategies

POLICY / ACT	Policy alignment to the MMS	
	Policy input Relevant to the MMS	**Policy implications on Skills Planning**
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 responsive to sectoral, 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	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 6 TVET colleges for capacitation and accreditation purposes • Facilitates workplace experience for TVET college lecturers • 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.
Human Resources Development Strategy for South Africa (HRDS-SA) (Published 2010)	• Accelerate training in the priority areas including artisanship • To leverage public and private sector programmes to create employment opportunities and work experience for new entrants into the labour market • Improve coverage and efficacy of vocational guidance	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
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
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 6 TVET colleges for capacitation and accreditation purposes • Workplace experience for TVET college lecturers • Workplace experience funded for learners

POLICY / ACT	Policy alignment to the MMS	
	Policy input Relevant to the MMS	Policy implications on Skills Planning
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 6 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) 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) for the MMS. • Facilitates the development of scarce or hard-to-fill artisan occupational skills in 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
Mining 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 MHS' 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

Source: MQA Strategic Plan 2015-2016

2.4. Conclusion

The five main 'key skills issues' impacting the MMS are Technology and Mining Phakisa, Global demand, Mining Charter and Employment equity, Occupational Health and Safety (OHS) and Mineral beneficiation. Proper implementation of the national and MMS-specific strategies by the MQA and other mining stakeholders will provide correct and relevant strategies in addressing these change drivers.

3. EXTENT OF SKILLS MISMATCH

3.1. Introduction

Having profiled the sector, its employment situation, and the key issues driving change, this chapter focuses primarily on understanding the demand for, and supply of skills, as well as occupation-specific skills mismatches for employers in the sector. The issue of skills gaps in the sector will also be addressed.

3.2. Extent and Nature of Demand

Demand for skills refers to the employers' needs for skills in the sector. Employees in the Plant and Machine Operators and Assemblers category constitute 41.6% of total employment in the MMS.

3.2.1. Occupational vacancies

Table 11 shows the vacancies by occupational category. Vacancy intensity (rate) refers to the number of vacancies as a percentage of the total employment within the occupational category. While the data indicates that there are no serious shortages, the categories that have among the highest number of vacancies are the Artisans (1.42%), Professionals (1.16%) and Managers (0.85%).

Table 11: Occupational vacancies by category

Occupational category (OFO)		Number of vacancies	Number employed	Vacancy intensity (rate)
Group	Title			
1	Managers	114	13 397	0.85%
2	Professionals	297	25 691	1.16%
3	Technicians and Associate Professionals	245	57 877	0.42%
4	Clerical Support Workers	21	21 582	0.10%
5	Service and Sales Workers	10	6 885	0.15%
6	Skilled Agricultural, Forestry, Fishery, Craft and Related Trades Workers (Artisan category)	568	39 949	1.42%
7	Plant and Machine Operators and Assemblers	1 053	216 245	0.49%
8	Elementary Occupations	47	127 534	0.04%

Source: Calculated from Weighted MQA WSP/ATR Submission, 2016

3.2.2. Hard-to-fill occupations

Hard-to-fill occupations refer to occupations, which employers struggle to find candidates for, for a sustained period, not because there is a scarcity in the country, but rather owing to other reasons, such as:

- Geographic location - many of the MMS's employers are situated in remote areas, which may not produce the talent required locally, and which employers may also struggle to attract from elsewhere. This could lead to the need to incentivise candidates with high salaries.
- Employment equity - in some cases, vacancies are hard to fill because of a lack of skilled people meeting employment equity criteria.
- Industry attractiveness - some employers believe that the sector does not attract skills.

Table 12 shows the top 10 occupations that employers classify as hard-to-fill, owing to one or a combination of the above factors. This information is based on extensive research and findings from the MQA's 2015-16 RSSP project, during which comprehensive and regular engagements were held in every province with representatives from industry, labour, training providers and government to understand the skills challenges and needs. Expert stakeholders were also consulted individually to corroborate findings and to determine whether any changes in the skills landscape had occurred since March 2016 when the last regional engagements were held.

Table 12: Hard-to-fill occupations

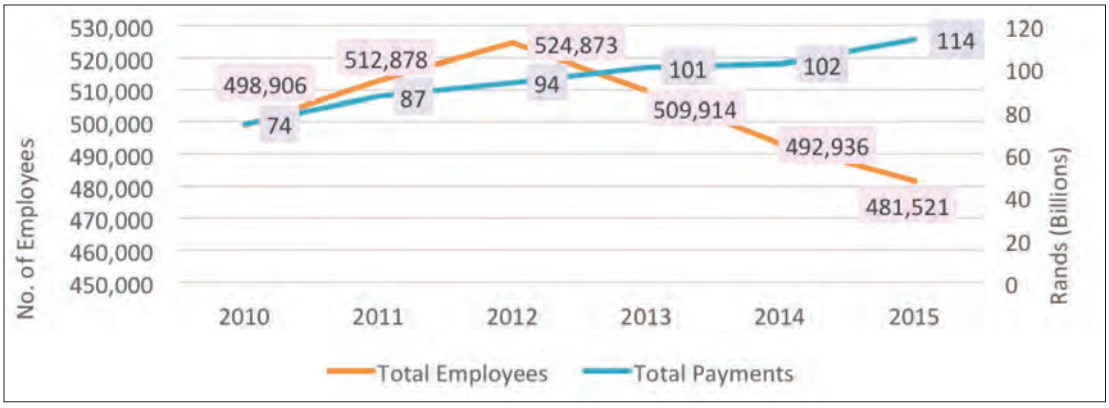
Hard-to-fill occupation	OFO code	Reason/s for challenge
Mining Manager	132201	Geographic location, high salary, lack of management skills, MMCC
Mine Planner	132202	Lack of planning & sector experience, lack of HDSAs
Mining Engineer	214601	Geographic location, high salary, lack of HDSAs, lack of GCC
Rock Engineer	214601	Geographic location, lack of career awareness at university
Surveyor	216502	Geographic location, lack of experience, lack of GCC
Rigger Ropesman	651501	Lack of roping skills, low interest from learners
Diesel Mechanic	653306	Lack of knowledge and experience in updated technology, lack of electrical knowledge. **Becoming scarce**
Boilermaker	651302	Lack of updated technology, declining interest from learners, declining throughput rates at college, low maths levels
Instrumentation Mechanic	672105	Lack of knowledge and experience in updated technology
Fitter	652301	Lack of knowledge and experience in updated technology

Source: RSSP workshops and national expert stakeholder consultations 2015-16

3.2.3. Wage trends

Figure 6 shows that before the year 2012, the number of employees in the mining industry was increasing at a faster rate than the increase in total wage payments. However, the trend was reversed in 2012. Total employment has fallen by 13.3% from a peak of 524 873 in 2012 to 481 521 in 2015. Overall, total wage bill has increased by 54% from 2010 to 2015. The DMR's annual figures were used.

Figure 6: Number of Employees vs Total Wage Payments



Source: DMR (2010-2015)

Further research over time is needed to fully understand these impacts, but also on the changing skills sets of those employed. As mentioned in Chapter 2, there are indications in the market of other productivity changes that occur as a result of mechanisation, upskilling and reskilling.

3.2.4. Employment trends

Table 13 shows the employment trends by occupational category since 2012. In 2014, there was a marked increase in employees across most categories, but 2015 then saw a significant decrease. In some cases, the numbers dropped to below 2012 numbers, especially in the lower-skilled categories. Since 2012, however, the biggest decreases in employment numbers are found in the Elementary occupations, with a 26% decrease (since 2012), Managers with a 24.1% decrease, and Plant and Machine Operators & Assemblers, with an 18.4% decrease since 2012.

Table 13: Employment trends by occupational category

Occupational category	2012	2013	2014	2015	2016
Managers	17 643	12 181	13 359	14 165	13 397
Professionals	26 852	21 853	25 749	26 601	25 691
Technicians and Associate Professionals	70 254	50 541	68 688	61 145	57 877
Clerical Support Workers	27 299	19 204	23 596	22 315	21 582
Service and Sales Workers	7 125	5 258	6 488	6 419	6 885
Skilled Agricultural, Forestry, Fishery, Craft and Related Trades Workers (Artisan category)	34 315	30 726	38 238	39 677	39 949
Plant and Machine Operators and Assemblers	264 952	202 386	238 764	213 412	216 245
Elementary Occupations	172 699	124 722	150 201	131 172	127 534
Total	621 139	467 826	565 083	514 906	509 160 (excludes the 10 841 learners)

Source: Calculated from Weighted MQA WSP/ATR Submission, 2012-2016

3.2.5. Conditions of employment

The conditions of employment in the MMS can be described in a number of ways, which includes the following:

- Physical conditions – the type of conditions within the sector vary greatly. For some mining occupations such as Miners, Rock Drill Operators and Mining Managers safety is an important element, which must be continuously monitored and, if necessary, addressed. Other occupations such as HR Practitioners and Administrators tend to be office-based with fewer safety concerns.
- Relationships between employer and employee – relations can become stressed prior and during protest action.
- Job security – the MMS is currently facing widespread retrenchment drives across the country and across subsectors. Many jobs, particularly those at the lower skilled levels, are not secure.

3.2.6. Migration

Bilateral labour agreements between South Africa and numerous countries in Southern Africa allow for mining companies to employ workers with Southern African Development Community origin, thus allowing for diversity of skills in the sector. Table 14 shows the number of foreigners employed in each occupational category.

Table 14: Foreign skills

Occupational category (OFO)		Total employed in the MMS	Number of foreigners employed in occupation group	Percentage of foreigners to total employed in occupation group
Group	Title			
1	Managers	13 397	423	3.16%
2	Professionals	25 691	812	3.16%
3	Technicians and Associate Professionals	57 877	4 921	8.50%
4	Clerical Support Workers	21 582	434	2.01%
5	Service and Sales Workers	6 885	264	3.84%
6	Skilled Agricultural, Forestry, Fishery, Craft and Related Trades Workers (Artisan category)	39 949	39 949	2.76%
7	Plant and Machine Operators and Assemblers	216 245	38 879	17.98%
8	Elementary Occupations	127 534	13 655	10.71%

Source: Calculated from Weighted MQA WSP/ATR Submission, 2016

Table 14 reveals that the occupational categories with the highest number of foreigners are Plant and Machine Operators and Assemblers (17.98%), Elementary Occupations (10.71%), and Technicians and Associate Professionals (Miners fall into this category) (8.5%). The use of migrant workers, highest in the two lowest-skilled categories where Table 13 showed that some of the biggest drops in employment numbers have occurred since 2012, has been raised by some of the MQA's Skills Research and Planning Committee members as being a possible area requiring further discussion and research.

3.3. Extent and Nature of Supply

The future growth prospects of the sector are dependent on the availability of appropriate and affordable skills; therefore, an analysis of the supply-side is necessary. Data received from the MQA, the DMR, DHET and Chamber of Mines on education and training, as well as comments from stakeholders at numerous national and regional meetings held between June 2015 and May 2016, were analysed for this section.

3.3.1. Current state of education and training provision

The skills required for the MMS are produced at school, TVET colleges, private training providers, universities of technology, universities as well as workplaces themselves.

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 1's labour market profile showed that the biggest proportion of workers (47%) have achieved the equivalent of grades 10 to 12 as their highest level of education. However, stakeholders at every regional meeting expressed concern at the quality of basic education in the country. Many occupations within the MMS require a foundation of good quality Maths and Science, which for the majority of the population is lacking, 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 (GDP) and 20% of total state expenditure, the government spends more on education than on any other sector.

School infrastructure has been a persistent challenge for many rural provinces and a fair portion of the Department of Basic Education's budget will be channelled to rural school infrastructure. The NDP calls for 450 000 grade 12 learners to achieve university entrance passes with Maths and Physical Science in 2030. However, the intake for these subjects at high school has been slow. 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.

Employees whose highest level of education is between grades 4 and 9 constitute 22% of the sector. This range includes AET levels 1 – 4. As discussed in Chapter 2, given that changing technology and Mining Phakisa's mechanisation goals will lead to a need for upskilling of many current and future employees in the areas of machine operations and maintenance, it will be important for stakeholders in the sector to prioritise the funding of AET training, up to and including level 4. This will help to develop adequate literacy and numeracy levels for industry's emerging new skills requirements. The MQA's WSP/AR submissions show that employers in the sector do offer training on AET 1 – 4 for their employees. In 2015-16 a total of 4 333 employees received one or more levels of AET training.

3.3.1.1.2. MQA interventions to address challenges at basic education level

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

3.3.1.1.3. MQA interventions in basic education: Maths and Science programmes

The MQA has developed an intervention, which aims to address the poor quality of Maths and Science at basic education level. It supports grades 10, 11 and 12 learners to successfully complete Maths and Science. In 2015-16, the MQA committed to support 1,000 learners, which was successfully achieved with a total of 1,010 learners supported in this programme. Stakeholders during the RSSP project suggested that these programmes be monitored for impact, and that lessons from this need to be incorporated into the programmes to ensure effectiveness. A popular suggestion from national and regional stakeholders was to focus efforts on the development of teachers and fewer beneficiaries, to ensure impact. It was widely suggested that considerable funding be directed at those who are applying for bursaries, and as a condition before commencement of studies.

3.3.1.1.4. MQA interventions in basic education: Career awareness

Stakeholders in the sector widely believe 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. There is generally a lack of informative career guidance for the majority of the population. A more targeted approach in career guidance would help many to understand the variety of career options and career progression opportunities that are available. In 2015-16, the MQA committed to target 10 000 learners to attend its career guidance workshops, the aim was to provide comprehensive information on careers and pathways in the sector and to correct any misperceptions about mining occupations, as the MMS is not perceived to be an attractive industry to work in. This target was exceeded by a substantial amount totalling to 13 871 delegates attended, the reason being an unexpected public response to the activities. Regional stakeholders during the RSSP project emphasised the role of career guidance in creating awareness and knowledge around the diverse mining career options available, as

well as to provide information about the importance of pursuing Maths and Science until grade 12 (including the consequences of wrong career choices).

Career awareness events should provide sufficient detail so that persons are empowered to make informed career decisions. This will enhance understanding regarding whether a career is suitable to them or not, and whether or not the mining industry is attractive to them, thus avoiding potentially career changes and unnecessary training expenditure at a later stage. Regional stakeholders also suggested that this initiative should be monitored for impact, and that an increase of such events at high schools be undertaken if possible.

3.3.1.2. TVET college sector

TVET colleges form a critical component of the current training capacity of skills for the sector. 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.

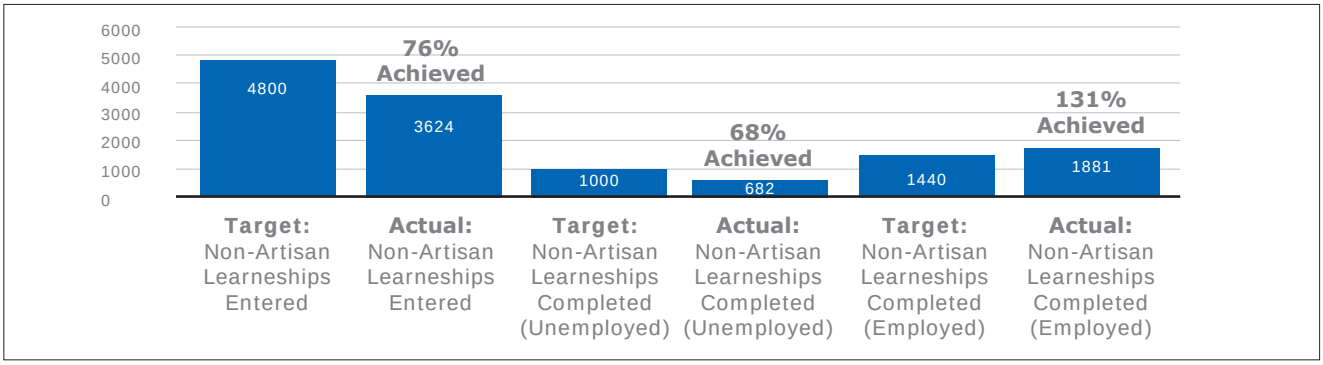
The main concern at this level, according to the regional stakeholders is the fact that many learners are not adequately work-ready upon graduating, particularly artisans. While employers appreciate the need to carry a measure of responsibility for the training of graduates to develop company-specific skills, indications are that many colleges' workshops are not equipped enough to provide adequate practical training required for the completion of qualifications, and curricula for the most part are not updated with latest technologies in the sector.

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

3.3.1.2.1. MQA interventions at TVET College: learnerships (non-artisan)

Figure 7 shows the annual targets versus actual achievements for 2015-16 on learnerships, excluding artisans. A total of 3 624 learners registered for MQA-funded non-artisan learnerships, which is 76% of MQA's target; 682 unemployed learners completed non-artisan learnerships during the year, a 68% achievement of the target; and 1 881 employed learners completed non-artisan learnerships during the year, which exceeded the target at 131%.

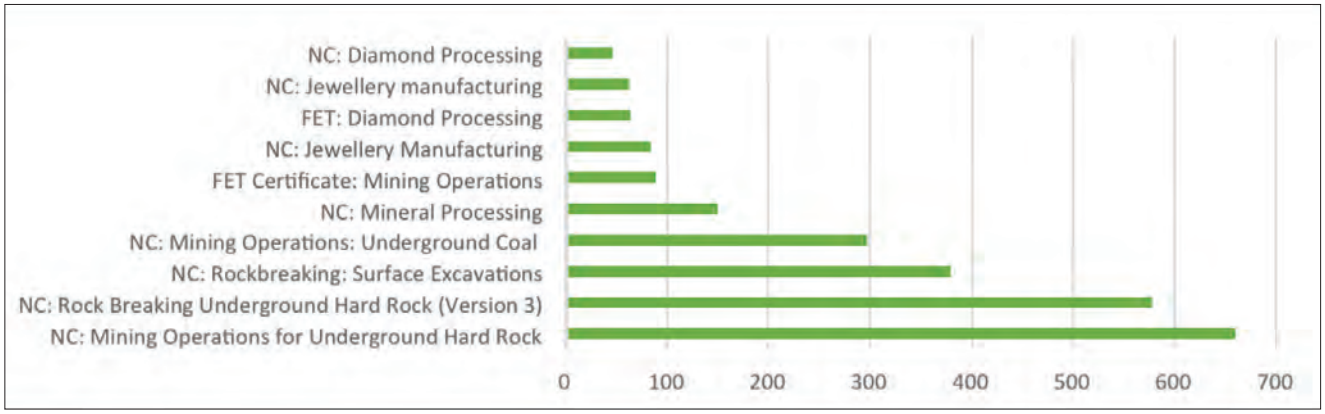
Figure 7: MQA learnerships (excluding artisan): target vs actual 2015 - 2016



Source: MQA database (2016)

Figure 8 shows the Top 10 learnerships (excluding artisans) completed by unemployed and employed learners in 2015-16. The top three concern core-mining skills at stage 1 of mining activities. With many subsectors in the MMS undergoing retrenchment drives, there is currently very little indication of a shortage in the skills supplied in the TVET college sector, with the exception of a lack of practical experience and knowledge in new technologies.

Figure 8: Top 10 learnerships completed in 2015 - 2016 (excluding artisan)

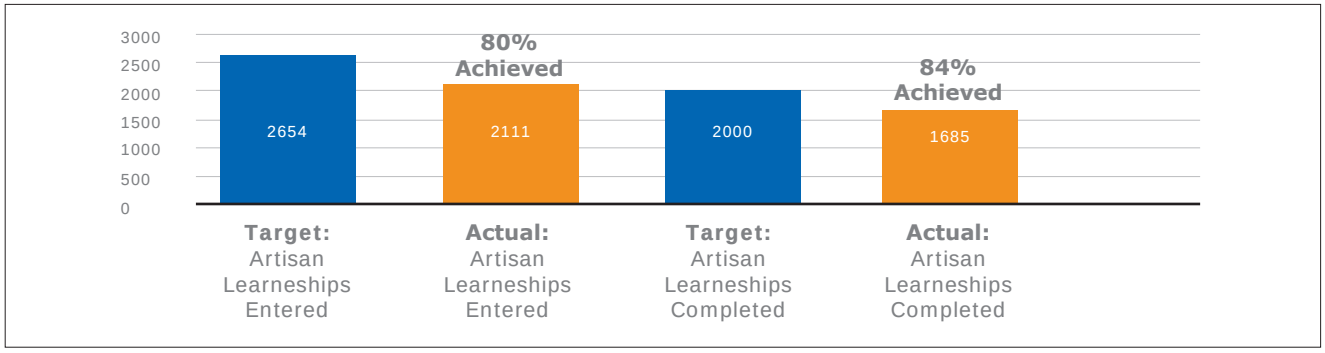


Source: MQA Database (2016)

3.3.1.2.2. MQA interventions at TVET College: artisan development

Figure 9 shows the annual targets versus actual achievements for 2015-16 where artisan learnerships are concerned. A total of 2 111 learners entered the MQA-funded artisan learnerships, which is 80% of the MQA's target; while 1 685 learners completed artisan learnerships during the same year, which is 84% of the MQA's target.

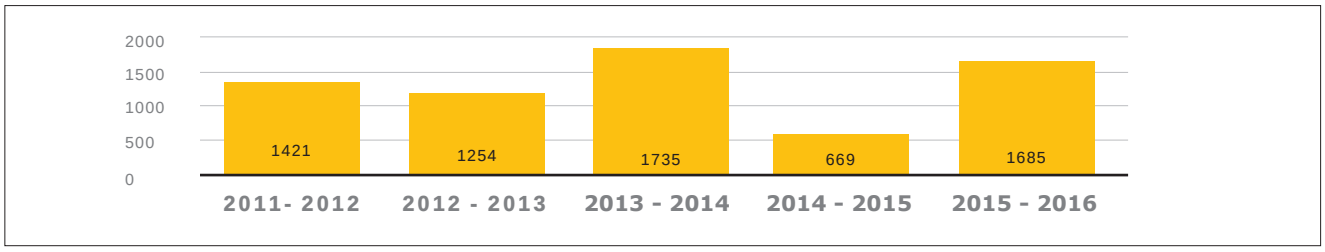
Figure 9: MQA learnerships (artisan): target vs actual 2015 - 2016



Source: MQA database (2016)

Figure 10 shows a 5-year analysis of the number of learners who completed artisan learnerships. From 2009, the numbers remained over 1,000 but in 2014-15, there is a significant drop to below 700. Upon analysis of previous enrolments figures, it was found that a significant drop in enrolments occurred in 2011, and then recovered to over 2 000 enrolments for subsequent years. This decrease 3 years ago may help to explain the reason for the low completion numbers in 2014-15; therefore, it was anticipated in the 2014-15's report that the numbers would show an increase in 2015-16. The numbers for 2015-16 indeed showed a significant increase in completions, the second highest in five years.

Figure 10: Artisan qualifications completed



Source: MQA database (2016)

Table 15 shows a breakdown of the artisan learnerships completed and entered in 2015-16.

Table 15: Artisan learnerships entered and completed

OFO Description	Number of learners completed 2015-16	Number of learners entered 2015-16
Electrician	480	440
Fitter	337	405
Diesel Mechanic	247	253
Welder	160	131
Millwright	108	94
Boilermaker	101	264
Instrument Mechanician	97	69
Fitter and Turner	87	76
Rigger Ropesman	49	81

Source: MQA Database (2016)

Firstly, Table 15 shows that the MQA funding towards artisan development may have decreased in recent years, owing to the number completed in 2015-16 being higher in some cases to the number entered in 2015-16. The MQA's artisan development team also advised that there is a lot of fluctuation in the system, with many learners leaving their studies for a while and then re-entering. Secondly, as Diesel Mechanic, Boilermaker, Instrument Mechanician and Rigger Ropesman are on the hard-to-fill occupations list, with Diesel Mechanic in particular becoming scarce, it will be important to see successful throughput of learners who have just entered. Furthermore, these learnerships need to incorporate changes in technology within the occupations and include work experience at suppliers of new technology to the mines. Stakeholders also expressed concern regarding Rigger Ropesman, stating that throughput numbers are decreasing – corroborated by the table above, and that interest in the occupation is declining, also corroborated somewhat by the table since its number of entered learners is one of the lowest.

Since the number of graduates is higher than the number of vacancies in the sector, it appears that enough artisans are being developed in the system. However, the MQA competes with other sectors for artisans, and an uncertainty with the completed numbers is that the number of graduates who seek and find employment in the MMS after studying is unknown.

3.3.1.2.3. 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 industry. In 2015-16, the MQA had a target to place 500 TVET NCV learners with host employers, and 529 learners was successfully placed. The target for P1 and P2 training for the University of Technikon students was also successfully achieved, with the target of 650 exceeded by 80, as well as internships for university graduates (target of 450 was exceeded by 88).

To help alleviate the burden from employers to mentor learners, the MQA has introduced an initiative to place coaches within workplaces to support employers with on-the-job mentoring and coaching activities. The target for 2016-17 is to place 50 coaches in companies for this purpose.

Suggestions from stakeholders included that the focus on TVET colleges should be on lecturer development. These suggestions are currently being addressed by the MQA, which has a programme to place lecturers in companies for workplace exposure. In 2015-16, the MQA's target of placing 20 lecturers was successfully achieved.

3.3.1.3. MQA-accredited training providers

As of April 2016, there were a total of 150 training providers, which were fully accredited by the MQA, meaning that they focus on MMS-related qualifications, with another 33 offering a few MQA-approved programmes. Training providers at regional workshops expressed that the process of achieving accreditation with the MQA is sometimes very lengthy which impedes the rate of skills development in the MMS.

3.3.1.4. Employer training reported on WSP-ATR

Companies in the sector contribute much to the development of skills for employees. Over one million training programmes were completed by employees in 2015-16. They varied greatly in type, from job-specific development programmes to learnerships, with the three most common being short courses (a total of 279 225 completed), induction training (243 443) and refresher/ex-leave training (163 479).

Upon deeper analysis of the different types of short courses completed, it was found that while many of them were not specified in the WSP's, among the highest were Rock Engineering Strata Control Operations, Occupational Health & Safety, and Blasting Assistant within Underground Hard Rock.

There were 5 868 employees who were impacted by the MQA learnerships programme. A further 353 learnerships were mentioned as programmes from other SETAs in the MQA companies, and they include:

- CETA: Refractories Installer (Site Assistance) Level 2
- CHIETA: Chemical Boilermaker Level 4
- ESETA: National Certificate in Electrical Engineering (Generation) Level 3
- ETDP: National Certificate: Occupationally Directed Education, Training and Development Practices Level 6
- FASSET: Certificate: Certified Accounting Technician Level 5
- INSETA: GUI Based Applications for End-user Computing Level 3
- merSETA: Further Education and Training Certificate: Automotive Repair and Maintenance (Earthmoving Equipment) Level 4
- SERVICES SETA: First Line Manager Level 5
- TETA: National Certificate in Freight Handling, Warehousing & Distribution Level 3

This reinforces the importance of ongoing collaboration between the MQA and other SETAs.

3.3.1.5. Chamber of Mines certificates

Table 16 shows the number of certificates in MMS-related qualifications, which the Chamber of Mines has issued since 2010. The numbers have declined significantly. December 2015 numbers show that about a quarter (253) of December 2014's total (1 107) were issued, possibly indicating declining interest levels from learners. A particular concern to key role players could be the low numbers of learners studying Advanced Rock Engineering, considering it is on the hard-to-fill list.

Table 16: Certificates issued by Chamber of Mines

OFO Description	As at July 2010	As at July 2011	As at July 2012	As at July 2013	As at Dec 2014	As at July 2015	As at Dec 2015
Certificate in Advanced Mine Surveying	29	57	70	58	91	57	6
Certificate in Advanced Mine Valuation	41	88	102	66	75	38	16
Certificate in Advanced Rock Engineering	3	1	11	3	4	4	3
Certificate in Basic Mine Sampling	272	125	141	63	164	80	43
Certificate in Basic Mine Surveying	163	134	130	142	156	77	66
Certificate in Elementary Mine Sampling	126	100	90	73	64	52	35
Certificate in Elementary Mine Surveying	150	114	130	88	141	95	25
Certificate in Mine Environmental Control	16	71	19	8	29	8	4
Certificate in Radiation Protection Monitoring Screening	260	70	125	109	181	61	41
Certificate in Rock Mechanics	11	10	27	25	25	16	2
Certificate in Strata Control	55	49	79	64	96	61	10
Intermediate Certificate in Mine Environmental Control	87	18	32	48	51	59	1
Certificate in Mine Survey Draughting	26	31	22	40	30	12	1
Practical Certificate in Mine / Environmental Control	3						
TOTAL	1 242	868	978	787	1 107	559	253

Source: Chamber of Mines (2016)

3.3.1.6. Higher education and training

Higher education and training (HET), 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 getting marks that enable them to enrol for studies at university – however, owing to the poor Maths and Science pass marks in the country, which is a requirement for the majority of MMS-related qualifications, the uptake for the sector itself remains relatively low.

3.3.1.6.1. Universities

In universities, some of the fields of study relevant to this sector are Mining Engineering, Mine Surveying, Metallurgy, Chemical Engineering, Geology, Electrical Engineering, Mechanical Engineering, 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 universities of technology. The other fields of study are each offered at a number of institutions.

Table 17 indicates that the number of graduates in the MMS-related qualifications at HET level has generally been increasing. While the number of Geology graduates dropped significantly in 2012, its numbers increased in 2013, and then sharply in 2014. The substantial increase in 2014 is a concern owing to prevalent comments by both national and regional stakeholders over the past two to three years that many Geologists are unemployed and have been struggling to find jobs. There is also a concern regarding Rock Engineering, a specialisation of Mining Engineering, that there is a lack of career awareness at university level for this career path, which has resulted in a shortage in the provinces of North West and Limpopo.

Table 17: Graduate numbers in MMS-related qualifications

Qualification	Output 1999	Output 2011	Output 2012	Output 2013	Output 2014*
Chemical Engineering	305	1 169	1 352	1 468	1 587
Electrical Engineering	1 225	2 567	2 579	2 888	3 249
Geology	97	906	45	50	1 012
Mechanical Engineering	531	1 892	2 064	2 259	2 447
Metallurgical Engineering	79	367	335	509	477
Mining Engineering	148	418	431	474	440

Source: DHET, HEMIS Data (2016)

* Most recent data from DHET available. The 2015 figures are not released yet.

Table 18 shows the breakdown of the MMS-related qualifications by gender and race, for the year 2014. The number of females enrolled in Electrical Engineering, Mechanical Engineering and Mining Engineering have historically been, and continue to be, significantly lower than males. However, the number of females enrolled in Chemical Engineering and Geology are much higher, as a percentage of the number of males in those qualifications. For all disciplines except Mechanical Engineering, Africans constitute a substantially higher proportion of graduates than other race groups.

Table 18: Graduate numbers in MMS-related qualifications, by gender and race, 2014

	Chemical Engineering		Electrical Engineering		Geology		Mechanical Engineering		Metallurgical Engineering		Mining Engineering	
	M	F	M	F	M	F	M	F	M	F	M	F
White	147	110	505	47	165	73	860	77	34	9	47	10
Indian	76	95	167	48	15	25	179	33	1	1	3	3
Coloured	42	41	92	21	37	30	101	16	2	1	5	0
African	580	496	1 732	637	325	342	967	214	239	190	236	136
Gender Total	845	742	2 496	753	542	470	2 107	340	276	201	291	149
Total*	1 587		3 249		1012		2 447		477		440	

Source: DHET, HEMIS Data (2016)
* 2014 is the most recent data from DHET available. The 2015 figures are not released yet.

3.3.1.6.2. Industry-funded bursaries (non-employee and employee)

Table 19 shows the number of bursaries for non-employees funded by the sector's employers who also contribute to skills development. There are three bursary types found on this list, which are linked to occupations on the hard-to-fill list: Mining Engineering, Mine Survey and Rock Engineering.

Table 19: Non-employee bursaries funded by employers

Programme Type	Number of bursaries (as of 31st May 2016)
Mining Engineering	241
Mechanical Engineering	173
Metallurgy	107
Electrical Engineering (Heavy Current Only)	77
Geology	66
Chemical Engineering	60
Mine Survey	35
Environmental Health and Management	17
Rock Engineering	11
Industrial Engineering	9
Analytical Chemistry	7
Electrical Engineering	4
Civil Engineering	2
Mine Environmental Control	2
Bio Chemistry	1
Surveying	1
Other	1 056
Total	1 869

Source: Calculated from Weighted MQA WSP/ATR Submission, 2015-2016

Table 20 shows the number of study-assistance programmes funded by the sector's employers for their employees. While these programmes are usually employee-driven, it is noteworthy that a relatively high percentage (12%) of bursaries is being directed towards Industrial Engineering, given stakeholders' concerns over rising costs and the ongoing need to optimise operations.

Table 20: Employee study-assistance programmes funded by employers

Programme Type	Number of study-assistance programmes
Industrial Engineering	303
Chemical Engineering	195
Electrical Engineering (Heavy Current Only)	176
Geology	153
Mining Engineering	70
Mechanical Engineering	55
Metallurgy	33
Environmental Health and Management	37
Analytical Chemistry	11
Mine Surveying	8
Jewellery Design Manufacturing	1
Other (unspecified)	1 475
TOTAL	2 517

Source: Calculated from Weighted MQA WSP/ATR Submission, 2016

3.3.1.6.3. MQA interventions at HET level

The MQA has a bursary scheme for tertiary studies. It applies to:

- Students entering their first year of study who possess a South African Matriculation Certificate (or an evaluated equivalent qualification) in the subjects and with subject grades that are required by the academic institution (or such equivalent qualification as that the institution may determine), for undergraduate studies;
- Bursars entering their second or third year of study who meet the requirements as specified under the 'Bursary Continuation, Suspension and Reinstatement' principles contained in this policy;
- Students studying towards a university or university of technology (degree, diploma and B Tech).

In 2015-16, the MQA's Annual Performance Plan (APP) required that 1 000 bursaries during the year be provided to unemployed learners for MMS-related qualifications. This target was achieved and exceeded by 672, due to overwhelming response from students requiring study assistance. The annual target of 150 for completed programmes was also exceeded, with 265 learners completing their studies. The MQA benchmarks its target throughput rate against educational institutions, which is said to be between 15% and 20%. Table 21 shows the current MQA-funded bursars in the system.

Table 21: MQA-funded bursars

Study Discipline	1st YR	2nd YR	3rd YR	4th YR	B. Tech	Hon	Masters	N1 - N5	NCV2-4	TOTAL
Mining Engineering	86	90	102	29	28	-	-	-	-	335
Mechanical Engineering	60	72	59	11	20	-	1	17	-	241
Electrical Engineering	55	47	26	3	16	-	1	45	5	199
Chemical Engineering	26	46	56	20	27	-	-	1	-	177
Metallurgical Engineering	35	47	44	3	44	1	1	-	-	176
Geology	38	60	28	10	2	7	1	-	-	147
Environmental Studies	6	53	42	3	11	-	-	-	-	115
Industrial Engineering	19	35	40	8	7	-	-	-	-	108
Analytical Chemistry	9	29	29	6	6	1	1	-	-	81
Other (Ns and NCV)	3	5	1	-	-	-	-	11	10	30
Jewellery Design	-	12	12	5	-	-	-	-	-	29
Mining Surveying	5	6	6	-	3	-	-	-	-	19
TOTAL	342	504	445	99	165	9	6	75	15	1 659
Percentage	21%	30%	27%	6%	10%	1%	0%	4%	1%	100%

Source: MQA database (2016)

Table 21 shows that two of the occupations on the hard-to-fill list, Mining Engineering and Mining Surveying have bursars currently in the system (335 and 19 respectively). While Mining Engineering represents the highest proportion of bursaries issued by the MQA (20.2%), it will be important for the MQA to create awareness about the specialisation of Rock Engineering among those pursuing this qualification, as a lack of career awareness is widely held by stakeholders to be the main reason for a shortage of Rock Engineers in the sector. However, the number of Mining Surveying bursars is low and may need to be addressed by the MQA. In contrast, the high number of Geology bursars in the system (147 in total), (the majority (66.7%) of which are in first and second year of studies), may need to be addressed by the MQA owing to stakeholders concerns over the past 2-3 years that large numbers of graduates cannot find work.

3.3.2. 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.

3.3.2.1. Government Certificates of Competency

Some of the core occupations within the MMS, such as Mine Engineer and Mine Manager, can only operate upon issuance 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 in order to qualify for a GCC. Table 22 shows the number of certificates which the DMR has issued in the past five years. The occupation of Mine Engineer is of most concern as its certificate numbers dropped by 19% in 2015-16 and is one of the occupations on the hard-to-fill occupations list. The Mine Manager occupation is also on the hard-to-fill list. Its certificate numbers dropped significantly in 2014-15 but started to recover in 2015-16. Generally, sector stakeholders have expressed concern over the decreasing numbers and the standards required to achieve a GCC, and as a result research has been underway to unpack the reasons. Once understood, the MQA will appropriate resources accordingly to address them.

There are significantly fewer females qualifying for all of these certificates. The MQA continues to support females through numerous programmes, in order to attract more to the sector and develop them if necessary.

Table 22: Certificates of Competency issued by DMR

Year	Mine Engineer (Elec & Mech)			Mine Manager (Coal & Metal)			Mine Overseer (Coal & Metal)			Mine Surveyor			Winding Engine Driver		
	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F
2011 - 2012	61	56	5	99	84	15	187	176	11	9	9	0	31	24	7
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

Source: DMR (2016)

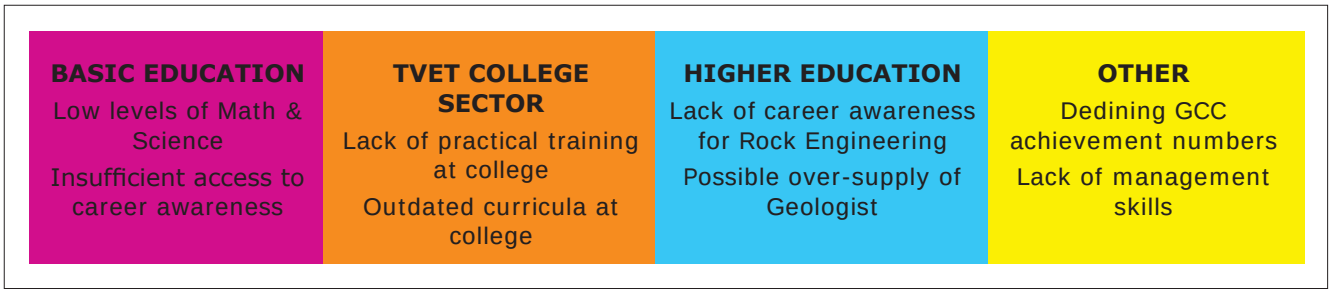
3.3.2.2. Management skills

Professionals with technical skills, 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 eight years. Numerous regional 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.

3.3.3. Summary of Skills Supply

Figure 11 shows a summary of the supply-side issues discussed above which are currently faced by the sector's employers.

Figure 11: Summary of supply-side concerns



Source: UCS 2016

3.4. Identification of Scarce Skills and Skills Gaps

3.4.1. Scarce skills

Scarce occupations, otherwise known as hard-to-fill vacancies, are defined as occupations that take three months or more to find a candidate with suitable work experience, qualifications and attributes at current wage levels. Scarce skills are usually caused by one of two factors:

1. Absolute scarcity – this relates to suitably skilled people but who are not available in the labour market. Reasons could include industry attractiveness.
2. Relative scarcity – this relates to suitably skilled people but who do not meet other employment criteria. Reasons could include lack of sector-specific knowledge.

The scarce occupations extracted from the 2015-16 WSPs as of 31 May 2016 are shown in Table 23. The table has been expanded from a top 10 to include all those occupations

with a vacancy intensity rate of 5% or higher (as this is the generally accepted level at which concern regarding possible scarcity is raised). Total scarcity refers to the sum of all vacancies identified in the WSP submissions, Total employed refers to the number that is currently employed by the sector, and Vacancy intensity refers to the number of vacancies as a percentage of the total employment within the occupation - therefore, the higher the percentage the higher the assumed scarcity.

Table 23: Scarce skills by vacancy

Occupation	OFO code	Alternative title/s	Total vacancy	**Total** employed	Vacancy intensity
Diamond and Gemstone Setter	661302	Jewellery Setter	51	127	40.16%
ICT Communications Assistant	351201	Computer Help Desk Operator, ICT Systems Analysis Assistant, ICT Communications Assistant	15	38	39.32%
Special Forces Operator	542203	Team Leader	5	17	29.85%
Telecommunications Technical Officer or Technologist	352201	Engineering Technician (Telecommunications)	4	16	25.64%
Telecommunications Line Mechanic	672204	Telecommunication Electrician	1	4	24.27%
Seismologist	211402	Geophysicist, Geophysical Scientist	4	19	21.02%
Ship's Master	315201	Deck Officer, Harbour Pilot	1	5	19.23%
Rock Engineering Manager	132203		7	39	17.91%
Psychometrician	263409		1	6	17.61%
Accountant	241106		1	6	16.45%
Legal Executive	341102		2	13	15.69%
Engineer Soldier	542305	Engineer Officer	1	7	13.89%
Ship's Officer	315202		1	7	13.74%
Telecommunications Network Engineer	215303	Communications Specialist (ICT), Communications Consultant	1	7	13.51%
Occupational Social Worker	263507	Adoptions Worker	4	38	10.53%
Computer Network and Systems Engineer	252301	Applications Developer, Systems Engineer, Computer Network Engineer, Network Support Engineer	11	123	8.91%
Employee Wellness Manager	121205	Employee Wellness Consultant	1	12	8.40%
Bricklayer	641201	Bricklayer (Refractory and/ or Chemical), Bricklayer (Refractory), Bricklayer and Plasterer	10	123	8.16%
Electronics Engineer	215201	Instrumentation Engineer, Information Engineer	6	79	7.64%
Electrical Engineer	215101	Control Engineer, Electrical Engineer (Mines)	25	352	7.11%
Goldsmith	661301	Jeweller, Jewellery Chainmaker (Hand Made), Designer Goldsmith	52	784	6.63%
Developer Programmer	251203	ICT Programmer, ICT Developer, Applications Developer	3	47	6.40%
Dentist	226102		1	17	5.92%
Automotive Motor Mechanic	653101	Auto Engineer/Mechanic, Automotive Fitter, Automotive Mechanic, Mechanical Service Advisor (Vehicles), Motor Mechanic	12	218	5.50%
Transportation Electrician	671208	Auto Electrician, Locomotive Electrician	37	738	5.02%
Electronics Engineering Technologist	215202	Instrumentation Technologist, Information Technologist, Computer Engineering Technologist	9	180	5.00%

Source: Calculated from Weighted MQA WSP/ATR Submission, 2016

When one considers the low total employment for the majority of occupations, their scarce intensity rates are not cause for concern. The vast majority of the occupations are also not core to the MMS. However, of those, which are, Diamond & Gemstone Setter and Rock Engineering Manager have considerable scarce intensity rates. Rock Engineer is also on the hard-to-fill occupations list so this may need to be addressed by the MQA. Other occupations which are core to the MMS and whose scarce intensity rates may be of concern to the MQA, are Electronics Engineer, Electrical Engineer, Goldsmith, Automotive Motor Mechanic, Auto Electrician and Electronics Engineering Technologist. It is believed by both national and regional stakeholders that more emphasis should be placed on the hard-to-fill

occupations (Table 12) rather than the scarce skills, as the hard-to-fill occupations were determined by a year of extensive consultation with numerous stakeholders, with consensus reached by industry, labour, government and training providers, while the scarce skills list is based on the number of vacancies only.

3.4.2. Mineral beneficiation skills

The occupations which are in shortage, as advised by jewellery manufacturing & design companies, include Gemmologist, Diamond Polisher, Diamond Cutter, Diamond and Gemstone Setter and Goldsmith. The latter two are also found on the scarce skills list. Only a few of these companies attended the meetings, therefore further research needs to be undertaken to fully quantify the extent of demand. The main reasons provided for the scarcity were a combination of the following factors:

- Lack of learners with inherent talent in innovative design
- Lack of learners who have a natural interest in and passion for the industry
- Learners are not employable when they graduate owing to a lack of practical and relevant experience, which is a risk for employers as metals wastage can be an expensive cost
- Lack of high quality training providers with well-equipped workshops

3.4.3. Skills areas in the sector that need improving

Table 24 lists the main skills issues, which emerged through analysis of stakeholder engagements.

Table 24: 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 which are critical to the MMS. Currently this is a concern for Boilermaker, which is showing decreasing throughput rates from learners.
Career awareness	Career awareness events are currently perceived as inaccessible and uninformative enough for learners in the majority of high schools. Career awareness should provide sufficient detail that a person is empowered to make an informed decision regarding whether or not the career might be suited to them or not, thus potentially avoiding career changes and unnecessary training expenditure at a later stage.
Employment equity	Employers struggle to find suitably qualified HDSAs to fill certain roles, in particular Senior Managers and Engineers.
Technology	Learners are often not perceived to be work-ready upon graduating, increasingly owing to changing technology and the practical components at colleges not having adapted accordingly. This is true for the majority of artisan qualifications.
Government Certificates of Competency	Sector stakeholders have expressed concern 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	Professionals with technical skills, 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. Numerous regional stakeholders suggested that opportunities need to be created at early career stages, for example managing small tasks, as well as attending management development courses.
Interest from youth	There is a perception from regional stakeholders that there is a decline in interest from the youth in pursuing qualifications for Rigger Ropesman, Boilermaker, Diesel Mechanic, Rock Drill Operator, Drill Rig Operator and Mechanical Loader Operator.
Geographic location	Numerous employers struggle to attract high-level skills owing to their remote locations, particularly Engineers and all the medical occupations (e.g. Occupational Health Nurse and Doctor). High salaries are expected in order to incentivise relocation to these areas.
Industry attractiveness	High-level individuals in non-core occupations, especially medical such as Occupational Health Nurse and Doctor are generally not attracted to working in the MMS.

Source: Regional and expert stakeholder engagements, 2015-2016

3.4.4. Impact of skills shortages on employers

Employers at regional meetings advised that the impact of these skills gaps include:

- The lack of high quality Maths and Science levels 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.
- Employers struggle to find qualified HDSAs to fill some of the engineering and management roles, which affects Employment Equity numbers.
- 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.
- 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.
- Employers sometimes struggle to find suitably qualified skills from local communities, which can result in community protests and unrest. This can lead to a decline in productivity and profitability while the unrest is ongoing, or in the case of new mines, operational start up delays.
- Individuals in non-core occupations such as Occupational Health Nurses are generally not attracted to working in the MMS, thus companies need to incentivise with high salaries. This is an increased cost to company.

3.4.5. Employability of graduates

- Graduates who complete artisan qualifications are perceived to be not 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. It therefore becomes the employers' responsibility 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.
- The MQA is undertaking impact assessments of bursary, internship, work placement and artisan qualifications, and a tracer study of bursars is currently underway as well.

3.4.6. PIVOTAL skills

The MQA's OFO Code Pivotal Skills list in Table 25 was determined by considering the hard-to-fill occupations, as well as the critical skills within occupations which are lacking, as advised by both national and regional stakeholders. The occupations on the scarce skills list were considered as well, with particular focus on those, which are on the hard-to-fill list as well. It is important to note that sometimes the occupation itself is not necessarily scarce, rather a skill within the occupation is. In this case, this is especially true for Mining Manager, Mine Planner and the artisan trades.

Table 25: MQA's OFO code PIVOTAL skills list (2017-18)

MQA's OFO CODE PIVOTAL Skills list														
SETA Name	Short/ Medium/ Long term	Period	Occupation Code	Occupation	Specialisation / Alternative Title	Intervention Planned by SETA	NQF Level	NQF Aligned (Y/N)	Quantity Needed	Quantity to be Supported by the SETA	0-100	101-1000	1001 & Above	Comments
MQA	Medium term	2017-2018	132201	Mining Manager	Operations Manager (Mining), Mineral Resources Manager	Management development programme & remote mine community development		Y	33		X			Quantity needed based on number of vacancies as at 31st May 2016 for all occupations
MQA	Medium term	2017-2018	653305	Diesel Mechanic	N/A	Artisan Development & workplace experience	4	Y	68		X			
MQA	Medium term	2017-2018	214601	Mining Engineer	Rock Engineer	Bursary, work experience & remote mine community development	7	Y	35		X			
MQA	Medium term	2017-2018	214601	Rock Engineer	N/A	Bursary, work experience, career awareness	7	Y			X			
MQA	Medium term	2017-2018	651501	Rigger	Rigger Ropesman	Artisan Development & career awareness	4	Y	29		X			
MQA	Medium term	2017-2018	651302	Boilermaker	N/A	Artisan Development, career awareness & Maths & Science Programmes	4	Y	51		X			
MQA	Medium term	2017-2018	132202	Mine Planner	Mine Planning Manager	Management development programme, Discretionary grants		Y	8		X			
MQA	Medium term	2017-2018	672105	Instrumentation Mechanician	N/A	Artisan Development & workplace experience	4	Y	25		X			
MQA	Medium term	2017-2018	652301	Metal Mechanist	Fitter	Artisan Development & workplace experience	4	Y	18		X			
MQA	Medium term	2017-2018	216502	Surveyor	Mine Surveyor	Bursary, work experience & remote mine community development	7	Y	20		X			

Source: Regional and national expert stakeholder engagements, 2015-16

It is important to note that since the PIVOTAL list is OFO code-based, it is not possible to reflect the MQAs other critical priorities in it. For example, AET, MDP, OHS, 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 are also required to address scarce and critical skills, the MQA's research team chose to focus its PIVOTAL list on those occupations, which are hard-to-fill 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. For example, the primary reason facing employers where Mining Manager is concerned is a lack of senior management skills, while the challenges with the artisan trades is a need for increased access to updated technology during studies. The quantities were informed by the number of vacancies for each occupation as at 31 May 2016.

The envisaged outcomes from the identified interventions include an increase in Mining Engineers and Rock Engineers in the sector, an increase of senior technical people with management skills, and an increase in the number of artisan graduates with relevant knowledge of and experience in updated technology being used by the sector. The PIVOTAL list is ranked in order of priority according to advice by both national and regional experts in the sector.

3.5. Conclusion

Analysis of the MQA's WSP/ATR submissions and comments from national and regional stakeholders between June 2015 and May 2016 indicates that while the number of vacancies per occupation are generally low, there is still a significant number of hard-to-fill occupations. These are: Mining Manager, Mining Engineer, Mine Planner, Rock Engineer, Surveyor, Rigger Ropesman, Diesel Mechanic, Boilermaker, Instrumentation Mechanician and Fitter. The primary reasons underlying the challenges were found to be related to changing technology which colleges have not adapted to, declining interest from the youth, low maths and science levels, lack of GCC, lack of management experience, lack of HDSA's with senior management experience, geographic location.

It was also reported that numerous employers struggle to attract high-level skills owing to their remote locations, particularly Engineers and all the medical occupations (e.g. Occupational Health Nurse and Doctor). High salaries are expected in order to incentivise relocation to these areas. Industry attractiveness is also a reason for the difficulty in attracting the medical occupations.

Main supply-side concerns were found to be as follows:

- Basic education: low Maths and Science levels of achievement; and insufficient access to career awareness.
- TVET college sector: lack of practical training at colleges; and outdated curricula at colleges.
- HET sector: Lack of career awareness for Rock Engineering, a specialisation of Mining Engineering; and a probable over-supply of Geologists.
- Other (not specific to a level of education): Declining GCC achievement numbers, and lack of management skills.

The MQA assists the industry in addressing these challenges through interventions, which include:

- Partnerships with colleges
- Local community projects such as learnerships, skills programmes, Maths and Science programmes, and adult education and training
- Targeting HDSA's to address transformation issues
- Career awareness programmes

Stakeholders strongly suggested that some of these programmes, in particular Maths and Science and career awareness events, be thoroughly researched, monitored for impact and adjusted to increase effectiveness.

4. SECTOR PARTNERSHIPS

4.1. Introduction

The MQA collaborates 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 the existing MQA partnerships in the sector. The chapter identifies problems towards maintaining and establishing partnerships and proposes measures for strengthening them. The chapter will also indicate new partnerships that the MQA has identified which will be considered during the cycle of this SSP Update.

4.2. State of Existing Partnerships

4.2.1. TVET college partnerships

The MQA has established official partnerships, through Memorandum of Understanding (MOU's), with five TVET colleges in provinces where the MQA has a regional presence, and because qualifications related to the MMS are offered at the institutions. For the most part, qualifications at the colleges are not yet accredited by the MQA; however one of the primary aims of these partnerships is to support and develop the colleges so that accreditation becomes a natural outcome in the medium to long term. The objectives of the partnerships with these five TVET colleges include facilitation of the offering of learnerships, trades and other industry qualifications, as well as lecturer development; workplace learning. Furthermore, the learner placements and assistance with compliance is offered to these colleges for them to be able to meet the standards for programme approval. It is difficult to make a judgement on the partnerships' level of success as most of them are in early stages making incremental progress and adjusting to challenges at the colleges. The partnership in Northern Cape, however, has already yielded significant progress through persistence and the prioritisation of collaboration, as will be discussed in its section below, and should serve as a benchmark to other regions.

The following provides a summary of the successes and challenges of the MQA partnerships with each of the 5 colleges:

4.2.1.1. Goldfields TVET College in Free State province

- Assistance with the placement of learners at workplaces is still in early stages, and engagements with employers are underway with one of the gold mine companies having indicated interest in becoming involved. The aim is to place some learners during the 2016-17 financial year.
- A pilot project for the placement of lecturers at workplaces to gain work experience was undertaken at Goldfields TVET college with the target of 20 lecturers being successfully met. However, the MQA intends to lengthen the work experience period to 18 months as the pilot showed that three months was too short a period for sufficient experience to be gained.
- An assessment of the workshop at Goldfields TVET College is currently being undertaken to ensure that the college's workshops complies with the standards for programme approval. The findings report is expected to be released imminently.

This partnership stands out for its initiative-taking focus and willingness to learn from experience and adapt quickly. It was noted by stakeholders at the regional workshops in Welkom in 2015 that more stakeholder collaboration is needed, and must be facilitated by the MQA, in order for the college to respond quickly and relevantly to industry needs.

4.2.1.2. Nkangala TVET College in Mpumalanga province

A change in senior management during 2015 at Nkangala led to a delay in the partnership's progress, however discussions with the MQA regarding how to move forward together are currently underway.

- Assistance with the placement of learners at workplaces is ongoing with the MQA regional office in discussions with employers. Some of the large companies have indicated interest in becoming involved. So far, eight National Certificate Vocational (NCV) learners have been placed, although there is still a challenge of ongoing resistance from industry regarding the NCV programme.
- Assistance with the placement of lecturers at workplaces to gain work experience is in a similar stage as learner placement. The MQA regional office's engagements with employers in this regard is yielding positive responses and candidates have been identified for these companies.
- Assistance with the compliance of Nkangala's workshop is still under discussion between the MQA and the college's new Management.

4.2.1.3. Northern Cape Rural TVET College in Northern Cape province

- Some of the large companies indicated interest in assisting learners with workplace experience with the aim of placing the first group of learners during 2016.
- Five lecturers benefited from lecturer development to gain workplace experience during 2015, with early indications showing that the new knowledge is helping learners in the classroom in practical application. The challenge is that lecturers can only be released during vacation times.
- Collaborative efforts between numerous stakeholders resulted in the workshop of one of the five campuses of Northern Cape Rural College, Okiep Campus, being deemed compliant in 2015, and their trade test centre becoming accredited by NAMB. The other two engineering workshops, which are part of Northern Cape Rural College, are still undergoing assessments.
- Regional stakeholders in Northern Cape province stated that one of the major challenges facing the partnership is that many learners are awarded bursaries but do not perform, mostly because of poor Maths and Science levels. It is believed that better screening of candidates is needed, otherwise bridging programmes should to be considered.

While there are still many challenges to overcome in the partnership with Northern Cape Rural TVET College, the process followed in achieving workshop compliance presents a model example of what can be achieved through multi-stakeholder collaboration and commitment. It will now be important for this partnership to be monitored for its impact on skills priorities in the province.

4.2.1.4. Orbit TVET College in North West province

- The placement of learners in workplace has not yielded any results yet as companies expressed having their own internal processes for placing learners within their companies. However, engagements that are more recent are showing that employers are willing to take on learners for artisan development.
- While there has been some initial interest from companies in the placement of lecturers at workplaces to gain work experience, they indicated it would be fruitless to place lecturers to gain experience if they are not being developed to become Artisans (since they are teaching apprentices and will struggle with the technical content). It was suggested that the MQA's grants for this be sufficient to offset the cost of temporarily replacing the lecturer fulltime to ensure training will not be disrupted.
- To date, none of the capacitation workshops have been accredited, however ongoing engagements are being held to find the best way to move forward. One of the large employers in the province is interested in becoming involved and will participate in an exercise of workshops audits aimed at establishing the college's state of readiness for accreditation on the MQA programmes. Initially, the programmes will target the engineering skills programmes.

- Regional stakeholders in North West province stated that one of the major challenges facing the partnership is that many learners at colleges do not perform, mostly because of inadequate career guidance as well as poor Maths and Science levels. It is believed that better career awareness programmes and screening of candidates is needed to ensure interest in and aptitude for qualifications being pursued.

4.2.1.5. Sekhukhune TVET College in Limpopo province

- Assistance with the placement of learners at workplaces is in early stages and has not yielded any results yet, although the MQA is in ongoing discussions with a number of employers.
- Assistance with the placement of lecturers at workplaces to gain work experience has an Engineering focus, as the MQA is in discussions with employers regarding assistance with the development of lecturers to offer Engineering programmes at the college.
- Regarding the compliance of workshops to meet the standards for programme approval, the MQA is currently in discussions with employers to possibly adopt the college in order to resolve infrastructure challenges.
- The colleges' Engineering programmes are currently undergoing accreditation assessments

4.2.2. University partnerships

The MQA has established official partnerships, through MOU's 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 partnerships with the universities identified above is for these institutions to employ historically disadvantaged lecturers to lecture on mining-related disciplines. They begin as junior lecturers and are mentored by their seniors, and are encouraged to complete PhDs. The MQA funds the salaries of these lecturers. The aim is to eventually get them absorbed by the universities as permanent employees.

The MQA's current target to support 27 HDSA lecturers has been successfully achieved. Since the partnerships' commencement in 2011, three lecturers have been successfully employed by the university, while six have secured employment in the industry. All of these were replaced, therefore the target of 27 is an ongoing commitment by the MQA.

One of the challenges in this partnership is that there is a very low turnover of lecturers at the universities, so it will likely be a lengthy period of time that the MQA needs to support the same pool of HDSA lecturers before they are considered for permanent employment. The MQA has intentions of providing the lecturers with three years of international exposure during their tenures, to gain valuable experience and are therefore more employable on their return to South Africa.

4.2.3. Partnerships with the DMR, Chamber of Mines and Organised Labour

The MQA has had an ongoing and close relationship with its three strategic tripartite partners: the DMR, the Chamber of Mines 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 MQA to respond to skills gaps appropriately and with support from its key stakeholders.

4.2.4. Inter-SETA partnerships

In alignment with the Minister of Higher Education and Training's call for increased inter-SETA collaboration, the MQA is becoming increasingly involved in inter-SETA meetings, often chairing meetings in Limpopo, Mpumalanga and North West provinces. These

meetings involve sharing skills development progress reports and focus on possible areas of collaboration. The SETA's also share costs and platforms for career awareness. However, obtaining formal agreements that were proposed is an ongoing challenge. Furthermore, stakeholders advised that not enough Memoranda of Understandings are in place for qualifications accredited by other SETA's required in the MMS.

4.2.5. Premiers' offices partnerships

The MQA has working relationships with the premiers' offices in Limpopo, Free State, Mpumalanga, Northern Cape, KwaZulu-Natal and Eastern Cape provinces. While the partnerships have not been formalised, there is consensus on deepening the relationship between the MQA and the premiers' offices. All skills development efforts by the SETAs 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 skills development initiatives. A challenge is that turnaround time to the implementation of agreements is sometimes long.

4.3. Proposed New Partnerships

4.3.1. Minerals beneficiation partnerships

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 Minerals Beneficiation Strategy is aimed at encouraging the country to move from the sale of mined minerals and metals to the sale of beneficiated, value-added products. The government is currently drafting the Mineral Beneficiation Action Plan (MBAP), 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 Minerals Beneficiation Strategy and MBAP is expected to create and retain much-needed jobs in the MMS. However, stakeholders advised that there is much scepticism as little so far has been done to implement the past commitments to mineral beneficiation goals. The argument made in this report is that these interventions are more likely to work if the activities are better coordinated, and that this will have significant implications for the skills development system. The MQA's role would be to respond accordingly with skills development initiatives. Stakeholders that can be engaged and partnered with to keep abreast of any developments are suggested below:

4.3.1.1. Government partnerships

The DTI completed a research project in 2013 that analysed backward and forward beneficiation potential in four key value-chains (ferrous metals, polymers, titanium and 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 the DMR needs to be put in place to ensure that the MQA can respond accordingly and timeously with the skills development requirements.

[32] 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): http://www.miningweekly.com/article/five-mineral-value-chains-prioritised-in-south-africas-draft-beneficiation-plan-2014-11-21. Retrieved 13 May 2016.

4.3.1.2. Training provider partnerships

The 'Skills Requirements for Mineral Beneficiation through Jewellery Manufacturing' report recommends that Training Provider capacity may need to be supported to provide stronger practical skills. This was corroborated at the regional stakeholder engagements, also revealing a need to capacitate colleges in the provision of comprehensive career guidance and screening programmes. The process will identify students who have an avid interest and talent in innovative design work, which is needed to contribute to the sector in becoming internationally competitive.

4.3.2. Green skills partnerships

Rhodes University's report, 'Green Skills for the Mining Sector' conducted on behalf of the MQA and released in May 2015, as well as stakeholder comments made during the regional meetings in June 2015, were used to inform the recommendations in this section.

4.3.2.1. Department of Water and Sanitation partnership

The Green Skills for the Mining Sector report recommended that the MQA support 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.

4.3.2.2. 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.

4.4. Conclusion

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

Greater collaboration is needed between the MQA and government departments working on implementing the Mineral Beneficiation Strategy, in order to understand in advance what the skills requirements will be.

The MQA is becoming increasingly involved in inter-SETA meetings, which involve the sharing of skills development progress reports and focus on possible areas of collaboration. However, obtaining formal agreements that were proposed is an ongoing challenge. Furthermore, stakeholders have advised that not enough MOU's are in place for qualifications needed in the MMS but which are accredited by other SETAs.

A partnership with the Department of Water and Sanitation is recommended to mitigate the challenge of significantly reducing water levels, to combine strengths and avoid duplication of work. It is also recommended that partnerships be formed with companies' research and development 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. Research Findings

The purpose of this chapter is to identify the top five key priority actions for the sector based on a consolidation of the analysis from previous chapters. This chapter will indicate the recommended skills priority actions that the MQA will prioritise for the cycle 2017-18, which will reflect the operational priorities inherent in the MQA's strategy. This is in its quest to implement its various learning interventions for the MMS as it aligns with national priorities.

The key findings of this report are as follows:

- The main change drivers currently impacting the MMS are:
  - Technology and Mining Phakisa impact skills planning and ensure that learners graduate with knowledge of and experience in the latest technology being used in the sector.
  - Retrenchments, as the widespread downscaling of operations across the sector owing to decreased global demand for mined commodities has led to large-scale retrenchment drives. This has resulted in the need to prioritise portable skills training.
  - Transformation targets contained in the Mining Charter are designed to redress historical imbalances.
- The current Mining Charter stipulates that there should be at least 40% participation from HDSAs in management positions. While HDSAs constitute 50% at the mid management level, exceeding the target, HDSAs are underrepresented at top and senior management levels, falling below the 40% target at 28.9% and 35.2% respectively.
- The 10 most hard-to-fill occupations are Mining Manager, Mining Planner, Mining Engineer, Rock Engineer, Surveyor, Rigger Ropesman, Diesel Mechanic, Boilermaker, Instrumentation Mechanician and Fitter. Experts believe that the most concerning are Mining Manager, Rock Engineer, Diesel Mechanic and Rigger Ropesman.
- The primary reasons for skills gaps are outdated technology at colleges; insufficient and irrelevant workplace experience; low levels of Maths and Science; insufficient access to high quality career awareness; geographic location; employment equity; lack of GCCs; lack of management skills; lack of interest from youth in certain occupations; and industry attractiveness.
- The main supply-side concerns were found to be as follows:
  - Basic education: low levels of Maths and Science; and insufficient access to career awareness.
  - TVET college sector: lack of practical training at colleges; and outdated curricula at colleges.
  - HET sector: lack of career awareness for Rock Engineering, a specialisation of Mining Engineering; and a probable over-supply of Geologists.
  - Other (not specific to a level of education): Declining GCC achievement numbers for core MMS-related occupations and lack of management skills.
- The MQA's targets for Maths and Science and career awareness events were exceeded in 2015-16. Stakeholders believe, however, that there is room for improvement and that the initiatives should be monitored for impact. This is in line with the importance of Maths and Science as building blocks for the majority of occupations in the sector, and with career awareness' potential to disseminate accurate information as well as draw the right skills and potential to the sector.
- The outlook of the MMS would be improved if the sector monitors the developments of Mining Phakisa and prepares existing and potential employees accordingly. The MMS should also take advantage of the implementation of the Mineral Beneficiation Action Plan (MBAP) and the SIPs projects, which are expected to increase economic activity and create new jobs.
- The industry is becoming more conscious of the growing need to protect the environment, with increased enforcement of legislation and consumer pressure driving the demand for eco-compliance. Skilled workers will be required in energy efficiency and sourcing of 'green'

products and services and managing 'green' supply chains. Alternative sources of energy are also being prioritised owing to the increasing costs of electricity, which impact production and profitability.

5.2. Recommended Priority 1: Support Transformation of the Sector through Skills Development

Employment equity plays a key role in South Africa's transformation agenda. In order for the MQA to support this national priority, it will continue to prioritise skills development to enable an increase in the number of HDSAs. These include, but not limited to, undertaking skills development interventions to capacitate HDSAs to occupy management and supervisory roles, with emphasis on enabling women to occupy positions in core mining occupations. The MQA will also prioritise skills development interventions to respond to the disabled, i.e. those individuals already employed, and those seeking employment in the sector with a view to increase the representation of the disabled persons in the MMS.

The current Mining Charter stipulates that there should be at least 40% participation from HDSAs in management positions. HDSAs in particular, are believed to be underrepresented at top and senior management levels. This is supported by the MQA's WSP submissions, which show that they fall below the target. The MQA intends to continue supporting black individuals in and for management roles, including support to individuals in its Management Development Programmes. It is also recommended that management programmes for engineering students be targeted for support, to pre-empt their advancement to managers of mining operations at later stages of their careers. Discretionary grants could be used to support the industry in the development of women for senior and executive management positions if the proposed higher targets are gazetted into a new Mining Charter.

The widespread downscaling of operations across the sector owing to decreased global demand has led to large-scale retrenchment drives. This has resulted in the urgent need for the MQA to prioritise portable skills training and support the industry where possible. Owing to the cyclical nature of the industry, it is believed that these initiatives need to take place as a pre-emptive measure, before retrenchments are a consideration. This is due to the taxing nature of retrenchments, which likely lead to lack of engagement during the training programmes. Additionally, research should be undertaken with employers and employees to determine what are the most relevant and useful training programmes for employees would be. The lay-off scheme could also be considered as part of a solution.

The MQA will also continue to support programmes such as lecturer development programmes and rural development projects aimed at addressing equity and transformational imperatives within the sector. The national and regional stakeholders strongly suggested that in Maths and Science focus be on the development of teachers, as well as to focus on fewer beneficiaries to ensure impact. A consensus was also reached on the need to re-direct bursary funding and prioritise applicants who are beneficiaries of the Maths and Science programme.

Stakeholders argued for inclusion of sufficient detail in career awareness events in order to empower event attendees to make informed decisions regarding whether or not a particular career might be suited to them. This will, therefore, limit the potential for career changes and unnecessary training expenditure at a later stage. It is also important to continue emphasising the positive effects on future job prospects of pursuing Maths and Science until grade 12. Further, stakeholders need to partner effectively to increase access to career awareness to high school learners.

People with disabilities consistently represent less than 1% of the labour force in the MMS. It is proposed that the MQA plays a more active role in supporting people with disabilities to acquire skills to take up employment in the sector as well as increase skills development interventions for those already employed.

5.3. Recommended Priority 2: Core Mining Skills Must Continue to be Developed through Skills Programmes

To ensure a sufficient pool of skills for the sector in the long-term, it is important that the MQA continue to support and fund programmes, which are core to the sector. These should include learnerships, both non-artisan and artisan. This will also involve improved monitoring and evaluation of training delivery and quality. Capacity building of TVET college lecturers will also continue to be supported to ensure improvement in the quality and relevance of public sector training.

Technological change in the sector is currently affecting numerous occupations including Rock Drill Operator, Blaster, Drill Rig Operator as well as most of the artisan trades. The MQA will need to direct funding towards upskilling programmes to train employees in new mechanised processes. The funding will also be used to provide support, where possible, to identified TVET colleges, which are not up-to-date with latest technology. Moreover, funding needs to be allocated to workplaces who are suppliers of new technologies. It will be crucial for the MQA to stay abreast with the Mining Phakisa's research and development programmes as well as the manufacturing efforts in order to understand the skills implications. Keeping up-to-date with these developments is essential as the time frame goals are relatively short: 5 years for remote drill-and-blast mechanisation and 10 years for 24/7 mechanisation. Upskilling and re-skilling of workers for mining, manufacturing, agriculture, and others will be necessary to ensure a just transition to future mining. It will be essential for the MQA to continue to be included in the skills planning discussions at Mining Phakisa Labs to monitor developments and their implications on skills. Research still needs to be conducted by the MQA on the potential impact of new mechanised methods on various skills, and the training that will be required for each to adapt accordingly. A strong focus on AET programmes, up to Level 4 as a way of improving literacy and numeracy levels, will be important for the MQA over the next five years to assist in preparing existing and potential employees to operate new machinery and coordinate new processes.

Interventions to ensure employability of graduates will also be prioritised through various workplace-training mechanisms. There will continue to be collaboration with industry to provide valuable workplace experience, via work-integrated learning for TVET college learners, P1 and P2 training for University of Technology students, and internships for university undergraduates.

The 10 most hard-to-fill occupations (Mining Manager, Mining Planner, Mining Engineer, Rock Engineer, Surveyor, Rigger Ropesman, Diesel Mechanic, Boilermaker, Instrumentation Mechanician and Fitter), will be prioritised in terms of skills planning initiatives, with a particular focus on Mining Manager, Rock Engineer, Rigger Ropesman and Diesel Mechanic. The reasons behind these occupations being hard to fill differ, as discussed in chapter 3, and must therefore be considered individually and uniquely where interventions are concerned. This is addressed in the PIVOTAL list.

With regard to the Government Certificates of Competence, the MQA should monitor the research being undertaken to understand the declining achievement numbers, as they are an important requirement for some of the core MMS qualifications such as Mining Engineer and Mine Manager.

5.4. Recommended Priority 3: Monitor and Develop 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. In order for this to succeed, there is need for greater collaboration and official partnerships among the MQA, industry councils and jewellery manufacturers. These partnerships should be sustained with mutual firm commitments to chart the way forward to revive the industry. The MQA will particularly seek to ensure an adequate and relevant supply of skills to the sector. Qualifications will need to be carefully scoped against industry requirements, with a longer term view of the type of workforce in mind.

The MQA and the government departments working on implementing the Mineral Beneficiation Implementation Plan need to increase their levels of collaboration in order to understand what the skills requirements will be, in order to respond accordingly and timeously. It is recommended that the MQA conduct research into possible ways to revive the jewellery manufacturing sector and to facilitate engagement on the possible removal of red tape, which could open doors for local skills development.

Two such examples are diamond cutting and polishing, which are mostly conducted abroad owing to enforced legislation in South Africa.

5.5. Recommended Priority 4: Continue to Improve Health and Safety Standards

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, injuries and occupational injuries. The government has put in place legislation and associated processes to ensure that the safety of workers is paramount as a key feature of the sustainability of the mining sector. In this respect, one of the MQA's legislative mandates is to continuously prioritise the improvement of the health and safety standards. The results of this have already been realised, notwithstanding other interventions by those in the sector. There there has been a notable decrease in mining injuries and fatalities, with total fatalities decreasing sharply from a peak of 744 per year in 1989 to 77 in 2015.

The MQA will, therefore, continue its progress regarding OHS skills capacity and training in the industry, through the following measures:

- Support skills development in OHS Skills programmes
- Train OHS Representatives over five years as required by the Mine Health and Safety Tripartite Leadership Summit Agreement signed on 5 September 2008.

There were indications at the regional meetings that there is a challenge in finding Mine Environmental Hygienists and OHS Practitioners, particularly in remote areas of the country. While these occupations did not make the top 10 scarce skills list, they represent key skills for the sector. It is proposed that the MQA should explore reasons, which contribute to a possible supply shortfall and if necessary determine the solutions, which will mitigate them.

5.6. Recommended Priority 5: Develop Skills for Sustainability

One of the most pressing challenges for the MMS is the potential damage caused to the environment by the mining operations. Unabated water usage, together with inadequate recycling initiatives in the mines will have significant and far-reaching consequences if not addressed soon. Proactive efforts to mitigate this challenge should be undertaken by the MQA in partnership with other government departments. There is a need to understand the gravity of the issue, and in particular, whether there are adequate skills to address it. A range of skills from demand determination to regulatory roles in the approval and enforcement of water use licences, will most likely be required. It is anticipated that support would include short (top-up) courses and the establishment of networks/communities of practice.

It is 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 (i.e. in clean technology and processes), and in the effective remediation of the impacts of mining on air, soil and water quality.

Research is underway to explore what the 'green skills' needs are within the entire mining value chain, including whether or not any are considered scarce.

Alternatives, including 'greener', sources of energy are being prioritised in the industry, owing to the increasing costs of electricity. These costs impact production and profitability, which will require the necessary skills in order to adapt current processes and operations.

5.7. Conclusion

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

- Priority 1: Support transformation of the sector through skills development
- Priority 2: Core mining skills must continue to be developed through skills programmes
- Priority 3: Monitor and develop the skills required for Minerals Beneficiation
- Priority 4: Continue to improve Health and Safety standards
- Priority 5: Develop skills for sustainability.

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Physical Address:
7 Anerley Road,
Parktown

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