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**UNIVERSITY OF JOHANNESBURG**  
**FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT**  
**DEPARTMENT OF EXTRACTION METALLURGY**  
**A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR**  
**THE DEGREE OF MASTER OF TECHNOLOGY IN EXTRACTION**  
**METALLURGY** **Is the Coal Mining Industry Ready for Women?**

---

**Date:** : 1 April 2019  
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***Supervisor*** : Prof Steven Rupprecht  
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## **DECLARATION**

I, Lehlohonolo Moses Ramokhothoane, declare that this thesis is my personal effort. External sources used herein have been quoted and referenced. I wish to submit this thesis, for the Degree of Master of Technology in Extraction Metallurgy (MTECH) to the University of Johannesburg, Republic of South Africa.

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## ABSTRACT

There is a Sesotho proverb that says: “Mmangwana o tshwara thipa ka bohaleng”, which loosely translated means that “the child’s mother handles the knife on the sharp edge”.

Women have always been in the forefront of stabilizing communities through cultivating lands, bringing up children and heading households in the absence of husbands working elsewhere.

The active participation of females in underground mining has been very limited, due to legislation in most parts of the world. South African women were only allowed to work underground in the mines after the passage of the Mines Health and Safety Act of 1996 (No 29 of 1996). Despite their formal admission to work underground, women were still encountering problems in being integrated into the teams. Sexual discrimination and lack of proper suitable facilities for women are some of the challenges women are faced with. These inequalities and anomalies were addressed by the introduction of the Broad Based Socio Economic Empowerment Charter for the Minerals and Mining Industry, (Mining Charter) in 2002.

The Mining Charter required various transformation measures to be implemented in the mining industry. This included the requirement for the mining companies to achieve 10% female representation, as a function of their total workforce, in technical fields, by the year 2009. In essence, where the mines employed women in staff positions historically, they are now

required to have at least 10% women in production and various other technical mining activities.

The present study investigates the readiness, i.e. the coal mining industry's ability to provide adequate facilities, have the correct mindset to nurture and develop women for advancement and provide a harmonious working relationship for all in the Mpumalanga coalfields.

A sample representing women working in dusty coal faces or processing plants was taken. The data collection for the research was by means of a questionnaire and a workshop to validate some of the information obtained from the questionnaires.

The research results indicate that about 13% of the workforce in 2018 comprised of women. However, the softer issues of acceptance, personal protective equipment (PPE), security and advancement of women, remain a challenge the physicality of the job still poses a challenge for women. Other issues such as change house facilities, pregnancy and maternity issues still remain as unresolved.

The view, as expressed by women board members of mining companies, that the situation is normal and conducive for women in mining, is in total contrast to what women in the coalface actually experience. Most, if not all, female board members are parachuted to the top of the mining companies and have not spend a significant amount of time in the coalface, to experience and feel what it is like, being in the mine. At Sasol, an executive director, responsible for mining, started her career in the retail industry and joined the company (Sasol) as an executive level, the owner of Mmakau mining has a qualification in social studies, both the non-executive directors at Goldfields qualified in politics and economics. The Chief Executive Officer of Konkola Copper

mines at Vedanta Resources is a chemical engineer by profession, but has not spent any time at the working face.



## ACKNOWLEDGEMENT

I would like to thank my supervisors, Prof Steven Rupprecht, Prof Hennie Grobler and Professor Mulaba for their guidance and patience throughout this research.

I would also like to thank my wife, Puleng, for always pushing me to realize my potential. My three children, Dipuo, Teboho and Tshepiso, you always encouraged me and believed in me. Thanks for allowing me to steal your valuable time and devote it to my studies.

My three little angels, Nuna, Thati and Rere, are always an inspiration.

Bafokeng, dulang le pelo tse ntle! May the good Lord bless you in abundance! I would also like to thank my friend, Phatelang Senoamadi, for always being there for me when I needed guidance, support and a space to vent.

Special thanks go to Dr Andre Dougall, for starting this journey together. You were able to shape and draw out the academic hunger in me. Much appreciated!

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## LIST OF ABBREVIATIONS

AA	Anglo American
CM	Continuous Miner
COM	Chamber of Mines
CTF	Culture and Transformation Framework
DSB	Daily Safety Bulletin
ECSA	Engineering Council of South Africa
ESKOM	Electricity Supply Commission
GCC	Government Certificate of Competency
GDP	Gross Domestic Product
HDSA	Historically Disadvantaged South Africans
ILO	International Labour Organisation
KPA	Key Performance Area
KPI	Key Performance Indicator
LHD	Load Haul Dumper
MC	Mining Charter
MCSA	Minerals Council South Africa
MMC	Mine Manager's Certificate of Competency
MPRDA	Minerals and Petroleum Resources Development Act
OEM	Original Equipment Manufacturer
PIT	Professional in Training
PPE	Personal Protective Equipment
RB	Roof bolter
SASOL	Sasol Mining

SC	Shuttle Car
SLP	Social and Labour Plan
SOUTH 32	The energy division of BHP Billiton previously known as BHP Billiton Energy Coal South Africa (BECSA)
SSF	Sasol Synthetic Fuels
WIM	Women in Mining



## **CHAPTER 1:**

### **INTRODUCTION**

#### **1.1 Chapter overview**

This chapter provides the introduction, background and objectives of this thesis. An introduction to the research problem provides the background of the importance of the research. An outline of the research problem, aim and objectives are then presented, as well as the outline of the thesis and flow of the research work.

This research indicates that, despite good progress made in terms of the numbers (13% achieved in 2018), workplace facilities, personal protective equipment (PPE), security and use of foul language on the mines, women are still not always accepted by men in the South African mining industry (Ramokhothane, 2019). Some men expect women to work like men; women feel disrespected by men with men not taking them seriously (Mokotong, 2016). Hence, there is a need to understand the context in which current coal mines operate regarding women workers and what are the requirements to change the industry's male-oriented set-up based on a changing mine personnel profile. For example, how work is organised in underground coal mines often relies on the physical capacity of an individual to do work. In contrast, the coal mining industry should be investigating ways to make coal mining more suitable for the 21<sup>st</sup> century workforce that accounts for women, and workers with health conditions. The coal mining industry needs to re-engineer aspects of the job and introduce further

mechanisation and automation, which can enable more women to work more efficiently on the operations of the mines.

## **1.2 Introduction and background**

Employment of women in the mining industry dates back to the 19th century. Various parts of the world, for example, India, Japan, the United Kingdom and the United States of America, had women employed in large numbers. The women's jobs were primarily manual. Women were used to carrying coal in buckets from the coal face and out the mine, and those who worked on the surface plants were used to sort waste rock from the good coal product (The British Newspaper Archive, 2017).

Other heavy industries, which were traditionally male-dominated, for example the military, also had a considerable number of women supporting during the war. The outbreak of World War 2 (1939 -1945) caused a shortage of labour, which in turn, necessitated that women were used in various roles during the war.

After the wars, women returned to their traditional roles, but had acquired new skills, and had a different outlook to life. The wearing of pants and short hair became fashionable, as a result of being in the army.

Various laws were passed preventing the employment of women underground (the South African Republic, SAR Transvaal 1898; International Labour Organization, ILO,1935; etc.) Different countries had rules that they believed were in the best interest of women and thought that rules somehow were protecting women against the harsh underground conditions.



In South Africa, post-1994, there was a shift in thinking in as far as the employment of women in the mines was concerned. The Mining Charter of 2002 set employment targets to address the historical exclusion of women in mining (pre-1994).

The employment of women in South African mines did not just happen without challenges and hence the need for this study.

### **1.3            Aim    of    the    study**

The study aims to determine how ready are the coal mines in the Mpumalanga Coalfields, in terms of employment of women in the mines. The emphasis of this study is to look beyond the numbers and test if the women are well integrated into the business, in the traditionally male occupations, in the underground production environment and processing plants on surface.

### **1.4            Problem        statement**

Section 100 (2) of the Mineral and Petroleum Resources Act (MPRDA), of 2002, calls for the socio-economic framework to redress past injustices through the mining charter. The Charter stipulated that at least 10% of the workforce should comprise of women in the technical fields by 2009.

26% of the mining companies have complied with the 10% women (inclusive of white women), participation in mining. The average percentage (%) of women participation was 6% in 2009, the bulk of who are represented in support functions, as reported in the Mining Charter

Impact Assessment report, (DMR, 2009). The progress made at the end of 2018 is about 13% (Mineral Council South Africa, 2018).

### **1.5 Aims and objectives of the research**

The aim of the research is to investigate the degree of integration of women in the mining industry. The research focuses on the coal mining industry in terms of the absorption and integration of women in the workplace, with particular emphasis on knowledge, attitudes and beliefs regarding working underground in coal mines, the adequacy and suitability of facilities, security, knowledge of key performance areas, knowledge of safety drivers, and culture and advancement opportunities.

The objectives of the study were to investigate the:

- Knowledge, attitudes and beliefs regarding working in the coal face.
- The adequacy and suitability of facilities on the mines
- Communication media and platforms employed on the mines
- Knowledge of key performance drivers
- Knowledge of safety drivers, and
- How safe is the working environment?

### **1.6 The significance and justification of the study**

The study seeks to inform the mining industry of the current status of integration of women in the coal mining industry in terms of the compliance

to the Mining Charter requirements and the realities that women in mining are faced with. Companies that do not comply with the charter requirements run a risk of having their mining licensing revoked. Recommendations are made as to how some of these challenges can be addressed.

### **1.7                    Locality   of   the   research**

The research is conducted in the Mpumalanga coalfields focusing on the three coal companies supplying ESKOM and export coal market. The three companies are Anglo American Coal, Sasol Mining (Sasol Synthetic Fuels (SSF)) and South 32, and have a combined contribution of approximately 25% of Mpumalanga's Gross Domestic Product (GDP) (Koko, 2015). The areas in which these three companies operate have a general population of 1 361 050 (Statistics SA, 2016).

The justification for the thesis to focus only on the Mpumalanga coalfield is twofold:

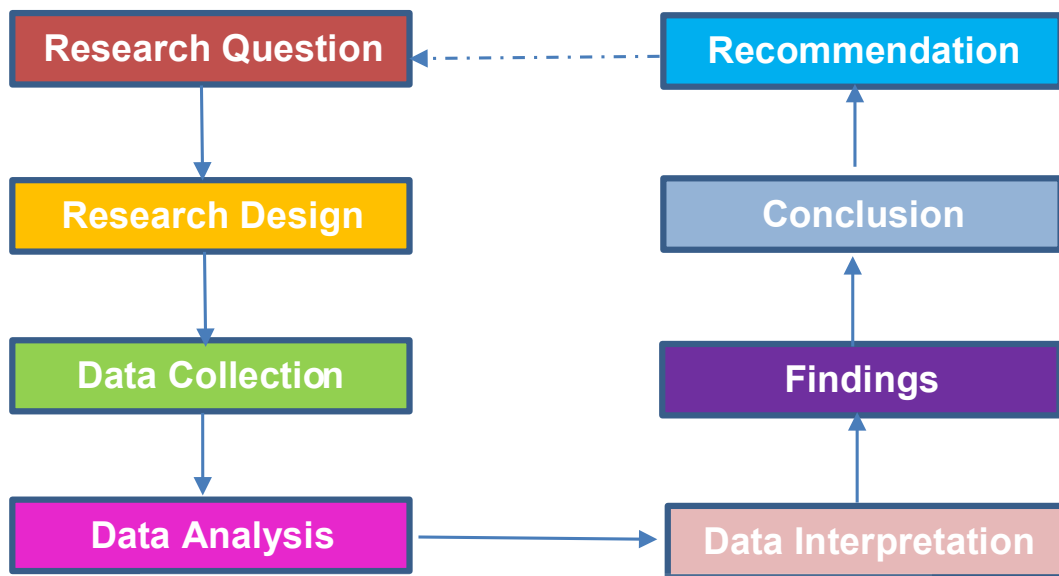
- (1) to keep the scope of work manageable, i.e. to investigate issues regarding women in mining is a very broad subject with other mining sectors having their own nuances,
- (2) as the researcher is a mine manager in the coal mining industry the issues surrounding women in coal mining is important, and from personal experiences the researcher understands some of the issues facing women in coal mining. The outcome of this research should assist the South African industry in general and in particular the South African coal mining industry

## **1.8**                    **Research    methodology**

The research methodology is based on a mixed method approach whereby both quantitative and qualitative data collection was performed. This approach was supported by a literature review and workshops to gain both theoretical and actual perspectives of the issues women encounter in the mining industry, and particular women working in the South African coal mining industry. The literature review was conducted to understand the concerns and issues that women employed in the mineral industry encounter globally, within the South African mining industry as well as the South African coal mining Industry.

A questionnaire was constructed and answered by 97 women in the coal mining industry employed at the three selected mining companies. Figure 1, depicts the research methodology for the quantitative approach of the questionnaire and subsequent analysis of the data. Upon the analysis of the data gleaned from the questionnaire and other information, the data was interpreted in order to provide findings and recommendations to the coal mining industry.

Although women have been involved in the mining industry for two decades there remains a number of outstanding issues that the coal mining needs to address urgently. Ultimately, this thesis seeks to address many of the outstanding issues the coal mining faces.



*Figure 1: Research methodology and flow sheet*

Figure 1 refers to the logical and systematic approach followed in addressing a research question up to the recommendations to address the issues raised from the research. The process started off by clearly defining the particular problem as identified in the industry.

The second step was research design, which is an overall strategy or approach chosen to integrate the different components of the study logically, thereby ensuring that the research problem is addressed adequately. This was the blueprint for the collection, measurement and data analysis, that is, how is the data going to be collected, what will be done with the data, and what conclusions will be formed from the data.

The third step was data collection. Data collection took a form of questionnaires sent to an identified sample of the population and conducted one on one interviews and workshops.

The fourth step was the data analysis. The collected data was analysed such that it paints a particular picture. Statistical methods were employed to analyse the data. In analysing data, the researcher looked at correlations, similarities and/or differences.

The fifth step was data interpretation, where one need to understand what the data is indicating. Data interpretation is linked back to what similarities, differences or even trends that were presented by the data.

The sixth step was the report of the findings. This is where data obtained is presented in figures, diagrams, graphs tables, and photographs with accompanying comments on the data.

The seventh step was the conclusion wherein the thesis is restated and a summary of the main points of evidence is given.

The last step is that the recommendations are provided as to how to remedy the situation or address the research problem.

### **1.9 Applicability of the research**

This research applies to the mining industry and in particular the South African coal mining industry with a specialised focus on the underground coal operations. Also, the findings are applicable to surface operations and for other fields other than just mining operations, for example, engineering, technical services and mineral processing.

### **1.10 Ethical Considerations**

Research ethics were applied before compiling this thesis. Ethics considerations were made during the design and application of the questionnaire. Recipients were told not to answer questions they did not understand, were uncomfortable with or felt were unprofessional in their interpretation of the questions. Also, the questionnaire did not require the participant's identities. The researcher was also cognisant that some discussions may be emotional or sensitive, such as female strength, menstrual cycle, employment situations, family and personal relationships and personal experiences. Participation in this research was voluntary, and recipients were informed of the studies focus and aim. At all times when collecting information from the research participants, the privacy and the right to confidentiality were considered and adhered to.

### **1.11 Outline of the thesis**

Chapter 2 highlights the literature upon which the research is based. It covers the history of women employment in the mines, the legal barriers women faced in South Africa and the challenges that women encounter daily.

Chapter 3 focuses on the research design, research population, research location, sampling size, methodology and data analysis, validity and ethical considerations.

Chapter 4 gives details and interpretation of the findings of the study. The findings are largely based on a questionnaire provided to women working on three coal mining operations in the Mpumalanga Coalfield.

Chapter 5 concludes that the coal mining industry has not yet fully embraced and integrated the women in mining. Despite the improvement in the numbers, 13% achieved in 2018, there are some significant gaps, in terms of security, changing facilities, pregnancy and use of foul language on the mines. The reliance on physical strength to make it in mining is still very prevalent.

Chapter 6 provides recommendations on how the coal mining industry can improve its image and attract as well as retain more women.





## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Chapter overview**

This chapter outlines the literature upon which the study is based. It covers the role of women pre- and post-world wars, the early mining in different parts of the world and what well known South African women views are about coal mining.

### **2.2 Historical aspects of women in mining**

A consideration of women working in mines in other parts of the world can assist in understanding the role of women in South African coal mines. In the United Kingdom, women have been working underground from the mid-1800's (Ralushai, 2003). Employment of women underground dates back to the 19<sup>th</sup> century in other parts of the world. Their jobs ranged from clerical to manual work underground. Those who worked underground were mainly "hurriers", people pulling coal tubs or "thrusters", people pushing coal tubs, as can be seen in figure 2.



*Figure 2: Women hurries (Jones, n.d.)*

Because of excessive heat and poor environmental conditions, women would work half naked, and this caused significant discomfort for the male counterparts. In 1840, the Children's Employment Commission gave graphic details on conditions of how women and children were working underground. This caused much furore and was later called "The Scandal of Female Miners in 19th Century Britain" (Bates, 2012).

In Japan, women started working on the mines in various positions in the middle of the 19th century. By 1909, women accounted for 10% of the workers on the collieries, and this increased significantly during World War 1. In the decade that followed, the number increased from 38 000 to 95 000. In India, women also worked in the mines. Their job was mostly sorting foreign objects from the coal before going to the plants (Ralushai, 2003).

Before the outbreak of war in August 1914 (World War I), women held very traditional roles in family life world-wide. Working class women were still tied

to the home or continued to work for meager wages in factories, on farms or as domestic servants. The expansion of women's education allowed some women to enter careers that had previously been male-dominated, but only those careers that were deemed suitable, such as teaching, nursing and office work (Grayzel, 2002).

During the war, there was a massive shortage of workers. Industry and agriculture demanded men, but so did the army. The labour shortage needed to be addressed and women were employed to fill this gap. Although many working-class women were already in employment, they mainly held traditional female roles in domestic service or in textile factories and mills. During world war 1, more opportunities opened up for women and the categories of jobs they undertook changed ( Kendrick, 1942).

Women began to produce war products, such as guns and ammunition, taking on jobs operating heavy machinery and driving vehicles. Women also went to the war front to provide support work in hospitals, treating injured soldiers, while many nurses continued to help the injured at home. By the end of World War 1, women constituted 20% of the working force for all the manufacturing industries in the United States (Social Security, 1942). Women were now more visible in the world of work, and although they were employed in essential roles and received improved wages, they were still paid lower rates than men (Bean, 2015).

While women undertook more 'male' jobs, the significance of their traditional role as wife and mother was also emphasised as women still required to conduct household duties while being formally employed. Women were told

they had a patriotic duty to encourage their men to fight in the war. They also helped the men serving in the war to remain motivated, sending more than 12 million letters and parcels to the troops every week, reminding them about the home and family they would return to after the war (Grayzel, 2002).

The end of World War I meant that women were expected to return to their previous roles and allow the returning soldiers to take back their jobs. While the number of women at work returned to pre-war levels, World War I did result in a number of permanent changes. A wider range of jobs was now available to women. Changes in style and appearance made necessary by war work, for example, wearing trousers and short hair, became fashionable. World War I had proven that women could do a wide range of work and do it well. However, the old order was soon re-established, and men took up the positions in mining (Grayzel, 2002).

The Second World War (1939 -1945) brought not only sacrifices but new jobs, skills and opportunities for women. Different countries deployed women in different roles during the war.

By 1945, more than 2.2 million women were working in the war industries, especially in ammunition plants. They participated in the building of ships, aircraft, vehicles and weaponry. Women also worked on farms, drove trucks, provided logistic support for soldiers and entered professional areas of work that were previously the preserve of men (Docevski, 2016).

In the Allied countries (United States of America (USA), Britain, France, United Soviet Socialist Republic (USSR), Australia, Belgium, Brazil,

Canada, China, Denmark, Greece, Netherlands, New Zealand, Norway, Poland, South Africa, Yugoslavia), thousands of women enlisted as nurses serving in the front-line units. Thousands of others joined armed militias at home and there was a great increase in the number of women serving for the military itself, particularly in the Soviet Union's Red Army. The method of recruitment was volunteerism in most countries. There was no formal legislated requirement for women to join the armed forces, but most of them joined because of patriotism (Nazemroaya, 2014).

South African women also had similar roles to play, like the rest of the women in other countries. The differences, though, were that the South African women were not allowed to carry or handle weapons. The women were further divided into racial lines in that only the white women were allowed to operate heavy vehicles and run the clinics, whereas the black women had to do knitting and carry rations for the soldiers. In exceptional cases, black women were allowed to study medicine, for the fear that the majority of the whites might leave and there could be a shortage of trained medical personnel (Chetty, 2001).

The number of South African women who were involved in military duties was significantly lower than their overseas counterparts. In terms of the home front support, the responsibilities were very similar (Chetty, 2001).

In the mid-1980's, women in Zimbabwe were working in tin, tantalite and chromite mines. It is estimated that more than 80% of women worked at tin and tantalite mines, as these represented surface operations and are perceived to be conducive to women labour (Ralushai, 2003).

In Lesotho in the 1970s, women worked as diamond diggers alongside their male-counter parts and shared their wages. Digging requires more physical strength and hence men were used to dig and the women would carry the ore to the sorting spots (Ralushai, 2003). In China, women had been encouraged to enter the mines in the 1970s, as part of the drive for equality that occurred during the Cultural Revolution.

From the above literature, women have been working in the mines for some time, albeit in marginalised environments.

### **2.3 Prohibition of women in mining**

The passage of the British Mines Act in 1842, excluding women and children (boys and girls under 10 years old), from working underground, marked a turning point in the industry. Some mines were using other means of hauling coal, a task commonly performed by women (so opposition from owners was minimal) and in key areas, there were now factory jobs for women (Judge, 2015).

There was also a growing middle class, which responded positively to reformers' evidence of unhealthy working conditions and moral degradation. Similar exclusions gradually spread around the world. Germany was first, with a ban introduced in 1878, North America followed with Ontario, for instance, introducing statutory prohibition in 1890, and Sweden passed legislation in 1900 (Ralushai, 2003)

Women were still working underground in France and Belgium in the twentieth century; Russia imposed a ban after the revolution in 1917; India did so in 1929 and Japan prohibited most kinds of underground work in

1933. In 1935 an International Labour Organisation (ILO) convention gave added weight to restrictions on underground work by women, but a number of countries relaxed their rules during the Second World War (Ralushai 2003).

The South African Republic, which ruled the Transvaal, in its Wet No. 12, 1898 (XVIII: 146), bluntly banned the employment of women. The relevant clause, written in Dutch, was carried over, almost word for word, into the Union of South Africa's Mines and Works Act, No. 12, 1911 (paragraph 8.1). This stated: "No person shall employ underground on any mine a boy apparently under the age of sixteen years or any female" (Alexander, 2007).

The employment of women never disappeared of course. Exceptions were made and laws were flouted. In particular, women continued to work in artisanal and small-scale mining. However, there was another turning point. In 1977, a United States lawsuit clarified the country's Equal Rights Amendment, yet again paving the way for the employment of women underground. The passed Equal Rights Amendment read, "Equality of rights under the law shall not be denied or abridged by the United States or by any State on account of sex" (Alexander, 2007)

## **2.4 Re-emergence of women in mining - An international perspective**

### **2.4.1 Australia**

Women's involvement in the mining industry was almost non-existent. Over the century prior to the 1970's all Australian territorial and state jurisdictions barred women from working below ground in any mine. In surface mines,

women were also prevented from working, although not legislative, but through the mostly unionised and often militant male workforces. In the late 1960s and early 1970s there was a change in the national employment policy which open the way for women's employment in the Australian mining industry.

As of 2018, employment of women in the Australian mining industry remains low with only 16% of women representing employees, nationally, in the mining sector, as compared to a national employment figure of 45% (McDonald, 2017). As an indication of the female participation in the Australian mining sector, Figure 3 and Figure 4 provide female participation in the Western Australian resources sector and females employees by occupation. The two figures provided indicates female employment is approximately 18%, however notably 80% of the women are employed in clerical or administrative duties on the mine.

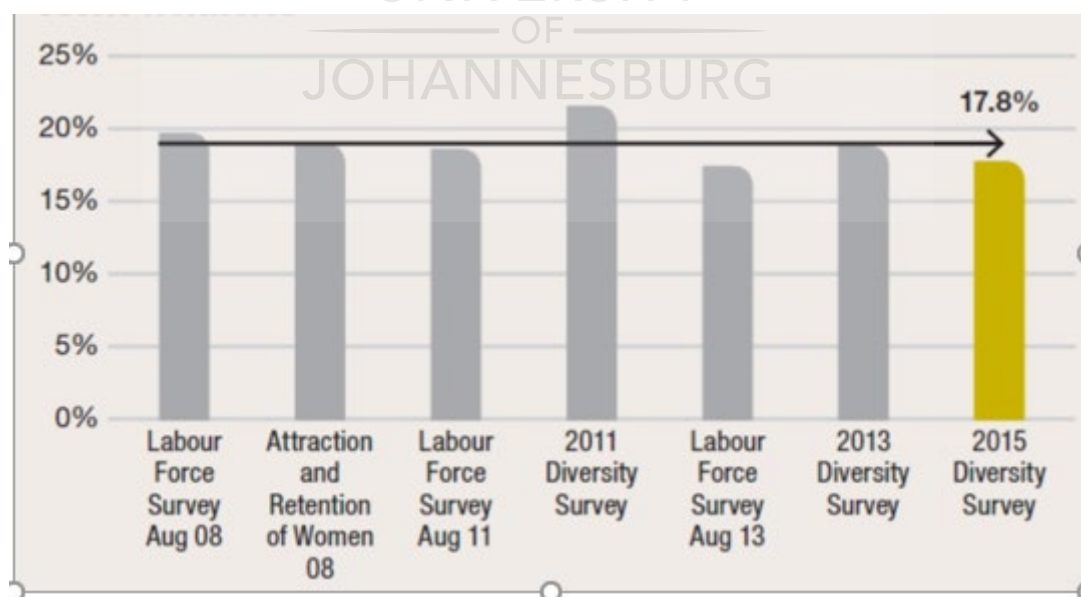


Figure 3: Female workforce in the Western Australia resource sector (McDonald, 2017)



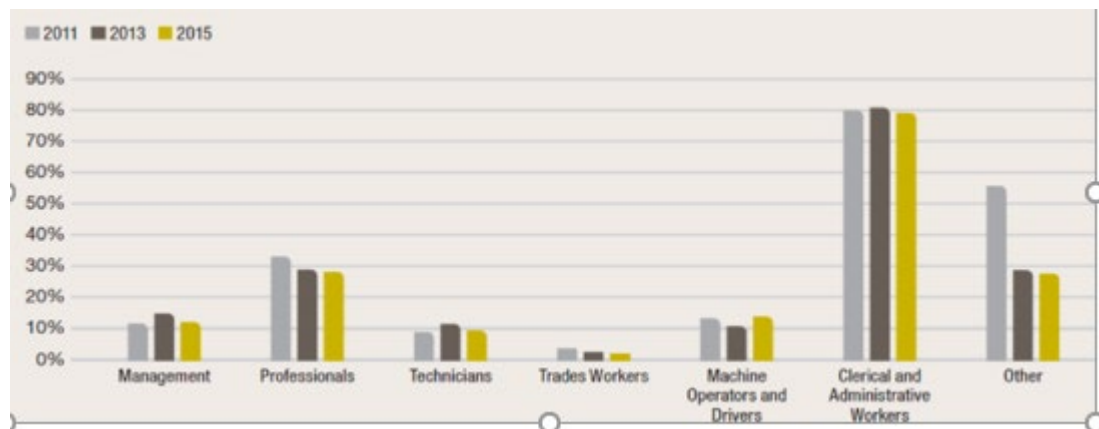


Figure 4: Female occupation in Western Australia resources sector (McDonald, 2017)

Discrimination and sexual harassment have been a major challenge in the mining industry. In a 1997 study, it was found that there was a perception of endemic discrimination against women in the industry. Similarly, harassment and discrimination were issues back in 1997. In 2012, female respondents to a survey indicated sexual harassment in the workplace was less prevalent, about half of the women interviewed in the 1997 study had been promoted to more senior roles with most of the 1997 female participants still working in the mining industry (Pattenden & Brereton, 2016).

#### 2.4.2 Canada

In 2015, women in the Canadian mining sector made up 19.4% of the total employment (Statistics Canada, 2016) with 17% of the mining labour force being female. Considering women have been inclusive in the Canadian mining industry since the early 1970's and the fact that women make up 45% of the countries workforce one could expect the number to have been

significantly higher but it suggests that barriers still exist for women to enter and advance in the Canadian mining sector.

Earlier research conducted by Keck and Powel (2006) at the International Nickel Company in the 1970's indicated that women mine workers were subjected to many forms of sexual harassment, such as offensive language, crude jokes, threats and verbal and physical assaults. The research indicated that men used sexual harassment to maintain masculine dominance in the workplace (Keck and Powel, 2006).

It seems that the main reasons that the mining industry has failed in the past to attract women over the years, in Canada, was mainly around hours that were generally not flexible, as well as the gender pay gaps that existed. Employment in mining is often characterised by working in remote locations, where one is involved in hard physical labour and very long work shifts. This has been very discouraging for women considering a career in mining, especially for those who have children (Keck and Powel, 2006).

#### **2.4.3 Sweden**

Sweden's mining industry remains a male-dominated sector with the majority of mine workers (90 to 95%) being men. If one expands the view of women in the Swedish mining industry, the employment figure slightly improves with 10 to 20% of the sector employing women (Abrahamsson et al., 2014).

According to Abrahamsson et al., (2014) women miners in Sweden are mainly found to work away from the working faces with women working as underground Load Haul Dump (LHD) drivers. Some women are involved in

mine development and construction. However, there are few women, and still basic requirements such as underground toilets remain missing. Andersson, (2012) also found that Swedish women suffered as “minorities” in the work place as women were often the only female on their work teams and had little contact with other women on sites. Many women were subject to comments that they were in the wrong place, did not belong in the mine and that the job was too dangerous, too unhealthy, too demanding or too technical for them.

Prior to the industrial revolution, women worked in both surface and underground mines performing physical labour that is now associated with male mine workers. This work was seasonal, and typically the entire household would work in the mine while at the same time conducting other activities usually farming (Abrahamsson et al., 2014). Notably, this is similar to current artisanal mining being undertaken in many third world countries (Rupprecht, 2019).

#### 2.4.4

#### United States of America

In the United States (US) the Civil Rights Act of 1964 created the Equal Employment Opportunity Commission to help prevent workplace discrimination. In 1972 the Civil Rights Act was amended and established affirmative action that required employers to hire minority workers i.e. African Americans and women (Lacianese, 2017). Women in the US were granted permanent legal right to enter the mining industry in 1973, and although legal status was gained, acceptance and recognition by the US mining industry was slow. In 1977 women made up just 1% of the mining

industry's workforce (Mercier, 2011). In 1978, the Coal Employment Project, an advocacy group for women, filed a class action lawsuit over sex discrimination in the hiring process. The coal operators agreed to hire women at an increased rate until they represented 20% of the underground workforce. As a result, coal companies hired 830 women in 1978. By the mid 1980s, that number quintupled (Lacianese, 2017). By 1979 women employed in mining increased to over 10% (Mercier, 2011).

Lacianese (2017) also commented on sexual harassment endured by women, explaining that sexual assault and harassment in mines is about dominance, rather than lust. Another form of sex harassment highlighted by Lacianese (2017) is the male co-workers drilling peepholes into the change house. In 1981, a \$5.5 million lawsuit was filed when men had drilled peepholes into a change house in a West Virginia coal mine.

Mercier (2011) highlights that during the 1980's, although women managed to gain entrance into the mining workforce, women still faced the challenge of being "prevented from moving out of low paying strenuous jobs for more skilled positions."

#### **2.4.5 India**

In India's mining industry women mostly are employed in menial lower paid jobs such as sweepers, cleaners or attendants in mining offices (Nayakm & Mishra, 2005).

Wicks (2002), in a study of a deadly explosion in a Canadian underground coal mine, sees a connection between masculine institutionalised identities

and organisational dysfunction, which created a situation in which the accident occurred. The study shows that rather than being a case of disobedience, this institutionalised identity was characterised by the miners' antagonism to management and their obedience to an institutionalised discourse that trivialised safety issues and made production more important than safety. It also shows that the logic of orthodoxy, preventing the miners from behaving in unconventional (although correct) ways, sustained the identity of miners as risk-takers and patriarchs, prioritising their breadwinning function before safety (Wicks 2002). Andersson (2012) also notes that male mine workers often take risks because of solidarity with other men, a kind of moral obligation between them (i.e., the men within the workers' collective).

## **2.5 Entrance of women in the South African mining industry**

The active participation of females in South African underground mining has been minimal, due to legislation in most parts of the world. South African women were only allowed to work underground in the mines after the passage of the Mines Health and Safety Act of 1996 (No 29 of 1996). Despite their formal admission to work underground, women still encountered problems in being integrated into the South African mining industry. These inequalities and anomalies were addressed by the introduction of the Broad-Based Socio-Economic Empowerment Charter for the Minerals and Mining Industry, (Mining Charter) in 2002.

The Mining Charter required various transformation measures to be implemented in the mining industry. The Mining Charter included, amongst

other requirements, the requirement for the mining companies to achieve 10% female representation, as a function of their total workforce, in technical fields, by the year 2009. In essence, where the mines employed women in staff positions historically, with the advent of the Mining Charter the mining industry was now required to have at least 10% women in production and various other technical mining activities (Mining Charter, 2002).

## **2.6 Women in mining post 1996**

An African idiom says “Empower a woman, and you empower a nation” holds so true. In the words of the Minister of Women in the Presidency, Minister Susan Shabangu, “women must take centre stage as the country gears itself for the implementation of radical socio-economic transformation policies and programmes in the next five years” (South African Government News Agency, 2014).

In as much as some progress has been made (6% of the workforce, as in the Mining Charter Impact Assessment report of 2009) in advancing women, more needs to be done in order to realise sustainable benefits in the economy. The South African economy needs all its citizens to grow and give the country first world status. The emancipation of women is a reality and remains top of the South African government agenda.

From the researcher’s experience, there are two types of men in the mines. The first group supports change and sees the value in it. To them, women in mining bring diversity and play a complementary role in achieving greatness. There is no fear of job security and humiliation, but a great sense

of “camaraderie”. These individuals play a significant role as change agents and make the women integration much easier and quicker.

The other group continues to enforce stereotypes, which works against the spirit of redressing the imbalances of the past. They will not voluntarily share their knowledge and experiences with the women in mining. They are people who are putting their energy into sabotaging the process of redressing the imbalances of the past.

Equally so, there are two types of women in the mines, the more professional type and the semi-skilled. The professional types usually have a qualification in the mining field, be it, mining, mechanical or electrical engineering, geology or metallurgy. They tend to have a fair understanding of the industry and are more focused on climbing the corporate ladder and making a success of their careers. They are about 30-35% of the total women in mining, in terms of representation, compared to the bulk of women in the mining sector (Rupprecht, 2018).

The other group of semi-skilled females, who would typically have a matric certificate or less, joined the mining sector on the basis that they wished to avoid the unemployment pool in the local communities and meet the minimum job requirements. As a result, some of the women in the group are disillusioned towards the professional females and do not always provide them the support they require. This semi-skilled group represents the majority of women in mining and tends to group together (Rupprecht, 2018).

The way women approach work is complicated and emphasises how household obligations and childcare influenced women’s response to the

conditions and location of employment. Women place the preservation and autonomy of the family above other priorities, and perceived outwork, low-paid, unprotected, repetitive manual labour, as a solution for remunerative work while caring for children. Here Simonton affirms that the reconciliation of family and work functions characterised and shaped women's labour (Simonton, 1998).

Today, in many parts of the world, including South Africa, women are often preferred as operators of the huge trucks used in opencast mining (Alexander, 2007).

The effect of legislation has in certain instances not helped the cause for women, but certainly, in the South African context, the country has seen a change in the employment figures. According to the Minerals Council of South Africa (2018), Mpumalanga coalfields employed about 82 250 employees (Minerals Council South Africa, 2018), of which  $\pm 13\%$  are women (Figure 5). There was a steady increase in the employment from the early days of the promulgation of the Mining Charter in 2002, to the present day.



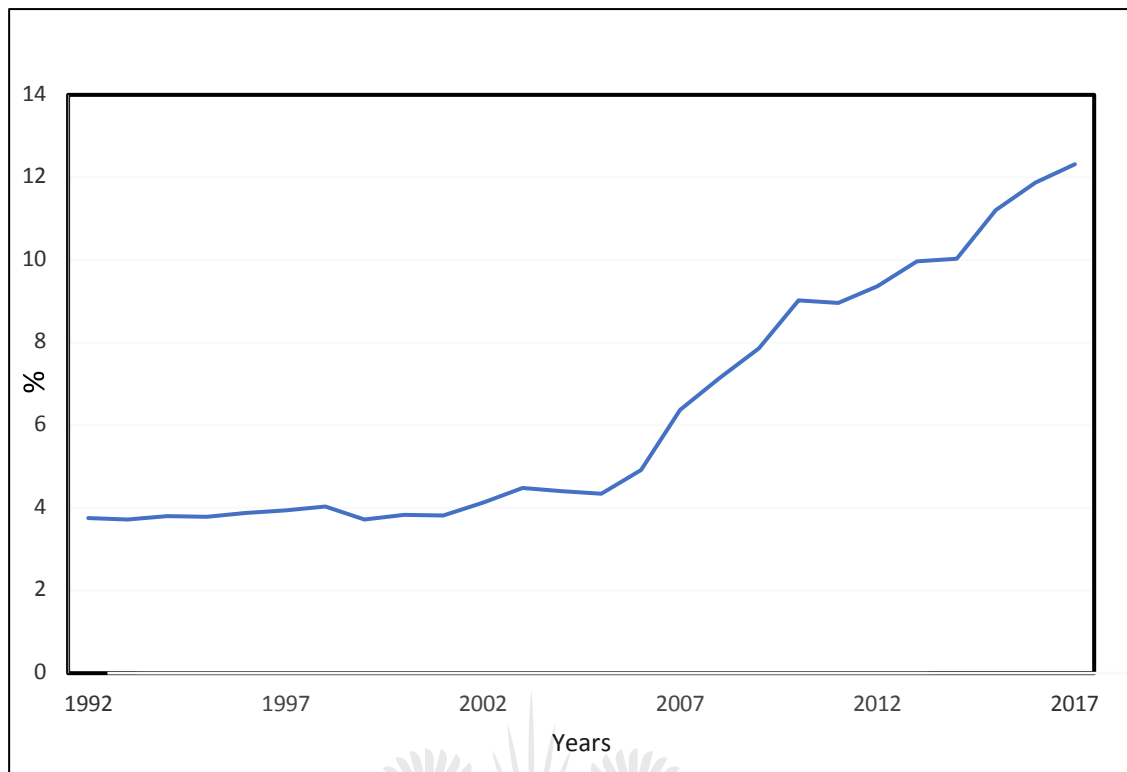


Figure 5: Employment of women in mining as a percentage to total (MCSA, 2018)

The South African mining companies have introduced women in the mines following the Mining Charter 2002 requirement that 10% of the workforce comprises of women in technical fields. The average percentage (%) of women participation was 6% in 2009, the bulk of who are represented in support functions according to the Mining Charter Impact Assessment report (DMR, 2009). Issues of Personal Protective Equipment, changing facilities, maternity benefits, are cited by various authors, as barriers to entry for women in the mining industry.

The Mining Charter has evolved over the years, and new targets have been set. These targets are far more stretched than was previously stated. According to the Mining Charter III, introduced in 2017, representation of

historically disadvantaged South Africans (HDSA) at various levels are shown in Table 1 (Deloitte Touche Tohmatsu Limited, 2017).

*Table 1 (a): Representation of Women at various levels MC III (Deloitte Touche Tohmatsu, 2017)*

LEVEL	Percentage Black	Percentage Black FEMALES
Board (Directors)	50	25
Executive Top Management	50	25
Senior Management	60	30
Middle Management	75	38
Junior Management	88	44

*Table 1(b): Representation of Women at various levels MC (DME, 2009)*

LEVEL	Percentage Black	Percentage Black FEMALES
Board (Directors)	40	0
Executive Top Management	40	0
Senior Management	40	0
Middle Management	40	0
Junior Management	40	0
Critical positions	-	10

The first Mining Charter was not very explicit about the target for women at higher levels. It focussed primarily on getting women in critical positions, hence the target of 10%.

What is clear, though, is that the new requirements are more stringent than the previous charter's requirements and more needs to be done to achieve the new targets.

Various stakeholders have different views on issues such as empowerment, in that, if the empowerment partner leaves the agreement, is the transaction still viewed as fully empowered or what. Also, a point of debate is the demographic representation reflected in the set targets?

In most companies, there were no structured plans on how to do this, and most companies relied on the services of international companies for help. According to Cynthia Carroll, Chairman of Vedanta Resources, employment of women in the mines brings the necessary diversity and promotes a healthy completion in the workplace. In terms of mobility, women provide a stable environment and hence reduces the turnover of labour and promotes the retention of skills. This has a massive spinoff in terms of safety and productivity (Carroll, 2016).

Dr Cornel Malan, Head: Research at Railway Safety Regulator, noted that research has shown that companies with an equal balance of men and women are twice as innovative as other companies. Researchers calculate that businesses can boost their innovation capacity by 110% by increasing the proportion of women from 25% to 40%. A gender-balanced workforce means that companies become far better at developing new products (Malan, 2014).

Caroline Shirindza, Technical Services Manager at Sasol Mining, believes that personal branding is key to establishing oneself. In this tough male-

dominated environment, “Me, myself and I”, will certainly not help, but building strong networks through associations, like buddy-buddy systems, will help. It is further encouraged to do introspection to be able to develop a balanced approach (Dimmer, 2017).

According to MaryAnn Mihychuk, Women in Mining was created to address an opportunity and a challenge, to integrate women into mining, an industry that is faced with many challenges on the day-to-day, “from getting the social license to operate to dealing with a lack of understanding by the public in general”. She says that most countries are mostly “pathetic” at attracting women into mining; other countries are doing studies to see where and how women can fit in. The first thing those studies have addressed is the perception that things are equal in the industry and that women have “made it” (Mihychuk, 2017).

In the “100 Global Inspirational Women in Mining 2016”, a golden thread of passion, drive and dedication is clear. The women emphasised the need to be in there for a long haul. Great success is not achieved overnight (Couch and Wyllie, 2016).

Gerald Seegers, Price Water House Coopers (PWC) Director for Human Resources Services, Southern Africa, stated that of the top 100 listed mining companies surveyed in South Africa, 23.8% of the board members are women, and of the top 500 mining companies in South Africa, 21.4% of the board members are women. The established appointment of women board members is also confirmed by Mavuso (2014) who reports that the mining sector has the highest number of women representation.

This is good news indeed. However, the majority of women selected board members are parachuted from elsewhere and have not climbed the corporate ladder to achieve board status. The issues that women are experiencing in the working face today could be dealt with differently if some of the women board members had come up through the corporate ladder

The research by Sole et al., (2009), highlights that a high number of female engineers leave the profession within five years of graduation. However, no reason is provided as to why this is happening. The research indicates that a small proportion of women are professional engineers (8%). However, some 30% of candidate engineers are women as reported in the Engineering Council of South Africa (ECSA), (2008) by Sole et al (2009). Hence there is a significant increase in women entering the field of engineering. While the number of women entering the field might be high, there is a challenge of retaining them in the industry.

The majority of women in the field of engineering are younger than 35 years. Almost all respondents in the research conducted by Sole et al. (2009), highlighted that family support, especially one's partner, is an important support structure.

For women in the mining industry racism, criticism, lack of respect and discrimination remain areas for change. Language and male attitude are also areas, highlighted by women, requiring transformation (Sole et al., 2009).

Affirmative action policies, although slightly agreed upon, were not conclusively agreed with because they were perceived as reverse

discrimination. Nearly 60% of white females disagree with Affirmative Action (AA) policy. Support from other professional women was highlighted as being important, as on average 75% of the women felt supported by other professional women.

Pregnancy and maternity remain a concern emphasizing following quotation, “If you want to have kids, do not study engineering”. The research by Sole et al., (2009) strongly indicates pregnancy and maternity as a serious area of concern. The research found 64% of women expect their career to be interrupted for personal reasons, with 85% of women wanting to enter and leave and re-enter the profession. Work–life balance is viewed as difficult to achieve in the mining industry with the most significant factor in enhancing the work environment being the flexibility of work hours and the workplace (Sole et al., 2009).

Other factors raised include:

- The wage gap between men and women;
- Stereotyping of women in the workplace;
- Policies relating to work-life balance;
- Flexible working conditions; and
- Extent of perceived discrimination and lack of respect

A common challenge facing the universities and mining industry is managing expectations. This applies to young professionals and young women entering the mining profession. Often students choose the engineering field for the

wrong reasons, having little understanding of the industry, the job, and challenges. There is a perception of high salary perks with little understanding of the time one must put in to gain the necessary experience in the workplace (Sole et al., 2009).

According to Matshingane (2017), women still face challenges regarding access to sanitation facilities, appropriate protective equipment. They feel that there is a lack of support from their supervisors and management.

## 2.7 Women in mining injuries and accidents

There has been an increase in the number of accidents involving women in the mining industry, as shown in Figure 6.

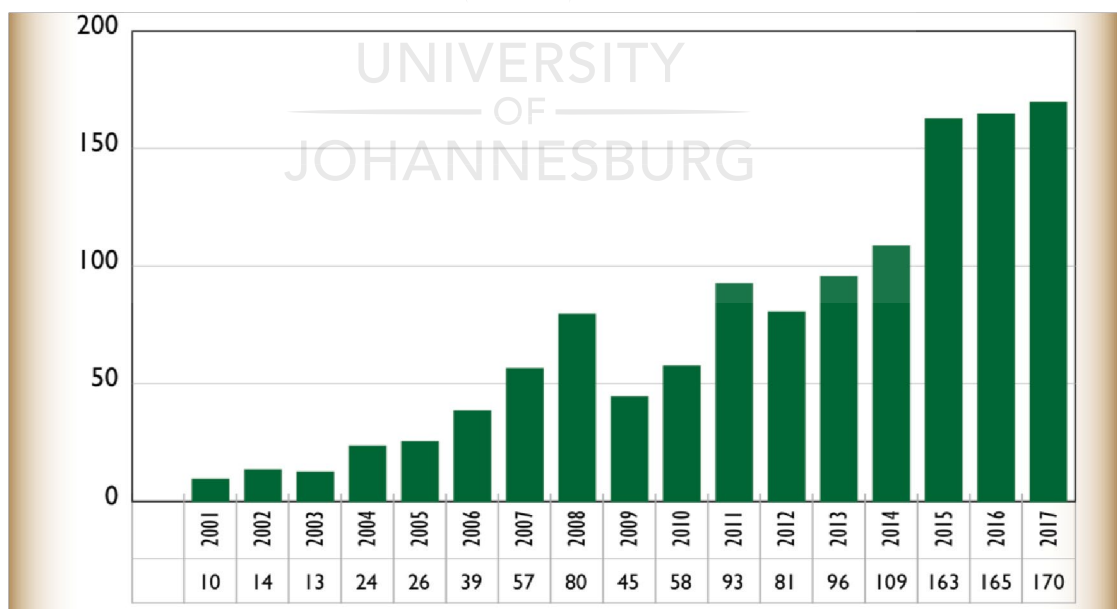


Figure 6: Number of injuries to women in mining (DMR, 2017)

The injuries reported involving women were mostly in the general category (68%) and followed by transport and mining (16%), as can be seen in the pie chart depicted in Figure 7 below.

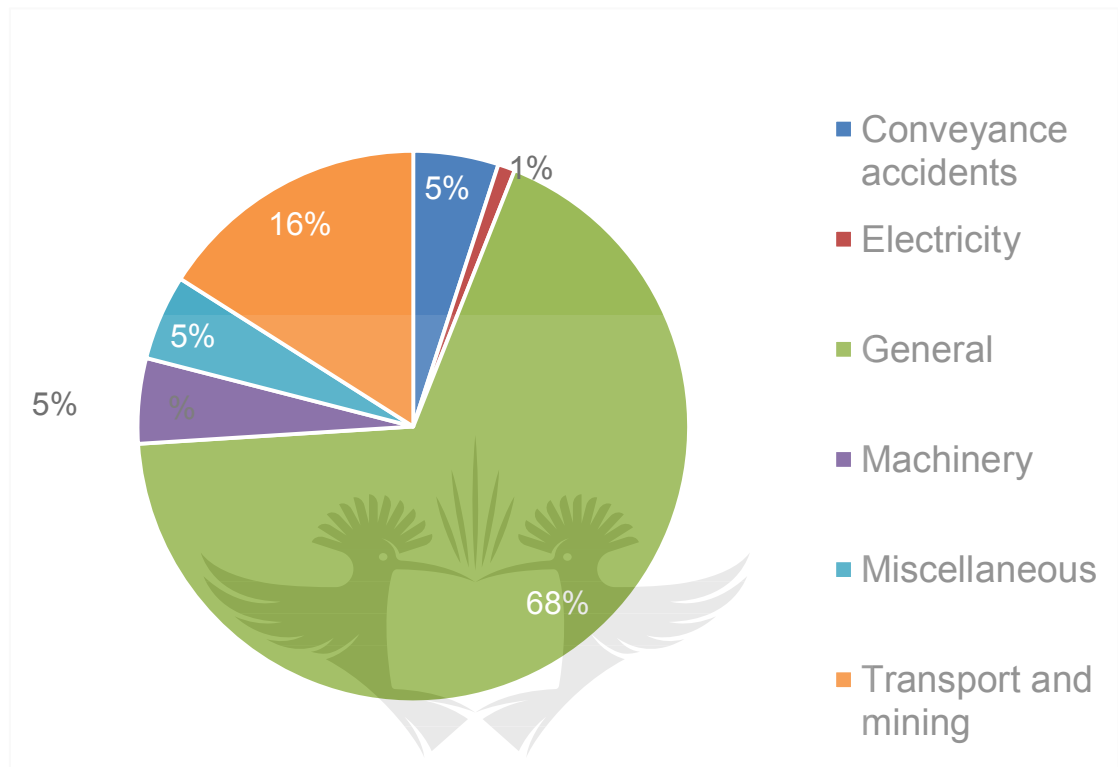


Figure 7: Classification of injuries to women in mining (DMR, 2017)

The following are explanations as provided by the DMR (2017) of the different injury classifications:

- Conveyance accidents: this includes injuries sustained during installation or operation of conveyor belts
- Electricity: electrocution during installation or during normal operations
- General: this category encompasses a wide variety of injuries or accidents, for example, inhalation of gas, harmful fumes and dust, inundation by ore, mud-rush, struck by rock(s), fell into, burning and scalding



- Machinery: refers to trackless mobile machinery (TMM)
- Miscellaneous: a combination of other injuries or accidents that do not form part of the main categories
- Transport and mining: this includes track-bound machinery, for example, locomotives, loading machines, tractor and trailer, coupling and uncoupling of motor vehicles and lifting equipment.

Sadly, the severity of accidents, involving women has increased, as can be seen in figure 8, below.

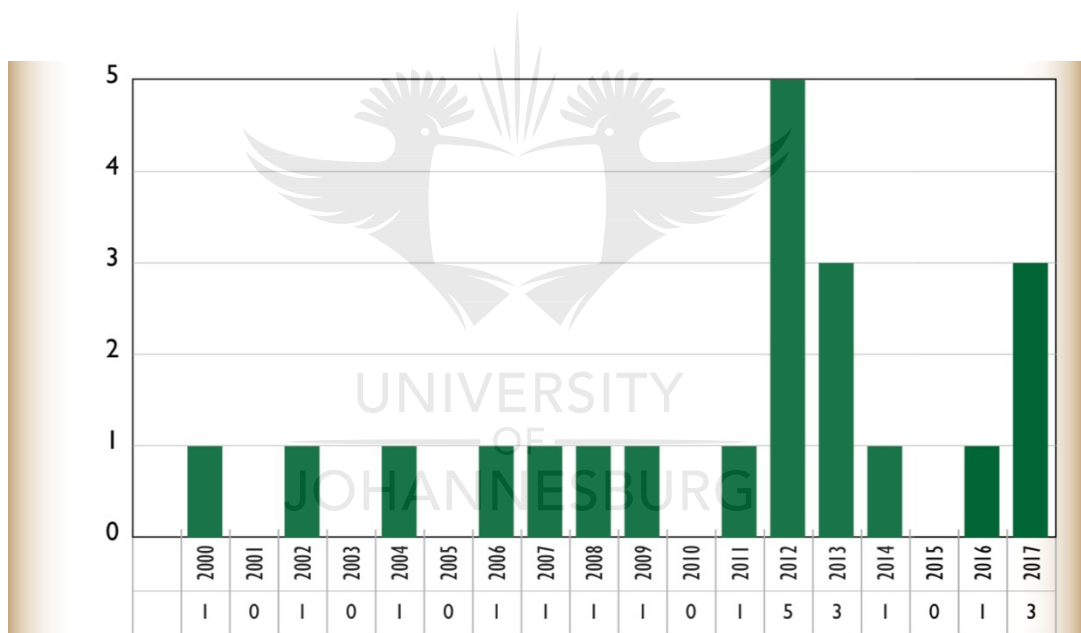


Figure 8: Women fatalities since 2000 (DMR, 2017)

The above information indicates that with the increase of employment of women in mining, there is an increase in injuries and fatalities. The more women employed in a high-risk environment, the higher the exposure to danger and the likelihood of injuries. However, the information also indicates that women are involved in fewer injuries and fatalities compared

to male counterparts. For example, in 2017 only 6.8% of the women were injured and 3.4% was fatally injured (Table 2), noting that women accounted for 12.3% of the employed workforce. The statistics for 2015 and 2016, which reported 5.2% (injuries) and 0% fatalities and 5.8% (injuries) and 1.4% (fatalities) for women in 2015 and 2016 respectively (Table 3 and Table 4).

Table 2: Women fatalities and accidents in 2018 (DMR, 2018)

Fatalities			Injuries		
Women	Men	Total	Women	Men	Total
3	85	88	170	2 314	2 484
Women as a percentage		3.4%	Women as a percentage		6.8%

Table 3: Women fatalities and accidents in 2017 (DMR, 2017)

Fatalities			Injuries		
Women	Men	Total	Women	Men	Total
1	72	73	165	2 681	2 846
Women as a percentage		1.4%	Women as a percentage		5.8%

Table 4: Women fatalities and accidents in 2016 (DMR, 2016)

Fatalities			Injuries		
Women	Men	Total	Women	Men	Total
0	77	77	163	2 976	3 139
Women as a percentage		0%	Women as a percentage		5.2%

The number of fatalities to women in mining has been zero or one per year since 2000, except in 2012 where there were five fatalities recorded in that year, which were made up of three fatal accidents on transportation and mining, one on fall of ground, and one on trackless mobile machinery.

In 2017, three women lost their lives when two of them were run over by trackless mobile machines and the other one was fatally injured by a fall of ground.

## 2.8 Mining

### 2.8.1

## The View of the South African Industry Mineral Council of South Africa

Roger Baxter, president of the Mineral Council South Africa, quotes a retention of just 15% of graduates remain in mine production with most eventually moving into other fields such as banking and consulting. The industry must recognise that there is a general trend, with both men and women, for graduates to move away from production. For mining companies, this is not always seen as a negative thing, as the industry has only a limited number of positions in middle and senior management. However, in terms of women in mining, at least in the short term,

measures must be taken to reduce the flow of women leaving the mining industry (Baxter, 2015).

### **2.8.2 Anglo American**

Anglo American has developed a wide range of initiatives across its operations to ensure that women have the same access as men to the many rewarding career opportunities provided by mining. Promoting gender equality is part of the company's commitment to human rights, as well as recognition of the vital contribution that women make to economic development, including as employees and as suppliers (Anglo American Sustainable Case Studies, 2016).

"Women in mining" champions have been appointed at a number of sites worldwide. Anglo Coal in South Africa, for example, has appointed female champions for each major technical and management discipline and has a special task team, also involving senior male managers, to drive progress throughout the business. Results of these efforts include the establishment of childcare facilities, the creation of suitable women-only toilet facilities, and the development of a Code of Good Practice for pregnancy in the workplace.

(Anglo American Sustainable Case Studies, 2016).

### **2.8.3 Sasol Mining**

Sasol Mining is sharpening the focus on empowering women and improving their representation at all levels of the organisation. This is being realized through the women empowerment strategy and Sasol Women's Network, launched in 2012. All the initiatives implemented were successful and were

continued this year. Initiatives included a series of regional personal development seminars enhancing workforce diversity. Embracing a culture of inclusion is critical to ensuring that diverse talent is strategically managed and nurtured to deliver successful business outcomes.

Sasol is committed to driving employment equity goals and enhancing diversity across the group and to develop the skills of women across the organisation and improve access to career advancement opportunities. Through the Mentorship Circle Programme, Sasol leaders mentor groups of women for a 12-month period. In 2014, 20 senior leaders within the organisation mentored groups of between 12 and 15 employees, totalling 264 women. The feedback from employees has been positive, with value delivered exceeding expectations (Sasol Sustainable Report, 2014).

The Sasol Women's Network will be launching programmes in Eurasia and Mozambique. Work is underway in these regions to translate the South African successes into meaningful fit-for-purpose programmes with the goal of increasing the representation of women across the group. Several of Sasol's business units implemented programmes this year to increase the proportion of women in their workforces.

Sasol Mining has a programme to train female mineworkers and prepare them for the working environment. Approximately 60 women participated in the training, most of whom have since been permanently appointed (Sasol Sustainable Report, 2014).

#### 2.8.4 South 32

South32 has adopted strategies which aim to progress towards a balanced gender and an ethnically diverse representation at Board, senior management and across all areas of their business including:

- Setting challenging and measurable diversity and inclusion objectives in each region and in the corporate functions relating to the recruitment, appointment and retention of women and people with diverse ethnic backgrounds;
- Broadening the fields of successors for senior management roles and potential candidates for Board appointments;
- Enabling a diverse workforce by removing barriers to participation which may disproportionately affect potential female candidates and those from diverse backgrounds, and review these policies to ensure that they are available to and utilized at senior management levels;
- Monitoring the effectiveness of, and continue to expand on, existing initiatives designed to identify, support and develop talented women and employees from diverse ethnic backgrounds;
- Supporting both the spirit and intent of transformation and empowerment in our industry and at local and national levels in South Africa, and at a minimum, complying with legislative requirements in relation to employment equality, including the requirements of the South African Mineral and Petroleum Resources Development Act No. 28 of 2002 and Employment Equity Act No. 55 of 1998 (South32 Diversity and Inclusion policy, 2015).

The three companies mentioned above have made their intentions of supporting the government requirements well-known. Their commitment in words is backed by rigorous actions.

## **2.9 Problems highlighted by Literature**

The following issues have been highlighted by literature:

- Reserve labour

Every time war erupted, women were called up to fill in any jobs that they were needed, be it agricultural, industrial or even in the military. But once the war was over, they had to return to their previous positions and make way for the men to assume their original positions (Grayzel, 2002).

- Pay disparities

Women doing the same jobs as men were not also remunerated on equal rates as their male counterparts. In some instances, the discrepancy was as big as a tenth of what their male counterpart (Bean, 2015)

- Long term partners in mining

The employment of women in the mining industry has not been viewed as long term. The women employment takes off well in the beginning but wanes away as times goes on. This is as a result of various reasons, for example, legal prohibitions, treatment by male counterparts or societal expectations.



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## **CHAPTER 3: RESEARCH METHODOLOGY**

### **3.1 Chapter Overview**

This chapter focuses on the research design with particular attention to methodology followed. The researcher further discusses the research population, sampling size, sampling methodology, research instruments, data collection and data analysis, significance and ethical considerations.

### **3.2 Research Design**

The research design refers to the overall strategy that the researcher chooses to integrate the different components of the study coherently and logically; ensuring that the researcher will adequately address the research problem. It constitutes the blueprint for the collection, measurement, and analysis of data (De Vaus, 2001).

Furthermore, the function of a research design is to ensure that the evidence obtained enables the researcher to effectively address the research problem logically and as unambiguously as possible. A questionnaire and a workshop were used to gather data, i.e. a qualitative approach was used.

### **3.3 Research Population**

A research population is an aggregate or totality of all the objects, subjects or members that conform to a set of specifications. All individuals or objects within a particular population, usually have a standard, binding characteristic or trait (Polit and Hungler, 1999).

The research population consisted of 97 respondents from three mining houses, namely Anglo American Coal, South 32 and Sasol mining. In addition, 17 women employed at the New Denmark Colliery participated in a workshop regarding issues that these women experienced on the mine as well as confirm the findings from the questionnaire.

The population of the present study comprised of women of various ages, educational backgrounds, different job categories, all working in the Mpumalanga Coalfields.

### **3.4 Research Sample**

Sampling is a process of selecting representative units from a population of interest so that by studying the sample, the results can be reasonably related to the population from which they were chosen.

According to Shetty (n.d.), a sample size of 30 is adequate for qualitative research.

The criteria used is cluster sampling where the job categories were divided into dusty environment (underground or surface) or non-dusty (administrative, clerical, or finance). The respondents were selected based on them being permanently employed, and working on the coal face, that is, coal mining face or processing plant (dusty environment) in the three aforementioned companies.

A cross-sectional sample of women who are working at the coal face directly or indirectly involved in production activities was taken. This sample comprised of different job categories. The following job categories were

considered: mining assistants or general workers, machine operators (shuttle car, roof bolt and continuous miners), maintenance operators, miners, face bosses, electricians, fitters, electromechanics, technicians, shift bosses, foreman, mine overseer, general engineering supervisor, production geologist, water treatment specialist, section manager, survey manager, production manager, mining manager: The sample size, N=97.

### **3.5 Research Methodology**

The research methodology applied for this thesis is qualitative and used to identify the current problems in coal mining encountered by women by way of generating a questionnaire.

According to Bless and Smith (1995), a questionnaire must be presented to each respondent in the same way to minimise the role and influence of the interviewer and to enable a more objective comparison of the results.

A total of 103 questionnaires were sent out electronically to various employees, of which 97 responses were received. The questionnaire was populated in Google Forms and had three distinct areas, namely:

1. Demographics
2. Facilities and Communication
3. Productivity and Safety. (See Appendix B)

The questionnaire was set such that the respondents' anonymity was guaranteed at all times. All that the researcher could access was a notification that there had been a response. The information was collated and analysed automatically (See Appendix C).

To those who did not have access to the electronic platforms, a link was sent to their colleagues to assist with access.

### **3.6 Research Location**

This research was undertaken in the Mpumalanga Coalfields. A brief history on the host companies where the research was conducted, Anglo American Coal South Africa, South 32 and Sasol Mining is discussed.

#### **3.6.1 Companies Background**

The three companies are coal producers situated in the Mpumalanga province. They supply 10 of the 11 coal-fired power stations and contribute up to 25% of the Mpumalanga province's gross domestic product (GDP) and is the largest source of revenue for the province (Koko, 2015). The areas in which these three companies operate have a population of 1 361 050 (Statistics SA, 2016).

##### **3.6.1.1 Anglo Coal South Africa**

Anglo Coal South Africa has nine operating mines, namely Goedehoop (underground operation), Kleinkopje (opencast operation), Landau (opencast operation), Greenside (underground operation), Kriel (both underground and opencast operation), New Denmark (underground operation), Mafube (opencast operation), Isibonelo (opencast operation) and Zibulo (underground operation), in the Mpumalanga Province, near the towns of Witbank, Middelburg and Standerton, and one mine in the Free State province, New Vaal (opencast operation), near the town of Sasolburg. This company supplies both the export and domestic (Eskom and inland) markets and operates both underground and opencast mines.

The annual coal output in the financial year 2015, was about 51 Million tonnes (Mt), of which about 18Mt went to the export market, and the difference consumed locally, for power generation at Eskom and other inland markets. The company employs about 13 800 full-time employees and contractors, of which about 1 804 are women (Anglo American Annual Report, 2015).

#### **3.6.1.2 South 32**

South Africa Energy Coal is a wholly owned subsidiary of South 32, which was previously known as BHP Billiton Energy Coal South Africa (BECSA), the energy division of BHP Billiton. It is commonly referred to as South 32 with its operations situated near the towns of Witbank and Middleburg. It operates four mines, namely Khuthala (underground operation), Klipsruit (opencast operation), Wolwekrans (opencast operation) and Middleburg (opencast operation).

The company supplies the export market predominantly. The annual output in the financial year 2016 was about 31Mt. The company employs approximately 1 480 personnel of which 137 are women (South32–Integrated Annual Report, 2016).

#### **3.6.1.3 Sasol Mining**

This company operates five underground mines, next to the town of Secunda

(Brandspruit, Bossjesspruit, Twistdraai, Middelbult and Syferfontein), in the Mpumalanga province. The sixth operation (Mooikraal / Sigma) is located in the Free State Province, adjacent to the town of Sasolburg.

The total output in the financial year 2016, was about 40Mt, and most of that production was consumed at the Sasol Synthetic Fuels (SSF), where it is converted into Liquid Fuels and about 3.2Mt was exported. The total employment in the year 2016, was approximately 9 800 people of which 960 are women (Sasol Integrated Annual Report, 2016).

### **3.7                    Validity      and      Reliability**

The questionnaire was sent to three individuals as a pre-test to determine the validity and reliability of the questions. Their results were also computed with the rest of the respondents. Because of a low number, their significance in terms of negatively influencing the results of this survey is negligible.

### **3.8                    Data      Analysis**

The results obtained from the questionnaires and workshop were analysed and interpreted, in relation to the objectives of the study. The results will be presented in Chapter 4.

### **3.9                    Ethical      Consideration**

The researcher maintained a high level of ethical standards throughout the study. A high level of anonymity of participants and their respective organisations was maintained. Respondents were assured that their answers would be kept confidential as they are collated electronically. Approval to conduct the study was granted by the University of Johannesburg, before proceeding with data collection.

### **3.10      Workshop      Results**

A workshop with women employed at the New Denmark Colliery was held on 20 June 2017 to test the validity of the results obtained from the survey.

The workshop was conducted for the thesis; however, as the researcher was also the mine manager, the information provided also informed the management team of the New Denmark Colliery. A mixture of technical, professionals in training, and technicians or artisans were amongst the group of 17. The entire group comprised of women working in the coalface. A number of questions were proposed:

- Feelings toward the retention of women in mining;
- The readiness of women to operate in the mining environment;
- Family commitments and support group to support the women in pursuing a career in the mining field;
- Sexual harassment and discrimination;
- The attraction of mining for women;
- Reason for women to leave the mining industry; and
- Other general issues

Professionals in Training (PIT), is a term used for individuals who have acquired a tertiary qualification in the fields of Mining, Electrical, Mechanical and Metallurgical Engineering and Geology. These individuals are put through a training programme that lasts a minimum of two years and a maximum three years and focuses on equipping the incumbents with essential managerial skills required for first-line leadership positions.

In instances where a Government Certificate of Competency (GCC), as in Mining and Engineering fields, is required, the necessary coaching and exposure required to prepare the individual, will be worked into the programme. A very structured mentorship programme is usually put in

place, to ensure the necessary support is given to the trainees. This mentorship guidance is from experts in the various fields, who hold senior positions in the organisation.

The technicians and artisans are individuals who have qualified with a trade test certificate. This qualification will be either mechanical, electrical (heavy or light current) or both. The training programme for these individuals is block structured, whereby the trainees will spend time at a technical college, and supplement that training with practical time on the mines before qualifying. The emphasis of this training is more technically inclined and not aimed at managerial upskilling.

Individuals, who have qualified with a trade test qualification, will be required to do extra subjects, in order to qualify for acceptance into writing the Government Certificate of Competency. These extra subjects are offered at the Technical Colleges, with very little or no help from the companies. A student is expected to enrol on her own and can then produce proof of registration to the company, and then a loan agreement can be entered into by the employee. One of the loan conditions is that if the student passes all subjects, then the loan is converted into a bursary, with no required payback by the employee.

One of the major challenges faced by the women in mining is the fact that they work shifts, have families to look after and are required to study part-time.



Critical comments requiring immediate attention were highlighted:

## 1 Change house and ablution facilities

### 1.1 Adequacy of facilities

Insufficient change house facilities with approximately 20 women sharing a small change house with only two toilets. Women are required to share showers in order to ensure that they can catch transportation from the shaft at the end of shift. A new facility with a bigger carrying capacity has been erected and operational by the end of July 2017.

### 1.2 Security

Security of change houses is insufficient. A turnstile exists, however, there is no entrance control either by clock card (not seen as 100% safe) or by biometric controls.

## 2 Toilets

These facilities, as can be seen in Figure 32 (a), are not ergonomically designed for women and mining apparel, that is, overalls are not supplied with consideration of women making use of underground toilets. Women highlighted the need to nearly completely undress to make use of underground toilets. Since the introduction of the Mining Charter requirements in the mid-2000, companies have not made significant strides in terms of providing most suitable and hygienic facilities, and henceforth they are encouraged to use more ergonomically and sanitary facilities. Companies are urged to look at suitable and well-sized facilities for women. These types of facilities are readily available in the market and

can be customised to suit the individual operations' requirements. These requirements could include been on skids or wheels, hanging hooks for cap lamps and rescue apparatus, hand washing basins and be appropriately sized to accommodate the biggest individual that can be employed underground, in terms of width and height, as is shown in Figure 32 (b). These toilets can further be furnished with combination locks, and the numbers only known by the women.



Figure 32: (a) Underground Toilet (b) Modern toilet

### 3 Underground security

This was also highlighted as there are many incidents where unauthorized persons have access to underground workings. Women feel vulnerable to these unauthorised persons when working underground, as they are often working alone. The women were also critical of security personnel, as it took over 48 hours for security to investigate incidents.

### 4 General concerns highlighted by the group include:

#### 4.1 The physicality of coal mining

The process of mining coal involves cutting and transporting coal. The freshly exposed coal face is then supported using roofbolts.

##### 4.1.1 Cutting

The cutting of coal is done by a continuous miner (CM), which weighs about 60-tonnes to 90-tonnes depending on the size. These machines are electrically powered by 3 300v through a 95mm or 120mm thick cables. These cables are manually handled, when the machine moves up and down between working faces. This cable weighs 6,8kg/m and 7,1 kg/m, respectively, at lengths of 200m to 250m. Over a 12-hour shift, this translates to about 120kg of mass handling behind the CM. The manual handling and physicality of the job is a real challenge for women conducting coal cutting activities.

#### 4.2 Transporting

The transportation of coal behind the CM is done by means of shuttlecars. These shuttle cars are electrically driven and have mechanisms of rolling up their cables, therefore no need to manhandle the cables. The issue that is experienced with shuttle cars is uneven floors. The bumpy rides for the entire shift is very uncomfortable and has proven to cause kidney problems.

#### 4.3 Supporting

The freshly exposed coal face needs to be supported, to prevent roof falls. This is done by drilling into the roof and installing bolts to keep the roof layers together. The drilling is done by an electrically driven roof bolting machine. The challenge presented by this activity is the bolts that are manually handled up and down on the machine throughout the entire shift. This activity can amount to about 3 tonnes of steel been handled every shift. This is a real challenge on the women strength and physique.

#### 5 Selection process

Inappropriate selection of women for employment. At times some of the women lack the physical attributes to pursue an underground career; others lack passion, while others look to pregnancy as a means to abuse the system thereby giving other women in mining a bad image. Some companies have resorted to physical testing potential employees; for example, Sasol Mining, as a means to determine the eligibility of women to perform manual work underground. This type of testing is extended to men, so as not to be viewed as a discriminatory practice. The practice involves the carrying and use of a pinch bar on uneven ground, for a specified period. The individual will be expected to demonstrate the ability to carry out the job safely. In the case where the individual is not able to perform the task, she will be given a second chance but failing that; no employment will be given.

## 6 Personal Protective Equipment (PPE)

Clothes are still not designed for women in mining, with belts and shoes sizes remaining a problem (Figure 33). According to Boodhram, 2016, maintaining diversity requires solutions and innovations that ensure a woman's comfort, yet maintain her dignity and femininity in the industry. Exxaro has redesigned its PPE clothing as just one initiative undertaken by the company's Women in Mining (WIM) committees to attract women (bizcommunity, 2018).



Figure 33: 2-piece protective clothing (Boodram, 2016)

7 Women Professionals-in-training appears to be “looked after” for their training period; however, the technician/artisan side are offered very little help.

One artisan described how she had to nearly resign to pursue further learning and was not guaranteed her job once her studies were completed.

This group of people can be referred to as the “unaccounted for” in the middle. This is not only a challenge to the women but the men as well. Mentoring and coaching can help to address this problem. Distance learning, with appropriate facilities, will help to alleviate this challenge.

In the quest to train more people, especially the Historically Disadvantaged South Africans (HDSA), from the areas that the mines do business in, most companies have taken on more learners than they require for their businesses. The learners, who qualify and cannot be absorbed by the companies, are then made available to the country and have at least acquired a technical qualification. This type of training is at times referred to as an unattached training programme.

Technicians and artisans are not considered for further development, and the mine would rather pursue local people than look within when granting bursaries.

Most companies offer study loans for fulltime employees with certain conditions. These conditions may include repayment of the loan when studies are not completed within a prescribed period or an individual might have to serve back time equal to the duration of the loan. These loans are usually interest free. As part of mining companies' license to operate, the companies undertake, through the Social and Labour Plan (SLP), to offer bursaries to deserving learners in their host communities. These bursaries are not limited to study fields that the companies use. The learners are free to choose any field of study that interests them. In the case where the

chosen field of study meets the mine's demands, the student will then be absorbed on the mine.

Pregnancy is still inappropriately handled. In many cases, pregnant women are not handled correctly and are not given any meaningful duties. Most women felt that coming to work and not sure what to do on a day, was frustrating. According to the Occupational Health practice, the employer may not require an employee who is breastfeeding her child to perform work in a hazardous area (Guild, 2001)

The women felt that on the job failure by a woman was often highlighted more than their male counterpart's failure. A lot is expected of women to equal their male counterparts' output. If an individual cannot perform a certain task, the generalization that all women are weak,

Although speaking with respect is a core principle for New Denmark, women find the use of foul language prolific.

The workshop confirms previous findings from published material in 2012 (Zungu, 2012), which highlighted the challenges related to PPE. An example is how PPE has not changed since Zungu (2012) identified the shortcomings of PPE for women in mining; six years later women are still struggling with single piece overalls, safety belts that are too large and safety boots that do not accommodate small feet.

A common thread the women shared was the inflexibility of the mining industry around family, pregnancy and respect. The industry is promoting more women in mining, but do not always have the facilities to support the number of women employed. In contracting mining industry, "last year [2016], 58 000 jobs were occupied by females in the mining area, this year the number already jumped to 61

000”, says Vanessa da Rocha, (Holding, 2017). Also, there appears to be a divide between Professionals-in-training (sourced from universities) and artisans /shift workers in terms of advancement opportunities, support /mentoring, and bursaries.

Suggestions have been made to close the divide and create an all-inclusive working environment. Since the majority of senior positions are still occupied by men, it is incumbent on the industry principals to make the advancement and integration of women based on a performance contract key performance area (KPA).

The women are of the opinion that they are ready to manage, but also realise that there are a number of sacrifices that must be made in order to advance in the mining industry. Many women delay starting a family in order to reach certain levels which offer job security. The ability to gain respect from workers is also essential and it was highlighted that gaining hands-on experience enable women to demonstrate their competency whereas general training did not provide sufficient practical skills.



## **CHAPTER 4: FINDINGS**

### **4.1 Chapter Overview**

This chapter discusses the data analysis and findings from 97 questionnaires completed by women working in coal mining operations, both underground and surface coal processing plants, in the Mpumalanga coalfields. The purpose of this study was to investigate the integration of women in the coal mining industry.

The findings are discussed according to the sections of the questionnaire. The three sections of the questionnaire were:

- Section A: Demographic data
- Section B: Work environment
- Section C: Productivity and safety

### **4.2 Demographic data**

This section of the questionnaire covered the respondents' age, race, work experience, dependents schooling, material ownership and qualifications. Though not central to the study, the personal information helped contextualise the findings and the formulation of appropriate recommendations to enable companies to attract and retain more women and to ensure the succession pipeline is streamlined.

#### **4.2.1 Respondents' Age**

The respondents were asked their age at the time of taking this questionnaire.

In Table 5 the respondents' age range are shown.

Table 5: Respondents' ages

<b>AGE</b>	<b>FREQUENCY</b>	<b>PERCENTAGE (%)</b>
21 - 30	29	29.90
31 - 40	48	49.48
41 - 50	15	15.46
51 – 60	5	5.15
<b>TOTAL</b>	<b>97</b>	<b>100.00</b>

From the respondents working in the mining environment, 79% of the respondents are in the age category of 21 to 40 with 21% of the respondents in the age group of 41 to 60. The 41 to 60 age group of respondents is amongst the initial recruits that took up positions that were traditionally male underground work categories.

Their work experiences range between 8 and 12 years.

The age distribution and marital status of the respondents is shown in Figure 8.

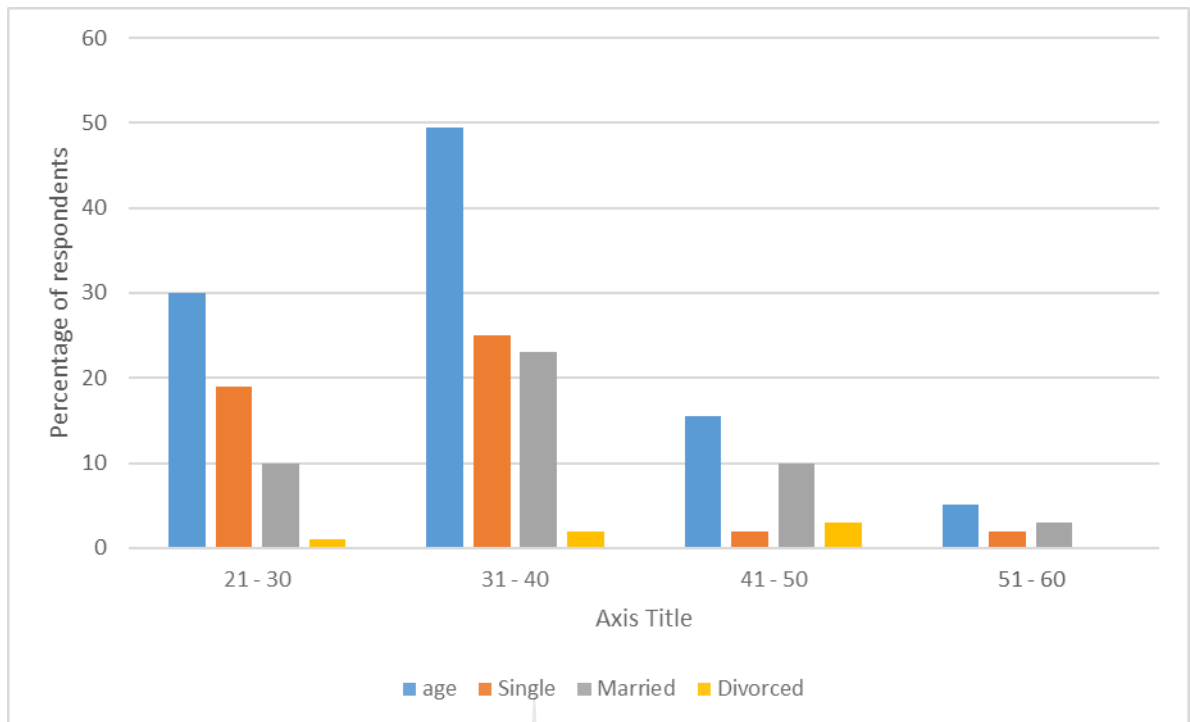


Figure 8: Age Distribution and Marital Status

Figure 8 indicates that of the total respondents, 49% of them are in the age category between 31 and 40 years and 30% in the category 21 -30. This indicate a fairly young workforce that can still be in the industry for the two to three decades, provided the retention strategies and integration plans are implemented and followed through.

#### 4.2.2 Race

Of the total respondents, only one woman was of Asian descent, three were Coloured, eight were White and 85 were Black (88%), as shown in Figure 9. Women in mining are largely represented by black females which is confirmed by Pretorius (2016), who stated that “it should be noted that black women are by far the majority of women mining, and this is statistically the case in South

Africa, based on racial composition and socio-economic distribution of the country”.

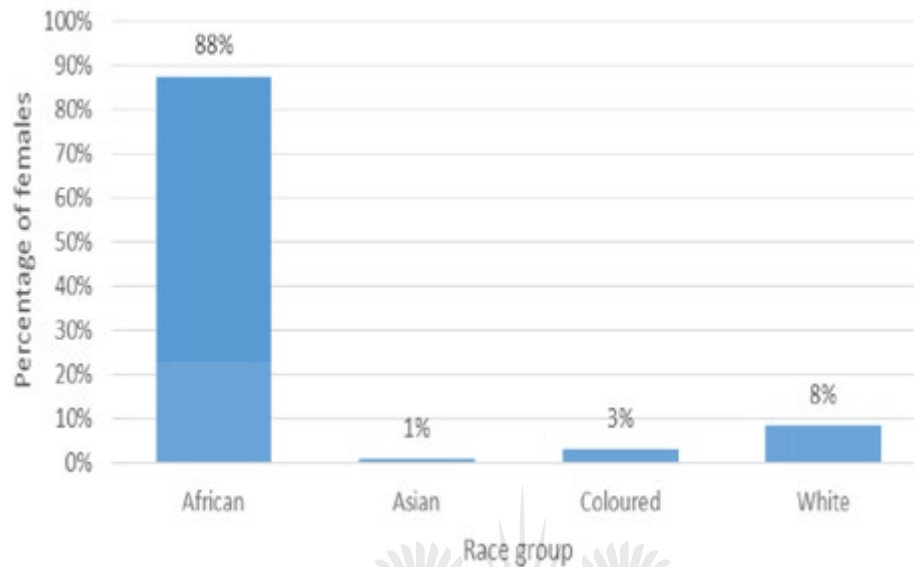


Figure 9: Race distribution

#### 4.2.3 Work experience

The work experience of respondents was selected as a means to determine if the industry has responded to the call for a minimum target of 10% women in mining as stipulated in the mining charter; (Mining Charter, 2002). The results are shown in Table 6.

Table 6: Work experience

YEARS OF SERVICE	FREQUENCY	PERCENTAGE (%)
Less than 1 year	5	5.15
1 – 3	32	32.99
4 – 7	25	25.77
8 – 11	25	25.77
12 or more	10	10.31

<b>TOTAL</b>	<b>97</b>	<b>100.00</b>
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Based on the questionnaire, it is notable that 64% of the respondents have been on the mines for seven or fewer years. This indicates that most companies started employing women on the mines much later than what the government had stipulated in the Mining Charter's 2002 targets for women in mining (10%). Only 10% respondents have been employed in the mines for longer than 12 years.

The data suggests that the drive to employ women in the coal mining industry commence in earnest around 2005, three years after the enactment of the Mining Charter. 90% of the respondents commenced employment post-2005.

#### **4.2.4 Number of dependents**

Of the total respondents, 19% have no direct dependents i.e. no children that they support directly, 71% have between one and three dependents, 6% have between four and six dependents and the other 3% have 7 or more dependents (Figure 10). Women who have fewer children realise an increase in their standard of living as confirmed by Shenk (2013), where she states "... that rising costs of children and higher payoffs to investing in self and children reduce fertility".

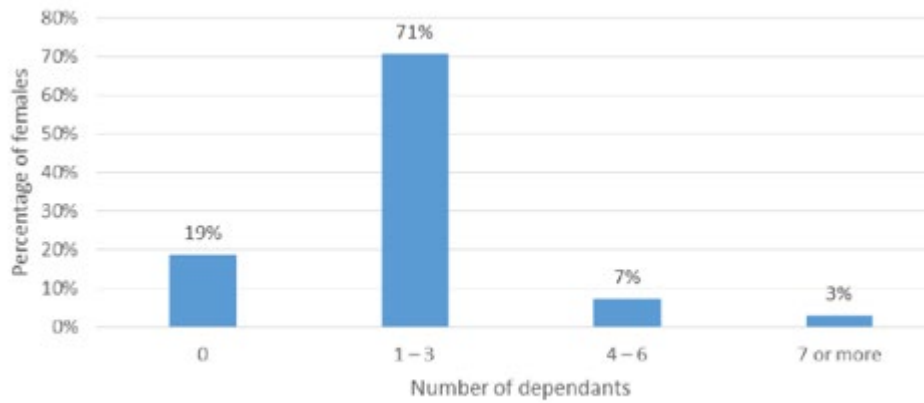


Figure 10: Number of dependents

Notably, the majority of women in mining have dependents, which demonstrates the extent that family/domestic pressures may have on women along with their work obligations. Working shifts, as most women in operations do, poses challenges in terms of bringing up children and create new family dynamics, for example, absent parenting.

#### 4.2.5 Dependent's schooling

As the former statesman, Nelson Mandela, once said, "Education is the Most Powerful Weapon to Change the World" (Schworm, 2013). The fruit of employment is evident in the pie chart shown in Figure 11. The more kids that are in schools have a better chance of survival in a country where unemployment rates are high due to low educational levels.

Figure 11 indicates that more than half (57%) of the respondents have their children in public schools. About a quarter of the respondents (24%) have dependents in private schools. The 19% of respondents indicated that their dependants are out of school. The deduction is that the dependants are either at a tertiary institution or looking for employment, but have completed their matric.

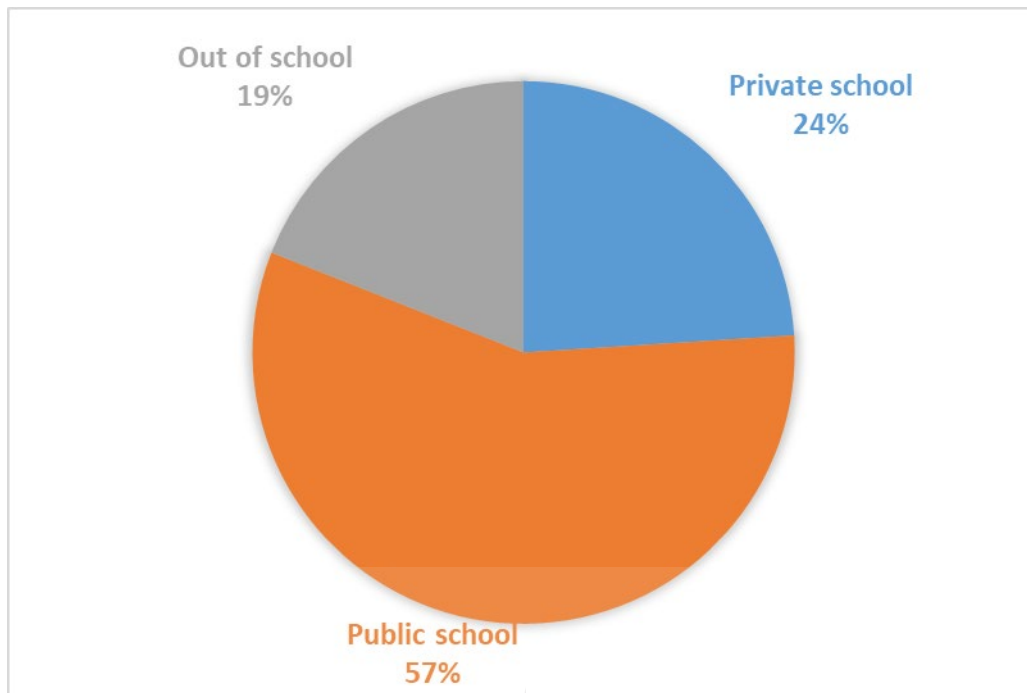


Figure 11: *Dependants schooling*

The respondents also place a premium on their own education, as can be seen in Table 7 in Section 4.2.6.

#### 4.2.6 Highest School Qualification

Table 7 represents the highest level of school education achieved by the respondents. Of the total respondents, 70% have acquired tertiary qualifications i.e. have obtained a diploma or degree. This makes the advancement of women much easier and assists new entrants to enter the mining industry.

For the 30% respondents that have matric or less, there is an informal obligation by the mining industry to assist these women to further their education. Workshop commentary indicated that these women feel left behind in terms of job advancement, as well as personal development. This category of women in mining requires further developmental consideration by companies. This form of assistance can come in a form of part-time or online

studies and can also be further enhanced by offering interest free loans to successful employees, i.e. employees that have successfully passed their study modules.

**Table 7: Highest school qualification**

<b>GRADE</b>	<b>FREQUENCY</b>	<b>PERCENTAGE (%)</b>
9 or less	3	3.09
10 – 12	26	26.80
12 + Diploma	32	32.99
12 + Degree	36	37.11
<b>TOTAL</b>	<b>97</b>	<b>100.00</b>

#### **4.2.7 Wealth acquired**

According to research from the University of Wollongong (2018), Australian National University (ANU) and the University of Technology Sydney (UTS), it was found that people born into low-income families do not easily move into higher-income bands later in life (Sciencedaily, 2018). This is the case for most women in mining due to being previously disadvantaged. Women of all races fall under the definition of Historically Disadvantaged South Africans (HDSA). Black women are the most disadvantaged of the races. According to Almquist (1975), “the black women in the labour force are disadvantaged because of their race”.

In terms of the mining pay structures, there is no difference between male and female employees. There are a minimum and maximum limit in a given pay



category. The only differentiator is the years of service but this would apply indiscriminately to both male and female employees. This is a standing agreement between the employers' and employees' representatives, under the auspices of the then Chamber of Mines (COM), now referred as the Minerals Council South Africa (MCSA).

The question asked to the participants was “do you own any of the following - a flat, a house, a car, both a car and a house/flat or none of the above? The question sought to determine what material acquisitions women in mining have, and the results are shown in Table 8 below,

Of the respondents, 54% own both a car and a house. This is a sign of a good investment mentality and independence, and diminishing reliance on public transport. This is somehow a contradiction to the Australian National University study mentioned earlier, because of the acquisitions that the women have made.

A question of whether these material objects are paid for was not asked but the assumption is that the women are credit-worthy and hence the banking institutions were able to grant them loans. This is also coupled to an element of affordability on the part of women.

**Table 8: Wealth acquired**

<b>WEALTH</b>	<b>FREQUENCY</b>	<b>PERCENTAGE (%)</b>
None	7	7.21
Car	23	23.71
House / Flat	15	15.46

Both Car & House/Flat	52	53.61
<b>TOTAL</b>	<b>97</b>	<b>100.00</b>

#### 4.2.8 Summary of personal data

Section A revealed the respondents' age distribution, racial group, work experience, number of dependents, dependents schooling, highest school qualification and ownership. Most of the respondents were 21 to 40 (79%), with 88% of the respondents black and have less than seven years' experience on the mines. The respondents believe in a better education for self and their dependents. 70% of the respondents have acquired a tertiary education, and 81% have their dependents in some form of formalised schooling system, which provides them with a solid foundation which could be used to assist women in mining in advancing their career in mining.

The data indicates that women in mining are having smaller families with 71% have fewer than three children. The research conducted by Sole et al., (2009) indicates that women in mining would rather delay having children than disrupt their career aspirations. This is further enhanced by Shenk's (2013) finding that "improvements in economic development, such as higher educational attainment, increasing employment in the formal labour market, and the shift away from agriculture, seem to have a doubly-powerful effect because they not only raise individuals' standards of living but also correlate to declining fertility rates, according to the results of our study".

### 4.3 Work Environment

The aim of this section was to investigate the work environment, looking at facilities that are provided for women in the workplace. In addition, this section reviews the communication styles and the applicability of the company values. Lastly, the author examines the perceived management and leadership styles found in the workplace.

#### 4.3.1 Change house facilities

The coal mining environment is generally dusty and dirty hence the need for protective equipment. Equally so, there is a need for a dedicated area where the women are allowed to change from their normal civilian clothes into the protective clothing and then be able to wash after they have performed their work.

The question and responses from the respondents regarding change house facilities are shown in Table 9.

*Table 9: Change house facilities provided*

Question Posed to Participants	Percentage (%) YES	Percentage (%) NO
Do you have changing houses at your work place?	92.7	7.3
Do men and women share the change houses?	4.2	95.8
Are the change houses adequate for the number of women on shift?	78.1	21.9

Do the change houses meet the women's needs, e.g. sanitary bins?	69.8	30.2
Are the change houses properly secured for women?	82.3	17.7

On the question on the availability of change houses, the majority of the respondents (93%) indicated that they have change houses but 7% of the mines are non-compliant. This is a contravention of the requirements of the Department of Labour, which states that the employer will provide changing facilities for employees after performing work in a dusty or harmful area, (DOL GNR,1988) Fine coal dust accumulating on dirty overalls that are taken home, can cause adverse health issues, especially on young kids. It is also very uncomfortable to be commuting in dirty clothes.

In the second question, on sharing facilities, 4% of respondents claim that they share change houses with male employees. This practice can facilitate other unsavoury behaviour, for example, sexual harassment. The sharing of change house facilities with male employees is also unacceptable especially if one notes that women have been allowed to work underground in the mining industry since 1996. Some 20 years later some women still do not have their own dedicated change houses.

The third question sought to test if the number of available facilities, particularly showering space, matches the number of women on shift. Nearly 22% of women feel that the facilities are not adequate. This causes the women to share showers, otherwise, those who are on lift clubs run a risk of

missing their transport if they do not share. Looking at the size of the showers in the change house, it is very uncomfortable and impractical for two women at the same time.

The fourth question intended to test the comfortability of the facilities provided for women in the workplace. Typical examples will be long mirrors, hair driers and sanitary bins in the change houses on the surface and the underground toilets. 30% of the respondents indicated that the facilities do not meet women's needs. Due to the state of the toilets underground, usually small and dirty, most respondents reported that, when they had their periods, it was very hard to change sanitary wear underground. Most respondents interviewed, indicated that they always wear double sanitary towels in order to prevent accidents. The state of the lavatories is not the only challenge these women face when they are menstruating.

"Traditional" men often do not understand the emotional roller coaster the women experience. These men also perceive these women as unclean, and they do not want to associate with them. Women also face challenges from traditional women who do not want to work with them if they have had a miscarriage (Benya, 2009).

The fifth question intends to test the security of the facilities on the mines. Following unfortunate incidents on the Platinum mines, where women were attacked in their change houses, it became crucial to ensure a heightened sense of security for the women.

Security of women in the workplace is of paramount importance. According to Montsho (2015), in an article in News24, there have been reports of

women being raped in change houses, on the mines (Montsho, 2015). Of the respondents, 82% felt that the facilities are secured for women. This is still not good enough, considering that there is still 18% of respondents who felt that the security of women is not up to standard.

Most companies have implemented biometric systems as access control to the change house facilities. The positioning of these facilities plays an important role, as hidden away facilities invite criminals. Adequate lighting of the facilities is equally an important consideration in regard to security (Ramokhothoane, 2018).

Some companies, e.g. Exxaro, also provide self-defence classes for women in mining. These will help women in compromised situations. Some companies also practice a buddy-buddy system, where women work in groups, so as to deter perpetrators (Colquhoun, n.d)

#### 4.3.2 Communication

The questions asked are aimed at identifying what communication styles are applied in the mine and how effective management messages are delivered. The use of foul language in the mines has been accepted and taken to signify the macho environment. Over the years, with the diversified workforce, this is no longer acceptable.

As can be seen in Figure 12, 53% of the respondents believe that open and honest communication does take place, even though there is 'rumour mongering' (35%). The 35% on rumour mongering cannot be ignored, as it can create an element of distrust within the organisations.

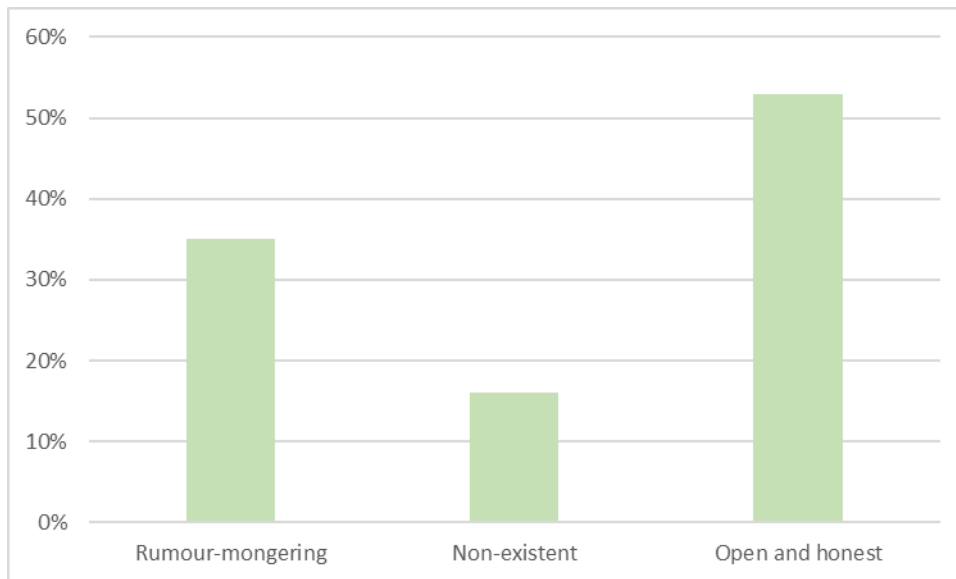


Figure 12: Communication Style

The second question that was asked was “how are management messages communicated?” Various communication media are available and in use on the mines, as is shown in Figure 13. The question sought to test the communication media used on the mines.

The most prevalent medium is through supervisors (67%) followed by emails (62%) and daily safety bulletins (DSB) (59%). This is pleasing in that supervisors take the lead to communicate with their teams. This also helps build cohesion between the supervisors and the employees. The daily safety bulletins communicate important management messages and would include safety performances per section, and production output per section.

The communication media does indicate that the women are informed and are aware of what is happening in their work environment. The use of emails (62%) is a good indicator of technology in use. It can, however, excludes women who do not have access to electronic media, and valuable messages can be lost.

Hard copies of important messages are made available at entrances of most working places, for individuals who do not have email access. Not one medium is sufficient but a combination of various media certainly enhances communication in general.

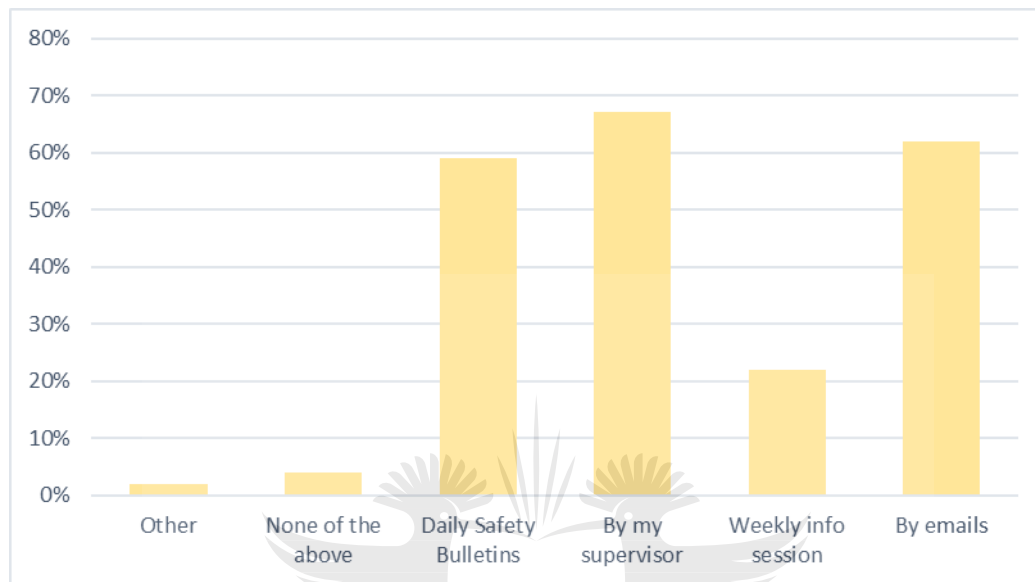
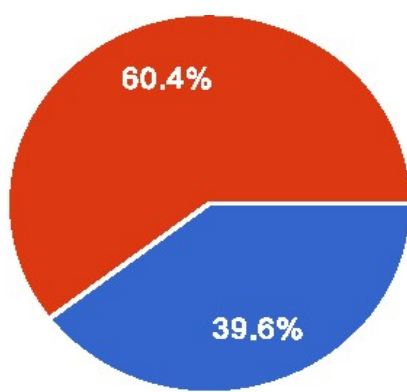


Figure 13: Communication media

The third question asked was “is the use of offensive language prevalent in your section/area?”. The question aimed to test the old adage of “Mining is a man’s world” and we use any language, as long as results are forthcoming. It is unfortunate that 40% of the respondents affirmed that this is still the situation (Figure 14). The majority (60%) though, feel that the situation has somewhat changed. It is being more than a decade and a half that the inclusion of women in the mining industry has been promulgated, but the environment has not been normalized to eradicate the use of foul language in the coal mines. This is

against the values or code of conduct in the mining industry.





Yes	39.6%
No	60.4%

Figure 14: Use of offensive language

### 4.3.3 Treatment

The introduction of women in mining in operations has necessitated adjustments in terms of engagements between the workforce. The male-only environment was transforming and new behaviours had to be adopted. The question that was asked was “are you treated with dignity and respect by fellow employees?”.

From Table 10, 66% of the respondents believe that they are treated with dignity and respect by their male counterparts. This is an important element for the acceptance and integration of women in the mines. For women to be able to function optimally, it is important that the environment is conducive for good performance.

Table 10: Treatment by fellow employees

<b>Are you treated w/ dignity &amp; respect</b>	<b>FREQUENCY</b>	<b>PERCENTAGE (%)</b>
Yes	64	65.98
No	21	21.65
Other	12	12.37
<b>TOTAL</b>	<b>97</b>	<b>100</b>

However, there remain some remnants of disrespect in the industry. The above results indicate room for improvement regarding establishing a more dignified work environment. Dignity and respect are core values in most companies and the results indicate that these important values are not abided by.

#### 4.3.4 Trust

Harmonious working environments are created when there is trust between supervisors and employees. The question asked was “do you feel trusted by your leaders/supervisors?”. This question aimed to test perceptions about the value of trust in the workplace. The results are shown in Table 11.

Table 11: Trust of Leaders

TRUST	FREQUENCY	PERCENTAGE (%)
Yes	31	31.96
No	23	23.71
Sometimes	43	44.33
<b>TOTAL</b>	<b>97</b>	<b>100</b>

24% of the respondents feel that they are not trusted by their leaders. The majority of the respondents 44%, said that they sometimes trust their leaders. This is an opportunity area where, with minimal interventions, a great working environment can be established. Employees that trust their leaders and feel trusted by their leaders, work more safely and are more productive. Team building exercises, indaba's or information sessions are good platforms to engage the employees and dismiss any notion that can be harboured by people who do not accept that the inclusion of women is a business imperative and not a compliance issue.

#### 4.3.5 How to make the workplace great

In order for employees to perform to their maximum level, the working environment has to be such that it is conducive to high performance. The question that was asked was "what do you think must be done to make your workplace great?" so as to facilitate excellent performance.

As can be seen in Figure 15, 75% of the respondents believe that, by teaching everybody UBUNTU, would really make the workplace great. Ubuntu is a Zulu

word that refers to compassion and humanity. In essence, it means, “I am who I am because we are”. If we share in the joy together, we shall grow together. If we share the pain together, it becomes bearable.

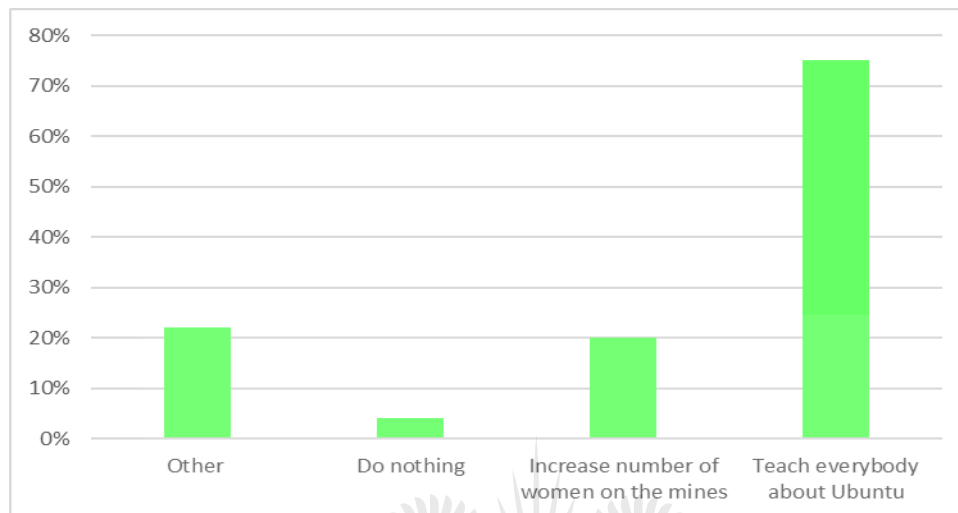


Figure 15: What will make your workplace great

The UBUNTU concept is a well understood and generally accepted way of conducting business on the mines. The first step in applying the Ubuntu principles, within a team concept, is to know each team member by their first names, where they come from, what their family backgrounds are. People want to be valued and cared for, and not be treated like tools of production.

At the start of a working shift, it is important to check the “heartbeat” of the team. This is done by doing a “check in”. Each team tells the rest of the team how he /she is feeling on the day. If a team member has a problem, collectively, as a team we help him /her “carry” the load.

20% of the respondents felt that increasing the number of women on the mines would make the workplace great. As the old saying goes, “there is power in

numbers”, the respondents felt that the challenges they were faced with, they could handle better if there is more of them in the workplace.

The “other” category includes “pay us more money, promote us, transfer my supervisor”. 22% of respondents felt that if the interpersonal relations with their supervisors were sorted out, a pay rise or promotion, the workplace would be great.

#### **4.4 Productivity**

This section aims to test the knowledge of the respondents in terms of the business drivers and their importance. As management thinker, Peter Drucker said, “You cannot manage what you cannot measure”, equally so, you cannot measure what you do not know.

Productivity refers to the ability to produce coal, within a specified time period and done safely. In terms of the research, knowing what has to be produced (key performance area), the weighting of different targets and the time in which the targets were achieved, is of paramount importance.

The following three questions relating to productivity were asked:

- Do you have any targets that you work towards?
- Do targets carry equal weight in terms of percentages?
- Did your team achieve the targets in the last month?

Table 12, below provides feedback to the three questions.

Table 12: Key performance areas

TARGETS	Percentage (%)	Percentage (%)
	YES	NO
Do you have targets?	92.7	7.3
Are targets equally important?	4.2	95.8
Did your team achieve their targets	78.1	21.9

As the old saying goes: “to measure is to know” (Thomson, 2010). It is important that employees know what the business drivers are and how they are measuring against them. It can be seen in Table 12, that nearly 93% of respondents know their targets and about 96% know that the targets do not carry equal weight in terms of percentages, in other words, some targets carry a higher weight than other targets.

A typical example is safety target will be higher than contamination. Contamination refers to the rocks and other impurities that are mined with the coal and do not have any economic value.

This is true in the sense that safety is a priority in most companies, and hence will carry a much heavier weight. A poor safety record will damage the company’s image, and hence management and leadership in mining companies will put a higher premium to safety. Most companies will start their daily business discussions with a dedicated slot for safety. The majority of the respondents (78%) indicated that they achieved their targets. It is important that

the teams meet their targets on time and all the time. A company that does not meet its target, runs a risk of bankruptcy.

#### 4.4.1 Work Targets

The three mining houses researched have a number of key performance indicators (KPI's). These areas are similar because they (the three companies) are in the same commodity and the mining methods are similar. The respondents mentioned the following as key targets: safety, delivery, costs, contamination, people management and fines.

Delivery refers to coal produced per shift or per day, safety refers to the measurement of harm or injuries to employees, costs refer to the money spent in producing the coal required, contamination is the unwanted material, for example, waste rock that is produced when the coal is cut, fines refers to the smaller particles, normally less than 6mm, that is produced during the coal cutting process and people management measures rate of absenteeism, training requirements and interaction between employees. The question that was asked relating to the key performance areas, was "how many targets are there in your work area?"

The question aimed to test the knowledge of the business drivers and the number of key performance areas each respondent had. Figure 16 indicates the number of key performance areas that the respondents said they have in the work areas.

5% of respondents indicated that they have only one KPA, 9% of respondents said they have two KPA's, 14% said they have three KPA's, 19% said they have

four KPA's, 24% said they have five KPA's and 29% of respondents said they have six KPA's.

These key performance areas help to focus the energy of the employees and assists in achieving the profitability of the operations.

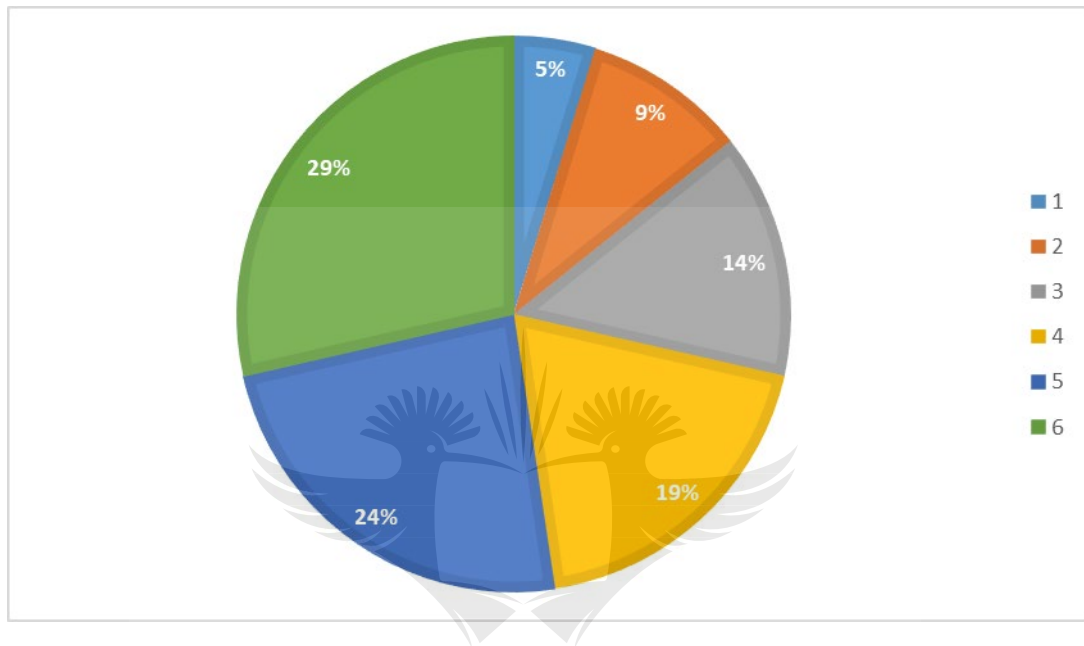


Figure 16: Number of performance work areas

The difference between the number of KPA's that the respondents indicated, is as a result of a cross-spread of the respondents. The respondent categories ranged from machine operators up to management level.

#### 4.4.2 Importance of key performance indicators

Successful mining operations are run on the basis of having a balanced view. This view is expressed in ensuring that the KPI's are given a rating that will reflect the business aspirations, but in terms of execution, the KPI's need to be delivered on, as per the agreements. KPI's cannot be traded upon or swapped



around, as individuals in the business feel like, without the approval of the business owners or boards.

The question sought to test if equal ratings are given to all the work KPI's. The majority of respondents (83%), as can be seen in Figure 17, indicated that the targets are equally important. This dispels the notion that it is production at all costs. Thus, indicating that the respondents are more receptive to work targets and may not try to place one target over the goal of another.

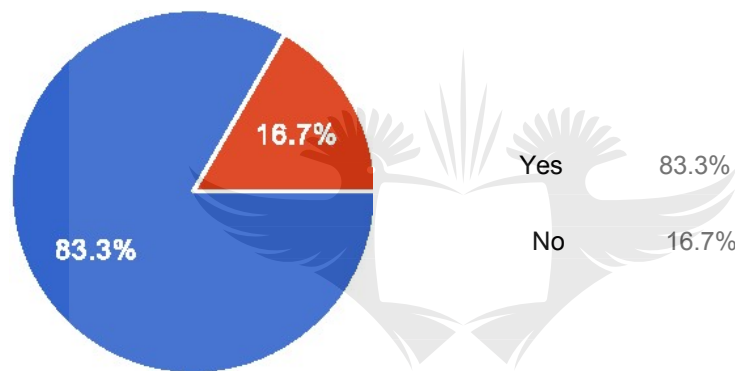


Figure 17: Are equal weighting given to all targets?

For a mining company to achieve its business objectives, it is important that the KPA's are met consistently. In the mining context, this achievement of KPA's on a monthly basis is very important. The question that was asked was "did you achieve the targets in the last 1 to 6 months' period"? The question sought to test the number of times in the past noticeable period did the team achieve the KPA's and what was the impact of having achieved the targets recently or not having achieved the targets at all.

One month means a one-month period since the team achieved its target, two months equates to two months since the team achieved the target and so on. Six months would mean that it was six months since the team achieved their set KPI's.

The majority of the respondents (34%), confirmed that the targets were last met six months prior to the survey, followed by one month (23%), and two months (15%).

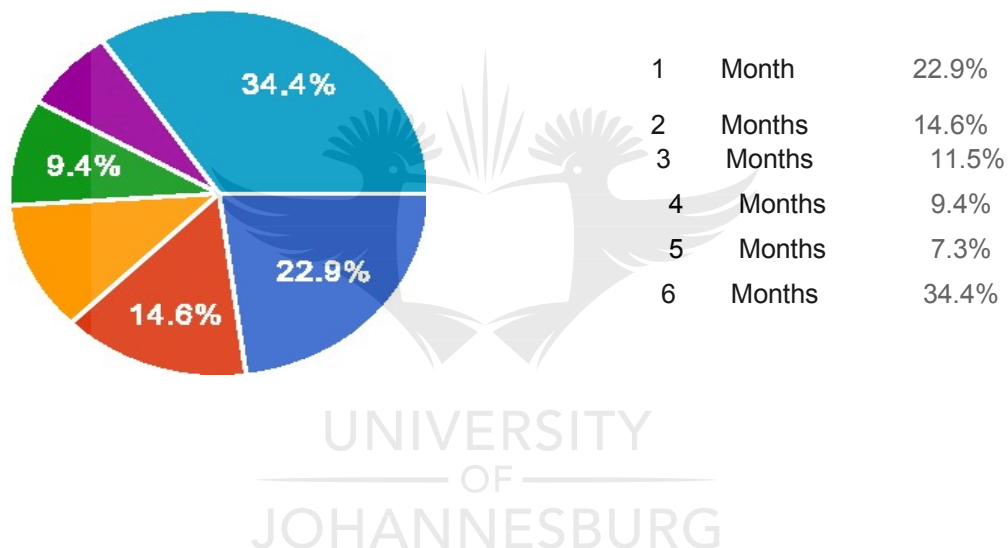


Figure 18: Achievement of working targets

#### 4.4.3 Bonus

The coal mining industry has traditionally been paying a form of an incentive scheme to the employees. The two generally accepted incentive methods are the annual incentive or the monthly production bonus scheme. The production bonus is paid out monthly, normally on the 15th of the following month of production whereas an incentive scheme is paid out annually, after the company's results have been audited, normally three months after the end of

the financial year. Both the methods are aligned to the key performance indicators of the business and are normally revised annually.

The annual incentive participants are generally employees in official bands, for example, the supervisors up to management level, whereas the monthly production bonus participants are traditional coalface workers, including first line supervisors.

The question that was asked was “in which incentive scheme do you partake?”. The question sought to determine the spread in terms of the different incentive schemes and more than half of the respondents, (57%) are on the production bonus scheme (Figure 19) and (43%) are in the annual incentive scheme.

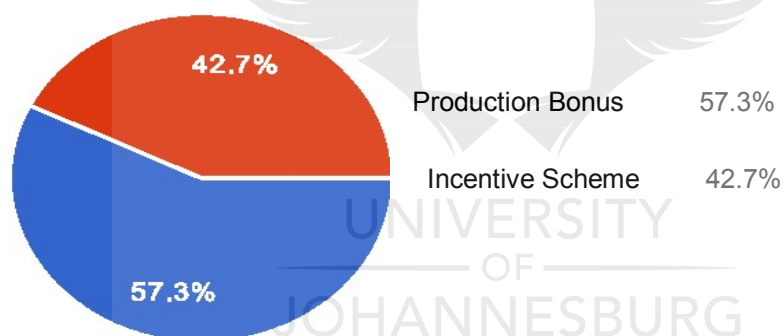


Figure 19: Involvement in production and incentive scheme

The question sought to test the knowledge around the different incentive schemes that are applicable to the various mines. The majority of the respondents (82%) answered in the positive (Figure 20), which supports performance, as individuals know what levers to pull in order to maximise earnings.

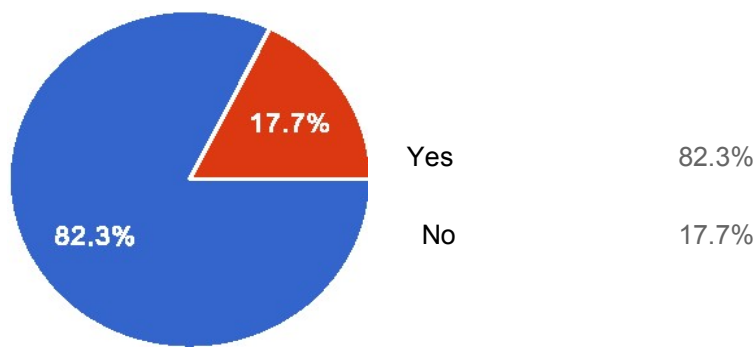


Figure 20: Knowledge of incentive schemes

The question sought to test the impact of the paying out periods of the different schemes, in relation to the line of sight rewards (Figure 21). Nearly half of the respondents (47%) receive their bonuses pay-out monthly. It has become tradition for most mining companies to pay production bonuses on the 15th of the following month. It is almost like people receive two salaries in a month. Of the respondents, 38% receive their pay outs annually, henceforth, they are on the incentive scheme. This group of respondents are mostly in middle to senior management positions

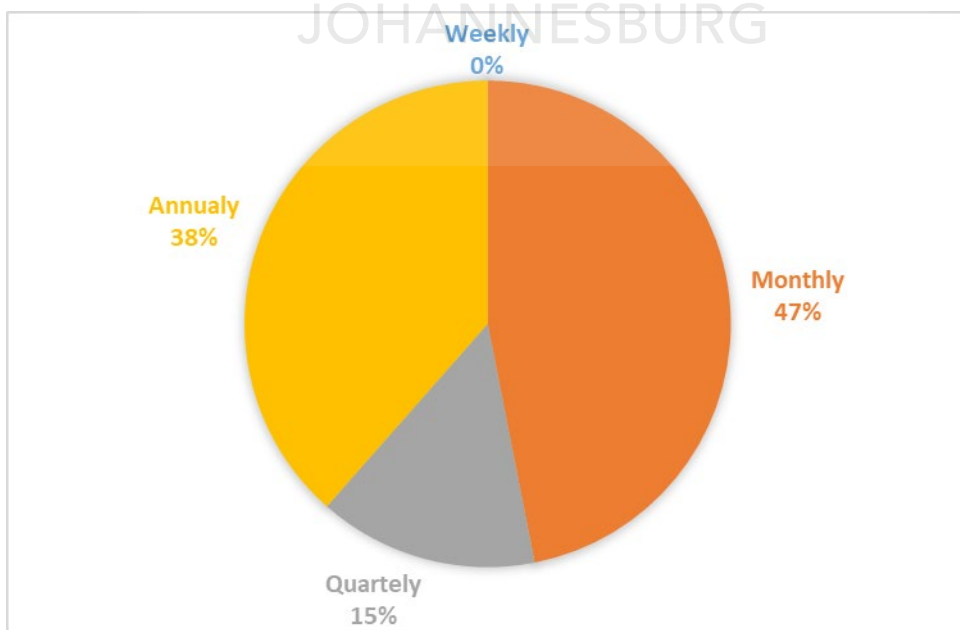


Figure 21: Payment of bonus

The fourth question asked was “how do you normally spend it (incentive or bonus?” The question sought to test the attitude towards spending when extra cash is available. The majority (81%) of the respondents spend their extra cash on household needs and investments. This shows a shift towards responsible expenditure and an investment mentality (Figure 22), instead of luxurious material consumables, like flashy clothes and expensive jewellery.

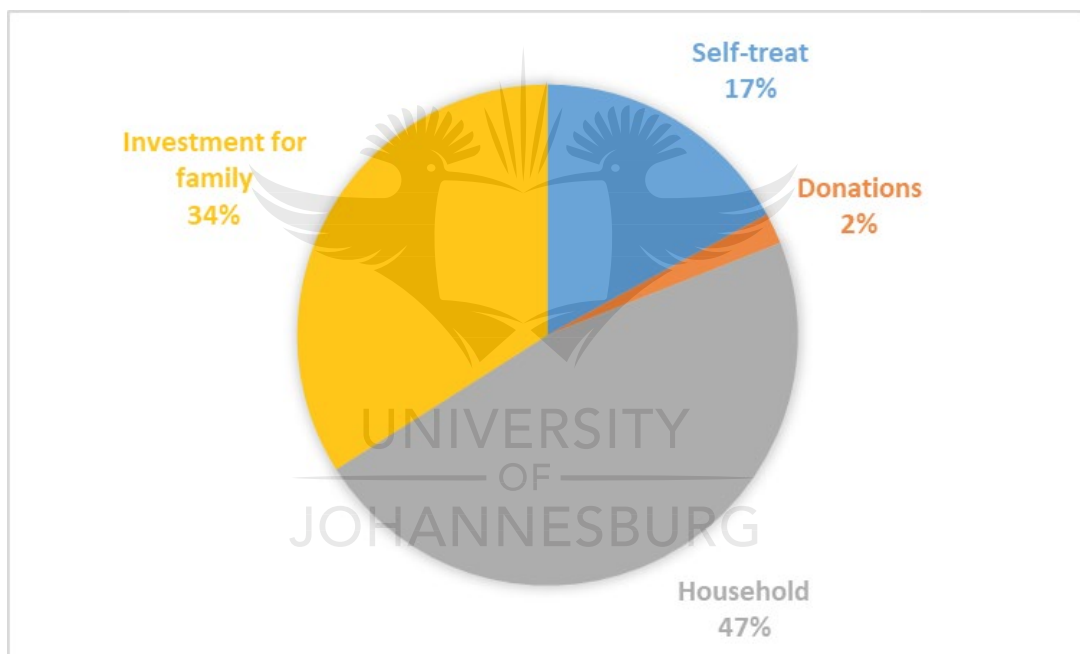
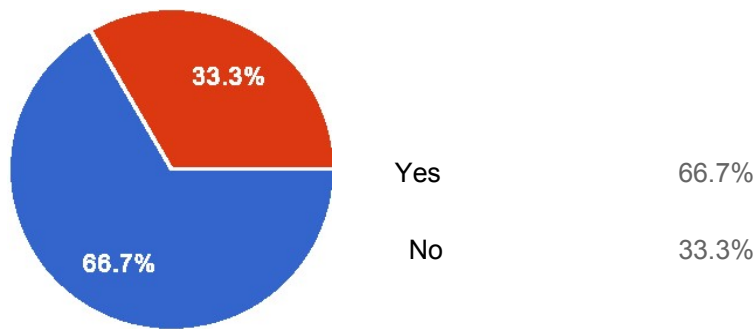


Figure 22: Spending bonus

The fifth question asked was “does the production bonus/incentive scheme make you perform more?” The question sought to determine the effectiveness, in terms of motivation to perform better, and 67% of respondents agree that either production bonus or incentive scheme motivate them to perform better (Figure 23).



**Figure 23: Bonus as a motivator**

## 4.5 Safety

### 4.5.1 Safety representatives

According to section 17 of the Mine Health and Safety Act, every employer who has 20 or more employees in his employment at any workplace, shall appoint in writing, a health and safety representative (OHSA, 1993). The employer is expected to do a risk assessment of the working areas and based on that, determine the number of working areas or sections. Each section shall have a safety representative, and generally, each working shift shall have one representative present at any one time of working.

The first question asked was “do you have a safety representative in your area?” The question sought to test the awareness and the attitude towards safety in the workplace and the majority (94%) has a safety representative in their workplace, as shown in Figure 24. The survey continued to inquire if the respondents knew the duties of the safety representative; 88% knew these duties while 12% did not know the duties of a safety representative.

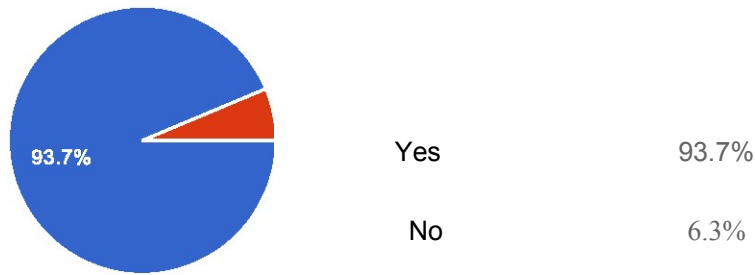


Figure 24: Safety representatives in section

#### 4.5.1 Safety briefings and training

According to section 10 of the Mine Health and Safety Act, and based on the risk assessment done, the employer shall provide training to the employees to assess the risk and hazards in the workplace. (MHSA, 1996). The benefit of providing training to employees is that they will be able to conduct risk assessments and make their working areas safe, without depending on safety representatives, safety officers or their supervisors showing them what to do.

The first question that was asked was “did you attend a safety briefing session in the last week/month?”. This question sought to test the involvement of the respondents in safety-related matters. 86% responded that they attended a

safety session in the previous week or month, as

can be seen in Figure 25.

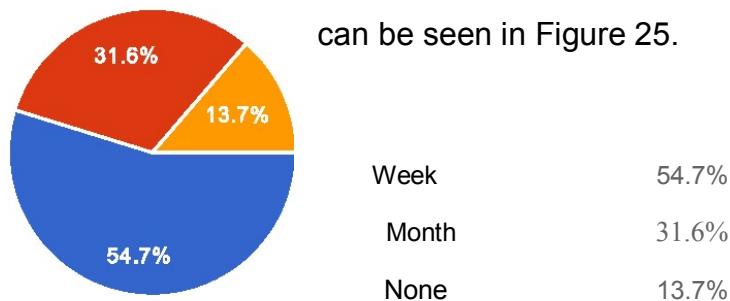


Figure 25: Safety briefings in section

The second question asked was “have you attended a safety course or training in the last month/ year?” As can be seen in Figure 26, 60% of the respondents attended a safety course in the previous month or year.

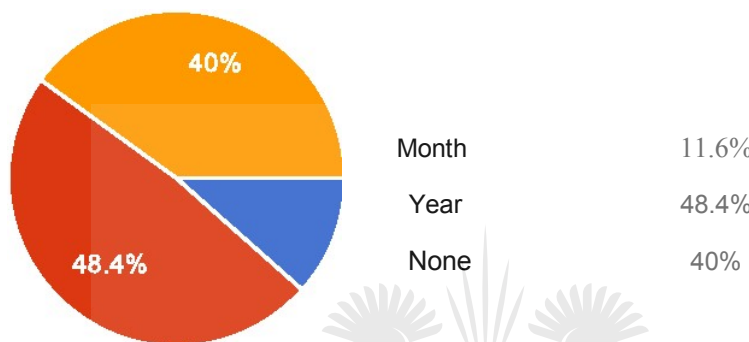


Figure 26: Safety Training

#### 4.5.2 Zero Harm

The number of accidents and injuries in the mining industry is alarming high. In the period January to November 2018, there were 81 fatalities in the whole industry, according to data from the Chamber of Mines. (Njini, 2017). Accidents and injuries have a negative impact on the morale of employees on the mine.

Most employees prefer to work for a safe company. A company perceived to be unsafe battle to attract the best talent. Numerous initiatives have been implemented to work towards Zero Harm, for example, the Chief Executive Officer (CEO)'s safety forum, where the industry's CEO's come together to map a safe way for the industry, also the monthly Department of Minerals' (DMR) tripartite forums, are hosted to ensure that the mining industry will achieve zero



harm. The Trade Unions are also putting pressure on management at various forums.

The question that was asked was “is zero harm possible in the workplace?”. This question regarding zero harm sought to test the belief of women in preventing accidents in the workplace. An overwhelming majority (98%) believes that zero harm is possible in the workplace (Figure 27).

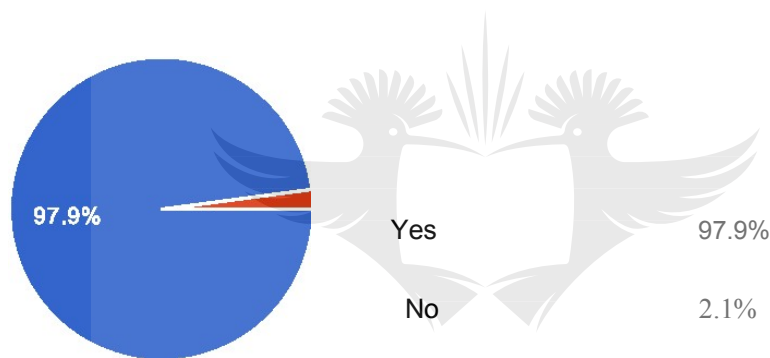
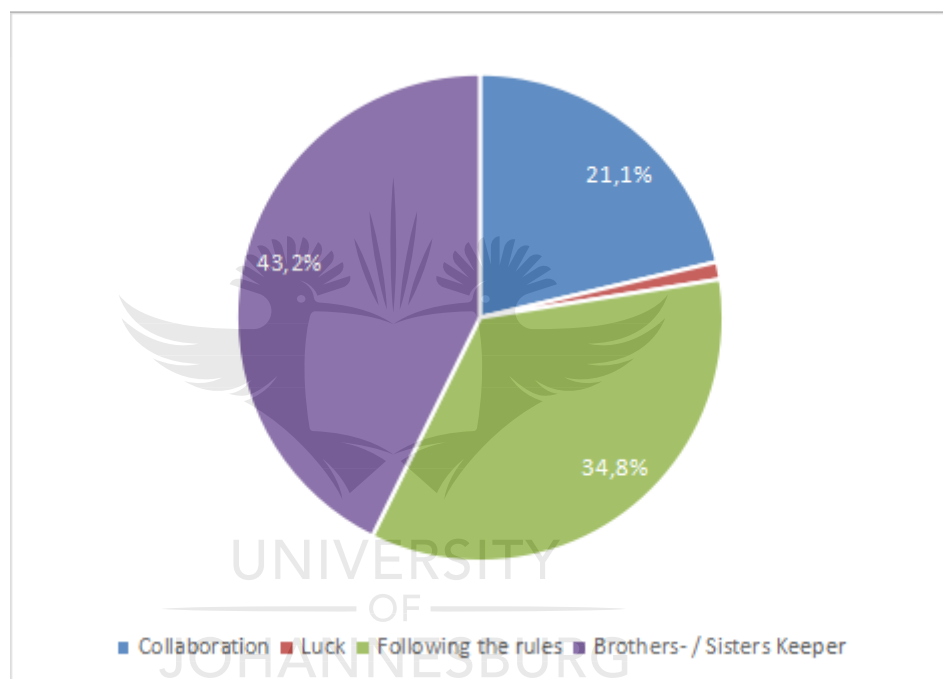


Figure 27: Is Zero Harm Possible in the Work Place?

The question that was asked is “what makes your team successful in terms of safety?” and the respondents had to choose between a number of options.

This question sought to test the knowledge of what brings about successful safety performance in the working environment. Since mining is a heavily regulated environment, following the rules is paramount to success. This is evident in the fact that 34.8% of the respondents agree with the statement, (following the rules), as can be seen in Figure 28. The respondents further believe that brother’s/sister’s keeper (43%) is also

contributing to their safety success. “Brother’s / sister’s keeper” is a concept where team members look after each at work. The premise is that together they can be safer at work. Collaboration, also known as, working and putting the team’s effort together was highlighted by 21% of respondents, as a contributor to a team’s safety success. Depending on luck to achieve good safety results is not believed to yield results.



**Figure 28: Reason for a work’s team safety success**

Good safety performance needs to be backed with the understanding of what has brought about the results. The results that are reported on, which are normally numbers do not reflect the underlying inputs and efforts that go into making the work environments safe.

The question that was asked was “do you believe that you need to work safely?”

The majority of respondents, 97%, believe that safety is a value, and hence the need to work safely. 2% of the respondents believed working safely was to earn bonus and 1% did not know the reason.

#### 4.5.3 Safety consciousness

In a study conducted amongst motorbike riders, it was reported that “female riders are more safety conscious and more interested in rest stops” (Hinchliffe, 2015). The researcher used the same argument in the mining environment. Women in mining were asked if they believed women were more safety conscious than men (Figure 29). This question was used to test the belief that women consider themselves more safety conscious than their male counterparts. An overwhelming majority (82%) responded in the affirmatively. The respondents attributed this to the fact that women are naturally caring, have a better concentration span and are less likely to take risks.

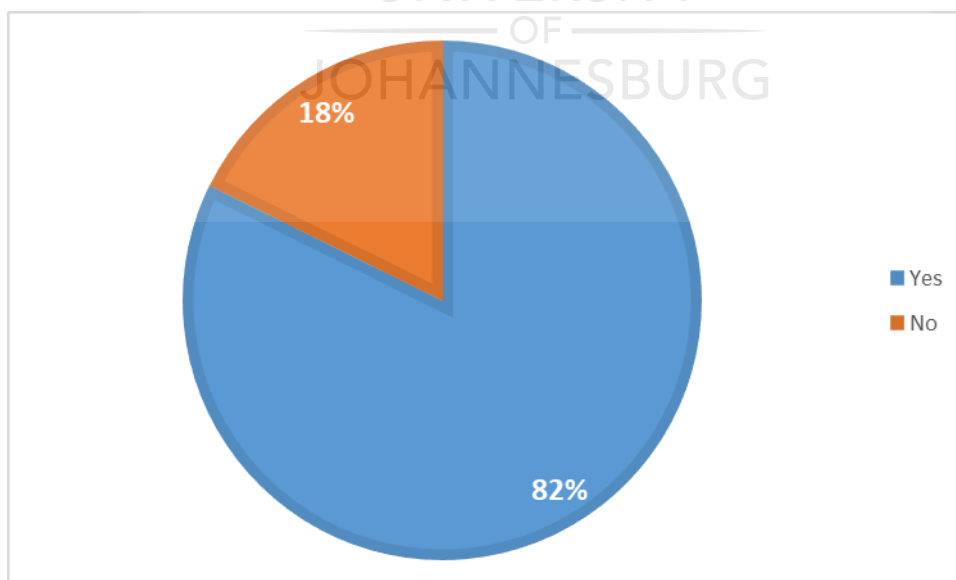


Figure 29: Are Women more safety conscious than men?

According to Anglo American Coal SA, (2016) more males are injured at work than women (Figure 30). Eighty-five per cent of accidents involve men. Supporting the premise that women take less chance at the workplace.

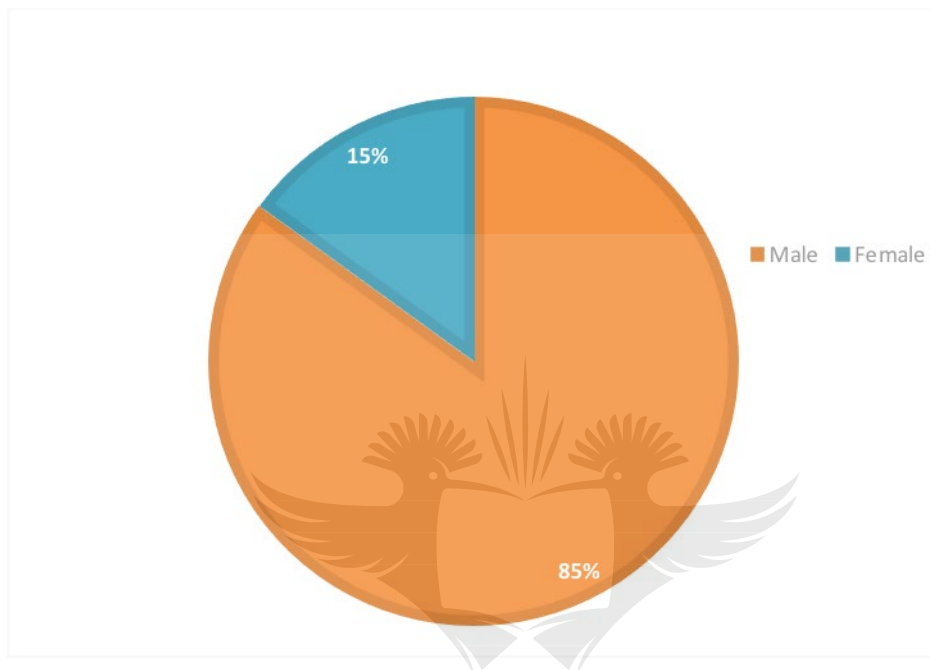


Figure 30: Male injuries vs Female injuries

The above findings concur with the results of the literature review (Section 2.7), which based on the DMR 2017/2018 Annual Report – Mine Health and Safety Inspectorate which indicated that women represent only 7% of the injuries and 3% of the fatalities. Women are involved in less incidents supporting the premise that women are more safety conscious and prone to take fewer risks.

#### 4.5.4 Safety bonus

There are differing views on paying out or incentivising for safety performance. Some people, especially in management positions hold a

strong view that safety achievements should not be incentivised. Women were asked if they felt a safety bonus should be paid. The aim of this question was to try to answer the question of money facilitating safe working. As can be seen in Figure 31, the majority of the respondents (74%) believe that a safety bonus should be paid, and 26% state that no bonus should be paid. Money as a motivator is viewed as having a temporary effect and when it is stopped been paid out, the results can be disastrous.

The South African trade unions have been fighting for closing the wage gap between the executives and the employees. The unions believe that employers are only interested in making profits at the expense of the safety of employees.

Through the Minerals Council of South Africa, the trade unions have been asserting for some time now and hence it has been included as a separate pillar, in terms of the Culture and Transformation Framework (CTF, 2011)



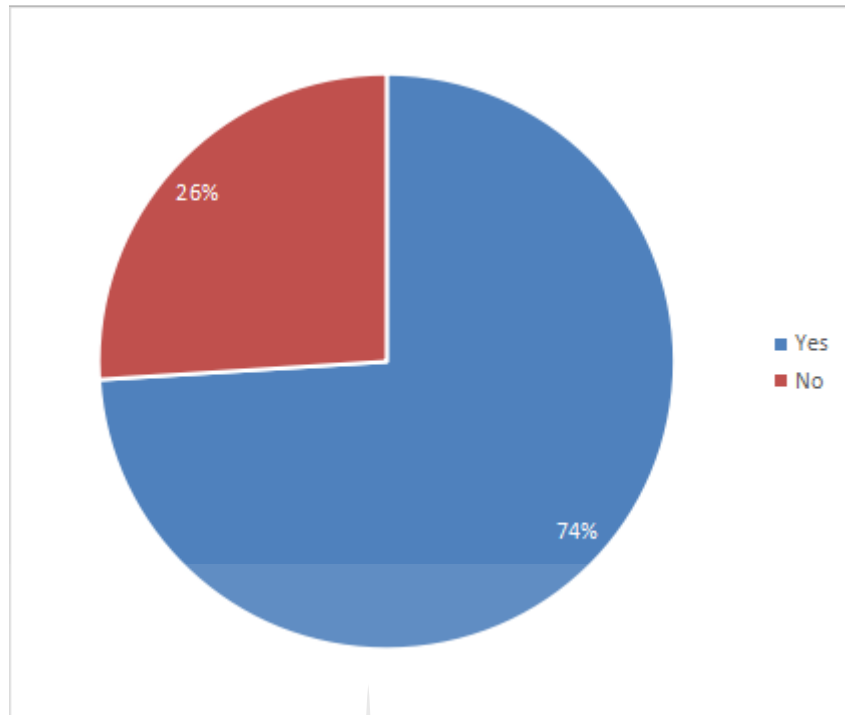


Figure 31: Do you believe that there should be a safety bonus?

It can be concluded that women in mining take safety seriously and take part in all safety-related issues. The research shows that women take fewer risks and are more safety conscious than their male counterparts, even though the safety programmes do not discriminate between men or women.

Women believe that safety is a value and zero harm is achievable. In order to lead in the space of safety, no one should rely on luck but put in a concerted effort to make the workplace safe.

Since the mining industry is so heavily regulated, there is certainly good collaboration and acceptance for the women in mining. Compliance to regulations is forcing companies to provide a safe working environment.

#### 4.6 Chapter summary

This chapter detailed the demographics and showed that 49% of the respondents are in the age group 31 to 40 and single. 88% are of African ethnicity.

The work environment is not completely conducive for women to work in. Change houses are not 100% compliant as per the legal requirement, as women indicated that they still shared change houses with men and the change house do not meet the women's needs. The use of foul language is still prevalent in the mines.

The business drivers, that is, safety and production, are well known and embraced.

The next chapter, (Chapter 5), focuses on the conclusions derived from the findings in Chapter 4, looking at the objective of the study.



## CHAPTER 5

## CONCLUSIONS

The mining industry, particularly the coal mining industry, has made great strides in working towards achieving mining charter requirements and in 2017, the employment of women in technical fields stood at 13%. As stated earlier, this thesis is not about the progress made towards achieving the numbers, but rather the integration of women in the industry vis-à-vis the ability of mining companies to provide an all-inclusive environment.

The following points highlight areas requiring further attention from the coal mining industry.

- Change house facilities

Although women have been recruited in the mines for more than two decades, some companies have not provided safe and adequate changing facilities for women in mining. Seven



per cent of the women reported not to have change house facilities while a further 4% of the women respondents claimed that they share facilities with men. Provision of suitable facilities is an essential requirement. The industry is expected to be 100% compliant. This is a contravention of the health requirements, as stipulated by the act.

Furthermore, the above is an indictment of the readiness of the mining industry to support women in mining. A further shocking finding is that at one mine women are required to share showers in order to ensure that they can catch transportation from the shaft.

The security of these facilities was highlighted as a concern with access to change houses not controlled, or controlled with a staff card rather than a more secure method such as biometrics. Eighteen percent (18%) of the respondents mentioned this fact. Internal security on the mines was highlighted as a concern, especially when women have to work in back areas or old workings.

- Toilets underground

The underground toilets are not fit for women needs, in terms of size, security, privacy, and hygienic conditions. The size refers to the height and width specifications of the toilets.

- Security

The security of women on the mines, both underground and on surface is still an issue. Majority of women (82%) indicated that their change houses are not secure, and the long duration taken to resolve security-related issues on the mines, is a concern. The incident that happened at Anglo American Platinum, in 2015, still lingers in the minds of many women.

- Pregnancy

Much literature has highlighted the failure of the mining industry to adequately deal with pregnancy issues, and women. This was also raised during the workshop at New Denmark colliery. The mining industry still lacks meaningful and structured programmes to accommodate women during pregnancy before they go on maternity leave. Equally so, there are no structured plans for the re-integration of the women after maternity leave. This is another gap identified in the coal mining industry.

- Personal Protective Equipment (PPE)

The issue of oversize gumboots and uncomfortable/unsuitable overalls is still prevalent to this day. These PPE have been designed with the male physique in mind and not conducive to women. Women complain that one-piece overalls require them

to nearly completely strip in order to use underground toilets. The use of twopiece overalls is still outstanding on many mines.

- Communication

The use of foul language has reduced over the years but has not entirely disappeared. Most women choose not to take offence to the use of foul language, but that should not be seen as a condonation.

Different communication platforms have been utilised by the mining companies to convey messages and a mutual trust relationship is being formed.

- Safety

With the selection criteria applied to the employment of personnel post 2005, new candidates have a higher level of education (70% of respondents had education levels above Matric), which results in women showing a high level of knowledge regarding safety initiatives on the mines (98% of the women respondents were of the opinion that zero harm is possible in the workplace). Women participate in safety training and meetings and are knowledgeable regarding the roles of safety representatives in their work areas. There is a high appreciation of the fact that safety is important as production and zero harm can be achieved.

- Productivity

Similar to safety, there is a high level of literacy amongst the respondents, which results in the respondents understanding and supporting the company's business drivers. The majority of the respondents knew what the key performance drivers are and knew that the key performance drivers are included in the monthly production bonus and the annual incentive schemes and remunerated similarly to their counterparts. Production and safety knowledge are also at a higher level.

- The reporting methods on the mines, be it the monthly or quarterly reviews, where only the numbers are discussed, is not highlighting the real issues affecting the women on the mines.

It is clear from the research that the mines in the Mpumalanga Coalfields have not fully integrated women into the business, as the basic requirements are still not in place.

## **CHAPTER 6: RECOMMENDATIONS**

In order for the coal mining industry to be completely ready for women in mining, the industry must address the issues highlighted in this thesis, noting that this thesis is not a comprehensive study of all the issues around the employment of women in the mining industry. The following recommendations are highlighted for consideration:

- Change house facilities

Companies must improve the changing facilities for women employed on the mine, as this is the right thing to do and in compliance with the requirements of the MHSA. This will have little or no significant cost implications, as there are cost-effective solutions to upgrade the changing facilities and can go a long way in improving the moral on the mine.

Change house facilities must be planned and constructed to meet planned intake of female employees. It is disappointing to still see these challenges that should have been addressed long time ago. Separate change house facilities for separate genders should be non-negotiable. A good guide from the Australians is to have one shower for every 10 employees, working in dusty areas. Security around the change house must be of high quality with sufficient lighting, security provided by female staffing, and biometric clocking to gain access to the change house.

- Underground toilets:

There are more hygienic and user-friendly toilets available in the market today. These units can be bought off the shelf and custom made to meet the clients' requirements. These units are lockable and hence address privacy and security issues. The positioning and the lighting of the toilets are also crucial in ensuring the safety of the women underground.

- Pregnancy and maternity procedures

Pregnant women are by law (MHSA, 1993) are not allowed to work underground. The law is not to discriminate against women, but due to the occupational health concerns around biological issues arising from pregnancy and interacting with workplace hazards and risks. The implication is that women lose some benefits, such as production bonus, when they are put in "accommodative" jobs for the period until they are on maternity leave. This period varies between two and seven months, and a loss of seven months production bonus is significant.

Designing an average annualized bonus payout system during this period will help the industry to attract and retain women. The issue of women postponing the starting of family's needs to be addressed, as women in mining would rather delay having children, rather than to disrupt their career aspirations.

The coal mining industry can further look at a re-integration system after maternity leave. Women who are breastfeeding are challenged in this regard and safe and secure childcare facilities close by to the mines will address this issue. These facilities can be managed by the local communities and also be contributing to the local development.

A “half-way house” type arrangement can be made, such as putting the women back in the accommodative jobs they had before going on maternity leave for a specified period or further training to upskill the women

Most women employed on the mines are of child-bearing age and some come from far rural areas where the extended families are not around to assist with caring for the babies and this necessitates the use of nannies or child care centres. Childcare creates a separation between mother and child, at a very early age.

These facilities established close to the mines will also cater for special help, such as a sick child, when the mother is underground. The current arrangements are cutting any ties with the baby until the end of shift.

- Safety clothes and personal protective equipment (PPE)

A decade has passed since the Mining Charter targeted 10% of women being employed in the technical field of mining and women in the industry still complain of impractical protective

clothing, non-fitting safety belts and boots and other issues.

The mining industry needs to design and supply fit for purpose protective clothing for women, for example, two-piece overall and PPE suitable for women.

Exxaro has already paved the way in this regard.

- Security

Stricter security measures are applied on the mines, but the risk posed by illegal entry into the mines remains. One would not want to reserve certain jobs for specific genders, but activities that involve working in remote areas need to be assessed carefully. Accessing old workings (back areas) is a problem, but with proper planning, these types of visits can be minimised. Careful planning and a permit to work in these remote areas are of utmost importance. Periodic visits and over-inspections by bigger management teams in these areas can help reduce the risk of harm to the women.

Panic buttons can be used in cases where women have to go to remote areas. Tracking technology on cap lamps is readily available and should be considered as a means to reduce the risk of assault or other hazards that women could be exposed to. Management should review standard operating procedure (SOP's) with the safety of women in mind. For example, as a general rule, women in supervisory positions should not be



allowed to access abandoned areas (back bye areas) by themselves.

- General recommendations

- Physical requirements

Address the physical nature of mining, for example, equipment and machinery and its appropriateness for women to operate such in the mining environment.

- Mine design and equipment

Coal mining has advanced in terms of mechanisation, but there is still a big opportunity in terms of automation. Cutting coal is no

small degree automated, but the conveyance behind a continuous miner can be automated. Trials are being conducted overseas for the automation of shuttle cars (SC) and with the insurgent of the 4th industrial revolution now is the ideal time to promote the advancement of automation in South Africa. Automation will enable women, and men for that matter, not to have to endure the bumpy and rough terrains, when conveying coal to the feeder breakers.

Carrying roof bolting materials to the machines is a very manual and cumbersome job. The original equipment

manufacturers (OEM) have developed pods, which are pre-loaded on the surface, to provide the necessary materials to the working sections. These pods are positioned behind the roof bolter (RB) and are winched up onto the machine. This eliminates the need to be carrying close on three tonnes of steel, up and down the machine and from the storage area.

What is further included on the roof bolting machine is the carousel, which helps to store up to 10 roof bolts at a time. The bolts are preloaded, which reduces the number of times that the operator has to handle the bolts.

Further work is been conducted around automatic resin injection. This initiative will help women in inserting resin into the drilled holes, without having to climb up and down on the machine, risking injuries. The system works on “shooting” the resin capsule into the hole and with small parachute-like stoppers prevent the resin from falling out the hole.

The ability to accelerate and use technology to ease the manual burden and physical challenges on women is an enabler to attract women to the mining industry.

The use of technology will enhance safety, as there will be minimal handling of bolts. The bumpy rides on shuttle

cars, which cause kidney and back problems, will be eradicated.

Technological advancement in the mines brings about higher productivity which in turn will open up more opportunities of employment in upstream markets. For example, more technical expertise will be required to support automation requiring a shift from shuttle drivers to other experts.

- Role of WIMSA

Women in Mining South Africa (WIMSA) was established in 2010, to create an empowering network to inspire, support and develop the progression of women working in the mining industry by providing access to education, skills development, mentorship and representation. This idea is noble, but the reality on the working face is different.

The conferences organisers seem to miss the reality of women working in the coal face. It seems the choice of speakers is always on the women “who have made it” but in reality, have little or no time spent in the coal face to appreciate the challenges that the women are faced with on a daily basis. More value can be achieved by inviting female shift bosses and mine captains to share their experiences and the discussions should focus on addressing these issues.

There is clear polarisation on the mines, in that the skilled level women do not bond with the first level supervisor women. Equally so, the first level supervisors do not bond with female middle managers. WIMSA can play a more strategic role by coming up with solutions and playing an oversight role in the implementation of the solutions.

- Study aids

Companies are further encouraged to implement study aids that will help women to advance in their chosen fields. This can be supported by company supported block studies or online studies that will offer flexibility in studying and still keep the families together. This type of help can come in a form of part-time or online studies and can also be further enhanced by offering interest-free loans to employees who successfully complete their studies.

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## **APPENDIX**

### **Appendix A**

LABOUR STATISTICS - MAIN MINING COMMODITY - COAL (MCSA 2018)



Year	Average number of employees      Earnings - R1 000      in service					
	Total	Males	Females	Total	Males	Females
1992	76 049	73 194	2 855	2 081 563	2 010 420	71 143
1993	61 438	59 152	2 286	1 883 545	1 821 312	62 232
1994	60 187	57 900	2 287	2 020 594	1 948 763	71 831
1995	62 064	59 715	2 349	2 370 974	2 288 345	82 629
1996	63 397	60 940	2 457	2 781 716	2 686 884	94 832
1997	61 607	59 182	2 425	3 204 101	3 094 864	109 237
1998	60 309	57 881	2 428	3 522 812	3 399 296	123 516
1999	55 378	53 317	2 061	3 831 148	3 698 025	133 123
2000	51 346	49 375	1 971	4 287 493	4 126 651	160 842
2001	50 740	48 801	1 939	4 451 185	4 293 204	157 981
2002	47 469	45 511	1 958	4 468 143	4 288 536	179 607
2003	47 239	45 125	2 114	5 481 105	5 251 724	229 381
2004	50 327	48 106	2 221	5 863 461	5 582 370	281 091
2005	56 971	54 501	2 470	6 481 823	6 155 962	325 861
2006	57 778	54 933	2 845	7 269 836	6 854 933	414 902
2007	60 439	56 582	3 857	8 692 014	8 107 180	584 834
2008	65 484	60 804	4 680	11 020 687	10 194 389	826 298
2009	70 791	65 227	5 564	12 815 351	11 717 347	1 098 004
2010	74 025	67 348	6 677	14 186 482	12 803 317	1 383 166
2011	78 579	71 542	7 037	16 068 639	14 496 896	1 571 743
2012	83 244	75 453	7 791	17 445 779	15 637 469	1 808 310
2013	87 768	79 020	8 748	18 933 574	16 841 395	2 092 179
2014	86 104	77 459	8 645	20 594 652	18 486 467	2 108 185
2015	77 747	69 031	8 715	19 932 153	17 697 759	2 234 394
2016	77 229	68 062	9 167	21 108 109	18 602 576	2 499 533
2017	82 248	72 115	10 132	22 415 573	19 653 974	2 761 599

96.25	3.75
96.28	3.72
96.2	3.8
96.22	3.78
96.12	3.88
96.06	3.94
95.97	4.03
96.28	3.72
96.16	3.84
96.18	3.82
95.88	4.12
95.52	4.48
95.59	4.41
95.66	4.34
95.08	4.92
93.62	6.38
92.85	7.15
92.14	7.86
90.98	9.02
91.04	8.96
90.64	9.36
90.03	9.97
89.96	10.04
88.79	11.21
88.13	11.87
87.68	12.32

## Appendix B

### Themes and Questions

The themes of the Research are structured as follows:

- **Section A : General and Demographic Information**
  - The Aim of this section is to collect information that will be used for determining the Geographical and

Demographic data and spread in the analysis for  
Statistical analysis

- **Section B: Work Environment**
  - The aim of this section is to look at the Work Environment, looking at Facilities that are provided for Women in the work place. Furthermore, we look at the communication styles and the applicability of the company values. Lastly, we look at the relationship between the individual and the leadership at the workplace
- **Section C: Productivity + Safety** ○ The section tests the knowledge of the individual with reference to Key Performance Areas, as applicable to the mine, and the impact that has on Safety

## Appendix C

Is the mining industry ready for women?  
DEMOGRAPHICS

\* Required

1 Age \*

20 years or less  
21 – 30 years

31 – 40 years  
41 – 50 years  
51 – 60 years  
61 years or more

2. Race \*

African  
Asian  
White  
Coloured

3. Marital status \*

Single  
Married  
Divorced

4. Number of dependents \*

0  
1 – 3  
4 – 6  
7 or more

5. Are your dependents at a \*

Pre-school / Crèche  
Public school  
Private school  
Tertiary  
Institution    Out  
of school

6. Highest Qualification \*

Grade 9 or less  
Grade 10 -12  
Grade 12 + Diploma  
Grade 12 + Degree

7. Do you plan to improve your qualifications in the following years \* 0 / None

1 – 3 years  
4 – 6 years  
7 or more years



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8. Do you own any of the following? \*

Flat

House

Car

Both a Car and a House / Flat

None of the above

9. If the answer to Q8 is “None”, do you plan to buy in the following number of years?

Less than 1 year

1 – 2 years

3 – 5 years

6 – 8 years

9 or more years

10. Years of service with the company \*

Less than 1 year

1 – 3 years

4 – 7 years

8 – 11years

12 or more years

11. Years of service in the section / area \*

Less than 1 year

1 – 3 years

4 – 7 years

8 – 11years

12 or more years

12. Current job in the section / area \*

Mining assistant

General worker

Shuttle Car Op

Roof bolt Op

CM Op

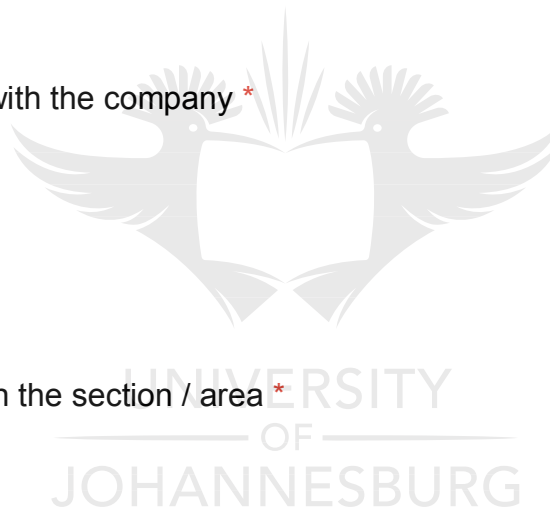
Miner / Face boss

Artisan

Supervisor

Foreman

Manager





Safety Officer

Survey

Assistant

Other :

13. Is this your first job position in your current section / area? \*

Yes

No

14. Do you believe that women can be promoted to higher managerial positions?

\*

Yes

No



15. How many women do you know in the Miner / Artisan position? \*

Your answer

16. How many women do you know in the Shift boss / Foreman position? \*

Your answer

17. How many women do you know in the Mine Overseer / Chief Foreman/ GES position? \*

Your answer

18. How many women do you know in the Manager position? \*

Your answer

19. How many promotional levels do you plan to move up in the next 5 years? \*

- 1
- 2
- 3
- 4
- None

20. Which of the following job categories are most preferred by women underground? \*

Mining assistant  
General worker  
Shuttle Car Op  
CM Op  
Roof bolt Op  
Artisan  
Technician  
Survey Assistant  
Planner Assistant  
Other:

21. Do you belong to any of the following clubs? \*

Book Reading club  
Stokvel  
Church  
committee  
Netball team  
Other:

22. Which position do you occupy in your club? \*

Ordinary member  
Secretary  
Treasurer  
Chairperson  
You can choose more than 1 option, where applicable

NEXT

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## **SECTION B**

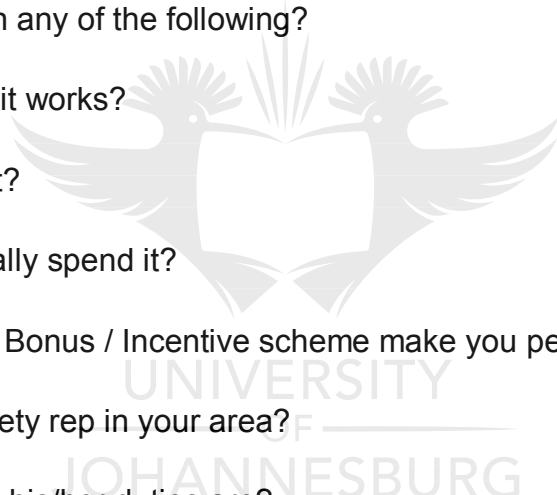
### **WORK ENVIRONMENT**

1. Do you have changing facilities at your work place?  
\*
2. Do men and women share the same facilities?  
\*
3. Are the facilities adequate for the number of women on shift?  
\*
4. Are the facilities adequate for women's needs?  
\*
5. Are the facilities secured for women?  
\*
6. How is the communication in your work area?  
\*
7. How are management messages communicated?  
\*
8. Are you treated with dignity and respect?  
\*
9. Is the use of Offensive language prevalent in your section / area?  
\*
10. What is the climate in your work environment?  
\*
11. Do you feel trusted by your leaders?  
\*
12. Do you trust your leaders?  
\*
13. Do you believe that your work environment is conducive for you to perform better?  
\*
14. What do you think must be done to make your work place "Great?"  
\*
15. What do you consider important in your life at work?

## SECTION C

### PRODUCTIVITY AND SAFETY

1. Do you have any targets that you work towards?  
\*
2. How many performance areas do you have targets on? (Choose only one answer)  
\*
3. Please list the performance target areas  
\*
4. Are the targets equally important?  
\*
5. What percentage is apportioned to each target? (List Target and a Percentage of 100%)  
\*
6. Did you achieve the targets in the last?  
\*
7. Do you take part in any of the following?  
\*
8. Do you know how it works?  
\*
9. When is it paid out?  
\*
10. How do you normally spend it?  
\*
11. Do the Production Bonus / Incentive scheme make you perform more?  
\*
12. Do you have a safety rep in your area?  
\*
13. Do you know what his/her duties are?  
\*
14. Did you attend a safety briefing session in the last week/ months?  
\*
15. Have you attended a safety course in the last month/ year?  
\*
16. Is Zero harm possible in the work place?  
\*
17. What is your team's safety success?  
\*
18. Why do you believe we need to work safely?  
\*
19. Are women more safety conscious than men?  
\*
20. If so, why  
\*
21. Do you have safety campaigns in your area?



\*

22. Who drives them?

\*

23. Do you believe that we should be paid safety bonus?

## Appendix D

----- Forwarded message -----

From: "Google Forms" <[nobody@google.com](mailto:nobody@google.com)>

Date: Sep 22, 2016 2:19 PM

Subject: Someone has responded to Is the coal mining industry ready for women?

To: <[moses.ramokhothane@gmail.com](mailto:moses.ramokhothane@gmail.com)>

Cc:



Hi,

Your form [Is the Coal Mining Industry ready for women](#) has a new response.

[Response 1](#)

[VIEW](#)  
[SUMMARY](#)

