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Comparing the equator principles' IFC performance standard 6 and the South African mining and biodiversity guideline to identify areas of overlap and gaps to improve biodiversity conservation in the mining sector

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2015

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COMPARING THE EQUATOR PRINCIPLES' IFC PERFORMANCE STANDARD 6 AND THE SOUTH AFRICAN MINING AND BIODIVERSITY GUIDELINE TO IDENTIFY AREAS OF OVERLAP AND GAPS TO IMPROVE BIODIVERSITY CONSERVATION IN THE MINING SECTOR.

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A Research Report submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of

Master of Science

Supervisor: Ingrid Watson

Signed on 6 November 2015 in Johannesburg

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DECLARATION

I declare that this Research Report is my own, unaided work. It is being submitted for the Degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

_____

(Signature of candidate)

_____day of_____20_____in _____

ABSTRACT

Environmental degradation and pollution continue to characterise the mining sector in South Africa despite a robust legislative framework which is aimed at enhancing sustainable mining practices. Of particular concern is the impact of mining on biodiversity. During 2013 the Departments of Environmental Affairs and Mineral Resources, together with the South African Mining and Biodiversity Forum, an alliance of stakeholders from industry, conservation organisations and government facilitated by the Chamber of Mines of South Africa, released the South African Mining and Biodiversity Guideline (SAMBG), which aim to mainstream biodiversity into the mining sector. The guideline seek to integrate biodiversity considerations into planning processes and manage biodiversity through the lifecycle of a mine, and so contribute to better outcomes. In addition to the guideline, mining companies that obtain funding from financial institutions that are signatory to the Equator Principles are required to implement IFC Performance Standard 6 (IFC PS6) which also deals with biodiversity conservation. There is a concern that the SAMBG adds further to the burgeoning pile of standards, guidelines and best practices that mining companies are required to meet, but without necessarily adding anything new. This research project deals with this concern through a review of the SAMBG to assess their potential contribution to biodiversity conservation and to determine, through a comparative analysis, whether any overlaps and gaps exist between the guideline and IFC PS6. A qualitative methodology was used to understand how the Aichi Biodiversity Targets are addressed by the SAMBG. Based on this review a conclusion as to the role of the SAMBG amongst the range of guidelines and standards was drawn. The research indicated that there is alignment between the SAMBG, the IFC PS6, the Aichi Biodiversity Targets and South African national environmental legislation. They all aim to achieve a similar outcome, the conservation and sustainable use of biodiversity, but provided different levels of detail and are targeted at slightly different audiences.

In memory of my late mother

Sylvia Thembi Mkhwananzi

1965 – 2003

ACKNOWLEDGEMENTS

The completion of this report would not have been possible without the support and encouragement of a number of people to whom I am very grateful of:

- I would like to express my heartfelt gratitude to my supervisor, Ms. Ingrid Watson for always being helpful and available whenever I needed to meet and discuss.
- Canon Collins for funding my studies and GreenMatter for the mentorship and coaching.
- To my One and Only Beloved Son, you my source of encouragement and motivation. I dedicate this to you “Junior”. Daddy is setting a Standard that will give you Guidance in your academic endeavours.
- My grandmother, having been in a teaching profession for the rest of your life. This is your reward from me for your contribution to the academic world.
- I would like to extend my appreciation to everyone who directly or indirectly contributed to this piece of work. Your insights and efforts were very valuable.
- And praise be to the Man Above, thank you God you never fail me.

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LIST OF ACRONYMS

AMD:	Acid Mine Drainage
CBD:	Convention on Biological Diversity
CITES:	Convention on International Trade in Endangered Species
CMS:	Convention on the Conservation of Migratory Species of Wild Animals
COP:	Conference of the Parties
CSBI:	Cross Sector Biodiversity Initiative
DEA:	Department of Environmental Affairs
D&0:	Derelict & Ownerless
EHS:	Environment, Health and Safety
EIA:	Environmental Impact Assessment
EMP:	Environmental Management Plan
EMS:	Environmental Management System
EP:	Equator Principles
EP FI:	Equator Principles Financial Institutions
ESMS:	Environmental and Social Management System
EWT:	Endangered Wildlife Trust
GDARD:	Gauteng Department of Agriculture and Rural Development
GDP:	Gross Domestic Product
GIIP:	Good International Industry Practice
GPG:	Good Practice Guideline
ICMM:	International Council on Mining and Metals
IFC:	International Finance Corporation
IFC PS6:	International Finance Corporation Performance Standard 6
IMF:	International Monetary Fund
IUCN:	International Union for Conservation of Nature
MEA:	Multilateral Environmental Agreements
MEC:	Member of the Executive Council
MPRA:	Municipal Property Rates Act
MPRDA:	Mineral Petroleum Resources Development Act
NBSAP:	National Biodiversity Strategy and Action Plan
NEMA:	National Environmental Management Act
NEMBA:	National Environmental Management Biodiversity Act
NEMPAA:	National Environmental Management Protected Area Act

NGO:	Non-governmental Organisation
NNL:	No Net Loss
NWA:	National Water Act
OECD:	Organisation for Economic Co-operation and Development
PGM:	Platinum Group Metals
PS:	Performance Standard
SAMBG:	South African Mining and Biodiversity Guideline
SAMBF:	South African Mining and Biodiversity Forum
SANBI:	South African National Biodiversity Institute
UN:	United Nations
UNCCD:	United Nations Convention to Combat Desertification
UNFCCC:	United Nations Framework Convention on Climate Change
WHC:	World Heritage Convention
WWF:	World Wide Fund for Nature

1 Introduction

Environmental degradation and pollution continue to characterise and be associated with the mining sector in South Africa despite a very robust legislative framework which is supposed to be enhancing sustainable mining practices in South Africa. Biodiversity continues to be under threat from mining activities despite the existence of a variety of standards, guidelines and best practices that mining companies are required to implement. Sustainable economic development, our water and food security require more strategic interventions at the highest levels to identify areas appropriate to mine and areas to prioritise for water and food (provisioning) in the landscape (Colvin *et al.*, 2011). Due to an increasing demand for mineral resources, minerals in accessible places have been depleted as advanced machineries, expertise and economies have led to mining activities often being proposed in remote biodiversity hotspots and other sensitive and protected environments that were previously unexplored, undeveloped and not considered for minerals (ICMM, 2006).

Mining can affect biodiversity directly and indirectly across the life span of a project. Biodiversity entails the variety and variability of all living material on earth. Biodiversity is source of numerous environmental services which sustain humans and life on earth – it provides a lot of services which include clean water, ecological infrastructure which acts as water catchment areas, it recycles nutrients and facilitates pollination. Direct or primary impacts from mining are usually readily noticeable and are caused by any activity that involves the clearance of land for creation of access roads, prospecting, topsoil removal or erection of tailings dump facilities or spillages of mine waste water or the atmospheric emissions such as smelter emissions or dust generated (Mclvor & Bertels, 2014).

Indirect or secondary impacts are often harder to identify immediately and can occur as a result of societal or environmental changes stimulated by mining processes. Cumulative impacts usually occur when there are current land uses in the area where the mining project is being developed. These activities can be mining or non-mining related, however they have an influence on the mining project. A typical example is the introduction of alien invasive species that have secondary impacts that are experienced well past the lifecycle

of a mine. These impacts should be identified and incorporated into the Environmental Management System or associated management plans (Mclvor & Bertels, 2014).

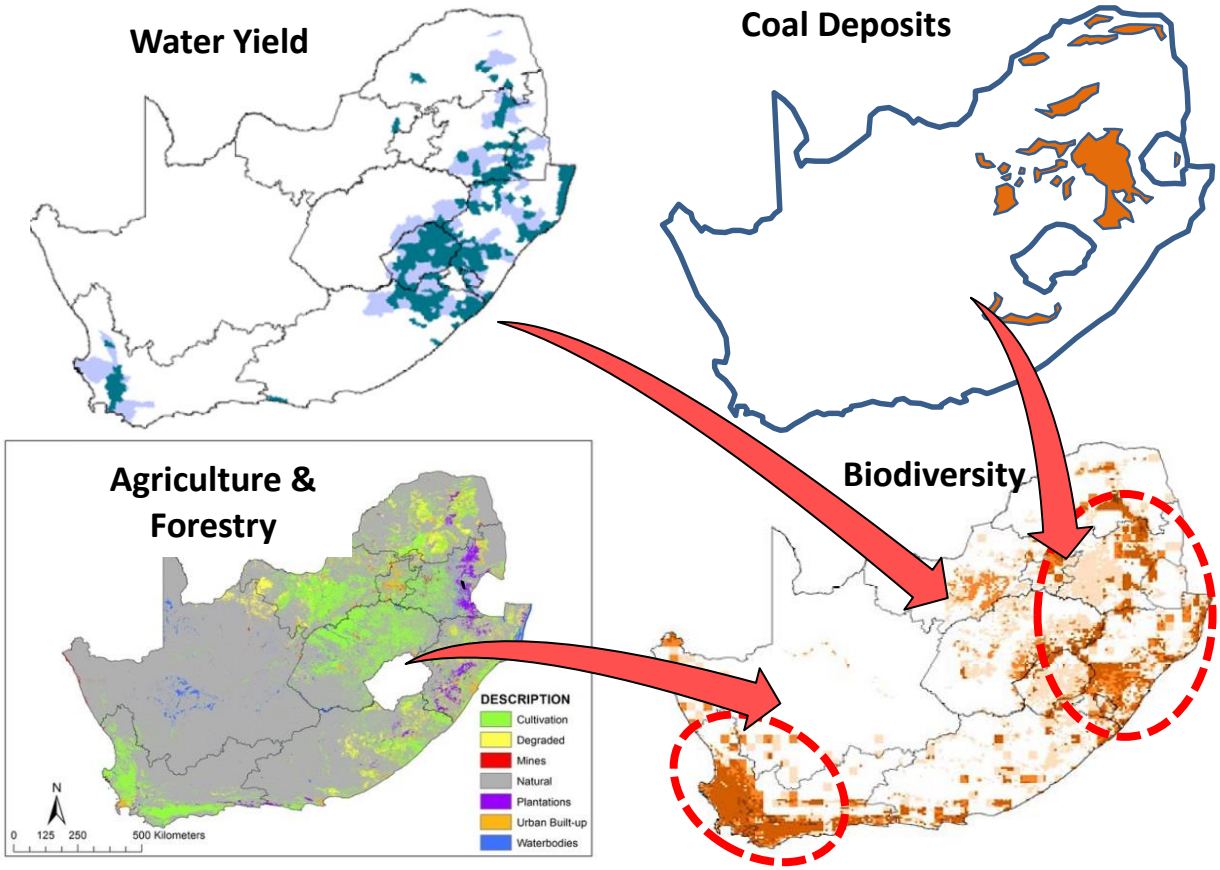


Figure 1: A map of South Africa showing coal deposits, biodiversity, water and food overlaps (Source: Ah-Shene & Ncube, 2014)

The problems that South Africa is facing in terms of managing the impacts of mining on biodiversity are attributed to the fact that there are big overlaps in areas where there are mineral deposits and where there are biodiversity hotspots. Unfortunately mining companies have no choice about where to mine except in places were minerals deposits occur. Looking at the Figure 1 above the bulk of coal reserves are located within high water yield areas, biodiversity hotspots and high agricultural/forestry areas which poses

a challenge. The high yield agricultural land, water production zones, important biodiversity areas and coal deposits as seen on the map overlap significantly.

Typically this is the situation in grassland areas across KwaZulu-Natal, Mpumalanga, the Free State and the Eastern Cape where most coal mining occurs and these grasslands are effectively the water production areas of the country. Without them, we would be unable to survive as a species, or grow our economy. Biodiversity is under serious threat from current mining activities and as more mining applications are being submitted for these areas, it will worsen the existing situation. Projecting an increase in future mining operations but given that coal is an ever decreasing resource and energy demands are increasing, this does not bode well for the food and water security in South Africa in the long-term (Ah Shene-Verdoorn & Ncube, 2014).

More importantly the biodiversity constraints for a mining project from a business point of view have to be identified in the initial phases of the lifecycle of the project. Failing to identify significant impacts associated with a proposed project can result in impacts on biodiversity that are spread across different ecosystem services, consequently having direct effects on the livelihoods of humans. The environmental implications of mining translate to substantial costs to rehabilitate any form of air or water pollution, huge amounts of waste generated, large degraded landscapes and associated legacies of mining activities. Mineral development in the modern world implies that we should consider the ecosystem holistically about where a project is located and recognise certain areas, which are rich in biodiversity and heritage resources, are not suitable for mining (UNEP, 2002).

Clearly mining has an impact on biodiversity and going forward in addressing these challenges, the SAMBG purports to be the tool essential for sustainable mineral development in South Africa. The SAMBG adds to an existing pile of standards, guidelines and best practices that mining companies in South Africa are already using, hence this justifies the aim of conducting this research in assessing the contribution of SAMBG to the conservation of biodiversity in the mining sector.

1.1 Research Aim and Objectives

The aim of this research is to determine how the SAMBG contribute to biodiversity conservation in the South African mining sector, and how these compare to existing international standards for addressing biodiversity in mining projects, specifically the IFC PS6.

To meet this aim the following objectives have been set:

1. To determine whether the SAMBG consider and address all aspects of biodiversity conservation relevant to mining;
2. To compare the requirements of the IFC PS6 to those of the SAMBG to identify areas of overlap and possible gaps;
3. To make recommendations on how mining companies should use the SAMBG in relation to other international standards and national legislation.

1.2 Research Questions

The following research questions have been posed and will be answered through the research.

1. How do the SAMBG consider/address the Aichi Biodiversity Targets, the global targets for biodiversity conservation?
2. What overlaps and/or gaps exist when comparing the SAMBG and IFC PS6?
3. How should the SAMBG be used by the South African mining sector?

1.3 Structure of the Report

Chapter one is an introduction which outlines mining impacts on biodiversity and how the SAMBG is seen as a response of mainstreaming biodiversity into the mining industry. However the guideline adds to a list of existing standards, guidelines and best practises used to address the biodiversity issue in the mining industry. In short, this chapter covers the background information to the study and aim of the research.

Chapter two looks at the significance of biodiversity and ecosystem services to human livelihoods. The identification of impacts on biodiversity and the extent of the problem looking into the future is also discussed. There is focus on the mining industry in South Africa, the related environmental and societal issues. Various frameworks for addressing biodiversity in the mining sector are outlined in this chapter, which is basically looking at the literature review of the research.

Chapter three gives an overview of the approach used in this research including all the data collection and the research methodology to answer the research questions.

Chapter four gives an account of the comparison between the SAMBG and IFC PS6 to find areas of overlap and gaps. It also looks at the relative contribution and position of the guideline amongst other standards, guidelines and best practices of conserving biodiversity in the mining sector. This chapter in summary looks at the results of the research and the discussion to clarify the findings.

Chapter five provides the conclusion and recommendations.

2 Literature Review

2.1 Biodiversity and Ecosystem Services

The Convention on Biological Diversity (CBD) describes biodiversity as “the variability of all life found on Earth and all the natural process at all levels from genes to ecosystems and the ecological and evolutionary processes that sustain these and the connections between these and all species”. Humans derive many benefits from natural or managed ecosystems, these are termed ecosystem services and include the ‘source’ and ‘sink’ functions of the environment. These services are categorised into four groups, namely, provisioning services such as goods like freshwater, food, timber and medicine; regulative services like the regulation of climate, attenuation of floods and disease control; cultural services related to non-material benefits such as recreation, aesthetics, education, spiritual and religious; and supporting services which include nutrient recycling, formation of soil and cycling of water (Wall & Nielsen, 2012). More diverse systems are better able to deliver these services.

Ecosystem services contribute to the wellbeing and ultimate survival of society, with humans being dependent on goods supplied by natural ecosystems (Wall & Nielsen, 2012). Plants also act as carbon storage and sequestration sites and biodiversity ensures sustained availability of benefits from nature by being resilient to events that can disturb ecosystems and cause environmental change (Rands *et al.,* 2010*)*. Ecosystem services are also key to the existence and profitability of business. In the agricultural sector for example, it facilitates processes like pollination, nutrient recycling and pest control. In the mining sector it enables provision of building materials, clean water, regulation of atmospheric gases as well as decomposition and detoxification of wastes (ICMM, 2006). These services are rendered free of charge, yet are incredibly valuable. The estimate value of ecosystem services provided by biodiversity globally is in excess of trillions of US dollars on a yearly basis (Daily, 1997).

There is a global initiative undertaken by The Economics of Ecosystems and Biodiversity (TEEB) which aims at “*making nature’s values visible*”. It intends to mainstream

biodiversity and ecosystem services values in decision making across all levels. This is achieved through a structured approach of valuation that enables policymakers to visualise the variety of benefits derived from biodiversity and ecosystems hence proving their values in economic terms and moreover, make suggestions of including such values in decision-making. Loss of these services poses significant risks to business. These risks may be operational, regulatory and legal, reputational, market and product related or financial. Corporate Ecosystem Service Reviews are important for companies as they are reliable methods for assisting decision-makers in recognising business risks and opportunities resulting from their reliance and impacts on ecosystem services (TEEB, n.d.).

There is growing recognition and concern related to biodiversity loss and its impact on ecosystem services. The rate of loss of species is estimated by scientists to be around 0.01% to 0.1% of all species per year or between 1,000 and 10,000 times the natural or background rate of extinction (the rate of species loss that would occur without human influence). Considering that if there are 2 million species on earth, approximately 200 to 2,000 would go extinct annually. Similarly, assuming there are 100 million species that exist currently, about 10,000 and 100,000 would be lost per year. No matter which numbers are correct, loss of biological diversity is a very serious problem and it is expected to worsen (Gaston, 2000). Considering the numerous significant social and economic contributions, it is crucial to quantify and ascertain the economic value of ecosystem services so that we can explain why we are protecting biodiversity. Human population size is gradually increasing and this growth has changed consumption patterns and has consequently caused humans to have a significant impact on ecosystems around the world (Wall & Nielsen, 2012).

This has led to the call to reduce human activities which have impacts on biodiversity gaining wider political recognition as evident in one of the most signed treaties in the world, the Convention on Biological Diversity (CBD), which was approved at the United Nations Conference on Environment and Development in 1992. The CBD's purpose is to substantially minimise the extent of biodiversity loss, hence it was also adopted by the

World Summit on Sustainable Development, then merged into UN Millennium Development Goals in 2005. Nearly 90% of member states recognise its significance, have implemented NBSAPs including related frameworks specifically designed to tackle biodiversity loss within their respective countries (Rands *et al.*, 2010).

Biodiversity loss continues to occur despite global efforts to conserve it being intensified (MEA, 2005). Millions of people are actively partaking in activities that support biodiversity conservation globally with the World Wide Fund for Nature (WWF) having a worldwide network in excess of 5 million supporters, and BirdLife International has partners operating in more than 100 nations which cooperate in work programmes in each continent. The BirdLife Partnership has been voted the world's most effective conservation alliance. Membership is relatively smaller in conservation agencies in developing countries compared to the developed and wealthy nations, however they are often influential and fast growing. It is crucial to understand that loss of biodiversity is not the expected outcome of human activities, usually it is the unintentional consequence of decisions made to achieve certain objectives hence it is considered as an economic "externality". This makes biodiversity an important type of externality because impacts of certain actions are normally experienced separately in location and time (Rands *et al.,* 2010).

Effective conservation and management of biodiversity is usually difficult since there is no central body that is overseeing all the biodiversity in the world although there are organisations that provide information and guidance such as the IUCN. This makes transaction-based measures challenging since the people responsible for destroying biodiversity would have long gone when others experience the impacts (Rands *et al.,* 2010). The evidence of this is legacies from past mining activities which are immediate problems and concerns for the current South African government, which is faced with Acid Mine Drainage (AMD) and also derelict and ownerless (D&O) mines now are a liability of the state. Actions of companies are critical to the future of biodiversity, corporate environmental performance is taken seriously by investors and corporate executives, hence there are a lot of initiatives that have been established to address impacts on

biodiversity caused by corporations, which is typically a practice in mineral extraction (Rands *et al.*, 2010).

There is a growing body of literature on resilience, of both ecological and social systems. This is in response to the increasingly obvious impacts of global change. More diverse ecological systems are more resilient. From an ecological perspective resilience is seen when an ecosystem responds to a disturbance by being able to resist the damage or recover fast. These disturbances that occur in our ecosystems may involve unforeseen incidents such as floods, wild fires, outbreak of insects and human actions such as mining. Folke *et al.* (2004) say disturbances of a significant size or lifespan can have an impact on an ecosystem and cause it to reach a level at which different processes other than the normal dominate. Human activities like loss of biodiversity and land use affect ecosystem resilience, causing sufficient changes in ecosystems, usually to undesirable and degraded conditions (Peterson *et al.,* 1998).

As already alluded to, resilience is also relevant to social systems. To bring about change in resilience we need a systems thinking approach that considers the holistic interaction of people and the ecosystems as socio-ecological systems and the desire to shift the mindset of acquiring optimal yield to efficient environmental resource management aiming at building ecological resilience through resilience scrutiny, changing techniques of both natural resources organisation and control (Walker *et al.,* 2004).

2.2 Mining

2.2.1 The Mining Industry in South Africa

Mining is a cornerstone of the South African economy. South Africa possesses an incredible assortment of mineral resources which facilitated a speedy change in the country's economy from an agrarian to a mining and industrial based one. South Africa's range of mineralisation is a result of its lengthy and multifaceted geological history. South Africa follows the United States in possessing the highest number of minerals found in

one country globally. An excess of 65 mineral resources are found around South Africa (Gauteng Department of Agriculture, Environment and Conservation, Digby Wells and Associates, Growth Lab and the Council of Geoscience, 2008). South Africa is one of the biggest producers in the world of diamonds, gold and platinum group metals, on top of having the biggest known deposits of gold, platinum group metals and chrome (Chamber of Mines of South Africa, 2012). The extractive industry including mineral beneficiation industry dates back to iron ore and copper mining as well as gold mining in the Mapungubwe region in Limpopo province between 1200 and 1300 AD (Gauteng Department of Agriculture, Environment and Conservation, Digby Wells and Associates, Growth Lab and the Council of Geoscience, 2008).

South Africa does not only have massive reserves of natural resources but the mining industry symbolises an important percentage of the country's economic productivity. Resource–rich countries are influenced by the extent of mineral dependency rather than size of reserve capital, usually cumbersome to evaluate precisely. Before categorising a nation as resource cursed, it is important to first determine the scale of resource wealth or resource reliance (Elbra, 2013). Mineral-based economies are those where the minerals traded add in excess of 40% to overall exports and where the mining input exceeds 8-10% of the entire GDP (Davis, 1995). In turn the IMF describes mineral reliance as state income derived from the minerals or mining industry portion of exports in excess of 25% of resultant amounts, divided by the previous 5 years (IMF, 2007). 2011 saw the extractive industry adding 8.8% of GDP (Chamber of Mines of South Africa, 2012), whereas in the preceding year resource trade created nearly 48% of all exports. Taking these statistics into consideration South Africa is classified as a resource reliant nation by IMF and Davis' extra conventional assessment (U.S. Department of the Interior, 2012).

South Africa usually depends greatly on the mining industry for development, a reliance that still exists today. The resources are not converting into riches for the bulk of the populace who remain still experiencing effects more usually linked with resource curse as it affects developing countries. South Africa has experienced many signs defined in the resource curse prose comprising comparatively low growth of the economy, low GDP,

gross imbalances and inequalities in society, deep-rooted poverty and the formation of a rentier country. However the conclusion is that South Africa has been unsuccessful in benefitting significantly from the mineral reserve capital, hence categorised as a resource cursed state. The mineral wealth did not only fail to benefit the majority of South African citizens, however part of the society has essentially been affected through the course of mineral extraction in most communities in mining towns (Elbra, 2013). The South African mining industry is seen as a major contributor to environmental and societal problems.

The degradation of the environment in South Africa due to mining activities is to some extent caused by the lack of cooperation between the responsible government departments. The status quo still persists as lack of interdepartmental coordination is exhibited when applications are being awarded in formally protected sensitive environments. This has worsened due to a shortage of staff as well as the increased staff rotation / loss of governmental officials responsible for enforcing these policies. As it stands, this failure to integrate policies across government departments has created a loophole for the mining industry to exploit these weak government regulations as they continue to apply for mining rights in protected environments and consequently being awarded rights to mine in these ecologically sensitive areas (Adler *et al.*, 2007). Despite the Constitution encouraging cooperative governance, the Department of Mineral Resources (DMR) in Mpumalanga is not cooperative. It grants prospecting and mining rights in fresh water resources priority areas, valuable arable land and critical biodiversity areas even when facing objections from other state agencies like conservation and tourism authorities, posing a serious threat to food and water security (Davies, 2014).

Moreover rehabilitation obligations are also not being achieved and this has also led to an increase in the number of derelict and ownerless mines (D&0) as more open uncovered pits and abandoned tailings dumps are scattered across the South African landscape.These mine dumps have led to the decline in private land value around the areas where they are located merely because of the environmental degradation they have caused. They are associated with interfering with local water quality as chemicals from runoff and airborne particulates move into and pollute both underground and surface water resources. Additionally the landowners do not have the legal right or financial

resources to rehabilitate or remine them, hence they have sterilised and polluted these landscapes (Adler *et al*., 2007). The separation of powers across national, provincial and municipal entities distinguishes responsible mining from unsustainable mining policies (IIED, 2002). As long as current legislation is not enforced effectively across the governance structures and there is no interdepartmental coordination to increase efficiency, a lack of enforcement of existing policies will cause cumulative impacts to persist in South Africa (Adler *et al*., 2007). The South African Mining and Biodiversity Forum (SAMBF) has managed to coordinate government action as it has brought government departments with different mandates to the same table to address the challenges.

The current policy frameworks sets the government on a reactive stance. This can be seen on the policy framework used to discourage pollution, the polluter-pays-principle (PPP), also the use of EIAs and the need to understand key terms in policies. The government has to be proactive so that historical trends do not continue and it gains public confidence (Adler *et al*., 2007). EIAs are a prerequisite for new mining projects in South Africa just like in many countries, hence they are considered international best practice as they are normally conducted after feasibility studies are done. However, they are still reactive since they are based on the current environmental and socio-economic conditions. In some instances they are inaccurate with key technical information or engineering designs missing. Usually EIAs are done before the project can commence, yet the receiving environment and mining projects are continuously changing (Sassoon, 2000). The information the legislation is based on may seriously miscalculate the resultant environmental and socio-economic impacts in a self-regulating industry (Adler *et a*l., 2007). The SAMBG is considered as an ideal tool to address reactive governance as it promotes under Principle 4, the use of the best EIA practice and overall the proactive approach of managing biodiversity impacts throughout the lifecycle of the mining project.

Conflict has been a motivation for reform in the South African mining sector. The switch to democracy saw government face conflict due to weak policies of the past that exaggerated issues concerning limited natural resources. There have been new policies

drafted to solve these problems, however in most mining related cases the regulations are fragmented and enforced by different agencies at municipal, provincial and national levels. It is important for government and decision makers to realise that the solution to addressing South Africa's mining issues does not lie in legislation alone. The formulation of policies that are enforceable, the understanding of South Africa's rich history and microeconomic concepts are part of the solution. Ultimately it is believed that conducting economics-based research will assist in understanding the causes of conflict which will enable development and application of appropriate legislative interventions (Adler et al., 2007). The guideline therefore has its fundamental principle requesting application of mandatory legislation.

2.2.2 Mining Activities

Mineral extraction by its very nature involves using a range of methods, some involving excavation and removal of huge quantities of soil from the earth. Economic aspects have to be considered when choosing which method to use that will be profitable considering more minerals should be extracted compared to other unwanted waste materials. Precaution has to be exercised to minimise the impact on the environment, usually the most visible challenge is land disturbance. Hence it is important to reduce the size of footprint of the project so that less land is degraded. A good example which is used in this section is diamond mining because their deposits occur in most ecosystems.

The initial process in the lifecycle of a diamond mining project is exploration, where minimal soil is disturbed when drilling and sampling is done. Upon the discovery of the deposit there is the establishment of a site which can either be followed by open pit mining or underground mining. This leads to the operational phase of the mine and it is not the same with different minerals being mined. However it is dependent on the occurrence of the deposits in the ground. In a situation where there are Kimberlite pipes extending deep into the Earth, an open pit method is used and in most cases the operation will be near the surface and extending up to a kilometre below the ground. This method involves production of a lot of waste rock, soil and sand during the mining operation as the

overburden is removed to expose the minerals. The alternative to this method could be underground mining and it can extend deeper into the earth as the shaft is sunk. This method produces less soil compared to opencast mining (World Diamond Council, n.d.).

Diamonds can also be mined from coastal and inland alluvial diamond deposits. To extract the diamonds the overburden has to be removed first, then sea-walls are erected. This process results in large scale disturbance of land when huge excavations are made. Upon completing the mining project, soil and vegetation has to be replaced although this could be achieved through wave and wind motion over time. Diamond mining can also be conducted on the seabed. The method of extracting diamond deposits located in the seabed is called marine diamond mining. To access these diamonds seabed matter is removed. The extraction of these diamonds will continue until they are exhausted which will then lead to mine closure whereby the seabed matter is returned to its original position (World Diamond Council, n.d.).

Diamonds can also be mined informally through digging of alluvial diamonds and this process is called small-scale or artisanal diamond mining. This operation is conducted using very simple equipment notably picks, pans and sieves to search for diamonds by small groups of people which could be individuals or families. Upon reaching the end of the lifecycle irrespective of the method used to mine, rehabilitation is done which is process of returning the environment to its condition prior to mining. It is seldom done in small-scale or artisanal mining projects (World Diamond Council, n.d.). It has to be noted that all minerals that exist in the world will be extracted using one of these methods discussed and all these methods have an impact on biodiversity. However the mining activities results in environmental issues which will be explained in the following section.

2.2.3 Impacts of Mining

Mining entails removal of mineral resources from ground surface in the form of ore or seam and processed to a commodity that a miner can attach economic value to. A variety of commodities wrested from earth ranges from gold to coal and platinum to iron and by

processing these minerals are classified into metals, fuel minerals, industrial minerals and construction materials. Prospecting, extracting and mineral beneficiation cover the phases through in which resources are situated, mined then processed (Bridge, 2004). However, by the nature of these processes involved in mining, a potential negative impact on the environment is created during the operations and years post closure. It is this negative impact that has caused many countries in the world to adopt policies designed to minimise the adverse impacts of mining activities.

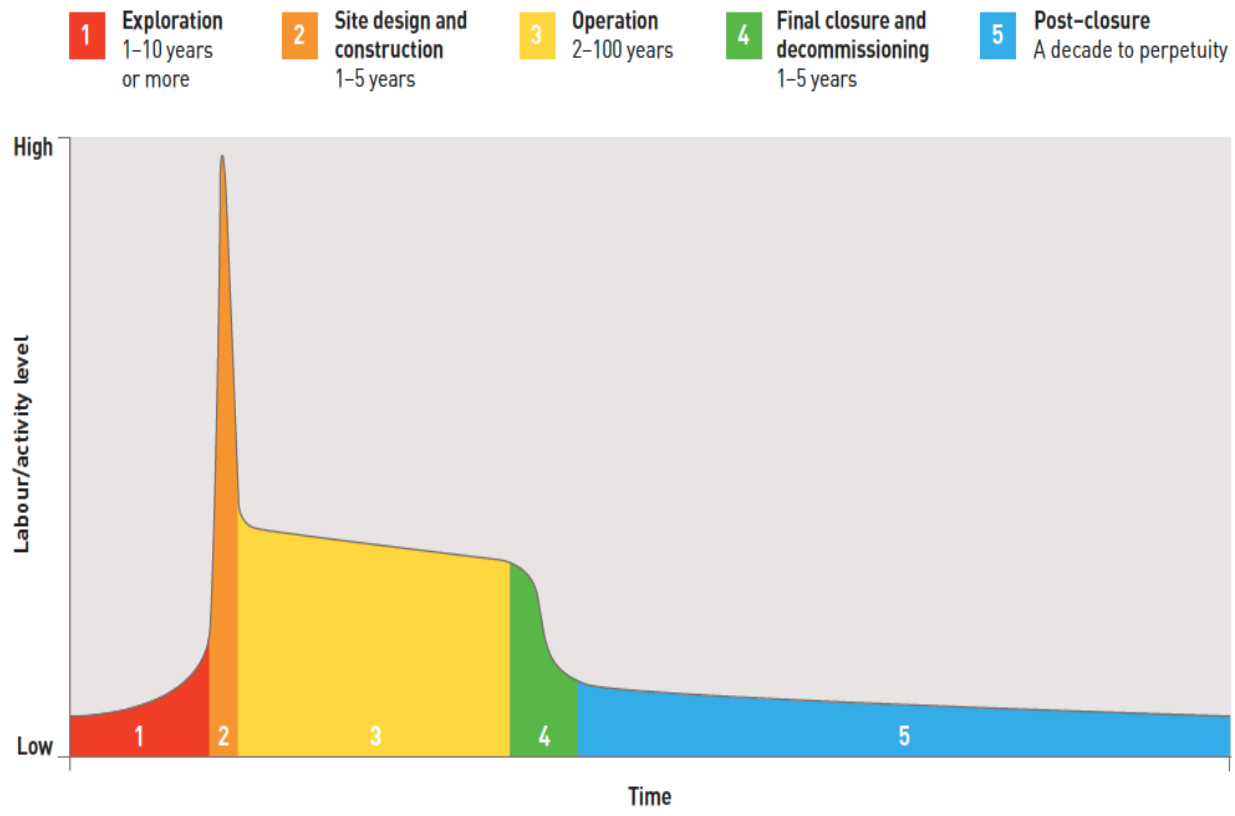


Figure 2: Impacts on the environment throughout the mine lifecycle (Source: ICMM, 2006)

Figure 2 above illustrates the significance of impacts of mining on the environment throughout the lifecycle of a mine. Environmental impacts of mining and mineral processing have been felt, criticised and only temporarily resolved for almost seven

centuries (Down & Stocks, 1997). It was in the mid-1980s that the mining industry seriously began to consider the environment as an essential strategic business component. The last couple of decades saw the mining industry being subjected to extreme scrutiny to ameliorate its environmental as well as its developmental and social performance (MMSD, 2003). The new era in mineral development was displayed by the following prominent indicators: complete legal adherence to national environmental policies in a drive to satisfy society's expectations, frequently described as a social license to operate; having an unusual diverse group of stakeholders of non-governmental bodies from financial organisations to environmental institutes and civic society groups progressively appearing in platforms of decision making previously only preserved for mine leadership; and also understanding environmental issues broadly extending considerably beyond predictable inquiries of technology preference or managerial style to incorporating cultural issues and formulation of closure objectives that are in line with the planned post mining land uses (Bridge, 2004).

The main effects of mining and associated activities on biodiversity include direct, indirect or induced and cumulative impacts. Direct impacts entail loss and degradation of indigenous vegetation and ecosystems such as grasslands, wetlands and indigenous forests are cleared for the mine and its associated infrastructures like roads, waste storage areas and housing facilities. There is loss of habitat for threatened or protected species. When habitats for species is destroyed or degraded, populations are reduced (flora) and they may be forced to move (fauna). There is also loss of species within local communities as a result of death of individuals caused by pollution, increased traffic (road kills) and infrastructure like power lines. Fragmentation of habitat may also lead to local extinction of highly threatened species. Ecosystems and the communities and the species they support have to interact and exchange genetic material with other ecosystems, communities and populations of species to remain viable. There might also be a need for species to change their territorial boundaries as they react to climate change for their continual survival (EWT Mining Toolkit, 2011).

According to the 2014 Mpumalanga Biodiversity Spatial Plan, half of Mpumalanga's natural habitat has already been modified through mostly mining, large-scale agriculture

and plantation forestry. Mpumalanga is endowed with diverse and mineral-rich geological formations, therefore mining is a major land use type for gold, chromium, iron platinum-group metals as well as coal. There is currently a rapid growing number for prospecting and mining rights applications especially for coal. Statistics show that for applications for land-use change received between 2000 and July 2014, 25.4% were for mining rights and 54.2% for prospecting rights. Although mining causes direct habitat loss, it also has significant impacts on the province's water security as poorly located or poorly managed open-cast mining affects the quantity and quality of water entering and leaving the rivers and wetlands. Mining makes important contributions to the provincial and national economy and in some areas poses a risk to biodiversity and ecosystem health (Lötter *et al*., 2014).

Coal mines within the Witbank Coalfield are spread over large tracts of land. The catchment feeding the Loskop Dam which has an area of 11,500 km² is considered to be the most polluted waterbody in the area as it includes mines at all various phases of mine lifecycle, from exploration to active mines and to those scheduled for closure. In this catchment 209 derelict and abandoned mines as well as 118 coal mines were identified by the Council of Geosciences. Land degradation and water pollution are the main direct impacts of mining from both an environmental and social perspective. Old underground mine workings have been observed to have collapsed in certain areas, resulting in huge areas cratered with sinkholes. Some of the underground mines are undergoing unprompted burning, are potential tangible risks and they contribute to air pollution. Such areas are deemed not suitable for any land use as they have coal tailings facilities and derelict mining groundwork including structures which make the land unhealthy for meaningful use. Operating, closed and abandoned mines are the main sources of water pollution, with AMD and related metal contamination creating the most common issues. Sulphide exposing materials including coal as well as unwanted waste material and rock fill aggregates used in the restoration of current open-pit operations also contribute to AMD formation (EO Miners, 2013).

Gold mining in the Witwatersrand region has also led to a serious environmental problem of AMD. This untreated acidic water from D&O mines is threatening both the Vaal and

Limpopo river systems. With this contaminated water flowing into river systems, it raises the acidity of the rivers and causing destruction of habitat for aquatic species, both flora and fauna, especially various types of fish species and also crocodiles being affected. The impacts of AMD increase downstream where communities are dependent on rivers and their tributaries for potable drinking water. The water is rendered undrinkable which causes water scarcity and this crisis consequently leads to outbreaks of diseases. Also the agricultural sector is affected with this acidic water killing crops. AMD needs urgent attention in the Witwatersrand region as it is capable of causing severe impacts that will affect big cities like Johannesburg and Pretoria. It can also cause irreversible destruction to river ecosystems. The weak environmental regulation and poor enforcement by government has caused the problem to worsen (Hobbs, *et al*., 2010).

Coal mining has been scrutinised to find out the role it has played in the contamination of local waterbodies resulting in noticeable rising contamination levels in the Olifants River Catchment. It has been implicated as directly responsible for lots of deaths of fish and crocodiles recorded in the Loskop Dam downstream of mining operations. Coal mining is identified as accountable for large scale contamination in this region from this catchment to the adjacent Vaal River Catchment, with researchers being of the view that it could subsequently cause scarcity of potable water for the downstream areas. Also many wetlands and rivers are alleged to have been blocked with coal dust (EO Miners, 2013). Mining causes inundation and the wetland's effectiveness as a natural filter is affected as the natural dormant period and regeneration period cannot occur. Some of the direct impacts include water, soil and air pollution which are caused by wastewater or effluent discharge, waste disposal and emissions respectively (EWT Mining Toolkit, 2011).

Other common issues in the mining areas, is the prospect or hope of jobs leading to establishment of big informal settlements characterised by high rates of joblessness and destitution. The physical and pollution risks as a result of coal mining aggravate the chances acquiring numerous associated societal health issues (EO Miners, 2013). Mining also leads to increased access to previously inaccessible areas as the deposits get depleted in accessible areas. This causes more destruction of natural habitat and consequently there is an influx of people which then results in an increased use of water

resources and also poaching. Also cumulative impacts could be caused by the influx of people with their own impacts which are often far greater than the narrow impacts identified for individual activities. Usually in an area proposed for a mine there are a number of current or anticipated proposals in the vicinity. Hence all the impacts from all activities will be highly significant and therefore will increase the effects on biodiversity (EWT Mining Toolkit, 2011).

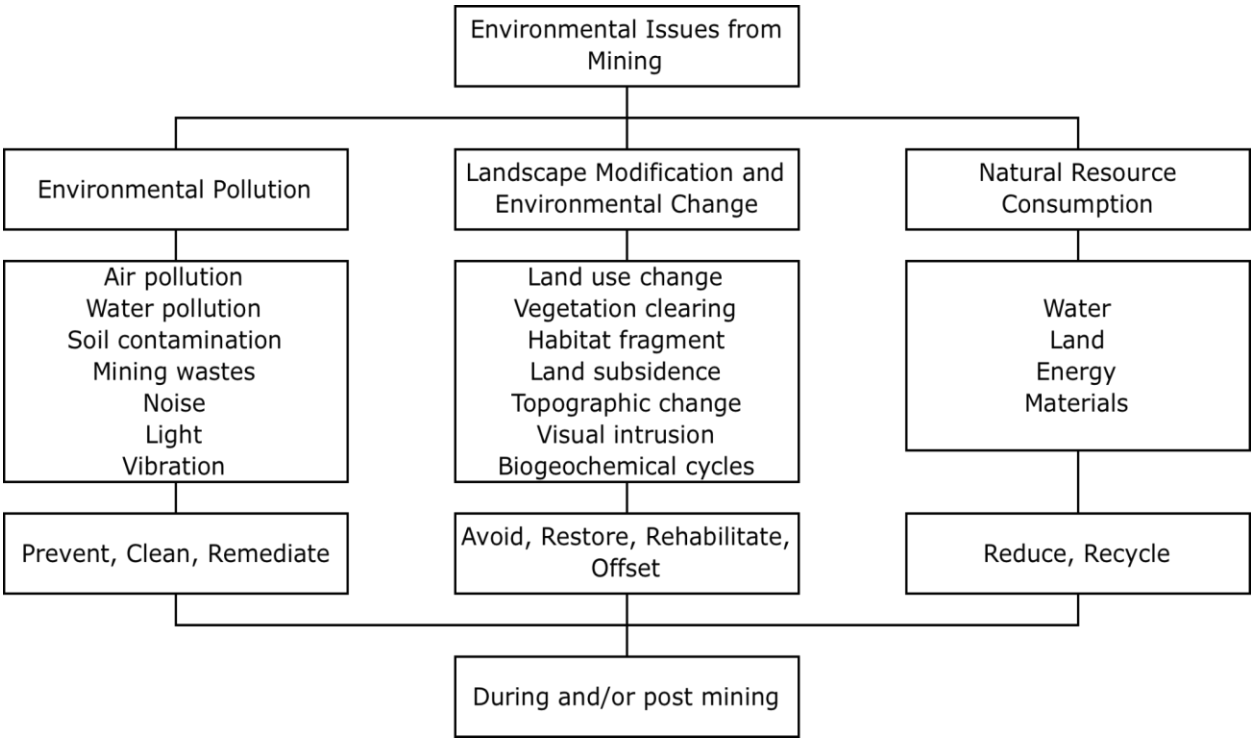


Figure 3: Environmental Issues from Mining (Adapted from Bian, Inyang, Daniels, Otto and Struthers, 2010).

The environmental issues of mining are summarised in Figure 3 above. The effects of mining on biodiversity include damage or loss of natural habitats through the removal of natural vegetation and the disruption of habitats, as well as the introduction of invasive species. There is also the disruption of ecological processes like the altering of the water table, disruption of the local hydrological cycle and disturbing species migration. The other impact is the pollution of air, soils, surface water, groundwater, including light pollution and noise pollution. The impacts on biodiversity generally increase in severity as the project develops. Restoration is essential and compulsory, however even with adequate

resources and dedication, it is a restricted process that can restore the composition of an ecosystem to its original state prior to mining and there might be cumulative impacts that will carry on impacting on biodiversity and ecosystem services even after post-closure. The effects on biodiversity as a result of mining activities increase with each stage of the process. Even after the mining process is finished, impacts such as Acid Mine Drainage which are termed as cumulative impacts may continue for many years as illustrated in the Figure 4 below (SANBI, 2014).

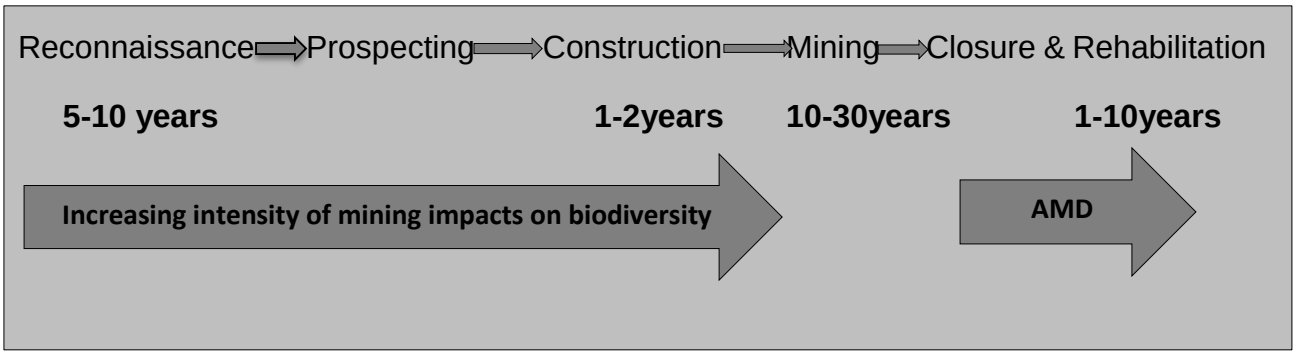


Figure 4: The impacts of mining on biodiversity increase with each stage of the process (Source: SANBI, 2014)

2.3 South African Legislation Regulating Mining

In response to the often negative impacts that mining has on the environment, countries have drafted legislation that regulates mining activities. This is the case in South Africa, with environmental legislation becoming increasingly stringent. Following the first democratic elections South Africa drafted a new constitution. This set the scope for all other legislation and significantly includes a section in the bill of rights on environmental rights. The Constitution of the Republic of South Africa, 1996 entitles every citizen to '*an environment that is not harmful to their health and well-being and to have the environment protected*' (Republic of South Africa, 1996). Mining companies are thus obliged to execute their activities in a way that minimises their impact on the environment. In enshrining this right other legislation regulating mining has been enacted, this includes:

- The **Mineral and Petroleum Resources Development Act** (No. 28 of 2002) ensures that the development of the state resources is conducted in an ecologically sustainable manner while encouraging reasonable social and economic development. Awarding of rights and permits for prospecting, mining, reconnaissance and production, requires environmental authorisation and the Minister may not grant a right or permit if activities associated with these authorisations will cause intolerable contamination, ecological ruin or damage to the environment. Mining companies are required to conduct environmental assessments prior to implementing a project, and managing their activities as stipulated in environmental management plans or environmental management programmes. These documents are prepared by applicants and approved by the Minister of Mineral Resources. Whilst the general requirements remain the same, these documents are now developed in terms of NEMA. Mines are also required to plan for and set aside financial provision for the closure of their operations.

- **National Environmental Management Act** (No. 107 of 1998) is the environmental framework act for South Africa. NEMA provides for particular features of management and implementation of relevant environmental legislation. NEMA provides for national principles that must *inter alia* act as practical tools to guide or be referred to by state departments when making decisions regarding conservation of the environment. These principles include, but are not limited to, the precautionary principle, the mitigation hierarchy, environmental justice and the “polluter pays” principle. NEMA provides for a system of integrated environmental management. In terms of this system, the Minister or Member of the Executive Council (MEC) is empowered to list certain activities that may not be conducted without an environmental authorisation being granted by a competent authority after considering an environmental impact assessment for a specific activity.

- **EIA Regulations** (Government Notice (GN) No. R983) published in terms of NEMA prompt the necessity for applicants to carry out either a Basic Assessment or Scoping and Environmental Impact Assessment if the proposed activity is listed in one or more of the three Listing Notices. In some circumstances both the MPRDA and NEMA

involve the process of identifying, assessing and evaluating of impacts, and the determination of appropriate measures.

- **The National Environmental Management: Biodiversity Act** (No. 10 of 2004) focusses on the protection and management of biodiversity and its components in South Africa, to give effect to ratified international agreements that are binding on South Africa, and to ensure the protection of the ecosystem entirely as well as species which have not been earmarked for exploitation. NEMBA prioritises conservation of ecosystems which are vulnerable and require protection so as to safeguard and maintain their ecological character. The Minister or MEC may publish national or provincial lists of threatened ecosystems which require protection. Ecosystems are classified in accordance with their respective conservation status: critically endangered, endangered, vulnerable or protected. The Minister or an MEC may also publish a list of processes or activities in a listed ecosystem that are "threatening processes". The South African government must adopt environmental management plans or environmental implementation plans for these ecosystems. These plans must be integrated into each Municipality's Integrated Development Plan.

- **National Environmental Management: Protected Areas Act** (No. 57 of 2003) provides for the declaration and conservation of South Africa's protected areas. Mining is legally not allowed in protected areas defined in the National Environmental Management Protected Areas Act (No. 57 of 2003). Section 48 of NEMPAA prohibits mining and prospecting activities in protected areas, specifically important nature reserve, national park, World Heritage Site, marine protected area, specially protected forest area and forest nature reserve or forest wilderness area.

- **National Water Act** (No. 36 of 1998) (Water Use Authorisations) its objective is based on water quality and quantity for water resources that sustain ecological needs of aquatic ecosystems and the well-being of people downstream. More importantly impacts on water resources whether its groundwater or surface water including impacts on flow or quality of water should be wisely analysed and assessed in comparison to the water resource needs and data on biodiversity significances. The

data are useful when conducting water use license or permit applications and also authorisations for waste disposal (SAMBG, 2013).

In late 2014 the environmental legislation regulating mining, and other developments, was amended. The overriding objective of the amendments was to streamline and align environmental authorisation. The system is referred to as the 'One Environment System'.

2.4 Frameworks for Addressing Biodiversity Loss

Having reviewed the literature, the author has developed Table 1 which highlights the various initiatives at different levels and by numerous actors, responding to the loss of biodiversity. The more significant of these are summarised in the table below, and discussed in more detail in the sections that follow.

Table 1: Initiatives of responding to biodiversity loss

Initiative leader	Initiative	Initiative date
Government	Convention of Biological Diversity	1992
	SA National Biodiversity Strategy and Action Plan	2005
Finance sector	World Bank Group EHS Guidelines, including guidelines for mining	2007
	IFC Performance Standards	2006
	Equator Principles	2003
Mining sector	ICMM Good Practice Guidance for Mining and Biodiversity	2006
	South African Mining and Biodiversity Guideline	2013

2.4.1 Convention on Biological Diversity

The Convention on Biological Diversity's (CBD) purpose is promoting conservation of biological diversity, sustainable use of its components, just and equal distribution of benefits derived in usage of and access to genetic resources and transfer of applicable technologies. The CBD is a multilateral treaty that is coordinated by UN which aims to

develop a countries approach to sustainable use and conservation of biodiversity. Usually considered a critical strategic document concerning sustainable development, the CBD was motivated by the global community mounting pledge to pursue sustainable development. The CBD's principal organ is the Conference of the Parties (COP), which include all countries globally that have endorsed the treaty. The vital governing body reviews milestones achieved under the Convention, pinpoints latest focus areas and arrange work plans for parties (CBD, n.d.).

The COP has capacity to make adjustments to the Convention, establish a panel of experts to advise, evaluate progress reports by members, and join forces with other international bodies and treaties. The CBD informs regulators that natural resources are limited. It should be acknowledged that previous conservation actions targeted certain species and habitats. Genes, species and ecosystems are recognised by the Convention as crucial for the survival of all humans. However, this has to be executed strategically and at a pace that will not cause decrease of biodiversity in future. The convention gives regulators direction dependent on caution of the presence of a risk that can cause substantial decline of biodiversity, inadequate scientific facts are not an excuse for delaying efforts to avoid or lessen such a risk. The Convention concedes that considerable funds and efforts are necessary to conserve biodiversity. It maintains that safeguarding biodiversity will reward humans in return significantly through environmental, economic and social benefits.

National Biodiversity Strategies and Action Plans are a requirement for contracting parties to the CBD. NBSAPs set out a strategy and plan for contracting parties to fulfil the objectives of the Convention (NBSAP, 2015). These programs are recognised internationally, they are designed to address threatened species and habitats and are key to the management of biological systems. NBSAPs are the principal instruments used by national governments for implementing the CBD and reporting back. The Convention obliges countries to develop NBSAPs and make sure they are mainstreamed into the decision-making and operations of all industries whose actions might generate impacts on biodiversity (SANBI, 2014). The International Year of Biodiversity was year 2010 and at the 10th Conference of Parties (COP) a protocol was adopted in Nagoya, Aichi

Province, Japan known as the Nagoya Protocol which is an additional arrangement to CBD. It offers a clear legal framework for the effective implementation of one of the three objectives of the CBD, that is, fair and equitable sharing of benefits arising out of the utilisation of genetic resources, thereby contributing to the conservation and sustainable use of biodiversity. The UN confirmed the era from 2011 to 2020 as the Decade of Biodiversity and Aichi Biodiversity Targets were set for this period (CBD, 2012).

The twenty Aichi Biodiversity Targets for 2015 or 2020 are categorised under five strategic goals as shown in Figure 5. The goals and targets embrace both targets for accomplishment at the global scale, and adjustable framework for the formation of national or regional targets. Parties were requested to establish individual targets under a flexible framework, considering national requirements and priorities, also realising that national targets contribute to reaching of global targets, and report thereon to the meeting of the COP. Members were asked to include the information in the NBSAPs (CBD, 2012). South Africa signed the CBD on 4 June 1993 and became a member of CBD on 2 November 1995 (Lötter *et al*., 2014). The NBSAP of South Africa was updated to resonate the CBD Strategic Plan for 2011-2020, the Aichi Biodiversity Targets (SANBI, 2014).



Figure 5: The Aichi biodiversity targets (Source: https://www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf

2.4.2 South Africa National Biodiversity Strategy and Action Plan

In accordance with Article 6 of the CBD, South Africa first developed a NBSAP between 2003 and 2005. This has been revised for the period 2015 to 2025. The NBSAP has aligned its priorities and its targets for biodiversity management in South Africa with those of the global community and also its national development obligations.South Africa's first NBSAP had a spatial component, the National Spatial Biodiversity Assessment 2004 (NSBA) which provided the first comprehensive national assessment of the status of biodiversity at the ecosystem level across terrestrial, freshwater, estuarine and marine ecosystems. Although the NSBA focuses on ecosystems, it however followed a landscape approach to biodiversity conservation and ecosystem resilience. The NSBA utilised systematic biodiversity planning to identify biodiversity targets, spatial priorities and indicators which could be incorporated into a long list of other environmental reports and plans at national and regional scale. In addition, the NSBA formed the basis of the development of provincial and local spatial biodiversity plans and protected area expansion strategies (NBSAP, 2015).

South Africa is endowed with lots of natural resources, including biodiversity and ecosystems. Biodiversity provides many different ecosystem services which are important for human livelihoods and economy. The NBSAP gives direction for the management of biodiversity resources and the ecological infrastructure so that it continues to contribute to South Africa's growth and development so that it can sustain its economy. The Department of Environmental Affairs leads the process of formulating, coordinating and monitoring the NBSAP. The implementation of the NBSAP is coordinated and monitored through the existing intergovernmental and sectoral coordination structures. The DEA also convenes an annual forum with all role players to review progress towards the implementation of the NBSAP (NBSAP, 2015).

The vision of the NBSAP is to manage, conserve and use biodiversity sustainably so that the citizens of the country benefit now and in future. The strategic objectives include:

- Management of biodiversity assets and their contribution to the economy, rural development, job creation and social wellbeing is enhanced.
- Investments in ecological infrastructure enhance resilience and ensure benefits to society
- Biodiversity considerations are mainstreamed into policies, strategies and practices of a range of sectors.
- People are mobilised to adopt practices that sustain the long-term benefits of biodiversity.
- Conservation and management of biodiversity is improved through the development of an equitable and suitably skilled workforce.
- Effective knowledge foundations, including indigenous knowledge and citizen science, support the management, conservation and sustainable use of biodiversity.

When looking at pressures on biodiversity at a national level, the NBSAP identifies mining to be a major driver of loss and degradation of natural habitats across all ecosystems. The rate of degradation and loss of natural habitats in marine, terrestrial and freshwater environments which affects species is higher in provinces like Gauteng, North West and Kwa-Zulu which are economic hubs. This degradation leads to fragmentation of natural habitats and it has an impact on species that require huge natural habitats for survival. Fragmentation interrupts ecological processes as it restricts movement of species. However the causes of loss and damage of natural habitats differ across these different ecosystems as cultivation and overgrazing are seen to be affecting wetland and terrestrial ecosystems, freshwater and terrestrial ecosystems are being impacted by invasive alien species and coastal ecosystems are prone to development activities on the coast whereas overfishing is affecting marine ecosystems. Spatial maps of biodiversity priority areas were developed to guide and assist in decision making around where to develop on terrestrial and marine landscapes (NBSAP, 2015).

2.4.3 World Bank Group Environment, Health and Safety Guidelines

The World Bank is an international financial institution that provides loans to developing countries for capital programs and it has two ambitious goals of ending extreme poverty as well as boosting shared prosperity. The World Bank has EHS guidelines to ensure that projects they fund are environmentally and socially sound. The Environmental, Health, and Safety (EHS) Guidelines are practical guiding and referral documents with common and precise industry sector illustrations of Good International Industry Practice (GIIP). The EHS Guidelines are applicable as prescribed by the relevant standards and policies in the event of a member or more of the World Bank Group being involved in a project. The General EHS Guidelines are crafted for application in conjunction with appropriate Industry Sector EHS Guidelines that offer guidance to operators on EHS matters in particular industry sectors. For multifaceted projects, it could be necessary to use various industry-sector guidelines (IFC, 2007).

The EHS Guidelines cover the procedures and performance levels usually believed feasible in new facilities by existing knowledge and expertise at affordable price. When EHS Guidelines are applied to existing projects, it may include launching targets that are site-specific as well as a fitting schedule of accomplishing them. The usage of the EHS Guidelines should be customised for impacts identified in a particular project based on the findings of an environmental assessment that considers site-specific conditions like the environment, country's legislation and related projected factors (IFC, 2007).

Skilled and competent individuals' professional judgement is used for implementing precise procedural recommendations. In the event of a country where the project is conducted having legislation that differs from operational standard stated in EHS Guidelines, projects are then expected to accomplish what is more rigorous. If not as rigorous as stated by presentations in EHS Guidelines in respect of particular project conditions therefore thorough validation for any proposed options is required as part of site-specific environmental valuation. The justification must prove that the selection of different performance levels safeguards the environment as well as human health (IFC, 2007).

The EHS Guidelines for Mining are relevant to most types of mining operations from underground to marine dredging. The mining of raw materials for building materials is discussed separately. The EHS Guidelines for Mining condense the EHS matters linked to mining operations and involving ore processing facilities which may happen throughout the mine lifecycle. Advice for the administration of EHS problems usually occurring in big projects is presented in the General EHS Guidelines. Potential environmental challenges related to mining activities may involve handling of wastes, hazardous materials, water-use, energy-use and also land-use and biodiversity (IFC, 2007).

The EHS Guidelines for Mining consider habitat modification as a serious risk to biodiversity linked with mining. It states that habitat modification can happen at any phase of the mine cycle with the highest possibility for short-term or irreversible change of terrestrial and aquatic environments taking place during the phase of starting a mine and when the mine is operational. However during exploration activities there is often a need to develop access roads, haulage passages, and mobile camps to accommodate employees which usually causes different extents of clearing of land and influx of secondary. It depends on the type of a mine the amount of the land that will be cleared to accommodate various mine infrastructure ranging from process plant to roads (IFC, 2007).

The management and conservation of biodiversity is key to sustainable mineral development. The EHS Guidelines for Mining identifies incorporating conservation requirements and development significances in a manner that is compatible with land use desires of local communities as usually a cumbersome problem for mining houses. The recommended approach includes taking note of the following:

- Presence of any critical biodiversity areas which will be negatively affected or critically endangered or endangered species decrease;
- Likelihood of the project affecting protected areas;
- The potential for implementation of biodiversity offset programmes or other remedial actions;

- The project or related infrastructure will cause an influx of people which will affect biodiversity negatively as well as local people. Also collaborations should be formed with internationally recognised scientific institutions to do research or implement monitoring and manage biodiversity programs;

- Engage with important biodiversity stakeholders to comprehend any incompatible land-use strains and the community reliance on natural resources and/or conservation needs that occur in that area.

Environmental monitoring programs are important to the mining industry and should be applied to address all actions that have been acknowledged to adversely affect the environment. Environmental monitoring actions should be dependent on primary or secondary signs of releases, wastes, and resource consumption relevant to the specific project. In certain mining developments monitoring should lengthen for a duration not less than three years post closure or extended if site circumstances require such treatment. The monitoring rate should be adequate to offer illustrative statistics for the variable being monitored. Monitoring should be done by skilled personnel following monitoring and record-keeping techniques and using correctly adjusted and serviced tools. Monitoring data should be scrutinised and interrogated at fixed timeframes and matched with the operating standards so that any essential remedial activities can be done. Further control on appropriate sampling and analytical methods for emissions and effluents is presented in the General EHS Guidelines (IFC, 2007).

2.4.4 IFC Performance Standards on Environmental and Social Sustainability

The International Finance Corporation is an international financial institution that offers investment, advisory and asset management services to encourage private sector development in developing countries. The IFC is a member of the World Bank Group as a private sector arm which focuses on reducing poverty and promoting development. It achieves this through mobilising financial resources for private enterprise, promoting accessible and competitive markets, supporting businesses and creating jobs and providing necessary services for the poverty-stricken and vulnerable. IFC’s Sustainability

Framework expresses the calculated pledge to sustainable development, and is an important part of IFC's method to risk management. The Sustainability Framework involves IFC's Policy and Performance Standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The Policy on Environmental and Social Sustainability defines IFC's obligations, activities, and duties linked to environmental and social sustainability. The Performance Standards are focused at clients, giving direction as to how to detect threats and effects and are tailored to help eliminate, restore and control impacts as a strategy of conducting business in a viable manner, including consulting stakeholders, and it is the responsibility of the client to reveal the activities the project involves. In scenarios where funding is directly from financial institutions, IFC wants its clients to use the Performance Standards to safeguard environmental and social threats and effects to boost development prospects (IFC, 2006).

The word "client" is utilised across the Performance Standards mostly to define the individual or organisation executing the project being funded or who received the project finance depending on the layout of project and type of funding. On top of satisfying the needs under Performance Standards, clients should obey the relevant national law as well as those laws fulfilling responsibilities of that country where the project is proposed under international law. The World Bank Group Environmental, Health and Safety Guidelines are practical guiding documents with general and precise examples of industry sector illustrations of good international industry practice. During project evaluation the IFC is dependent on the EHS Guidelines as their practical source of information. The EHS Guidelines has performance levels and procedures that are acceptable to IFC and that are usually considered as achievable and affordable in new facilities using existing technology. For projects funded by EP FI, the use of the EHS Guidelines on existing facilities could require setting site-specific targets with a suitable timeframe of accomplishing them. The EIA process can suggest other targets or methods whether high or low, if tolerable to IFC, then considered as project or site-specific requirements (IFC, 2006).

The General EHS Guideline comprises of information on wide-ranging environmental, health, and safety issues potentially applicable to all industry sectors. It must be applied in conjunction with the related industry sector guideline(s). The EHS Guidelines may be sometimes restructured. When the country where the project is being carried out the legislation is different from stages and procedures outlined in the EHS Guidelines, developments are projected to accomplish any which is additional rigorous. If less rigorous stages or methods are suitable in interpretation of certain development conditions, a comprehensive and exhaustive explanation for any planned option is required as part of the onsite precise environmental assessment. This validation must exhibit that the selection for any optional performance level is considerate of human health and the environment. (IFC, 2006).

Of particular relevance to biodiversity conservation is PS6. Performance Standard 6 identifies that safeguarding and preserving biodiversity, sustaining ecosystem services, and protecting existing natural resources is essential to sustainable development. The requests outlined in this Performance Standard have been directed by the CBD. The environmental and social risks and impacts identification process determines the application of Performance Standard 6. The client's Environmental and Social Management System (ESMS) informs and guides the actions needed to meet the requirements of the Performance Standard. Having considered the risks and impacts, the Performance Standard is applicable to developments situated in modified, natural and critical habitats that have a likelihood of impacting on or depending on ecosystem services that the client has power to manage, as well as on projects that include the generation of living natural resources like agriculture, fisheries and forestry (IFC, 2006).

Biodiversity conservation and management also involves the use the mitigation hierarchy, more specifically the biodiversity offsets. These are usually used as a last viable option after all the prevention, minimisation and restoration measures have been applied and there are residual impacts. Biodiversity offsets conservation outcomes involve compensating for significant residual biodiversity impacts arising from project development and persisting even after appropriate avoidance, minimisation and restoration measures have been applied. A biodiversity offset should be tailored and used

to accomplish quantifiable conservation results that can sensibly be anticipated to achieve no net loss and rather a net gain of biodiversity, however a net gain is needed in critical habitats. The planning of a biodiversity offset must observe to the “like-for-like or better” principle and should be executed in line with key accessible data and existing practices (IFC, 2006).

The principle of “like-for-like or better” shows that biodiversity offsets should be structured to protect similar biodiversity assets that are being impacted by a project. In some instances, areas of biodiversity that are affected by development could be of national or community value, therefore similar areas with same biodiversity components should be a priority for conservation even where they are under threat, hence they need thorough management. In such circumstances, it is wise to opt for an offset involving swapping (i.e. where the offset aims for biodiversity of higher priority than the impacted by the project) as for critical habitats, it will meet the requirements of Performance Standard 6. If a client is planning the design of an offset as restoration method, sourced specialists with familiarity in offset design and application should be used (IFC, 2006).

In a case where a client is buying from a primary producer, especially what is not to be produced in the areas where there is a significant modification of natural ecosystems or critical habitats, this has to be included in the ESMS to assess the primary suppliers. The verification process can detect the origin of stock and the habitat type of the area of production. The client will arrange a continuous assessment of the client’s main supply chains, minimise sourcing from suppliers that prove they are not adding to the substantial change of natural and/or critical habitats (this can be shown by supply of certified product, or effort towards verification or certification under a reliable scheme in certain commodities and/or locations). If necessary, call for actions that will lead to the client over time changing his contractors to those that can prove being not responsible for the substantially affecting the environment. The capacity of a client to entirely deal with these threats will depend on client’s level of influence and dealing with his key suppliers (IFC, 2006).

2.4.5 ICMM Good Practice Guidance for Mining and Biodiversity

The International Council on Mining and Metals (ICMM) was established in 2001 to improve sustainable development performance in the mining and metals industry. Today, it comprises of 23 mining and metal companies as well as 35 national and regional mining associations and global commodity associations. It was in May 2003 when the ICMM Council adopted sustainable development principles and requested their business affiliates to assess their performance against. From this set of principles, Principle 7 clearly focuses on the conservation of biodiversity. In tandem with the establishment of the sustainable development principles, ICMM was involved in talks with a various interested and affected parties especially with IUCN, to have an in-depth knowledge of dynamics pertaining to mining projects and biodiversity. In August 2002 at the World Summit on Sustainable Development, the IUCN and ICMM initiated a multiparty discussion on mining and biodiversity. The aim was to create a stage for industry, society, NGOs and government to participate in discussions concerning harmonising ecosystem integrity with socio-economic benefits of mining (ICMM, 2006).

The GPG focuses on experts in the mining industry with practical skills and commitment to protect the environment as well as other specialists who are involved in exploration or feasibility studies. The GPG is envisioned to increase the understanding and capacity of such people, and also inform where the support of biodiversity experts is needed or is vital. The GPG has potential to sustain beneficial interactions or affiliations amongst mining and biodiversity specialists as it encourages improved common understanding of the topic. It has to be understood that the GPG does not only focus on improving mining personnel's knowledge of biodiversity, it also seeks to increase biodiversity experts' knowledge on mining. The Good Practice Guideline includes all stages necessary to increase biodiversity conservation in the lifespan of a mine. It accepts obligations of corporates to the ICMM sustainable development principles and sub-elements, as evident in different affiliates' biodiversity strategies, policies or standards. However there is no focus on the improvement of policies with respect to biodiversity in any aspect besides the EMS (ICCM, 2006). Consequently, it gives a sequence of practical guidance to help corporates to:

- Comprehend boundaries concerning their actions and biodiversity: Aid companies to identify boundaries between their different operational activities and biodiversity, and to consult thoroughly with stakeholders.

- Evaluate the possibility of their actions having undesirable impacts on biodiversity: Start applying hands-on approach to evaluate the likelihood for operational activities that adversely impact biodiversity and associated stakeholders.

- Alleviate possible effects on biodiversity: Detect and apply a mitigation hierarchy to safeguard biodiversity and impacted stakeholders.

- Discover possibility to add to biodiversity conservation: Past the mitigation of impacts, identify the ability to add to biodiversity management or safeguarding.

The GPG was produced for use in various operational situations, covering a range of ecosystem categories and significance. As a result, the use and understanding of the guidance will usually rely on indigenous local knowledge or biodiversity expertise. The GPG goes further to overlooking any virtuous or decent concerns, which are gradually the focus of organisation rules, it highlights the significance for companies to address biodiversity for a multiplicity of thorough corporate motives. A lot of mining houses have embraced a gradually more complicated method of biodiversity management as part of their assurances to instituting and retaining a social or functional 'license to operate' (ICCM, 2006).

Implementing appropriate measures to conserve biodiversity is being seriously considered to be important as it enables companies:

- accessibility of the land/property throughout the life span of a project

- reputation an immaterial but important benefit to trade, and can profoundly sway the opinions of communities, NGOs and other stakeholders of existing or proposed mining operations; and

- ability to acquire capital, specifically when the funding is sourced from EP FI, which use the IFC Performance Standard 6 on biodiversity to all projects worth more than US$10 million

In addition, sound biodiversity protection will provide incentives to mining organisations, including:

- improved financier assurance and allegiance;
- fast permitting cycles and no appeals, due to good relations with regulatory authority;
- enhanced community interactions;
- robust helpful collaborations with NGOs;
- better worker inspiration; and
- minimal threats and loses.

The GPG offers the mining sector a framework of ideas required to improve biodiversity management throughout the mine lifecycle. Ultimately, through implementation of the GPG, mining companies are capable of reducing the potential of adverse impacts on biodiversity, project interruptions and loss/damage to reputation/corporate image (ICMM, 2006).

2.4.6 South African Mining and Biodiversity Guideline

In 2013 the Departments of Environmental Affairs and Mineral Resources, together with the South African Mining and Biodiversity Forum which is an alliance of stakeholders from industry, conservation organisations and government facilitated by Chamber of Mines of South Africa, released a set of guidelines, the South African Mining and Biodiversity Guideline (SAMBG). The guideline is a practical tool to expedite the sustainable development of South Africa's mineral resources in a manners that allows regulatory authority, industry and consultants to reduce the impact of mining on biodiversity and ecosystem services. The availability and abundance of mineral deposits in South Africa

entails that mining and the environment will always be interacting, hence there is a need to find a common ground. In the absence of the integrity of our natural systems, sustained long-term economic growth or life is not possible, hence in an attempt to achieve this common objective the guideline is a crucial step in the right direction. From a business perspective, the guideline clarifies the benefit mining companies will acquire by adopting a risk-based approach to managing biodiversity. It acknowledges that certain impacts are unavoidable but gives direction as to where mining is not allowed, where different types of biodiversity priority areas may create an obstruction to mining, and where biodiversity considerations may discourage the options for mining (SAMBG, 2013).

The role of the guideline is to incorporate applicable biodiversity facts when making informed decisions about areas selected for mining and the effective ways to eliminate, reduce or rehabilitate impacts caused by mining on biodiversity. This enhances social, ecological and economic sustainable development. The guideline ensures that there is reliability when making judgements about biodiversity issues, therefore it helps appropriate decision-makers in applying and administering law and also helps companies to adhere to law, which is best practice and minimises business risk. Importantly, this is a guideline to assist in mainstreaming biodiversity into the lifecycle of a mining project unlike having separate rules that are used independently without clarification or examination. The guideline helps to level the playing field as it has managed to bring different government departments with different roles to one table concerning issues about mining and the environment so that they collaborate and come up with sustainable solutions applicable to all (SAMBG, 2013).

The guideline contains six key principles which are important in dealing with biodiversity issues in the mining environment. They include the use of law, use of accessible important biodiversity data, consulting with stakeholders effectively, applying best EIA practice, applying the mitigation hierarchy and effective executing of the EMP. The guideline differentiate the categories of critical biodiversity areas according to their provision of ecosystem services. Therefore for mining companies this information is useful for them to evaluate the risk of investing in new projects or consequences for existing operations in these key biodiversity areas. They advise what mitigation measures to apply to

minimise the impacts. For regulators, it is adopted to implement the law in areas where mining is legally not permitted (Category A) and for some categories to make sure thorough assessment of biodiversity is conducted and mitigation hierarchy prescribed accordingly to minimise impacts. Hence both, the mining companies and regulators, must use the key biodiversity data available to properly ascertain, measure, calculate and deal with likely impacts on biodiversity (SAMBG, 2013).

2.5 Legislation versus Voluntary Standards

There is an ongoing debate around the role and importance of voluntary standards (self-regulation) and national legislation. A common reason for self-regulation is the desire to raise industry standards, therefore self-regulation is a means to exceed minimum legal requirements and can also enhance understanding and compliance with regulations. Originally, the voluntary standards development process stemmed from the private sector and it was independent from governmental or regulatory processes. The voluntary standards can be considered to be a set of global requirements for those conducting economic or development projects which must be observed as they will be audited against them. Implementing a standard maybe a voluntary process as there are some standards that force an organisation to stick to the compulsory requirements for which, in return, they are rewarded with some apparent benefit and non-compliance is linked to consequences (US-EU High-Level Regulatory Cooperation Forum, 2009).

Voluntary standards are usually referenced in specifications and contracts, however their application is not voluntary. At times they are made mandatory and incorporated into law by government bodies. An acceptable definition of standards mentions that “they are sets of rules, conditions or requirements concerned with the delineation of procedures, specification of performance, design or operations, measurement of quality and quantity in describing products, systems, services or practices” (US-EU High-Level Regulatory Cooperation Forum, 2009, p.1). Voluntary standards can be used by any individual or organisation, whether private or state. Voluntary standards are developed by industry,

non-profit organisations, trade associations, and others (US-EU High-Level Regulatory Cooperation Forum, 2009).

Most of the standards seem to have an overarching objective of promoting sustainability however they are not consolidated. There is evidence of poor co-ordination, duplicated activity and confusion that has created a perception that these parallel standards fail to provide robust means of achieving the set goals (Frasen, 2011). Standards implementation is dependent on decisions of individual participants and even though the principal administration authority is absent, they have law-like effects, are mandatory and enforced by use of neutral, third-party certification systems (Guler *et al*., 2002). It is worrying that with the lack of a regulatory body, several parties will want to endorse their standards to resolve the identical challenges. Considering that the number of voluntary standards is increasing in governing transnational arenas, this is creating problems for standards organisations. Despite appearing to be pursuing common and cross-cutting objectives, standards institutions are marketing their personal respective standards at the same time, which are similar or even more identical (Reinecke *et. al.,* 2012).

Standards markets are platforms where standards setters provide diverse but identical and mutually recognised standards which are close substitutes. Standards organisations which communally observe and jointly place each other at micro-level usually take part in processes at aggregate level that encourage cooperation and separation. Although standard setters have an understanding on particular objectives and definitions, however they distinguish themselves when highlighting specific features, also when pursuing certain audience of adopters and their stance as baseline or premium solution. Continued dissimilarity enables standards markets to be a place of constant competition and unease. Market participants passionately partake in ongoing field-level discussions and negotiation processes where politics, agency and vested interests determine the level of understanding of problems (Hoffman, 1999).

There are no clear mechanisms that promote the co-existence of multiple standards. This is evident in the many standards available in the mining sector which seek to address

biodiversity issues. We have the ICMM GPG addressing the same issues with World Bank EHS Guideline for Mining. The IFC PS6 is addressing issues for all industries particularly on biodiversity considerations. The SAMBG seemingly is focusing on the South African context of the biodiversity impacts from mining activities and has numerous extracts from all the above mentioned standards and also makes references to related and applicable legislation. Therefore the application of the guideline is voluntary however since it is endorsed by government departments it can be easily enforceable in the mining sector to achieve proactive governance needed to address impacts on biodiversity.

3 Methodology

3.1 Research Approach

A qualitative research method was used for this project. The questions posed required a comparison, explanations and literature review which was sufficient to arrive at the desired answers. The research seeks to determine how the recently developed SAMBG contributed to biodiversity conservation in the South African mining sector, and how the guideline compares to existing international standards for addressing biodiversity conservation in mining projects hence a comparative analysis was undertaken. Comparative studies deal with a selection of cases in a strategic manner based on available information. It is important to understand the objectives of each case and the background information as to how and why they were formulated. The comparative method uses many cases and promotes thorough analysis of a few cases rather than more shallow statistical analysis of many cases although there is frail ability to sort out opposing descriptions, especially the problem of few cases many variables. Hence it was important to review other international and national guidelines and standards for addressing biodiversity in mining projects, to determine how these compare to the SAMBG and how the SAMBG contributes to biodiversity conservation in the South African mining sector. This was very useful as the structure and content on these standards and guidelines could easily be interpreted and incorporated to this project.

3.2 Research Design and Data Collection

The SAMBG have only been released recently therefore it is too early to assess how they have contributed to biodiversity conservation in practice. However, there is an opportunity to assess, through a desktop review, whether they consider the key biodiversity issues identified by global initiatives, and if they possibly contribute something new to the existing requirements. The desktop review required a detailed review of relevant literature, the various guidelines, standards and targets as well as a comparative analysis between the SAMBG and IFC PS 6. Prior to conducting the analysis of the different guidelines and standards, the criteria used in the analysis was developed by the student based on the

content, process, approach and areas covered by the each of them. Based on this review, recommendations could then be made on how the mining sector in South Africa should implement the guidelines.

Three questions were posed to address the aim of this research. The first question looked at assessing how the SAMBG consider the Aichi targets. Answering this question involved reviewing the Aichi targets and the SAMBG and also assessing how the guidelines meet each of the 20 targets, which are listed under the 5 strategic goals. Another assessment was done to find out how the SAMBG considers and seek to achieve the relevant targets. The criteria used to determine how the targets are addressed by the guideline was also developed by the student and as listed below:

Direct: The guideline specifically addresses the particular target;

Implied: The guideline does not directly mention the target, but the outcome is implied;

Partly: The guideline addresses a certain aspect or mentions the target;

Not relevant: The guideline does not address the target completely.

In order to answer question two on assessing the overlaps and gaps between the IFCPS6 and the SAMBG, a comparative analysis was done to assess the overlaps and gaps that exist between the standard and the guideline. It was a challenge to produce a criteria to compare the two however the starting point was in trying to understand if both were implemented on a similar project, would the results be the same or different. This criteria was formulated by considering the key elements that make a guideline or standard to be considered as effective. This then required reviewing literature that focuses on similar comparisons, the approach and technique used in those studies was then adopted and incorporated in this research. The outcome was then tabulated.

The criteria developed are as defined below:

Scope of application: Projects where the guideline/standard is used;

Objectives: Specific outcomes of the guideline/standard;

Processes: Approach adopted by the guideline or standard to conserve biodiversity;

Legal comparison: Legal status of the guideline/standard (voluntary or legally binding);

Tools: Additional resources that can be used together with the guideline/standard;

Reporting/monitoring consequences: Implications for non-compliance

Principles: guiding/fundamental principles that underpin the guideline/standard

The third question focused on determining the contribution and position of the guideline within the broader range of guidelines and standards on biodiversity conservation in the mining sector. The conservation of biodiversity in the extractive industry from the South African context as well as at the international stage was considered. All applicable legislation, regulations and guidelines were reviewed at national level to see the contribution and position of the guideline to the country's efforts of mainstreaming biodiversity into the mining industry. An analysis of the international scene specifically Multilateral Environmental Agreements (MEAs) and international best practice guidelines and standards was conducted to determine how the guideline contributes and is positioned amongst these.

The research focused mainly on the recently launched Mining and Biodiversity Guidelines and how they will add value in the conservation of biodiversity in the mining sector in South Africa. Hence more emphasis was focussed on reviewing the guideline, how it intends to achieve sustainable mineral development and promote responsible mining practices that incorporate biodiversity considerations in operations. Taking into account that IFC Performance Standard 6 on biodiversity conservation and sustainable management of living natural resources is fundamental to sustainable development and it is a requirement by EP FI to clients seeking project finance, it was meaningful to have a comparison between IFC PS 6 and the guideline. Moreover to determine the relative contribution and position of the SAMBG within the broader range of standards and guidelines that South African mining companies are expected to adhere to. The following international and national guidelines and standards were sourced and reviewed to substantiate the findings of this research: World Bank Environmental; Health and Safety Guidelines for Mining; ICMM Good Practice Guidance for Mining and Biodiversity; South Africa's National Biodiversity Strategy and Action Plan and National Environmental Management: Biodiversity Act.

4 Results and Discussion

4.1 Are Aichi Biodiversity Targets Addressed by SAMBG?

The Aichi Biodiversity Targets are a short-term plan for biodiversity protection. This short-term plan provides a set of 20 targets. It was agreed in the COP-10 meeting. South Africa is a signatory of the CBD hence it is obliged to achieve these targets. The South Africa Mining and Biodiversity Guideline were launched in May 2013. It was evident that the mining industry posed a severe threat to biodiversity despite the existence of good environmental legislative framework therefore the guideline seek to improve consistency in dealing with the biodiversity issues. The results below shows how the guideline attempts to address the targets:

Table 2: The SAMBG and the Aichi Biodiversity Targets

	Aichi Target	How this is addressed in the SAMBG
Strategic Goal A: Address the causes of biodiversity loss		
1	By 2020, make people aware about the values of biodiversity	Direct: The guideline requires its primary audience to use it to identify the biodiversity considerations significant at each stage of the mining life cycle. There is a training for users to learn how to implement the Guideline and in the process they get to know about biodiversity and are able to contribute to its conservation.
2	By 2020, integrate biodiversity values in development and poverty reduction plan	Direct: It requires the national and provincial regulators to mainstream biodiversity into planning processes in mining industry to achieve sustainable development while implementing programmes that support economic growth and the equal sharing of benefits.
3	By 2020, subsidies which are harmful to biodiversity and eliminate them, phase them out or reform them	Not relevant
4	By 2020, implement plans for sustainable production and consumption.	Direct: The guideline is a product of a wide-ranging collaboration of government, business and stakeholders who share a common view of sustainable mineral development which has less impacts on the environment
Strategic Goal A is addressed by the guideline as its primary aim is to increase uniformity in addressing biodiversity issues. It incorporates applicable biodiversity data in planning processes about mining preferences by explaining ways to prevent, reduce or rehabilitate impacts on biodiversity caused by mining so as to achieve ecologically, economically and socially sustainable development. The guideline offers help to applicable decision-makers in applying and imposing the law and it has been		

instrumental in facilitating cooperation and alignment of government departments and processes going into the future.		
Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use		
5	By 2020, reduce the rate of natural habitat loss and forest loss by at least 50%	Implied: The guideline requires investments of conserving biodiversity to be planned, concentrated and helpful to achieve sustainable development as there are constrained funds accessible for management and conservation of biodiversity.
6	By 2020, reduce overfishing	Partly: The guideline requires focus on areas for offshore protection. These classify spatial significances for demonstrating offshore biodiversity, safeguarding key ecosystems, contributing to fisheries sustainability and reducing by-catch
7	By 2020, areas under agriculture, aquaculture and forestry managed a in sustainable manner	Direct: The guideline requires use of existing tools and opportunities which also include the controlling and preservation of biodiversity in manufacturing sectors like agriculture and forestry to minimise impacts on biodiversity and safeguard ecosystem integrity.
8	By 2020, reduce pollution and excessive use of fertiliser	Implied: The guideline recommends the application of NEMA principles. Costs of resolving, of avoiding, managing or reducing further contamination must be funded for by those liable for damaging the environment (polluter pay principle).
9	By 2020, prevent invasive alien species (non-native)	Direct: The guideline requires caution when choosing species to be used at the decommissioning phase of a mine as this could lead to introduction of invasive alien species. It highlights mined areas as disturbed areas were invasive alien species strive. The guideline prescribes sources of where to find information about invasive species.
10	By 2015, reduce the choral reflow damage, ocean acidification	Not relevant
Strategic Goal B is addressed by the guideline as constrained funds are accessible for conserving and managing biodiversity on chosen areas that create a difference. Hence efforts must be planned, concentrated and helpful to achieve sustainable development. This is the key principle underpinning South Africa's method of administering and safeguarding its biodiversity which led to the classification of biodiversity priority areas.		
Strategic Goal C: Safeguard ecosystems, species and genetic diversity		
11	By 2020, conserve terrestrial and inland water, coastal – marine area	Implied: The guideline requires use of spatial biodiversity plans which have supported the identification of biodiversity priority areas. It emphasises on priority areas for land-based protected area expansion which are big, whole and complete areas of high biodiversity importance appropriate for extension of large protected areas. Also important areas for

		offshore protection that safeguard viable resource consumption and an illustrative protected area network.
12	By 2020, Prevent extinction of threatened species	Direct: The guideline requires species information to be considered, although the location of all species is not known, occurrence of species of significance on site should warrant conservation or special management which will then inform a mining decision. The presence of threatened species in areas that will be impacted by mining increases the implication of mining on biodiversity.
13	By 2020, uphold genetic diversity of agro-plants, domesticated animals and reducing genetic erosion	Not relevant
Strategic Goal C is addressed as there is a map and table in the guideline that can be used by mining companies to evaluate the extent of threat of financing new mining projects and insinuations for existing mining activities in any of the biodiversity priority areas.		
Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services		
14	By 2020, safeguard ecosystems for women, tribes, and poor	Direct: The guideline requires that assessment of environmental impacts of proposed mining projects to be a must. Mining can cause impacts on biodiversity and related ecosystem services that are significant and which have repercussions for human well-being. These impacts have to be reduced or rehabilitated as they present severe threats to livelihoods supported by biodiversity with the poor and vulnerable communities relying on them being the most affected.
15	By 2020, Combat desertification and restore the degraded ecosystem	Partly: The guideline requires representation of terrestrial and marine biodiversity in a protected area network as well as their contribution to climate change resilience. It highlights protecting biodiversity and the services provided by healthy ecosystems as helping to reduce the vulnerability and risk of society and communities to climate change.
16	By 2015, operationalise the Nagoya Protocol on genetic resources via national legislations	Not relevant
Strategic Goal D is addressed as the guideline lists the numerous benefits people derive from the diverse ecosystems that deliver ecosystem services. The benefits extends to economic activities and the contribution of biodiversity to economies is massive yet usually under-valued.		
Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building		
17	By 2015, National Biodiversity Strategy and Action Plans – update for participation	Partly: The guideline has to be used with relevant reference technical documents on biodiversity priority areas, integrated

		environmental management and impact evaluation, restoration, mining and related activities.
18	By 2020, integrate the knowledge of tribal communities	Directly: The guideline requires mining houses to obtain useful contribution from stakeholders and they should regard them as important agents to the assessment and management of impacts on biodiversity hence they have to gather local traditional/indigenous knowledge of the area and also identify local values and levels of dependence on ecosystem services.
19	By 2020, widely sharing, transferring and application of scientific and technological knowledge	Directly: Principle 2 recommends the use of available biodiversity information hence the guideline use spatial plans based on best available science and are related to policy and legislative tools. It further advises of the availability of ecosystem guidelines to assist stakeholders involved in land-use planning and environmental assessment.
20	By 2020, Financial resources mobilisation	Not relevant
Strategic Goal E is addressed as the guideline is a product of multi-stakeholders. There are numerous training activities that have taken place and others scheduled to make sure that people know how to use this useful product and are capacitated. The implementation or application of the guiding principles of the guideline will reduce the pressures on biodiversity in the mining industry.		

The results above show that the guideline have addressed at most 75% of the Aichi Biodiversity Targets as 15 of the 20 targets were addressed either directly, partly or through implication however all the five strategic goals were addressed by the guideline. The guideline is sector specific solely for the mining sector, hence the other five targets it could not address them at all as they are related to other industry sectors. The adoption of the guideline by government and industry is very important to achieve sustainable mineral extraction in South Africa. South Africa as a signatory to international agreements, through the guideline can meet its international obligations.

The importance of the link between biodiversity and business is recognised by the United Nations Convention on Biological Diversity which adopted a strategic 10-year plan for 2011-2020, known as the Aichi Biodiversity Targets. All industries irrespective of their scope, locality or sector, rely upon and have a direct or indirect impact on biodiversity and ecosystem services through their activities, supply chain or investment choices. The integration of biodiversity into decision-making and operations and supply chains can turn many threats into opportunities, empowering a company to distinguish its product in a

competitive industry and have an advantage of remaining ahead of regulations and public pressure or improving a company's social license to operate or accessing new markets and revenue streams (IUCN, n.d).

The five overall strategic goals provide prospects for enhanced alignment between business strategies, the CBD's main objectives and new or improved public policies and regulatory frameworks (IUCN, n.d). The goals and targets encompass both ambitions for success at the global level, and a flexible framework for the formation of nationwide or regional targets. Parties are requested to set their own targets within this flexible framework, considering national requirements and priorities, while also bearing in mind national contributions to the achievement of the global targets (CBD, 2012). It can therefore be concluded that the SAMBG definitely addresses the Aichi Biodiversity Targets.

4.2 Comparison between SAMBG and IFC PS6

The IFC Performance Standard 6 considers that the protection and conservation of biodiversity and the efficient use of ecosystem services and management of existing natural resources is key to sustainable development. On the other hand, the South Africa Mining and Biodiversity Guideline focuses on integrating applicable biodiversity data into decision making about mining alternatives and how effective to prevent, reduce or mitigate impacts caused by mining on biodiversity in so doing support ecologically, economically and socially sustainable development. Hence these two are compared to see the overlaps and gaps of their implementation in industry.

Table 3: Comparison between the SAMBG and IFC Performance Standard 6

CRITERIA	SAMBG	IFC PS 6
Scope of application	All mining projects in South Africa Industry initiative adopted by mining houses, consultants, NGOs and national and provincial government officials Throughout the lifecycle of the project	Projects from all industry sectors worth more than US$10 million in developing countries EPFI makes it one of the conditions of project finance deal with their clients It extends over to supply chain
Objectives	A risk-based approach to managing biodiversity and associated ecosystem services To offer advice as to where mining is not legally allowed, where different types of biodiversity priority areas may constitute a hurdle to mining and where biodiversity considerations may limit the options for mining	To protect and conserve biodiversity To maintain the benefits from ecosystem services To promote the sustainable management of living natural resources through the adoption of practises that integrate conservation needs and development priorities
Processes	The guideline grouped biodiversity priority areas into four categories according to their biodiversity significance and implications for mining: Category A. Legally protected – mining prohibited; Category B. Highest biodiversity importance – highest risk for mining; Category C. High biodiversity importance – high risk for mining ; and Category D. Moderate biodiversity importance – moderate risk for mining There are 14 types of biodiversity priority areas. Application of mitigation hierarchy and biodiversity offset (beyond the site). Biodiversity offsets relatively new in South Africa. There should be careful selection of species to be used to stabilise soils or at the decommissioning phase of the mine to avoid introducing invasive alien species.	Protection and conservation of Biodiversity: habitats defined as terrestrial, freshwater or marine geographical unit. They are divided into modified, natural and critical. Critical habitats being a subset of modified or natural habitats. Legally protected and internationally recognised areas important and consultation required if proposed project is located there Application of mitigation hierarchy and biodiversity offsets a must. Design for offset adhering to “like-for-like or better” principle Invasive alien species should not be intentionally or accidentally introduced even when permitted under the existing regulatory framework

	Systematic biodiversity planning: strategic and scientific approach to identifying areas of importance for biodiversity management and conservation. Biodiversity stakeholder engagement – a thorough procedure, stakeholders identified and objectives of the proposed miming activity clarified.	Management of Ecosystem services: it looks at services on which project operations are most likely to have an impact or those services on which the project is directly dependent for its operations. Stakeholder engagement process as defined in Performance Standard 1 is followed when affected communities are likely to be impacted.
	Use of existing tools and opportunities to integrate the management and conservation of biodiversity into production sectors like agriculture and forestry to reduce impacts on biodiversity and ensure ecosystem integrity.	Sustainable management of living natural resources: applicable to clients involved in land-based agribusiness and forestry to sustainable manage living natural resources through application of industry-specific good management practises and available technologies.
Legal Comparison	Best practice guideline that does not have any legal standing although it is endorsed by Departments of Environmental Affairs and Mineral Resources	Contractually bidding as it is a more strategic tool and there is an obligation to adhere to mandatory requirements
Tools	BGIS, Conservation Plans, EIA,	ESMS, adherence to other Performance Standards
Reporting/ Monitoring Consequences	Prosecution, loss of social license to operate and withdrawal of right/permit	Cannot access finance, contract terminated
Principles	Apply law as a minimum	Use of existing regulatory framework guided by the Convention on Biological Diversity
	Use of best available biodiversity information	Best available information and current practices to be used in the design of biodiversity offset
	Engage relevant stakeholders thoroughly	Stakeholder consultation procedure as explained in PS 1
	Use best EIA practice to classify, measure and calculate impacts on biodiversity	Competent professional to assist in conducting the risks and impacts identification process
	Apply mitigation hierarchy and develop robust EMP	External experts to assist in the development of a mitigation hierarchy
	Ensure effective implementation of EMPs, including adaptive management	Adopt a practise of adaptive management where implementation of mitigation and management measures are responsive to

		changing conditions and results of monitoring throughout the project's lifecycle

The results above show that guideline and the performance standard have a lot of similarities as they are both industry initiatives targeted at upholding biodiversity conservation and sustainable development. They share similar objectives and mention habitat types, the guideline talks of biodiversity priority areas and the performance standard speaks of natural and modified habitats. They both recognise legally protected and internationally recognised areas. These two mention invasive alien species and the threat they pose on biodiversity. The application of mitigation hierarchy and the use of biodiversity offsets as a last option is applicable to both. The performance standard is a voluntary standard and the guideline is a best practice guideline and both have no legal standing although they have monitoring/reporting consequences in the event of non-compliance. They also have similar processes and principles as the guiding principles of the guideline are also requirements of the performance standard and processes of the performance standard are also covered in the guideline.

Both the IFC PS6 and SAMBG are tools that have an objective to conserve biodiversity in the mining industry although at a different hierarchy of governance. It is important to note that in IFC PS6, the mitigation hierarchy is the main concept. It describes the actions that have to be undertaken to anticipate and prevent, or where prevention is not practical, minimise and rehabilitate, and, where residual impacts exist, offset for risks and impacts to biodiversity (CSBI, 2013). IFC PS6 extends on the mitigation requirements outlined in Performance Standard 1 to clarify requirements for businesses regarding the implementation of biodiversity offsets when the minimisation of impacts cannot be done (Kyngdon-McKay *et al*., 2014). IFC PS6 distinguishes between Modified versus Natural habitats and identifies areas with high biodiversity value as Critical Habitat. It also provides perceived outcomes for projects in Natural Habitat to target to attain No Net Loss (NNL) and Critical Habitat should accomplish Net Positive Impact. Net Positive Impact can be described as an end-goal for project results whereby likely impacts on biodiversity

from the project are overshadowed by the actions implemented, in alignment with the mitigation hierarchy, to achieve net gains for biodiversity.

There are various definitions for the critical habitat however this is in accordance with criteria taken from a diverse range of definitions of priority habitat for biodiversity conservation used by the conservation community and applied in associated governmental legislation and regulations. Critical habitat is acknowledged regardless of the nature or size of the project or impact. Therefore the description is centred on biodiversity of the area, not the impacts from a development. Critical habitat is an intrinsic property of an area (CSBI, 2013). IFC wants clients to embrace the model of no net loss or rather net gain in the establishment and implementation of biodiversity offset policies. The client thinking of developing an offset as part of the mitigation tactic must include external specialists with expertise in offset design and application. The intention of an offset must stick to the 'like –for-like or better' principle and executed in accordance with best available data and current practices. IFC PS6 also focuses on clients with a desire to operate in protected areas and obliges them despite implementing the mitigation hierarchy they should also validate that the proposed project is legitimately allowed, engage with protected area donors and administrators, affected communities, indigenous people and other stakeholders, as well as applying supplementary activities to support and boost the conservation objectives and efficient management of the area. (Kyngdon-McKay *et al*., 2014).

IFC's compulsory least requirements for clients focusing on protected areas and biodiversity conservation are high and are considered as international best practise, however it is still not clear that the legislative addition of IFC PS6 is the simplest and most effective method for governments of developing economies to manage the extractive industry's biodiversity impacts. The IFC PS6 does not cover both the public and private sector obligations in one schedule as the governments do not adopt the collective ideology of risk when consulting with extractive industries and other participants in the formulation of government policies. This could be as a result of the stakeholder engagement process not being clearly outlined in the IFC PS6. However IFC PS6 simplifies opportunities and risks encountered by the public and private sectors and urges

businesses to adopt the calculated incorporation of biodiversity considerations in project level planning processes (Kyngdon-McKay *et al.*, 2014). IFC PS6 is comprehensive in terms of requirements regarding biodiversity conservation. Embracing a common language of risk by both the private and public sectors can bring stakeholders together which can translate to positive outcomes for biodiversity conservation which is extremely reliant on partnerships and collaborations for it to succeed. Hence the implementation of IFC PS6 is a viable option to consider for regulatory authorities in their management of the extractive industry's biodiversity impacts.

On the other hand the South Africa Mining and Biodiversity Guideline is a practical tool for incorporating biodiversity considerations throughout the life-cycle of a mine. The development of the guideline dates back to 2005 when an alliance of a wide range stakeholders from the mining industry, conservation organisations and government departments formed the South Africa Mining and Biodiversity Forum which was facilitated by the Chamber of Mines was central to bringing them to one table. (Kyngdon-McKay *et al*., 2014). The South Africa Mining and Biodiversity Guideline is regarded as one of the best biodiversity frameworks globally (World Future Council and Centre for International Sustainable Development Law, 2012). Critical to its success has been the extensive and enthusiastic stakeholder consultation process that guaranteed the guideline acknowledged the desires of all stakeholders and that they are practically applicable. Also the collaborative nature of its development warranted that its guidance is relevant to everyone. It was developed through negotiation and cooperation making sure all players are on the same page. (Kyngdon-McKay *et al*., 2014). In addition, risk was the shared view used in the development of the guideline and big corporations talking about the reason to broadly comprehend their environmental risks as a basis for them embracing NNL standards (Mostert, 2014).

Previously South Africa had no consistency in the implementation of its protected areas framework. This was caused by the DMR having inadequate information about the whereabouts of protected areas and therefore granting mining rights there. Conflict between government departments including Department of Mineral Resources, Department of Environmental Affairs and Department of Water and Sanitation over mining

operations in both sensitive and non-sensitive environments were many and collaboration was inadequate. The opposing directives of each respective department was the problem. DMR was seen to be prioritising mining above everything else and based its success on the amount of rights granted to mining companies whilst departments with an environmental obligation wanted an extra careful process of allowing mining operations (Kyngdon-McKay *et al*., 2014). The One Environmental System which came to effect in December 2014 has aligned the application process and the timeframes for mining rights with environmental authorisation and integrated water use license to make sure it is done simultaneous. The guideline will come handy in this process as it talks to a wide range of stakeholders.

Looking at IFC PS6 and the SAMBG it is evident that the two having striking similarities, with only a few notable differences. The IFC PS6 looks at all industry sectors in developing countries because they often lack their own necessary capital and the project has to have a threshold value of more than US$10 million and being financed by an Equator Principles Financial Institution. However the SAMBG is for all mining projects in South Africa regardless of their size, location, value and who is funding the project. The guideline covers the whole lifecycle of the mine and the performance standard goes beyond that to also focus on the supply chain. The guideline just like the performance standard talks about stakeholder engagement however with more detail and it is tailored for the South African mining context. The guideline identifies the various stakeholders precisely from government departments down to grassroots structures were there are communities, groups or individuals that can be benefit or be adversely impacted by a bid or a development and are concerned with its consequences (Consultative Forum on Mining and the Environment, 2002). It then outlines how the procedure ought to be conducted citing relevant South African legislation in the process, that is, MPRDA, NWA and NEMA as they all stipulate stakeholder engagement as part of the relevant authorisation processes (SAMBG, 2013). The detailed process is laid out in Chapter 3 section 3.3 and Chapter 5 section 5.3 of the guideline. The performance standard is strategic document that the guideline is practical and implementable offering guidance on the ground during operations however if guideline and performance standard were to be

implemented on a similar project they will yield the same results, hence it is drawn that they have a 100% percent overlap.

4.3 The Relative Contribution and Position of the SAMBG

This section shows position of the guideline within the South African environmental legislation, performance standards, Aichi principles as well as international agreements and guidelines on biodiversity conservation in the mining industry. All applicable national environmental legislation, regulations, guidelines and tools were all listed. This information was then used to indicate the position of the guideline amongst them. An analysis was also conducted to see how guideline compares with a broader range of international guidelines and standards.

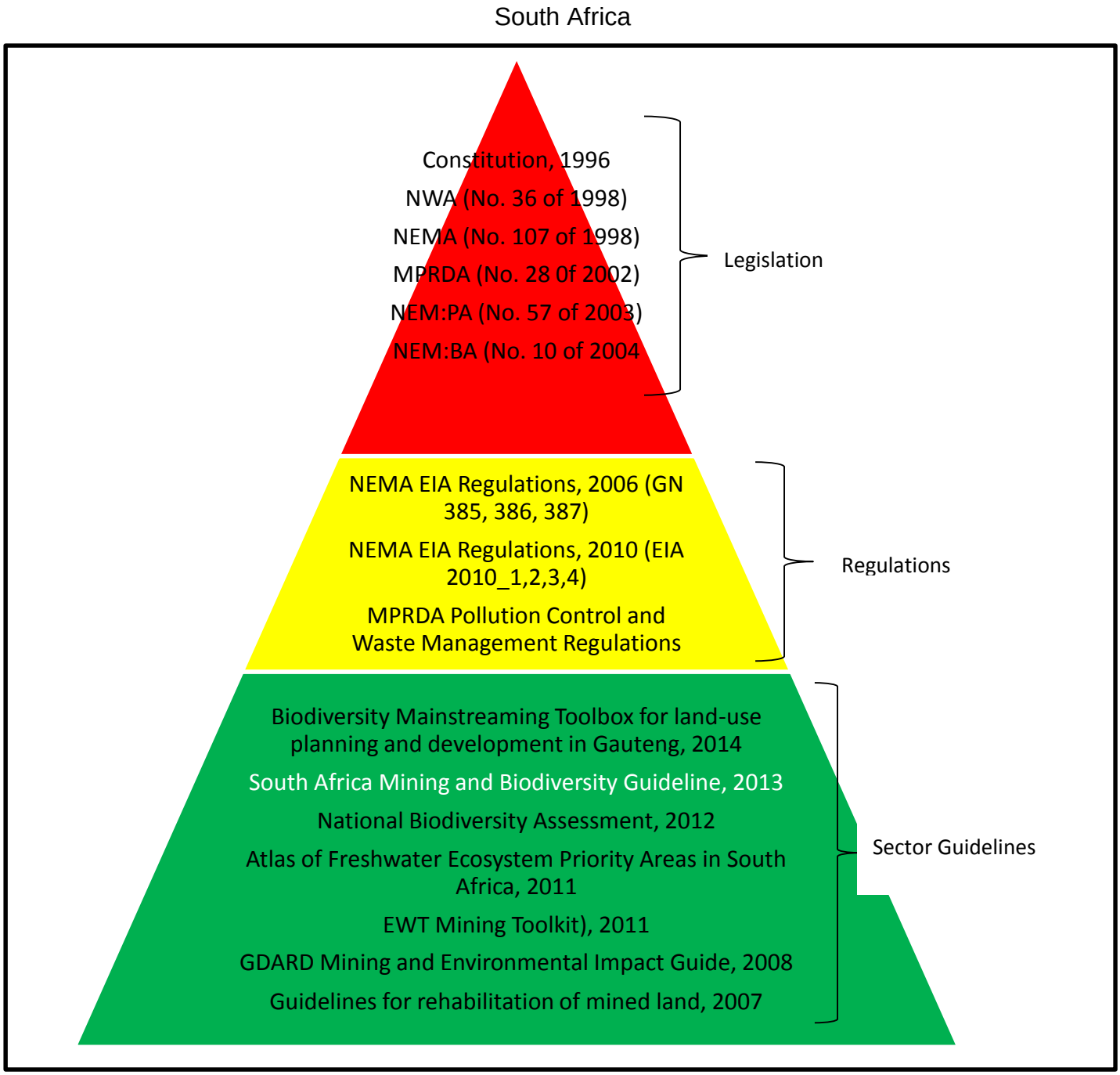


Figure 6: The applicable legislation, frameworks and sector guidelines and policies for conserving biodiversity in the mining sector in South Africa

Acronym	Full Name
Constitution	The Constitution of the Republic of South Africa, 1996
NWA	National Water Act (No. 36 of 1998)
NEMA	National Environmental Management Act (No. 107 of 1998)

NHRA	National Heritage Resources Act (No. 25 of 1999)
MPRDA	Mineral Petroleum Resources Development Act (No. 28 of 2002)
NEMPAA	National Environmental Management: Protected Areas Act (No. 57 of 2003)
MPRA	Municipal Property Rates Act (No. 6 of 2004)
NEMBA	National Environmental Management: Biodiversity Act (No. 10 of 2004)

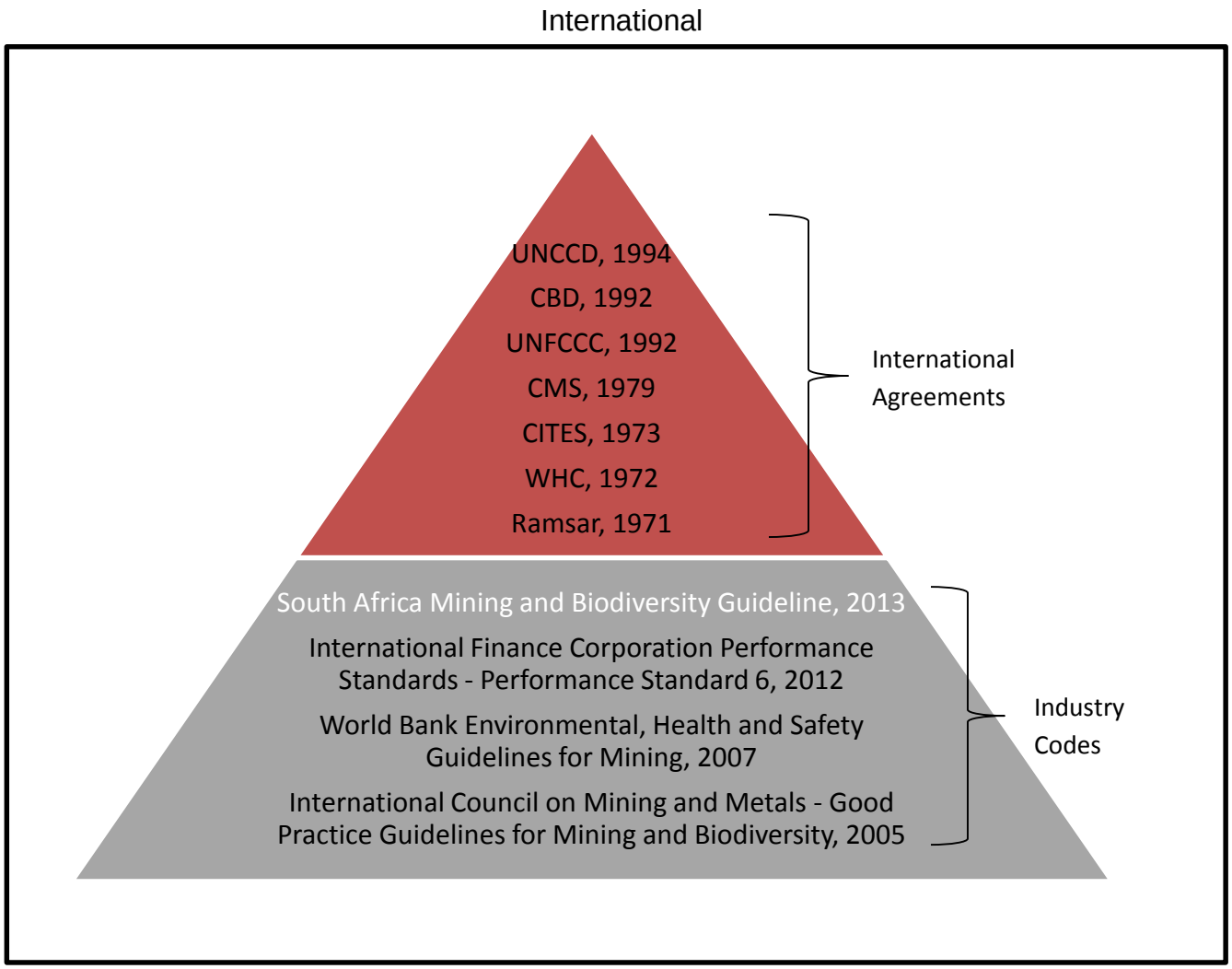


Figure 7: International guidelines and standards for conserving biodiversity in the mining sector

Acronym	**Full Name**
UNCCD	United Nations Convention to Combat Desertification, 1994
CBD	Convention on Biological Diversity, 1992

UNFCCC	United Nations Framework Convention on Climate Change, 1992
CMS	Convention on the Conservation of Migratory Species of Wild Animals, 1979
CITES	Convention on International Trade in Endangered Species, 1973
WHC	World Heritage Convention, 1972
Ramsar	Convention on Wetlands, 1971

The above results show that the guideline is at the level of sector guidelines not legislation and regulations. The guideline logically differentiates South Africa's priority areas to openly inform both the public and private sectors about the risks of mining operations in priority areas. The guideline therefore levels the field for all mining companies by collecting key biodiversity information and presenting it in an accessible, simple and user-friendly manual which is practically easily to implement by all. The guideline was developed on strong scientific foundations which provides a single repository of information for mining industry to refer to. In as much as the guideline was developed through a broad stakeholder support it also emphasises the importance of an effective and thorough interested and affected parties consultation process which enables relevant authorities to implement and enforce laws, assist mining companies to conform with laws, adopt best practice and minimise business risk and communities to approve of the mining projects and award 'social license to operate'. It highlights the value of monetary, reputational, stakeholder and affiliation for mining companies in embracing a risk-focused outlook to managing biodiversity. The six guiding principles of the guideline are applicable to regulating the biodiversity impacts of mining activities globally.

The key to protecting and conserving biodiversity lies in adhering and complying with all the applicable environmental legislation and regulations. It should be noted that non-compliance has consequences to both the developer and the environment. The guideline is a practical tool that can be used to guide how a project is executed hence is it proactive. It should be noted that the SAMBG has aspects that refer directly to South Africa's legislation making it a relevant tool for the South African mining industry. The guideline has no legal standing hence it falls within sector guideline. This guideline is best practice meaning its proper implementation has desirable benefits for all stakeholders and it is

critical to conserving biodiversity. It should be noted that since biodiversity has no boundaries and there is no universally applicable legislation to all countries therefore the Convention on Biodiversity was inspired by the world's pledge to sustainable development and its purpose is to promote conservation of biodiversity by all member nations and also collaborate with international agreements. Apart from the convention there are also international agreements as well international best practice guidelines and standards which contributed immensely to the development the guideline and are listed in Figure 7 above. The guideline borrows some concepts from other industry codes such as International Council on Mining and Metals - Good Practice Guidelines for Mining and Biodiversity; World Bank Environmental, Health and Safety Guidelines for Mining; and not limited to the International Finance Corporation Performance Standards.

South Africa has an extensive policy and legislative framework concerning the environment, from the Constitution all the way through to guidelines and plans (SANBI, 2014). The South African legislation on biodiversity listed in Figure 6 above was utilised in this study as it was seen to be relevant to the mining industry, it was used in the development of the guideline and it ensures implementation and enforcement of policy and legislation. It should be noted that this network of legislation is geared towards sustainable development and the conservation and management of South Africa's rich biodiversity. The SAMBG therefore contribute to the compliance with legislation and regulations for conservation of biodiversity in the mining sector as it emphasises the need to apply the law as an administrative requirement in order to acquire the necessary approvals. It does not exempt the user from complying with the relevant pieces of legislation (SAMBG, 2013).

The guideline emphasises on the mitigation hierarchy encouraging scheduling for biodiversity across the lifespan of the mine from exploration to closure. Such a methodology guarantees that biodiversity is considered as a core business issue hence a mining company can appropriately manage and minimise biodiversity impacts and efficiently offset any residual impacts. The guideline therefore complements existing guidelines and tools as it borrows information from them not only to reflect the changing industry value but to highlight the potential for improvement in industry practice especially

in attempts to strike a balance between economic growth and environmental sustainability. The role of the guideline is to support the incorporation of biodiversity issues into the mining life cycle rather than a set of rules which can be used separately without clarification, cross-examination and link with the situation (SAMBG, 2013).

The guideline is aligned with both national and international standards and it is a tool that can be used to meet national biodiversity conservation targets as well as international obligations. This could be seen in results in Table 1 where the guideline was observed to address the Aichi Biodiversity Targets. Considering fundamental principles and the content of the guideline, it can be noted that is a tool that can also be replicated in other countries in the region with certain exceptions though, which may include the political climate and strength of civic society movement in that particular country (Kyngdon-McKay *et al*., 2014). It can be then said that the guideline contributes and is positioned well within national environmental legislation, guidelines, tools and international agreements as well as best practice guidelines and standards.

5 Conclusion and Recommendation

The motivation behind this research was to advise EP FI whether they should require their clients to implement the guideline, in addition to the existing requirements of the PS. In order to make a recommendation, the two, the guideline and the PS, were compared. This has however been problematic primarily due to the different 'level' of the two documents. Whilst the overarching objective, to include biodiversity considerations in development, is the same, the performance standard is more strategic, generic and geared towards company management. Although it is voluntary it has expectations or measurable outcomes that a company are required to meet, report on and be audited against. Standards help to ensure uniformity across industry concerning to application of particular expertise. The guideline, on the other hand, is a practical tool developed to assist and guide implementation. It is specific to mining in South Africa, and although also voluntary, does not require reporting and compliance audits. On reflection, these different levels were not adequately understood and considered when designing the research question.

Regardless of this, the research has indicated that there is alignment between the Aichi Biodiversity Targets, South African national environmental legislation, the Performance Standard and the guideline. They all aim to achieve the same thing, the conservation and sustainable use of biodiversity, but at different levels. They thus provide different requirements levels of detail, ranging from aspirational and strategic to practical and implementable. The findings from this research indicate a significant overlap between the Performance Standards and the guideline, however the guideline provide the detailed, practical guidance, links to legislation and other resources, that an implementer would require – the environmental manager of a specific mine, for example.

In addressing the original motivation of this research, the researcher would recommend to Equator Principles Financial Institutions that they advise their clients seeking funding for mining projects in South Africa to use the guideline. The guideline is specifically designed for the South African mining industry, covers the entire mining lifecycle, is

detailed, practical and offers guidance on how operations can be conducted. One gap that is covered by PS is that of the supply chain, this is not addressed in the guideline.

Perhaps as valuable as the guideline document itself, has been the process to develop and disseminate the guideline. The South African Mining and Biodiversity Forum have brought many different stakeholders around the table - mining industry, academic institutions, practitioners, non-governmental organisations and, critical to its success, the involvement of the two governments departments responsible for mining and biodiversity. All these different stakeholders viewed risks to biodiversity differently and it is the development of the guideline that enabled all stakeholders to have a common understanding of the threats to biodiversity caused by their actions. In rolling out the guideline, training has been provided to a range of individuals, including regulators, environmental consultants and mine employees. This is in line with Target 1 of the Aichi targets, to make people aware of the value of biodiversity and address the causes of biodiversity loss. The key to reducing loss of biodiversity lies in collaborating and partnerships, the guideline encourages cooperation within and between different sectors to achieve sustainable development. Most notable has been the collaboration between government departments which has always been a huge challenge.

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