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**THE UNINTENDED CONSEQUENCES AND SPATIAL IMPLICATIONS OF MINING
DOWNSCALING IN SOUTH AFRICA – A CASE OF MINING IN MERA FONG CITY
LOCAL MUNICIPALITY**

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DECLARATION

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A handwritten signature in black ink, appearing to read 'Anri de Lange', is written over a horizontal line.

Anri de Lange

February 2019

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All praises to my Heavenly Father, the source of my strength. With the constant reassurance: “Put God in charge of your work, then what you’ve planned will take place (Proverbs 16v3)”, I was able to complete this thesis.

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LIST OF ABBREVIATIONS

DEAT	- Department of Environmental Affairs and Tourism
DME	- Department of Energy
DMR	- Department of Mineral Resources
DPME	- Department of Performance Monitoring and Evaluation
ECA	- Environmental Conservation Act
EIA	- Environmental Impact Assessment
ICMM	- International Council on Mining & Metals
HDSA	- Historically disadvantaged South Africans
IDP	- Integrated Development Plan
GRDA	- Group for Regional Development Analysis
LED	- Local Economic Development
LUMS	- Land Use Management Schemes
MCLM	- Merafong City Local Municipality
MPRDA	- Mineral and Petroleum Resource Development Act

MPRRA	- Mineral Petroleum Resources Royalty Act
MSA	- Municipal Systems Act
NEMA	- National Environmental Management Act
NSDS	- National Spatial Development Strategy
PGDS	- Provincial Growth Strategy
PMG	- Platinum Group Metals
RSLPG	- Revised Social and Labour Plan Guidelines
SDF	- Spatial Development Framework
SALGA	- South African Local Government Association
SLP	- Social and Labour Plans

CHAPTER 1: SETTING THE SCENE

1.1 BACKGROUND AND PROBLEM STATEMENT

Mining closure and the downscaling of mining activities are not new and its occurrence and consequences have been internationally documented (Veiga, Scoble and McAllister, 2001; ICMM, 2008; Hilson, 2010; Winde and Stoch, 2010; Browne, Stehlik and Buckley, 2011; Lawrie, Tonts and Plummer, 2011; Morar, 2011; World Bank Group and International Finance Corporation, 2013; Mckenzie, Haslam Mckenzie and Hoath, 2014; Marais et al., 2005; Rixen and Blangy, 2016). In South Africa, mining downscaling has also been a reoccurring phenomenon since the 1990s and despite the plethora of literature on the impact of mine closures in South Africa, Rogerson (2012) still argues in Marais (2013) that literature on this topic remains limited. The Centre for Development Support (2005, p. 2) and Martinez-Fernandez et al. (2012, p. 246) confirm this statement and mention that the impact of mining closures in South Africa has been “under-researched” and “academic attention appears to have dwindled”.

Settlements that develop near mines influence a wide array of elements including environmental, social, economic and spatial elements. Environmental effects of mine closure have been well documented. Research, however, pays little attention to the social, economic and, more specifically, the spatial effect that mining downscaling have had on surrounding urban settlements (Marais and Nel, 2016; Emuze and Hauptfleisch, 2014).

In South Africa, mining has formed the “backbone” in an otherwise agriculturally-dominated economy (Winde & Stoch, 2010a), but mining is twisting the spatial spine of primary, secondary and rural settlements in the country. The negative spatial impact of mine closure is being wrongfully attributed to poor pro-active planning by local municipalities. Marais et al. (2017, p. 2) state that: “local role players find it extremely difficult, either to respond to mine downscaling or to articulate a planning approach that is not associated with growth”.

The unintended consequences of mine closures and mining downscaling have had a significant impact on South African settlements and despite available policies, legislation and frameworks, these negative impacts still reoccur. Literature has documented the social, environmental and economic impact; however, the spatial impact of mining downscaling remains undocumented. Mining legislation and spatial planning policies have not succeeded

CHAPTER 1: SETTING THE SCENE

in countering the negative effects of mining activities on South African settlements. Furthermore, only a limited amount of research exists in this respect.

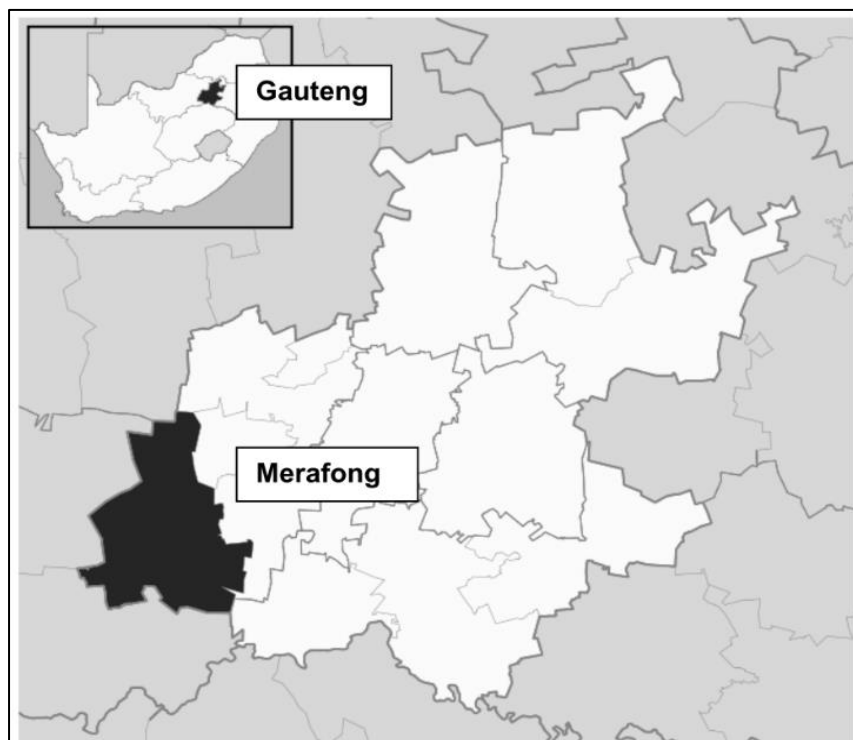


Figure 1.1: Regional context of Merafong City Local Municipality (Source: MCLM SDF)

1.2 AIM AND OBJECTIVES OF THE STUDY

The study aims to assess what the socio-economic and spatial implications of mining downscaling in the Merafong City Local Municipality are and determine how these challenges affect the implementation of current mining and spatial policies.

Considering the above aim, the study has the following objectives:

- Review international and national literature on the socio-economic and spatial consequences of mining downscaling and closure
- Review current South African legislation on planning, mining and mine closure
- Evaluate the socio-economic and spatial consequences of mine downscaling in the Merafong City Local Municipality, through the use of statistics and geographic data

1.3 DEFINITIONS

The study uses some important concepts. At this point, I am defining these concepts in the way I am using them in the study.

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- a. **Abandoned mine:** An abandoned mine, derelict mine or liquidated mine, is where a mine has ceased to operate, environmental management including rehabilitation and/or demolition have not been conducted to acceptable standards, and the holder has been liquidated, the mine has been abandoned or left without any responsible legal entity/person (Swart, 2003, p. 490). Abandoned mines often result in unsustainable settlements.
- b. **Closed mine:** Where a mine has been granted a closure certificate in terms of Section 12 of the Minerals Act, 1991 (Swart, 2003, p. 490). Once a mine has been granted a closure certificate, the company is responsible for environmental rehabilitation and actions stipulated in the mine's closure plan.
- c. **Densification:** A term used by planners, designers, developers and theorists to describe the increasing density of people living in an urban area. Densification is seen as a good spatial principle as it promotes liveability and walkability. A densified urban settlement also contributes to a more viable and cost-effective delivery of service infrastructure.
- d. **Economic diversification:** The process where an economy moves away from excessive dependence on a single dominant sector (Gylfason, 2016). A well-diversified economy is more robust and resistant to changing economic climates. To ensure sustainable post-mining settlements, economic diversification is critical.
- e. **Mine downscaling:** The process of reducing the operating expenditures of the mine. Mine downscaling is often the result of balancing the financial viability of a mine. Mine downscaling can include the closure of mine shafts, the reduction of employment and the introduction of alternative mining technologies.
- f. **Mining settlements:** The residential developments or built-up area near a mine, often developed after (or in conjunction with) the initiation of mining activities. Developments often include social facilities, such as schools and clinics. Mining settlements mainly develop to accommodate the employees near mining activity.
- g. **Mining community:** Refers to a community, which is located "adjacent to the mine and in which most of the employees of the mine live" (Johansson, Talman, Tykkylainen, & Eikeland, 1992, p. 57). Mining communities do not only consist of mine employees, but include all individuals that have settled in the area for business or social purposes.
- h. **Temporary closure:** When the mine is said to be in a state of care and maintenance and has stopped production for various technical, environmental, financial or labour-related reasons, but the holder has not declared their intent to finally close the mine (Swart, 2003, p. 490). Temporary closure often has an impact on the local economy as trade is halted, but the local municipality should still provide social services.

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1.4 METHODS

1.4.1. Research approach and research design

The research approach for this study will be a concurrent mixed-method design. I collected qualitative data and assessed and processed available quantitative data. Quantitative data is in the form of statistics and population trends and qualitative data is in the analysis of policy documents and the interviews conducted for the study (Johnson and Onwuegbuzie, 2004).

The research design focusses on Merafong City Local Municipality and consequently, I pursued the case study research strategy. Case study research has become increasingly popular as a research method and focusses on understanding the interchanging dynamics present in a single setting (Klein, 1988). Case study designs are known to incorporate both qualitative and quantitative data and this method research design is often used with the mixed-method research approach. The case study method relies on a great wealth of empirical materials as the case study is an “in-depth investigation” (Hamel, 1993, p. 45). A variety of information, statistics, opinions and spatial data were collected and analysed to understand mining in the Merafong City Local Municipality, in an attempt to answer the research question and determine the spatial implications of mining downscaling in the area.

1.4.2. Data collection strategy

This study uses secondary data, which can be defined in broad terms as the analysis of data collected by someone else. There are many advantages of the use of secondary data. The most obvious advantage is saving in expense and time. The researcher can spend the bulk of her/his time on data analysis as using secondary data does not require the time-consuming factor of collecting, cleaning and processing data. A further advantage of secondary data is the extent and variety of available data and different avenues of research can be followed to collect different types of data linking to the same topic (Boslaugh, 2007; Smith, 2008; Vartanian, 2011).

The most appropriate way to utilise secondary data is to seek data that is directly related to the research question (Boslaugh, 2007, p. 6). Consequently, for this study, I shall analyse the existing spatial and geographic data of the study area. These data sets include statistics and maps indicating formal and informal settlements in the area, the expansion thereof in the past 10 to 15 years, and patterns of densification and urban sprawl. I gathered the information by using tools such as GIS (MapAble) and Stats SA. The second set of secondary data includes the Spatial Development Framework (SDF) and the Integrated Development Framework (IDP) of the municipality.

CHAPTER 1: SETTING THE SCENE

Thirdly, I conducted in-depth qualitative (open-ended) interviews with key informants. I analysed the qualitative interviews using themes. The purpose of interviews is not to test a hypothesis to get a simple answer to a question, but rather understanding the “lived experience” (Seidman, 2006, p. 9). These interviews aimed to collect information on the current way in which spatial planning takes place in the area. Through these interviews, I tried to compare the viewpoints of the municipality, the mining company, private sector planners, and the residents of the mining settlements. I conducted eight interviews:

- Two with officials of the local authority (spatial planner & financial director of the Municipality)
- Two with mining companies (department responsible for social labour plans)
- Two planners/specialists in the area (private sector planners)
- Two business owners of the mining area (business owners)

I applied purposeful sampling. Purposeful sampling is well known in qualitative studies (specifically open-ended interviews, data collection strategies) as it involves the selection of individuals that are “especially knowledgeable about or experienced with a phenomenon of interest” (Palinkas et al, 2015, p. 3). Table 1.1 provides a detailed overview of the participants.

Table 1.1: Overview of interviewed participants

	<u>Category</u>	<u>Designation</u>
1	Municipality	Senior town planner – spatial planner at the municipality for five years
2	Municipality	Manager: Risk Management and acting as IDP manager for 12 years
3	Mining company	Vice-president: Sustainability at a mining company for three years
4	Mining company	Head of Properties at a mining company for 22 years
5	Area town planner	Professional town planner with knowledge of mining and downscaling in the Merafong Municipality.
6	Area town planner	Professional town planner with knowledge of mining and downscaling in small mining dependent settlements.
7	Business owner	Business owner of a company supplying products to the mining industry. Business has been operating in the area for 39 years.
8	Business owner	Business owner of a company supplying products to the mining industry. Business has been operating in the area for 40 years.

CHAPTER 1: SETTING THE SCENE

1.5 REASONS FOR SELECTING THE STUDY AREA

There are various motivations for the selection of the Merafong City Local Municipality as a case study. Firstly, the gold mining industry is the municipality's reliant economic sector, and alterations in this industry are easily noticeable. The municipality fits the profile of an area where mine downscaling in the mining sector has occurred and where the GDP of the mining sector has decreased significantly. As the Merafong Municipality developed mainly because of gold mining activities in the area, the influence downscaling of the mines has, can be well observed.

Secondly, the Carletonville area has a history of research (Tunce, 2016; van Eeden, 1997; Van Eeden, 1998). This research focussed on the rise, development and decline in mining activity of the area. However, no research is available on the spatial implication of mine downscaling in that region.

Thirdly, my current employer has executed construction and project management services for a mine in the Merafong district and has contacts with a mining company located in the area. This provided a gateway to interview not only the local municipality and town planners, but to get an informed opinion on the mining company's view on the effect of mine closures on the area.

1.6 OUTLINE OF STUDY

Considering the above background, the study is organised into five chapters (of which this chapter is the first). Chapter 2 (Literature on mine closures) focusses on national and international literature on mine closures and discusses the socio-economic and spatial consequences of mining downscaling and closure. The focus in Chapter 3 (Mining legislation) shifts towards a review of current South African legislation on planning, mining and mine closure. In Chapter 4 (Mining in Merafong: a case study), I discuss the socio-economic and spatial consequences of mine downscaling in the Merafong City Local Municipality, through the use of statistical and geographic data. The chapter considers the perspective of mining companies, the municipality, town planners and local business owners with regard to mine downscaling and the impacts thereof in the area. In the final chapter (Conclusion) I draw on some central themes from the whole study and indicated future research possibilities.

CHAPTER 2: LITERATURE ON MINE CLOSURES

“Over the last few years, mine closure has become one of the most difficult issues facing mining companies, mining communities, and mining countries around the world.” (World Bank Group & International Finance Corporation, 2002, p. 1).

2.1 INTRODUCTION

The fact that resources are finite is not a novel realisation. The unsustainable lifespan of mining towns and mining settlements, has been the focus of research. Despite the problems concerning mine closures, it should not be viewed as a “problem to be fixed”, but rather as the “natural conclusion of the process of exploiting a finite resource” or “as the final and logical outcome of a series of steps” leading to closure being seen as “a straightforward and anticipated event” (Tykkylainen & Bradbury, 1992, p. 22). The purpose of this chapter is thus two-fold. Firstly, the chapter aims to provide an international perspective on mine closure and to discuss international strategies on mine closure. Secondly, the chapter aims to understand the South African scenario of mine closures and the history that has led to the negative impacts of mine closures in the country.

This chapter focusses on the national and international problem of mine closures and their environmental, spatial and socio-economic impacts. The first section focusses on mine closure in the international context and highlights specific elements and strategies of different case studies. The section includes lessons from international best practises. The following section investigates mine closure in South Africa. The subsections discuss the history of gold-mining in South Africa, the reasons for the downscaling and closure of gold mines in South Africa, and the consequent impact of these closures.

2.2 MINE CLOSURE IN THE INTERNATIONAL CONTEXT

Mine downscaling and closure has been an international occurrence over the last few decades. The literature often highlights the similarities between mining settlements and the impact of (and the response to) closure. However, mine closures differ from one country to the next (Tykkylainen and Bradbury, 1992; Cristina Martinez-Fernandez and Wu, 2007). The boom-and-bust cycle is a known characteristic of the mining industry and de-industrialisation in response to the decline of mining economies, has been the reality for many mining

CHAPTER 2: LITERATURE ON MINE CLOSURES

communities. The downscaling of mining activities and closure of mines have consequences for the surrounding settlements. The dynamics of shrinking mining cities are poorly understood and not often discussed (Keyes, 1992; Nel and Binns, 2002; Cristina Martinez-Fernandez and Wu, 2007). Mine closure is more intricate than merely stopping production and decommissioning the mine (World Bank Group and International Finance Corporation, 2002). The aim of this section will be to draw reoccurring themes from international case studies, by investigating mining communities and their response to mine closure.

This chapter is based on case studies. Canada, specifically Canada West, is familiar with the boom-and-bust cycles with regard to the extraction industry. In Alberta and British Columbia (BC), two provinces in Western Canada, there are various examples of ghost towns that stemmed from mine closures (Keyes, 1992; Marais, McKenzie, et al., 2018; van Assche et al., 2016; Veiga et al., 2001). China's economic development is to a large extent dependent on resource-based cities, and many strategies have been formulated to reverse the decline of mining settlements (Andrews-Speed, Yang, Shen, & Cao, 2003; He, Lee, Zhou, & Wu, 2017; Zhang et al., 2011). The island of Thasos, Greece, has been famous for its mineral wealth, and the single industry economy started to decline as resource depletion became evident in the 1950s. The government (Greek military dictatorship) started to fund various strategies to counter the economic decline of the area (Caravelis and Ivy, 2001).

Based on the case mentioned above, the following section will highlight international strategies for mine closure. All strategies can be categorised under two main avenues: economic diversification, and planning and regulation.

2.2.1. Economic diversification

The need for economic diversification is one of the most central themes concerning mine closures in international literature. The main motivation for economic diversification comes from the realisation that mining communities will not survive closure if the economic base has not shifted away from the reliance on the mining industry. Often, local role players realise the importance of economic diversification too late. In 1982, the government of Canada deployed a task force to investigate the problems faced by mining communities. The task force concluded that diversification planning should be an integral part of the process of planning a new mine (Keyes, 1992, p. 41). The main aim of economic diversification in Canada is to decrease unemployment. This is done through the introduction of new industries or the expansion of existing industries (Page and Beshiri, 2003). There are many ways and

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strategies to achieve economic diversification, including horizontal diversification, vertical diversification and development of capacity and technology.

Horizontal diversification

Keyes (1992) highlights the concept of diversification in his work on mine closure in Canada. He argues that diversification of the economic base of mining settlements during the mining process can contribute to more sustainable communities after closure. Horizontal diversification involves the creation of an entirely different economic sector outside mining, such as manufacturing and forestry. Horizontal diversification is also seen as the preferred alternative, as it reduces the community's dependence on a single sector (Centre for Development Support (CDS), 2005).

Further reflecting on Canada, Van Assche (2016) mentions that infrastructure development is often a buffer for the boom-and-bust cycles of mining settlements. The development of a dam and hydro projects in Revelstoke, BC (Canada) is an example of horizontal diversification. The Island Copper Mine on Vancouver Island in Canada is another good example of economic diversification. The mining company purchased dock facilities and buildings for commercial production of crayfish and sturgeon on the island. This encouraged other sustainable local incentives and business opportunities in the tourism and fish processing industries (Randall & Ironside, 1996; Wasylycia-Leis, Fitzpatrick, & Fonseca, 2014).

Economic diversification in mining communities features prominently in China. The literature refers to the development of "substitute industries," rather than "horizontal diversification". A substitute industry develops a non-traditional industry, by adding capital and technology to local talent and knowledge. He et al. (2017, p. 76) mentions that 24 cities in China have been categorised as resource-depleted and started to experience urban shrinkages since 2004. The government realised the need to step in and facilitate economic restructuring in these cities.

Pingxiang's economy (a city in China) traditionally relied on coal mining, but a decline was unavoidable. The number of jobs provided by the industry in Pingxiang declined from 120,000 in 1995 to 26,000 in 2007 with the prediction of more closures in the decades to come. In 2007, the government implemented strategies of economic transformation of the city (Zhang et al., 2011). In just seven years the GDP increased from 31.6 billion yuan to 86.5 billion yuan. The Chinese government achieved the restructuring by focussing on the development of substitute industries. Firstly, the Pingxiang government transformed the firecracker industry

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by rebuilding 100 automatic production lines to mechanise the production process. Secondly, the government emphasised the development of a recycling economy. Thirdly, the government developed areas in the city as key tourism destinations, to the extent that the city received a reward for China's Best Leisure and Tourism City in 2013. Tourism generated 10 billion yuan of the city's revenue (He et al., 2017, p. 80; Zhang et al., 2011).

Thasos, Greece, is another case study where tourism-based horizontal diversification was a strategy funded by the government, to counter the negative impacts of mine closures. After World War I, the revitalisation of mines was unfeasible and the inhabitants were unable to develop a healthy economy. The Greek military dictatorship promoted a diversification strategy after the mine closure, which included the promotion of a tourist economy and the rebirth of the area as a tourist destination (Caravelis and Ivy, 2001).

A similar case study originates from Northwest Canada where the local government started acting proactively to diversify the economy 20 years before the closure of the Sullivan mine. The local government invested in tourism to attract people to the picturesque surroundings. Before closure, the mine also developed a ski hill and a golf course to support the tourism industry. After closure, the government bought these facilities creating a year-round resort area and attract major investment from a resort developer (World Bank Group & International Finance Corporation, 2002).

Vertical diversification

Vertical diversification is also possible and examples exist in Canada and China (Keyes, 1992). Keyes, (1992) and Hvidt (2013) define vertical diversification as additional activities related to the mining sector that broaden the community's economic base, such as processing, transportation and mining of other commodities. Vertical integration or "extended industries" refers to the expansion of the industry chain (He et al., 2017, p. 77). Daqing City in China, is classified as one of the most successful resource-based cities who managed to shift its economic structure to extended industries. The development of new technology and the shifting from deep processing to fine processing (thus adding value to the resource) assisted in vertical diversification. This shift in the economic structure was possible because of Daqing's unique policy to attract investment, which is one of the key catalysts for economic diversification (World Bank Group and International Finance Corporation, 2002; He et al., 2017).

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Capacity and technology

The creation of community capacity is a common international strategy to deal with mine closure (He et al., 2017; van Assche et al., 2016). Capacity can refer to a certain skill or an area of expertise that translates into a new development (and consequently new revenue stream) in an area. When a mine closes down, mining companies can no longer maintain services such as roads and transport, telecommunication and sanitation services. The World Bank Group (2002) states that one of the most significant approaches to counter the negative impact of mine closure is to build capacity within mining communities to maintain the essential services. At the Misima Mine in Papua New Guinea, the mining company collaborated with the local community and municipality, for more than five years to develop the capacity to manage social services after mine closure (Jackson, 2002; World Bank Group & International Finance Corporation, 2002).

He et al. (2017) highlights the necessity of innovation, technology and science during the downscaling process. Other researchers refer to this as “economic specialisation” (Page and Beshiri, 2003, p. 2). The mine closure strategy in Pingxiang City, China, emphasises the following concepts: the promotion of cooperation between industries and tertiary education facilities, the increased emphasis of the research economy, and the development of an information bank of technology. The emphasis on research, science, innovation and technology, thus played a crucial role in the transformation of the mining settlement.

A successful economic transformation is possible if a resource-based city managed to develop innovative ways to promote economic growth or adapt pro-actively to the shrinkage. Education and skills development play an integral part in achieving this (Andrews-Speed et al., 2003; He et al., 2017). The focus on education and skills was also central to the strategy followed in Alberta, Canada. The city is known as a driver of local innovation with a centred focus on local economic needs and the creation of “new knowledge”. In other mining settlements in Canada, elements of the strategy were also visible with the development of an agricultural innovation college in Olds and the innovation of a more efficient slaughterhouse for cattle in the Rockies (Van Assche et al., 2016, p. 175).

2.2.2. Planning and regulation

Internationally, governments have realised the importance of planning to close mines successfully. It is to these planning related issues that this section now turns.

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Land use planning

A planning-based approach (planning for specific land uses) is an important strategy to manage the impact of mine downscaling (Van Assche, 2016). Land use planning generally aims to see the organisation of space as the best way to promote development or, in another definition, “optimising land resource use for the benefit of society” (Andrews et al., 2011). Often governments assume that mineral extraction is not compatible with other land uses. However, mineral extraction is a temporary use of land and Andrews et al. (2011) advocate that mines and government should consider post-mining land use options. In areas where mining activities have taken place over an extended period, larger mining communities have developed, and the post-mining land use matter becomes a significant anthropological and socio-economic consideration (Kivinen, 2017).

In Finland, the assignment of post-mining land uses one of the most prominent post-mining strategies. Often mining land is redeveloped to accommodate aquaculture, aquatic sports and other recreational activities. In areas where the mine site was near population centres, the government earmarked land for industrial and infrastructural re-use (Kivinen, 2017). Two closed mines have been utilised for research and scientific studies related to secondary raw materials and mine water treatment (Heikkinen et al., 2008; Kivinen, 2017; Wolkersdorfer, Sartz, Sillanpää & Häkkinen, 2017). In Finland, the process of mine closure is under administrative regulation and control. Mining licences require closure management plans and “mine site reclamation to other uses”. This regulation ensures that mining companies consider uses that will sustain the socio-economic benefits of the mining operations (Kivinen, 2017, p. 1705).

The strategies used by Finland ensure that mining companies started to consider sustainable land use practices with the initiation of mining activities. Early attempts to deal with mine closure ensure appropriate planning for closure and help to create viable post-mining communities.

Formalisation and tax incentives

Researchers highlight the potential role of formalisation as a post-mining strategy. Often informal settlements develop around mining sites. However, Van Assche (2016, p. 147) states that informality “creates dead capital” and restricts the potential of a sustainable post-mining settlement. He further mentions that formality promotes stability and increases the likeliness of internal and external investment in an area. When a settlement must subsist after mine

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closure, (as stated earlier), entrepreneurship and development of new revenue streams are important. Formality increases a resident's opportunity to get a loan from the bank. Statistics indicate that businesses that start up on a bank loan, generate twice as much revenue after three years, than a start-up with no debt (Mandelbaum, 2018). Formalisation assists with post-closure survival.

The regulatory environment can promote entrepreneurship and investment (Mainhardt-Gibbs, 2003; Van Assche et al., 2016). Tax incentives and deregulation are also highlighted as strategies in the case of closure (Van Assche, 2016, p. 150). The strategy entails imposing tax incentives to bring companies to areas of declining economic activity, such as mining settlements. In Canada (Calgary, BC) taxes were lowered post mine closure in an attempt to promote economic development (Puppim de Oliveira & Ali, 2011).

Planning and classification of mining settlements

International literature emphasises that not all mine closures have the same impact on the surrounding communities. Not all mining communities are the same and mine downscaling and closure processes can consequently not be treated the same. Research mentions the importance of planning for closure, but planning for closure differs from mine to mine.

In the Nordic region, mining communities are defined based on the projected lifespan of the mining operation, the size of the mining community, their degree of isolation, and the diversification of their local labour market, as this would influence investment in the mining community (Coetzee & Soderbaum, 2015; Tykkylainen & Bradbury, 1992). The Group for Regional Development Analysis (GRDA) conducted a study on mining communities in an attempt to quantify and reduce the impact that mining closure had and continues to have, on the surrounding mining community. This report classifies mining communities by the size of local inhabitants¹; the degree of dependence (if the mine employed a tenth of the community, government classified the community as mining-dominated); and isolation from the mining community (if the mining community was 25km away from an alternative labour market, the mining community was seen as integrated, if not, government classified it as isolated) (Johansson et al., 1992). Therefore, the mine closure strategy in the Nordic region depended on the classification of the potential of the mining settlement. If the mining settlement did not

¹ Large mining communities contained between 16,000 and 32,000 inhabitants. Medium-sized mining communities contained between 1,000 and 8,500 inhabitants. Small mining communities contained between 200 and 900 inhabitants.

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pose the potential for future development, the closure of the mine would lead to the retraction of investment, the relocation of the workforce and the “shut-down” of the entire mining settlement.

Linking with the strategy mentioned above, policy measures and development plans can also promote shrinkage strategies (He et al., 2017; Hollander, Pallagst, Schwarz & Popper, 2009; Martinez-Fernandez, Audirac, Fol, & Cunningham-Sabot, 2012; Pallagst, 2012). There is a general standard among policymakers and planners, to always move towards development, progress, expansion and management of growth, with a general impression that all cities and towns can achieve growth. More often than not governments do not consider shrinkage strategies (Botha, 2013; Cristina Martinez-Fernandez & Wu, 2007). Pro-growth strategies can be detrimental to mining settlements. The pro-growth plan in shrinking mining towns has resulted in a positive impact on GDP, without having a positive impact on the current unemployment rate. In many resource-based cities, pro-growth policies (to counter shrinkage) have resulted in expanding sub-urban areas and the hollowing-out of the inner-city (doughnut effect) (Hollander et al., 2009, p. 11).

Many resource-based cities have implemented shrinking strategies, these include: Youngstown (USA), Parkstad Limburg (Netherlands) and Leipzig (Germany), all undertaking strategies to: demolish vacant buildings; prioritise city centres; revitalise neighbourhoods; rebuild green spaces to make the city eco-friendlier; improve family-work balance; support education, innovation and science; and promote job-creating incentives.

Planning with municipalities

International literature realises the important role both municipalities and mining companies play in the closure of a mine. During the downscaling and closure process, mining houses can no longer maintain the service infrastructure that has been constructed to run mining operations. However, simply “handing over” these services to the local government is rarely feasible. New approaches to solving this dilemma have surfaced in international literature. These approaches entail that mines are responsible to build capacity within the mining communities and local governments to be able to maintain services (ICMM, 2008; World Bank Group & International Finance Corporation, 2002, p. 4).

In Papua New Guinea (Misima mine), the mining company had been working with the local municipality and communities, to enable them to manage services after closure (Macdonald,

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McGuire, & Weston, 2006). In Romania, the mines (in collaboration with the municipalities) sold old mine buildings to entrepreneurs, with the main aim to promote the development of new business opportunities and consequently generate new employment. In Indonesia (Kelian gold mine) mining companies and government officials worked together to transfer mine infrastructure to the local community. The local municipality would then search for someone with the relevant technical, financial, managerial and I capabilities to operate the asset, and new economic and employment opportunities could be generated (World Bank Group & International Finance Corporation, 2002, pp. 3, 9).

2.2.3. Conclusion of lessons learned

International literature presents ample examples of mining closures and downscaling. Many countries have managed to close mines successfully. When considering the policies and strategies of mine closures in Canada, the Nordic Region, Australia, Papua New Guinea, Romania, China and Finland, various lessons can be learned and closure strategies commended. Keyes (1992, p. 43) captures this in the following words:

“Not all communities are going to survive – history is littered with too many examples of failed efforts – nor should they, if a reasonable effort at survival and diversification proves unfeasible.”

This section provided international case studies of strategies and policies that were implemented to counter the negative effects of mine closure. The two main pillars on which most successful mine closures rest, is economic diversification, and planning and regulation. Horizontal diversification is the development of economic activities in a different industry than the extraction industry, and vertical diversification is the extension of additional activities that relate to the mining sector. Another form of economic diversification is through the building of capacity and promotion of innovation.

As mentioned above, the second pillar of international mine closure strategies, is planning and regulation. Land use planning indicates the importance of planning and promoting certain land uses – post mine closure – to promote sustainable development. Formalisation and tax incentives are strategies observed in Canada and aim to promote internal and external investment in a mining settlement after mine closure. The classification of mining settlements indicates where there is potential for growth and development at the point of mine closure. The Nordic Countries classify these settlements to ensure that there will be a future return on investment in an area. Where mining settlements have no or little potential for sustainable

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existence post mine closure, the government retracts investment, relocates the workforce and “shuts down” the mining community. In the USA (Youngstown), Netherlands and Germany these shrinkage strategies have also been evident. Finally, planning with municipalities has been seen as an important mine closure strategy. In Papua New Guinea, Romania and Indonesia, mining companies liaised with local municipalities to ensure the sustainability of the mining community once the mining companies had retracted from the area. Table 2.1 summarises these strategies and examples.

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Table 2.1: Summary of international closure strategies and implementation

<u>Strategy pillar</u>	<u>Closure strategy</u>	<u>Country</u>	<u>Strategy implementation</u>
Economic diversification	Horizontal diversification	Canada	Development of infrastructure to create “new” industries. Development of damming and hydro projects in Revelstoke.
Economic diversification	Horizontal diversification	Canada	Development of tourism potential of Sullivan Mine and surrounding area.
Economic diversification	Horizontal diversification	China	Development of firecracker industry in Pingxiang City. Focus on recycling economy and developing settlement as a tourist destination.
Economic diversification	Horizontal diversification	Greece	Development of tourism industry in Thasos after the collapse of the mining industry.
Economic diversification	Vertical diversification	China	Development of new technologies in Daqing to shift mining from deep processing to fine processing.
Economic diversification	Vertical diversification	Canada	Development of supporting infrastructure to service coal industry in British Columbia.
Economic diversification	Capacity and technology	Papua New Guinea	Mining company worked with local government and community for five years before closure to ensure capacity post mine closure.
Economic diversification	Capacity and technology	China	Development and promotion of tertiary industries and research economies to improve mining techniques and quality of mineral extraction.
Economic diversification	Capacity and technology	Canada	In the mining town of Alberta, the development of “new knowledge” was promoted.
Economic diversification	Capacity and technology	Canada	In Olds an agricultural college was developed to promote economic diversification.
Economic diversification	Capacity and technology	Canada	In the Rockies, more efficient slaughterhouses for cattle were developed to promote economic diversification.
Planning and regulation	Land use planning	Finland	Assignment of post-mining land uses. Post-mining sites in Finland redeveloped to accommodate purposes such as aquaculture, aquatic sports and other recreational uses.
Planning and regulation	Land use planning	Finland	In areas where the mined site was near population centres, land uses were earmarked for industrial and infrastructural re-use.
Planning and regulation	Formalisation & tax incentives	Canada	Taxes were lowered post mine closure in an attempt to promote economic development.
Planning and regulation	Planning and classification of mining settlements	Nordic Countries	Classify mining communities based on the lifespan of the mine, size of the mining community, and degree of isolation and diversification of the labour market.
Planning and regulation	Planning and classification of mining settlements	USA, Netherlands and Germany	Implementation of shrinkage strategies in mining settlements.
Planning and regulation	Planning with municipalities	Papua New Guinea	The mining company worked with the local municipality to promote capacity building.
Planning and regulation	Planning with municipalities	Romania	Municipalities sold old mining buildings to entrepreneurs with an aim to promote developments.
Planning and regulation	Planning with municipalities	Indonesia	Mining companies and local municipalities worked together to transfer mine infrastructure to the local community.

2.3 MINING AND MINE CLOSURE IN SOUTH AFRICA

Mining has played a dominant role in weaving South Africa's spatial, social, political and economic fabric over the last century. In her book, *Digging Deep: A History of Mining in South Africa* (2013, p. 72), Davenport states that the exploitation of gold, more than any other factor, has shaped the socio-economic and political history of South Africa. In 2017, the mining industry contributed to 6,8% of the country's GDP or an estimated R312bn real value. The mining industry employed 464,667 people and contributed to 1,4 million indirect jobs in 2017 (Chamber of Mines, 2017, p. 8).

However, the future of gold-mining in South Africa is gloomy. Statistics indicate that most available ore bodies are near depletion and gold mines struggle to remain viable. Most South African gold mines have started to downscale and prepare for closure since the early 1990s (Binns & Nel, 2001). This section discusses national mine closures by considering the history of gold-mining in South Africa, the reasons for downscaling, as well as the consequences of mine downscaling and closure.

2.3.1. The history of gold-mining in South Africa

The discovery and mining of the Witwatersrand Gold Field dominate the history of gold-mining in South Africa. However, Penning (1883) mentions that the exact history of gold-mining in the country is not easily traceable, as Portuguese pioneers and settlers mined for gold for more than 100 years before the 1886 discovery of gold in the Witwatersrand. The international gold craze started with the 1848 discovery of alluvial gold in California and soon gold fever was raging across the world. In South Africa, during this time, the Voortrekkers (Boers) settled to the north of the Vaal. The Voortrekkers (largely an agricultural community), were strongly opposed to any of their people searching for gold, as they knew that word of such a discovery would attract foreign adventurers, and eventually fortune-seekers from all over the world would flood their country.

The man who ignited interest in South Africa's goldfields in the late 1860s, is the German explorer Karl Gottlieb Mauch. Mauch was a passionate explorer, botanist and geologist with a desire to travel and explore Africa. He settled in South Africa in 1867 and went on a safari with the elephant hunter Hendry Hartley. It was during this safari where he discovered gold adjacent to the Tati River (Davenport, 2013, p. 79). Penning (1883, p. 2) mentions that by December 1867 rumours reached England that the German explorer had announced the discovery of an extensive and rich goldfield in the country. By April 1868, the first gold rush in South Africa was in full swing, with an influx of men from Britain, Germany, Australia and

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America. Unfortunately, those first prospectors had little luck and after seven weeks of hard labour in an old 35-foot shaft, they recovered no more than half an ounce of gold. Towards the end of 1868, the London and Limpopo Mining Company was formed in England. The company commenced mining at the Tati River Goldfield by mid-1869, with the hope to extract gold in the area with the use of mechanically operating crushing machinery. Gold in the area was far too sparse and irregularly distributed to be viable. Within a few months, the London and Limpopo Mining company (South Africa's first, and unsuccessful, mining company) abandoned its operations.

The Tati Goldfield left a large group of disappointed prospectors behind and by 1870 there were dozens of hopeful prospectors, scattered across the Northern and Eastern Transvaal, panning the riverbeds for gold. During the same time, local farmers began prospecting on their farms. Because of this, prospectors found a gold reef on the farm Eersteling, situated near the present-day town of Polokwane. The reef was christened Natalia Reef and the Marabastad Goldfield was proclaimed a public digging (Davenport, 2013, p. 81). News of the discovery spread like wildfire and dozens of prospectors congregated on Eersteling.

In 1872, Edward Button, who was mainly responsible for the gold discovery on Eersteling Farm, travelled back to England to raise capital to start the Transvaal Gold Mining Company. He raised £50,000 and purchased a 12-stamp battery and dressed stone to build a boiler house and chimney. Unfortunately, as with the London and Limpopo Mining Company, the Transvaal Gold Mining Company was not a great success, as the gold production was just enough to cover the cost of the 12-stamp battery.

However, despite the disappointment, Davenport (2013, p. 84) mentions that the significance of Eersteling in South Africa's history is three-fold. Firstly, the Transvaal Gold Mining Company was the first company to start operations and to produce some gold. Secondly, it compelled the Volksraad to produce the country's first mining legislation (Mineral Law Amendment Act 16, 1907) and finally, it lured more fortune hunters to the area, increasing the chances of finding the gold strike that would make South Africa famous (Van der Schyff, 2012).

A handful of prospectors continued to search for gold in the Transvaal area and in February 1873 they discovered payable gold. The year 1873, was "rich" with gold discoveries – the first discovery was at Spitskop Hill, the second discovery at Geelhoutboom (New Caledonia Goldfield) and the third at Pilgrim's Rest (Penning, 1883, p. 6). Collectively, more than 2,000 diggers were working on these three diggings from 1872 to 1876. By 1877 most alluvial gold

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had been extracted, and the goldfields went into a state of decline (Davenport, 2013, pp. 86, 95, 99).

In mid-1882, almost a decade after the 1873 findings, the first notable gold discovery was made on the farm Berlyn (called De Kaap Goldfield), in the uplands of the Drakensberg Mountains, followed by a gold-bearing quartz discovery in 1884, christened Barberton. Barberton quickly grew to be one of the most important mining towns in South Africa and within two years the town had ten hotels, five churches, three newspapers, a club and a number of government buildings, paving the way to the gold discovery that would shape South Africa's legacy as a gold-bearing country (Davenport, 2013, p. 105).

The Witwatersrand Rush and the golden years

Hendry Lewis was the first prospector to discover payable gold on the Witwatersrand on the farm Blaauwbank in the district of Rustenburg. Mining on this farm was not successful. However, it encouraged the search for gold on farms in the vicinity, which led to the discovery of gold on the farm Tweefontein. In 1884 prospectors formed the Tweefontein Company, imported a 10-stamp battery and recovered gold to the value of £750 in two months. The next great discovery in the Witwatersrand goldfields was on the farm Langlaagte. However, despite the fact that diggers were aware of the richness of gold on the farm, they could not begin mining without the government officially proclaiming the area a public digging, according to the terms stipulated in the Transvaal's Gold Law. On 20 September 1886, Johannesburg was proclaimed, catalysing the most lucrative gold mining industry the world has ever known (Harrington, Mcglashan and Chelkowska, 2004, p. 65; Davenport, 2013). Within 10 years (after the discovery), the Witwatersrand was labelled as the largest gold-producing region in the world (Harrison & Zack, 2012).

The growth of South Africa's gold mining sector was dominated, but not confined, by the Witwatersrand and gold production from De Kaap Goldfield and Pilgrim's Rest was functional. Over the next three decades after the initial discovery in 1886, the Witwatersrand gold mining industry experienced volatility. Uncertainty in the mining industry came in the form of the general strike by mineworkers and mine managers in 1913; the First World War in 1914; and the preclusion to sell gold on the open market. The First World War had a significant impact on the gold mining industry, as the British war effort required the country's gold to be sold directly to the Bank of England. The fixed gold price for five years ultimately meant that mines were forced to sell gold at a fixed rate that did not take escalating costs of supply and labour

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into account, consequently resulting in a reduction of profits. By 1919 the situation had deteriorated to the extent that three of the fourteen mines closed down.

The First World War had a momentous impact on Britain and the country was forced to officially abandon the gold standard at the end of 1919. The significant increase in premium and the ability to sell gold on the open market blew new life into the Witwatersrand mines. White workers received a 40% wage increase and black mineworkers received a rise of one penny, in an attempt to keep the rate of black unskilled workers low. The price of gold at this inflated level was not sustainable and from 1921 the gold price began to decrease steadily as a result of the post-war deflationary recession. In December 1921 the Chamber of Mines emphasised the need to reduce working costs on old mines in an official letter to the South African Industrial Federation. The Chamber of Mines suggested a three-fold plan: firstly, to reduce earnings of highly paid underground contractors; secondly, to limit job reservation for white workers in semi-skilled activities and rather make use of experienced black workers in those occupations; and thirdly, alterations to the underground working system (Davenport, 2013).

The suggestions from the Chamber of Mines resulted in one of the most debilitating strikes in South Africa's history, which resulted in a loss of annual gold production (Davenport, 2013). The state brutally suppressed the strike and strikers were compelled to return to work on the terms mentioned above of the Chamber of Mines. The gold mines and the economy grew rapidly and recovered from the strike.

By 1923, 40 mines operated on the Rand and by 1929 only 29 mines were still in production (Davenport, 2013; Harrison & Zack, 2012). The initiation of the gold exploration programme in 1933 used the advantages of improved technology and financial backing, resulting in the discovery of new goldfields during the Second World War. South Africa was writing its history with the development of the Witwatersrand mining industry to the Far West Rand. Expansion of the industry was happening on a scale never before witnessed – within seven years, eleven new mines at the Witwatersrand Goldfields came into production.

The Witwatersrand was not South Africa's only golden egg – within the timeframe of three decades, four new goldfields developed: Wes Wits, Klerksdorp and Evander Goldfield as well as the Orange Free State Goldfields. The development of the Free State Goldfields was a remarkable achievement. In just ten years, the mining companies sunk and brought into production 13 deep-level mines. In addition to the mines in the Free State Goldfields, five mines were opened along the Wes Wits Line; four mines near Klerksdorp and three mines on

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the Evander Goldfield. (Davenport, 2013, pp. 305, 306, 329, 340; Harington et al., 2004, p. 67). We will return to this area again in Chapter 4.

Gold-mining, no longer South Africa's "gold mine"

Between the 1940s and 1970s, South Africa's gold production grew significantly, despite the closures of more than 30 mines along the East, Central and West Rand. The mines that were still in operation at the turn of the 19th century were large and profitable mines that were established on the newer found goldfields in the late 20th century and were dominated by a new generation of companies – AngloGold, Gold Fields Limited, Durban Roodepoort Deep Gold Limited and Harmony (Davenport, 2013). Gold-mining has for many years formed the industrial backbone of an agricultural-dominated economy in South Africa and was the main reason for rapid urbanisation and the development of infrastructure (roads, railways, water and electricity, educational and medical facilities) in the country (Nattrass, 1995; Winde and Stoch, 2010b).

The drastic decline in South Africa's gold mining sector from the 1980s onwards, initially, did not raise much alarm as had been the case in the 1920s, primarily because South Africa's economy was more diverse than 60 years earlier, and the mining sector had also become more diversified (Davenport, 2013, p. 349). The impact of the fall of the gold mining industry has become noteworthy. South Africa produced 87% less gold in 2015 than 35 years ago. In 2007 South Africa was the world's top gold producer, but the latest statistics indicate a recent fall to 6th place. Most gold mines in South Africa will be exhausted within the next 33 years and based on 2017 figures this would result in a loss of 122,200 jobs, R29,9bn in employee earnings and R0,9bn in royalties paid (Stats SAA, 2015; Chamber of Mines, 2017, p. 11).

In an attempt to paint a detailed picture of the impact and consequences of downscaling and closure of gold mines in South Africa, it is important to consider the reasons for downscaling and closure other than obvious exhaustion of resources.

2.3.2. Why do gold mines downscale or close in South Africa?

Mine downscaling is often a gradual process that leads to mining closure. During this time of "downscaling", mines cease certain operations at different points in time, based on its profitability. Winde and Stoch (2010, p. 72) mention that various reasons can influence the profitability of a mine.

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Marais (2013a) indicates that there were numerous factors at play, influencing the profitability of gold mines in South Africa. The late 1980s saw a drastic drop in gold price from \$900 per fine ounce to below \$300 per fine ounce. This drop in gold price initiated a downscaling process; a gold mine can operate at a high level of profitability in one year and the following year (while maintaining the same output and expenses) operate at a lower level of profitability (Crankshaw, 2002). Natrass (1995, p. 857) summarises this phenomenon as follows, “Gold-mining has long been the backbone of the South African economy . . . [but] rising costs, falling ore grades and a stagnant gold price, however, are steadily eroding the economic viability of the industry.”

The second factor that contribute to the profitability of a mine, is the availability of resources (in the case of gold mines, an ounce of gold per ton of rock mined). In Johannesburg, Central Rand’s mining production peaked in 1911; it’s gold accounted for 80% of the county’s gold output. In time, profitable mines were commissioned on the Far East Rand and Far West Rand and from 1923, these gold mines “eclipsed Central Rand”. With the gradual depletion of resources, the operation of Central Rand declined further between 1938 and 1949, accounting for a mere 34% of national production (Refer to Figure 1) (Harrison & Zack, 2012). The impact of this on the profitability of mining production was unavoidable. By the 1960s the average profitability per ton of rock mined for the Central Rand was only R1,92 versus R5,48 for the Far West Rand and R5,59 for the Free State. All the large mines operating in the Central Rand started to downscale and were shut down by the late 1970s (Harrison & Zack, 2012).

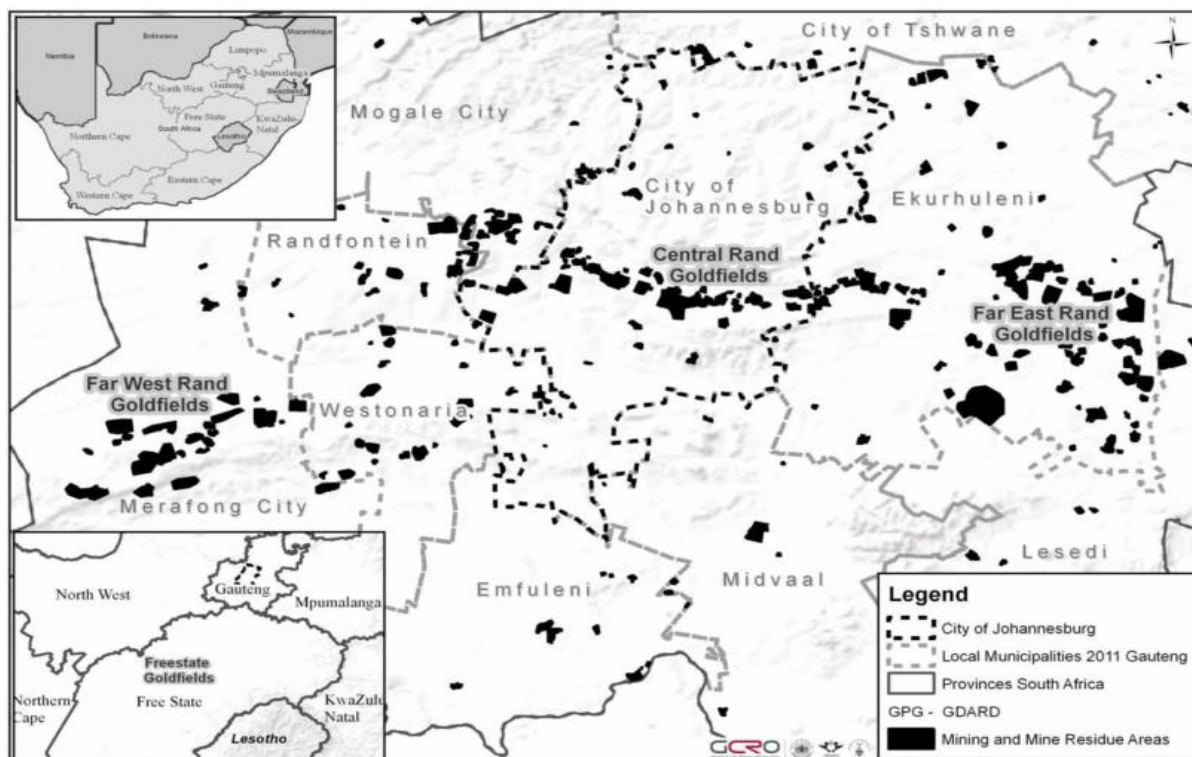


Figure 2.1: South Africa's goldfields (Source: Gauteng City Region Observatory)

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The third contributing factor was the fact that gold reefs in South Africa (more specifically in Witwatersrand) break the surface with small outcrops, but dip steeply into the earth, necessitating deep-level mining, and expensive extracting technologies (Crankshaw, 2002; Harrison & Zack, 2012; Winde & Stoch, 2010b). Gold had to be mined at ever deepening levels, requiring high-level skilled labour, which increased the labour expense on gold mines as well as costly machinery to extract gold at ever greater depths.

As previously mentioned, “labour” and “conflicts” on gold mines were synonyms. These conflicts did not only have a social implication but an economic implication as well. Harrison and Zack (2012, p. 561), state that the impacts of the labour force were “far-reaching”. Various factors influenced the fluctuation in the cost associated with labour. These factors included increased minimum wage, costs associated with labour strikes/inactivity of mining operations, increasing social responsibility of mining companies toward employees, and many more. The impact is apparent, as increased costs of operation are equal to a decrease in profitability, consequently resulting in the downscaling and closure of mines. Crankshaw (2002, p. 65), elaborates on this factor and highlights the growing influence of labour in decisions affecting mining operations. A large number of workers, low wages, poor living and working conditions, and an autocratic management style, characterised the mining industry. These factors lead to the first, and largest, a black independent trade union in South Africa. Black mineworkers founded the National Union of Mineworkers in 1982. In 1984, the National Union of Mineworkers had their first legal strike, followed by a strike in 1986. The decline in profit was countered, by a concurrent decline in employment in the South African gold mining industry as visible in figure 2. Labour unions continue to affect the profitability of modern-day mining operations, contributing to the fourth factor influencing profitability.

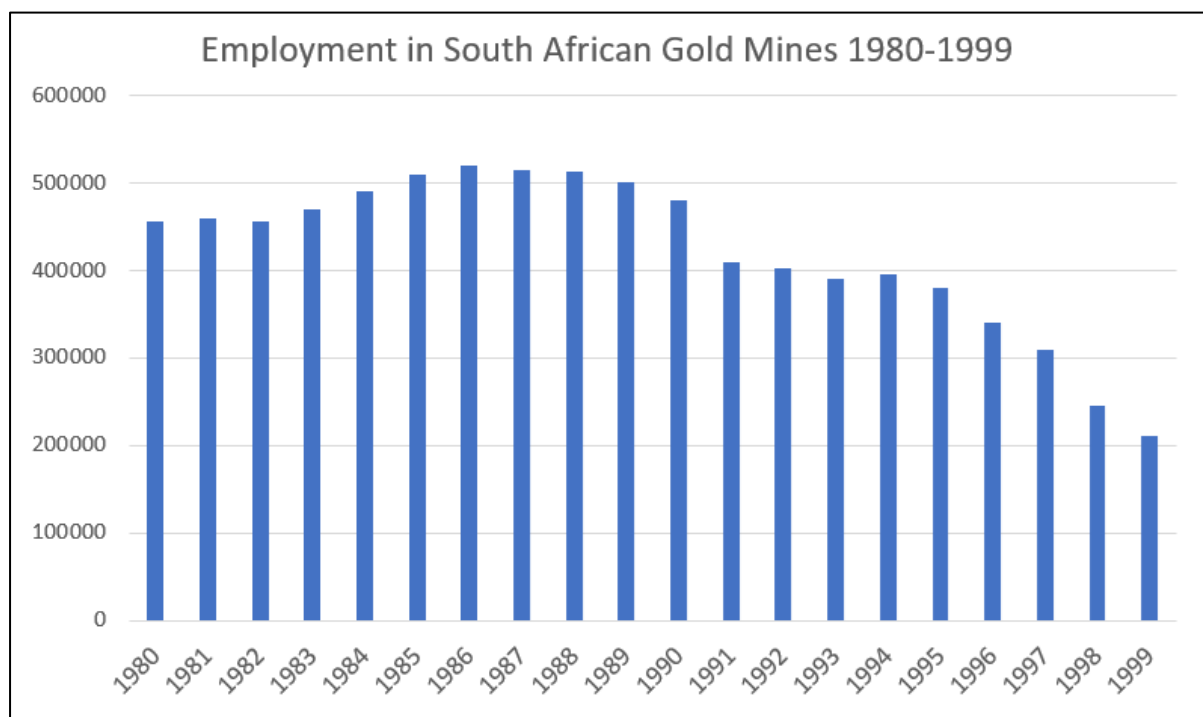


Figure 2.2: Employment in the South African Gold Mines 1980 to 1999 (from Crankshaw, 2012)

Globalisation is the fifth reason for mining downscaling and closures. Crankshaw (2002, p. 63) mentions that South Africa's mining industry has been immensely impacted by the country's democratisation and re-entry into the global economy and has joined the global investment community that demands more transparency, higher returns and greater efficiencies. The result was that mines did not want to spend money on peripheral activities such as sports clubs and housing. Saving money on peripheral activities was an attempt to remain globally competitive. Globalisation forced mining companies in South Africa to remain as profitable as possible, to be able to compete with the international gold market.

In the years of political and economic isolations since the early 1960s (resulting from South Africa's apartheid policy), mining companies were cut off from international management, interaction, policies and investment. Hobart Houghton (1967, p. 111) was one of the first economists to observe that ownership of shares in mining companies increasingly belonged to South Africans during the time of apartheid-related sanctions on South Africa (40,5% in 1935 versus 70,9% in 1964). Insulation from international "shareholder scrutiny" resulted in inefficient management and lack of sufficient capital employment or investment. Malherbe (2001) mentions that key capital efficiency measures such as return of investment and return of assets were not central and (despite technical knowledge) financial and commercial capacities on mines were lacking, as highlighted by statistics indicating the increasing working costs and decreasing profits that mining companies were facing (Crankshaw, 2002, p. 69).

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The impact on labour productivity has a direct impact on output, and the influence of the HIV/AIDS virus was the seventh profitability influential factor. Crankshaw (2002, p. 72) states that the virus has feasted on the social conditions associated with labour migration, and recent studies by AngloGold indicated that 23% of its employees were HIV positive. The impact of the disease on employees, calculated to an estimated increase of 10% of cost per gold bar produced (Centre for Development Support (CDS), 2005, p. 94; Humby, 2016, p. 660).

From the literature it is evident that there are various reasons why gold mines started to downscale and close in South Africa. The fluctuation of the gold price, the depletion of resources, the cost of higher skills and technology required to mine gold at deeper levels, labour conflicts, globalisation, limited international influence, and the impact of HIV/AIDS on labour productivity, are all factors that influenced the profitability of gold mines in South Africa.

The next chapter will elaborate on the impact mines that were downscaling, had on the economic, social and environmental aspects of mining settlements.

2.3.3. The local consequences of mine downscaling in South Africa

“Mine closure is often traumatic for local communities – especially in remote areas if local government is weak and labour productivity and non-mining income are low and labour mobility minimal.”

(Strongman 1992, p.13 in Marais, 2013b, p. 504)

Some mining towns in South Africa developed further than the lifecycle of the mine and mining industry. However, most mining towns in the country experienced a major economic decline and became ghost towns or state-dependent settlements (producing no economic activity and dependent on grants from government). A number of researchers have investigated these local impacts (Chamber of Mines of South Africa, 2007; Harington et al., 2004; Krause & Snyman, 2015; Marais, 2006a; Marais & Cloete, 2013; Marais & Nel, 2016; Ntema, Marais, Cloete, & Lenka, 2017; Van Heerden, 2016).

There are various negative consequences linked to the downscaling and closure of gold mines in South Africa. Rogerson (2012) and Marais, Van Rooyen et al. (2017) argue that although attempts have been made to document these impacts, literature in this respect remains limited. These negative consequences can snowball, each one contributing to the destructive effect of mine downscaling in a specific geographical location.

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The economic decline

Downscaling and closure of gold mines have inevitably led to an economic decline. Once mining companies decide to start a downscaling process, there is a decline in resource output (amount of resources mined) and consequently a decline in resource trade. Mining decline results in a smaller contribution to the GDP and consequently a provincial and national economic decline.

The downscaling of mining activity was the catalyst for the crumbling economy of the Free State Goldfields area. In 1990 the region contributed 55% to the economy of the Free State province, where it currently accounts for a mere 15%. In the 1980s the Free State contributed 9,5% of the national economy, while it currently only contributes 5% of the GDP. The declining economy resulted in a structural shift, from a primary sector driven economy to a tertiary sector driven economy (Nel and Binns, 2002, p. 253; Marais, 2006b, p. 60, 2013a, p. 366; South African Government, 2016, p. 2).

The City of Matlosana and the City of Majhabeng are municipalities characterised by similar reliance on the gold mining industry. A study on mine closure done by Marais et al. (2015, p. 9) indicates an economic decline in both areas when comparing percentage contribution to the GDP. In 1996 the percentage contribution was 55,6% in Matjhabeng and 63,4% in Matlosana, and by 2011 this figure dropped to 29,4% and 31,2% respectively. The contribution of the gold mining industry to the GDP of Welkom, a gold mining reliant town in the Free State, fell by an average of 4,7% between 1985 and 1997 and in Rustenburg the mining industry's contribution to the GDP declined from 68,2% in 1996 to 59,5% in 2015 (Ndaba, 2010, p. 8; Nel & Binns, 2002, p. 257).

As is the case with many towns in South Africa, the whole economy of towns such as Westonaria, Carletonville and Welkom is dependent on gold mines, ranging from hairdressers, housing agents, artisans and teachers, to cafes, supermarkets and suppliers. Approximately 90% of local firms in Welkom primarily serviced the needs of the mining industry. The closure of mines is a fatal threat to the economic future of these cities and towns (Nel & Binns, 2002, p. 257; Winde & Stoch, 2010b, p. 73). The decline and alteration in the economy were only the start of the snowball but had given momentum to various other negative consequences.

The decline in employment

The effect of a diminishing economy results in the unavoidable decline in employment, not only in the mining industry itself but also in complementary and reliant industries such as

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transport, manufacturing and construction. Statistics indicate that the number of workers employed in the gold mine industry in South Africa fell from 480,000 in 1990 to 170,000 in 2001 (Marais, 2013a, p. 504; Denoon-Stevens and Page, 2017, p. 5).

In 1992 the closure of the Stilfontein Gold Mine in Matlosana Municipality resulted in the loss of 24,000 jobs. Only one year earlier, the closure of the Harmony Gold Mine in the Matjhabeng municipality resulted in the loss of 10,000 jobs (Marais et al., 2015). In Rustenburg, the Lonmin Mine retrenched 7,000 miners in 2009 and 9,000 miners in 2011, while Anglo American reduced its workforce from 88,300 to 5,100 between 2007 and 2012 (Ndaba, 2010, p. 10). These mines lost a total of 133,200 jobs and the mining industry remains a large contributor to unemployment in South Africa.

By 1988 the Free State Goldfields employed 180,000 mineworkers. By 2010 this figure dropped to 35,000 – an 80,6% decline. Furthermore, an assessment done in 1996 indicates that for every two jobs lost in the mining sector, one employment opportunity was lost in another sector (Marais, 2013b, p. 509; Nel & Binns, 2002, p. 257). In the Northern Cape, one of the world's leading mining companies (De Beers Mine), has started to downscale as the availability of resources decrease, consequently cutting staff from 3,000 to 250 (*Sowetan Live*, 2009, p. 1). Unemployment in Welkom has increased from “zero to about 65%” in 2001, resulting in almost 50% of residents living below the subsistence line (Nel and Binns, 2002, p. 254)

Changing demography

Unemployment and retrenchments subsequently result in a decline in population as well as a change in demographics. The impact on the demographics of a mining area is three-fold – firstly the population size and female/male ratio are impacted; secondly, the percentage of highly skilled workers reduces; and thirdly it impacts the unemployment rate. The decline in employment results in a decline in population, as people (mostly the breadwinner) leave their families behind, and migrate from mining areas in search of new employment opportunities. Post-mine populations are often older and more state-dependent.

In Matjhabeng the population decreased from 472,000 in 1996 to 410,000 in 2001, and further declined at -0.4% per annum from 2001 to 2011 (Marais, Van Rooyen, et al., 2017, p. 10).

In 1991 males accounted for 57% of the Free State Goldfields, by 2005 this figure had dropped to 52%. Further statistics indicate that 6,300 professionals were employed in the Welkom Municipality in 1996, by 2001 this figure has dropped to 2,500, evidence of the theory that

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pointed to the leakage of highly skilled and experienced people. Many skilled professionals leave the mining region in search of new mining opportunities in South Africa and abroad (Marais, 2013b, p. 512).

Although many workers leave the area to find other employment opportunities, there is also a large number of the retrenched workforce who give up on the hunt for employment. These mineworkers who mostly resided in single-sex hostels, leave these hostels after closure for informal settlements, creating major problems for the local municipality regarding housing delivery obligations (Marais, 2013b).

The spatial impact of downscaling and closure

Mine downscaling and closure have a negative spatial effect. Apartheid led to South African cities and towns characterised by low densities and high levels of segregation. Mines have aggravated the situation. The initial spatial impact of mining forced unnatural migration of people and labour to areas of employment opportunities at the new mine. Rapid urbanisation occurred even though the resources in these areas were finite, and employment possibilities were short-lived (Emuze & Hauptfleisch, 2014, p. 882). Examples of rapid urbanisation for mining opportunities, include cities such as Johannesburg, Kimberley, Postmasburg, Rustenburg, Klerksdorp, Welkom, and many others. Mines usually develop in small unpopulated/rural areas. The mines then recruit vast amounts of employees and provide housing to them.

Mining companies consequently develop low-budget, cost-effective, low-density infrastructure without having to legally comply with spatial planning principles such as densification and integration. Once mines start to downscale and close, mining companies are eager to make their abandoned housing infrastructure available. However, it invalidates the principle of densification and promotes urban sprawl in settlements where a declining urban core is already visible (contributing to the previously mentioned doughnut-effect) (Marais, 2013a; Marais, Van Rooyen, et al., 2017, p. 11).

An illustration of this impact, is evident in the town of Kathu in the Northern Cape province. In 2012 a mining company employed 8,000 new people. Statistically, if each employee had one family member living with them, this would result in a population increase of 16,000 people in one year. The housing stock increased from 1,300 units in the mid-2000s to approximately 2,500 units by 2014, resulting in the removal of trees and further urban sprawl, with the knowledge that it will be almost impossible to diversify the area's post-mining economy

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(Emuze and Hauptfleisch, 2014, p. 884; Marais and Cloete, 2013, p. 82). Similarly, in Postmasburg, a mining town in the Northern Cape province, 1,000 new houses had to be constructed between 2009 and 2015. The conceptual occurrence of urbanisation is not always equivalent to a negative spatial effect. However, the impact becomes detrimental when governments and mines do not manage urbanisation.

Housing market

The phenomenon of sudden housing supply mentioned above, has a fundamental impact on the housing market of the surrounding settlements. A study conducted by Marais (2013b, p. 516) on the housing market of settlements in the Free State Goldfields indicates that the average price of a house of two mining towns (post mine closure) was respectively R400,000 and R350,000 in comparison to the national average of R1m. As stated above, this suggests an oversupply of housing, which resulted from mine downscaling and an exit of the skilled population.

Impact on municipalities

Towns and townships (such as Carletonville and Westonaria) benefitted from mining-related infrastructure, which included hospitals, schools, sports facilities, recreational sites, 4-lane highways and well-maintained water and electricity systems, but when these mines close, there are various consequences for the local municipality. The local municipality is obligated to provide and maintain services (at a high cost) to low-density settlements, that were developed by mining companies while mining activities were still in operation (Marais, 2013b, p. 514; Winde & Stoch, 2010b, p. 73).

The total impact on the municipality is multidimensional. In certain mining regions the mining companies own various properties in a region, pay rates and taxes on these houses, and contribute to the income of the municipality. Mines paid a large portion of the municipal income (in rates and taxes) in full and on time. With the privatisation of the housing stock, more municipal resources were required to collect rates and taxes, and many individuals failed to pay the municipality, resulting in bad debt (Marais, 2013b, p. 517; Marais, Van Rooyen, et al., 2017, p. 12; Siyongwana & Shabalala, 2018, p. 1).

Another impact on the local municipality is a “snowball impact” from the previously mentioned growing informal settlements around mining areas. The impact of growing informal settlements on the local municipality is severe, creating major problems regarding housing delivery obligations. Informal settlements exist in the North West province where mines started to

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downscale in the Marikana, Wonderkop and Freedom Park areas. The cost for replacing existing informal housing in this area amounted to R3bn (at an average cost of R150,000 per house). The municipality could only manage to plan for 3,600 new houses near mining areas, however, at that rate, it would take over 30 years to replace the regions' informal housing. Marais et al. (2018, p. 4) reports on a similar phenomenon in Postmasburg in the Northern Cape Province, where the informal settlement expanded with 2,500 households.

Informal settlements surrounding mines are the result of a shift towards the so-called "clean wage" system in the mid-1980s, where workers received the monetary value for services such as transport and housing, which were previously subsidised by the mining houses. Hostels provided for mineworkers were systematically privatised and disassociated from the mine. In an attempt to save money, mineworkers settled in informal areas around mines instead of paying a higher rent to live in these hostels. Mining companies, therefore, contributed to unplanned sprawl of informal settlements (Marais & Cloete, 2013; Ndaba, 2010).

Environmental impact

The long-term effects that mining has on the environment is a reiterated topic. Krause and Snyman (2015) state that mining operations are viable for approximately 30 years, however, the environmental impact remains a problem long after mine closure. Historically, mining companies in South Africa did not have an obligation to the environment (during the closure process) to the same extent as currently legislated, resulting in sludge dams containing poisonous substances, rock dumps and neglected mine shaft areas with rusty steel and iron structures.

In the Free State Goldfields, Anglo American Cooperation owned most of the mines in the early 1990s. At the time of selling these mines, legislation did not have prescriptive rehabilitation requirements. Siyongwana and Shabalala (2018) and Krause and Snyman (2015) say that mine closure results in the obstruction of river systems by the quarry, water pollution and dust generation of the abandoned land.

Contribution to poverty and other social impacts

Despite the economic, spatial and environmental impacts presented above, it is necessary to highlight the social impact of closures and consequent impacts of unemployment. In various case studies, the unemployed population that remains in the downscaled mining area, struggles to find other employment opportunities in the vicinity, which eventually results in increased crime rates, substance abuse, health and mental problems, social disruptions,

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decline in standard of living, and ultimately increased poverty is among the “snowball effects” in mining settlements (Siyongwana & Shabalala, 2018, p. 2). Poverty also results in a state-dependent population, which reduces the economic viability of an area and further contributes to the destructing effect of mine downscaling and closures.

In the Free State, the poverty rate increased from 39,45% to 51,7%, from 1996 to 2006. By 2002, the Free State Goldfields region was the urban area in South Africa with the highest poverty rate (52%) and lowest per capita income (R9,619 per annum) (Marais, 2013b). The increase in the poverty rate, combined with slow service delivery in Khutsong township in the West Rand, fuelled social unrest and led to various riots and xenophobic attacks on foreign migrant workers (Winde & Stoch, 2010b, p. 74). The issue of social impact was echoed by residents of the Postmasburg mining town, emphasising the increased crime, prostitution and drug abuse and xenophobic attacks.

A study conducted by Siyongwana and Shabalala (2018, p. 4) at Pilgrim’s Rest, found that 83% of respondents claimed that crime has increased, 54% pointed out the manifesting drug and alcohol abuse, 61% experienced health problems because of environmental degradation caused by the closed mine, 48% of respondents indicated they have undergone and psychological stress and have experience emotional trauma during the period of mining retrenchments and 67% of respondents indicate the decline in standard of living post closure (Siyongwana and Shabalala, 2018, p. 4).

Illegal mining

The snowball effects of mining closure and downscaling further lead to the engagement of detrimental and often fatal illegal mining activities (in response to the decline in the economy and employment opportunities and an increase in poverty). Illegal mining as a negative impact has been investigated by both Marais (2013a) and Siyongwana and Shabalala (2018) in closed mines in the Free State Goldfields and at Pilgrim’s Rest.

2.4 CONCLUSION

The chapter discussed international mine downscaling, the history of gold mines in South Africa and the impact of mine downscaling as recorded by literature. South Africa still has much ground to cover when considering mine closures and downscaling. Successful approaches and interventions to mine closures (as internationally recorded) are not yet visible in South Africa and if these interventions are not considered, the impacts on the social, economic and spatial fabric of the country will continue to cause deterioration.

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It is important to understand that it is unrealistic to expect local attempts to be sufficient to address mine downscaling, as the extent of such downscaling, is too vast (Marais & Cloete, 2013). The current national strategy on the revitalisation of mining areas appears to be inappropriate and unsuccessful for areas of mine downscaling, mining areas are grouped under the blanket phrase “economic revitalisation” (Marais, Van Rooyen, et al., 2017, p. 2).

The following chapter will summarise current policies influencing mine closure. This will be a critical consideration of this study, as it is important to understand where policies can be improved and adapted to lessen the impact of declining mining settlements.

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“Without a good legal framework for mine closure, mining companies do not know their obligations and potential future liabilities, and mining communities do not know their rights or responsibilities. The absence of a comprehensive legal framework for mine closure can also lead to inefficiencies and confusion among different ministries and government units at the central, regional, and local levels.” (World Bank Group & International Finance Corporation, 2002, p. 12)

3.1 INTRODUCTION

A legal framework that provides clear parameters for mine closure is important for successful mine closures. The World Bank (2010) states that the degree to which national governments have strategic and legal directives in place to address closure and downscaling of mining operations, depends on the experience that the country has had with closure. The effectiveness and ability of these legislative frameworks to successfully counter the negative impact of mine closure, as mentioned in the previous chapter, were discussed elsewhere (Murombo, 2008).

As mentioned in Chapter 2, international strategies of mine closure includes the economic diversification of mining areas during mining operations; the advancement of research and technology within mining settlements and mining communities; the development of an integrated task force, who specifically plan for closure; the classification of mining towns based on certain criteria and relating closure strategies for each classification; the development of shrinkage strategies instead of expansion and development strategies. The chapter further elaborated on the current negative impacts on mine closure in South Africa as highlighted in literature: economic decline, the decline in employment, change in demographics, negative spatial impacts, the decline in the housing market, the financial burden on municipalities, negative environmental impacts, increased poverty, and negative socio-economic impacts.

This chapter discusses the current national and provincial legislation and policies applicable to mine closure. The main aim of this chapter is to determine what legislation is applicable mine closures and within what parameters and conditions are mining companies allowed to start operations, operate, downscale and close. Consequently, this will determine if current legislation (1) relates to international themes in mine closure; and (2) aims to address the current negative impact of mine closures in South Africa as stipulated in the previous chapter.

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3.2 THE HISTORY OF MINING LEGISLATION IN SOUTH AFRICA

Over the years mineral rights legislation in South Africa has been developing in such a way, that different minerals have been regulated by different regulatory frameworks, contributing to a complex system. The Mining Rights Act 20 of 1967 was the initial attempt to consolidate the plethora of legislation under a single act. However, this Act did not legislate the environmental responsibilities of mining companies. Consequently, before the Minerals Act 1991 (Act 50 of 1991), mining companies used mining methods without consideration of possible environmental impacts and they had no obligation towards environmental rehabilitation (Swart, 2003). The Government did not have the ability or funds to address the negative mining legacy caused by mining companies. The Mineral Act (No. 50 of 1991) further allowed for the disposal of state-owned mineral rights to the private sector in section 64 of the act.

The substitution of the South African Mineral policy with an acceptable “post-apartheid” system started after the 1994 elections (Cawood & Minnit, 1998). In 1995 the chamber of mines of South Africa released a document requesting that the government intervention in the mining sector should be limited and policies on mineral rights and minerals beneficiation should remain unchanged (Cawood, 2004). Later that year the Mineral Policy Process Steering Committee was established, comprising representatives from labour and the private and public sector. This committee decided the state own all mineral rights and that state-held mineral rights could be leased to companies. In 1997, this committee presented a draft Green Paper on Minerals and Mining Policy for South Africa and Cabinet approved the White Paper on Minerals and Mining Policy in 1998.

The Department of Mineral Resources (DMR) administers the mining industry of South Africa. The Mineral and Petroleum Resources Development Act (MPRDA) (28 of 2002) regulates the South African mining law and is the most dominant piece of legislation pertaining to mining and prospecting in South Africa. The Minister, as well as the Director-General and Deputy Director-General, have decision-making powers to grant mining rights. The procedure to apply for mining rights in South Africa is similar to the different type of minerals (gold, diamond and platinum) (Cawood, 2004; DMR, 2014; Stevens, 2017).

The DMR drafted a mining charter in conjunction with the MPRDA. The Mining Charter deals with the transformation of the mining industry and aims to ensure that historically disadvantaged South Africans can enter the mining industry. The Mining Charter was published in 2004, and amendments took place in 2010 and 2018. The charter deals with the expansion of opportunities to historically disadvantaged South Africans (HDSA) regarding mining industry employment and ownership, management of mining projects, and sharing of

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benefits from the South African Mining Industry (Cawood, 2004; Stevens, 2017). In addition to the MPRDA and the Mining Charter, mining companies have to comply with relevant national, provincial and local (municipal) legislation. I discuss these laws, policies and regulations under the following subsections.

3.3 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA, 1996

The Constitution of the Republic of South Africa of 1996 is the supreme law of South Africa and provides the foundation against which other laws are measured. Legal practitioners often reference The Constitution of South Africa in discussing legal literature concerning mine closures (Centre for Applied Legal Studies [CALs], 2016; Rogerson, 2011; Stevens, 2017; Swart, 2003; Van Heerden, 2016) and mines have to conduct mine operations and mine closures with cognisance of the rights of others. The following can be highlighted from the Constitution:

Chapter 2 (24) (a) Everyone has the right to an environment that is not harmful to their health or well-being (RSA, 1996, p. 1253)

Chapter 7 (152) (1) The objects of local government are – (b) to ensure the provision of services to communities in a sustainable manner – (c) to promote social and economic development – (d) to promote a safe and healthy environment (RSA, 1996, p. 1331)

CALS (2016) and Swart (2003) acknowledge the relationship between mining closure and Section 24 of the Constitution. They adopt the premise that a healthy environment is critical for the development of people, and that Government should prevent unacceptable environmental degradation caused by the mining industry.

It is important to note that Section 24 of the Constitution is the most referenced section with regard to mining legislation. Consequently, current legislation has concentrated on the environmental aspect of mine closure, while neglecting the social and economic aspects. Chapter 7(152)(1) specifies that it is the constitutional mandate of municipalities to “promote a safe and healthy environment” and further mandates local government to: ensure the provision of services to communities in a sustainable manner; provide a democratic and accountable government for local communities; and promote social and economic development (South African Local Government Association [SALGA], 2015). Municipalities, therefore, play an important role in the initiation, operation and closure of mines in their judicial areas. The nature, role and functions of municipalities are described in the White Paper on

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Local Government (RSA, 1998b) as well as the Municipal Systems Act (2000) and are discussed in this chapter.

3.4 MINERALS AND PETROLEUM RESOURCE DEVELOPMENT ACT (MPRDA)

The objectives of the Mineral and Petroleum Resources Development Act (Section 2) indicate that this Act is unlike any of its predecessors, most notably the incorporation of social aspects. The Act has also acknowledged that the regulatory regime should be of an international standard. The fundamental principles (Chapter 2 of the Act) encompass the following: (1) emphasise the State's role as owner and custodian of South Africa's mineral wealth – mineral rights are exclusively state-owned; (2) promote economic growth through increased beneficiation of mineral production; (3) ensure that mining activity promotes rural development through employment opportunities; (4) ensure that mineral developers comply with the principles of sustainable development, and (5) ensure that holders of mining rights contribute to the socio-economic upliftment through social and labour plans (Cawood, 2004; RSA, 2002).

As mentioned previously, the Mineral Act (No. 50 of 1991), allowed for the disposal of state-owned mineral rights to the private sector. The Government repealed The Minerals Act of 1991 and replaced it with the Minerals and Petroleum Resource Development Act (Act 28 of 2002) (MPRDA). Some changes are visible when one compares the 1991 and 2002 legislation. The MPRDA has a more specific focus on equitable access to properties; rehabilitation has made way for the more holistic concept of sustainable development; and the MPRDA emphasises more meaningful empowerment of HDSA. The MPRDA is seen by many as a catalyst for transforming the mining industry, with a specific focus on a “cradle-to-grave” approach to mining (Marais, 2013a; Rogerson, 2011; Swart, 2003; Van Heerden, 2016). Rogerson, (2011, p. 13374) states that the Act defines the “entire regulatory environment of the minerals industry from rights and ownership to mineral sales, value addition (beneficiation) and marketing”.

The MPRDA tries to balance the mining company's ability to create wealth, with the socio-economic needs of the society affected by mining activities. One of the strategies proposed in the Act to achieve this is through local beneficiation. The MPRDA also makes provision for a Minerals and Mining Development Board (Chapter 5 of the MPRDA). The Board is, among others, also required to provide input on mine closure and must advise the Minister of strategic mineral development issues. The Act states that the owner of the mining right must notify the board when a mine has been marginalised for a year (profit ration of less than 6%) and when more than 10% or 500 workers are likely to be retrenched. The board then investigates the possible socio-economic and labour impact of the potential mine closure and advise the

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Minister on corrective steps, with the intent to reduce the negative socio-economic impact on the community (Cawood, 2004; RSA, 2002).

It is critical to understand what the MPRDA enacts with regard to mine downscaling and closure specifically. Section 43 (1) of the MPRDA specifies that the holder of mining rights remains responsible for its environmental footprint until the Minister has issued a closure certificate. Section 43 (4) further states that an application for closure must be made 180 days before closure and that an environmental risk report must accompany a closure application.

Section 107 of the MPRDA makes provision for “regulations”. Government compiled these regulations in 2004. The regulations aim to guide mining companies to comply with the Act; the document is not static, and has consequently been amended and improved in November 2006 and in April 2011 (RSA, 2011). The regulations indicate the need for and content of various applications as enforced by the MPRDA. Section 49, 50, 51 and 52 of the regulations stipulate the content of the scoping report; the environmental impact assessment report; the environmental management programme; and the environmental management plan. These reports or programmes and plans relate only to the environmental aspects of mining activity.

Although one of the objectives of the Act is to “(2)(e) promote employment and advance the social and economic welfare of all South Africans”, the requirement of a social and labour plan is not stipulated in the Act itself. However, section 41, 42, 43, 44, 45 and 46 of the Mineral and Petroleum Resource Development Regulations deal with the provision, objectives, submission, amendment, reporting and contents of the mentioned social and labour plans (RSA, 2002, 2011). With the promulgation of the Act, it was expected that the new social and labour plans (SLPs) would address social issues relating to mining activity (Marais, 2013a). This has, however, not been the case and I shall return to a discussion of SLPs later in the chapter.

Section 56 of the regulations deals with the principles of mine closure and includes environmental and health and safety principles. Principles of socio-economic upliftment and sustainability post mine closure are, however, not stipulated. Section 62 of the regulations explains what the closure plan entails, which include (1) closure objectives; (2) a summary of the regulatory requirements and conditions for closure negotiated; (3) a summary of the results of rehabilitation undertaken; (4) a description of methods to decommission mining operations; (5) details of long-term management and maintenance; (6) details of closure cost and financial provision for maintenance and post-closure management; (7) a sketch plan describing future land use proposals for the site; and (8) record of interested and affected parties. The regulation

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makes no reference to the socio-economic requirements or considerations during or after the closure process (RSA, 2011).

I discuss the environmental requirements for closure regarding the MPRDA in the next section, in conjunction with the National Environmental Management Act (NEMA).

3.5 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) (NO. 107 of 1998)

NEMA, as well as the MPRDA, regulate certain environmental requirements regarding mine closure. The environmental impact of mine operations and mine closures have obvious legal implications. There is a well-established body of international legislation regarding the environmental impact of mining. This has not always been the case for South Africa. As previously mentioned, legislation forcing mining companies to take responsibility for the negative environmental impact caused by operations, only materialised in the early 1990s (Swart, 2003). The key legislation relating to mine operations and mine closure that will be discussed in this section is NEMA and the MPRDA.

In South Africa, the first legislation to introduce integrated environmental management and set a platform to assess the impact of certain activities on the environment, was the Environment Conservation Act (ECA) (73 of 1989). Environmental Impact Assessment (EIA) regulations, were stipulated under this act. However, these regulations had many flaws and did not promote the intended integrated environmental management. EIAs under the Environmental Conservation Act, resulted in the inconsistent application of environmental laws, lengthy EIA processes without compulsory timeframes, included too many small developments, and did not provide for mandatory public participation or support use of strategic planning tools (DEAT, 2004; Dixon, 2003; Swart, 2003).

The national Department of Environmental Affairs and Tourism embarked on a consultative process to develop the new EIA regulations regarding NEMA. The Minister of Environmental Affairs and Tourism promulgated the EIA regulations regarding NEMA in 2006, and these replaced the EIA regulations regarding the Environmental Conservation Act (Murombo, 2008). There are many differences between the old and the new regulations. The most significant, however, is the separation of the listed activities into two categories: activities subject to a basic assessment (listed in GN No. R.386 of 2006) and those subjected to a scoping and EIA (listed in GN No. R.387 of 2006) (DEAT, 2004; Murombo, 2008).

Mining closure procedures under NEMA 1998, aim to promote the so-called “one environmental system”. These amendments introduced certain additional obligations with

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regard to mine closures stipulated in Section 24(R). These include the obligation to apply for a closure certificate and for environmental authorisation, and to do an environmental impact assessment, as well as the obligation for financial provision.

Previously, Section 41 of the MPRDA obliged the holder of the mining right to make “financial provision” for the rehabilitation of the environment and to annually assess any environmental liability and increase provisions associated with mining operations (RSA, 2011, p. 46). This section of the Act was, however, repealed by NEMA, with effect from 7 June 2014 and provision for environmental rehabilitation is now regulated by Section 24 of NEMA 1998 (Magowan, 2015).

In 2015, Government published the Financial Provision Regulation to give effect to Section 24 of NEMA. Unlike the previous MPRDA stipulations where financial provision was required for mine closure, the new regulations have three distinct provisions, namely: “annual rehabilitation”, “mine closure rehabilitation”, and “future rehabilitation” for residual environmental impact, which may become known in the future (Magowan, 2015; RSA, 1998a, 2011; Warburton, 2017).

3.6 MINERALS AND PETROLEUM RESOURCE ROYALTY ACT (28 of 2008) (MPRRA)

The MPRRA came into effect on 1 March 2010 and Van der Zwan and Nel (2010) mention that no type of mining tax has caused as much controversy as mineral royalties. It is important to mention this Act under current mining legislation. Although the MPRRA does not directly relate to closure or downscaling, it has an indirect effect on mining companies, as higher royalties may result in lower profitability margins, and as mentioned in Chapter 2, lower profitability accelerates the mine closure process.

As mentioned, the MPRDA provides for the country’s mineral and petroleum resources, as the common heritage of the people of South Africa. Consequently, the state is the custodian of these resources, and the Act allows the state to determine the levy or fee payable for resources extracted. Government, as the custodian of natural resources, enabled National Treasury and the Department of Mineral Resources to develop these resources according to legislation, which led to the enactment of the Mineral and Petroleum Resources Royalty Act (28 of 2008). The resistance from the mining industry was evident, and the industry expressed the view that the proposed regime was inappropriate and the introduction of the new tax could significantly affect the industry. The South African mineral royalty regime aim to encouraging exploration and maximize vlua addition to the country’s GDP while compensating the nation for the depletion of mineral resources (Van der Zwan & Nel, 2010).

3.7 WHITE PAPER ON LOCAL GOVERNMENT (1998)

In alignment with the Constitution, local government became a distinctive sphere of Government in 2000, and had executive and legislative powers to act and implement laws. The White Paper on Local Government (1998) is a defining policy document of South African legislature. Within the framework of the Constitution (1996), the White Paper on Local Government (RSA, 1998b) sets a platform for a “developmental local government”. A developmental local government is one that promotes socio-economic development and is committed to working with communities and municipal stakeholders in a holistic way to ensure the development of sustainable human settlements (DPME, 2015; SALGA, 2015).

The key interrelated outcomes of local government as stipulated in the white paper is (1) provision of household infrastructure and services; (2) creation of liveable, integrated cities, towns and rural areas; (3) local economic development; (4) and community empowerment and redistribution (RSA, 1998b). The White Paper on Local Government, in alignment with the Constitution, therefore highlights the role local government plays to drive and oversee development in the country.

However, Christmas and De Visser (2009, p.107) state that Government was unable to achieve this mandate under the White Paper on Local Government. They highlight that local government has failed to harness its newfound power in post-apartheid South Africa and has not claimed its “rightful position as the driver of development at the local level, and instigator of bottom-up growth and progress, which is meant to shape and transform society in the new South Africa”.

3.8 MUNICIPAL SYSTEMS ACT (No. 32 of 2000)

In alignment with the White Paper of Local Government, the Municipal Systems Act of 2000 (MSA) specified the requirement for municipal planning to be developmentally orientated. The MSA presents a detailed definition of developmental local government as promoted in the White Paper on Local Government (De Visser, 2009). In Section 25, it further introduced the process of Integrated Development Planning (IDP) as a compulsory function, which allowed local government to strategically identify and budget for development in their municipalities over a five-year cycle (DPME, 2015). De Visser (2009, p. 22) says the IDP “is expected to integrate the planning of all municipal departments under the umbrella of a united strategy”, but that this should “go beyond planning rhetoric and be the basis for the municipality’s annual budgets and its spatial planning”.

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Despite legislation that was well thought through and developed to empower local municipalities, statistics indicate that 28% of local municipalities cannot prepare IDPs and 35% have some basic capacity and can only prepare an IDP with additional support (De Visser, 2009). It is further noted by the author that assigning the function to coordinate the development efforts of a municipal area solely to local municipalities, might result in a negative developmental outcome. In light of this, it is possible to conclude that the negative impact of mine closures can stem from weak local authorities. I shall discuss this further in the conclusion of this chapter.

3.9 SOCIAL AND LABOUR PLANS

As stipulated in the section above, the MPRDA and NEMA legislate that mining right holders should take cognisance of the impact of mining activities on the environment. The MPRDA further aims to transform the mining and production industry in South Africa, with the introduction of Social and Labour Plans (SLPs). The purpose of these SLPs is to address the mining and mine closure associated problems and assist with the integration of plans and programmes between mines and municipalities (Marais, 2013a).

CALS (2016) mentions that the rationale behind the SLP system is to use the power of the state to deny or approve mining rights based on the opportunity mining companies can provide mineworkers and the community to benefit from the resources in their area. The Act requires the submission of the SLPs as a prerequisite for granting mining rights. The SLPs require that applicants for mining rights should develop and implement comprehensive plans pertaining to human resources, housing, employment equity and job security during downscaling (DMR, 2010; RSA, 2011). Specifications with regard to the content of the social and labour plans are stipulated in Part 2 of the regulations and pertain to the provision, objectives, submission, amendment, reporting and contents of the SLPs (Dixon, 2003).

To assist mining companies with their SLPs, the Revised Social and Labour Plan Guidelines (RSLPG) was drafted in 2010. According to these guidelines the objectives of the SLP are fourfold: (1) to stimulate economic growth; (2) to promote employment; (3) to ensure that companies with mining rights contribute to socio-economic development in their operating areas; and (4) expand on the existing skills base of South Africans (DMR, 2010). The sections of the RSLPG include human resource development, mine community economic development, management of downscaling, and financial provision. SLPs contain commitments to the Department of Mineral Resources (DMR) to develop programmes pertaining to local economic development and human resources. Once the plan is submitted, along with the mining right application, it is a binding document and cannot be altered without

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the consent of the Minister. On the granting of the mining right, these programmes become binding conditions of the mining right until Government issues a closure certificate. The holder of the mining right has to submit an annual report on its compliance with the SLP (Centre for Applied Legal Studies, 2016; Rogerson, 2011).

The Revised Social and Labour Plan Guidelines of 2010 state that projects mentioned in SLPs should align with the IDPs. The legislation also requires alignment with other relevant frameworks such as the National Spatial Development Strategy (NSDS) and the Provincial Growth and Development Strategy (PGDS). The guidelines highlight the importance of consultation, coordination and integration with local authorities and relevant stakeholders and the SLP guidelines further require that mines should indicate how their operation will impact job creation, poverty, infrastructure and SMME development. (DMR, 2010; Rogerson, 2011).

However, Marais (2013) argues that SLP guidelines pertain more to operational mines and that guidelines regarding mine closure are less significant. Local Economic Development (LED) is done based on immediate gratification and results, with no long-term perspective of sustainable development in mind. He further argues that the word “partnership” is not used in the SLP guidelines and consequently proper alignment between the municipalities’ IDP and mines’ SLP to ensure sustainable economic development post mine closure, is absent in the guidelines.

Even though SLPs have found traction and do make provision for mining companies to address the negative socio-economic impact they have on mining communities post mining operation “on paper”, this has not been the reality. Rogerson, (2011) mentions that the plans have the potential to “be the basis for a smooth transition to a post-mining economy in local communities which are mining dependent”. However, the monitoring of commitments made in the SLP remains a challenge. Marais (2013, p. 370) shares the same conclusion and mentions that mines have implemented numerous projects under the umbrella of SLPs. However, integrated municipal and mine planning are still missing. Consequently, “the outcomes are not significantly different from those of corporate social responsibility programmes”.

3.10 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT (SPLUMA)

SPLUMA aims to create a spatial planning and land use management system that promotes resilient, sustainable, efficient and just development (RSA, 2013). Chapter 4 of SPLUMA makes provision for spatial development frameworks. Local governments must prepare these spatial development frameworks as part of a municipality’s integrated development plan, by the provisions of the (previously mentioned) Municipal Systems Act. According to SPLUMA,

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the municipal SDFs should identify current and significant future structuring and restructuring elements of the spatial form of the municipality, including estimates of economic activity and employment trends and locations in the municipal area, for the next five years. Chapter 5 of this act makes provision for land use schemes that should be developed by municipalities. The purpose of land use schemes is to promote (a) economic growth; (b) social inclusion; (c) efficient land development; and (d) minimal impact on public health, the environment and natural resources (RSA, 2013, p. 37).

Although the Act aims to promote spatial transformation, the reality is that most municipal spatial frameworks (SDFs) are copy-and-paste documents and do not speak to the true need of the community (Ngcobo, 2010, p. 54). The plans require estimates of economic activity and employment trends and locations, but the frameworks do not provide strategies of how these trends and activities should be addressed or improved. The Land Use Management Schemes (LUMS) aim to promote viable and inclusive spatial settlements. However, the schemes specify as to how to develop specific zonings. One major concern is that the spatial impact of mining and rectification thereof will not be addressed by the SDFs or LUMS, as specified in SPLUMA.

3.11 CONCLUSION

All legislation discussed in this chapter pertains directly or indirectly to mine closure and mine downscaling. The highest law in South Africa is the Constitution. This study focusses on two main sections of the Constitution that can influence mine closure, which is (1) the right to a safe environment; and (2) responsibility of local governments to promote social and economic development.

As mentioned, the MPRDA is the most prominent law regarding mining activity and is supported by the Mineral Petroleum Resource Development Regulations, which stipulate requirements for mine closure and also introduces the required SLPs. NEMA stipulates mine closure procedures from an environmental point of view and also makes financial provision for the rehabilitation of the environment post mine closure. The Minerals and Petroleum Resources Royalty Act is also discussed in this chapter, as this act may influence the profitability of mine companies and result in a shorter “life of mine”.

The White Paper on Local Government, in alignment with the Constitution, emphasises the role of local government to promote socio-economic development of a municipal location and consequently legislates municipalities to integrate with the planning and development of mining companies within their judicial area. The Municipal Systems Act further makes

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provision for integrated development planning as a compulsory function of a municipality, allowing municipalities to strategically develop and budget for a five-year cycle. Social and Labour Plans (as stipulated by the Mineral Petroleum Resource Development Regulations) are expected to dovetail the IDPs of local municipalities. However, in many cases the local municipalities cannot compile and implement the IDP, shifting the development responsibility back to mining companies.

The Spatial Planning and Land Use Management Act regulates spatial planning, which makes provision for SDFs and LUMSs. According to this legislation, local municipalities should identify current and future spatial structuring elements and propose municipal land use that promotes (among others) economic growth.

It is important to note that mining companies need to comply with national, provincial, and municipal laws. From a spatial planning point of view, there are many opportunities to impose regulations (e.g. zoning requirements imposed regarding municipal LUMSs) to ensure sustainable development and closure of mines (Stevens, 2017). Limpitlaw, (2004) also indicates that legislation with regard to mine closure should compel mining companies to align closure planning with the planning framework of local government – integrated development plans, spatial development frameworks and land use management schemes. This will ensure that land use post mining is aligned with surrounding development initiatives. It also ensures that the mine's investment in human capital and infrastructure meet local and regional development needs and enable economic growth post closure.

Mining legislation has come a long way since 1967 to ensure sustainable mine closures. Although legislation relating to mine closure does exist, the calibration of current legislation to achieve sustainable (post mine closure) settlements is absent. It can be concluded from current legislation that the municipal IDPs should promote economic development and the SLPs of mining companies. However, international mine closure concepts are not mentioned. Not one of the documents required by legislation promotes or enforces economic diversification in mining areas during the mining operation. Although the SLPs refer to skills transfer, the advancement of research and technology within mining settlements and mining communities is not mentioned.

Chapter 5 of the MPRDA does specify the development of a board but does not specifically require the development of an integrated task force (consisting of the mining company and the relevant local municipality) that plans for closure. Mine closure legislation is similar for all

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mines, and variant closure strategies are not considered, despite the variation of location, extent and impact of mine closure.

Even though the MPRDA has a stronger focus on socio-economic sustainability and upliftment, most mining communities still experience an economic downturn, a decline in employment, negative spatial impacts, an increased financial burden on municipalities, a growing poverty rate, and a negative socio-economic impact. Consequently, it can be concluded that current mining legislation pertaining to mine closures in South Africa does not (1) relate to international themes in mine closure; and (2) does not address the current negative impact of mine closures in South Africa as stipulated in the previous chapter.

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“There is reason to be concerned about how long the existing seven gold mines (in Merafong)... will be able to meet the demands of the community with its overwhelming single-purpose economic base.” (Van Eeden, 1997)

As mentioned in Chapter 2 of this document, literature indicates certain consequences of mine downscaling in South Africa. This section compares challenges as highlighted in literature with the statistical data of Merafong City Local Municipality, to determine the impact of mine downscaling on the case study area. A number of demographic, economic and infrastructural shifts in settlements is evident in the spatial development of Merafong. Therefore, for the purpose of this study, the statistical and spatial analysis, as well as the analysis of the strategic documents, will consider:

- 1. The impact of mine downscaling.** This is delineated in Chapter 2 of this study and include: poverty, unemployment, decline in population, segregated developments, and increased informal settlements. Specific reference should also be made to the impact of mine downscaling on the spatial development of the municipality. As mentioned, the influence of mine downscaling or closure has a spatial impact on the municipality as alteration in employment, demographics and poverty result in changing settlement patterns in a specific area.
- 2. Proposed spatial densification and economic diversification strategies.** In the analysis of international mining settlements in Chapter 2 of this document, the importance of economic diversification and spatial densification strategies have been reiterated as it has a direct influence on space. Increased economic diversification translates into the development of additional commercial and industrial land use. Settlements thus change to facilitate the economic growth. Spatial densification is also seen as one of the key spatial advances in mining settlements as dense developments promote sustainable settlements.
- 3. Infrastructural challenges.** Infrastructural challenges are synonymous with settlements where mines have started to downscale and close. It is common knowledge that infrastructure development can have a spatial influence on a settlement as areas develop where there are available infrastructure, and because municipalities are obligated to provide infrastructure where people settle. The sustainability of infrastructure post mine closure has been reiterated by literature and has been identified as a consequence of mine downscaling in South Africa in Chapter 2 of this document.

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4.1 THE HISTORY OF MERAFONG CITY LOCAL MUNICIPALITY

Merafong City Local Municipality (MCLM) (previously Gatsrand District of Potchefstroom) is classified as a category B municipality, as defined by the Municipal Structures Act (Act 117 of 1998). The area of the local municipality spans 1,631km² and comprises 28 wards. MCLM falls within the Gauteng province and the West Rand District Municipality and includes the following areas: Carletonville, Fochville, Khutsong, Kokosi, Wedela, Blybank, Welverdiend and Greenspark. In this section reference will specifically be made to Carletonville, as it was the first establishment in the area and is currently the largest settlement in MCLM (Merafong City Local Municipality, 2018). The location of Merafong City Local Municipality in a regional, provincial and national context, is shown in Figure 4.1.

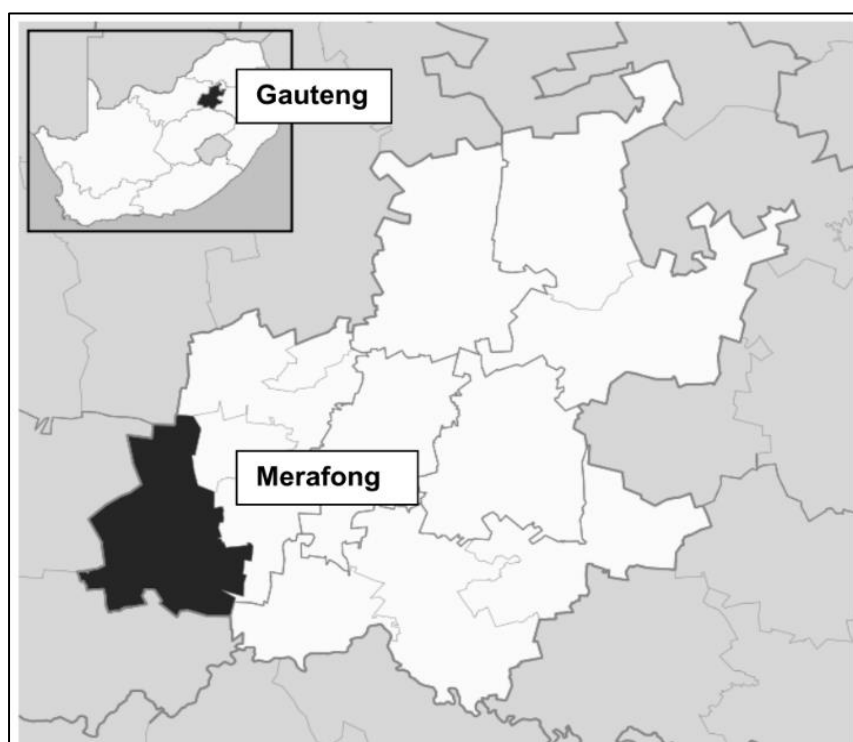


Figure 4.1: Regional context of Merafong City Local Municipality (Source: MCLM SDF)

Initial development of MCLM started in 1937 when development of the present Carletonville area gained momentum. Prior to 1937, agriculture had been the core economic activity in the Merafong area, but from 1937 gold mining companies started to buy out prime agricultural land for mining activity and town development. After a decade, three gold mines were established in the area: Blyvooruitzicht (1937), West Driefontein (1945), and Doornfontein (1947) followed by expansion in the early 1950s, which gave rise to four new gold mines: Western Deep Levels, East Driefontein, Deelkraal and Elandsrand.

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On 20 January 1948, Carletonville was proclaimed, followed by an influx of people and businesses to the area, as well as the development of infrastructure and a railway. The growth in the labour population resulted in a need for housing and general services. Gold mining companies took the responsibility of supplying funds for the improvement of local infrastructure (building roads, providing water and electricity, developing schools, administrative and financial functions) (Winde & Stoch, 2010b). By the late 1950s, Carletonville had expanded significantly. It was eminent, however, that the expansion of Carletonville was not indicative of a balanced economic sector, as the town development and economic enterprise mainly evolved around meeting the needs of the gold mines. One of the main reasons for this economic imbalance, is that, despite the fact that there were large extractive industries and opportunities for industrial development, there were few mining-orientated industries locally (Van Eeden, 1997; Van Eeden, 1998).

Van Eeden (1997) mentions that there were cognisance among Carletonville community leaders (now known as Merafong City Local Municipality) since the 1950s that secondary and tertiary sectors had to develop (within 40 years) in the area to economically survive the decline of gold resources (Winde & Stoch, 2010b). It appeared that the mining industry had done its part to attract investors. However, Van Eeden (1997) states that the industry mainly stimulated town development to meet their own needs and that the local government was left to ensure sustainable economic development without the cooperation of mining companies.

The current economic status quo can be attributed to the fact that there was not sufficient collaboration and exchange of ideas between the two mentioned parties. This predicament became a reality by 1988 when gold production of the mines in the Merafong Municipality started to decline. This was mainly related to the older mines. The more recently established mines of Deelkraal and Elandsrand continued mining (Van Eeden, 1997; Van Eeden, 1998). The dominance of the gold mining sector in the Merafong Municipality resulted in economic insecurity and distorted spatial patterns.

The prominent influence that the gold mining industry has had and the consequential lack of a diversified economy has been a major challenge and had a significant impact on the spatial development of the municipality. The purpose of this chapter is to determine if the IDP and SDF of the Merafong Municipality have successfully countered or addressed the development of distorted spatial patterns that resulted from mining activity and mine closure in the area.

The first subsection will consider evidence that there was a decline in mining production in the Merafong City Local Municipality. This will support the correlation between mine downscaling and the spatial impacts of a settlement. The second subsection will consider the impact of

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mining decline based on statistical information, and the third subsection based on spatial data. The final subsection will consider how the strategic documents of the municipality – which include the Municipal Spatial Development Framework (MSDF) and the Integrated Development Plan (IDP) – articulate and acknowledge the mentioned impact and to what degree they actually plan for mine closure.

4.2 STATISTICAL DATA ON MERAUFONG CITY LOCAL MUNICIPALITY

This section will indicate the impact of mine downscaling, based on socio-economic statistics. For the purpose of comparativeness, most statistical data in this section is drawn from the Census of 1996, 2001 and 2011 as reported by Statistics South Africa (Stats SA, 2015).

4.2.1. Demographics

The IDP mentions that in 2011, the figure of in-migration versus out-migration in the MCLM was 662 to 23,545. This estimated net migration rate is further indicated by Table 4.1 where the decline in population is evident. According to Stats SA (2018), the population is expected to decline with another 12,8% by 2020. The decline in population reflects the negative growth and low quality of life in the area.

Table 4.1: Population size from 1996–2011 (Source: Stats SA Census)

Population	Count
1996	209,798
2001	210,483
2011	197,520
2020 (expected)	172,186
% change from 1996–2001	0,3%
% change from 2001–2011	-6,2%
% change from 2011–2020 (expected)	-12,8%

Table 4.2: Gender distribution from 1996–2011 (Source: Stats SA Census)

Gender distribution	Male count	Female count
1996	136,043	73,683
2001	120,957	89,524
2011	107,157	90,363
% change from 1996–2001	-11,1%	21,5%
% change from 2001–2011	-11,4%	0,9%

When considering the gender distribution (Table 4.2), it is evident that there is a much larger distribution of males versus females. This is a typical phenomenon of mining areas – males usually move to an area of economic opportunities, and females (wives and mothers) usually do not migrate to the area, or migrate at a much later stage. In 1996 the population distribution in Meraufong City Local Municipality was rather skew with 65% of the population being male and 35% female. Since 1995 the male population have decreased. The most probable cause

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is male out-migration as a result of mine closure in search of better job opportunities. The female population on the other hand, has increased since 1996 with more than 22%. The reason for this in-migration is speculative, however, the phenomenon aligns with that of a typical mining town. In many scenarios, males initially move to areas of economic potential and stability, in time the females (usually wives and mothers) settle in the area as well (hence the constant in-migration of the female population).

When the mines start to downscale, a decline in economic opportunities follows, and the out-migration of males searching for new prospects ensues. The females stay behind in the mining town and attend to the settled families, the further in-migration of females can be attributed to the fact that females settle together to assist and offer support with the raising of families.

Table 4.3: Population age from 1996–2011 (Source: Stats SA Census)

Age	0–5	6–18	19–35	36–55	56–70	71+
1996	18,514	32,595	82,204	62,268	9,037	1,984
2001	20,598	38,412	74,034	65,295	9,419	2,722
2011	22,437	36,941	66,798	55,358	12,278	3,708
% change from 1996 to 2001	11,3%	17,8%	-9,9%	4,9%	4,2%	37,2%
% change from 2001 to 2011	8,9%	-3,8%	-9,8%	-15,2%	30,4%	36,2%

The age distribution (Table 4.3) is another consideration when discussing the impact of mine closure on an area. In 1996 the largest part of the population (69,9%), was of working age. Since 1996, these two age groups (19–35 and 36–55) have experienced the most significant decline. The three age groups that experienced an increase in numbers from 1996 to 2001 and from 2001 to 2011, were 0–5 years, 56–70 years and 71+ years old. This directly translated into an increase in the birth rate from 1996 to 2011 and an increase in the elderly population. The increase in these two population groups can once again be attributed to the mining settlement phenomenon.

As mentioned in the previous paragraph, families settle in these areas. Consequently, more children are born, thus the increase in the age group 0–5. When mines start to downscale and economic opportunities start to decline the portion of the population that is not able to search for new opportunities (age 56+), remains settled in the mining town. The drastic increase in the population aged 56–70 and 71+ is indicative of the fact that out-migration is mainly the population in search of economic opportunities. In most scenarios this population group becomes state-dependent and is a huge financial burden on the municipality.

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Table 4.4: Population education level from 1996–2011 (Source: Stats SA Census)

Education levels	Higher	Grade 12	Some secondary	Primary	No school
1996	4,659	14,409	46,179	10,656	23,806
2001	6,537	25,891	63,032	16,703	26,019
2011	9,120	34,847	62,246	10,960	10,323
% change from 1996 to 2001	40,3%	79,7%	36,5%	56,7%	9,3%
% change from 2001 to 2011	39,5%	34,6%	-1,2%	-34,4%	-60,3%

The education profile of Merafong shows some improvements. From 1996 to 2001 and 2001 to 2011 there was an increase in population percentage with Grade 12 and higher education levels, and a decrease in population percentage with no schooling. This could be attributed to the fact that schooling in mining communities is, to a large extent, funded and administered by mining companies. It is evident that the downscaling of mining activities did not have a negative effect on the educational output of the municipality.

4.2.2. Economy

Table 4.5, Table 4.6 and Table 4.7 relate to the economic profile of Merafong City Local Municipality. Although mining is still the dominant employment sector in Merafong City, it contributed 54,9% to the GDP in 2011 and currently only contributes 29,1% to the GDP. This drastic alteration in GDP has also been carried over to the employment per sector statistics. Although the largest percentage of the population is currently employed by the mining sector (25,4% of the labour force as per Table 4.7), mining activities have downscaled drastically since 2001 and have led to nearly 75% of the original workforce being retrenched in 2011 (HDA, 2015; Merafong City Local Municipality, 2018).

Table 4.5: Employment status from 1996 to 2011 (Source: Stats SA Census)

Employment status	Employed	Unemployed	Not economically active
1996	106,799	25,674	32,910
2001	83,626	41,096	34,008
2011	66,635	34,182	42,461
% change from 1996 to 2001	-21,7%	60,1%	3,3%
% change from 2001 to 2011	-20,3%	-16,8%	24,9%

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Table 4.6: Individual income 2011 (Source: Stats SA Census)

Individual income 2011	Population	% of population
No income	73,430.86	37,18%
R1–R400	23,880.99	12,09%
R401– R800	6,348.88	3,21%
R801–R1,600	15,379.50	7,79%
R1,601–R3,200	12,217.70	6,19%
R3,201–R6,400	21,525.35	10,9%
R6,401–R12,800	8,901.38	4,51%
R12,801–R25,600	4,860.55	2,46%
R25,601–R51,200	1,430.03	0,72%
R51,201–R102,400	284.34	0,14%
R102,401–R204,800	137.62	0,07%
R204,801 or more	96.63	0,05%
Unspecified	19,639.09	9,94%
Not applicable	9,387	4,75%

Table 4.7: Employment % and change in employment per sector 2017 data (Source: Merafong IDP)

Employment per sector	Sectoral employment (% of labour force)	Employment dynamics (2006 to 2016)
Community services	13,0%	3,932
General government	6,6%	1,492
Finance & business services	14,4%	4,538
Transport & communication	4%	1,765
Trade	20,6%	7,168
Construction	6,2%	1,570
Utilities	0,3%	102
Manufacturing	7,2%	1,086
Mining	25,4%	-12,970
Agriculture	2,2%	-1,070

Table 4.8: Gross Value Added (GVA) per sector and % change in mining and total GVA in West Rand District Municipality (Source: Stats SA)

GVA p. sector	GVA 1996	GVA 2001	GVA 2006	GVA 2007	GVA 2011	GVA 2016
Agriculture	573,662	489,429	446,653	421,538	456,240	418,831
Mining	33,242,543	30,138,647	20,047,229	18,251,491	11,865,587	9,419,503
Manufacturing	4,455,056	4,982,765	5,148,124	5,072,416	4,818,211	4,800,414
Electricity	911,524	757,944	847,290	830,505	832,907	739,831
Construction	681,755	658,676	1,011,711	1,089,059	1,276,331	1,409,527
Trade	3,318,588	3,863,288	4,457,379	4,559,225	4,639,391	5,011,544
Transport	1,555,456	2,205,634	2,503,251	2,500,549	2,632,177	2,896,476
Finance	3,255,604	4,059,679	5,191,442	5,262,971	5,803,275	6,401,798
Community services	7,057,579	6,851,767	6,921,738	6,715,574	7,415,149	8,004,592
Total GVA	55,051,765	54,007,829	46,574,816	44,703,330	39,739,267	39,102,516
% change in mining GVA		-9,34%	-33,48%	-8,96%	-34,99%	-20,61%
% change in total GVA		-1,90%	-13,76%	-4,02%	-11,10%	-1,60%

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The employed population declined by 21,7% from 1996 to 2001 with a further decline of 20,3% from 2001 to 2011. The unemployment rate significantly increased from 1996 to 2001 with 60,1%, which also links directly to the mining industry retrenchments. Despite the fact that the unemployment percentage might appear to have decreased from 2001 to 2011, it should be observed that the percentage of the population that is not economically active have increased with 24,9%. The unemployment figure has not necessarily decreased, but the unemployed population has become discouraged, therefore their status is captured as “not economically active”. For this reason, the latest census statistics indicate that a large portion (37,18%) of the population does not have an income. The portion of the population that is earning an income that is below the lower-bound poverty line (as defined by Stats SA, 2018), totals 62,42% of the MCLM population (including unspecified figures).

4.2.3. Infrastructure

Due to the remote location of mining operations, mining companies have a long history of providing housing for its employees. Unlike most metropolitan areas where housing markets grew organically, mining towns developed for the sole purpose to serve the interests of the mine. As previously mentioned, Merafong City Municipality is one of the biggest contributors to the mining sector in the West Rand District Municipalities, and the housing models follow a similar mining community trend (HDA, 2015). The fact that 6,5% of houses accommodate a “room or flatlet on a property” or “house or flat or room in a back yard”, is indicative of the fact that there are different housing options, ranging from housing allowances, housing tenures and house ownership by employees.

Table 4.9: Dwelling units in Merafong Municipality 2011 Census (Source: Stats SA)

Dwelling unit (2011 Census)	Population count	% of population
Brick house	39,776	62%
Traditional dwelling	137	0,2%
Flat or apartment in a block of flats	4,634	7,2%
Cluster house in complex	846	1,3%
Town house (semi-detached house in a complex)	204	0,3%
Semi-detached house	174	0,3%
House/flat/room in a back yard	2,867	4,5%
Informal dwelling	14,212	22,2%
Room/flatlet on a property	1,292	2%

The housing development policy of the mines does not take cognisance of densification, integration and diversification strategies. This is evident in the fact that semi-detached houses, town houses and flats or apartment blocks, make up a mere 9,1% of the housing types. A

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further indication of the mine's housing policies, is the high percentage of informal dwellings – many mines pay “living-out-allowances” that offer employees flexible housing options in the area. The downside of this allowance, however, is that many employees prefer to live in an informal settlement in an attempt to save their allowance, resulting in the high percentage of informal dwelling units in the area.

In conclusion, it is evident from available census statistics that the Merafong City Local Municipality has statistical traits similar to typical mining towns. Firstly, since mine downscaling started in the early 2000s, there has been a significant out-migration. The majority of the population is male. However, over the last few years the male population has decreased and the female population has increased. The majority of the “working-age” population has left the area, while the older age groups (56+), have decided to settle in the area despite the lack of economic opportunity. The portion of the educated population has increased, mainly due to the assistance and investment of the mining companies in the area.

The mining sector remains the dominant employment sector, despite the fact that there has been a significant decline in employment in this sector. The imbalance of the employment ratio to other sectors indicate that the Merafong Municipality has not managed to diversify their economic base and is still reliant on mining as a main source of income and employment.

Unemployment in the MCLM has increased considerably. Many brick houses has been developed by the mining companies in this municipality, however, there is only a small percentage of higher density dwelling units. Informal dwelling units in the area also constitute more than 22% of all dwelling units in the MCLM.

All these statistics have a spatial impact on the area which is illustrated in the diagram on the next page. The following section will aim to spatially indicate (via collected GIS data) how the landscapes have changed in the Merafong City Local Municipality.

4.3 SPATIAL DATA ON MERAUFONG CITY LOCAL MUNICIPALITY

Based on geographic data it is possible to observe certain spatial trends in the area. The data is primarily gathered from SA Cities network and Stats SA and is processed by MapAble. Spatial data contributes to the observed spatial impact that downscaling of mining has on settlements as mentioned in the first section of this chapter. Mines in the Merafong City Local Municipality area have started with their downscaling process, thus alterations in the spatial pattern can be observed.

Figure 4.2 indicates the population density in the MCLM area. As is evident from this spatial mapping, there are few areas in the municipality with a “high” and “very high” density rating.

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This is a challenge when sustainable settlements are considered. Dispersed and sprawled settlements have increased infrastructure maintenance costs, reduced integration and mixed-use options. It results in increased travelling costs and time to economic activities, as well as unviable public transport in the area.

The settlement pattern in MCLM in terms of density is an indication that little has been done by mining companies and the municipality to ensure integrated and sustainable settlements. This spatial data links directly with Table 8, as the largest part of the population lives in brick houses (usually RDP developments) and a very small part of the population lives in semi-detached, cluster homes or townhouses, contributing to the low densities on the urban periphery.

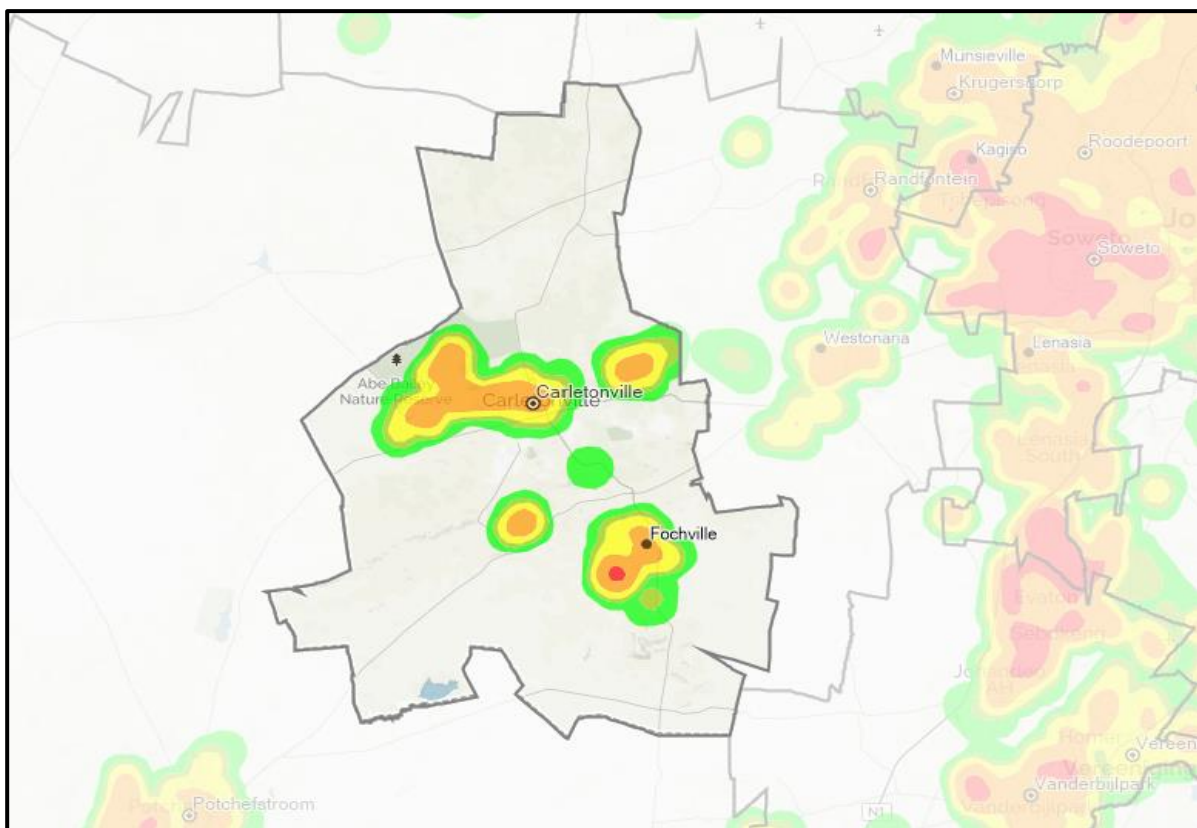


Figure 4.2: Population density in the MCLM (Source: MapAble 2018)

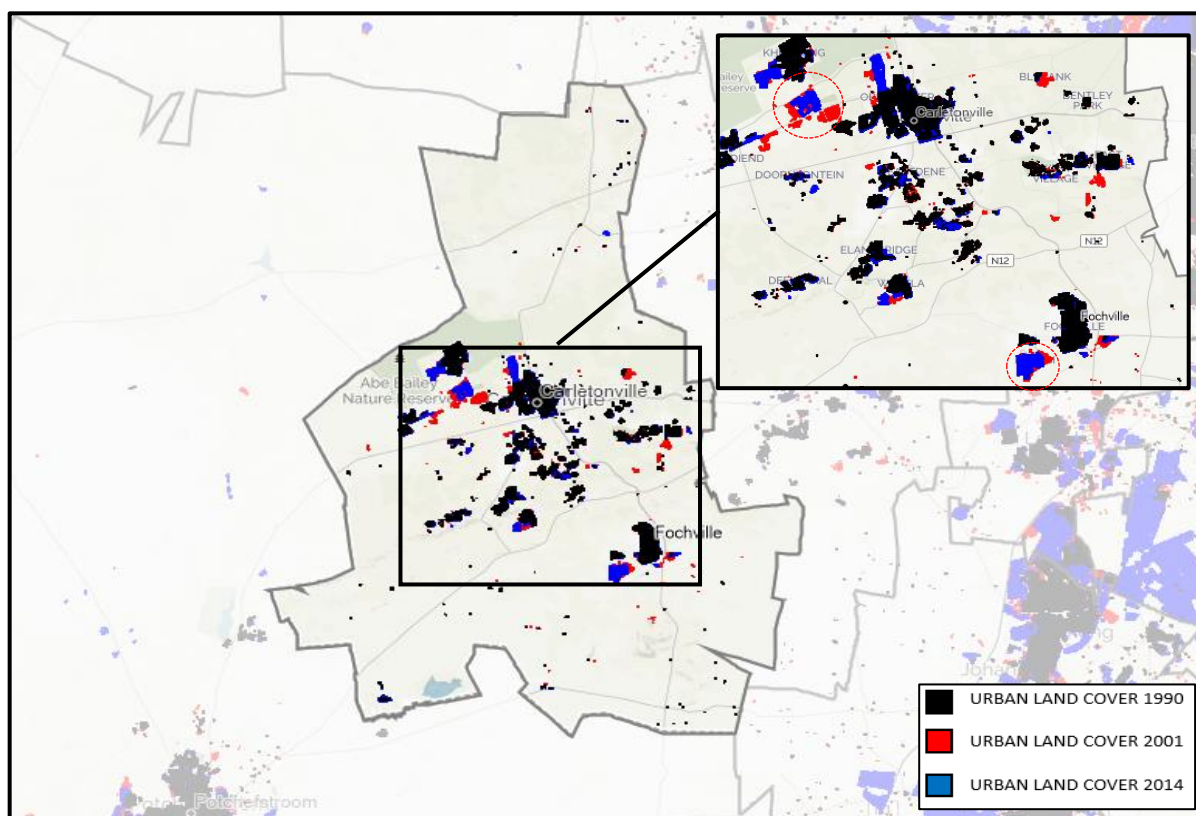


Figure 4.3: Urban Land Cover from 1990-2014 in the MCLM (Source: MapAble 2018)

Figure 4.3 indicates urban land cover since 1990 to 2014. It is interesting to note that the most significant expansion has happened in the township areas in MCLM and fewer urban expansions at the urban core of Carletonville and Fochville. The black areas indicate the urban land cover in 1990, the blue area the urban land cover in 2001, and the red area the urban land cover in 2014. This is confirmed when considering the spatial data regarding the development of informal and township areas in the MCLM.

In Figure 4.4 the expansion of the informal areas and township areas are confirmed. Despite the fact that there has been an out-migration from the MCLM (as per Table 4.1) and despite the fact that there has been a decline in employment (as per Table 4.7), informal settlements keep on expanding. It has also been noted that the household sizes have been decreasing and the number of households have increased. From 1996 to 2001 there was a 100,7% increase in households consisting of one person, and from 2001 to 2011 there was a 79,9% increase in households consisting of one person. A trend that can be observed is that the population moves out of the mining hostels to live on their own, to get on the list to receive an RDP house, but the impact of this action is, however, detrimental to the spatial development of the area. Figure 4.5 to 4.8 is further evidence of spatial expansion of this phenomenon. These images indicate the spatial development of township areas and informal settlements in

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a timeframe of only five years. These areas have expanded despite the declining economic climate of the municipality.

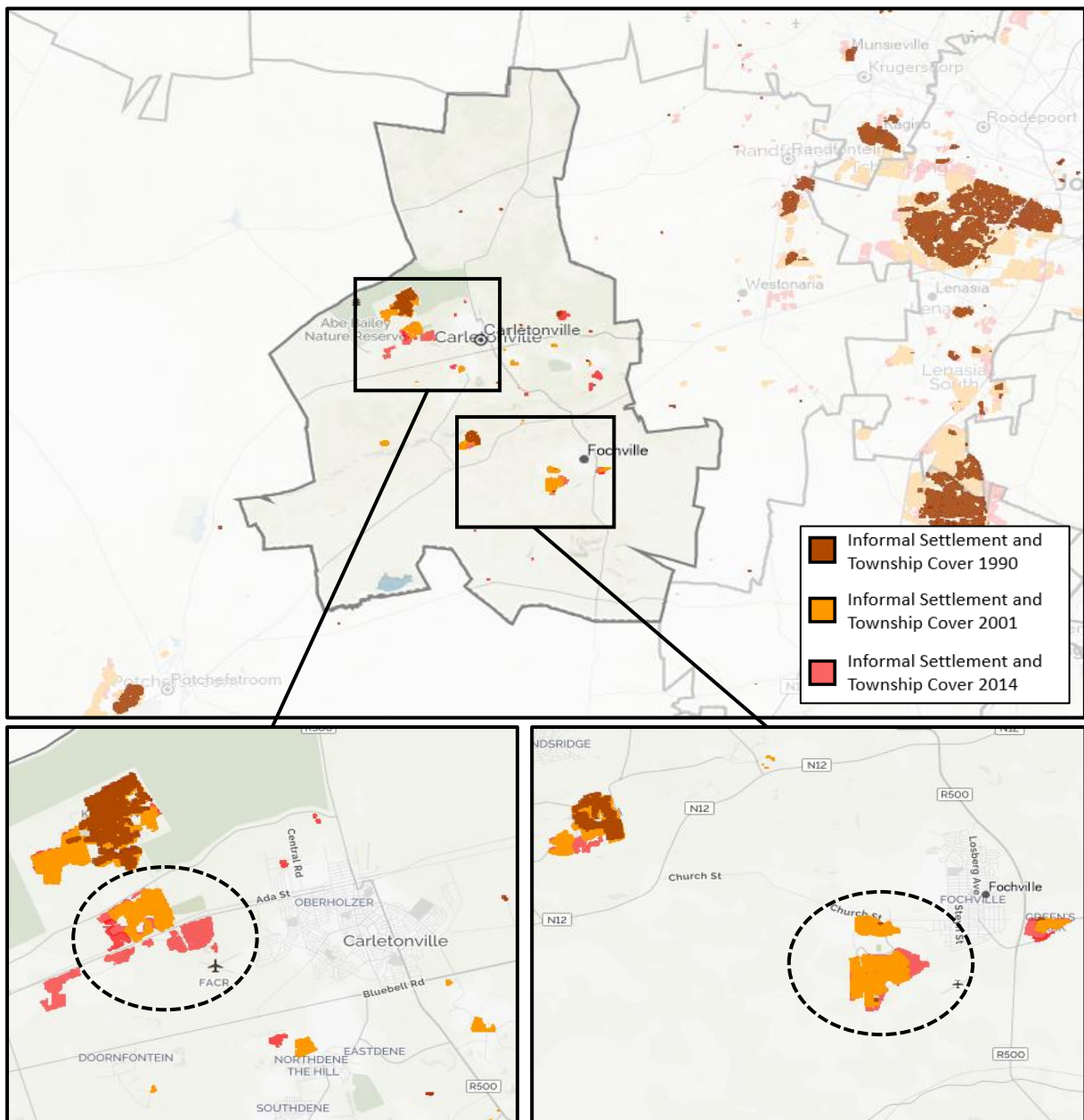


Figure 4.4: Informal and township expansions from 1990 to 2014 (Source: MapAble 2018)



Figure 4.5: 5 Year (2007 to 2013) spatial change of Khutsong South (MCLM) (Source: Google Earth Pro)

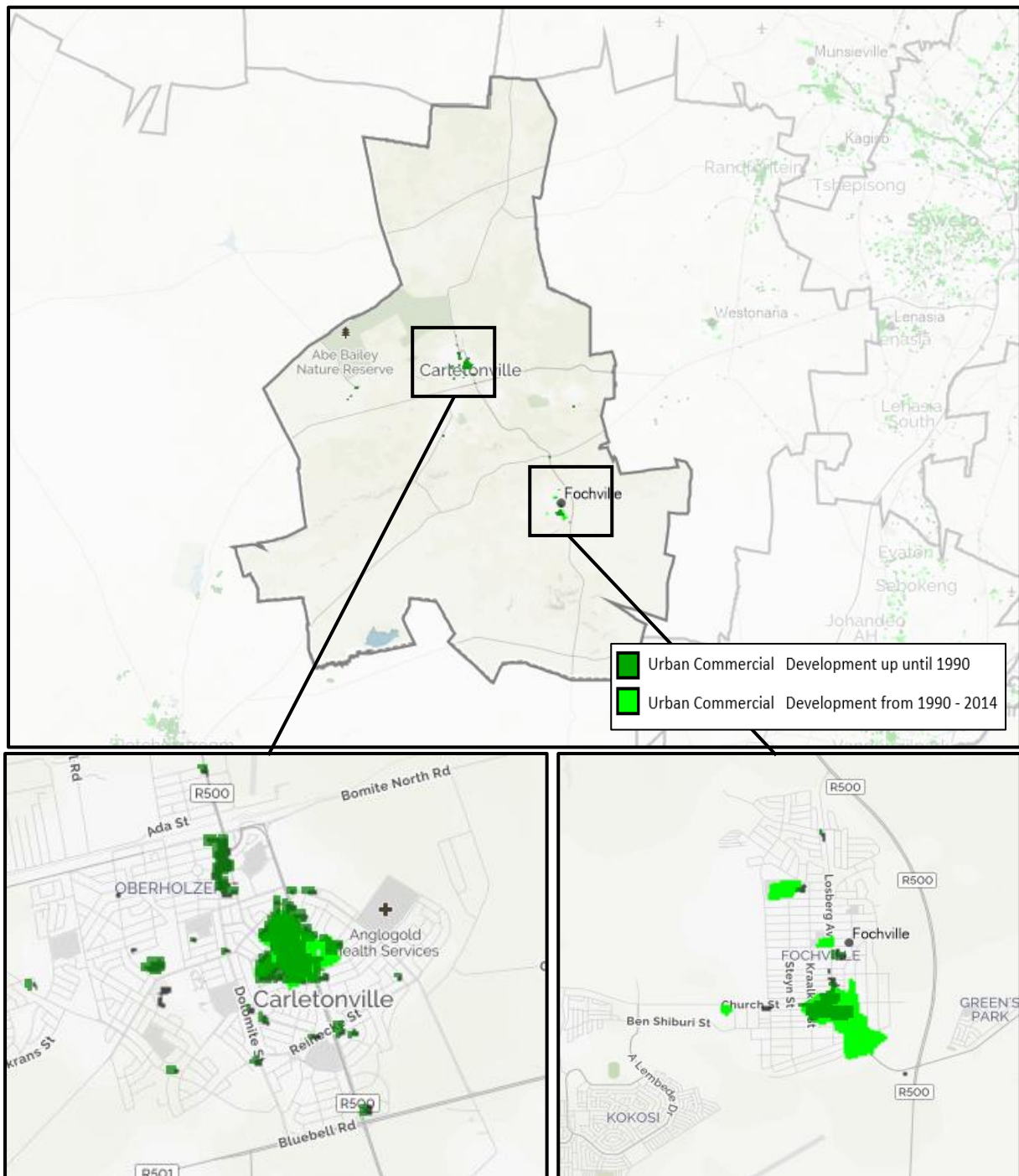


Figure 4.9: Commercial development and expansion from 1990 to 2014 (Source: MapAble 2018)

Figure 4.9 and Figure 4.10 indicate that very little commercial and industrial expansion have taken place since the 1990s. Economic diversification is essential in a mining settlement to ensure sustainable development and a robust economy post mine closure. However, as is evident from Table 6 and 7, this has not been the case in the MCLM. Figure 4.9 indicates that there has not been much commercial expansion since 1990. The commercial expansion that has taken place (mostly in Fochville), is centred and is further evidence of the residential

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sprawl in the MCLM. When an area expands without spatial expansion of the commercial developments, the population is, in essence, located further and further away from economic opportunities with each new residential development.

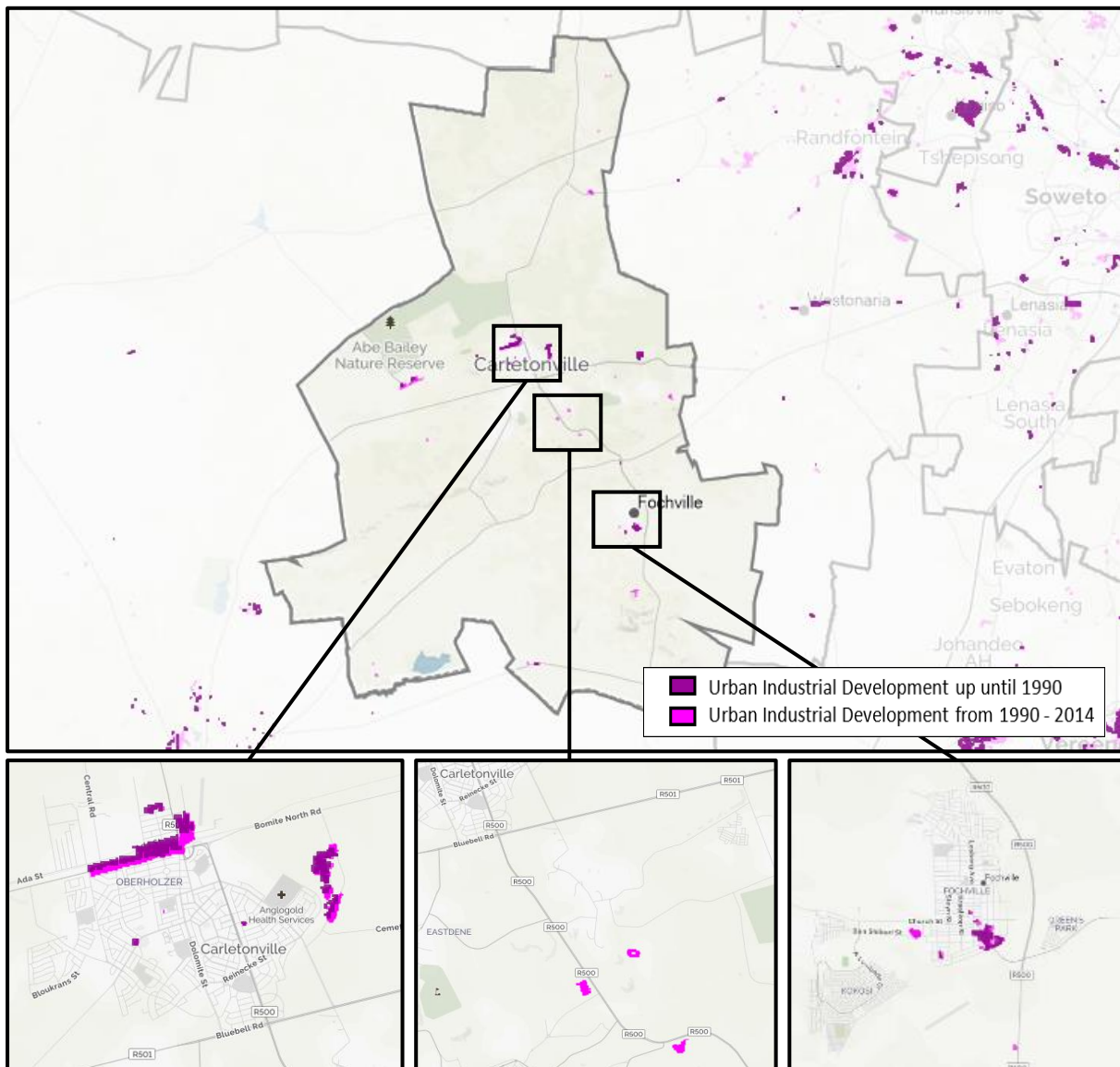


Figure 4.10: Industrial development and expansion from 1990 to 2014 (Source: MapAble 2018)

The same narrative is reiterated by Figure 4.10 – Industrial development and expansion. The best complementary use for the extractive industry is the development of the industrial sector. However, the MCLM spatial data indicates that there has been no industrial expansion other than the development indicated in pink by Figure 4.10. Mining companies require large industrial products and industrial support while mining is active. However, when mining is the reliant sector, the growth of industrial areas are limited and further development post mining are not feasible. In MCLM this can be observed when considering the limited expansion and development of industrial uses post 1990.

4.4 INTRODUCTION TO THE MERAUFONG CITY LOCAL MUNICIPALITY MSDF & IDP

Most of the active Meraufong City Local Municipality mines have started with the downscaling and closure process. Section 4.2.2 (Statistical data on MCLM) indicates statistical trends and Section 4.2.3 (Spatial data on MCLM) indicates spatial trends of MCLM that are typical to a mining settlement where downscaling has started to take place.

The Integrated Development Plan (IDP) is a single and inclusive strategic planning instrument that intends to promote local economic development, spatial development, infrastructure development, institutional transformation, and budget alignment of a municipality. The Meraufong Municipal Spatial Development Framework (MSDF) is one of the plans that feeds into the IDP. The MSDF focusses mainly on the spatial aspects and implications of development planning, where the IDP focusses on broader developmental issues. The purpose of this section is to determine if the IDP and MSDF address the current spatial impact of mine closure in the Meraufong area, and if strategies (in collaboration with the mining houses) are proposed to counter it.

The MSDF and IDP are completely different documents with different mandates. The purpose of the analysis is to determine if certain challenges or issues (as identified by myself) are identified in the strategic documents and if plans or strategies are proposed to address these issues. Based on research from Chapter 2: Literature on mining closure, Chapter 3: Mining legislation, and knowledge gathered from the statistical and spatial analysis above, the following key concepts to be addressed have been identified:

Firstly, the impact that mine downscaling has had on the area should be identified and addressed, as well as the future projected impact and mitigation measures to counter the impact.

Secondly, as mentioned in Chapter 2, economic diversification is critical when post-mining sustainability is considered. This can include interventions to attract investors such as tax incentives, public-private opportunities, and entrepreneurship development platforms. This should be considered and highlighted by the IDP and strategies and implementation plans to diversify the economy should also be considered.

Thirdly, the importance of densification and diversification of land use in a settlement has been reiterated. This strategy is highlighted by concepts such as infill development, urban edge, urban boundary, nodal development, movement networks, high-density development, medium-density development, and spatial targeting.

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Lastly, the degradation and maintenance of infrastructure have been seen as a major hurdle in municipalities post mine closure. Infrastructure development should thus be a critical consideration in the MSDF and IDP.

4.4.1. The MCLM IDP on mine downscaling in MCLM

The **impact of mine downscaling** or “downsizing” is identified in the MCLM’s IDP as a threat to the municipality, confirming that the impact of downscaling was considered. The IDP mentions the importance of collaboration and consultation between the municipality and mining companies and stipulate that it is necessary to have “structured consultation with mining houses to integrate socio- and economic- plans of mines with the IDP needs” (Merafong City Local Municipality, 2018, p. 62). Further consequences of mine downscaling are considered with regard to the unfavourable spatial development of the municipality, and the impact the unregulated spatial use of mining companies has, is highlighted. The document states that mining companies established dormitories “without any regard for post mining use” and the municipalities “did not apply proper spatial logic” (Merafong City Local Municipality, 2018, p. 72).

As a result of this, the IDP also mentions that the viability of the mine villages, post mine closures, is seen as a spatial threat to the municipality. A further impact of mine downscaling, according to the IDP, is the fact that mining companies have been the core property developers in the area. Most properties are owned by mining companies, and remain unused as there are no prospects of further expansion of the mines, “mine-owned erven in corridors and nodes remain undeveloped” (Merafong City Local Municipality, 2018, p. 71). In response to these challenges, the IDP confirms “Outcome 9: Build spatial communities” as part of the municipality’s “turnaround plan” in an attempt to address the spatial legacy of downscaled or closed mines. Strategies that have been proposed under this outcome include acquiring strategic land from mines for development.

The IDP recognises the importance of **densification strategies**, however, densification strategies have not been implemented by the municipality based on the fact that geotechnical data of the area is not available and consequently “virtually no densification is taking place” (Merafong City Local Municipality, 2018, p. 70).

Infrastructure challenges have been reiterated in the IDP and the connection between infrastructure challenges and mine closures is evident. Challenges relating to the “aging of municipal infrastructure”, “poorly maintained water, roads and electricity infrastructure”, and “scattered settlements with uncoordinated infrastructure”, were stated as threats in the MCLM IDP (Merafong City Local Municipality, 2018, pp. 12, 39, 73). Based on the fact that most mining infrastructure has previously been developed and maintained by mining houses, the

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municipality does not have sufficient capacity to plan and execute infrastructure maintenance and development. The expansion of settlements based on the mining legacy has led to various infrastructural challenges.

Although the IDP states that the mining sector is still the dominant contributor to the municipality's GDP, the IDP does not make specific reference to the challenge created by the single industry economic base of the municipality. The lack of **economic diversification** is not identified as a municipal threat or challenge. The IDP chapter on risk management refers to the impact of mine downscaling from an economic point of view and the declining mining economy is seen as the third highest risk of the municipality. The IDP states the importance of developing a "new economy loose from a mining based economy" (Merapong City Local Municipality, 2018, p. 126). The IDP further mentions strategies to promote diversification of the economy, including (among others) the establishment of a business-friendly environment, a business support centre, access to finance and business development tools. Over and above these strategies, Anglo Gold Ashanti has also established an Enterprise Development Centre (EDC) as part of its Social and Labour Plan (SLP). The purpose of this centre is to render support to businesses, such as ICT, assistance with access to finance, development of business plans and concepts, etc.

To a certain extent strategies are developed to implement **economic diversification**. "Outcome 8: Sustainable environment" includes the following strategies: Finalise the feasibility of the bioenergy mega project, agricultural parks, and solar energy project in an attempt to diversify the economy. In the budget of R1m, the municipality included both the Merapong solar farm cluster feasibility study and the Merapong bioenergy eco-industrial park feasibility study. No allocation has been made for the agricultural park's study in the municipal IDP, however, AngloGold Ashanti and Kusasaletu's SLPs allocated R4,5m and R4m respectively for the development of agricultural projects (Merapong City Local Municipality, 2018, p. 145).

The IDP mentions many of the challenges that a typical mining town faces, such as the negative spatial impact of the mining sector, lack of densification strategies, lack of economic diversification and poorly maintained infrastructure. The MCLM IDP does not propose feasible, sustainable and strategic solutions to these issues. One strategy has been proposed to counter the spatial impact of mining. There is, however, no clear directive how this should be done. It is expected that the MSDF would propose more strategies to address the spatial implications of mining settlements. The municipality acknowledges the lack of densification strategies in the municipality, however, no strategy or action plan is proposed to counter it.

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Strategies to address the infrastructure challenges merely aim to supply additional service to the outlining communities. No correlation is drawn between the potential financial benefit of reducing the infrastructure cost and the densification of settlements. Mention has been made about economic diversification in the MCLM. Based on the budget allocations for diversification programmes, however, it is evident that the mining companies – and not the municipality – are still the driver behind these strategies, which impact the sustainability of these projects.

4.4.2. The MCLM MSDF on mine downscaling in MCLM

As mentioned above, the MSDF proposes more direct strategies to address the spatial implication of mining settlements. The MSDF states that a lack of control by the municipality and failed implementation strategies have resulted in scattered mining settlements and the mushrooming of informal settlements around mine shafts. The spatial strategies of the MSDF that aim to reduce the impact of downscaling of mining activity, will be discussed in this section.

The **impact of mine downscaling** has been reiterated in the MSDF with specific emphasis on the scattered development of mining villages. The MSDF provides background of the spatial development of the MCLM, and mentions that under-regulated mining surface rights have resulted in the current scattered settlement pattern in the municipality. Mining companies established mining dormitory villages “without regard for post mining use and the municipalities governing these spaces did not apply proper spatial logic” (Municipality, 2016). The MSDF mentions that settlements such as Blybank and Wedela have developed close to mining operations, but will become a scattered settlement as it will not be sustained indefinitely. It is further emphasised that the impact of mining will be addressed by ensuring urban efficiency, which is greatly dependent on the structure morphology and land use patterns of an urban area (Merafong City Local Municipality, 2016).

Although the IDP briefly mentions that **densification strategies** have not been implemented (Merafong City Local Municipality, 2018, p. 70), the MSDF describes three strategies relating to the densification of MCLM. The strategy divides the Merafong settlement into three distinct areas that will be connected through a development corridor. It further highlights three growth management boundaries: a boundary in which land use intensification is encouraged; an urban development boundary which contains urban development and limits future urban expansions; and a rural-urban interface boundary where only certain land uses are allowed. The strategy mentions that the viability of mining settlements should be determined.

Infrastructure challenges are explained in the MSDF. There is a significant lack of information with regard to current infrastructure in the municipality, as well as a lack of planning and coordination for the future. The MSDF mentions that infrastructure in the municipality has

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been deteriorating due to a lack of infrastructure maintenance (Municipality, 2016). Contributing hereto, is the lack of professional skills in Meraufong relating to the construction sector, such as those of engineers, town planners, architects, quantity surveyors, and land surveyors (Municipality, 2016).

The MSDF discusses **economic diversification** in detail as it has a direct spatial implication on a settlement. The importance of developing “new economic rivers and the densification of the economy” (Municipality, 2016) is explained, as well as the advantages of economic diversification in terms of job creation, a bigger tax base, and the absorption of local purchasing power. Implementation strategies of this policy include: promoting industrial development in the municipality, enabling faster development and growth in the agricultural sector, and urban renewal initiatives.

The MSDF also highlights certain challenges with regard to economic diversification in the municipality and mentions that certain areas of mining land cannot be rehabilitated sufficiently for agricultural use, and this impacts on the possibility of economic diversification for agricultural purposes. Another challenge is the fact that there is a political unwillingness to dispose of property for development purposes (Municipality, 2016).

4.5 THEMATIC ANALYSIS OF INTERVIEWS

For the purpose of this study, I conducted eight key informant interviews. Firstly, the interviews aim to understand the consequences and impact of mine downscaling in the municipality. Secondly, the aim is to determine how mining companies, private companies, the municipality, and the town planners in the Meraufong City Local Municipality perceive mine downscaling.

I analysed the data by means of thematic analysis. Although each interviewee was asked different questions and answered the questions from a different background and perspective, it was possible to identify themes from the transcriptions of the interviews. These themes will be discussed in this section.

4.5.1. The nature of mine decline

In Meraufong City Local Municipality there are four mines and three mining companies, which are currently in operation (of the 11 mines that existed 20 years ago). There are future mining prospects in the municipality, and the local authority mentions that one new mine might open and that the reworking at a previously closed mine might start in the near future. This creates an opportunity to firstly act proactively to ensure better spatial planning for future closure, and

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secondly provides an opportunity to plan for spatial integration and consider economic diversification prior to the initiation of mining activity.

Merafong Municipality has seen a sharp decline in employment, because of the downscaling of mines in the area. Interviewees mention a few factors, which contribute to downscaling of mines in the area and consequently result in unemployment. The municipality mentions that “the easy gold has been mined out”, resulting in the requirement of more expensive extraction methods. The mine representative concurs that “the gold resource is depleted in the area”, and that the phenomenon of mine closure is a natural and expected occurrence. He further indicates that labour conditions have accelerated the decrease in profitability of the mine and subsequently mines have to be much safer and comply with more strict health and safety regulations than were historically required. He further argues that the decline in profitability of the mines, as well as technological improvements, reduced the labour requirement at mines and had a consequent impact on unemployment.

Another mine representative comments on the impact mine closure has had on unemployment in the municipality. She states that in “2015 we were just under 28,000 employees and we currently stand at 8,000”. Although many of these employees were transferred to other mines, a significant increase in unemployment was inevitable. Unemployment has had a ripple effect on the rest of the municipality to the extent that private businesses that service the mines, are also forced to reduce their labour force, as one private business owner mentions, “after 2014, we lost basically 20% of our labour”.

The municipality states that the lack of employment results in the fact that “crime goes up on a monthly basis”. There is a proportional relationship between the increase in unemployment and the increase in criminal activities in the municipality. This criminal activity often has a direct financial impact on the municipality, especially when service infrastructure is damaged. A private business owner elaborates on the detrimental effect cable theft and stolen telephone infrastructure have on the municipality. He mentions that the local government is not in a position to create an “investable environment, or to give tax incentives, because... they are actually bankrupt”. He mentions the municipality does not create a conducive environment for investment in the municipality.

The interviewee from the municipality mentions that despite the fact that mines have been closing since the 1980s, post-mining economic activities have received little attention from mines or the regulatory authorities. He is of the opinion that the “window of opportunity” for dealing with this problem of downscaling is diminishing on a daily basis. The town planner

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concur and states that the sooner one acts on mine closure and downscaling, the better the chance will be to develop an appropriate response. The municipality mentions that they have attempted to diversify the economy and expand the “one sector economy”. However, economic diversification is difficult to come by and the economy is still heavily dependent on mining.

4.5.2. The implications of mine downscaling

The core focus of this study is to determine the unintended consequences of mine downscaling and closure, with a specific focus on the negative spatial implications. Chapter 2 of this study indicates the negative impact highlighted in literature. The statistical and geographical data (in the first part of this chapter) shows the negative impact of mine closure. It has also surfaced as a theme during the interviews.

When a mine closes, “the reason why that (mining) town exists, is no longer there”, as an interviewee points out. He further notes the negative spatial impact and mentions that mine closure leave behind segregated human settlements and communities, as mining often happens in remote locations or on the periphery of municipalities. The mining company states that areas around mines were developed for “the mines self-interest”. He explains that when mines develop mining villages, its main focus is the quantity of residential houses and recreational facilities required. The mentioned development is then “ring-fenced” to benefit only the employees, and not the broader community. When the mines close down the settlements remain.

This spatial phenomenon is echoed by the municipality, who mentions that mines have closed down in the municipality, but people still reside in the mining settlement with the hope that the mine will be resuscitated at some point. In Merafong Local Municipality, the Blyvooruitzicht mine closed down. When it was still in operation, the mine provided bulk and social services. After closure, however, the mine withdrew their responsibility, as it is not a legal requirement to sustain the settlement if the closure process has been initiated. The municipality has been forced to provide services to the residents without any financial compensation. The impact of the financial burden on the municipality has negative consequences and a local business owner mentions that, “this Carletonville area has gone backwards quickly, particularly the last five years”. He elaborates on the potholes, the neglected state of infrastructure, and the lack of service provision.

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Another negative spatial impact, relates to the layout of the mining settlement. Often mines develop mining settlements without cognisance of spatial planning principles. Historically, mines were only required to apply to the DMR (previously the Department of Minerals and Energy) for a mining licence and property. The interviewed spatial planner mentions that “from a spatial development point of view, mining houses could do what they wanted if they had approval from the DMR. They steamrolled planners”. Mines obtained large pieces of land for the planned mining operations, and were in a position to build low-cost and low-density human settlements for its employees. He further mentions that mines developed these properties to fit their needs, and this resulted in low urban efficiency in these mining settlements.

The mining company representative states that “mines are comfortable doing what is working for them and their employees, not concentrating on what happens outside or on forward planning”. The negative impact the layout of the mining settlement can have on the future spatial planning of the municipality, has thus not been considered. However, despite comments that mining companies are not aligning with spatial planning principles when developing mining settlements, the interviewed town planner emphasises that mining companies “should not have to do any spatial planning – that is a municipal function” and that the low urban efficiency in mining settlements is a result of the historical absence of local authorities providing guidance on good spatial planning principles.

Formalisation of the township is another concern raised. The municipality mentions that “the mining settlements in Merafong are on farm portions, they’re not established townships” and this poses various challenges. The town planner concurs and mentions that “very seldom does the mine lodge a township establishment application with the municipality”. The interviewed mining company in Merafong has started with the “formalisation project” in attempt to “incorporate the area (mining settlement) into the municipality”. It is, however, noted by another interviewed town planner, that the municipality has been reluctant to formalise the mining area and take over ownership as “they have more responsibility, but not a lot of additional income” once they take ownership. The mine representative in Merafong mentions that the municipality is not willing to take over current infrastructure before the mines have not upgraded the available bulk infrastructure to “comply with the red book standards”. He further mentions that this upgrade has not been done and does not comply yet, because the mining companies deem it an unnecessary cost.

4.5.3. Economic diversification and downscaling

The importance of economic diversification has been reiterated in the interviews. The interviewed business owners are in agreement that there are no current incentives to attract

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investment to the area. One municipal representative states that, “we haven’t done a lot in terms of diversification, we have only started to look where other sectors can be improved” in an attempt to diversify the economic base. Another municipal representative, however, mentions that the municipality is in the process of developing incentive packages and special development areas. He further elaborates on the flagship project called, “the Meraufong Bio-Energy Eco-Industrial Park... which is estimated to create between 2,000 and 3,000 jobs in a basic sector of the economy”.

The mining company representative states that “municipalities are just waking up to the urgency of diversifying the economy”. He highlights that to develop the flagship project you need ample funding and investment, which might be difficult when considering the current Meraufong environment. He (as well as the private business owner) mentions that services in the municipality are substandard, roads are not maintained, there are blockages and the sewer is constantly overflowing.

The mine is of the opinion that “municipalities are not doing enough to create a conducive environment for a diversified economy”. This is a perpetuating issue, because as the mines are downscaling, the tax base decreases, which limits the municipality’s capacity to maintain bulk service infrastructure. If infrastructure is not maintained, businesses will not invest in the area and consequently the economic will stagnate. The municipality emphasises the importance of diversifying the economy at an early stage of mining development, and states that it is important that the municipality does not merely become complacent with the existence of mines in its area. Both the municipality and the mines should be actively engaged in diversifying the economy, “because complacency is what brought us here from the local government’s side”.

4.5.4. The establishment of a forum for mine downscaling

Various interviewees have depicted the importance of two-way communication between the mining companies and the municipality. In Meraufong this is, however, a difficult objective to achieve. The municipality mentions that, “unfortunately the relationship between the municipality and the mines is a bit tainted... the top management of the municipality and the mines are only talking to each other through their lawyers...” as there has been previous disagreement between the two parties. The municipality is, however, committed to “rebuild the trust relationship with the mine”. Another interviewee supports this statement and mentions that mining houses should play a much bigger role as an interested and affected party in the municipal programmes.

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An interviewee mentions that mining companies should be involved in drafting municipal strategies (SDFs, IDPs, and Human Settlement Plans) and the municipality should also be included in the development of the Social and Labour Plans of the mines. A representative from the mining company further builds on these ideas, but mentions that it is critical that, “such a forum needs to be driven from the top”. He mentions that there have been many engagements between the mines and the municipalities where conclusions could not be reached, because the decision-making authority was not present. “You can’t have an LED (local economic development) officer run with this type of issue – you need to have the mayor, and on the other side you need to have decision-makers from the mines as well.”

4.5.5. Lessons learned from mine closure in Merafong

The most recurring lesson learned from mine closure in Merafong relates to the role the closure plan should play in mine closure. The mining representative states that “mine closure should be part of the development of the mine. When you start a mine, you should have your closure plan with you and start implementing the plan from the word go”. Another interviewee mentions that a closure plan should specifically impose an action plan relating to the people and the infrastructure after mine closure, and “should be actioned upon approval of the mining licence”. From the municipality’s point of view, the interviewee mentions mining should be incorporated in municipal planning to the extent that “closure plans are incorporated into our spatial development framework”.

The town planner says another lesson that can be learned is that mine closure has “serious implications on the spatial form of the municipality which is difficult to fix” and Merafong is a good example of this. He mentions that it should always be remembered that mining is a temporary land use and that developing permanent settlements based on a temporary activity, results in unsustainable settlements. The municipality indicates that once a mine opens, the mine should first consider “incorporating its workers into the existing urban fabric, and not creating new scattered villages” that will become a municipal burden after mine closure. The mine representative mentions that this will also assist the municipality in “reducing their dependency on the mine at a very early stage”. It is critical that the municipality works with the mines when compiling its closure plans and incorporates these plans into the municipal spatial development framework. It is further important to set targets in terms of what the mines plan to demolish, what it plans to keep, and if or when it plans to formalise. The plan has to clearly indicate the designated areas where demolition will take place, as well as the areas for rehabilitation and other areas where municipalities can retrofit and use the current urban infrastructure.

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In conjunction with this idea, the second interviewed town planner mentions the important role township establishment can play in preventing an unsustainable post-mining spatial footprint. She mentions that the formalisation of the mining settlement should be determined based on “the value of what is there and feasibility to establish a permanent settlement in the area”. She says factors that have been considered to determine the feasibility of township establishment of mining areas in the Merafong City Local Municipality include “distance from town, historic value, contribution of infrastructure to the economy, and integration of the current community in activities other than the mine”.

Aligning with this idea, the municipality states that to the extent possible, workers should be incorporated into “the existing urban fabric, not create new scattered villages”. When new mines in the municipality open, the municipality will request the mines to rather develop in the current urban area, than develop settlements and villages on the periphery of the municipality. This is repeated in another interview, where the town planner mentions that with the development of new mines, local authorities should require the mines to “rather provide accommodation in town where there are currently a lot of vacant stands and then institute a public transport system to the mine”.

4.5.6. Insufficient legislation relating to downscaling

The inadequacy of current legislation to ensure mine closures without negative impacts have been mentioned by the municipality, town planners and the mines. One town planner states that legislation “is not sufficient at all... they focus on some of the right things, for example the rehabilitation of the environment, but nothing gets said about those communities that were created and established and what happens afterwards” and another says “current legislation is not strong enough”.

A mine company representative says that closure legislation relates mostly to environmental obligations and “don’t speak to the social closure... it creates a vacuum where the law is open to interpretation”. She indicates that legislation does not require companies to “explore all possible avenues to make sure that you leave a sustainable community before closure”. This is one of the reasons why there are so many negative post-mining effects on the Merafong Municipality – when mines are not legislated to reduce negative impacts, it will not go out of its way to do so, as this is a further cost implication. Mining is a business and the ultimate goal is profitability. Another interviewee concurs, stating “legislation doesn’t cover the social aspects of mine closure... it focusses on the environmental aspects”. He further indicates that legislation concerning the rehabilitation fund is “inadequate”, it focusses on environmental

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rehabilitation, but does not require “social rehabilitation”. The mine representative correctly states that closure plans “don’t speak to the social side. It just speaks to the assets and the amounts and what is affected and how much each one is funded for. There is nothing about social integration, where I think the biggest gap is”.

The municipality mentions that “legislation is very thin” and another representative from the municipality says “the legislation is not strong enough to say what will happen with the people, what will happen with the infrastructure, what will happen with all the properties”. The municipality further explains that legislation that aims to promote the development of sustainable post-mining settlements (with limited negative impacts) “should be addressed with spatial planning legislation, not in the DMR legislation, because they are dealing with mining, we (the municipality) are dealing with spatial planning”.

4.5.7. Land use management and spatial planning and downscaling

Interviewees consider the possible impact land use management and spatial planning can have on the development of sustainable post-mining settlements. SPLUMA enacts each municipality to develop their own Land Use Management Schemes (LUMS) and Spatial Development Frameworks (SDF), as mentioned in Chapter 3.

The interviewed town planner mentions that mining companies must “also become stakeholders in the SDF process, because that’s the plan and drive spatial changes”. He indicates that the municipality should “accommodate mining in the land use scheme” and that land use management can be used as a tool in the Merafong Municipality to integrate the mining areas in the municipal spatial planning. The SDF and LUMS can also be used to earmark certain areas for economic development and incentive investment. Both town planners mention how the Midvaal Municipality has successfully implemented this – by means of the SDF they incentivised companies to open up close by. This directly contributes to economic diversification and creation of job opportunities.

In conclusion of this theme, the town planner mentions that the Merafong Municipality should “make sure you accommodate mining in your land use scheme in some way, and that you also focus in your SDF on ways and means to incentivise businesses to locate closer to these unemployed communities and potentially employ them”. The second interviewed town planner says ad hoc implementation of the SDF is possible as it is reviewed annually. “If the mines plan to formalise the SDF, they should have a chapter to indicate how this formalisation can sustainably contribute to the spatial development of the municipality.”

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4.5.8. Impact of social and labour plans in the Merafong Municipality

Social and labour plans are a legislated requirement of the Department of Mineral Resources that aim to ensure that mines “give back” to the community in which they are benefitting and creating profits. A town planner mentions that in the Merafong Municipality (as in most municipalities where he worked at), social and labour plans are not developed “in conjunction with the community”. He says it would be ideal if the social and labour plans align directly with the IDP of the municipality, as “the integrated development plan takes into account all the needs of all communities”. The mines are not legally required to determine the needs in the area and spend its funds accordingly.

The municipality states that “SLP funding should be linked to our (the municipality’s) strategies and policies”. He says it would be beneficial if there can be alignment of the SLPs of the three mining companies in the Merafong Municipality. He states that “they don’t want to work together on SLPs and we try to force them to spend SLP funding on programmes that we determine”. If the mines work together on SLP initiatives that are predetermined by the municipality, it will give better scale to the funds. He explains that a single R10m project can have a much greater impact and is more likely to diversify the economy than three small R3m projects. He concludes that there have been engagement with two of the mining companies, who have committed to align their social labour plan with the municipality’s Integrated Development Framework.

Similarly, the mining company representative states that most SLP projects are executed in line with the local authority. She mentions that “everything we execute in that social labour plan is done in conjunction with the municipality”, and further concludes, “we work hand in hand with the municipality when we develop our social and labour plan to also include the Integrated Development Plan of the municipality, because when you hand over the project, it has to be owned by someone and it can only be owned by the municipality as a custodian of the community. So, we can’t implement anything in the Merafong area that affects the local community without consulting the municipality”.

Unfortunately this has not been the case with all mining companies in the municipality. The second municipal representative adds that some SLPs of the current mining companies in the local area only address “the soft issues – they don’t address real issues like economic issues, industrialisation, creating employment – they just want to spend the money and report that they’ve given us money. It doesn’t really add value in terms of improving the living conditions of the people”. She states that a single mine has to spend approximately R3m on projects in

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the SLPs, but “you can’t see the value of that”. Another concern raised by this interviewee, is that some SLPs of the mines in Merafong City Local Municipality allocate money towards projects that are already set to be implemented by national departments. As a result, the municipality does not get this funding from national departments for sports facilities, science laboratories, and health care as it is already being implemented by the mine.

MCLM has to a large extent been making plans to eradicate unemployment, and it has done the feasibility profiling of some projects to determine its viability and sustainability as a solution to create jobs, post mine closure. Although these plans and incentives are only in the pipeline, there is potential for successful economic diversification, if there is collaboration between the municipality and the mining company. The municipality states that “the idea with these projects is to replace mining as the base of the economy, by developing new mechanisms to deal with incentivised investment”. One of the flagship projects in Merafong Municipality is called the Merafong Bio-energy Eco-industrial Park.

The municipality has made strides in planning regarding post mine closures. However, despite these efforts, a lot more is required, and this cannot be driven by local authorities alone – provincial and national government should play their part in developing sustainable local settlements.

4.5.9. Conclusion

The Merafong City Local Municipality is largely dependent on the mining sector as a primary GDP contributor. It is evident from the interviews that the Merafong Municipality has been impacted by the decline in mining activity. Various mines have closed down in the municipal area and the lack of collaboration between the municipality and mining companies have had a detrimental spatial impact and has also placed a large financial burden on the municipality.

As the mines in the municipal area start to downscale, unemployment, the crime rate, and the Government dependency of the municipality, also increase. Despite general consensus on the extent of the impact that mine closure has had, there are different opinions with regard to the responsibility of both mining companies and municipalities to limit these negative impacts.

In Merafong Municipality, mines have historically developed mining villages for the sole purpose of utilisation by mining employees. Integration with the nearest town has never been a requirement of the Department of Mineral Resources and local authorities did not have the correct tools to enforce and promote integration and guide spatial development of mining

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settlements. In the Merafong Municipality, the impact of unsustainable spatial development of mining towns has been experienced first-hand – when one of the mines closed, the municipality was burdened with sustaining the settlement and maintaining bulk services to the people who remained in the area.

The formalisation process in the Merafong Municipality has become a major hurdle as municipalities require an upgrade of infrastructure before the mining property is “handed over” to them, but mining companies are of the opinion that the mine should not be burdened with the cost of upgrading, as it was built in alignment with the required standards at the time of initiation. The local authority and mining companies in the Merafong Municipality have had various engagements with regard to the formalisation process, but – as mentioned above – communication has been difficult in instances where the relationship between the municipality and the mining company has been compromised. Despite this knowledge, all interviewees state that the development of a forum (that consists of mining company and municipal representatives) to address mining closure, is critical. The respondents mention that this would be the only solution to successfully close mines in the Merafong City Local Municipality.

The central theme of the interviews relates to the closure plan of the mines, although interviewees could only elaborate on closure plans in the MCLM. The reality is that the issues discussed regarding closure plans relate to national mine closure. The importance of planning for mine closure when mining activity commences, has been reiterated. Multiple respondents mention that closure plans are only concerned with environmental considerations, and that social rehabilitation, as well as the rehabilitation and incorporation of infrastructure, have been omitted. Closure plans should specifically state what happens to people and buildings when the mine closes.

The initial development of mining settlements, as well as the process of formalisation, should be carefully reconsidered. Integration of settlements in a post-mining economy becomes unfeasible if the settlement does not have certain densities. In Merafong there are examples of how a mining settlement can place a financial burden on the municipality and there is also an example of how difficult it is to integrate and formalise a mining settlement that has previously been excluded from the municipality’s spatial planning.

Legislation has not been adequate in addressing the negative spatial impact of the Merafong Municipality, and interviewees indicate that the Spatial Development Framework and Land Use Management Systems should be used as spatial planning tools to ensure the integration of a settlement, prevent the development of settlements on the periphery, and attract

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economic investment in certain sections of the municipality. In the same instance the interviewees call for all SLPs to be integrated in the municipal IDP and for a forum consisting of decision-makers from both the municipality and mining companies, to be established to deal with the impact of closure from a holistic perspective.

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“Eventually if you take the view that a mine is a temporary land use you will need to do something different with mining development.”

(Interviewee – Town Planner)

5.1 SUMMARY OF THE STUDY

The main aim of the study is to determine the unintended consequences and spatial implications of mine downscaling and closure of South Africa’s gold mines. Downscaling of gold mines in South Africa is inevitable, and various factors have contributed to the downscaling and eventual closure of gold mines in South Africa. The detailed literature study confirmed research on the environmental implications of mine closure, however, social and spatial implications have been under-researched.

International mine closure strategies are documented in the study to determine which approaches can be implemented to lessen the impact of mine downscaling in South Africa. The two main pillars on which most successful international mine closures rest, are economic diversification and planning and regulation. When considering the negative impact of mine closures in South Africa, it becomes evident that the lack of economic diversification, planning and regulation have resulted in economic decline, a decline in employment, negative spatial implications, a burdened local municipality, increased poverty and detrimental environmental ramifications.

Further investigation into the legal requirements for mine closure concludes that, although legislation relating to mine closure does exist, current legislation is not calibrated to achieve sustainable (post mine closure) settlements. Even though the MPRDA has a stronger focus on socio-economic sustainability and upliftment, most mining communities still experience economic decline, more unemployment, negative spatial implications, an increased financial burden on municipalities, growing poverty levels, and socio-economic challenges. Consequently, it can be concluded that current mining legislation on mine closures in South Africa does not (1) relate to international themes in mine closure; and (2) does not address the current negative impact of mine closures in South Africa as stipulated in the previous chapter.

The Merafong City Local Municipality was chosen as a case study to determine the impact of mine downscaling and closure as the gold mining sector is the municipality’s reliant sector and

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alteration in this industry is easily visible. The municipality fits the profile of an area where mine downscaling in the mining sector has occurred and where the GDP of the mining sector has decreased significantly. The Merafong Municipality developed mainly because of gold mining activities in the area, therefore the impact mine downscaling has, can be well observed.

Statistical information of the study area indicates negative demographical implications of mine downscaling, including a decrease in population; an increase in female population and a decrease in male population; an increase in an older population and decrease in the working population; a decrease in employment and an increase in population earning no income. The mining sector remains the dominant employer, even though there has been a significant decline in employment in this sector.

The imbalance of the employment ratio to other sectors indicates that the Merafong Municipality has not managed to diversify its economic base and is still reliant on mining as the main source of income and employment. Unemployment in the MCLM has increased considerably. Many brick houses have been developed by the mining companies in this municipality. However, there is only a small percentage of higher density dwelling units. Informal dwelling units in the area constitute more than 22% of all dwelling units in the MCLM.

The spatial information on Merafong Local Municipality indicates that there have been numerous urban sprawls and this has been met by an increasing supply of RDP developments by the municipality. Dispersed and sprawled settlements have increased infrastructure maintenance costs, and reduced integration and mixed-use options. It results in increased travelling cost and time to get to economic activities and also in unviable public transport in the area. Even though there has been an out-migration from the area and despite the decline in employment, the informal settlements keep on expanding. The study further notes that the municipal IDP and SDF have mentioned the negative spatial implications of mine downscaling, but have not developed its policy documents to such an extent that it could address the spatial disparities created.

To get more in-depth information on mine closure and possible solutions to mining, open-ended interviews were conducted with the mining companies, the municipality, local business owners, and town planners of the area. From these interviews, further negative spatial impacts were highlighted. A few key concepts were raised including the importance of economic diversification; the establishment of a forum for mine downscaling interviews; as well as the fact that current legislation relating to mine downscaling is insufficient.

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5.2 MAIN FINDINGS OF THE STUDY

This study has considered the unintended consequences of mine closure. The study aims to assess what the socio-economic and spatial implications of mining downscaling in the Merafong City Local Municipality are and determines how these current challenges could be addressed through the effective implementation of the current mining and spatial policies. The study considers international case studies of mine closure, literature on national mine closure, as well as a spatial, statistical and qualitative study of Merafong City Local Municipality, with the aim to determine what can be done differently with regard to mine closure in South Africa.

Economic diversification has been reiterated in international literature (Centre for Development Support (CDS), 2005; Keyes, 1992; Page & Beshiri, 2003; Van Assche et al., 2016), and has been seen as a prominent element of mine closure in China, Canada and Greece. In South Africa, the absence of economic diversification during the mine closure process is highlighted in literature (Nel & Binns, 2002, p. 253; Marais, 2006b, p. 60, 2013a, p. 366; South African Government, 2016, p. 2) and has led to a declining economy in settlements with a high dependence on mining activity. It has also led to increased levels of unemployment. The mentioned economic decline has also been noticeable in the MCLM with a 60% increase in unemployment since 1996.

This lack of economic diversification has not been noted as a key risk in the municipal IDP. The IDP does not propose feasible, sustainable and strategic solutions to this issue. Closure plans and Social Labour Plans of the mines in conjunction with the Integrated Development Plan and Spatial Development Plan of a municipality, can guide economic diversification before mine closure. The SDF can be used as a tool to direct economic activity towards the area and the social and labour plans should align directly with the municipality's IDP to promote development in specific sectors that can result in economic diversification in the municipality. The closure plan should stipulate economic diversification with the initiation of mining activity. It should not only focus on environmental rehabilitation, but socio-economic rehabilitation as well.

Land use planning is seen as a significant tool to promote sustainable mining settlements internationally, and the assignment of land use is a prominent post-mining strategy (Kivinen, 2017; Van Assche et al., 2016). In Finland, for instance, mine closure is subject to administrative control and regulation. Mining licences require closure management plans and "mine site reclamation to other uses". This ensures that mining companies consider uses that will sustain the socio-economic benefits of the mining operations (Kivinen, 2017, p. 1705).

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When considering current legislation in South Africa, it can be noted that there is legislation to compel a mining company to impose zoning before commencing with mining activity, by utilising municipal Land Use Management Schemes (LUMS) (Stevens, 2017; Limpitlaw, 2004). This will ensure that post-mining land use is compatible with surrounding development initiatives.

LUMS give municipalities the authority to instruct mines to rezone the property to be mined, over and above the mining authorisation from the Department of Mineral Resources. In theory, every mining company that needs a prospecting or a mining licence, needs to apply for zoning from the municipality. The current challenge is that many local municipalities do not have adequate land use management schemes as yet, and some LUMS do not have zonings like “mining”. The compilation of LUMS should thus be reconsidered – if municipalities do accommodate mining as a primary right or a zoning they can impose specific conditions (e.g. a rezoning will be granted if all the environmental authorisations and the mining right are in place, but the conditions of the specific zoning is that the mine may not create any human settlements).

This will require mines to incorporate their developments in the existing spatial fabric of the closest mine, and then impose transport arrangements, rather than merely developing low-density, residential settlements on the periphery of the municipality. SPLUMA provides the opportunity to incorporate new mines into the spatial development strategy of the municipality with the enactment of the wall to wall municipalities. However, the challenge in Merafong Municipality is the fact that the mines have already been established, long before the development of this legislation, these settlements will thus have to be formalised and integrated into the municipality.

The formalisation of mine settlements is highlighted by international researchers, a key international post-mining strategy. However, in the international arena, the potential of the mining settlement is considered before establishing it as a permanent settlement. In the Nordic region, mining communities are defined based on the projected lifespan of the mining operation, the size of the mining community, its degree of isolation, and the diversification of the local labour market, as this would influence investment in the mining community (Coetzee & Soderbaum, 2015; Tykkylainen & Bradbury, 1992).

Legislation should provide clear guidelines and parameters for when a mining area should formalise and when it should be demolished post mine closure. Formalisation of a mining settlement should be sustainable and there should be clear measurements to determine the

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sustainability (distance from town, historical value, the contribution of the infrastructure to the economy of the area, how the area can be integrated with the community, and if there is a current variation in the typology of housing opportunities). In Merafong Municipality a study of sustainability has been conducted by the town planner, which concludes that the mining settlements should be incorporated in the municipality. However, the process of formalisation has not been possible as yet, because of disagreement between the municipality and mining companies. This informs the next conclusion.

Collaboration between municipalities and mines is realised by international literature as a critical requirement to close mines successfully (ICMM, 2008; World Bank Group & International Finance Corporation, 2002, p. 4). This has been noted in countries such as Papua New Guinea and Romania. Mining companies and municipal representatives in the Merafong Municipality elaborate on this and states that mining companies are currently not included as interested and affected parties in the stakeholder engagement process of strategic municipal documents such as the Spatial Development Framework, the Land Use Management Scheme and the Human Settlements Plan. The municipalities are also not included in the future planning of the mines. This is a critical flaw that is not only evident in the Merafong Municipality, but nationally. The legislation does not require the establishment of forums to deal with mine closures, and it is noted that the content of closure plans should be reconsidered to include collaboration as a critical requirement for successful mine closure.

Closure plans have been seen as the most important tool to limit the negative impact of mine closure. Closure plans should speak specifically to which aspects (other than the environment) mines should be required to consider when they close down. The closure plan should include the rehabilitation of these elements (land, property, people and the economy) in the rehabilitation fund and the fund should be used to develop sustainable settlements and not only a sustainable environment. Closure plans should promote the diversification of the economy as a critical requirement with the initiation of mining activity and should stipulate what should happen with a mining settlement and infrastructure post closure. Currently, closure plans only relate to the rehabilitation of the environment, but it does not legislate what happens to communities that were created and established, and what happens to the people and infrastructure afterward. It does not stipulate plans regarding the maintenance of infrastructure post mine closure. Closure plans should require the inclusion of an asset management plan to stipulate the extent of the assets that need to be looked after.

When the mine at Blyvoortzicht in Merafong Municipality closed down, there was supposed to be funds available to deal with mine closure, but rehabilitation was only focussed on the

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environment and not the economy or the people. Furthermore, according to the law, environmental funding can only be accessed (as mentioned in Chapter 3) once the land is rehabilitated. There is therefore no access to the money to rehabilitate and money for rehabilitation should be found elsewhere. The legislation is inadequate in this regard and incorporates provision for social aspects or social rehabilitation or diversification of the economy. The rehabilitation fund is a major cause for concern, because there is no clear guidance on how to access the rehabilitation fund, and how it can be used beyond just rehabilitating the environment. The rehabilitation fund only speaks to demolishing and leaving the area as close to its natural state as possible. It is important to note that the legislative environment should not make it too difficult or expensive for mining companies to mine in South Africa. If that is the case, reliant or mining dependent businesses will have a tough time surviving. Closure plans should thus be a collaborative initiative between mines and the local authority.

In conclusion, mining closure has had a detrimental effect on South Africa and has ignited various negative spatial and socio-economic elements. Spatial planning has been implemented to limit these negative effects and to ensure that future mining activities develop sustainably. Current mining legislation, however, is not sufficient to limit the current negative impact. Mining legislation has a prominent focus on the environment and does not create a platform from which social and infrastructural challenges of mine closure can be addressed. The next section will indicate that future studies can be conducted to elaborate on the current research.

5.3 FURTHER STUDY RECOMMENDATIONS

Finally I would like to end with four main conclusions:

5.3.1. Mining in South Africa

This study focusses on mine closure in the gold mining industry only. Although mine closure will have similar negative impacts regardless of the minerals mined, it will be of value to understand what the status of mine closure on different minerals is. Mines of certain minerals may have a longer downscaling process, and it will be interesting to see if the spatial, economic and demographical impact of a municipality reliant on a different resource, will be similar to that of the Merafong City Local Municipality, which is reliant on gold-mining. Certain industries present more opportunities for vertical and horizontal diversification, which might also alter the impact downscaling of a mine has on the municipality.

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5.3.2. In-depth study of international mine closure policies and legislation

Further research can be conducted on the mine closure policies and legislation of international mines. This study mainly focusses on a few international strategies used to close mines successfully. However, a detailed study on the policies implemented in these countries might provide a framework as to how South African mine closure legislation can be altered and improved to reduce the negative impact of mine closure on local municipalities.

5.3.3. In-depth legislative overview

An in-depth study can be conducted to determine which elements of current South African mine closure legislation can be amended or altered or improved to promote sustainable post-mining settlements. For this study a broader view of all legislation relating to mine closure was taken, but a detailed study can further consider the following:

1. How legislation can be amended to accommodate mentioned strategies
2. Provide guidelines on the social, spatial and economic responsibilities of mine companies and the municipality

5.3.4. Spatial planning legislation as a tool for mine closure

A further study can consider how spatial planning legislation can promote mine closure. It will be beneficial to study an area where the LUMS, IDP and SDF have successfully contributed to and guided successful mine closures. Examples of this can be found in Lephalale where the SDF is being used as a guide by the municipality to approve certain mining-related developments (residential, etc.). It will be beneficial to further conduct a study on how an SDF can be drafted to assist a municipality in making informative decisions with regard to mining.

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ANNEXURE A – LIST OF INTERVIEW QUESTIONS

a) Broad structure of questions for the municipality

- How long have you been working as an employee of the Merafong City Local Municipality?
- Has the mining production/employment of the workforce declined in the past 30 years, if yes, why? When and why did the mine start to downscale and what does the future hold?
- How did mine downscaling or closure impacts on the municipality, business and spatial planning? What drive these impacts?
- Does the municipality enforce certain development and planning principles (densification, integration, mixed land use, liveability, etc.) on mining areas, or are mines allowed to develop as they wish? What are the negative impacts that this has had on the spatial planning of the municipality?
- Economic diversification is required to ensure future sustainable settlements in mining areas, as it also promotes diversification of land use. What has the municipality done to promote economic diversification in the municipality? Has this been met with equal input from the mining companies?
- What is the municipality doing to minimise the impact of downscaling or closure?
- The IDP states that the municipality acquires strategic land from mines for development as part of their spatial turnaround strategy. Has this been the case and has the municipality strategically developed these portions, and has this extra land not increased the municipality's liabilities?
- What lessons are to be learned from the mine closure in this area? What should we do or not do?
- Is current legislation for mine closure sufficient to ensure sustainable post-mining settlements? If not, what should be done differently?
- How should spatial planning legislation address the mine downscaling?

b) Broad structure of questions for the mining company

- How long have you been working as an employee of a mining company in the district?
- Has the mining production or employment of the workforce declined in the past 30 years, if yes, why? When was the mine established? When and why did the mine start to downscale and what does the future hold?
- How did mine downscaling or closure impact on the municipality, business and spatial planning? What drive these impacts?

ANNEXURE A – LIST OF INTERVIEW QUESTIONS

- When mines develop around mining areas, are the developments based on certain planning principles (densification, integration, mixed land use, liveability, etc.) or are the cost-effectiveness of the developments the main driver?
 - How has your housing policy changed over time and how has this influenced planning in the area?
 - It is noted from international literature that the development of mines has had negative spatial impact on settlements and has resulted in expanded informal settlements, dispersed residential areas, settlements that are not integrated, and without mixed land uses. Has this been the case in Merafong Municipality? Why and how do mining companies aim to address this?
 - Economic diversification is required to ensure future sustainable settlements in mining areas, as it also promotes diversification in land use. What has the mining company done to promote economic diversification in the municipality? Has this been met with equal input from the municipality?
 - What are mine companies and the municipality doing to minimise the impact of downscaling or closure?
 - The IDP states that the municipality acquire strategic land from mines for development as part of their spatial turnaround strategy. Has this been the case and has the municipality developed these portions strategically and has this extra land not increased the municipality's liabilities?
 - What lessons are to be learned from the mine closure in this area? What should we do or not do?
- c) Broad structure of questions for the town planner
- What is your experience in the Merafong City Local Municipality relating to mining?
 - How did mine downscaling or closure impact on the municipality, business and spatial planning? What drive these impacts?
 - Does the mining companies have certain development and planning principles (densification, integration, mixed land use, liveability, etc.) that guide the development around mining areas or are mines allowed to develop as they wish? What are the negative impact that this has had on the spatial planning of the municipality?
 - What lessons are to be learned from the mine closure in this area? What should we do or not do?
 - Is current legislation for mine closure sufficient to ensure sustainable post-mining settlements? If not, what should be done differently?
 - How should spatial planning legislation address the mine downscaling?

ANNEXURE A – LIST OF INTERVIEW QUESTIONS

d) Broad structure of questions for the business owner

- How long has your company been operating in the Merafong City Local Municipality, relating to mining?
- Why did your company decide to open a branch or head office in the Merafong City Local Municipality?
- Has there been areas or timeframes of increase or decrease in business opportunities in your business and does it relate to the mining sector or the municipality?
- Has the downscaling of the mining operations affected your business?
- How did mine downscaling or closure impact on the future planning of your company?
- Are you aware of any initiatives for incentives from the municipality or from mining companies to promote economic development in the municipality and attract investment?
- In your opinion, would you say the mining companies in the area are doing enough to ensure the settlement is sustainable post mining operations?
- In your opinion, would you say the municipality is doing enough to ensure the settlement is sustainable post mining operations?
- What recommendations would you make to the municipality and mining companies to ensure a developing and growing business community during mine downscaling and what legislation, strategies or policies would ensure the future growth of your business?