

Investigating Western Australia's rehabilitation fund as a fiscal policy solution for South African abandoned mines

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Dissertation submitted in fulfilment of the requirements for the degree
Magister Scientiae in Geography and Environmental Management at the
Potchefstroom Campus of the North-West University

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May 2015

Report declaration

I, Danitza Janse van Rensburg declare that the dissertation, which I hereby submit for the degree MSc Geography and Environmental Management at the North West University, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

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Abstract

Historically on a global scale and in South Africa it was common practice for mining operators to abandon a mine once the mineral extraction on site was completed. The operators had no obligation to rehabilitate the land and in most cases the disturbed areas were abandoned with no regard for the residual impacts that the site may present or the continued environmental deterioration. This represents the mining legacy of many countries, particularly in South Africa. The continual underestimations in financial provisioning for premature mine closure, leads to the continual abandonment of mining sites. Abandoned mines and the resultant legacy of environmental pollution are of major concern as literature indicates that there are around 6000 abandoned sites in South Africa. The problem is that no-one is currently taking responsibility for these sites as the Minister for Mineral Resources has stated that the South African government would not take the liability onto them. With this being said the burden still falls on the state as the mining companies responsible for the pollution may no longer exist or have the finances to carry out post-closure rehabilitation to ensure that the site no longer poses a threat to the environment.

To address a similar problem, Western Australia has implemented the *Mining Rehabilitation Fund Act 33* (2012) which delegates due responsibility for abandoned sites. The act provides for a government administered pooled fund into which all current mining operators pay an annual levy. The funds are used to rehabilitate abandoned mining areas, alleviating the burden of government to solely fund their rehabilitation. The aim of this research is, therefore, to investigate the viability of Western Australia's *Mining Rehabilitation Fund* as a fiscal policy solution for the rehabilitation of South African abandoned mines. To achieve this aim, three lines of inquiry are pursued. Firstly, to "identify the challenges related to abandonment of mine sites in South Africa," secondly "to compare the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund" and lastly "to investigate how such a policy will be received by stakeholders in the South African mining industry."

The research was approached from a pragmatic philosophical stance. A qualitative dominant mixed methods research approach with an embedded design is used for data analysis. The strategies of inquiry consist of a literature review, comparative analysis and open-ended interview questions which provide qualitative data and structured

survey questions which produces quantitative data. Surveys were carried out with selected stakeholders to investigate how such a policy will be received in the South African mining industry. The methods employed for the analyses of data consist of a scoping and literature review, coding and categorising, a comparative analysis, the identification of themes and analytical evaluation of survey data. An article format was chosen for the presentation of results and is presented in chapter 4.

The challenges related to the abandonment of mine sites in South Africa are related to skills shortages, poor enforcement of existing legislation and an out of date *Guideline document for the evaluation of the quantum of closure related financial provision* (DME, 2005). The comparison of the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, highlighted that both frameworks have the intention to protect the environment and promote sustainable mining but as can be seen in South Africa, even if the intentions of the legislation is good, it has limited value without proper implementation and enforcement. The results indicate a general feeling of stakeholders that such a policy is necessary and will be beneficial, but the respondents have doubts in the ability of the South African government to enforce the law. They also felt that it was unfair to hold the current mining operators responsible for the heedless actions of the previous miners and ruling party.

Keywords: *abandoned mines; rehabilitation fund; fiscal policy solution; South Africa; Western Australia*

Opsomming

In die verlede, op beide 'n globale skaal en in Suid-Afrika, het mynbou operateurs 'n myn doodeenvoudig verlaat nadat ontginning van minerale gestaak is. Dit is tog 'n onhoudbare situasie, en het gruwelike agteruitgang van die omgewing tot gevolg gehad. Alhoewel dit algemene praktyk was, kan dit nie so voortduur nie, en hierdie is 'n poging om die kollig op die probleem te laat val.

Daar was geen verpligting vir operateurs om die land te rehabiliteer nie, wat 'n aanduiding gee van die mynbou-nalatenskap van baie lande sowel as Suid-Afrika. Die voortdurende onderskatting van finansiële voorsiening vir die vroeë sluiting van 'n myn, lei tot die voortdurende verlating van mynbou terreine.

Verlate myne en die gevolglike nalatenskap van omgewingsbesoedeling is van groot kommer want literatuur dui daarop aan dat daar ongeveer 6000 verlate myn terreine in Suid-Afrika is. Die probleem is dat niemand tans verantwoordelikheid vir hierdie terreine aanvaar nie omdat die Minister vir Minerale hulpbronne gesê het dat die Suid-Afrikaanse regering nie die aanspreeklikheid op hulle sou neem nie. Met hierdie gesê val die las steeds op die staat as die mynmaatskappye nie verantwoordelikheid vir die besoedeling kan aanvaar of rehabilitasie kan uitvoer om te verseker dat die terrein nie 'n bedreiging vir die omgewing is nie.

Om 'n soortgelyke probleem aan te spreek, het Wes-Australië die '*Mine Rehabilitation Fund*' Wet 33 (2012) geïmplementeer wat voorsiening maak vir verlate myne. Die wetgewing maak voorsiening vir 'n regering geadministreerde fonds waarin alle huidige mynbou operateurs 'n jaarlikse heffing betaal. Die fondse word gebruik om verlate myn terreine te rehabiliteer wat verligting bied aan die regering. Die doel van hierdie navorsing is dus, om die lewensvatbaarheid van Wes-Australië se *Mining Rehabilitation Fund* as 'n fiskale beleid oplossing vir die rehabilitasie van die Suid-Afrikaanse verlate myne te ondersoek. Om hierdie doel te bereik, word drie lyne van ondersoek nagestreef. Eerstens, om "die uitdagings wat verband hou met verlating van myn terreine in Suid-Afrika vas te stel," tweedens "om die wetlike bepalings vir verlate myn terreine in Suid-Afrika met dié van Wes-Australië te vergelyk, spesifiek die rehabilitasie fonds" en laastens "om vas te stel hoe so 'n beleid deur rolspelers ontvang sal word in die Suid-Afrikaanse mynbedryf."

Die navorsing is vanuit 'n pragmatiese filosofiese benadering gedoen. 'n Kwalitatiewe dominante gemengde metodes navorsing benadering met 'n ingeboude ontwerp is gebruik vir data-analise. Die strategieë van ondersoek bestaan uit 'n literatuuroorsig, vergelykende analise en oop onderhoud vrae wat kwalitatiewe data verskaf en 'n gestruktureerde onderhoud vrae wat kwantitatiewe data produseer. Opnames is uitgevoer met geselekteerde rolspelers om te bepaal hoe so 'n beleid in die Suid-Afrikaanse mynbedryf ontvang sal word. Die metodes wat gebruik word vir die ontleding van die data bestaan uit 'n omvangsbepaling en literatuuroorsig, kodering en kategorisering, 'n vergelykende analise, die identifisering van temas en analitiese evaluering van data. 'n Artikel-formaat is gekies vir die aanbieding van die resultate en is in hoofstuk 4 aangebied.

Die uitdagings wat gepaard gaan met verlate myn terreine in Suid-Afrika sluit in vaardigheidstekorte, swak toepassing van bestaande wetgewing en 'n verouderde '*Guideline document for the evaluation of the quantum of closure related financial provision*' (DME, 2005). Die vergelyking van die wetlike bepalinge vir verlate myn terrein bestuur in Suid-Afrika met dié van Wes-Australië, lig uit dat beide raamwerke die voorneme het om die omgewing te beskerm en volhoubare mynbou te bevorder, maar soos in Suid-Afrika gesien kan word, selfs al is die intensies van die wetgewing goed, het dit beperkte waarde sonder behoorlike implementering en handhawing nie. Die resultate dui op 'n algemene gevoel dat so 'n beleid nodig is en voordelig sal wees, maar twyfel in die vermoë van die Suid-Afrikaanse regering om die wet toe te pas. Die rolspelers het ook gevoel dat dit onregverdig is om die huidige mynbou operateurs verantwoordelik te hou vir die optrede van die vorige myn operateurs en die regerende party.

Sleutelwoorde: *verlate myne; rehabilitasie fonds; fiskale beleid oplossing; Suid-Afrika; Wes-Australië*

Preface

The preface serves to clarify the structure of the dissertation. The results are presented in an article format, guided by the guidelines for authors for the South African Geographical Journal. The dissertation is arranged in the following chapters, according to the North-West University Guideline (North-West University, 2010):

- Title page
- Abstract
- Preface and “Opsomming”
- Table of contents
- Chapter 1: Introduction

This chapter is an adapted version of the research proposal and contains the introduction and background, research aim and objectives and a conclusion on the introduction.

- Chapter 2: Research design and methodology

This chapter gives an outline of the methods of data collection, analysis and presentation to be employed in order to fulfil the research aims and objectives as provided in chapter 1. Annexure A contains the survey used to ascertain stakeholder views and Annexure B indicates the weighting factors for each participant and method of calculation thereof.

- Chapter 3: Literature review

This chapter contains 4 sections. The first section defines important concepts as they are used throughout the paper. The second section discusses the challenges related to the abandonment of mines in South Africa; the factors which lead to the abandonment of sites and the impacts that abandoned mines have on our environment, providing motivation for the necessity of this study. The third section discusses Western Australia’s fiscal policy solution and how it works so that it may be determined if a similar policy could benefit South Africa. The fourth and final section of this chapter presents a comparative analysis between the South African and Western Australian legislative frameworks, pertaining to premature mine closure, abandoned mines and financial provisions for rehabilitation of current and emerging rehabilitation liabilities.

- Chapter 4: Article

Chapter 4 is presented in an article format. The format was guided by the South African Geographical Journal, a potential journal for which this study may be submitted. The article contains condensed versions of the introduction and research methodology and then presents the results of the study aligned with the three objectives. The guidelines for authors are found at the start of chapter 4.

The research findings are presented in this chapter. The results are divided into 3 sections, the first section addresses Objective 1 which is to identify the challenges related to abandonment of mine sites in South Africa and presented in a frequency graph accompanied by a discussion thereof. The second section addresses Objective 2 which is to compare the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund and is presented in paragraph format followed by a summary table of the comparative categories. The third section addresses Objective 3 of the research which is to generate an overall expert opinion on the viability of a fiscal policy solution such as the Mining Rehabilitation Fund for the rehabilitation of South Africa's abandoned mines and presents the survey results to Likert-type questions in graphs.

- Chapter 5: Conclusion and recommendations

The conclusion and recommendations are presented as separate sections, namely concluding remarks on objectives, on methodological learning, on literature review, recommendations and the concluding summary on title.

- Annexures

The Annexures consist of the survey questionnaire used to ascertain stakeholder's views (Annexure A), the interview respondents and assigned weighting factors (Annexure B) and the raw data for the comparative analysis, presented in a tabular format (Annexure C).

- Bibliography

The bibliography and referencing is done according to the Harvard Referencing Style (North-West University, 2012).

Acknowledgements

I extend my appreciation to all the professionals who shared their thoughts and views in the survey process. Your valued input was vital to this research.

To my research supervisor, Jan-Albert Wessels, thank you for your guidance, patience and valued inputs throughout the research process. Without your guidance, this research may have taken far longer than planned.

To my family and friends who I love dearly, thank you for your support and unconditional love in this turbulent year.

To my mother, Antoinette, thank you for your eyes, your ears, your mind.

And lastly, to Willem, my love, thank you for providing the sustenance for a healthy mind and body, which kept me functioning at my best throughout this research process.

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Acronyms

AMD	Acid Mine Drainage
CEO	Chief Executive Officer
CGS	Council for Geoscience (SA)
D&O	Derelict and ownerless mines
DEA	Department of Environmental Affairs (SA)
DME	Department of Minerals and Energy (SA)
DMP	Department of Mines and Petroleum (WA)
DMR	Department of Mineral Resources (SA)
DWA	Department of Water Affairs (SA)
EMP/EMPr	Environmental Management Plans or Programmes
EPAct	Environmental Protection Act (WA)
EPAuth	Environmental Protection Authority (WA)
MPRDA	Minerals and Petroleum Resources Development Act (SA)
MPRDR	Mining and Petroleum Resources Development Regulations (SA)
MRF	Mining Rehabilitation Fund (WA)
NEMA	National Environmental Management Act (SA)
NWA	National Water Act (SA)
NWU	North-West University
SA	South Africa
UNEP	United Nations Environmental Programme
UNEP-FI	United Nations Environmental Programme-Finance Initiative
WA	Western Australia
WWF-SA	World Wide Fund- South Africa

CHAPTER 1: INTRODUCTION

1.1 Introduction and background

South Africa, like much of the world has a legacy of abandoned mine sites which have the potential to cause significant environmental impacts. This legacy is a result of old mining practices which had not made adequate provision for financing or planning for mine closure and rehabilitation activities. Abandonment of sites is also presently an on-going occurrence as financial provisions are often inadequate and closure plans are non-existent or lacking in due consideration of realistic significant impacts (Auditor General, 2009; Menéndez, 2005; Swart, 2003:489; United Nations Environmental Programme-Finance Initiative (UNEP-FI), 2012:23). Moreover, the Auditor General (2009:1) notes that the South African regulatory framework does not provide for cases of abandoned mines nor does the legislation delegate due-responsibility or have an approved strategic or business plan for the rehabilitation of these sites. To address comparable issues Western Australia has established a rehabilitation fund to deal with abandoned sites and alleviate the financial burden on government and rehabilitate these sites to a sustainable landform. This presents an opportunity for South Africa to learn from a working example on how to deal with abandoned mines.

The South African mining industry presents the ability to extract precious mineral deposits, metals, construction materials and energy minerals for various uses in society at large (United Nations Environmental Plan (UNEP), 2000:4) and has the potential to be a valuable contributor to the economy by attracting foreign investors, creating local jobs and contributing to the establishment and upgrading of local infrastructure. With this being said, irresponsible mining practices carry many negative repercussions in the short- and long term. According to Peck, *et al.* (2005:vii), the negative impacts of mining practices could be adequately mitigated with the guidance of stringent legislative frameworks and the implementation of 'sustainable policy-, capacity- and institutional-development.' Miranda, Chambers and Coumans (2005:1) are of the opinion that "nearly all negative social and environmental impacts are avoidable if companies would operate according to best practice standards". In the past, this was not the case and there was no legal obligation to rehabilitate land, resulting in the mining legacy of South Africa giving an indication of the destructive implications related to unregulated mineral extraction which creates a large ecological footprint, above and below ground level. The

predicament with building an economy on mineral exploitation is that in order to feed the ever growing economy, the environment and greater social welfare is being sacrificed.

Impacts occur at all stages of the mining process and may manifest below ground in the form of water-, soil- and land stability issues and related pollution, as well as impacts above ground in the form of surface water pollution, social impacts, air, land and soil degradation (Auditor General, 2009; Azapagic, 2004; Botham, 2012; Daffue, 2010; Swart, 2003; UNEP-FI, 2012).

Abandoned mine sites (orphaned mine sites) are classified by UNEP (2000:6) as:

“...mines that are no longer operational, are not actively managed, are not rehabilitated, causing significant environmental or social problems, and for which no-one is currently accountable for the rehabilitation or remediation of the site.”

The Council for Geoscience (CGS) officially listed a total of ‘5 906 abandoned sites in South Africa as of May 2008’ (Auditor General, 2009:6) of which the “majority had closed down before the *Minerals and Petroleum Resources Development Act* (MPRDA) (Act 28 of 2002) came into effect.”

Abandoned mine sites are often a direct source of on-going pollution (Menéndez, 2005; Swart, 2003:490) and lack a responsible party liable for the rehabilitation of the site as the operators are often liquidated. The sites are however ‘not classified as ownerless as the owners are traceable, but do not necessarily have the financial means or capabilities to assume responsibility for post-closure rehabilitation,’ (Menéndez, 2005; UNEP, 2000:6). It is essential to note the difference between abandoned mines and derelict and ownerless (D&O) mines where there is no traceable owner to assume responsibility for the rehabilitation of the site (Swart, 2003:490) because as Webb (2012) states, ‘the Department of Minerals and Resources (DMR) (formerly the duty of the Department of Minerals and Energy (DME)) is focused on rehabilitating mine sites which bear legal ramifications such as D&O mines.’ According to Wait (2012) the DMR ‘committed to the rehabilitation of 12 D&O mines in the 2012/2013 financial year,’ but the Mineral Resources Minister indicated that the, "DMR had not rehabilitated any abandoned mining sites in the previous two financial years and that it did not plan to rehabilitate any in the 2012/13 year," (Wait, 2012). It is clear that the government do not

have access to sufficient funds, nor do they accept responsibility for the rehabilitation of abandoned sites, further justifying the need for a fiscal policy solution.

According to the Auditor General (2009:5) the cost of the 'rehabilitation of South African abandoned mines was estimated at R30 billion by the DMR during the 2007/08 and 2008/09 financial years.' This amount excludes the cost of long term acid mine drainage (AMD) treatment and further operating fees on abandoned sites, such as the pumping of water to prevent shafts from flooding and decanting. Abandoned mines are classified according to the risk they pose. According to the CGS of the DME, 1730 of the 5906 abandoned mine sites in South Africa are classified as high-risk mines which will cost an estimated R28,5 billion to rehabilitate. It is therefore very important, as noted by the Auditor General (2009:5) to ensure proper financial provisioning for mine closure from the start of mining activities to prevent further abandonment of sites adding to the existing burden which poses a threat to the social and environmental well-being of the country.

A possible solution, suggested by Wessels (2013), to the problems associated with a lack of financial provision for the rehabilitation of abandoned mines, may be the application of a fiscal policy and implementation of a Trust Fund such as the *Western Australian Mining Rehabilitation Fund* (MRF) (Western Australia, 2012). This fund could be specifically adapted to South Africa's needs, so that financial provision is made for mines which are presently abandoned and so that rehabilitation of these sites may start as soon as possible. This could help to instigate real and measurable action with regards to the rehabilitation of abandoned sites and the financing thereof and involves the cooperation of both government and the mining industry.

The fund (Western Australia, 2012) requires that 'all registered and operational mines register to annually pay a percentage of their overall rehabilitation liability' into the fund so that money may be 'made available immediately to deal with the existing issue of unrehabilitated, abandoned mine sites.' The initiative also encourages concurrent rehabilitation of impacts as they arise so that the 'end financial and environmental costs of rehabilitation are minimised,' (Department of Mines and Petroleum (DMP), 2013).

Based on the literature above, the necessity for the study is recognised and the purpose of the study is, therefore, to investigate the possible adoption and relevance of a similar fiscal policy solution in South Africa as that of Western Australia through a

comparative analysis of their different legislative frameworks dealing with rehabilitation and premature mine closure.

1.2 Research aim

The subject of this study is the legacy of abandoned mines and on-going abandonment of sites as a result of improper closure planning and financing for rehabilitation. This study, therefore, aims to investigate Western Australia's rehabilitation fund as a fiscal policy solution to rehabilitate South Africa's abandoned mines.

1.3 Research objectives

In order to achieve the research aim, three lines of inquiry are pursued and are presented as the following objectives:

1. to identify the challenges related to abandonment of mine sites in South Africa,
2. to compare the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund, and
3. to investigate how such a policy will be received by stakeholders in the industry.

The objectives are used to maintain a logical link between the aim and conclusions.

1.4 Concluding remarks on introductory chapter

The importance of this research is emphasised in the introduction as the South African legislative framework does not make sufficient provision for abandoned mines. As long as these sites remain abandoned and unaccounted for, they continue to degrade the environment and pose major health threats to individuals and the surrounding ecosystems which rely on clean water, soil and air for survival. It is important that the Western Australian example is investigated to determine if it is a viable solution to deal with South Africa's abandoned mines, moreover, the reasons for mine site abandonment need to be explored to determine what can be done to prevent further abandonment of sites adding to the existing burden of abandoned sites. It is also important to investigate how such a policy will be received by selected stakeholders in the industry.

CHAPTER 2: RESEARCH DESIGN & METHODOLOGY

Morse, *et al.*, (2002) suggested that a study remain focussed in order to ensure reliability and validity of data, thus ensuring rigor. In order to investigate Western Australia's rehabilitation fund as a fiscal policy solution to rehabilitate South Africa's abandoned mines the research design is predetermined and the methods employed are focussed on achieving the research objectives.

This chapter will set out the structured process to be followed in terms of collecting literature and survey data, and the methods employed for the analysis and presentation thereof to identify the challenges related to abandonment of mines in South Africa, compare the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund and to investigate how such a policy will be received by stakeholders in the industry.

2.1 Research design

A research design essentially provides the structure of the entire research process to be followed and the philosophical assumptions which ultimately guide the formulation of the problem to choosing the types of data and deciding on how the data is collected, analysed and presented in order to fulfil the research aim and objectives (Creswell and Plano Clark, 2011:53; De Vaus, 2001) The types of data to be collected and the methods for data handling are discussed throughout this chapter. According to De Vaus (2001:9), "the function of the research design is to ensure that the evidence obtained enables us to answer the initial question as unambiguously as possible," and the design is, therefore, carefully planned before the collection of data commences.

The research design takes into account the worldview which is essentially the paradigm in which philosophical assumptions and knowledge claims are based and dictates how the researcher views the nature of reality (Creswell, 2003). A variety of philosophical assumptions were reviewed and ultimately the pragmatic paradigm best suits this research as it does not represent one single philosophical system, but rather makes use of the most appropriate approaches or methods for arriving at a conclusion (Biesta, 2010; Creswell, 2003:11; Creswell and Plano Clark, 2011). The pragmatic worldview allows for the exploration of both qualitative and quantitative data which is necessary to conduct a literature review, do a comparative analysis and carry out a survey. This

ensures that all avenues of knowledge are explored to understand the problem (Creswell, 2013:28).

2.2 Research methodology

A research methodology is the plan for the research process and describes the procedures and strategies to be employed for the handling of every piece of data from the collection and analysis to its inclusion in the work (Creswell, 2013).

After a review of the possible approaches for conducting the research a qualitative dominant mixed methods approach data handling has been identified as the most suitable approach to achieve the research aim (Creswell and Plano Clark, 2011) as it allows for the inclusion of both qualitative and quantitative data. Various suggested methods of incorporating these two types of data exist, but the embedded design provided the most suited structure for the requirements of this research. The embedded design involves the collection, analysis and integration of quantitative data within the traditional, overarching qualitative research design (Creswell and Plano Clark, 2011:90). The reason for embedding and mixing the quantitative data within the overall framework of qualitative data is to correlate findings and use the quantitative data (from survey: questionnaire) to add substance to the findings of the qualitative study. For this study the quantitative data is generated concurrently with the qualitative data as suggested by Creswell and Plano Clark (2011:53-105) and Morse and Niehaus (2009). The mixed methods approach with an embedded design thus ensures that the qualitative literature and survey data is diversified and enhanced by the quantitative survey data so that the final product may be focussed, well-informed, based on a solid foundation of combined published knowledge and personal experience and the practical analysis thereof than what a solely- quantitative or qualitative approach can achieve.

2.3 Data collection methods

The methods of data collection and analysis to be followed for the research are:

- A literature analyses of available secondary sources, for achievement of objective 1 and 2, will encompass:
 - The clarification of rehabilitation and closure concepts such as: D&O mines, abandoned mine sites, rehabilitation and closure (Auditor General, 2009; Menéndez, 2005; Swart, 2003; UNEP, 2000:6);

- The identification of the challenges related to premature mine closure and abandonment of mine sites in SA (Anglo American plc., 2013; DMR, 2010; Sapa, 2010; World Wide Fund-South Africa (WWF-SA), 2012);
 - A comparative analysis of the legal provisions for abandoned mine site management in SA and WA (Walk, 1998) with the consideration of the possible implementation of the WA rehabilitation fund (DMP; 2010, 2013, 2014a; Department of Mines and Petroleum and Environmental Protection Authority (DMP and EPAuth), 2011; Western Australia, 2012).
- An empirical investigation into primary data sources to achieve objective 1 and 3 will include:
- Analysis of interview results to be collected in this research process along with existing research results collected by Wessels (2013) in a survey for previous research termed *Driving policy innovation in mine closure and abandonment management, environmental risk mitigation and rehabilitation of abandoned mine sites*, carried out within the context of The World Cafe method (The World Cafe, n.d.).
 - Interviews with relevant stakeholders in the mining sector to establish their views on provisions being made for abandoned mines in SA and to determine how a policy such as that of WA will be received by stakeholders in the industry. The interviews are analysed with the use of a qualitative dominant mixed methods approach (Creswell, 2013; Creswell, 2014; Dicocco-Bloom and Crabtree, 2006).

2.4 Data analysis strategy

The definition of analysis, as defined by Jorgensen (1989:107) is:

“...a breaking up, separating, or disassembling of research materials into pieces, parts, elements or units. With facts broken down into manageable pieces, the researcher sorts and sifts them, searching for types, classes, sequences, processes, patterns or whole. The aim of this process is to assemble or reconstruct the data in a meaningful or comprehensible fashion.”

The analysis of data is, therefore, done to simplify the large amount of data into portions specifically relevant to achieve the three objectives and to maintain focus and rigor throughout the study.

2.4.1. Qualitative literature review

Boote and Beile (2005:3) state, “a researcher cannot perform significant research without first understanding the literature in the field,” and Creswell (2014:29) identified three distinct reasons for the use of a literature review, applicable to this research process and applied as follows. The preliminary assessment of literature is done by means of a scoping review of the literature as suggested by Grant and Booth (2009:101), to ascertain the existing bodies of knowledge on the subject and to place the research problem within a broad literary context through the collection of primary and secondary research. This will also include the study of reputable and relevant literature in order to identify and describe the applicable worldviews, designs and models for conducting the overall research in a consistent, well-directed and focussed manner helping to maintain rigor throughout the study. The second use for the review is a more in depth literature review of relevant studies and research findings (Grant and Booth, 2009:97). The aim with this literature review is to establish definitions, closure concepts, issues and challenges related to the research aim. Legal documents, legislation and other policies regarding best practice guidelines for mining activities are also reviewed, thereby achieving Objective 1 to identify challenges related to abandonment of mines in South Africa. The third and final use of the qualitative literature review is to contrast and compare findings from the literature in order to achieve Objective 2, which is to compare the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund.

The types of primary literature sources used in this research are published- and peer-reviewed journals, theses and scholarly articles. Secondary sources of qualitative literature data, mainly in the form of internet sources, include company documents and policies, conference presentations, environmental policies, international standards and government documents.

Not all literature that is reviewed is included in the final research paper. A process of "quality appraisal" of research is undergone to determine the literature of highest repute and value to the current research (Grant and Booth, 2009:104). Grant and Booth (2009:104) list two simplistic criteria which are used to evaluate the quality of the literature in this research. The first is "robustness" that assesses the "validity and reliability" of the literature source. The original source of knowledge or insight is

identified and quoted wherever possible and sources are compared in an attempt to gather the most reliable literature data and discard irrelevant and unreliable data. The second criterion as identified by Grant and Booth (2009:104) is the literature's "relevance to the local context" which is its "applicability" to address the problem and research questions at hand.

The anticipated outcomes of the literature review are therefore to indicate what existing bodies of knowledge and previous research there is on the topic, identify gaps in the literature and the need for further research, discarding irrelevant information and aid in formulating the research questions and objectives. The final literature review is presented in chapter 3 of this paper.

2.4.2. Survey

The first set of survey data to be analysed, is that collected by Wessels (2013) in a study titled, *"Driving policy innovation in mine closure and abandonment management, environmental risk mitigation and rehabilitation of abandoned mine sites."* The survey results were collected from individuals within the context of The World Cafe method (The World Cafe, n.d.) where they are first familiarised with the topic and given some background information, then asked to share their professional insights in the survey. This research identified the need for further research into fiscal policy solutions for South Africa's abandoned mines. As stated by Dicocco-Bloom and Crabtree (2006:317) the availability of this preliminary data allows for:

- (i) 'concurrent data collection and analysis,'
- (ii) 'early saturation of categories which may give insight into the focus direction for this research,' and
- (iii) 'bringing issues to light early in the research process.'

A summary and subsequent interpretation of this initial survey data, by means of codes and categories, will allow for the identification of the issues within the topic of research and is presented in an article format compiled in chapter 4 of this paper, as is discussed further on.

The second set of survey data is collected during this study to achieve part of Objective 1 which is to identify challenges related to the abandonment of mines and Objective 3 which is to investigate how a policy such as the MRF will be received by stakeholders in the industry. The data is collected by means of semi-structured interviews making use

of open-ended questions to produce qualitative, open-ended response data in the form of phrases and a structured questionnaire, serving as a structured interview and producing quantitative data in the form of numeric descriptive results. The survey results are approached within an interpretivist paradigm, described by Creswell (2003:8) as delving into the respondents' views, perceptions and experiences with regards to challenges and fiscal policy solutions related to abandoned mines. The qualitative survey data are analysed by means of inductive reasoning which as described by Creswell (2003:9) and Johnson and Onwuegbuzie (2004:17) is used in social research to "generate meaning from the data collected." This is achieved through the 'discovery of patterns'. The quantitative survey data are analysed by means of deductive reasoning which is the "testing of theories and hypotheses" (Johnson and Onwuegbuzie, 2004:17) and where the 'research is conducted with reference to ideas inferred from the theory,' (Bryman, 2012:711). In this case the qualitative data guides the collection of the quantitative data. The sample size of 25 stakeholders is used to collect survey data and the survey questions are included under Annexure A.

Creswell (2013:156) explains that purposeful sampling is an integral part of qualitative research and refers to the selection of interviewees and sites which actively and purposefully contribute to the understanding and development of a sound reasoning as to the viability of the MRF's application in South Africa. Stakeholders in the industry were identified based on their work experience in the field of mine closure planning and rehabilitation activities. This ensures that the responses are well informed and based on experience working in the South African mining industry, thus, adding to the reputability of the data collected. The nature of the survey is cross-sectional as it only interacts with the respondents once, in a natural setting and provides an indication of their thoughts and feelings at a specific point in time (Creswell, 2014). As suggested by Bryman (2012:218) the survey respondents are informed as to why they were chosen to be a part of the survey process, and that their participation is voluntary. They are assured that all correspondence is treated as confidential and their identities are protected.

The goal with the survey is to generate an overall expert opinion on the viability of a fiscal policy solution such as the MRF in South Africa and their perceptions on the key issues in the mining industry related to the management of abandoned mines, rehabilitation, premature mine closure and financial provisioning. The survey questions may aid in identifying any literature sources or legislative- and policy documents

regarded by the respondents as significant in dealing with abandoned mines or making financial provisions, which may have been omitted from the literature review.

(i) Qualitative survey data

The interview data is recorded by means of hand-written memo's and respondents' written answers and analysed so that commonalities, similar phrases, patterns, themes, distinct differences, relationships and the general feeling (codes) of the stakeholder may be identified, isolated and tabled (Creswell, 2013:184; Miles and Huberman, 1994:240). From there a small set of generalisations (categories) based on interconnected categories of knowledge and experiences are established in order to capture the essence of the qualitative interview data to aid in exploring the meaning and perceptions behind the interview responses (Dicocco-Bloom and Crabtree, 2006:314).

(ii) Quantitative survey data

As suggested by Bryman (2012:211) the collection of quantitative data is in the form of structured questions with a fixed range of possible answers. The demographic data contains two structured questions and the last part of the survey consists of three structured questions to ascertain the attitudes of major stakeholders and measure the degree of agreeability of the respondents to the viability of Western Australia's fiscal policy solution in South Africa. The survey is found under Annexure A.

The quantitative response data is analysed manually to determine the frequency of the responses and is presented as numeric descriptive results. The data is entered into Microsoft Excel, analysed manually and presented in a graphical format of frequency tables. This format for assessing closed questions is known as the "Likert scale" as described by Bryman (2012:712) used "to answer attitude questions" and more specifically for this research, the handling of Likert-type data which is used to measure the level of agreeability of the respondent and the intensity of their feelings to the issue at hand, ranging from strongly agree to strongly disagree and generating a frequency indication of the number of similar responses.

The survey respondents are assigned 2 weighting factors, indicative of their experience (in years) working in the mining industry and working with closure, abandoned mines or rehabilitation activities, respectively. The weights are assigned as indicated under Annexure B and added together to give a total experience rating, also found under

Annexure B, which is indicated by different sized markers in the graphs used to present the findings of the survey data as presented in Figure 3, 4 and 5. A greater weight is assigned for having worked with mine closure, abandoned mines or rehabilitation activities as the respondents who have spent more time with these activities may have a greater capacity to judge the viability of a fund such as the MRF in South Africa. The respondents' weighting factors are used to generate a sum value for each response on the Likert scale which will give an indication to the intensity of the feelings toward the various aspects of the viability of the MRF as a fiscal policy solution for South African abandoned mines.

2.4.3. Qualitative analysis of mining policies and legal frameworks

The comparative analysis method as described by Walk (1998) is a variable-oriented analysis and is used to qualitatively compare South African to Western Australian policies and legislation pertaining to abandoned mine sites management and the financial provisions for rehabilitation activities. The comparative analysis is intended to identify relevant similarities and differences on how abandoned mines are dealt with and what financial provisions are required by mining companies, thereby gaining a greater understanding of the implications of the legislation and how it affects the industry's ability to deal with abandoned mines. The comparative analysis will achieve Objective 2 as the Western Australian case is a positive example of a way to deal with a comparable problem of abandoned mines as experienced in South Africa.

The key to this type of research is to identify "comparable units of analysis" (Walk, 1998) across which to compare the two data sets or cases. These units are selected in a systematic manner, while focussing on the research scope and questions. Categories, as the units of analysis, are identified based on the issues related to premature mine closure and the legislation is searched for any relevant sections.

The comparative analysis aims to highlight the major differences and underlying conditions in how the two countries deal with mine site rehabilitation and closure and to determine how different conditions and causes impact and affect one another, thereby enabling the comparison and consideration of the workings within a framework which generate a particular outcome in the way these issues are dealt with (Walk, 1998). Although the legislation may be well rounded and only lacking in some regards, it is still important to view the case as a whole, never excluding the possibility of further

influencing factors not identified in the legislation, for example a lack of enforcement or corruption. The comparative analysis is therefore aimed at enhancing the understanding of the workings of the two legislative frameworks.

Table 1 is a summary of the research design framework, the methodology, research approach and methods of data collection and analysis to pursue.

Table 1: Research design framework indicating methodologies, data collection & data analysis

Research objective	Plan for achieving the objectives	Methods of data collection, handling & analysis	Knowledge claims	Methodology& research approach
Objective 1	<p>Determine the major factors limiting financial provision for rehabilitation, leading to premature mine closure or mine site abandonment. Identify the issues associated with current & emerging rehabilitation liabilities</p> <p>Consult:</p> <ul style="list-style-type: none"> • primary & secondary literature sources, & • Wessels' (2013) interview correspondence with a class of master's students 	<p>Scoping review of primary & secondary source documents in the form of legal documents, peer-reviewed journals & all available documents on financial provisions for mining area rehabilitation & closure in SA.</p> <p>Collect & analyse (coding & categorising) interview data in the form of semi-structured interview questions (producing qualitative, inductive, open-ended response data) with relevant stakeholders.</p> <p>Identification of themes for comparison from a combination of literature sources.</p>	<p>Overall pragmatic paradigm. Interpretivist paradigm to analyse survey data.</p>	<p><u>Qualitative strategy with a mixed methods approach:</u></p> <p>Scoping literature review & analysis of qualitative interview data by means of identification of themes in the literature & coding & categorising the survey results.</p>
Objective 2	<p>Compare the approaches of the South African & Western Australian mining policies & legislative frameworks regarding;</p> <ul style="list-style-type: none"> • closure paradigms, • management & responsibility for abandoned mining areas, • financial provision & guarantees for rehabilitation, • current & emerging rehabilitation liabilities 	<p>Literature review of SA & WA mining policies & legislation related to financial provisions & abandoned mines to determine if it SA legislation can be realigned with sustainable practices & goals & accommodate the implementation of a MRF.</p> <p>Comparative analysis of SA & WA mining policies & legislation by means of comparable units of analysis.</p>	<p>Pragmatic paradigm</p>	<p><u>Qualitative strategy with a mixed methods approach:</u></p> <p>literature re review followed by a qualitative comparative analysis of SA & WA cases</p>
Objective 3	<p>Investigate how the possible implementation of policy such as the Western Australia Mining Rehabilitation Fund will be received by stakeholders in the South African mining industry by means of collecting data from 25 selected survey participants.</p>	<p>Survey questions in the form of a structured questionnaire (providing structured, deductive, quantitative response data) with relevant stakeholders will be used to generate an idea of the general feeling towards the viability of a fiscal policy solution such as the MRF in South Africa.</p>	<p>Pragmatic & interpretivist paradigms</p>	<p><u>Quantitative strategy with a mixed methods approach:</u></p> <p>Analysis of deductive quantitative, structured response data - questionnaire</p>

2.5. Concluding remarks on research design and methodology

The research design is intended to provide parameters and structure to guide the research process. Only the most fitting methods are used to collect, analyse and present the data so that the research aim of investigating Western Australia's rehabilitation fund as a fiscal policy solution to rehabilitate South Africa's abandoned mines is addressed. The inclusion of both qualitative and quantitative data will ensure that the final study is based on a solid foundation of combined knowledge sources and data types and the critical evaluation thereof will add to the quality and validity of the final product.

CHAPTER 3: LITERATURE STUDY

This qualitative literature study is conducted in line with the predetermined research design, with a pragmatic stance where the literature is carefully selected to ensure validity and reliability of sources as directed by chapter 2. Concepts referred to in the text are described shortly and thereafter the challenges related to abandonment of mines in South Africa are identified and a comparison is drawn between the legal provisions for abandoned mine sites management in South Africa and that of Western Australia, specifically the rehabilitation fund, in order to investigate Western Australia's rehabilitation fund as a fiscal policy solution to rehabilitate South Africa's abandoned mines.

3.1 Clarification of rehabilitation and closure concepts

It is of importance to properly define the terminology used to describe specific conditions and the conceptual differences in abstract terms, to provide clarity as they are used throughout the legislative documents and in this research paper. The next sections, therefore, provide brief literature background on; sustainability, rehabilitation, closure and financial provision, premature mine closure, abandoned mines and derelict and ownerless mines.

3.1.1. Sustainability

The sustainability concept is a fundamentally important term to define especially in the context of mining. The nature of mining activities involves the removal of non-renewable resources from the earth which, in itself is a practice which cannot be sustained either ecologically, socially, economically or humanly. It is very important to define what is expected of mines during planning with sustainable goals in mind. The *National Environmental Management Act 107* (NEMA) (South Africa, 1998) focuses on ecological sustainability and provides this definition of sustainable development in the preamble, a term used extensively in South Africa's environmental legislative documents:

“Sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of decisions to ensure that development serves present and future generations.”

South Africa and Western Australia work with similar definitions for sustainability as both countries drew from the definition of sustainability as it was defined in the Brundtland Commission and the book *Our Common Future* (1987). Western Australia's working definition of sustainability is as follows, "meeting the needs of current and future generations through integration of environmental protection, social advancement and economic prosperity," (Government of Western Australia, 2003:5).

3.1.2. Rehabilitation

Rehabilitation or reclamation of mined land is according to Peck, *et al.*, (2005:5) the treatment and restoration of disturbed land to a 'condition which is similar to the original state of the environment, or to improved and more sustainable conditions.' Although rehabilitation efforts strive to attain a near natural state of the environment, natural systems are complex and difficult to recreate and it is reasonable to rehabilitate to conditions which are not detrimental to ecosystem health. The management of negative environmental impacts is therefore done in such a way as to return the disturbed land to pre-mining conditions or as Van Zyl, *et al.* (2002:14) puts it, to a "stable and productive post-mining landform", compatible with the surrounding environment or an agreed upon land use as stipulated in the Mine Closure Plan (Coaltech Research Association and the Chamber of Mines of South Africa, 2007:4; Department of Environmental Affairs (DEA), 2012; Limpitlaw, *et al.*, 2005; Van Zyl, *et al.*, 2002; WWF-SA, 2012).

3.1.3. Closure and financial provision

A closed mine site is defined by Peck *et al.*, (2005:4) as generally being, "a former active mining site where mineral exploration, mining or processing has concluded and all current appropriate regulatory obligations have been satisfied." Mine closure is therefore the completion of mining activities and as described by Peck *et al.*, (2005:5) mine closure is usually accompanied by a "legally binding sign-off of liability" and occurs when "all current appropriate regulatory obligations have been satisfied." All rehabilitation activities on a mining site have to be completed so that the land does not pose any harm to society or the environment and is fit for end-land use purposes with the aim of receiving a closure certificate and being free of further responsibility for the site.

Final mine closure, at the end of a mine's life, differs from temporary mine closure where mining on a tenement is temporarily halted for economic, financial, environmental

or technical reasons such as commodity prices, health and safety issues, environmental risks or legal obligations. Swart (2003:489) states that temporarily closed mines are conserved in a state of “care and maintenance” with the intent to re-open the mine. In some cases these mines are eventually abandoned as it may not be feasible to re-open for mining and the finances for “care and maintenance” do not last indefinitely. This adds to the burden of abandoned mines.

The South African government defines financial provision in the NEMA Amendment Act 24, S1(f) (South Africa, 2014:4) as “the insurance, bank guarantee, Trust Fund or cash... guaranteeing the availability of sufficient funds,” necessary for rehabilitation, remediation or closure activities to ensure that the mine does not pose an environmental or health risk in the future. Financial provisions are to be made before mining activities commence and only once the finances are secured will an authorisation to mine be granted.

3.1.4. Premature mine closure

Premature mine closure is closure of a mine before the expected closure phase as stipulated in the mine plan. The main causes of premature mine closure as compiled from Ernst and Young (2013), Filen (2012), Peck, *et al.* (2005:37) and WWF-SA (2012).are:

- ‘mounting pressures in the company due to technical difficulties with extraction or processing such as unexpected conditions related to geology,’
- ‘inefficiencies in the processes,’
- ‘economic factors, market changes or financial risks such as increased mandatory payments, variations in liability conditions or continued low commodity prices,’ and
- ‘unforeseen risks and adverse environmental impacts of mining operations.’

Premature mine closure often leads to abandonment of sites as the mining company may not have the funds available to carry out the decommissioning and closure phases as proposed in the approved Mine Closure Plan. Mines in South Africa are required to annually set aside a percentage of the funds necessary for total rehabilitation and reclamation of the site at closure according to the DMR *Guideline document for the evaluation of the quantum of closure-related financial provision* (DME, 2005). The costs of rehabilitating the land before the expected time of mine closure is usually more than

what the mine has invested for rehabilitation as the estimations for the annual payable amount are calculated based on the expected life cycle of the mine with the year of closure being predetermined (Daffue, 2010:24).

3.1.5. Abandoned mines

Peck, *et al.* (2005:4) and UNEP (2000:6) both define an abandoned mine site as one which is 'no longer operational or actively managed and lacks a responsible party liable for the rehabilitation of the site but which is not necessarily ownerless.' The owners of these sites are traceable, but do not have the means to undertake responsibility for post-closure rehabilitation (Menéndez, 2005; Peck, *et al.*, 2005:5; UNEP, 2000:6). The Auditor General (2009:3) is quoted as saying, "legally, the owner of a mine remains responsible for all liabilities related to that mine until a closure certificate has been issued," in line with S43 of the MPRDA (South Africa, 2002). Simply put, abandoned mines carry legal ramifications which D&O mines do not and D&O mines are always abandoned but abandoned mines are not necessarily D&O. A great deal of mines has been abandoned due to the legacy of out-dated practices which hadn't ensured adequate financial provision for mine closure or rehabilitation (Auditor General, 2009; UNEP, 2000:6).

As explained by Peck (2004:124) abandoned mine sites may be characterised by the 'inadequate containment of physically or chemically unstable mining waste.' These sites therefore pose a major threat to both surface and groundwater by means of acidification of water moving through the mine shafts and exposure to tailings wastes. As Peck (2004:x) explains, there remains a "degree of uncertainty" surrounding abandoned sites, their associated risks and management thereof as well as accountability issues regarding the responsible parties and what they are responsible for to ensure the mine attains closure. Abandoned mines will continue to pose a threat to the social, economic and environmental well-being of the country, unless a fiscal policy is implemented to deal with the financing for rehabilitation of these sites.

3.1.6. Derelict and ownerless mines (D&O mines)

D&O mines are in very poor conditions due to disuse and abandonment but differ from abandoned mines in that they are mines where 'no closure certificate has been issued, and no traceable owner exists to assume responsibility for the rehabilitation of the site,' (Auditor General, 2009:3; Peck, *et al.*, 2005:64; Swart, 2003:490). Once a mine is

classified as D&O, the government assumes responsibility of the site and may provide funding for rehabilitation according to section 46 of the MPRDA (South Africa, 2002). It is therefore in the best interests of South African citizens and the government that current mining practices don't add to the existing rehabilitation liability of abandoned or D&O mines.

The National Strategy for the Management of Derelict and Ownerless Mines (DMR, 2009:4) is quoted as saying, "the Department of Mineral Resources has undertaken extensive research on the subject matter and has discovered about 6000 derelict and ownerless mining sites including mine dumps." The Auditor General (2009:3) is quoted as saying, "according to a report by the CGS to the DME, there were 5 906 officially listed abandoned mines in South Africa at the end of May 2008." It is unclear whether the D&O mines and abandoned mines that have been counted are considered to be the same sites as both are standing at around 6000 sites. This makes it difficult to distinguish between the amount of abandoned sites, for which no party is willing to take responsibility, and D&O mines where the government is required to accept responsibility for the site.

3.2 Challenges related to mine closure and abandonment in South Africa

In order to achieve Objective 1 of this study, the major challenges which may lead to premature mine closure and ultimately abandonment of mines in South Africa, have been identified by means of a qualitative literature review and interviews with individuals who have experience in the field of mine closure.

3.2.1. South Africa's mining legacy

The mineral revolution of South Africa kicked off with the discovery of diamonds in Kimberly in 1870 and gold in the Witwatersrand in 1886 (Farnie, 1956). Mining practices were rudimentary and continued without any form of regulation until 1903 when the first attempts to regulate the industry were introduced in the form of *The Mines, Works and Machinery Regulations Ordinance of South Africa* (54 of 1903) which only required that a mined area be fenced off and refilled. *The Mines and Works Act 27 of 1956* (South Africa, 1956) was the first to require a rehabilitation plan on how topsoil was to be treated and vegetation recovered post-closure. It did not, however make any provision for long-term impacts of mining practices, such as water, soil and air pollution. Unregulated mining continued for an excess of 121 years before the introduction of *The*

Minerals Act 50 of 1991 (South Africa, 1991) which was the first to consider every aspect of mining, and required life cycle planning, an Environmental Management Plan (EMP)/Programme (EMPr), a closure plan, financial provision for mine closure, consultations on mine closure, guidelines established for the execution of all the plans and programmes and monitoring by the state to ensure compliance (DMR, 2010). The MPRDA (Act 28 of 2002) was promulgated in order to incorporate NEMA (Act 107 of 1998) and *The National Water Act* (NWA) (Act 36 of 1998) in a holistic framework governing mining with the focus on environmental and human well-being through sustainable development principles.

3.2.2. Impacts of abandoned mines

The large amount of abandoned mines in close proximity to human settlements (Auditor General, 2009:4) stresses the importance of developing legislative controls for the rehabilitation of abandoned mines and the need for rehabilitation projects to start sooner rather than later. Of particular relevance to this study are the short and long term impacts and associated risks caused by abandoned mines in South Africa. These impacts include;

(i) Environmental impacts

The environmental impacts of unrehabilitated, abandoned mines on public health and safety as compiled from Auditor General (2009), Azapagic (2004), Botham (2012), Daffue (2010), Menéndez (2005:4), Swart (2003) and the UNEP-FI (2012:16) include the following; 'long term acidification and pollution of local surface- and groundwater systems with radioactive elements, acids, salts, cyanides and heavy metals known as AMD, pollution of agricultural soil due to a build-up of toxic elements. It also includes loss of biodiversity and ecosystem destruction through the disturbance of natural habitats, straining vulnerable ecosystems, output of large volumes of solid and liquid waste, air pollution as a result of smelter emissions and dust creation, disturbance of the landscape, open mining pits, uncovered shafts and sinkhole formation as a result of accelerated dolomitic weathering by acidic mine water, exhaustion of Earth's non-renewable resources, tremendous energy use as well as posing continued threats to human health and safety as far as contaminated water and air moves.'

(ii) Social impacts

Mining has its benefits in the social realm, offering 'opportunities for job creation and facilitating social development through the enrichment of communities,' (Swart, 2003), but alongside these benefits are the negative social impacts of mining which prioritises economic growth and elitist enrichment at the cost of the environment and the communities impacted by these practices. Mines pose impacts on overall health and cause social and cultural disruption of communities in the construction, operational, closure and decommissioning phases as highlighted by Swart (2003), Turton (2008) and UNEP (2000).

Communities, adversely affected by mining-related pollution, no longer have access to clean drinking water, rivers and streams are highly acidic, contaminated by radioactive uranium, strontium and radium, and individuals can no longer grow food in their gardens due to sulphate contamination and heavy metal poisoning from elements such as 'lead, boron, magnesium, cadmium and bismuth' thereby increasing the incidence of poverty (Miranda *et al.*, 2005; UNEP-FI, 2012; WWF-SA, 2012). This means that a lot of time and energy is spent collecting clean water and food for the family.

According to Jenkins and Yakovleva (2005:272) and Miranda *et al.* (2005), 'mines create an economic dependency and instances of unexpected mine closure and abandonment of site causes distress because of the socio-economic threat of joblessness and poverty.' Communities are left in what is referred to as a "boom and bust" economy which explains the process of economic expansion and contraction (Investopedia, 2014). In an effort to earn a living, unemployed miners are prone to return to mining abandoned sites, posing a health and safety concern.

(iii) Financial risks

As a result of the new environmental regulations and best practices (NEMA and MPRDA) the mining industry faces mounting costs and increasing financial risks involved with the rehabilitation of these sites. This is an inherent consequence of the mining process. The environmental impacts of mining are well documented and a mining company cannot expect to simply exploit the resources and walk away, burdening the surrounding communities and government with the long term impacts of environmental degradation.

Ernst and Young (2013) state that mining companies are ‘under pressure to lower commodity prices when the environmental costs of mining are ever increasing forcing them to cut non-essential costs, sell non-core assets and rid the process of inefficiencies’, which often lead to the liquidation of a mine, increasing the chances of a site being abandoned without a responsible legal entity. Allocation of funds for social expenditure and mandatory payments such as ‘windfall taxes, export taxes, royalty payments or carbon taxes, as well as the influences by varied and competing stakeholders’ as indicated by Filen (2012) place financial pressure on mining companies. A major financial burden includes the constant pumping of water to prevent the groundwater rebound and flooding of abandoned mine shafts which, if unmaintained could lead to ground subsidence as ‘open voids erode and possibly re-activate faults’ (Menéndez, 2005:7).

A joint venture between Coaltech Research Association and the Chamber of Mines of South Africa, produced “*Guidelines for the Rehabilitation of Mined Land*” (2007) and the following issues are identified as the most costly for mine site rehabilitation:

- ‘water; decanting, seepage, waste water treatment, volume and quality of water to be monitored,’
- ‘waste treatment; stockpiling, waste rock dumps and discards dumps,’
- ‘earthmoving; soil replacement and amelioration, overburden stockpiles, waste rock,’
- ‘landscape restoration; stabilising topography and landforms, re-vegetation,’ and
- ‘social aspects; retrenchment, alternative livelihoods and dependency on mining infrastructure.’

3.2.3. Responsible parties

The Constitution of the Republic of South Africa (108 of 1996), which supersedes all other legislation states that, “everyone has the right to an environment that is not harmful to their health or well-being,” (S24(a) of Act 108 of 1996) and “to have the environment protected” in accordance with the principles of sustainability which promote the protection of the environment for the benefit of current and future generations of the country (S24(b) of Act 108 of 1996). This is to be achieved “through reasonable legislation and other measures” which strives to prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development

and use of natural resources (S24(b) of Act 108 of 1996). Economic and social development is promoted so long as the means are fair and justifiable.

It may be deduced that the South African governmental ministers, with the support of their departments concerned with environmental matters, such as the Department of Mineral Resources (DMR), Department of Environmental Affairs (DEA) and the Department of Water Affairs (DWA), are responsible for ensuring that measures are in place to guarantee that abandoned mines are rehabilitated in a timely and effective manner (South Africa, 1996 and 2002). This is in line with their respective legislative mandates and constitutional duty which is to provide services for the “effective transformation and governance” (DME, 2010:5) of various industries for “economic growth and development” (DEA, 2012:4-11), thereby improving the quality of life for communities and not compromising the right of these citizens to an environment which is not harmful to their health or well-being (South Africa, 1996). The DMR’s Strategic Plan (2011:1) stated that the department sought to “promote and regulate the minerals and mining sector for transformation, growth and development and ensure that all South Africans derive sustainable benefit from the country’s mineral wealth.”

Limpitlaw and Hoadley (2006:3) are quoted as saying “in a developing country context...the involvement of the state is critical for long-term planning and sustainability after closure.” Badly conducted mine closure results in excess liabilities for mining companies and the government. It is therefore the responsibility of both parties to ensure they do everything possible to ensure proper closure and lasting management and monitoring.

Section 28 of NEMA (South Africa, 1998) and S43 (1) of the MPRDA (South Africa, 2002) provides for *duty of care and remediation of environmental damage* and supports the “polluter pays principle” and goes as far as to hold polluters responsible for pollution and degradation caused before the promulgation of NEMA in 1998. The legislation also holds polluters responsible for indirect pollution as a result of mining activities. Although this legislation is in place, the discrepancies in legal obligations for the time period in which the mines were in operation result in mining companies and government not seeing eye to eye in terms of acceptance of responsibility for the rehabilitation of these abandoned sites (Sapa, 2010). The government, which in this instance technically refers to the South African tax payer, is currently financially burdened with the responsibility of treating the dewatering gold mines of the Witwatersrand basin where

groundwater is flooding the underground shafts and acidifying, posing a threat to human and ecosystem health (CGS, 2010).

The DMR does not currently take responsibility for the rehabilitation of abandoned mine sites (Wait, 2012) but does intend on rehabilitating D&O sites. The National Treasury is committed to providing 'R50 million annually' (DMR, 2010) for the rehabilitation of D&O mines, however there are mining areas such as the Transvaal and Delagoa Bay Coal Mine which requires R100 million to rehabilitate (DMR, 2010). The funding is not nearly enough to deal with the extent of the problem, not to mention the funding required to rehabilitate the multitude of existing abandoned mine sites for which the government fails to take responsibility.

Mining operators also have a responsibility to take care of the natural and social environments from which they draw their profits and have a responsibility to consider South African citizens in their actions as instructed by the overall legislative framework. This presents some problems as identified by Peck, *et al.* (2005:47) as many 'international mining companies have no long-term investment in the sites they operate on,' nor do they take due responsibility for the ecosystems or communities impacted by their activities. It is due to this lack of consideration and rejection of responsibility that it is expected of the government to take action to protect the rights of its citizens and their environment. An international problem exists as indicated by Peck (2004) who is of the opinion that, 'governments are selling the nation's resources for short-term gain, and scarce resources (such as water) are being made available to foreign operations and denied to local communities.'

3.2.4. Legislative controls

Section 24N of NEMA (South Africa, 1998) and section 38A of the MPRDA (South Africa, 2002) makes provisions for the issuing of environmental authorisations, without which, mining activities may not commence. The EMP/EMPr needs to be aligned with the legislative requirements (S24L of NEMA) and needs to be approved (S24N(6) of NEMA) to ensure that all possible environmental impacts have been identified and the plan is adequately prepared to deal with the potential impacts which may arise as a result of the mining activities, before an environmental authorisation is granted. This measure aids in preventing current mining activities from adding to the burden of environmental degradation. South Africa, along with many other countries, is burdened

by the legacy of previous mining practices which abandoned operations without any regard for the long term impacts on the environment. The existing problem cannot be reversed and therefore must be dealt with jointly by the state and the mining industry through the prevention of further abandonment of sites by means of the implementation of existing legislative controls and the clean-up of existing abandoned sites. Socio-economic development cannot proceed if it means sacrificing the environment as the practices are unsustainable and unconstitutional.

3.2.5. Financial provisions

The WWF-SA (2012) report, "*Financial Provisions for Rehabilitation and Closure in South African Mining*" highlights some key concerns related to the current financial provisions made for rehabilitation. South Africa experiences 'variation in quality and standard of EMPs/EMPrs,' (WWF-SA, 2012:4) and varying consideration is afforded to impacts such as long term water quality issues. Another concern is the lack of- or inadequate- rehabilitation plans without which an 'accurate estimation of financial provisions for closure cannot be made,' (WWF-SA, 2012:4). The lack of innovation and adaptability experienced within the DMR with regards to guidelines and regulations indicates internal issues of management and enforcement of existing requirements (WWF-SA, 2012:4). Mining companies experience uncertainties surrounding financial provision for mine closure due to out of date guidelines (WWF-SA, 2012:4; DME, 2005). Inadequate provisioning of funds for mine closure in the early planning stages could result in major unforeseen costs emerging in the last 3-5 years of mining operations (Anglo American plc., 2013). At these stages of the mining process, it may not be financially viable for the mining operators to set aside funds for satisfactory rehabilitation which, according to Anglo American plc. (2013), is a 'recipe for short cutting and compromising' in order to meet the minimum requirements of mine closure and avoid further liability or responsibility.

No funding scheme is in place for the maintenance or remediation of abandoned mines as the DMR's strategic management plan is intended only for the rehabilitation of D&O mines (DMR, 2009) and does not include provision for abandoned sites for which the owners are known but do not have the means to complete rehabilitation.

Currently, financial provision for closure is regulated by section 53 of the *Mining and Petroleum Resources Development Regulations* (MPRDR) (South Africa, 2004) made

by means of annual contributions to a fixed Trust Fund or other financial guarantee to cover the estimated closure costs for reclamation and rehabilitation at the expected time of mine closure. Closure costing is calculated by using the DMR's *"Guideline document for the evaluation of the quantum of closure related financial provision"* (DME, 2005). The guideline provides a working manual for going about to calculate the quantum for closure in which the size and extent of disturbed land, environmental sensitivity, impacts and risks posed are all considered in calculating the final closure costs. The quantum of financial provision, which is calculated annually by the holder of the mining right's environmental management team and with the help of specialist studies, is submitted to the Department of Mineral Resources' Regional Offices. The quantum then needs to be "assessed, reviewed and approved" by the DMR as being "sufficient to cover the environmental liability at that time and for closure of the mine at that time," (DME, 2005:iv). It is specifically stipulated in the objectives (DME, 2005:iv) that the quantum is to provide for "premature closure at any time (the current environmental liability)" and "end-of-mining closure (the future environmental liability)". In the case of premature mine closure the DMR are responsible for commissioning a third party to complete the rehabilitation work with the funding set aside in the national budget and may then retrieve these funds from the mine (DME, 2005:v).

The financial provisions can be made by means of Trust Funds, bank guarantees or deposits into accounts as directed by the Director-General. According to the DME (2005:3):

"A large number of the bigger mining operations opted (since 1994) for the Trust Fund as method for financial provision, which caused a shortfall in overall liability in cases of premature closure. This shortfall was, in most cases, not covered by any of the other methods. The annual contributions to a Trust Fund are tailored for funding the final mine closure over the life of a mine."

Trust Funds may not be as effective as a financial guarantee from a bank, because money invested in fixed trusts hold back funds which could be used for concurrent rehabilitation or for investments in improved mining practices, ultimately lowering the liabilities at mine closure, whether it is planned or premature. According to Daffue (2010:24) and the DME (2005:2) Trust Funds 'make it difficult to provide adequate funding for premature closure as the cost of closure will be higher than the available funds in the trust when a mine closes prematurely.'

The DME (2005) and Daffue (2010:26) note that ‘final closure liability is affected by the extent and type of mining- and mining practices employed, as well as the ecological sensitivity of the area, and is influenced by inflation and unforeseen impacts arising such as future pollution or the presence of problematic geologic formations such as dolomitic strata.’ These factors may contribute to a degree of uncertainty of the requirements for financial provision and may result in continual liability growth.

In 2008, when the number of South Africa’s abandoned mines stood at 5906, the CGS estimated the cost of rehabilitation for these mines to be around R30 billion (Auditor General, 2009:5). The CGS identified 1730 of these abandoned mines as high-risk candidates for which the estimated rehabilitation costs stood at R28.5 billion, implying that R1.5 billion would be sufficient to rehabilitate the remaining 4176 sites (Auditor General, 2009:5).

Table 2 is a summary of the challenges experienced in South Africa with regards to premature mine closure and the factors which may ultimately result in the abandonment of a mine site, as identified in the literature review. Respondent’s comments from the qualitative survey data support the challenges identified in the literature.

Table 2: Challenges experienced in South Africa which may give rise to premature mine closure and abandonment

	Challenges experienced in South Africa related to premature mine closure	Quotes from participants (#) in surveys
SA's MINING LEGACY	<p>SA's mining legacy: previous legislation didn't make provision for proper rehabilitation & mine closure</p> <p>No accountability: law is too soft on traceable owners</p> <p>Preference of mining sector: over the economic efficiency or sustainability of the land-use</p>	<p>#14: "They are from the early 1900's & as such difficult to trace the rightful owner."</p> <p>#9: "Previous mineral regulations disregarded financial provisioning."</p> <p>#11: "Legacy issues from the past."</p> <p>#7, #8: "Owners (& directors) of abandoned mines are not held accountable."</p>
RESPONSIBLE PARTIES	<p>Lack of human & financial resources in government: existing environmental provisions are not enforced</p> <p>Lack of human & financial resources in government: closure certificates are not issued</p> <p>Lack of governmental support & involvement: pertaining to mine planning & closure</p> <p>Lack of enforcement of legislative controls: government do not hold current polluters accountable</p> <p>Social closure aspects: mines are unable to create or maintain sustainable income for surrounding communities after mine closure</p> <p>Scope & objective: of rehabilitation plan is not always well-defined or all inclusive</p> <p>Lack of competency in compiling EMP's: due to varying quality of EAP's</p> <p>Lack of commitment from top management: responsible for the implementation of the EMP</p>	<p>#12: "Lack of skilled personnel."</p> <p>#14: "Government has insufficient funds rehabilitate abandoned mines."</p> <p>#8: "DMR did not ensure that the rehab plan was conducted as approved by the department."</p> <p>#9: "Lack of guidance by the DMR office."</p> <p>#1, #4, #13: "Lack of enforcement."</p> <p>#12: "Enforcement particularly bad as the skill set & knowledge are not enough to deal with the various complexities."</p> <p>#6: "End challenges have changed."</p> <p>#1: "Lack of knowledge around the social aspects of closure."</p> <p>#7: "Closure risks (environmental & social) of abandoned mines are not quantified."</p> <p>#4: "Failure to appoint competent environmental consultants & specialists to audit rehabilitation practices & assist with closure plan development."</p> <p>#7: "Closure risks (environmental & social) are not prepared for."</p> <p>#9: "Lack of technical ability of mining companies."</p> <p>#12: "Lack of skilled personnel."</p> <p>#15: "EMP performance assessments are not conducted as stipulated in the EMP & in some cases it is done very poorly."</p> <p>#12: "Negligence & ignorance."</p> <p>#15: "Mines deviate from the onset from the approved EMP that is approved by the DMR."</p> <p>#1: "Reluctance for disclosure."</p> <p>#4: "Closure plans being developed in isolation thus no cooperation with adjacent industries & other mining operations in the area."</p>
LEGISLATIVE CONTROLS	<p>Environmental management regime is advanced & complex: not necessarily well organised or streamlined</p> <p>Unrealistic or unattainable goals: are set in the closure plan; structural or institutional constraints to sustainable development are not considered</p>	<p>#15: "Compliance with on-going changes in legislation is often costly & time consuming, thus neglected."</p> <p>#12: "Negligence & ignorance."</p> <p>#16: "Discipline in environmental health & safety has to become part of the culture. Difficult to achieve when people do not even obey the law in SA."</p> <p>#6: "Planning for rehab cannot be done effectively to meet regulatory time lines."</p> <p>#1: "Planning process- too little too late."</p> <p>#7: "Closure risks (environmental & social) are not prepared for."</p>

	Challenges experienced in South Africa related to premature mine closure	Quotes from participants (#) in surveys
LEGISLATIVE CONTROLS continued...	<p>Fragmentation of laws: related to the requirements for mine closure & management of abandoned mines</p> <p>"One size fits all" approach: application of externally developed closure plans to a system without proper adaptation or due consideration of varying conditions & impacts</p> <p>Legislation encourages late planning: for mine closure (concurrent rehabilitation is not a requirement)</p> <p>No clear incentives: for concurrent rehabilitation, resulting in more significant & unforeseen risks</p> <p>Small scale miners: Lack of legislative enforcement for these "fly-by-nights"</p> <p>No clear, unambiguous criteria: for how to achieve mine closure & be issued a closure certificate</p> <p>EMPs quality vary greatly: no standard for conducting EMP's, inadequate consideration of long term impacts</p> <p>Compliance is costly & time consuming: for closure & rehabilitation</p>	<p>#7, #11, #15: "Insufficient concurrent rehabilitation - rehabilitation backlog."</p> <p>#4: "Mines being abandoned with little to no concurrent rehabilitation ever evident."</p> <p>#2: "Lack of legislative framework for the rehabilitation of defunct mines."</p> <p>#4: "Closure plans being developed in isolation thus no cooperation with adjacent industries & other mining operations in the area."</p> <p>#16: "People do not have the will to rehabilitate the mine; both employers & employees."</p> <p>#4, #14: "In some cases is after a mine is rehabilitated, illegal mining takes place thereby disturbing the rehab already undertaken."</p> <p>#22: "Small scale miners, mismanagement & neglecting rehab."</p> <p>#7: "No water liability assessment."</p> <p>#9: "Differing perceptions about the definition of rehab & the extent to which rehab should ideally be done."</p> <p>#15: "EMP performance assessments are not conducted as stipulated in the EMP & in some cases it is done very poorly."</p> <p>#15: "Mines deviate from the onset from the approved EMP that is approved by the DMR."</p> <p>#1, #5, #15, #22: "Liabilities passed to smaller players with less capacity; the previous rehabilitation funding disappears with the previous owners."</p>
FINANCIAL PROVISIONS	<p>DMR's (formerly DME) 2005 Guideline document for the evaluation of the quantum of closure related financial provision:</p> <ul style="list-style-type: none"> • is out of date • is generic in nature & does not make provision for site specific conditions • does not make provision for some forms of mining, e.g. subsistence mining • does not incorporate the requirements of- or align itself with other existing legal documents (or stay up to date with amendments) • does not make provision for adjustments of estimations to compensate for inflation, resulting in underestimations of adequate financial provisions <p>Uncertainty surrounding adequacy of financial provisions: for rehabilitation, post closure water treatment & management</p> <p>Difficulty in quantification: of wastewater rehabilitation & treatment costs</p> <p>Insufficient data regarding the short- & long-term impacts of the mine: Resulting in insufficient financial provision being made</p> <p>Unforeseen costs: concerning sustainable development planning</p>	<p>#15: "The guideline document of the DMR is out-dated."</p> <p>#15: "Financial provision made to rehabilitate mines cannot easily be accessed to pay for rehabilitation; cash flow problems."</p> <p>#15: "The financial provision made by most mines is not sufficient, the guideline document of the DMR... under estimate the closure liability (quantum). There aren't adequate funds available to close the mine."</p> <p>#15: "Lack of provision for water management."</p> <p>#1, #2, #6, #7, #12, #14, #16: "inadequate financial provisioning; inaccurate closure cost calculation."</p> <p>#4: "Limited funds are allocated for post-rehabilitation monitoring activities in financial provisioning (normally provision is only made for water monitoring for a 3 year period)."</p> <p>#6: "Unforeseen costs."</p>

3.3 Western Australia's fiscal policy solution

3.3.1. Purpose of the Mining Rehabilitation Fund

Mine closure planning in Western Australia is regulated as per the *Guidelines for Preparing Mine Closure Plans* (DMP and EPAAuth, 2011), which are required to be reviewed, updated and adapted at least every three years to include any new impacts which have arisen during the mining process. Because Mine Closure Plans were strictly only required by Western Australia's Department of Mines and Petroleum (DMP) as of 2011, a large number of incomplete mine closures and inadequate rehabilitation of sites occurred before this, resulting in their legacy of abandoned mines. Clark and Clark (2005:68) speak about the comparable role of governments around the world to "enact and implement appropriate policy and legislation," thereby protecting themselves from major financial burdens and against persisting environmental concerns.

Before the promulgation of the MRF Act of 2012 (Western Australia, 2012), mining operators and tenement holders in Western Australia operating small to medium sized projects were subject to the conditions in the Mining Act 107 of 1978 (Western Australia, 1978) regarding financial provisions and were required to provide mining security in the form of an initial deposit and further annual contributions into an unconditional or on-demand performance bond, or a bank guarantee. The DMP of Western Australia (2014b) defines an Unconditional Performance Bond as:

"...a contract between the Minister for Mines and Petroleum and a third party of a financial standing that is acceptable to the Minister, providing the third party to unconditionally pay an agreed sum to the Minister upon his request following the failure of the tenement holder to meet with the environmental conditions imposed on a mining tenement."

These bonds are only effective when proper closure planning is done so that enough funds are set aside to deal with the entirety of the reclamation and rehabilitation costs. These bonds, similar to that which is currently used in South Africa, do not make adequate financial provision for premature or unplanned closure. As noted by Daffue (2010:24), the funds available in the bond at a time of sudden and unexpected closure would not be enough to cover the necessary closure liability. The performance bond system quarantined funds and no longer made adequate provision for rehabilitation costs as the Western Australian DMP (2010:4) estimated that the bonds system

provided for roughly 80% of the total rehabilitation liability at closure. According to the DMP (2010:4), the minimum bond rates in 2005 provided for only 25% of the rehabilitation liabilities and by 2010 it had fallen below 25%. The larger mining projects, such as the main iron ore producers in Western Australia are usually subject to separate State Agreement Acts (DMP, 2010:iii) which will specify the financial arrangements necessary to cover rehabilitation costs for these high risk projects.

The Western Australian MRF Act 33 of 2012 (Western Australia, 2012) was promulgated on 31 July 2013 and tenement holders were given a chance to join voluntarily. As of 1 July 2014, participation in the MRF was compulsory (DMP, 2013). The MRF provides excellent backup financing if mining operations cease and the company is unable to cover the entirety of the rehabilitation costs, as well as providing financing for the persistent problems caused by abandoned mines.

3.3.2. Rehabilitation levy

According to the DMP (2013:6), all holders of mining authorisations are required to make an annual, non-refundable contribution to the MRF of approximately 1% of the total estimated mine closure liability for each site, based on- and proportionate to the “disturbance data and outstanding rehabilitation on the site” as required by section 12 of the MRF Act (Western Australia, 2012) and required by the DMP (2013:4). The MRF Act provides incentive for concurrent rehabilitation as the levy is re-calculated annually. If mining impacts are concurrently managed and rehabilitated, the annual levy will decrease.

The MRF is a “government-administered, pooled fund” (Western Australia, S5 of Act 33 of 2012), which will generate interest over time (DMP, 2013:2) and which makes funds available immediately for the rehabilitation of abandoned mines and land affected by abandoned sites' past operations and present impacts.

Dr. Phil Gorey, Executive Director: Environment, for the Western Australian DMP, expects to see "the vast majority of companies" having their "bonds returned once they're paying into the MRF" but when it comes to "certain high-risk sites, the bonds will be retained," (Evans, 2014). The department (DMP, 2013:2) will use discretion and power to keep environmental bonds in place where they see fit. The return of bonds therefore frees up finances for concurrent rehabilitation activities.

The state department responsible for administering the MRF, in this case being DMP will put the power of authority in their Chief Executive Officer (CEO)/Minister who will assess the liability of every tenement holder and determine the levy payable as per section 14 of the MRF Act (Western Australia, 2012). A “Mining Rehabilitation Advisory Panel” is established under the MRF Act (Western Australia, 2012), section 33, who functions as advisors on matters relating to administration and implementation of the act. The DMP (2014a) have excused small scale operations with a closure liability smaller than Aus\$50 million, from paying the levy, although they will still be required to provide disturbance data for their site.

3.3.3. Rehabilitation & mine closure responsibility

It is important to note that according to section 9A of the MRF Act (Western Australia, 2012), ‘tenement holders are not excused from carrying out mine closure and rehabilitation as stipulated in the approved mining plans and programmes’ and only in the event of the mine undergoing premature mine closure and is unable to complete closure as planned due to lack of financing, will the capital held in the fund be accessed to assist in the rehabilitation of these abandoned sites. According to the DMP (2013:2), the MRF will only provide funds for rehabilitation of abandoned mining areas “after every effort has been made to trace responsible parties and recover funds.” Section 8(1)-(2) of the MRF Act (Western Australia, 2012) states that the “interest generated by the fund” will be used to rehabilitate those abandoned mines which form part of the legacy of abandoned mines.

3.3.4. Disclosure of disturbance data & return on bonds

As per section 15(2) of the MRF Act (Western Australia, 2012) the tenement holder is responsible for providing accurate and up to date disturbance data which will be used to calculate the annual levy payable. False and misleading information could lead to a holder being liable to pay a penalty of Aus\$ 20 000.

With the introduction of the MRF, the ‘majority of tenement holders will have their security bonds retired once the levy is paid in accordance with the requirements of the MRF Act’ as noted by the DMP (2013:2), unless the CEO determines that the site poses a high-risk of rehabilitation liability which will not be adequately covered by the payment of the annual levy. The DMP released a guideline document (DMP, 2013:3), stipulating the conditions or “eligibility criteria” which prescribes the conditions for which a security

bond will be retained or retired to the tenement holder to ensure that the detainment and retirement of bonds is done according to what is necessary to ensure proper rehabilitation procedures are financed.

3.4 Comparative analysis of legal provisions for abandoned mine sites management in South Africa and Western Australia

A comparative analysis enhances the understanding of the workings of the two legislative frameworks and fulfil Objective 2 of this study which is to compare the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund. The raw data for the comparative analysis can be found under Annexure C.

Categories for analysis are identified within the legislative frameworks in order to ascertain how the legislative provisions in South Africa and Western Australia are similar and how they differ, to identify how varying conditions impact and affect how abandoned mines are dealt with and identify the factors which may lead to the further abandonment of sites and lack of financial provisioning.

It is important to note that 'as of 1901 Western Australia forms part of the Commonwealth of Australia which is technically the federal government representing the Australian mainland and surrounding islands' as explained by Maynes (2013:4). Maynes (2013:13) goes on to note that Western Australia forms part of a 'smaller self-governing unit of the whole which remains responsible for its own legal system accepted by the Western Australian parliament and enforced by their own courts.' The laws made by the Commonwealth parliament (Commonwealth of Australia, 1900) however supersede those of the smaller jurisdictions.

3.4.1. Constitutional provisions for the environment

The Constitution of the Republic of South Africa Act 108 of 1996 (South Africa, 1996) specifies environmental conservation, delegates the responsibility of environmental protection in various legislative documents and section 146(2) states, "(c) the national legislation is necessary for - (vi) the protection of the environment." Western Australia's *Constitution Act 23 of 1889* (Western Australia, 1889) was later amended and is superseded by the *Commonwealth of Australia Constitution Act* (1900) as Western Australia now forms part of the Commonwealth of Australia. Neither the Western

Australian, nor the Commonwealth Constitution specifically mentions the term “environment”. The Commonwealth Constitution, like that of South Africa, does however delegate legislative power to identify, assess and mitigate potential or persisting environmental impacts by means of support for the formulation and implementation of regulative documents, guidelines and policies which strive towards implementing sustainable practices for the greater good of the Commonwealth of Australia.

A holistic approach to environmental management considers the fundamental elements of effective mine closure planning and mining area rehabilitation. Both the Western Australian and South African constitutions strive to achieve sustainable goals and ensure the constitutional rights of citizens are protected, which indirectly supports proper environmental management.

3.4.2. Rehabilitation and closure plans

Western Australia’s *Guidelines for the Preparation of Mine Closure Plans* (DMP and EPAAuth, 2011) suggest the necessary structure and content of a Mine Closure Plan and provide all the necessary legal and best practice information regarding the formulation thereof. According to the DMP and EPAAuth (2011:12), Western Australian legislation follows a “risk based approach” of “adaptive management” when it comes to mine closure planning. This encourages concurrent rehabilitation, which ensures the early identification of impacts or potential risks, dealing with issues as they arise and thereby cutting large costs at closure. Up to date plans and procedures make good provision for when sudden and unexpected closure arises. The DMP and EPAAuth (2011:14) explain that “adaptive management” makes use of ‘systems for closure performance monitoring and maintenance’ which ensures that closed mines may have proper management and record keeping and facilitates the measurement of the relative success of Mine Closure Plans so that the industry as a whole may learn from the successes and failures of Mine Closure Plans (DMP and EPAAuth, 2011).

NEMA (South Africa, 1998) and the MPRDA (South Africa, 2002) aim to be well-coordinated and both strive for sustainable development.

As can be seen by section 24(1) of NEMA (South Africa, 1998), sections 51, 52, 55, 56, 62 of the MPRDR (South Africa, 2004) and sections 23(1) and 10(k) of the MPRDA (South Africa, 2002) South Africa’s legislation shows the intention to subject all new mining operations to a legal process of ensuring that financial provisions and

management plans are prepared for the protection of the environment and that a closure plan is in place. In contrast to Western Australia's approach of providing guideline documents laden with best practice procedures and innovative strategies, (DMR and EPAuth, 2011) few guideline documents specifically related to mine closure planning exist in South Africa. The Department of Environmental Affairs and Tourism (DEAT) (2004), as part of their information series, released a supportive text (clearly stipulated that this is not a guideline document) to support with the formulation of EMPs/EMPrs. A guideline document for the preparation of EMPs was released by the provincial government of the Western Cape's Department of Environmental Affairs and Development Planning (Lochner, 2005). These documents are out-dated and do not consider new innovations or better practices. Other forms of support are in the form of private mining company documents which strive to achieve closure, such as the example of the Anglo Mine Closure Toolbox (Anglo American plc, 2013).

3.4.3. Management of abandoned mining areas and emerging liabilities

The *Environmental Protection Act* (EPA) 76 of 1986 (Western Australia, 1986) shows the intention to not only prevent further pollution but also delegates responsibility to prevent, as far as possible, any environmental damage and mitigate the damage which cannot be prevented as seen in section 16 which provides for the "functions of authority" with respect to the "prevention, control and abatement of pollution and environmental harm." For cases of sudden and unexpected closure, as guided by sections 24 and 88 of the *Mines Safety and Inspection Act* 62 of 1994 (Western Australia, 1994) the closure process will be sped up, a decommissioning plan will need to be drafted and the Mine Closure Plan needs to be reviewed within 3 months of abandonment (DMP and EPAuth, 2011:9). Up until the time of a closure certificate being issued, the mining operations remain the responsibility of the holder or other responsible appointed person, as directed by section 114B of the Mining Act 107 of 1978 (Western Australia, 1978).

Sections 28 and 24R(1) of NEMA (South Africa, 1998) and section 43(1) the MPRDA (South Africa, 2002) undertake a similar venture as that of Western Australia by supporting the polluter-pays principle and taking retrospective action in terms of liability for the pollution and degradation of the environment. The legislation does not mention abandoned mines specifically but it is inferred from the abovementioned sections that the mining right holder remains liable for their abandoned mines (which are a source of pollution) until such time as the DMR have issued a closure certificate as per section 43

of the MPRDA, freeing them of their responsibility. Botham (2012:iv) is quoted as saying, "in South Africa no mine closure certificates have ever been issued under either the Minerals Act of 1991 or the MPRDA of 2002." The possible reasons for this as identified by Botham (2012:iv) may have to do with the difficulty in convincing the relevant authorities of the sustainability of rehabilitation and ensuring that the site will not pose any environmental liabilities or risks in the future. This may pose a problem as it implies that the government are reluctant to take responsibility for the site, even when the responsible entity no longer exists, and as no closure certificates have been issued under the MPRDA, the government still considers all the holders of mining rights responsible for their abandoned sites.

The DMR have developed The *National Strategy for the Management of D&O Mines* (DMR, 2009) but a strategic plan is yet to be developed to deal with the rehabilitation of abandoned mines. As per section 46 of the MPRDA (South Africa, 2002), the 'Parliament should set aside funds to employ a third party for the rehabilitation of a prematurely abandoned site where it is urgently needed to prevent environmental degradation.' These funds, according to section 46(1) are to be "retrieved from the right holder." Currently abandoned mines are not being factored into the parliamentary budget as indicated by the Mineral Resources Minister who is quoted by Wait (2012) as saying that the "DMR had not rehabilitated any abandoned mining sites in the previous two financial years and that it did not plan to rehabilitate any in the 2012/13 year."

3.4.4. Financial provisions and guarantees for rehabilitation post closure

Section 15 of the *Mining Act Regulations* (Western Australia, 1981) provide for "expenditure conditions" and require that mining operators provide for a performance bond, according to section 126, which serves as a form of financial security for closure rehabilitation and section 60(1) of the Mining Act states, "the applicant for an exploration license shall lodge...a security for compliance with the conditions to which the exploration license...will...be subject." The MRF Act (Western Australia, 2012) has now replaced the bonds system as the mandated financial security and makes use of a government-administered, "pooled fund" (DMP, 2013:2), into which annual levies are paid. As the mines still operate under the Mining Act (Western Australia, 1978) they remain responsible for financing the rehabilitation of site according to the approved Mine Closure Plan as per Western Australia's *Guidelines for Preparing Mine Closure Plans* (DMP and EPAAuth, 2011:26). The purpose of the MRF Act (2012) according to

section 6 thereof is “to provide a source of funding for the rehabilitation of abandoned mine sites and other land affected by mining operations carried out in, on or under those sites.”

The South African DMR *Guideline document for the evaluation of the quantum of closure related financial provision* (DME, 2005:9) is used to assist in financial calculations for closure costing and assigns “Master Rates” (DME, 2005:6) to variables such as, among others the “environmental sensitivity of the mine area”, the “risk class” for the type of mining and “associated by-products”, results of “specialist studies” and the “size and location of the mine.” Financial provisions are required by section 41 of the MPRDA (2002) and may be provided for as required by section 53 of the MPRDR (2004) in the form of a ‘Trust Fund, bank guarantee or a deposit into a fixed account.’ The guideline document, however, appears generic in nature and does not adequately consider all the factors which may influence rehabilitation costs, such as the soil types, underlying geology or the climate. This may result in underestimations of financial provisions to deal with the entirety of the closure liability at the expected time of mine closure. Moreover, sudden and unexpected closure is also not provided for. According to the guideline (DME, 2005:1), “the Master Rates...will be updated on an annual basis.” Section 41(3) of the MPRDA (2002) and section 54(2) requires that the holder annually reassess the environmental liabilities for each site and that the financial provisions be adjusted accordingly (DME, 2005:2). Section 41 of the MPRDA (2002) which governs “financial provisioning for remediation of environmental damage” has been repealed and the guideline document has not been updated to include the amendments to the MPRDA bringing about a fragmentation of responsibilities as the DMR guidelines are still the principle document relied on for calculating the necessary financial provisions.

3.5 Concluding remarks on literature review

As can be deduced from the above comparison and the review of literature, both South Africa and Western Australia recognise that a mining right carries environmental liabilities attached to it and the owner of the mining right therefore carries the burden of completing closure. Like South Africa, the Western Australian legislation makes it clear who the responsible parties are for mine closure and rehabilitation and a clear effort is seen by the Western Australian government to acknowledge their own liability and

responsibility to ensure good governance and the prevention of abandonment of sites as far as possible.

There still seems to be a gap in the capacity of government to enforce the sustainable ideals towards which South Africa's legislation strives, as can clearly be seen by the lack of action to deal with abandoned mine sites and make provision for premature mine closure. The generic requirements for environmental management means that there is no standard format from which to work and the government does not identify trends or best practices in the South African industry. The legislation is therefore based on an ideal, not the reality of the situation.

Although both NEMA and the MPRDA hold past polluters accountable, many of these polluters have ceased to exist or simply don't have the finances available for rehabilitation activities. Although the legislation dictates that finances be set aside by the government for the rehabilitation of sites which pose a threat to surrounding communities or the environment, the government fails to take responsibility for these sites, in blatant contradiction with their legislative mandate and constitutional duty. These abandoned sites continue to degrade and pollute the environment and will continue to do so until such a time as they are rehabilitated to conditions which are not detrimental to ecosystem health. In South Africa, there is a shortage of skills and financial resources to provide for the monitoring and frequent updating of legislative documents and therefore no improvement in mine closure planning, resulting in the same scenarios of inefficient rehabilitation and continued abandonment of sites.

South Africa's legislation only provides generic descriptions of requirements for mining companies and little is done in terms of proper execution and implementation of the legislation, rendering it redundant. The guideline on financial provisions is out of date, ill-adapted, generic and inefficient in providing accurate guidance for the quantification of financial provisions for closure, resulting in underestimations and effectively mine site abandonment.

The inherent nature of mining requires that a site be monitored and maintained indefinitely as the threat of AMD will remain as long as there remains a cavity in the ground. The threat of emergent liabilities affords reason for the South African government to not grant mine closure certificates. This is a major role player in the

abandonment of mines as mining companies do not make provision for indefinite monitoring and maintenance of their sites.

South Africa has much to learn from Western Australia who also has a legacy of abandoned mines and the implementation of the MRF Act deals with this problem directly by promoting concurrent rehabilitation and by holding present miners, who still generate an income from mineral extraction, accountable for a percentage of the finances required to deal with the legacy of abandoned mines, thereby also protecting themselves in the instance that they may be forced to abandon site. The Western Australian government acknowledge their role in protecting the environment and their intentions lie with protecting the rights of their citizens and taking care of their environment.

CHAPTER 4: ARTICLE

Guideline to authors for the South African Geographical Journal

i. General Guidelines

- UK English throughout the paper.
- Not exceeding 7500 words. Word count to be included.
- Order of chapters: title page, abstract, keywords, main text, acknowledgements, appendixes, references, tables with captions (on individual pages), figure captions (as a list). (Tables should be included at the appropriate point in the text).
- Double spacing with wide margins.
- Non-discriminatory language.

ii. Style guidelines

- Single column ranged left.
- Title: Bold, first word and proper nouns cap only, ranged left.
- Abstract: text smaller, indented both sides, ranged left, 200 words.
- Keywords: word; another word; lower case except names. Position aligned with abstract, same size as abstract. 5 or 6 keywords.
- Headings: A. Bold initial cap only, B. Bold italic initial cap only, C. Italic initial cap only, D. Italic initial cap only. Text runs on. All ranged left, numbers to be included if supplied, no indent below.
- Paragraphs: indented
- Tables: (Table 1) in text. Table 1. Title initial cap only. (ranged left above table)
Note: This is a note. (ranged left under table) Tables should be included at the appropriate point in the text.
- Figures: (Figure 1) in text. Figure 1. Caption initial cap only. (ranged left under figure)
Note: This is a note. (ranged left under figure)
- Displayed quotations: Indented left and right, smaller font (over 40 words, or when appropriate)
- Lists: (1) for numbered lists. Bullets if wanted.
- Acknowledgements: A heading. Text smaller.
- Numbers and units: Numbers: spell out one to nine, then 10, 1000, 10,000. 10% (except at start of sentence)
- Dates: 4 October 2005. In the twenty-first century, in the 1970s
- Reference style: Harvard references

Investigating Western Australia's rehabilitation fund as a fiscal policy solution for South African abandoned mines

South Africa's mining legacy has resulted in a large number of abandoned mines which continue to pose a threat to the environment as the regulatory framework makes no provision for cases of abandoned mines nor does the legislation delegate due-responsibility or have an approved strategic or business plan for the rehabilitation thereof. The challenges related to abandoned mine sites in South Africa were investigated and South Africa's legal provisions for abandoned mine sites management was compared with that of Western Australia, specifically the Mining Rehabilitation Fund Act to determine if it may serve as a viable fiscal policy solution. A mixed methods approach is utilised to analyse literature, draw a comparative analysis and interview stakeholders. It was found that the current implementation and enforcement of legislation is lacking in some regards and due to various uniquely influencing factors, places doubt in the ability of the country to adopt a policy such as that of Western Australia with comparable success. The stakeholders interviewed expressed reluctance to accept responsibility for the wrong-doings of their predecessors and improper legislative provisions and felt that it would only be adding to the existing financial burden on the industry and render the mining activities uneconomical.

Keywords: abandoned mines; rehabilitation; fiscal policy solution; South Africa; Western Australia

Word count: 6782

4.1 Introduction and background

South Africa, like much of the world has a legacy of abandoned mine sites which have the potential to cause significant environmental impacts. This legacy is a result of old mining practices which had not made adequate provision for financing or planning for mine closure and rehabilitation activities. Abandonment of sites is also presently an 'on-going occurrence as financial provisions are often inadequate and closure plans are non-existent or lacking in due consideration of realistic significant impacts' (Auditor General, 2009; Menéndez, 2005; Swart, 2003:489; United Nations Environmental Programme-Finance Initiative, 2012; 23). Moreover, the Auditor General (2009:1) notes that the South African regulatory framework 'does not provide for cases of abandoned mines' nor does the legislation delegate due-responsibility or 'have an approved strategic or business plan' for the rehabilitation of these sites. To address comparable issues Western Australia has established a rehabilitation fund to deal with

abandoned sites and alleviate the financial burden on government and rehabilitate these sites to a sustainable landform. This presents an opportunity for South Africa to learn from a working example on how to deal with abandoned mines.

According to Peck, *et al.* (2005: vii) the negative impacts of mining practices could be adequately mitigated with the guidance of stringent legislative frameworks and the implementation of ‘sustainable policy-, capacity- and institutional- development.’ In the past, this was not the case and there was no legal obligation to rehabilitate land, resulting in the mining legacy of South Africa giving an indication of the destructive implications related to unregulated mineral extraction which creates a large ecological footprint, above and below ground level. The predicament with building an economy on mineral exploitation is that in order to feed the ever growing economy, the environment and greater social welfare is being sacrificed.

Abandoned mine sites (orphaned mine sites) are classified by the United Nations Environmental Programme (UNEP, 2000:6) as:

“...mines that are no longer operational, are not actively managed, are not rehabilitated, causing significant environmental or social problems, and for which no-one is currently accountable for the rehabilitation or remediation of the site.”

The Council for Geoscience (CGS) officially listed a total of ‘5 906 abandoned sites in South Africa as of May 2008’ (Auditor General, 2009:6) of which the “majority had closed down prior to 2002 when the *Minerals and Petroleum Resources Development Act* (MPRDA) (Act 28 of 2002) came into effect.”

Abandoned mine sites are often a direct source of on-going pollution (Menéndez, 2005; Swart, 2003:490) and lack a responsible party liable for the rehabilitation of the site as the operators are often liquidated. The sites are however ‘not classified as ownerless as the owners are traceable, but do not necessarily have the financial means or capabilities to assume responsibility for post-

closure rehabilitation,' (Menéndez, 2005; UNEP, 2000:6). It is essential to note the difference between abandoned mines and derelict and ownerless mines (D&O) where there is no traceable owner to assume responsibility for the rehabilitation of the site (Swart, 2003:490) because as Webb (2012) states, 'the Department of Minerals and Resources (DMR) (formerly the duty of the Department of Minerals and Energy (DME)) is focused on rehabilitating mine sites which bear legal ramifications such as D&O mines.' According to Wait (2012) the DMR 'committed to the rehabilitation of 12 D&O mines in the 2012/2013 financial year,' but the Mineral Resources Minister indicated that the, "DMR had not rehabilitated any abandoned mining sites in the previous two financial years and that it did not plan to rehabilitate any in the 2012/13 year," (Wait, 2012). It is clear that the government do not have access to sufficient funds, nor do they accept responsibility for the rehabilitation of abandoned sites, further justifying the need for a fiscal policy solution. According to the Auditor General (2009: 5) the cost of the 'rehabilitation of South African abandoned mines was estimated at R30 billion by the DMR during the 2007/08 and 2008/09 financial years.' This amount excludes the cost of long term acid mine drainage (AMD) treatment and further operating fees on abandoned sites, such as the pumping of water to prevent shafts from flooding and decanting. Abandoned mines are classified according to the risk they pose. According to the CGS of the DME (Auditor General, 2009:5), 1730 of the 5906 abandoned mine sites in South Africa are classified as high-risk mines which will cost an estimated R28.5 billion to rehabilitate.

A possible solution, suggested by Wessels (2013), to the problems associated with a lack of financial provision for the rehabilitation of abandoned mines, may be the application of a fiscal policy and implementation of a Trust Fund such as the *Western Australian Mining Rehabilitation Fund* (MRF) (Western Australia, 2012), specifically adapted to South Africa, so that financial provision is made for mines which are presently abandoned and so that rehabilitation of these sites may start as soon as possible. This could help to instigate real and measurable action with

regards to the rehabilitation of abandoned sites and the financing thereof and involves the cooperation of both government and the mining industry.

Based on the literature above, the necessity for the study is recognised and the study aims to critically investigate the possible adoption and viability of a rehabilitation Trust Fund in South Africa as Western Australia's example which could provide guidance to correct and realign mining policies and legislation with sustainable practices and goals. In order to achieve the research aim, three objectives are set. Objective 1 is to identify challenges related to abandonment of mines in South Africa. Objective 2 is to compare the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund. Objective 3 is to investigate how such a policy will be received by stakeholders in the industry.

4.2 Methodology

A ‘mixed method approach to data handling’ (Creswell and Plano Clark, 2011) within an “embedded design” (Creswell and Plano Clark, 2011:90) was used to achieve the research aim, as suggested by Creswell and Plano Clark (2011), Creswell (2013), Creswell (2014), Dicocco-Bloom and Crabtree (2006) and Miles and Huberman (1994).

Objective 1 is to identify the challenges related to abandonment of mines in South Africa. This is achieved by means of an in depth qualitative literature review (Grant and Booth, 2009:97) on existing bodies of knowledge and by means of surveys with relevant stakeholders.

Objective 2 is to comparatively analyse the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund. This is achieved by means of a literature review and subsequent comparative analysis as explained by Walk (1998). Categories, as "comparable units of analysis" (Walk, 1998), are identified based on the issues related to premature mine closure and the legislation will be

searched for any relevant sections. The comparative analysis is aimed at ‘enhancing the understanding of the workings of the two legislative frameworks and determines how different conditions and causes impact and affect one another’ enabling the comparison and consideration of the workings within a framework which generate a particular outcome in the way these issues are dealt with (Walk, 1998).

Objective 3 is to investigate how a policy such as the MRF will be received by stakeholders in the industry. The surveys consist of semi-structured and open-ended questions to produce qualitative data in the form of phrases, indicating key issues in the mining industry related to the management of abandoned mines, rehabilitation, premature mine closure and financial provisioning. The qualitative survey data is recorded (hand-written memo's, audio recording, respondents' written answers) and analysed so that commonalities, similar phrases, patterns, themes, distinct differences, relationships and the general feeling (codes) of the stakeholder may be identified, isolated and tabled. From there a small set of generalisations (categories) based on ‘interconnected categories of knowledge and experiences are established in order to capture the essence of the data and aid in exploring the meaning and perceptions behind the interview responses,’ (Creswell, 2013, Dicocco-Bloom and Crabtree, 2006; Miles and Huberman, 1994:240).

The collection of quantitative survey data is in the form of structured questions (Bryman, 2012:211) with a fixed range of possible answers which is used to gather demographic data and attitude data. ‘Likert-type questions’, as explained by Bryman (2012:712) are useful in ‘ascertaining the attitudes’ of major stakeholders and measuring their ‘degree of agreeability’ and the ‘intensity of their feelings,’ to the viability of Western Australia's fiscal policy solution for South Africa, ranging from strongly agree to strongly disagree. The survey is found under Annexure A.

The survey respondents are assigned 2 weighting factors, indicative of their experience (in years) working in the mining industry and working with closure, abandoned mines or rehabilitation activities, respectively. The weights are assigned as indicated in Annexure B and added together to give a total experience rating which is indicated by different sized markers in the graphs used to present the findings of the survey data. A greater weight is assigned for having worked with mine closure, abandoned mines or rehabilitation activities as the respondents who have spent more time with these activities may have a greater capacity to judge the viability of a fund such as the MRF in South Africa.

4.3 The Mining Rehabilitation Fund

Western Australia, like South Africa has a legacy of abandoned mines which, as indicated by Morrison-Saunders and Pope (2013:212), pose a ‘social, environmental and financial challenge for the government.’ Clark and Clark (2005:68) speak about the comparable role of governments around the world to “enact and implement appropriate policy and legislation,” thereby protecting themselves from major financial burdens and against persisting environmental concerns.

The MRF is a “government-administered, pooled fund” (Western Australia, S5 of Act 33 of 2012), which will generate interest over time (Department of Mines and Petroleum (DMP), 2013:2). According to the DMP (2013:2) the MRF will only provide funds for rehabilitation of abandoned mining areas “after every effort has been made to trace responsible parties and recover funds.” Section 8(1)-(2) of the MRF Act (Western Australia, 2012) states that the “interest generated by the fund” will be used to rehabilitate those abandoned mines which form part of the legacy of abandoned mines.

According to the (DMP, 2013:6) all holders of mining authorisations are required to make an annual, non-refundable contribution to the MRF of approximately 1% of the total estimated mine closure liability for each site based on- and proportionate to the “disturbance data and

outstanding rehabilitation on the site” as required by section 12 of the MRF Act (Western Australia, 2012) and required by the DMP (2013:4). The state department responsible for administering the MRF will put the power of authority in their Chief Executive Officer (CEO)/Minister who will assess the liability of every tenement holder and determine the levy payable as per section 14 of the MRF Act (Western Australia, 2012). A “Mining Rehabilitation Advisory Panel” is established under the MRF Act (Western Australia, 2012), section 33, who functions as advisors on matters relating to administration and implementation of the act. The DMP (2014a) excuse small scale operations with a closure liability smaller than Aus\$50 million, from paying the levy, although they will still be required to provide disturbance data for their site.

The MRF Act provides incentive for concurrent rehabilitation as the levy is re-calculated annually. If mining impacts are concurrently managed and rehabilitated, the annual levy will decrease.

The fund is a replacement for the performance bond system which quarantined funds (DMP, 2010:4). These bonds, similar to that which is currently used in South Africa, as noted by Daffue (2010:24) ‘do not make adequate financial provision for sudden and unplanned closure as the funds available in the bond before the expected time of closure would not be enough to cover the necessary costs of closure.’ With the introduction of the MRF, ‘the majority of tenement holders will have their security bonds retired once the levy is paid in accordance with the requirements of the MRF Act’ as noted by the DMP (2013:2), unless the Chief Executive Officer (CEO) determines that the site poses a high-risk of rehabilitation liability which will not be adequately covered by the payment of the annual levy.

It is important to note that according to section 9A of the MRF Act (Western Australia, 2012), ‘tenement holders are not excused from carrying out mine closure and rehabilitation as stipulated in the approved mining plans and programmes’ and only in the event of the mine undergoing

premature mine closure and is unable to complete closure as planned due to lack of financing, will the capital held in the fund be accessed to assist in the rehabilitation of these abandoned sites. According to the DMP (2013:2) the MRF will only provide funds for rehabilitation of abandoned mining areas “after every effort has been made to trace responsible parties and recover funds.” Section 8(1)-(2) of the MRF Act (Western Australia, 2012) states that the “interest generated by the fund” will be used to rehabilitate those abandoned mines which form part of the legacy of abandoned mines.

4.4 Results and analysis

The predetermined research design was used to achieve the aim of the research which is to investigate Western Australia’s rehabilitation fund as a fiscal policy solution to rehabilitate South Africa’s abandoned mines. The aim was achieved by means of the mixed methods approach to the handling of qualitative literature and survey data.

4.4.1. Results of Objective 1: challenges related to abandonment of mine sites in South Africa

Figure 1 gives the analysis results of Objective 1 which was to identify the challenges related to abandonment of mine sites in South Africa. The literature review aided in identifying the challenges regarding mine site abandonment and these challenges were arranged into categories which were later used to code qualitative survey response data. The frequency of responses to every challenge was recorded.

As can be seen in Figure 1 the four most noted factors which result in mine site abandonment, according to the informed opinions of stakeholders in the industry, are;

- (1) uncertainties surrounding financial provisions, underestimations and limited finances,
- (2) lack of government enforcement of legislative controls and lack of accountability,
- (3) lack of competency in compiling and implementing Environmental Management Plans or Programmes (EMP/EMPr), and

- (4) DMR “*Guideline document for the evaluation of the quantum of closure related financial provision*” is out of date.

It may be deduced that stakeholders in the industry feel the South African government do not do everything in their legislative power to ensure that current mining practices do not add to the burden of abandoned mines as the enforcement of existing legislation is lacking, past and present polluters are not held accountable and little guidance is offered to mining companies with regard to what is expected of them to mine according to best practice standards. The guideline document of the DMR which all mining companies in South Africa rely on to calculate the financial provisions necessary for closure has not been updated since 2005 and there is no other form of assistance afforded to mines in terms of guideline documents for the preparation of EMPs/EMPrs or Mine Closure Plans. This results in underestimations, thereby increasing the likelihood of mining sites being abandoned due to a lack of funding for rehabilitation, monitoring and maintenance post-closure as closure liabilities far exceed what the mining company can provide when they are no longer generating an income. There are no lessons learned across the industry as every company approaches mine closure planning individually and without the use of an effective guideline document, resulting in the same scenarios of inefficient practices and continued abandonment of sites.

The inherent nature of mining requires that a site be monitored and maintained indefinitely as the threat of AMD will remain as long as there remains a cavity in the ground. The threat of emergent liabilities affords reason for the South African government to not grant mine closure certificates. This is a major role player in the abandonment of mines as mining companies do not make provision for indefinite monitoring and maintenance of their sites.

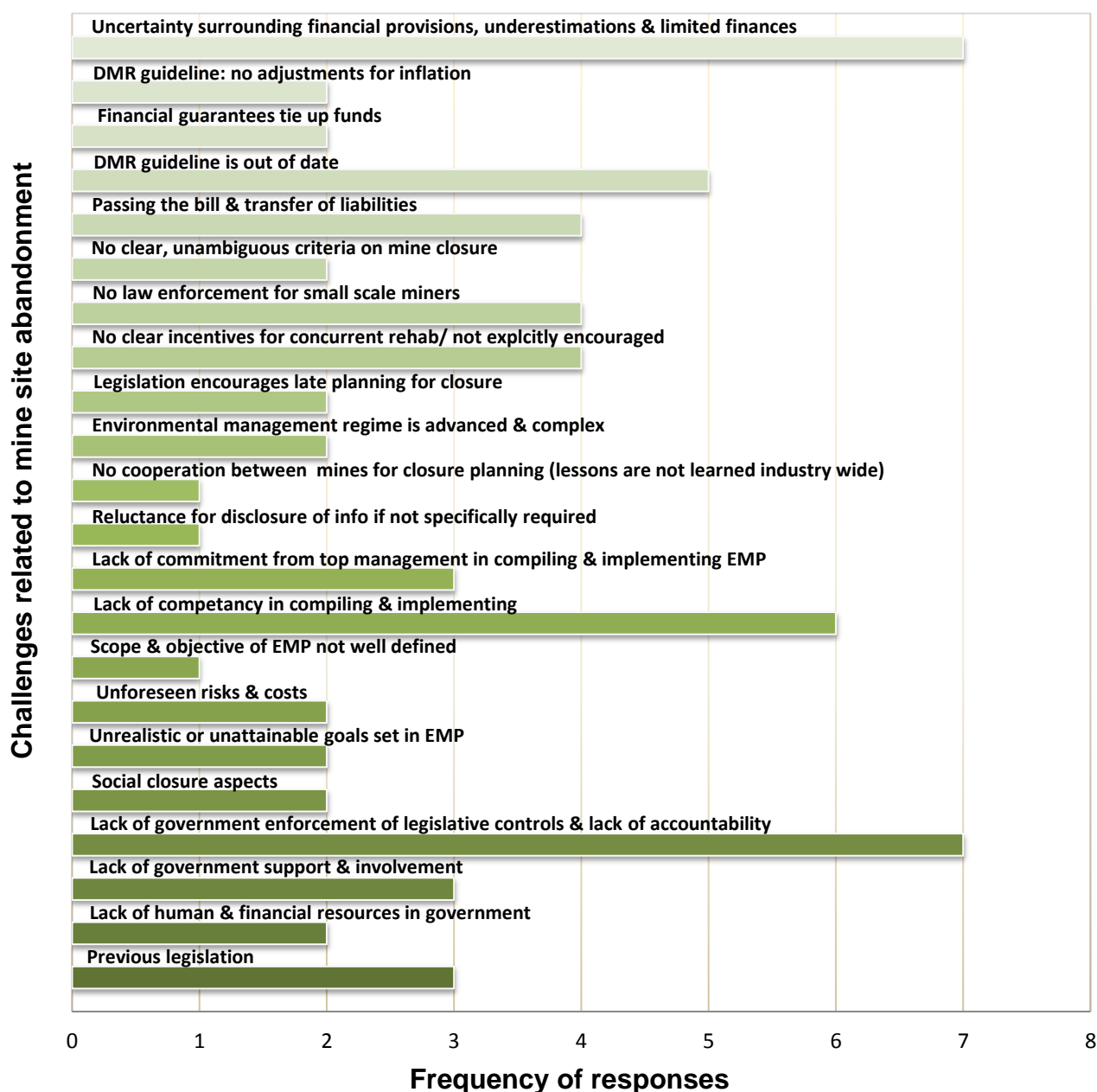


Figure 1: Frequency graph of survey responses on challenges related to mine site abandonment

4.4.2. Results of Objective 2: comparison of legal provisions for abandoned mine sites management in South Africa with that of Western Australia

Objective 2 of this research was to compare the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund.

Categories for analysis are identified within the legislative frameworks in order to ascertain how the legislative provisions in South Africa and Western Australia are similar and how they differ, to identify how varying conditions impact and affect how abandoned mines are dealt with and identify the factors which may lead to the further abandonment of sites and lack of financial provisioning. The comparative analysis therefore aims to enhance the understanding of the workings of the two legislative frameworks. Table 3 is a summary of the comparative analysis of the two frameworks by means of categories and is followed by a summary on the legal provisions specifically dealing with abandoned mine sites management in the two countries. The raw data can be found under Annexure C.

Table 3: Comparative analysis between South Africa and Western Australia's applicable legislation

		SOUTH AFRICA		WESTERN AUSTRALIA	
Comparative categories		Source	Relevant extract(s) & comments	Source	Relevant extract(s) & comments
Constitutional & legislative provisions for the environment	Environment mentioned in Constitution	<i>Constitution of the Republic of South Africa Act 108 of 1996</i>	S24(a),(b)(i-iii)	<i>Western Australia's Constitution Act 23 of 1889 & Commonwealth of Australia Constitution Act of 1900</i>	Neither Constitution specifically mentions the environment.
	Provides for national legislation to protect environment		S146(2)(vi) , defines & establishes sustainability principles & the DMR's constitutional mandate.		The Commonwealth of Australia makes legislative provision in the forms of other Acts which deal specifically with the environment.
	Relevant environmental & mining legislation	<i>National Environmental Management Act (NEMA) 107 of 1998 & Minerals & Petroleum Resources Development Act (MPRDA) 28 of 2002 and MPRD Regulations (MPRDR) (2004)</i>		<i>Environmental Protection Act (EPAct) 87 of 1986, Environmental Protection, Biodiversity Conservation Act 91 of 1999, The Mining Act (MA) 107 of 1978 & Mining Rehabilitation Fund Act (MRF Act) 33 of 2012 and the respective regulations</i>	
Mine Closure Plans & Environmental Management Plans (EMP)	Are Mine Closure Plans/EMPs required?	MPRDA	Environmental Management Plan (EMP) is required which aids in guiding mines in effective closure. Mine Closure Plans are not required until mine closure is imminent.	<i>The Guidelines for the Preparation of Mine Closure Plans (DMR & EPAAuth, 2011:3) & MA</i>	Mine Closure Plan to be submitted as part of the Mining Proposal (S700 of the MA amendments)
	When should they be made available?	NEMA & MPRDA	EMP required before an environmental authorisation to mine or mining permit is issued.		Operate according to internationally accepted best practice: plan for closure before the commencement of any activities.
	How often should they be updated?	MPRDR	S55 ; as stipulated in the EMP otherwise every two years.		Reviewed throughout life of mine & submitted to DMP every three years for approval (Mine Closure Plan)
	Are there government developed guidelines for their formulation?	MPRDR	S51& S52 provide a basic idea of the contents of an EMP.	<i>The Guidelines for the Preparation of Mine Closure Plans (DMR & EPAAuth, 2011)</i>	Suggest the structure and content of the Mine Closure Plan and provide all the necessary legal and best practice information regarding Mine Closure Plans.
		NEMA & MPRDA & MPRDR	Provide for mine closure principles (MRPDR, S56) & provide generic descriptions for 'contents of closure plan' (MPRDR, S62).		
		Information Series 12 (DEAT, 2004)	Supportive text (clearly stipulated that this is not a guideline document) to support with the formulation of EMPs.		
		Lochner, 2005	Guideline document for the preparation of EMPs for mines in the Western Cape.		

		SOUTH AFRICA		WESTERN AUSTRALIA	
Comparative Categories		Source	Relevant extract(s) & comments	Source	Relevant extract(s) & comments
Management of abandoned mines & emerging liabilities	Responsible parties post-closure	NEMA & MPRDA	NEMA S24R(1) , S28 & MPRDA S43(1) supports the “polluter pays principle” & hold polluters responsible for pollution & degradation caused before the promulgation of NEMA in 1998 as well as indirect pollution as a result of polluting activities. Polluters remain responsible even when they have ceased to exist.	EPAct	S16: Appointed authorities are responsible for encouraging the protection of the environment
				MA	S114B: "continuation of liability after expiry, surrender or forfeiture of mining tenement" & do not excuse the responsibilities of the previous holder from carrying out closure liabilities.
		NEMA & MPRDA	MPRDA S 46(1) : if the holder has ceased to exist or been liquidated & rehabilitation on a site is needed to prevent further degradation, the Minister must “ <i>take the necessary measures to prevent further pollution or degradation</i> ”, after which the minister may recover the costs of remediation from the responsible party (which is the previous holder of the mining right, therefore funding is simply not available for the rehabilitation of abandoned mines).	MRF Act	S9A: the person responsible for the site & rehabilitation thereof at the time of it being declared abandoned, is liable to pay a cost into the MRF as debt due to the state. If it has been established that the liable person is unable to provide for rehabilitation, the MRF comes into effect to provide for rehabilitation.
	Legislative provisions for abandoned mines		There is no legal document in place which specifically deals with abandoned mines. The legislation does not delegate due-responsibility or have an approved strategic or business plan for the rehabilitation of these sites.	<i>Mines Safety & Inspection Act 62 of 1994</i> & MRF Act	<i>Mines Safety & Inspection Act 1994</i> S42(1)(a): DMP to be notified before abandonment & cessation of activities. S88 "provides for plans for abandonment or suspension." Mine Closure Plan to be updated within three months to include a decommissioning & care & maintenance plan (DMR & EPAAuth, 2011:9). The MRF Act is specifically aimed at providing funding for the rehabilitation of abandoned mines (S8).
Financial provision & guarantees for rehabilitation post-closure	Financial provisions for mine closure	MPRDA & MPRDR	S23(1) , S10(k) & S53 (MPRDR) Financial provision must be provided before the EMP may be approved or an environmental authorisation awarded. Financial guarantees include loan agreements, bank or other financial guarantees or any other approved scheme.	MRF Act	Mines are responsible for providing finances for rehabilitation in any form they deem fit. The mandatory financial provision is made by paying annual levies into the MRF (S11).
	Calculations of financial provisions	<i>Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine (DME, 2005)</i> (Administered by the DMR)	DMR guideline document is the principle document relied on for calculating closure costing. Last updated in 2005. S41(3) of the MPRDA which required that financial provisions for final closure liabilities be re-assessed annually has been repealed. DMR guideline has not been updated annually to compensate for inflation or include amendments of the MPRDA.	MRF Act & Regulations	MRF Regulations provide a comprehensive guide for the calculations of the annual levy payable. The financial provisions for rehabilitation of sites may be provided in any form & may be calculated based on previous guidelines (DMR & EPAAuth) which are no longer obligatory.

The Environmental Protection Act (EPAct) 76 of 1986 (Western Australia, 1986) shows the intention to not only prevent further pollution but also delegates responsibility to prevent, as far as possible, any environmental damage and mitigate the damage which cannot be prevented as seen in section 16 which provides for the “functions of authority” with respect to the “prevention, control and abatement of pollution and environmental harm.” For cases of sudden and unexpected closure, as guided by sections 24 and 88 of the *Mines Safety and Inspection Act 62 of 1994* (Western Australia, 1994) the closure process will be sped up, a decommissioning plan will need to be drafted and the Mine Closure Plan needs to be reviewed within 3 months of abandonment (Department of Mines and Petroleum and Environmental Protection Authority (DMP and EPAAuth), 2011:9). Up until the time of a closure certificate being issued, the mining operations remain the responsibility of the holder or other responsible appointed person, as directed by section 114B of the *Mining Act 107 of 1978* (Western Australia, 1978).

Sections 28 and 24R(1) of NEMA (South Africa, 1998) and section 43(1) the MPRDA (South Africa, 2002) undertake a similar venture as that of Western Australia by supporting the polluter-pays principle and taking retrospective action in terms of liability for the pollution and degradation of the environment. The legislation does not mention abandoned mines specifically but it is inferred from the abovementioned sections that the mining right holder remains liable for their abandoned mines (which are a source of pollution) until such time as the DMR have issued a closure certificate as per section 43 of the MPRDA, freeing them of their responsibility. Botham (2012:iv) is quoted as saying, “in South Africa no mine closure certificates have ever been issued under either the *Minerals Act of 1991* or the MPRDA of 2002.” The possible reasons for this as identified by Botham (2012:iv) may have to do with the difficulty in convincing the relevant authorities of the sustainability of rehabilitation and ensuring that the site will not pose any environmental liabilities or risks in the future. This may pose a problem as it implies that the government are reluctant to take responsibility for the site, even when the responsible entity no

longer exists, and as no closure certificates have been issued under the MPRDA, the government still considers all the holders of mining rights responsible for their abandoned sites.

The DMR have developed *The National Strategy for the Management of D&O Mines* (DMR, 2009) but a strategic plan is yet to be developed to deal with the rehabilitation of abandoned mines. As per section 46 of the MPRDA (South Africa, 2002) the 'Parliament should set aside funds to employ a third party for the rehabilitation of a prematurely abandoned site where it is urgently needed to prevent environmental degradation.' These funds, according to section 46(1) are to be "retrieved from the right holder."

Section 15 of the *Mining Act Regulations* (Western Australia, 1981) provide for "expenditure conditions" and require that mining operators provide for a performance bond, according to section 126, which serves as a form of financial security for closure rehabilitation and section 60(1) of the *Mining Act* states, "the applicant for an exploration license shall lodge...a security for compliance with the conditions to which the exploration license...will...be subject." The MRF Act (Western Australia, 2012) has now replaced the bonds system as the mandated financial security and makes use of a government-administered, "pooled fund" (DMP, 2013:2), into which annual levies are paid. As the mines still operate under the *Mining Act* (Western Australia, 1978) they remain responsible for financing the rehabilitation of site according to the approved Mine Closure Plan as per Western Australia's "*Guidelines for Preparing Mine Closure Plans*" (DMP and EPAAuth, 2011:26). The purpose of the MRF Act (2012) according to section 6 thereof is "to provide a source of funding for the rehabilitation of abandoned mine sites and other land affected by mining operations carried out in, on or under those sites."

The Mineral Resources Minister indicated that the, "DMR had not rehabilitated any abandoned mining sites in the previous two financial years and that it did not plan to rehabilitate any in the 2012/13 year," (Wait, 2012). South Africa does not have any policy in place to rehabilitate

abandoned mine sites and could benefit from the implementation of a fiscal policy solution such as that of Western Australia.

4.4.3. Results of Objective 3: investigating how such a policy is received by stakeholders in the industry

In order to achieve Objective 3, which is to investigate how such a policy will be received by stakeholders in the industry, an overall expert opinion is generated. The results of the survey questionnaire which produced quantitative data are presented in the following figures. Figure 2 indicates the keys used to symbolize the weighting factors assigned to the respondents in the survey, as clarified in the methodology. Figures 3, 4 and 5 are representations of the respective results obtained from three quantitative questions in the survey which ‘measured the respondents’ degrees of agreeability and the intensity of their feelings by means of Likert-type questions,’ (Bryman, 2012:712). The respondents’ weighting factors are used to generate a sum value (as indicated at the bottom of each respective figure) for each response on the “Likert scale” (Bryman, 2012:712), where 1 carries the least weight and 10 carries the most. This will give an indication to the overall intensity of the feelings toward the various aspects of the viability of the MRF as a fiscal policy solution for South African abandoned mines.

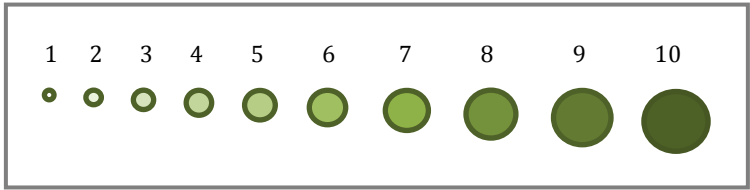


Figure 2: Key indicating respondents’ weighting factors

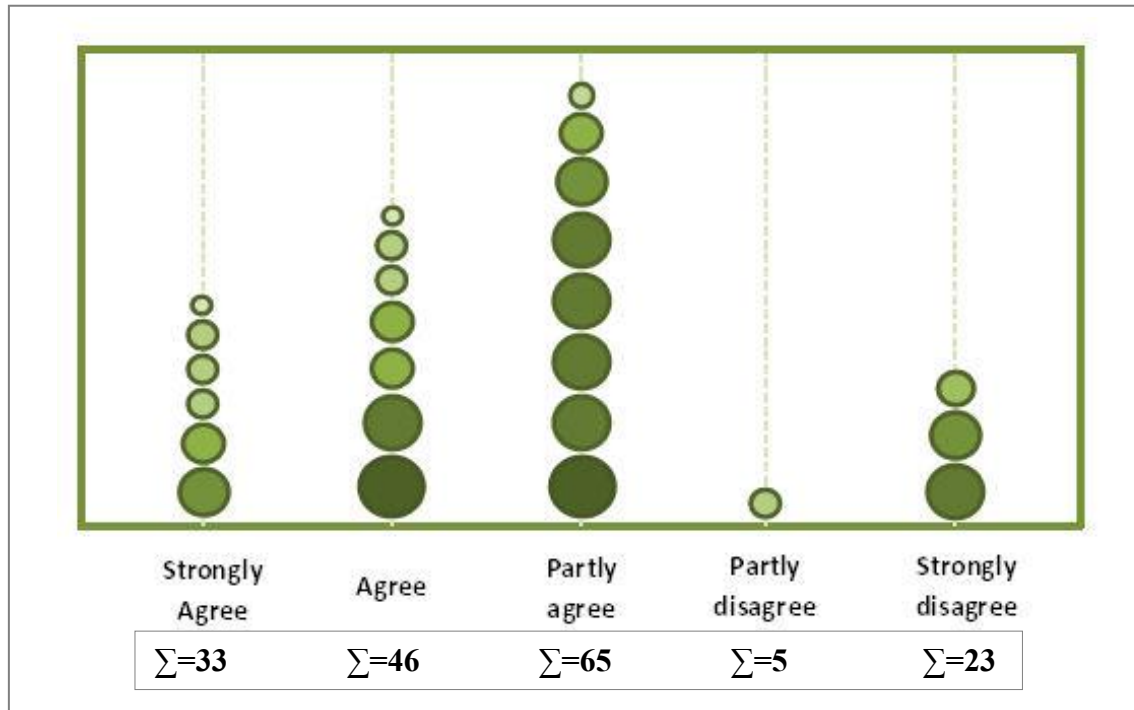


Figure 3: A figure showing respondents' views, indicating if they think a fund like the MRF will be beneficial for South Africa

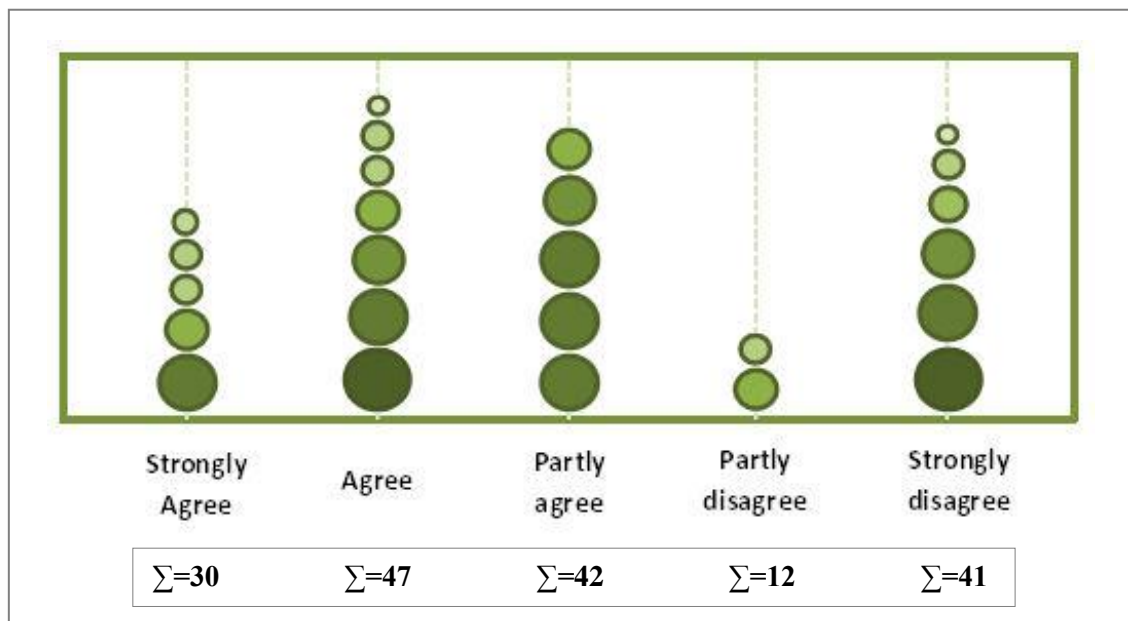


Figure 4: A figure showing respondents' views indicating if they think a fund like the MRF will be a viable solution to deal with South Africa's abandoned mines

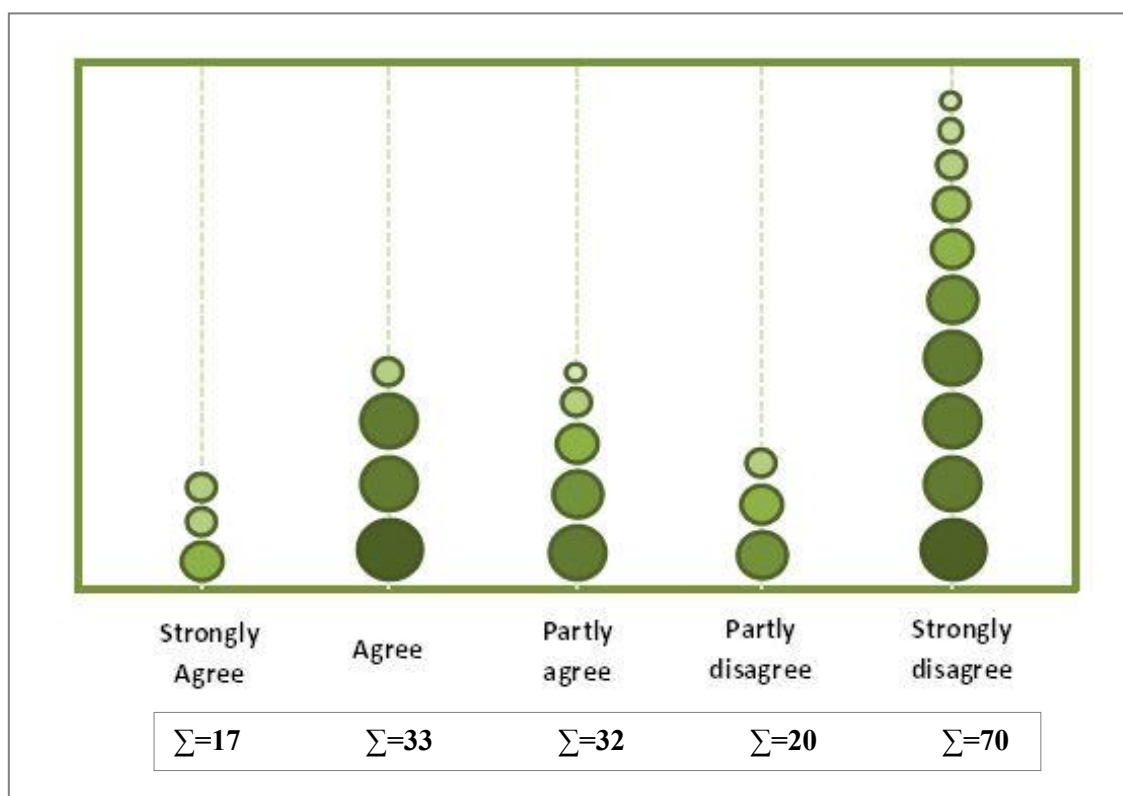


Figure 5: A figure showing respondents' views indicating if they think the South African government could adopt or support a fund like this

As can be seen in Figure 3, which measured whether the respondents thought the MRF would be beneficial for South Africa, the responses are concentrated in the 'partly agree' category and decrease slightly in the direction of 'strongly agree', indicating a great inclination to the agreeability of the benefits which such a policy could afford to the situation in South Africa. Figure 4 shows the agreeability of the respondents to the viability of a solution such as the MRF for South Africa's situation. Once again the respondents' answers are indicative that they agree to the viability of the proposed fiscal policy solution but slightly more weight was focussed in the 'strongly disagree' category than in the previous question about the benefit thereof. This indicates that although the policy may be seen as highly beneficial, the viability thereof in the South African context is more uncertain. Figure 5 indicates the respondents' views on the capability of the South African government to adopt and support (ie. implement) such a fund. The concentration of responses fell in the 'strongly disagree' category but there is, however, a

relative weight representation in the ‘strongly-’ to ‘partly agree’ categories, indicating that there was still some conviction in the ability of government to adopt and support such a fund. As the slight majority of respondents’ answers fell in the ‘partly-’ and ‘strongly disagree’ categories, it indicates that the faith in the South African government’s ability to implement legislation is uncertain and this will need to be addressed before any further legislation is drafted so that the stakeholders in the industry may be assured that the implementation thereof will be fair and consistent.

4.5 Conclusion

The aim of this research was to investigate Western Australia's rehabilitation fund as a fiscal policy solution to rehabilitate South Africa's abandoned mines. South Africa does not have any policy in place to deal with the legacy of abandoned mines and Western Australia’s Mining Rehabilitation Fund serves to deal with a similar problem as that faced in South Africa. In order to achieve the research aim, Objective 1 identified the challenges related to abandonment of mine sites in South Africa were identified in order to determine which issues were most significant and continued to contribute to the abandonment of sites. Objective 2 compared the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund, to ascertain how the two countries’ frameworks make legislative and financial provision for the management of abandoned mine sites and provide guidance to prevent, as far as possible further abandonment of sites. Objective 3 investigated how such a policy would be received by stakeholders in the industry by means of a survey.

4.5.1. Concluding remarks on objectives

The objectives for the research maintained rigor and focus throughout the process and were appropriate for achieving the research aim by providing sufficient guidance in terms of

identifying the major issues which continue to result in the abandonment of mines, drawing up a comparative analysis and investigating the viability of the possible solution to the problem.

4.5.1.1. Objective 1: challenges related to abandonment of mine sites in South Africa

The continued abandonment of mine sites in South Africa points to some crucial shortcomings in the implementation of existing legislation and enforcement of the law. The lack of competency both in the mining sector and government, with regard to the compilation of Mine Closure Plans and EMPs, continues to supplement the abandonment of sites as the quality of documents vary greatly and government simply do not have adequately trained personnel or policy guidelines to assess the quality of documents produced or enforce existing laws. This perpetuates the cycle of inefficient closure planning and tolerates the bare minimum with regards to efforts made to comply with legislative requirements. The out of date *Guideline document for the evaluation of the quantum of closure related financial provision* (DME, 2005) indicates a disregard on the behalf of government to ensure that mines provide sufficient finances for mine closure and don't make provision for sudden and unexpected mine closure. It seems as though the government does not realise the significance of its role as the law enforcer and guardian of the country's natural resources for the benefits of present and future generations as they act in contravention with their own legislative mandate which is to provide guidance for the formulation of procedures and assess these procedures to ensure compliance.

4.5.1.2. Objective 2: comparison of legal provisions for abandoned mine sites management in South Africa with that of Western Australia

The comparison of the legislative frameworks of South Africa and Western Australia highlighted some key areas of shortcomings which could potentially lead to abandonment of sites and the on-going degradation of sites which form part of the abandoned mine legacy of South Africa. Firstly, South Africa, unlike Western Australia, has no policy in place to deal with the legacy of abandoned mines. The government refuses to take responsibility for these sites and even if they

acknowledged their role in the matter, they do not have a means to generate the kind of funding necessary to rehabilitate all the abandoned mining areas in the country. Secondly, the existing legislation which aims to prevent further abandonment of sites is not properly implemented. This is evident in government's disregard for drafting up to date and stringent guidelines and a lack of assessment and monitoring of procedures drafted by mines. It is also clear that no effort is made to develop industry guidelines based on the most successful practices available. Thirdly, there is no monitoring system in place for mines where operations have ceased, which results in reluctance of government to issue closure certificates in an attempt to escape liability and no lessons are learned concerning what works and what does not work with regards to lasting mine closure. Lastly, the South African government fails to recognise their role in ensuring that South Africa's natural resources, such as water and soil, are protected and do not realise that when they permit mining activities, the government also enters into an agreement that they will take over responsibility for the site once rehabilitation is completed according to the Mine Closure Plan (and a closure certificate is issued). Once mining operations have ceased, the site still needs to be monitored and maintained and pro-active measures need to be taken to maintain the natural ecosystems in good health for the benefit of the entire country, also entailing the continued pumping of water to prevent AMD and the decanting thereof. This is a major role player in the legacy of- and continued abandonment of mines as mining companies do not make provision for indefinite monitoring and maintenance of their sites. By not issuing closure certificates the government indicates that they refuse to take responsibility for these sites post-closure, which begs the question why mining is allowed in the first place. It is evident that there is a displacement of liabilities and lack of accountability because in light of the benefits of mining, both the government and mining operators are more than willing to partake in the activity, but when the reality of the environmental and financial impacts of mining become apparent, it is all too easy for the polluters to renounce their responsibility and the government to refuse liability.

This begs the question of who is to take responsibility for these sites as they continue to degrade the environment and infringe on South Africans' constitutional rights.

Policies, regulations, guidelines and legislative documents need to be aligned with one another in order to support unified goals and provide a clear indication of what is expected of mining plans and development projects. When the legal framework is not properly implemented and up-to-date, all-encompassing legislation is not drafted, irresponsible mining practices arise and rehabilitation is not done properly, giving rise to a state of constant environmental deterioration.

4.5.1.3. Objective 3: investigating how such a policy is received by stakeholders in the industry

Consultation with stakeholders in the industry provides insight into their views on the possible implementation of a fiscal policy solution such as the MRF for dealing with South Africa's abandoned mines. The results of the survey indicated a great inclination to the agreeability of the benefits which such a policy could afford to the situation in South Africa. The overall view also indicated that the MRF is seen as a viable solution to deal with South Africa's abandoned mines although there was some doubt expressed by the respondents. This indicates that although the policy may be seen as highly beneficial, the viability thereof in the South African context is more uncertain. Lastly, the survey indicated that there was doubt among the majority of the respondents about the capability of the South African government to adopt and support such a fund, indicating that the faith in the South African government's ability to implement legislation is uncertain and this will need to be addressed before any further legislation is drafted so that the stakeholders in the industry may be assured that the implementation thereof will be fair and consistent.

There is much to be done in terms of research into solutions on how to streamline mining legislation and ensure that the shortcomings with regards to financial provisioning are addressed. Further investigation is required to differentiate which sites are classified as abandoned and

which are classified as D&O, so that pro-active measures may be taken to ensure the treatment of these sites.

As discovered during the research process, it may not seem fair to hold current mining operators responsible for the wrong-doings of past miners and the ineffective legislation which permitted the neglect of the environment, but the crux lies in the mining activity itself, which if not approached correctly, is wholly unsustainable and if mining operators are to draw their profits from the environment, they should be willing to pay a percentage of their income to assist in dealing with the persistent negative impacts of the of the mining industry's activities as a whole. As can be seen from the Western Australian example, it is possible to generate the support of the industry, as long as the enforcing party, in this case the government, does their part in ensuring that they provide proper guidance and fair enforcement and implementation of the legislation, free of corrupt activities. The fund, therefore, serves as a viable fiscal policy solution to deal with South Africa's legacy of abandoned mines. It will, however, require some adaptations to the unique conditions of the South African mining industry, such as employing a third party to administer the fund. Only once closure certificates start being issued and the existing issues of financial underestimations and poor enforcement of legislation are addressed, could the establishment of such a fund positively address the legacy issues.

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CHAPTER 5: CONCLUSION & RECOMMENDATIONS

The aim of this research was to investigate Western Australia's rehabilitation fund as a fiscal policy solution to rehabilitate South Africa's abandoned mines. South Africa does not have any policy in place to deal with the legacy of abandoned mines and Western Australia's Mining Rehabilitation Fund serves to deal with a similar problem as that faced in South Africa. In order to achieve the research aim, Objective 1 identified the challenges related to abandonment of mine sites in South Africa in order to determine which issues were most significant and continued to contribute to the abandonment of sites. Objective 2 compared the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund, to ascertain how the two countries' frameworks make legislative and financial provision for the management of abandoned mine sites and provide guidance to prevent, as far as possible further abandonment of sites. Objective 3 investigated how such a policy would be received by stakeholders in the industry by means of a survey.

It was necessary that *Western Australia's Mining Rehabilitation Fund* be investigated as a possible fiscal policy solution to deal with the abandoned mines in South Africa as the government does not have access to sufficient funds, nor do they accept responsibility for the rehabilitation of abandoned sites. It was also imperative that the South African legislative framework, pertaining to requirements for mine closure and financial provisioning was investigated and compared to the Western Australian case, which acts as a working example of how to effectively deal with premature mine closure and financial considerations, so that lessons may be learned and shortcomings identified. It was also realised that aside from the legislative provisions made, the implementation and enforcement thereof is of even greater consequence in ensuring success.

The rest of the concluding chapter is structured in sections which provide concluding remarks on the various parts of the research process.

5.1 Concluding remarks on objectives

The objectives for the research maintained rigor and focus throughout the process and were appropriate for achieving the research aim by providing sufficient guidance in terms of identifying the major issues which continue to result in the abandonment of mines, drawing up a comparative analysis and investigating the viability of the possible solution to the problem.

5.1.1 Objective 1: challenges related to abandonment of mine sites in South Africa

The continued abandonment of mine sites in South Africa points to some crucial shortcomings in the implementation of existing legislation and enforcement of the law. The lack of competency both in the mining sector and government, with regard to the compilation of Mine Closure Plans and EMPs continues to supplement the abandonment of sites as the quality of documents vary greatly and government simply do not have adequately trained personnel or policy guidelines to assess the quality of documents produced or enforce existing laws. This perpetuates the cycle of inefficient closure planning and tolerates the bare minimum with regards to efforts made to comply with legislative requirements. The out of date *Guideline document for the evaluation of the quantum of closure related financial provision* (DME, 2005) indicates a disregard on the behalf of government to ensure that mines provide sufficient finances for mine closure and don't make provision for sudden and unexpected mine closure. It seems as though the government does not realise the significance of their role as the guardian of the country's natural resources for the benefits of present and future generations as they act in contravention to their own legislative mandate which is to provide guidance for the formulation of procedures and assess these procedures to ensure compliance.

5.1.2 Objective 2: comparison of legal provisions for abandoned mine sites management in South Africa with that of Western Australia

The comparison of the legislative frameworks of South Africa and Western Australia highlighted some key areas of shortcomings which could potentially lead to abandonment of sites and the on-going degradation of sites which form part of the abandoned mine legacy of South Africa. Firstly, South Africa, unlike Western Australia, has no policy in place to deal with the legacy of abandoned mines. The government refuses to take responsibility for these sites and even if they acknowledged their role in the matter, they do not have a means to generate the kind of funding necessary to rehabilitate all the abandoned mining areas in the country. Secondly, the existing legislation which aims to prevent further abandonment of sites is not properly implemented. This is evident in government's disregard for drafting up to date and stringent guidelines and a lack of assessment and monitoring of procedures drafted by mines. It is also clear that no effort is made to develop industry guidelines based on the most successful practices available. Thirdly, there is no monitoring system in place for

mines where operations have ceased, which results in reluctance of government to issue closure certificates in an attempt to escape liability and no lessons are learned concerning what works and what does not work with regards to lasting mine closure. Lastly, the South African government fails to recognise their role in ensuring that South Africa's natural resources, such as water and soil, are protected and do not realise that when they permit mining activities, the government also enters into an agreement that they will take over responsibility for the site once rehabilitation is completed according to the Mine Closure Plan (and a closure certificate is issued). Once mining operations have ceased, the site still needs to be monitored and maintained and pro-active measures need to be taken to maintain the natural ecosystems in good health for the benefit of the entire country, also entailing the continued pumping of water to prevent AMD and the decanting thereof. This is a major role player in the legacy of- and continued abandonment of mines as mining companies do not make provision for indefinite monitoring and maintenance of their sites. By not issuing closure certificates the government indicates that they refuse to take responsibility for these sites post-closure, which begs the question why mining is allowed in the first place. It is evident that there is a displacement of liabilities and lack of accountability because in light of the benefits of mining, both the government and mining operators are more than willing to partake in the activity, but when the reality of the environmental and financial impacts of mining become apparent, it is all too easy for the polluters to renounce their responsibility and the government to refuse liability. This begs the question of who is to take responsibility for these sites as they continue to degrade the environment and infringe on South Africans' constitutional rights.

Policies, regulations, guidelines and legislative documents need to be aligned with one another in order to support unified goals and provide a clear indication of what is expected of mining plans and development projects. When the legal framework is not properly implemented and up-to-date, all-encompassing legislation is not drafted, irresponsible mining practices arise and rehabilitation is not done properly, giving rise to a state of constant environmental deterioration.

5.1.3 Objective 3: investigating how such a policy is received by stakeholders in the industry

Consultation with stakeholders in the industry provides insight into their views on the possible implementation of a fiscal policy solution such as the MRF for dealing with

South Africa's abandoned mines. The results of the survey indicated a great inclination to the agreeability of the benefits which such a policy could afford to the situation in South Africa. The overall view also indicated that the MRF is seen as a viable solution to deal with South Africa's abandoned mines although there was some doubt expressed by the respondents. This indicates that although the policy may be seen as highly beneficial, the viability thereof in the South African context is more uncertain. Lastly, the survey indicated that there was doubt among the majority of the respondents about the capability of the South African government to adopt and support such a fund, indicating that the faith in the South African government's ability to implement legislation is uncertain and this will need to be addressed before any further legislation is drafted so that the stakeholders in the industry may be assured that the implementation thereof will be fair and consistent.

5.2 Concluding remarks on methodological learning

The choice of a qualitative dominant mixed methods approach was satisfactory in achieving the research aim and objectives. The qualitative literature review aided in identifying categories and themes of importance for the study which were used to analyse interview data and select codes for the comparative analysis of the two legislative frameworks. A meticulous and comprehensive review of literature ensured that the research objectives were approached from a substantive perspective and viewed within the context of the prevailing conditions and issues surrounding abandonment of mines and a lack of financial provisions.

The inclusion of quantitative data within the overall qualitative framework allowed for a generalisation in the views of the survey respondents and assisted in presenting a definitive indication of their shared opinions on the viability and benefits of the suggested fiscal policy solution in the South African context. The quantitative portion of the survey questionnaire was quick and simple to complete, thereby improving the efficiency of the overall survey process, especially where respondents were contacted telephonically. The collection of qualitative interview data aided in gaining a deeper understanding of the respondents' views on the situation and the categories, as identified in the literature review, helped sort the qualitative data into manageable chunks for easy analysis and aided in generalising findings.

The pragmatic philosophical view allowed for the analyses of the practical significance of the workings within the legislative frameworks and the implementation thereof and did not place any limitations on the types of data which could be collected, or the analytical methods employed for arriving at the final presentation of the research paper.

5.3 Concluding remarks on literature review

The literature study provided the main source of data for this research and aided in identifying major issues in the South African legislative framework from the documents themselves and aided in gaining a deeper understanding to the problems with the implementation and enforcement thereof.

One of the major issues identified in the literature is that although the DMR draws a distinction between abandoned and D&O mine sites in their own legislative documents, research into the subject has revealed that abandoned and D&O mines are not necessarily treated as separate entities as both have been estimated at around 6000 sites by the government departments and Council for Geosciences. This could lead to confusion regarding which sites the government takes responsibility for and which it does not. Further investigation into this matter may be necessary to ensure that there is a definitive distinction made by the government between the two types of mines and to ensure that the responsible entities are held accountable.

It has also become clear that the greater underlying issue of mine closure planning needs to be addressed in order to combat the legacy issue of abandoned mines. Integrated mine closure needs to be applied throughout the life cycle by means of up to date closure and rehabilitation plans and unexpected closures should always be expected, suggesting that financial provisions for premature closure also need to be taken into account. The ultimate test of the sustainability of mining emanates post closure, where the economic, social and environmental conditions need to be in the same or better conditions than they were before the onset of mining activities, and this is only possible if mining is done according to best practice standards and adequate financial provision is made for closure, which is evidently not the case in South Africa. The Western Australian approach can provide a great example of how the legacy issue of abandoned mines can be dealt with as it promotes concurrent rehabilitation and provides up to date, holistic guidelines on how to achieve sustainable closure. There is an unmistakeable gap in the capacity of South Africa's government to enforce the

sustainable ideals towards which the legislation strives, as indicated by the lack of action to deal with abandoned mine sites and poor enforcement of the existing legislation. It is evident that the Western Australian government acknowledge their role in protecting the environment and their intentions lie with protecting the rights of their citizens and taking care of the environment.

If a fund such as the MRF is to be introduced in South Africa, some crucial changes need to be made in the management of funds. Firstly, tax transparency needs to be ensured by the government and the entire mining sector so that it is clear how funds are allocated and utilised and whether these funds are being used for personal gain or for the social and environmental development of affected communities and environments. This was a major concern with the survey respondents who had little confidence in the ability of government to uphold such a responsibility. It may be a better option for a third party to administer such a fund, thereby ensuring the welfare of the environment and South African citizens are placed first. Secondly, it may be problematic that the mines themselves provide the disturbance data as it leaves room for dishonesty in an attempt to minimise levies paid, especially when there are no strict guidelines to follow and little follow-up from government. This will require independent assessments of proposed financial provisions made by mines, improved inspections and peer reviews by experts in the field as some mining companies consider some information as confidential especially if it is not specifically requested by the law. This poses another problem as South Africa already faces a skill shortage challenge both in the mining industry and in government.

5.4 Recommendations

There is much to be done in terms of research into solutions on how to streamline mining legislation and ensure that the shortcomings with regards to financial provisioning are addressed. Further investigation is required to differentiate which sites are classified as abandoned and which are classified as D&O, so that pro-active measures may be taken to ensure the treatment of these sites.

5.5 Concluding summary on aim

It may not seem fair to hold current mining operators responsible for the wrong-doings of past miners and the ineffective legislation which permitted the neglect of the environment, but the crux lies in the mining activity itself, which if not approached

correctly, is wholly unsustainable and if mining operators are to draw their profits from the environment, they should be willing to pay a percentage of their income to assist in dealing with the persistent negative impacts of the of the mining industry's activities as a whole. As can be seen from the Western Australian example, it is possible to generate the support of the industry, as long as the enforcing party, in this case the government, does their part in ensuring that they provide proper guidance and fair enforcement and implementation of the legislation, free of corrupt activities.

The fund serves as a viable fiscal policy solution to deal with South Africa's legacy of abandoned mines. It will, however, require some adaptations to the unique conditions of the South African mining industry, such as employing a third party to administer the fund. Only once the existing issues of financial underestimations and poor enforcement of legislation are addressed, could the establishment of such a fund positively address the legacy issues.

Annexures

Annexure A: Survey questionnaire



Survey questionnaire aimed at investigating Western Australia's rehabilitation fund as a fiscal policy solution for South African abandoned mines (September/October 2014)

This survey which consists of 3 pages is carried out for the purposes of fulfilling a M.Sc. degree in Geography and Environmental Management and is done in order to *establish the views of selected respondents* on issues related to the research aim and objectives, which are as follows:

1. to identify the challenges related to abandonment of mine sites in South Africa,
2. to compare the legal provisions for abandoned mine sites management in South Africa with that of Western Australia, specifically the rehabilitation fund, and
3. to investigate Western Australia's rehabilitation fund as a fiscal policy solution to rehabilitate South Africa's abandoned mines.

Part 1: Demographic data

1.1 Who employs you?

1.2 What is your current role and position?

1.3 How many years' working experience do you have in the mining industry?

- | | | |
|--|---|--------------------------------------|
| <input type="checkbox"/> Less than 5 years | <input type="checkbox"/> 5-10 years | <input type="checkbox"/> 10-15 years |
| <input type="checkbox"/> 15-20 years | <input type="checkbox"/> More than 20 years | |

1.4 How many years have you spent working specifically with mine closure, abandoned mines or rehabilitation activities?

- | | | |
|--------------------------------------|--|---|
| <input type="checkbox"/> None | <input type="checkbox"/> Less than 5 years | <input type="checkbox"/> 5-10 years |
| <input type="checkbox"/> 10-15 years | <input type="checkbox"/> 15-20 years | <input type="checkbox"/> More than 20 years |

Part 2: Critical reflection

2.1 What (in your opinion and experience) are the **key challenges** related to premature mine closure and abandoned mines in South Africa?

2.2 What (in your opinion and experience) are the **key legal provisions and guides** for dealing with abandoned mines?

Background to Western Australia's Mining Rehabilitation Fund (MRF)

The MRF is a **government-administered, pooled fund** which provides **immediate finances** for the rehabilitation of abandoned mines and land affected by **abandoned sites' past operations & present impacts**.

All holders of "mining authorisations" are required to **contribute to the fund** based on-, and proportionate to- the **environmental disturbance** of the site, the **size** of the disturbed land and **outstanding rehabilitation**.

The State Department responsible for administering the MRF will put the **power of authority** in their Chief Executive Officer (CEO) who will **assess the liability** of every holder and determine the levy payable.

The fund is a **replacement for the environmental bond system** which **quarantined funds**. The environmental bonds system required companies to pay 25% - 30% of the estimated rehabilitation liability into a fixed bond, whereas the **Mining Rehabilitation Fund** requires an **annual contribution of approximately 1% of the total estimated mine closure**.

2.3 Do you (in your opinion and experience) think a fund like this will be **beneficial**?

- | | | |
|---|---|--|
| <input type="checkbox"/> Strongly agree | <input type="checkbox"/> Agree | <input type="checkbox"/> Partly agree |
| <input type="checkbox"/> Partly disagree | <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Cannot judge |

2.4 Do you (in your opinion and experience) think a fund like this will be a **viable solution** to deal with South Africa's abandoned mines?

- | | | |
|---|---|--|
| <input type="checkbox"/> Strongly agree | <input type="checkbox"/> Agree | <input type="checkbox"/> Partly agree |
| <input type="checkbox"/> Partly disagree | <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Cannot judge |

2.5 Do you (in your opinion and experience) think the South African government could **adopt** or **support** a fund like this?

- | | | |
|---|---|--|
| <input type="checkbox"/> Strongly agree | <input type="checkbox"/> Agree | <input type="checkbox"/> Partly agree |
| <input type="checkbox"/> Partly disagree | <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Cannot judge |

Annexure B: Interview respondents and assigned weighting factors

Table 4: Weighting factors representing the experience of survey respondents in the industry

Years in the mining industry	Weighting Factor (1)	Years working with mine closure, abandoned mines or rehabilitation activities	Weighting Factor (2)	Total weight for respondent = weighting factor (1) + weighting factor (2)
		None	0	
<5	1	<5	2	
5-10	2	5-10	3	
10-15	3	10-15	4	
15-20	4	15-20	5	
>20	5	>20	6	

Table 5: Respondents' assigned weighting factors

Respondent number	Weighting factors	Total weight of respondent
#1	5+4	9
#2	5+3	8
#3	4+4	8
#4	3+4	7
#5	5+2	7
#6	5+4	9
#7	4+5	9
#8	1+2	3
#9	2+3	5
#10	3+2	5
#11	2+3	5
#12	3+2	5
#13	2+3	5
#14	4+5	9
#15	4+5	9
#16	5+5	10
#17	3+4	7
#18	4+4	8
#19	4+5	9
#20	2+2	4
#21	5+6	10
#22	2+3	5
#23	4+2	6
#24	3+4	7
#25	1+2	3

Note: “holder” refers to the holder of relevant reconnaissance permission, prospecting right, mining right, retention permit, mining permit or mining authorisation, as the case may be & is responsible for the mining activities.

Annexure C: Raw data on comparative categories of applicable legislation pertaining to premature mine closure, abandoned mines and financial provisions for rehabilitation of current and emerging rehabilitation liabilities

	SOUTH AFRICA		WESTERN AUSTRALIA	
	REGULATION	RELEVANT EXTRACTS & COMMENTS	REGULATION	RELEVANT EXTRACTS & COMMENTS
CONSTITUTIONAL PROVISIONS FOR THE ENVIRONMENT	Constitution of the Republic of South Africa Act 108 of 1996 (South Africa, 1996)	<p>Highest authority of legislation enforced by the Minister for Justice & Constitutional Development.</p> <p>S146(2) of the Constitution (1996:133(1)) states, “(c) <i>The national legislation is necessary for - (vi) the protection of the environment.</i>”</p> <p>Section 24 defines & establishes sustainability principles & the DMR’s constitutional mandate. S24(a) states “<i>everyone has the right to an environment that is not harmful to their health or well-being.</i>” S24(b) states that “<i>everyone has the right to have the environment protected, for the benefit of present & future generations, through reasonable legislative & other measures that (i) prevent pollution & ecological degradation; (ii) promote conservation; & (iii) secure ecologically sustainable development & use of natural resources while promoting justifiable economic & social development.</i>”</p> <p>NEMA gives effect to section 24 of the Constitution of RSA & embraces sustainable development.</p>	Western Australia’s Constitution Act 23 of 1889 (Western Australia, 1889) was later amended & is superseded by the Commonwealth of Australia Constitution Act (1900) as Western Australia now forms part of the Commonwealth of Australia	<p>Neither the Western Australian, nor the Commonwealth Constitution specifically mentions the environment.</p> <p>The Commonwealth of Australia makes legislative provision in the forms of other Acts which deal specifically with the environment.</p> <p>One such example is the Environmental Protection & Biodiversity Conservation (EPBC) Act 91 of 1999 (Commonwealth of Australia, 1999) as amended, which contains sections headed “<i>requirements for environmental approvals, protection of the environment from proposals involving the Commonwealth</i>” as well as “<i>cases where environmental approval is not necessary.</i>” The EPBC Act has jurisdiction over any actions that have an environmental impact on any Commonwealth land (Australia, 1999).</p> <p>*Note: As of 1901 Western Australia forms part of the Commonwealth of Australia which is technically the federal government representing the Australian mainland and surrounding islands (Maynes, 2013, 4). Western Australia therefore forms part of a smaller self-governing unit of the whole which remains responsible for its own legal system accepted by the Western Australian parliament and enforced by their own courts. The laws made by the Commonwealth parliament however supersede those of the smaller jurisdictions (Maynes, 2013:13; Commonwealth of Australia, 1900).</p>

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RELAVENT ENVIRONMENTAL LAWS	SOUTH AFRICA		WESTERN AUSTRALIA	
	REGULATION	RELEVANT EXTRACTS & COMMENTS	REGULATION	RELEVANT EXTRACTS & COMMENTS
	<p>National Environmental Management Act 108 of 1998 (NEMA) (South Africa, 1998) with amendments as of 2 June 2014</p> <p>The National Water Act 36 of 1998 (NWA) (South Africa, 1998)</p>	<p>NEMA is the main environmental legislative framework guiding organs of state in making decisions which will affect the environment, by means of acts & regulations focussing on environment related aspects such as water (NWA), biodiversity (NEM:BA) & waste (NEM:WA)</p> <p>NEMA provides the principles & procedures for applying co-operative governance & legislation with the aim on protecting the environment for sustainable development & S2(4)(1) states, “<i>there must be intergovernmental co-ordination & harmonisation of policies, legislation & actions relating to the environment.</i>”</p> <p>Social, environmental & economic impacts of an activity are to be considered by environmental authorities.</p> <p>The Department of Environmental Affairs enforce environmental requirements for current, future & past polluters.</p> <p>The regulatory authorities set up directives for discharging qualities & quantities for mine water according to the regulations of the NWA. This applies to abandoned mines as well.</p>	<p>Environmental Protection Act 76 of 1986 (EPAct) (Western Australia, 1986) as at 18 November 2013</p> <p>Environmental Protection & Biodiversity Conservation Act 91 of 1999 (EPBC) (Australia, 1999) as at 1 July 2014.</p>	<p>The Environmental Protection Act (Western Australia, 1986:1) provides “<i>for an Environmental Protection Authority, for the prevention, control & abatement of pollution & environmental harm, for the conservation, preservation, protection, enhancement & management of the environment...</i>”</p> <p>The Act delegates due responsibility to prevent as far as possible any environmental damage in Western Australia & mitigate the damage which cannot be prevented.</p> <p>The EPBCA (Australia, 1999) is the central piece of environmental legislation governing the Commonwealth of Australia & all matters of national importance.</p> <p>S26(1) provides for <i>actions on Commonwealth land</i> and states that, “<i>a person must not take ... an action that has, will have or is likely to have a significant impact on the environment.</i>”</p> <p>Chapter 2 of the EPBCA is headed, “<i>protecting the environment.</i>” The goal with this chapter is to provide a guide for the Commonwealth Minister for the Environment to work from in order to decide whether projects which carry significant impacts are approved or prohibited from continuing (1999:10) those activities, which create impacts that cannot be prevented.</p>

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RELEVANT MINING LAWS	SOUTH AFRICA		WESTERN AUSTRALIA	
	REGULATION	RELEVANT EXTRACTS & COMMENTS	REGULATION	RELEVANT EXTRACTS & COMMENTS
	<p>The Minerals & Petroleum Resources Development Act 28 of 2002 (MPRDA) (South Africa, 2002) with amendments as of 1 May 2013</p>	<p>The MPRDA replaced the Minerals Act 50 of 1991 (South Africa, 1991) providing a “<i>holistic cradle-to-grave approach</i>,” which strives toward sustainable economic, social & environmental development (Swart, 2003:492). The Department of Minerals & Energy (DME) was replaced by the Department of Mineral Resources (DMR) as the enforcing authority.</p> <p>This Act provides for matters related to the “<i>equitable access to & sustainable development of the nation’s mineral & petroleum resources</i>,” (South Africa, 2002:5).</p> <p>The MPRDA (2002:17) is defined as being the Act which, “<i>includes the regulations & any term or condition to which any permit, permission, license, right, consent, exemption, approval, notice, closure certificate, EMP/EMPr or directive issued, given, granted or approved in terms of this Act, is subject.</i>’</p>	<p>The Mining Act 107 of 1978 (MA) with Mining regulations 1981 (Western Australia, 1981)</p> <p>Mining Rehabilitation Fund Act 33 of 2012 (MRF Act) (Western Australia, 2012)</p>	<p>The Mining Act applies to mineral exploration & mining operations within Western Australia.</p> <p>The regulations as contemplated in the Mining Act may, as stipulated in S162 (2)(n), “<i>provide for the protection of land upon which mining operations are conducted & require the rehabilitation to the satisfaction of the Minister of land disturbed by the mining operations.</i>”</p> <p>The MRF Act (Western Australia, 2012:1) provides for;</p> <ul style="list-style-type: none"> • The establishment of the Mining Rehabilitation Fund, • The declaration of abandoned mine sites, & • A levy payable in respect of mining authorisations & for related purposes. <p>The MRF provides a replacement for the environmental bonds system as required by the Mining Act (Western Australia, 1978).</p>

Note: “holder” refers to the holder of relevant reconnaissance permission, prospecting right, mining right, retention permit, mining permit or mining authorisation, as the case may be & is responsible for the mining activities.

	SOUTH AFRICA		WESTERN AUSTRALIA	
	REGULATION	RELEVANT EXTRACTS & COMMENTS	REGULATION	RELEVANT EXTRACTS & COMMENTS
REHABILITATION & CLOSURE PLANS	MPRDA 28 of 2002 MPRDR of 2004 NEMA 108 of 1998 Environmental Management Plans, Integrated Environmental Management, Information series 12 (DEAT, 2004) Guidelines for Environmental Management Plans, 1st ed (Lochner, 2005)	<p>Mine Closure Plans are site-specific documents which identify social, environmental & economic aspects & impacts of the mining activities & the requirements thereof as well as the suggested programmes & procedures to be implemented in order to close the mine sustainably.</p> <p>NEMA provides for the procedures to be followed to receive an environmental authorisation, without which mining may not commence. This includes the formulation of an EMP/EMPr (S51 & S52 of the MPRDR which provide a basic idea of the contents thereof.) the EMP/EMPr should be monitored & assessed (S55 of the MPRDR) as stipulated in the EMP/EMPr otherwise every two years. It does not specifically mention that Mine Closure Plans are required before mining starts.</p> <p>Environmental risk assessments are required by NEMA S24(1). Mining may only commence once it has been established that all significant impacts have been identified & a programme is in place for proper environmental management & so that new mining activities are undertaken responsibly (S23(1) of MPRDA).</p> <p>Mine Closure Plans: Both NEMA and the MPRDA provide for mine closure principles to be followed (S56 of MPRDR) & provide generic descriptions for <i>contents of closure plan</i> (S62 of MPRDR).</p> <p>The DEAT (2004), as part of their information series, released a supportive text (clearly stipulated that this is not a guideline document) to support with the formulation of EMPs. A guideline document for the preparation of EMPs was released by the provincial government of the Western Cape’s Department of Environmental Affairs & Development Planning (Lochner, 2005).</p>	Guidelines for the Preparation of Mine Closure Plans (DMP & EPA, 2011) EPA 76 of 1986 MA 107 of 1978	<p>As stated in the Foreword of <i>The Guidelines for the Preparation of Mine Closure Plans</i> (2011:3) it is internationally accepted best practice to plan for closure before the commencement of any activities & planning should continue throughout the life of the mine until such a point where the mine has been closed & rehabilitated.</p> <p>Mine Closure Plans: The Mining Act of 1978 requires that Mine Closure Plans be reviewed throughout the life of the mine & submitted to the DMP every three years for approval or as stated in the tenement conditions (DMP & EPA, 2011:8). If the mine operates under a state agreement other than the Mining Act of 1978, the Mine Closure Plan will be reviewed according to the Environmental Protection Act of 1986, part IV (DMP & EPA, 2011:8). These regulations make provision to ensure that current mining practices don’t add to the rehabilitation burden on the state.</p> <p>Mine Closure Plans need to be site specific & demonstrate the intention to achieve ecological sustainability at closure through identification & specialist reporting of significant impacts of the mining activity (DMP & EPAAuth, 2011:19) as well as propose solutions to deal with these problems. They also need to ensure that mining does not result in any “<i>unacceptable liability to the State</i>,” (DMP & EPAAuth, 2011:3).</p> <p>The DMP & EPAAuth follow a risk based approach when it comes to mine closure planning (DMP & EPAAuth, 2011:12) thus improving the chances for early identification of impacts or potential risks. They also encourage the use of “<i>adaptive management</i>” (DMP & EPAAuth, 2011:14) which aims to learn from previous mistakes made in terms of closure planning & formulate closure plans in order not to repeat the mistakes.</p>

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WESTERN AUSTRALIA			
	REGULATION	RELEVANT EXTRACTS & COMMENTS	
REHABILITATION & CLOSURE PLANS	Guidelines for the Preparation of Mine Closure Plans (DMP & EPAAuth, 2011)	<p>In cases of unexpected closure the closure process will be sped up, a decommissioning plan will need to be drafted & the Mine Closure Plan needs to be reviewed within 3 months of abandonment (DMP & EPAAuth, 2011:9).</p> <p>Mine closure is achieved when the planned mine closure & environmental management is carried out as prescribed by the state approved Mine Closure Plan & may only happen if the Minister is satisfied with the rehabilitation & the holder does not owe any monies, such as royalties, fines or contributions to the MRF. Up until the time of a closure certificate being issued, <u>the mining operations remain the responsibility of the holder or other responsible person as appointed.</u></p>	

	SOUTH AFRICA		WESTERN AUSTRALIA	
	REGULATION	RELEVANT EXTRACTS & COMMENTS	REGULATION	RELEVANT EXTRACTS & COMMENTS
MANAGEMENT OF ABANDONED MINES & EMERGING LIABILITIES	MPRDA 28 of 2002 NEMA 108 of 1998	<p>S28 of NEMA provides for <i>duty of care & remediation of environmental damage</i> & supports the “polluter pays principle” & goes as far as to hold polluters responsible for pollution & degradation caused before the promulgation of NEMA in 1998 as well as indirect pollution as a result of polluting activities, whether the impacts arise immediately or at a different time to the activities.</p> <p>NEMA S24R(1) shares the view of S43(1) the MPRDA which states, “<i>the holder... or previous holder of an old order right or previous owner of works that has ceased to exist remains responsible for any environmental liability, pollution or ecological degradation, the pumping & treatment of extraneous water, compliance with the conditions of the environmental authorisation & the management & sustainable closure thereof, notwithstanding the issuing of a closure certificate by the Minister in terms of this Act to the holder or owner concerned.</i>”</p> <p>Provisions are made in the MPRDA to ensure that rehabilitation plans & programmes are considered from the start of all new projects & to prevent further abandonment of site adding to current rehabilitation liabilities.</p>	EPAAct 76 of 1986 Guidelines for the Preparation of Mine Closure Plans (2011)	<p>Extracts relevant to responsibilities for proper mine closure are found in S16 of the Environmental Protection Act of 1986 which provides for the <i>functions of authority</i> with respect to the <i>prevention, control & abatement of pollution & environmental harm</i>. The appointed authorities are responsible for encouraging the protection of the environment by means of identifying & studying any potential degradation, publishing guidelines to assist all professions in lowering & mitigating impacts, to publish policies for environmental protection as well as to “<i>promote, coordinate or carry out planning & projects in environmental management,</i>” S16(p) (EPAAct of 1986).</p> <p>S114B of the Mining Act provides for the <i>continuation of liability after expiry, surrender or forfeiture of mining tenement</i> & states that the forfeiture does not excuse the responsibilities of the previous holder from carrying out closure liabilities.</p>

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	SOUTH AFRICA		WESTERN AUSTRALIA	
	REGULATION	RELEVANT EXTRACTS & COMMENTS	REGULATION	RELEVANT EXTRACTS & COMMENTS
MANAGEMENT OF ABANDONED MINES & EMERGING LIABILITIES	MPRDA 28 of 2002 NEMA 108 of 1998	<p>S 46(1) of the MPRDA state that if rehabilitation is necessary on a site, but it is established, “<i>that the holder of or his or her successor in title, is deceased or cannot be traced or, in the case of a juristic person, has ceased to exist, has been liquidated (abandoned mines) or cannot be traced (derelict & ownerless), the Minister may instruct the Regional Manager concerned to take the necessary measures to prevent further pollution or degradation, or to make the area safe,</i>” after which the minister may recover the costs of remediation from the responsible party.</p> <p>The guideline document for the quantum of closure related financial provision is quoted as saying that, “<i>the methodology for computing the quantum is based on the assumption that a third party will be employed by the DME to undertake the necessary rehabilitation and remedial work, should the mining operation close prematurely. This assumption is in line with the adopted international approach,</i>” (DME, 2005:v).</p> <p>When a site is abandoned a closure certificate must be applied for according to S43(3) of the MPRDA. MPRDA S43(5): A closure certificate will only be issued once it has been confirmed, in writing, by the Chief Inspector of Mines & the Department of Water & Environmental Affairs, that “<i>provisions pertaining to health & safety management of potential pollution to water resources, the pumping & treatment of extraneous water & compliance to the conditions of the environmental authorisation have been addressed.</i>” A mining right carries environmental liabilities attached to it & the owner of the mining right therefore carries the burden of completing closure</p>	<p>Guidelines for the Preparation of Mine Closure Plans (2011)</p> <p>Mines Safety & Inspection Act 62 of 1994</p> <p>MA 107 of 1978</p> <p>Contaminated Sites Act 60 of 2003</p> <p>MRF Act 33 of 2012</p>	<p>According to the Contaminated Sites Act 2003(Western Australia, 2003), S22 provides for the <i>persons responsible for remediation of contaminated sites</i>, such as tailings storage facilities & provides a <i>hierarchy of responsibility</i> for remediation, as follows;</p> <ul style="list-style-type: none"> • the polluter (S25), • the owner (S26) or person responsible for changing the land use, • the owner (S27), • insolvent body corporates (S28), & • the state (S29). <p><i>Mines Safety & Inspection Act 1994 S42(1)(a)</i> states that the DMP be notified before abandonment & cessation of activities. The Mine Closure Plan has to be updated within three months to include a decommissioning & care & maintenance plan (DMR & EPAuth, 2011:9). S88 provides for <i>plans for abandonment or suspension</i> & describes that the person responsible for the mine needs to seek the approval of the district inspector, to determine if the rehabilitation has been done in accordance with the updated Mine Closure Plan.</p> <p>The MRF Act, S9A provides for <i>liability for rehabilitation costs</i> & states that the person who was responsible for the site & the rehabilitation thereof at the time of it being declared abandoned, is liable to pay a cost into the Mining Rehabilitation Fund as debt due to the state. If it has been established that the liable person is unable to provide for the rehabilitation, the MRF comes into effect to provide for rehabilitation.</p> <p>The Chief Executive Officer (CEO) of the DMP, according to S10(2) – (3) may appoint an authorised person to, “<i>enter an abandoned site or affected land for the purpose of carrying out rehabilitation work,</i>” & they may bring onto site what is necessary to carry out the rehabilitation. The rehabilitation of abandoned sites will be funded by the MRF.</p>

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	SOUTH AFRICA		WESTERN AUSTRALIA	
	REGULATION	RELEVANT EXTRACTS & COMMENTS	REGULATION	RELEVANT EXTRACTS & COMMENTS
FINANCIAL PROVISION & GUARANTEES FOR REHABILITATION POST-CLOSURE	<p>MPRDA 28 of 2002</p> <p>Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine (DME, 2005) (Adminstrated by the DMR)</p>	<p>MPRDA: Financial provision must be provided before the EMP may be approved or an environmental authorisation awarded. The applicant has to provide proof of finances according to S23(1) & S10(k) of the MPRDA which states that the applicant for a mining right must show that they have the financial ability to undertake the proposed mining operations, by means of a budget or documentary proof. Such proofs are contemplated in the MPRDR S53 which provide for <i>methods for financial provision</i> & state that finances are provided in order to cover the costs of <i>rehabilitation, management & remediation of negative environmental impacts</i>.</p> <p>The forms of financial provisions include loan agreements, bank or other financial guarantees or any other approved scheme. It is therefore expected of the mining company to have the finances available to rehabilitate the land as stipulated in the approved environmental management & Mine Closure Plan.</p> <p>S51(b)(v) of the MPRDR requires that the EMPr include an outline of the implementation programme regarding the financial provisions for executing the EMP.</p> <p>S89 of the MPRDA indicates that financial provisions are made for every separate mining company. In order to protect the government from liabilities arising due to unforeseen environmental impacts, the Minister may retain a portion or whole of the financial provision made by the holder for 20 years after a closure certificate has been issued (section 6 of MPRDA & section 24R(2) of NEMA). Problems arise here when the financial provisions made are not adequate to deal with the entirety of the financial liability for rehabilitation & mine closure, not to mention the inefficiency of the financial provisions to deal with premature mine closure.</p>	<p>MA 107 of 1978</p> <p>MRF Act 33 of 2012</p>	<p>The Mining Act Regulations (S15) require that mining operators provide a bond which serves as a form of financial security for rehabilitation at closure. The MRF (2012) has now replaced the bonds system as the financial security & makes use of a government-administered, pooled fund, into which annual levies are paid. The mining company remains responsible for the rehabilitation of the site but may provide funding in any form they deem fit.</p> <p>S124(2) of The Mining Act of 1978 states that the holder is responsible for surface rehabilitation & should take any possible measures to ensure that environmental damage is minimised as far as is possible & provide monetary compensation for the rehabilitation of the impacts as a result of mining activities.</p> <p>The MRF Act of 2012, S11 provides for the <i>mining rehabilitation levy</i> which is to be recalculated annually by means of the MRF Regulations & based on the rehabilitation liability estimate which considers the size- & extent- of disturbed land. S15 holds the holder liable to provide assessment data of the disturbed land. The data is evaluated by the CEO of the DMP & the levy is then calculated based on the approved assessment data. This infers that if concurrent rehabilitation is done, the levy to be paid will decrease.</p>

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	SOUTH AFRICA		WESTERN AUSTRALIA	
	REGULATION	RELEVANT EXTRACTS & COMMENTS	REGULATION	RELEVANT EXTRACTS & COMMENTS
FINANCIAL PROVISION & GUARANTEES FOR REHABILITATION POST-CLOSURE	MPRDA 28 of 2002 Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine (DME, 2005)	<p>The DMR <i>guideline document for the quantum of financial provision</i> (2005:9) which is used to assist in financial calculations for closure costing, assigns weights to variables such as the environmental sensitivity of the area, the risk class for the type of mining & associated by-products, specialist studies & the size & location of the mine.</p> <p>S54 of the MPRDR provide for <i>quantum of financial provision</i> & makes reference to the DMR guideline. The guideline, according to the Regulations, should include a detailed itemization of costs required for, <i>premature closure & related rehabilitation, prevention & management of further pollution of the atmosphere, water& soil; & the leakage of water & minerals between subsurface formations & the surface</i>. Costs should also be provided for the <i>decommissioning & closure of the operation & further post closure management of residual & latent environmental impacts (S54(1)(a)-(c))</i>.</p> <p>According to the guideline, financial provisions must be reassessed annually and adjusted according to the disturbance data of the site. Section 41(3) of the MPRDA which governs this has been repealed. The guideline document has not been updated to include the amendments to the MPRDA bringing about a fragmentation of responsibilities as the DMR guidelines are still the principle document relied on for calculating the necessary financial provisions.</p>	MRF Act 33 of 2012	<p>Section 8 of the MRF Act of 2012, provides for <i>payments from the fund</i> & states that money credited to the fund (whether it be levies paid into the fund, interest generated, penalties recovered) may be used, for the rehabilitation of abandoned mine sites & other land affected by mining operations.</p> <p>As per section 33 of the MRF Act of 2012 the Mining Rehabilitation Advisory Panel was established to deal with the administration of the Act & to provide advice on any other matter relating to the Act.</p>

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