

Managing biodiversity in a developing country mining context

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Abstract

South Africa is one of the most biologically diverse countries in the world. However, biodiversity is suffering under the huge demand for natural resources and the increasing dependence of rural communities on these same resources. It has also become apparent that an alarming number of species are threatened, endangered or even destroyed. Surveys have revealed that 34% of the country's 440 terrestrial ecosystems are threatened. The three severest threats to biodiversity are overexploitation, overgrazing and mining.

There is however a range of international, regional, national and local laws and best practice guidelines that aim to protect and preserve the natural faunal and floral diversity of the various rural areas and regions. The prescription of sustainable practices enables communities that depend on the services of ecosystem in their area, to utilise without depleting the resources provided by nature. South Africa is a signing party to more than seven conventions and treaties that either protect or govern biodiversity. In addition to this, the South African government has promulgated eighteen pieces of legislation and guidelines to protect and govern the use of biodiversity.

The focus of this study was on the impacts platinum mining have on biodiversity and how effectively these impacts are managed. Data for the case study was obtained from Impala Platinum. Impala leases its land from the Royal Bafokeng Nation and inter alia shares it with the people who use the areas in between for grazing and other subsistence activities.

The aim of the study was, in the first place to identify how Impala Platinum's Environmental Management Plans (EMP's) and Closure Plan (which manages current and post mining activities and their impacts) are aligned with the various international, national and local requirements for biodiversity management, and secondly to evaluate the effectiveness of the current management measures put in place, which regulates activities impacting on biodiversity.

To give effect to the above outcome it was necessary to first identify the various international, national and local treaties, legislature and guidelines. Secondly, an environmental risk assessment was conducted where the current management measure were weighed against the various international, national and local requirements in order to deduce the level of effectiveness of the current EMP's and Closure plan. It was found that the majority of the EMP's compiled under the Environmental Conservation Act No. 73 of 1989 (ECA) lack substantive management and preventative measures. It was only in the later EMP's (between the years 2000 – 2004) that the prescribed management measures improved and became more effective. This was because the Environmental Impact

Assessment (EIA) process had matured in South Africa and an entire new regime of more descriptive EIA regulations had been promulgated under the National Environmental Act No. 107 of 1998, which repealed the majority of the outdated ECA regulations.

It was also found that the environmental standards, management objectives and priorities that were developed in the EMP's did not contingently and specifically reflect the conditions in relation to the environmental, developmental and biodiversity contexts to which they apply. The Closure plan on the other hand, was a regurgitation of the same unimaginative objectives focusing on remedying past legacies instead of providing a lasting solution to sustain and improve the environmental conditions left by the mine, and most importantly it does not address the social issues that result from mine closure. For example, the overexploitation and overgrazing of the areas in between the various mining operations by the Royal Bafokeng Nation's people is a crucial aspect that has not been thoroughly addressed in the respective documents. Habitat disturbance, which was not addressed for instance, requires a wide range of actions e.g. educating local communities on pasture management, post-rehabilitation monitoring, amelioration etc.

To improve compliance with current legislation and adherence to the guidelines proposed by best practice initiatives, various recommendations are put forward to control both the negative activities brought on by the Royal Bafokeng and Impala Platinum. These include the implementation of: Biodiversity (inclusive) impact assessment, good environmental governance, the precautionary approach, the ecosystems approach, sustainable biodiversity management practices through conservation planning, biodiversity action plans, stewardship and land care tools, conservation plans, biodiversity offsets, effective mine closure planning and the forming of a Biodiversity Action Steering Committee (BASC).

Finally, an eight step model is proposed as a tool to evaluate the effectiveness of specifically the platinum mine's EMP's and Closure plans to manage activities affecting biodiversity. The model is based on the concepts of direct and indirect drivers of change and the Deming cycle and is an elaboration of the model proposed by UNEP and the International Association of Impact Assessment. The model focuses on both the natural and anthropogenic drivers that may affect biodiversity and will aid the management of a mine to supplement the shortcomings of these documents. As an indirect outcome the model may possibly even improve, the relationship between the specific company and the communities with which it shares its land.

Key words:

Environmental Management Plans, Closure plans, Mining, Community and Biodiversity.

Opsomming

Suid-Afrika is een van die mees biologies diverse lande ter wêreld. Hierdie biodiversiteit ly egter onder die groot aanvraag na natuurlike hulpbronne en die toenemende afhanklikheid van landelike gemeenskappe op hierdie hulpbronne. Dit het duidelik geword dat 'n ontstellende aantal spesies bedreig of selfs totaal vernietig word. Opnames het getoon dat sowat 34% van die land se 440 terrestriële ekostelsels bedreig word. Die drie grootste bedreigings vir biodiversiteit is oorverbruiking, oorbewyding en mynboubedrywighede.

Ten opsigte van bogenoemde bedreigings is daar internasionale -, streeks -, nasionale - en plaaslike wetgewing en -riglyne wat daarop gemik is om die verskeie landelike areas en streke se natuurlike fauna en flora diversiteit te bewaar en behoue te laat bly. Deur die voorskrif van volhoubare praktyke word gemeenskappe wat afhanklik is van die produkte wat ekostelsels verskaf, in staat gestel om daardie hulpbronne op so 'n manier te benut dat dit nie uitgeput word nie. Suid-Afrika is 'n ondertekenaar van meer as sewe konvensies en verdrae wat biodiversiteit reguleer of beskerm. Daarbenewens het die Suid-Afrikaanse regering agtien stukke wetgewing met gepaardgaande riglyne gepromulgeer wat as beskermingsmaatreëls die menslike impak op biodiversiteit reguleer.

Die fokus van hierdie studie is op die impakte van die platinum-mynbedryf op biodiversiteit en hoe effektief sulke impakte bestuur word. Die data vir die gevallestudie is verkry van Impala Platinum. Impala huur grond by die *Koninklike Bafokeng Nasie* terwyl die huurgrond steeds met die stamlede, gedeel word. Die stamlede gebruik die areas tussen die verskeie mynbou-areas vir weivled en ander bestaansaktiwiteite.

Die doel van hierdie studie is in die eerste plek om te bepaal of Impala Platinum se Omgewingsbestuurplanne (OBP's) en Sluitingsplan (SP) (wat die impak van die huidige en na-sluitingsaktiwiteite reguleer) in ooreenstemming is met die verskeie internasionale, nasionale en plaaslike vereistes vir biodiversiteitsbestuur en in die tweede plek om die effektiwiteit van die huidige bestuursmaatreëls wat die impakterende aktiwiteite moet reguleer, te evalueer.

Om hieraan uitvoering te gee was dit eerstens nodig om die verskeie internasionale, nasionale en plaaslike wetgewing, verdrae en riglyne te identifiseer. Tweedens is 'n omgewingsrisiko-analise gedoen wat die huidige bestuursmaatreëls opweeg teen die verskeie internasionale, nasionale en plaaslike vereistes om die vlak van effektiwiteit van die myn se OBP's en SP te bepaal.

Daar is gevind dat die meerderheid van die OBP's wat saamgestel is onder die Wet op Omgewingsbewaring Nr. 73 van 1989 (WOB) 'n gebrek het aan substantiewe bestuurs – en

voorkomingsmaatreëls. Dit was eers in die latere OBP's (wat tuseen die jare 2000-2004 saamgestel is) wat die effektiwiteit van die bestuursmaatreëls begin verbeter het. Die rede hiervoor is dat die Omgewingsomvangsbepalingsproses (OOB) meer 'volwasse' geword het sedert die nuwe regime van meer beskrywende OOB regulasies wat onder die Wet op Omgewingsbestuur Nr. 107 van 1998 gepromulgeer is. Dit het grootendeels die verouderde WOB en sy regulasies vervang.

Dit is ook bevind dat die omgewingsstandaarde, bestuursdoelwitte en prioriteite wat vir die OBP's ontwikkel is, nie voorwaardelik en spesifiek die toestande in verhouding tot die omgewings, ontwikkelings en biodiversiteitskonteks waarin dit saamgestel en van toepassing is, gereflekteer het nie. Die Sluitingsplan aan die ander kant het dieselfde verbeeldinglose doelwitte herhaal wat daarop gemik was om naletenskappe reg te stel eerder as om blywende oplossings te voorsien wat die omgewingstoestande kan volhou of verbeter wat deur die myn agtergelaat word. Die belangrikste is egter dat die SP nie die sosiale kwelpunte aanspreek wat nagelaat word deur die sluiting van die myn nie. Byvoorbeeld, die oorverbruik en oorbewyding van die areas tussen die verskeie mynareas deur die lede van die *Koninklike Bafokeng Nasie* is 'n uiters belangrike kwelpunt wat nie duidelik aangespreek word in die OBP's en SP nie. Habitatversteuring wat nie in die SP bespreek is nie, vereis 'n wye verskeidenheid aksies wat dit kan hanteer, bv. die opvoeding van die plaaslike gemeenskap in wyveldbestuur, die toepassing van na-rehabilitasie monitering, korrekte bemestingspraktyke op gerehabiliteerde areas, ens.

Om die huidige wetgewing se vereistes na te kom en aan riglyne se voorstelle te voldoen word die volgende voorstelle gemaak om beide die *Koninklike Bafokeng Nasie* en Impala Platinum se aktiwiteite te beheer. Dit sluit onder andere in die implimentering van: 'n eksklusiewe biodiversiteitsomvangsbepaling, goeie omgewingsbestuurpraktyke, 'n voorkomingsbenadering, 'n ekostelselbenadering, volhoubare biodiversiteitsbestuurspraktyke deur bewaringsbeplanning, biodiversiteit aksieplanne, rentmeesterskap en landskapsorgnudsprogramme, bewaringsplanne, biodiversiteitsverplasing, effektiewe mynsluitingsplanne en die vorming van biodiversiteit aksiebegeleidingskomitee.

Laastens is 'n model met agt stappe ontwikkel wat as instrument kan dien om die effektiwiteit van die platinummyndryf se OBP's en SP's ten opsigte van hulle vermoë om aktiwiteite wat 'n impak het op biodiversiteit te bestuur. Die model is gebaseer op die konsep van direkte - en indirekte dryfkragte van verandering en die sogenaamde Deming-siklus. Dit sluit ook 'n uitbou van die model in wat deur die 'UNEP' en die 'International Association of Impact Assessment' voorgestel word. Die model fokus op die natuurlike en

antropogeniese dryfkragte wat biodiversiteit kan beïnvloed. Dit sal help om die myn se bestuursbenaderings te verbeter deur tekortkominge soos in bogenoemde dokumente aan te vul. As 'n indirekte uitkoms van hierdie model kan dit ook die verhouding tussen 'n maatskappy en die gemeenskap wat dit beïnvloed en wat 'n moontlike medeverbruiker van grond is, verbeter.

Sleutelwoorde:

Omgewingsbestuursplanne, Sluitingsplanne, Mynbedryf, Gemeenskap en Biodiversiteit.

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Glossary of Abbreviations:

ACHPR: African Commission on Human and People’s Rights.

ACHPR: The African Charter on Human and People’s Rights.

APA: Agricultural Pests Act.

BAP: Biodiversity Action Plan.

Bonn: Convention on the Conservation of Migratory Species of Wild Animals.

CARA: Conservation of Agricultural Resources Act 43 of 1983.

CBD: Convention on Biological Diversity.

CCNRR: The Convention on the Conservation of Nature and Natural Resources.

CEM: Centre for Environmental Management.

CHRUP: Centre for Human Rights University of Pretoria.

CITES: Convention on International Trade in Endangered Species.

DEAT: Department of Environmental Affairs and Tourism (now Department of Environmental Affairs).

DoA: Department of Agriculture.

DWAF: Department of Water Affairs and Forestry South Africa (Now Department of Environmental Affairs).

ECA: Environment Conservation Act No. 73 of 1989.

EIA: Environmental Impact Assessment.

EMF: Environmental Management Frameworks.

EMP: Environmental Management Plan.

GCS: Groundwater Consulting Services.

GMOA: Genetically Modified Organisms Act No. 15 of 1997.

ICMM: International Council on Mining & Metals.

IUCN: International Union for Conservation of Nature.

MEE: Metago Environmental Engineers Ltd.

MPRDA: Mineral and Petroleum Resources Development Act 28 of 2002.

NBSAP: National Biodiversity Strategy and Action Plan.

NBSAP: National Biodiversity Strategy and Action Plan.

NEMA: National Environmental Management Act 107 of 1998.

NEMBA: National Environmental Management: Biodiversity Act 10 of 2004.

NEMPA: National Environmental Management: Protected Areas Act 57 of 2003.

NES: Ntumbuluko Environmental Services.

NFA: National Forests Act 84 of 1998.

NSBA: National Spatial Biodiversity Assessment.

NWA: National Water Act 36 of 1998.

NWBSID: North West Biodiversity Site Inventory & Database Development.

NWDACE: North West Department of Agriculture, Conservation and Environment.

OAU: Organisation of African Unity.

PBSAP: Provincial Biodiversity Strategy and Action Plan.

PWCLE: Protocol on Wildlife Conservation and Law Enforcement.

RAMSAR: Convention on Wetlands of International Importance especially as Waterfowl Habitat.

RBN: Royal Bafokeng Nation.

REDCO: Rehabilitation Design and Construction.

RIEMP: The Rustenburg Local Municipality Integrated Environmental Management Policy.

RSEA: Rustenburg Strategic Environmental Assessment.

SADC: Southern African Development Community.

SANBI: South African National Biodiversity Institute.

SCP: Systematic conservation planning.

SDF: Spatial Development Frameworks.

SEA: Strategic Environmental Assessments.

SES: Strategic Environmental Services.

SRK: Steffen, Robertson & Kirsten Consulting Engineers and Scientists.

UNCCD: United Nations Convention to Combat Desertification.

UNCED: United Nations Conference on Environment and Development.

UNEP: United Nations Environment Programme.

UNGA: United Nations General Assembly.

1 Chapter 1: Introduction

1.1 Context and historical perspective

South Africa is one of the most biologically diverse countries in the world. The country holds approximately 24 000 plant species of which 10 000 are endemic, but approximately 2000 of those are threatened (Driver *et al.*, 2005: 11). Key business and economic levels and -processes depend directly and indirectly on the natural ecological services that biodiversity provides. (Bishop *et al.*, 2008: 17). Humans benefit not only from biodiversity's contribution to material welfare and livelihood but also from the direct or indirect influence it has on their security, resilience, social relations, health, freedom of choice and actions (Agardy *et al.*, 2005: IV).

Humanity's impact on biodiversity is increasingly becoming apparent through the alarming rate at which species are threatened, endangered or even destroyed (Bishop *et al.*, 2008: 17). Humans have increased species extinction rates by as much as 1000 times over the past few hundred years (Agardy *et al.*, 2005: 3). Biggs *et al.* (2004: VI) state that "*the largest immediate threat to biodiversity is the expansion of degraded lands into areas currently under sustainable use*". Bishop *et al.* (2008: 17) support this statement by affirming that land transformation (e.g. farming, mining, forestry, etc.) is decreasing habitat size as population sizes and resource demand increase.

In the case of South Africa, the impact on biodiversity is significant. South Africa's National Biodiversity Strategy and Action Plan show that 34% of the country's 440 terrestrial ecosystems are threatened. Of these, 5% are critically endangered (mainly in the fynbos and forest biomes), 13% are endangered (mainly in the grassland and savanna biomes) and 16% are vulnerable (mainly in the fynbos and grassland biomes). In addition to this, 82% of the one hundred and twenty signature river systems are threatened. Almost half (44%) are critically endangered, while 27% are endangered, 11% are vulnerable and 18% are classified as "least threatened". Of South Africa's 34 marine biozones, 65% are threatened, 12% are critically endangered, 15% are endangered, 38% are vulnerable and 35% are regarded as "least threatened" (DEAT, 2005: 14-15).

The following factors contribute to the major loss of biodiversity in South Africa, the North West Province and the Impala Platinum lease area: alien invasive species, land degradation and habitat fragmentation, climate change, overexploitation, mining, agriculture and urbanisation. These causes of the degradation of biodiversity will be discussed more thoroughly in the third chapter.

However, another significant impact on the environment and a key focus of this study is the uncontrolled use of plant species by indigenous people for nutritional, cultural, medicinal, religious and other purposes. Wynberg (2002: 233-234) argues that since 1994 conservation in South Africa has moved squarely into the socio-political arena concerned with human rights, access to natural resources, equity and environmental sustainability. The onus for the conservation of biodiversity has shifted to the individual. It is now the responsibility of the citizens themselves to manage and utilise biodiversity in such a way that the entire South African society may benefit from it. Biggs *et al.* (2004: IV & 42) agrees and states that the underprivileged and rural communities who always relied on ecosystems in their immediate surroundings to supply in their basic needs, are now protected by the adoption of more integrated, sustainable and equitable policies to redress the issue of defective sectoral approaches to resource management in the past.

In cases where land belonging to indigenous people is leased to mining companies, the mine has to comply with legislation relating to the conservation of biodiversity. However, in many cases, the local community are still living on the land, and they continue to use species according to their cultural beliefs and historical rights. The consequence is that the mining companies do not have total control over the conservation of biodiversity in their lease areas, for which they continue to be legally responsible. Mine management has come to realise that they have a corporate social responsibility towards the communities that directly and indirectly benefit from the operations of the mines, and are therefore continually attempting to conserve biodiversity through community engagement programmes.

Due to the significant contribution it makes to the South African economy, mining in this country has always been seen as “untouchable”. The impact it has is however equivalent to the cumulative effect of dairy farming, dryland farming as well as irrigated cropping. The negative influence of mining is also ranked fourth after urban settlements, the timber industry and rural settlements (O’ Connor & Kuyler, 2006: 4). A better understanding of the reasons for the loss in biodiversity have, however, led to intensified efforts to conserve biodiversity. Internationally, the main instrument developed to aid and improve biodiversity conservation is the Convention on Biological Diversity (CBD). In South Africa the National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) and the National Environmental Management: Protected Areas Act 57 of 2003 (NEMPA) are the core protectors of biodiversity and sensitive areas. All of these acts are based on the principles of the National Environmental Management Act 107 of 1998 (NEMA).

The Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA) which specifically regulates mining in South Africa, is also linked to the principles of NEMA. The MPRDA is a new and somewhat radical piece of legislation related inter alia to the environmental and socio-economic aspects of mining. What is important is that the MPRDA requires that the principles set out in Chapter 1(2) of the National Environmental Management Act 107 of 1998 have to be applied to all mining activities (Maze *et al.*, 2004: 3). These principles are:

- A. Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- B. Development must be socially, environmentally and economically sustainable.
 - a) Sustainable development requires the consideration of all relevant factors including the following:
 - i. That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
 - ii. That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
 - iii. That the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
 - iv. That waste is avoided or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
 - v. That the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
 - vi. That the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;
 - vii. That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and

- viii. That negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented are minimised and remedied.
- b) Environmental management must be integrated acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.
- c) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.
- d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.
- e) Responsibility for the environmental health and safety consequences of a policy, programme, project, product process, service or activity exists throughout its life cycle.
- f) The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding skills and capacity necessary for achieving equitable and effective participation and participation by vulnerable and disadvantaged persons must be ensured.
- g) Decisions must take into account the interests needs and values of all interested and affected parties, and this includes recognizing all forms of knowledge including traditional and ordinary knowledge.
- h) Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.
- i) The social, economic and environmental impacts of activities, including disadvantages and benefits must be considered assessed and evaluated and decisions must be appropriate in the light of such consideration and assessment.

- j) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.
- k) Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.
- l) There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment.
- m) Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.
- n) Global and international responsibilities relating to the environment must be discharged in the national interest.
- o) The environment is held in public trust for the people. The beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.
- p) The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.
- q) The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.
- r) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores estuaries, wetlands and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

In order to comply with all legal and other requirements, Environmental Management Plans (EMP's) and Closure plans relating to the mining sector have to be compiled and submitted to the regulator, which is mainly enforced through the MPRDA. Mining companies can be held accountable if they do not adhere to the objectives and associated management measures as specified in these documents. However, in terms of biodiversity, these documents don not in all cases adequately address biodiversity management practices and are predominantly compiled with a view to providing strategic biodiversity goals with few concise and quantifiable outcomes.

It is therefore necessary to evaluate the ability of EMP's and Closure Plans to manage the impacts on biodiversity effectively and thus to ensure its conservation. Only by providing clear-cut managerial steps regarding biodiversity can specified targets and objectives be achieved. If these precise guidelines are in place, companies will know exactly what is expected of them and they can in all fairness be held accountable for those targets and objectives.

The main objective of this research is therefore to develop a comprehensive model that can be used to evaluate the affectivity of EMP's and Closure Plans in mitigating or managing the impact, which the mining activities will have on the various aspects of biodiversity. Impala Platinum's EMP and Closure plan will be used as a case study to develop the model. Apart from the model, the results of this research will also provide an assessment of the mine's compliance with all biodiversity requirements, as well as possible steps to be followed by the mine in cases of non-compliance.

1.2 Research questions

From the above discussion, the following main research question can be formulated:

"Is it possible to develop a model to assess the compliance of a Platinum mine with all legal and other requirements with respect to biodiversity management"?

The above question presupposes answers to the following sub-questions:

1. What are the requirements for managing biodiversity on an international, national, regional and local level?
2. What are the typical direct and indirect impacts of a platinum mine such as Impala Platinum on biodiversity?
3. What does Impala Platinum do to conserve biodiversity?
4. Is Impala Platinum currently in compliance with all requirements related to biodiversity, and if not, what additional measures should be implemented?
5. Which criteria, based on the requirements of biodiversity management, can be used to develop a model which can be used as a benchmark to determine the adequacy and efficacy of a platinum mine's biodiversity protection measures?

This mini-dissertation commences with a literature study in which international, national and regional guidelines, treaties and legislation applicable to biodiversity conservation and management will be discussed. From this literature study the various gaps in Impala Platinum's EMP's and Closure plan will be indentified where there is a lack in efficacy to manage and conserve biodiversity conservation. Secondly, a

description will be given of the various impacts Impala Platinum has on biodiversity, as well as the main causes of these impacts. Thirdly, recommendations will be made on how to address the shortcomings identified in chapter 2. Finally, from the assessment in Chapter 2 criteria will be developed that can be utilised to create a model with which the current biodiversity management actions as described in the EMP's and the Closure Plan of Impala Platinum will be assessed.

1.3 Research Methodology

In order to answer the 5 research sub-questions, the following methodologies will be employed:

1.3.1 Question 1

In order to determine an international and national benchmark in biodiversity protection and conservation, a comprehensive list will be compiled from legal and other requirements in the field of biodiversity on all levels. In order to manage biodiversity effectively Impala Platinum has to comply with all measures contained in the list. This will form part of the literature study for this mini-dissertation. The information gathered will also be used to compile the Environmental Risk Assessment and gap analysis.

1.3.2 Question 2

To determine the total impact of Impala Platinum on biodiversity, all reports, specialist investigations, as well as the EMP's and the Closure Plan will be used to compile a comprehensive description of the direct and indirect impacts. However, to put the impacts on the study area in perspective a description of the impacts on biodiversity in South Africa must be described first.

The significance of the impacts will also be quantified by using an Environmental Risk Assessment model based on the Australian and New Zealand Risk assessment and management model, which is used by the Centre for Environmental Management (see Appendix C).

The risk assessment process entails/follows these 8 steps:

- Step 1: Description of the intention i.e. Why are we doing the risk assessment?
The main goal of the risk assessment is to determine the effectiveness of the control measures that are provided in Impala Platinum's EMPs and Closure Plan to mitigate or manage the impacts that may affect biodiversity. It must be noted

that the focus will be on the controls provided in the above-mentioned documents and not on the actual implementation of these controls on the sites themselves.

- Step 2: This step entails the identification of the hazards. *'A hazard is the intrinsic potential for an agent, activity or process to lead to an incident, or ongoing condition'* (CEM, 2009: 3.1-1). For example, the process of servicing machines or equipment might be a hazard because it may lead to the contamination of water or soil when oil is accidentally spilled.
- Step 3: In this step, the consequences will be identified (i.e. the impacts). The impacts or consequences are the results of a hazardous process, for example soil pollution.
- Step 4: In step 4 a risk matrix (see Appendix C) will be used to identify the severity and the likelihood/probability of the consequence/impact. Severity is indicated on the Y-axis from A to F, where A is indicated as Catastrophic and F as Low risk or insignificant. Probability/likelihood is indicated on the X-axis from G to L, where G is Highly unlikely and L is Regular.
 - Step 4.1: Selecting the severity of the probable impact (A-F) on the Y-axis.
 - Step 4.2: Selecting the probability/likelihood (G-L) on the X-axis.
- Step 5: Risk estimation, where one determines the raw risk based on the results obtained from the combination of Steps 4.1 and 4.2. The raw risk is the environmental risk that the specific area or subject faces with no controls in place. For example, suppose you have chosen a severity of D (step 4.1) and a likelihood of J (Step 4.2), then the point at which the two scales meet gives a raw risk rating of ALARP.

There can be three raw risk ratings depending on the selection made:

- Intolerable, which demands immediate intervention to lower the risk.
- ALARP (As Low As Reasonably Possible), which implies that the risk is not tolerable and cannot be reduced further without the expenditure of costs that are grossly disproportionate in relation to the benefit gained (CEM, 2009: 3.1-11).
- Maintain/maintenance is the lowest possible risk rating that can be attained. This implies that the current situation, with the present level of controls, must be maintained to avoid an increase in the level of risk.

- Step 6: Here one identifies the current levels of control that are in place. Secondly, the relevant national, provincial or regional legislative requirements must be documented, and thirdly the international, national or regional best practice or guidelines must be documented.
- Step 7: In this step one determines whether the current levels of controls comply with the various identified requirements. This step will facilitate the identification of the residual risk. The residual risk is the level of risk present with management controls in place.
- Step 8: This is the final step where one determines the residual risk based on the current levels of controls in place and the compliance of these controls with the various statutory requirements. The same procedure as described in steps 4 and 5 is followed to determine the residual risk.

1.3.3 Question 3

The Management steps currently implemented by Impala Platinum in accordance with their EMP's and Closure Plan to minimise the impacts on biodiversity will be described based on the Environmental Risk Assessment that has been compiled when answering Question 2. Following the identification and analysis of the management measures, a gap analysis will be done to identify shortcomings in management's measures.

1.3.4 Question 4

The gaps identified in the gap analysis will be addressed by implementing appropriate additional measures and by positive action from management. This will enable the mine to assign additional resources (capital and/or human) in order to close the gaps and effectively and continually manage and monitor the various impacts that have been identified.

1.3.5 Question 5

The proposed model for the evaluation of biodiversity management effectiveness for mines is based on the concepts of direct and indirect drivers of change, the so-called Deming cycle, and is an elaboration of the model proposed by UNEP and the International Association of Impact Assessment. The model focuses on both the natural and anthropogenic drivers of change that may affect biodiversity. It differs from the UNEP-model in that it is designed for the platinum mine sector, although further studies and adaptations may lead to the application of the model to the other

mining sectors. It provides a framework for assessment and guides the user through 8 phases to evaluate the measures taken in the operation's EMP's and /or Closure Plans (See Figure 7 and 8):

1. Phase 1: Planning
2. Phase 2: Appraisal of possible impacts [Plan] – HIPPO
3. Phase 3: Assigning a value to biodiversity [Plan]
4. Phase 4: Determining physical and economical interventions [Plan]
5. Phase 5: Mitigation [Do]
6. Phase 6: Alternatives and Re-establishment [Do]
7. Phase 7 Evaluation of the proposed measures [Check]
8. Phase 6: Management and maintenance

The various phases are divided into a prescribed sequence, which is based on the closed loop of the Deming cycle. The Deming cycle is based on the principle of continual improvement, which forms the basis of the ISO 14001: 2004 standard or Environmental Management System. It has four phases, which are interlinked in a closed loop (Figure 1):

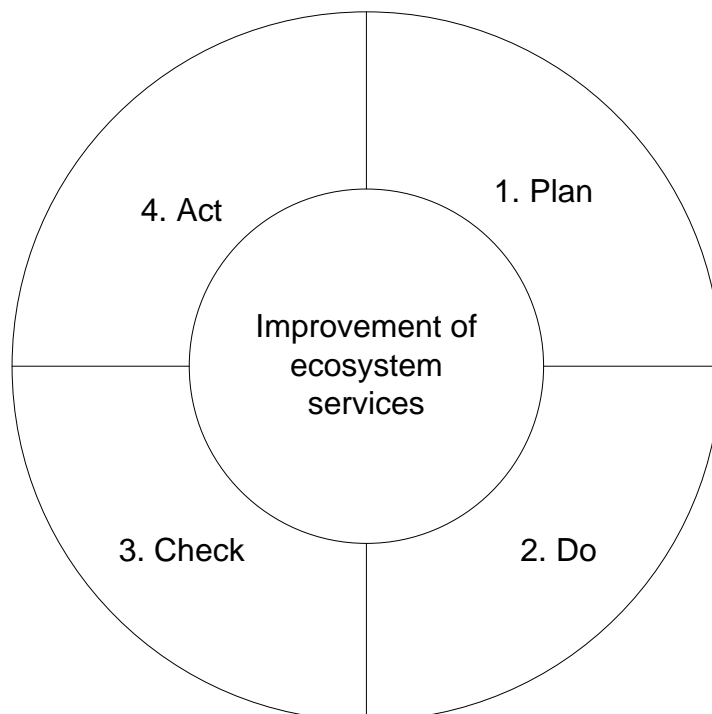


Figure 1: The Deming Cycle (CEM, 2008: 5-3)

1. Plan:

In this phase, the goal is to understand the gaps between expectations (legislative, best practice etc.) and what is currently delivered or achieved and what the risks are if the organisation does not intervene and the present state of affairs continues. Priorities must be set within an action plan (CEM, 2008: 5-3) to close the identified gaps.

2. Do:

The recommended changes must now be implemented in order to close the gaps and data should continually be collected to determine whether the gaps are closing (CEM, 2008: 5-3).

3. Check:

The effectiveness of the actions implemented must be verified and monitored and defects pinpointed where they exist (CEM, 2008: 5-3).

4. Act:

The results of the implemented actions must be studied in order to redesign these actions for improved outcomes (CEM, 2008: 5-3).

The methodology described above is designed for implementation in the Platinum mine industry, but further research and refinement can lead to an improved model with application possibilities in other types of mining operations. For a full description of the model process, see Chapter 5.

2 CHAPTER 2 – International, National and Regional requirements for managing biodiversity

The condensed review of literature in this chapter focuses on biodiversity management and will provide a general background to the brief context outlined in the introduction. These sources are comprised of guidelines, treaties and legislation on a regional, national and international scale. The chapter also contains an overview of current known impacts on biodiversity and the effectiveness of the practices mines currently employ when aligning operational procedures with the statutory required environmental management plans (EMP's).

Analysis of this guiding documentation, current practice and identified impacts will facilitate the identification of gaps in current biodiversity management practice in site specific areas such as the impacts relating specifically to the mining sector which is relevant to this study. The outcome will provide a model for evaluating management documentation (EMP's and Closure plans) specifically compiled for the mining sector to evaluate their effectiveness in managing biodiversity. The current practice as it transpires from the literary research will be used in conjunction with the findings of the gap analysis to create the model for evaluating EMP's and Closure plans. Appendices A and B provide a more detailed description of all the relevant guidelines, laws and policies applicable to a terrestrial mining company such as Impala Platinum.

2.1 International documents on biodiversity

According to Devine (2009: 126), international law regulates the relationships among states (also known as interstate law). One of the primary functions is to preserve and protect each state's rights and to ensure that they perform their duties. States have their own instruments (legislation) to enforce their provisions, usually through the three spheres of government: the legislature (usually the parliament, who enacts the law), the judiciary (usually the courts, who enforce the law) and the executive branch (usually the president and the cabinet, who enforce the decisions made and actions taken by the judiciary and legislature). International law functions and is enforced differently. Because there is no executive international government or judiciary, it relies upon the sovereignty¹ of states in the enforcement of international provisions (Devine, 2009: 127). On an international level, the following documents have been compiled:

¹ According to Viotti and Kauppi (2001: 510) a sovereign state can exercise internal sovereignty over its own territory and external sovereignty over its relations with other states. No-one has the mandate to tell a state how to conduct its domestic and foreign affairs. Although some states differ in the power they possess, they are equal in terms of sovereignty.

- **The Convention on Biological Diversity (Signed: June 1993 Ratified: 2 November 1995 by South Africa):**

This is a principle document that is used for referral and legislative development regarding biodiversity, its conservation and management. Its principal objectives are:

- The conservation and sustainable use of biological diversity, and
- The fair and equitable sharing of benefits arising from its utilisation.

The guiding objectives of the convention are contained in Articles 6 to 20. The key provisions contained in the articles are:

- Measures for the conservation of biological diversity,
- In situ and ex situ conservation;
- Incentives for the conservation and sustainable use of biological diversity,
- Research and training;
- Public awareness and education; impact assessment of the projects;
- Regulating access to genetic resources;
- Access to and transfer of technology; and
- The provision of financial resources for conservation (CBD, 1992).

- **Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR) (Signed and ratified on 12 March 1975):**

In essence, this convention aims to stem the loss and promote the sustainable use of wetlands. The convention addresses a major issue in the country i.e water loss by promoting its conservation. Through the provisions of this convention, South Africa designated 16 sites to the List of Wetlands of International Importance (DEAT, 2002).

Wetlands provide a range of essential ecological services needed for the survival of not only biodiversity but also humans. They are the repositories of indispensable ecological treasures. The conservation and sustainable use of wetlands are therefore in the interest of all South Africans (DEAT, 2002).

The convention encourages the conservation of wetland habitats, and provides a framework for international cooperation for wetland conservation because many of these systems cross the boundaries of countries (DEAT, 2002).

- **1992 Rio Declaration on Environment and Development**

The Rio Declaration on Environment and Development, also known as the Rio Declaration, was a short document produced at the 1992 United Nations Conference on Environment and Development (UNCED) (or the Earth Summit). Its main goal was to create a new partnership between states, international organisations and key sectors to create an understanding of the need for harmonising development and the environment. From the proceedings of the conference 27 principles, intended to guide sustainable development around the world were formulated (UNGA, 1992).

- **The International Council on Mining & Metals (ICMM) – Good practice guidance for mining and biodiversity:**

In May 2003, the ICMM Council approved a set of sustainable development principles and committed its corporate membership to measure performance against them. One of the principles explicitly addresses the conservation of biodiversity: **“Principle 7: Contribute to conservation of biodiversity and integrated approaches to land use planning”** (ICMM, 2006: 9).

The document was prepared in response to this commitment and is aimed at providing the mining industry with the steps required to improve biodiversity management throughout the mining cycle. By adhering to these guidelines, mining companies would be able to:

- Identify and evaluate biodiversity,
- Understand the interfaces between their activities and biodiversity,
- Assess the likelihood of their activities having negative impacts on biodiversity,
- Develop mitigation measures for potential impacts on biodiversity and rehabilitation strategies for affected areas, and
- Explore the potential to contribute to biodiversity enhancement or conservation (ICMM, 2006: 9).

- **ICMM – Planning for integrated mine closure: Toolkit:**

This document/toolkit promotes a more disciplined approach to integrated closure planning and the promotion of uniformity of good practice across the mining sector. The concepts presented apply uniformly to both large and small operations. However, it is not intended to be prescriptive; it provides a suite of tools that can be brought to bear in formulating well-considered decisions when planning for closure.

It uses a risk and opportunity based process to guide the practitioner through the iterative process of preparing for planned closure. (ICMM, 2008:6). The integration of biodiversity in closure planning is of great importance. It will ensure that ecosystem will continue functioning after rehabilitation and closure by setting certain social and technical measures in place to ensure this.

Other international treaties and conventions that are applicable to biodiversity but are not deemed important for this study include:

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn)
- Convention to Combat Desertification (UNCCD),
- World Heritage Convention (WHC),
- Stockholm Convention on Persistent Organic Pollutants,
- The African Charter on Human and People's Rights,
- Protocol on Wildlife Conservation and Law Enforcement, and
- The Convention on the Conservation of Nature and Natural Resources.

2.2 National documents

There are two main approaches to environmental law; Anthropocentrism, which is a human-centred approach and Biocentrism, which is a life-centred approach (Glazewski, 2005: 7).

Anthropocentrism holds that our duties towards the natural world are determined by the duties we have towards our fellow human beings. This places humans at the focal point of all that exists on the planet. Anthropocentrism is reflected in Chapter 1 section 2(2) of NEMA, which states: "*Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.*" (Glazewski, 2005: 7).

On the other hand, Biocentrism holds that all living organisms owe their intrinsic value to their membership of the earth's community. It focuses on our independent duties towards all living things rather than our collective duty towards humanity. Therefore, we must take precaution and consider our potential impacts on all living things before taking action (Glazewski, 2005: 7). This principle is also contained in the NEMA's Chapter 1 section 4(b), which states: "*Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option*". Both of these principles drive environmental law in South Africa.

There are, however, national policies that also provide guidance and are enforceable, such as the National Strategic Biodiversity Action Plan or the National Water Strategy, which provides specific actions to be taken regarding the management of biodiversity and water in South Africa. Such documents usually provide more precise guidance regarding management of certain elements such as biodiversity or water.

The following is a summarised account of the legislation and national guidelines for biodiversity that are applicable to biodiversity management in South Africa.

- **National Environmental Management Act 107 of 1998:**

NEMA is the primary framework for environmental legislation in South Africa and therefore most of its provisions are relevant to biodiversity (Glazewski, 2005: 281). The primary function of the Act is to promote national environmental interests through the provision of institutional structures and legal mechanisms to provide for environmental protection and sustainable utilisation (Glazewski, 2005: 135). The sections of the act that refers specifically to ecosystems and biodiversity are: S2(4), S23(2), S28(10 and S30(3)-(5).

- **National Environmental Management: Biodiversity Act 10 of 2004:**

NEMBA was promulgated in June 2004 and most of its provisions came into effect on the 1st of September 2004. The Act revolutionised the way biodiversity was regulated in South Africa (Glazewski, 2005: 268). The main and overall purpose of the Act is:

- To provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA,
- The protection of species and ecosystems that warrant national protection,
- The sustainable use of indigenous biological resources,
- the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources,
- The establishment and functions of a South African National Biodiversity Institute (South Africa, 2004).

- **Conservation of Agricultural Resources Act 43 of 1983 (CARA):**

This is South Africa's main piece of agricultural legislation; it contains a number of control measures relevant to biodiversity, the most important of which is the control of weeds and invader plants (Glazewski, 2005:285). In the process of

rehabilitation this act is one of the main documents applicable to post operational care.

The act's main objective is the provision of control over the utilization of the natural agricultural resources of the country in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith (South Africa, 1983). Sections to take into account here are S5(1)&(5),

- **Agricultural Pests Act 36 of 1983 (APA):**

This act together with CARA applies to rehabilitation practice and general land management practice. This Act provides measures to control plants and prevent plant diseases (Glazewaki, 2005: 289). The most important section to take into account here is S5.

- **National Environmental Management: Protected Areas Act 57 of 2003:**

The main objective of the act is to provide for a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity. This system was devised to ensure the protection of the entire range of biodiversity, including both natural landscapes and seascapes (Glazewaski, 2005: 340). Section 48 specifically focuses on mining in protected areas.

- **Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA):**

This Act came into effect in May 2004 and is the central piece of legislation regulation mining activities in the country. It places great emphasis on sustainable development and environmental protection (Glazewski, 2005: 466). These provisions are explicitly expressed in objective (h) and (i) of the Act which gives effect to section 24 of the Constitution, by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development. In addition, it is the objective of the act to ensure that holders of mining and production rights contribute towards the socio-economic development of the areas in which they are operating (South Africa, 2002). The most important Section of this Act is section 37, which relates to the environmental management principles.

- **National Water Act 36 of 1998 (NWA):**

The NWA repeals and replaces various previous Acts that deal with water. In conjunction with the Water Services Act the country now has a holistic and cohesive regulatory body for water (Glazewski, 2005: 432).

The main purpose of this Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account, amongst others, also factors relating to biodiversity:

- The promotion of efficient, sustainable and beneficial use of water in the public interest,
- The protection of aquatic and associated ecosystems and their biological diversity,
- The reduction and prevention of pollution and degradation of water resources,
- The meeting of international obligations,
- The managing of floods and droughts, (South Africa, 1998).

Important sections that relate to biodiversity and mining are S19(1) & (2), S20(3) & (4), S21(a)-(k), S37, S118(1), S117(c) and GN.R. 704.

- **National Spatial Biodiversity Assessment (NSBA):**

The NSBA was commissioned by the DEAT as part of the National Biodiversity Strategy and Action Plan. This document consists of four components, dealing with terrestrial, freshwater, estuarine and marine environments. Each of these components' current status and protection levels is assessed and priorities for conservation are identified. The conservation actions to be taken are not limited to protected areas but includes the wise management of land and natural resources throughout the landscape and seascape (Driver *et al*, 2005: v).

- **National Biodiversity Strategy and Action Plan (NBSAP):**

The NBSAP sets out a framework and a plan of action for the conservation and sustainable use of South Africa's biological diversity and the equitable sharing of benefits derived from this use. This document was prepared by the DEAT, from 2003 to May 2005 (DEAT, 2005: 4).

The result of this study is a set of strategic objectives, outcomes and activities necessary to achieve the goals of conservation, sustainable use and equity. An implementation plan was developed that sets out high priority activities which are aimed at the achievement of the objectives. The leading agents, partners, targets and indicators are also indicated. Long-term, fifteen year targets have been set for the strategic objectives, while five-year objectives have been set at the outcome level (DEAT, 2005: 4).

The main objective of the strategy is to ensure the conservation and management of terrestrial and aquatic biodiversity and the sustainable and equitable benefits to the people of South Africa, now and in the future (DEAT, 2005: 28). There are also five other strategic objectives. It is required that biodiversity programmes, plans and policies are aligned with these objectives. Therefore, although all these targets and requirements are directed towards national, provincial and local governments, most of them will also be applicable on a smaller or medium scale (depending on an organisation's size) to organisations that have an impact on biodiversity. These strategic objectives (SO's) each possesses specific outcomes or targets that include the following:

- An enabling policy framework must be established that will integrate biodiversity management objectives into economic objectives,
- Enhanced institutional effectiveness and efficiency must be developed to ensure good governance regarding biodiversity,
- Integrated terrestrial and aquatic management systems must be established to minimise the impacts of threatening processes on biodiversity, to enhance ecosystem services and improve social and economic security,
- Human development and well-being must be enhanced through sustainable use of biological resources and equitable sharing of the benefits, and
- Conservation areas that conserve a representative sample of biodiversity must be established to maintain key ecological processes.

Other national documents that are applicable to biodiversity but are not deemed important for this study include:

- Genetically Modified Organisms Act No. 15 of 1997,
- National Forests Act 84 of 1998,
- Plant Breeders' Rights Act 15 of 1976,
- Plant Improvement Act 53 of 1976,
- National Veld and Forest Fire Act 101 of 1998,
- Report on Land Degradation in South Africa (1999),
- Best Practice Guidance for Biodiversity-inclusive Impact Assessment (2008),
- Guidance Document on Biodiversity, Impact Assessment and Decision Making in Southern Africa (2006), and

- South Africa's State of the Environment (2007).

2.3 Regional documents

Because the study area is situated in the North West province and the Rustenburg local municipality the documents discussed will be applicable to this regional setting.

- **North West Biodiversity Site Inventory & Database Development (NWBSID):**

This document was compiled in response to international and national requirements for managing land in a sustainable manner by using sound environmental management practices. The project was administered by Strategic Environmental Focus (SEF) and the Finish Environmental Institute (SYKE) for the North West Provincial Government (NWDACE, 2004: 11).

A synergistic approach was used to focus on species and diversity of ecosystems to quantify these entities in an electronic database. No such coherent database for species distribution within the North West Province previously existed and therefore, the project had a pragmatic approach to collate, classify, and extrapolate the existing data to specific taxa (flora, mammals, avifauna, herpetofauna, ichthyofauna, macro-invertebrates and Lepidoptera) (NWDACE, 2004: 11). Specific management objectives are also provided for these various taxonomic groups.

- **Rustenburg Strategic Environmental Assessment:**

Due to Rustenburg's accelerated growth and development its natural and human resources have come under increasing pressure. The situation has led to social as well as environmental problems such as the expansion of informal settlements, sub optimal infrastructure, pressure on the boundaries of the Kgaswane Mountain Reserve and a loss of biodiversity and heritage resources. Because of these threats it was of paramount importance that to embark on strategic environmental planning to ensure sustainable development (Eco assessments, 2003: 2).

The outcome was a Strategic Environmental Assessment (SEA). This strategic document formulates plans and programmes for these specific environmental problems. It proactively underpins the consideration of environmental issues with strategic decision-making (Eco assessments, 2003: 2). The Rustenburg SEA sets specific management objectives for Surface water quality, Ecological systems, Birds, Herpetofauna, Lepidoptera, Mammals, Riverine Wetlands, Endorheic Pan Wetlands, Exotic Vegetation, Sensitive plants (Red Data, Protected and Medical Plants), and Other invertebrates.

- **Strategic Environmental Assessment for the Royal Bafokeng Nation (RBN): Ecology:**

As part of the implementation of the Strategic Development strategy, a need for a strategic level environmental assessment was identified. The strategic level plan was initially labeled a Strategic Development Plan (SDP), with the aim of integrating environmental, social and economic issues into a single development plan. Following an SDP workshop held with key stakeholders in the RBN, a decision was taken to limit the scope of the study to an SEA, focusing on the environmental component (biophysical elements of the environment and their relationship to socio-economic conditions in the RBN) (Hoare, 2008: 7)

This assessment involved the collection and interpretation of ecological data (i.e. fauna and flora, sensitive and/or threatened ecosystems and species) of the Impala Platinum lease area to be used as:

- An aid in the identification of key issues
- Indicator of sustainability objectives and criteria.
- A resource inventory.
- Indicator of relevant environmental opportunities and constraints.
- A tool to provide input into means and measures that can be utilised for the management of the environment.

The outcome of this study was an action list accompanied by motivations for taking the listed actions for the various identified issues. However, it seems as though the RBN has not acted on the proposals concerning the lease area yet.

- **North West Province Biodiversity Conservation Assessment Technical Report:**

The purpose of this document is to finalize the first biodiversity conservation assessment version for the North West Province which will be used to inform the development of the Provincial Biodiversity Sector plans, bioregional plans, and also be used to inform Spatial Development Frameworks (SDF's), Environmental Management Frameworks (EMFs), Strategic Environmental Assessments (SEAs) and the Environmental Impact Assessment (EIA) process in the province. This report summarizes the results of the biodiversity assessment which has been conducted. Detailed summaries of the analyses performed are contained in the appendices (Desmet, Schaller, & Skowno, 2008: 1).

However, since it provides a map of critical biodiversity areas it is also an important management tool. It forms the basis for the development of a biodiversity sector planning document in line with SANBI's guidelines on the development of bioregional plans. It also contains recommendations for biodiversity management that need to be incorporated into a conservation plan for the province in the form of a Provincial Biodiversity Strategy and Action Plan (PBSAP).

- There is a host of other national and regional guidelines that inform biodiversity management guidelines and provide the status of biodiversity either on national or regional scale. These documents include:
- The Rustenburg Local Municipality Integrated Environmental Management Policy,
- Northwest Province Environment Outlook: A report on the state of the environment (2008),
- Rustenburg Local Municipality State of the Environment Report (2007),
- Provincial Fact Sheet: Land degradation North West (1999),
- North West Province State of the Environment Report: Overview (2002),

2.4 Requirements of Impala Platinum's EMP's and Closure Plan

The various requirements set out in Impala Platinum's EMP's are mostly generic. Therefore, a combination of the various requirements² was made and where a difference in management action occurs, it was noted. The following subjects are evaluated: Topography, soils, land capability, land use, natural vegetation, animal life, surface water, groundwater, and sensitive landscapes. Each of these subjects has distinct aspects listed under them along with their possible impacts (see Table 1). For each group of impacts a generic set of objectives/requirements must be met. To view the complete table of aspects, impacts and objectives see the Environmental Risk Assessment in Appendices C. For example:

² It must be noted that at the time of the study, Impala Platinum was in the process of applying for a coalesced EMP, which would combine all the requirements of all the various EMP's into one single regulatory document.

Table 1: Example of EMP requirements for Environmental Risk Assessment

Current level & classification of controls or combinations of controls	Effectiveness of current combinations of controls	Applicable Legal Requirements
<p>The following control measures will be employed:</p> <ul style="list-style-type: none"> • The top 900 mm of soil will be conserved where possible. • Topsoil will be stockpiled separately during stripping. • Concurrent rehabilitation will take place to minimise loss of topsoil. • Impala has a topsoil management procedure in place (MEE, 2005: viii). 	<p>Impala's management measures are sufficient for the shaft complexes. Nonetheless, the other areas are being degraded by overgrazing, which will cause even more erosion because these open areas are larger than the shaft complexes.</p>	<p>The following legal requirements apply:</p> <ul style="list-style-type: none"> • Constitution S24(a) & (b). • NEMA S2(4)(a)(vi), S2(4)(b), S2(4)(h), S2(4)(r), S23(2)(a) & (b), S28(1) & 30(4), S2(4)(a)(i), S30(3) & (5). • MPRDA S37(1) & (2). • NWA S19(1) & (2).

2.5 Limitations in the EMPs and Closure plan

The main shortcoming that transpired from all the exclusions in the EMP's and the Closure plan was that the environmental standards, management objectives and priorities that were developed (specifically the EMP's) do not contingently and specifically reflect the conditions relating to environmental, developmental and the biodiversity contexts to which they apply. Appendix A and B provides a 'yard stick' whereby the different requirements of the EMP are measured against the various requirements of international and national documents relating to biodiversity. When examining this comparison between requirements set by the EMP's and Closure Plan on the one hand and legislation and international best practice on the other in the Gap Analysis (see Appendix D), it becomes clear that some of the objectives provided in the EMP's are too tolerant and do not allow for concise decision making and action. The following objective set for the No. 14 Shaft EMP, might serve as an example: *"Remove topsoil and subsoil from the site. Establish areas for the topsoil and subsoil stockpiles and design the stockpiles so that the topsoil can be used for rehabilitation purposes when the sites are decommissioned (MEE, 1999: (6-1))"*. The objective omits several important aspects: no reference is made to specifics such as compaction alleviation, specific stockpile heights, placement methods etc.

The Closure plan on the other hand, was a regurgitation of the same unimaginative objectives focusing on remedying past legacies instead of providing a lasting solution to sustain and improve the environmental conditions left by the mine, and most importantly it does not address the social issues that result from mine closure. Habitat disturbance, for instance, requires a wide range of actions e.g. educating local communities on pasture management, post-rehabilitation monitoring, amelioration etc.

The implication of the present situation is that the mine will leave without attending to its legacy, which is not in line with its policy and vision. If no pre-emptive identification of issues relating to degradation takes place, no provisional plans can be developed to combat them. “Rehabilitation” has become a convenient phrase that is used as the solution to all mining legacies. It provides a safe and comfortable option for environmental companies as well as the mining industry since it is much more demanding to provide creative and innovative solutions to minimise liabilities as soon as possible. Another major concern is that rehabilitation plans are compiled separately from EMP’s. In essence, these documents must communicate with each other in such a way that objectives are aligned to meet environmental, social and economic targets. Currently these documents narrowly focus on the dismantling of structures and on planting grass and not on providing communities with post-mining soil that they can utilise in a way that is both economically and environmentally sustainable.

In some instances, mines avoid their responsibility by focusing only on the direct impact of mining activities. Environmental management plans tend to protect the mining company by either restricting the responsibility to the area where the mine has a direct impact³; or by describing their responsibility in vague terms so that the final decision concerning the scope of their responsibilities still rests with the mines themselves. This is not entirely the case with Impala where provision is made for addressing impacts beyond the mine’s limit of control. For example; where it is required to improve the quality of water at one of their points of discharge into the Leragane stream, they commit themselves to minimise the impact on downstream water users and to cooperate with Omnia who is a co-polluter in order to minimise the impact.

However, mines have recently started to align their EMP’s with management tools such as BAP’s and Conservation Plans in order to move towards a document that focuses more on its original function, namely Environmental Management and not operational management. This will, in some instances, require an entire ‘renovation’ of an EMP, but with adequate post monitoring and enforcement, it will lead to more effective management of the environment. Thus, in order to achieve true environmental management quality that reaches limits far beyond those that can be achieved through rehabilitation, the mindset of management within companies and the environmental industry must shift towards proactive thought and action rather than constant ‘crisis control’.

³ An area of impact refers to the area of land, which is occupied by operations it can be scattered or concentrated i.e. a single shaft, a plant or a tailings facility. When all these occupied areas are all added together an area of impact is obtain. This excludes areas surrounding the affected areas.

3 CHAPTER 3 – Direct and indirect factors that impact on biodiversity in South Africa and on Impala Platinum

Our understanding of the value of biodiversity has improved in recent years, so too has our comprehension of significant threats to it. Biodiversity is currently suffering from pressures and losses which in turn have a dramatic effect on the invaluable and irreplaceable services which the ecosystem provides. Over the past 50 years, several ecosystems have been degraded at an ever increasing rate. The incline in population growth has brought with it an even greater demand for natural resources (International Council on Mining and Metals (ICMM, 2006: 11)

Hassan *et al.* (2005: 79) contend that many ecosystem services are under greater pressure locally than internationally. The reason for this as stated above, is that human communities depend for their wellbeing on populations of species that are accessible to them. It is because of this that people generally lack the necessary knowledge of biodiversity. A delicate interdependence exists between the species and their environment i.e. large animals, temperate systems, and components of biodiversity used by them to survive. There is an alarming ignorance among the populace, especially regarding the status of biodiversity on a regional and even national level. According to Tyler Miller (2007: 62) human activities are threatening biodiversity at all levels. Biodiversity has either been eliminated or degraded to such an extent that it is on the brink of extinction. However, species currently become extinct sooner rather than later due to lack of adaptation to the rapid change in environmental conditions. Studies such as the 2005 Millennium Ecosystems Assessment indicate that the current extinction rates are a 100-10 000 times higher than the natural rate. The acronym Hippo is used to portray the five major causes of species decline and premature extinction:

- **Habitat destruction and degradation** which is the most important cause,
- **Invasive species** that we introduce either deliberately or by accident,
- **Pollution** which is the lead cause for global climatic change,
- **Population growth.** Our ever increasing numbers coupled with an increase in resource consumption have a negative effect on wild species and natural areas,
- **Overexploitation,** which includes the overhunting of species for their skins, tusks, meat and other parts that are used for medicines. By implication the resources that wild species depend on to survive are likewise overexploited.

The five indicators of the HIPPO model are clearly evident in the current situation of the Impala platinum mine. This will transpire more clearly later in this chapter.

To put the biodiversity issues of the study area into context one must first view them in a broader context (internationally, nationally and on a regional level). This broader perspective has a direct or indirect bearing on the situation in the lease area. The five major factors contributing to decline and loss of biodiversity have been clearly defined in the HIPPO model above and will therefore be referred to in no specific order.

The environmental issues that exist between the North West Province, Rustenburg Local Municipality and the Royal Bafokeng Mining Complex (which Impala Platinum's lease area forms part of) the issues are very similar. The North West Province stretches over a total area of 116 010 km², making it the sixth largest province in the country. Approximately 3.4 million people inhabit the Province and the population is still growing at a rate of 3-4% per annum. Most (65%) of the people in the Province reside in rural areas. However, the rate of urbanisation is increasing (especially in Rustenburg), largely due to the lack of employment opportunities in rural areas (Walmsley & Walmsley, 2002: 3). The Rustenburg municipal area covers approximately 3 500 km². This area is one of the richest and most diverse natural resource bases in the country (NES, 2005: iii).

The Royal Bafokeng Mining Complex covers an area of 102 664 hectares. Urban areas, including rural settlements, residential and commercial areas and roadways, constitute just over 9.2% of the area. These consist of a number of urban nodes scattered throughout the area. Currently 3.3% of the area is cultivated; however, on the basis of topocadastral information, an additional 26.2% of the area was previously cultivated. Mines and quarries constitute the final major transformation types and make up 2.5% of the surface of the area (Hoare 2008: 30).

The conservation of plant and animal species must be seen within a certain context, especially regarding richness of species. The North West Province in particular does not contain a high level of species richness compared to other provinces, such as the Western Cape. The South African National Biodiversity Institute (SANBI) has launched a programme known as the Threatened Species Programme, which will determine the status of species in the country (NWDACE, 2008: 112).

According to this programme and the International Union for Conservation of Nature (IUCN), there are eight threatened plant taxa in the Province. Of these, two are endangered and six are vulnerable. Since the previous State of the Environment Report in 2002, an additional 25 plant species have been added to the list of species of special concern (NWDACE, 2008: 112).

A collaborative effort between the Endangered Wildlife Trust and the IUCN's Conservation Breeding Specialist Group resulted in the updating of mammal species in the Red Data List category. Because of this initiative, more data is available regarding threatened mammal species in the Province. For instance, large mammals considered to be threatened occur largely in protected areas. However, smaller threatened mammals such as the white-tailed mouse (*Mystromys albicaudatus*) and the rough-haired golden mole (*Chrysothalpus villosus*) do not occur within natural open unprotected areas and are subjected largely to anthropogenic activities (NWDACE, 2008: 115).

Reptilian, avian, butterfly and fish species face the same dangers. Although there is an abundance of habitats for threatened species such as the African Giant Bullfrog (*Pyxicephalus adspersus*), the Bataleur (*Terthopius ecaudatus*), Morant's Blue (*Lepidopchrysops hypopolia*), and the Rock Catfish (*Austroglanis sclateri*), these habitats are threatened by human activities in their vicinity. Especially in wetland and riparian habitats where Bull Frogs live, people destroy the natural vegetation to collect medicinal plants and the water quality of not only these habitats but also the effected rivers have deteriorated to such an extent that species become seriously threatened or endangered (NWDACE, 2008: 115, 117 & 118).

These figures and information underlines the importance of prioritising species according to their conservation status and of protecting them accordingly. Sufficient conservation areas within the breeding grounds of the various species must be set aside to ensure their protection and future survival. However, government has launched several programmes to combat these issues such as South Africa's National Biodiversity Strategy, the Climate Change Response Strategy and the National Action Programme to Combat Land Degradation and Alleviate Rural Poverty

In order to grasp the challenges facing the Impala Platinum lease area, one has to consider the broader context. Therefore, both the direct and indirect challenges facing biodiversity in South Africa will be highlighted. The five elements of the HIPPO model will be evident with one addition, which will be explained below in 3.2. However, it is necessary to put the importance of biodiversity into context in order to grasp the severity of the impacts on it. An account of the valuation methods will be provided as well as an explanation of the necessity to value biodiversity. A full account of the particular calculated value of biodiversity in the Impala Platinum lease area does not form part of this study. Nonetheless, one can deduce this value from accounts given of the status of biodiversity in South Africa and the Impala Platinum Lease area.

3.1 The value of biodiversity

Determining the value of biodiversity is a complex matter. One must first look at the constituent parts of biodiversity. Various ecological-economists divide the valuation into three categories, i.e. goods, services and attributes. These three entities can be defined as follows:

- **Goods** are concrete resources that can be harvested, such as water, minerals, and food.
- **Services** are processes that directly or indirectly contribute to economic productivity. Such services would include the purification of water by wetlands or the nursery function of estuaries that contribute to fisheries.
- **Attributes** relate to the structure and organisation of biodiversity. These benefits are less tangible, such as beauty, rarity, diversity, and can also have spiritual, educational or cultural values (Turpie, 2009: 44).

The Millennium Ecosystem Assessment has gone a step further and classified the services provided by ecosystems as follows:

- **Provisioning services**, such as food and water;
- **Regulating services**, such as flood and disease control;
- **Cultural services**, such as spiritual, recreational and cultural benefits; and
- **Supporting services**, such as nutrient cycling (Turpie, 2009: 44).

The first three services fit well within the context of goods, services and attributes. The fourth service does, however, create some confusion because it is sometimes double counted in valuation studies. Nevertheless, the underlying services provide the platform for other services to exist and continue.

In the following section there will be differentiated between the qualitative and quantitative values of biodiversity. It must be noted that the calculation of these two values does not form part of the study. Only the concepts per se will be discussed and supporting information will be provided. In a refined form these concepts and proposed calculation methods provide useful tools for further research.

3.1.1 Qualitative value

Environmental and resource economists usually use the concept of “total economic value” to determine the value of an ecosystem. It qualifies as qualitative as this is

based on perceptions of what the value of biodiversity is. This tool consists of the following components:

- **Direct use values:** These values are generated through the consumptive or non-consumptive use of resources and directly relate to the goods supplied by ecosystems (e.g. wood and food) and their attributes (e.g. bird watching), be it for recreational, commercial or for sustenance purposes. These values are predominantly generated on a local scale.
- **Indirect use values:** These values are derived from the ecosystem services described above. These values are generated from outputs from ecosystem services that are inputs for other economic sectors, such as the water purification by wetlands. These values are predominantly generated on a regional to global scale.
- **Option and non-use values:** This is the option to use ecosystem resources because they are currently protected. These often intangible benefits are usually in the form of conservation areas where genetic diversity is being preserved. These values are predominantly generated on a regional to global scale (Turpie, 2009: 47).

Determining the qualitative value of biodiversity is a complicated matter. Qualitative value is determined by how people value the importance of biodiversity and ecosystem services based on either their physical or physiological dependence there on. For example, those residing in cities and even large towns may place a lesser physical value on biodiversity than those living in rural areas because people living in rural areas are more dependent on the services and resources biodiversity provides for their livelihoods than those living in cities.

The scenario can be reversed where people living in cities and larger towns place a larger aesthetic value on biodiversity because they are not as much exposed to it as rural communities. Rural communities can also place a high spiritual value on biodiversity because it can form part of their traditions and beliefs. It becomes quite complicated and therefore each scenario needs to be assessed on its own to determine the sampling methods to be used in determining the value of biodiversity and ecosystems in specific areas.

3.1.2 *The quantitative value of biodiversity on the Impala Platinum lease area*

As with the qualitative valuation of biodiversity, the quantification of biodiversity on Impala Platinum's lease area does not form part of this study. However, the various

concepts of quantification will be discussed and an account of the species richness will be given. It is useful to quantify biodiversity when an organisation or individual wants to know exactly how many species there are on a specific property and how these various species interact with each other. The first index that needs to be calculated is the index relating to species richness. According to Stirling & Wilsey (2001: 286) species richness is the number of species in a specific area. It is currently the most widely used diversity measure where different species and their numbers are physically counted using a range of methods. Without focusing on the process of calculating species richness two of the most common equations or indices used in calculating species richness according to Magguran, (1988: 11) are:

a) The Margalefs Diversity index: $D_{Mg} = (S-1)/\ln N$; and

b) The Menhinick's index: $D_{Mn} = S/\sqrt{N}$

Note: D equals the measure of species richness; S or S-1 equals the total number of species recorded; and N or ln N equals the total number of individual organisms in the sample

Diversity is a community attribute related to stability, productivity, trophic structure, and migration. However, the way we measure diversity presumes the importance of abundance, the nature of relationships between richness and abundance, and possibly whether communities are open or closed. Relative species abundance in a community is measured with a standardized index of species abundance (evenness or equitability) that typically lies on a scale ranging from near 0, which indicates low evenness or high single-species dominance, to 1, which indicates equal abundance of all species or maximum evenness. The two most common equations or indices used in calculating species diversity according to Hill *et al.* (2007: 84) are:

a) The Shannon's index: $H = \sum(p_i \ln p_i)$; and

b) The Simpson's index: $H = 1 - \sum p_i^2$

Why is it so important to value biodiversity in the first place? There are a number of positive attributes and limitations regarding valuation. From a positive point of view, valuation can have the following benefits:

- **It justifies conservation:** The reason why sensitive ecosystems become more and more threatened is that companies that degrade them are of the opinion that damaging ecosystems is more cost effective than repairing them. However, when one starts calculating the contribution ecosystems make in the form of services they provide, the mutual benefits become apparent (Turpie, 2009: 49).

- **It can determine optimal levels of use:** The valuation of ecosystems used in conjunction with ecological-economic models is a useful tool when analysing management alternatives. This will highlight the economic consequences of, for instance, overexploitation or conservation of parts of ecosystems (Turpie, 2009: 50).
- **It can determine optimal levels of development:** Valuation can point out alternative levels of development to increase the benefits when changing developments to conserve ecosystems (Turpie, 2009: 50).
- **Designing financing systems:** Valuation can be helpful in the design of financial systems that internalise external costs that are tapped from the environment. For instance, industries use water from various sources and then discharge effluent back into these systems without actually paying the true cost of degrading the environment. By putting a value or cost on ecosystem services, those who are degrading will have to pay a certain price for making use of these services (Turpie, 2009: 50).
- **Designing incentive measures:** By valuating ecosystem services, incentives (e.g. in the form of tax rebates) can be created to encourage organisations to engage in more sustainable practices (Turpie, 2009: 50).

From a negative perspective, putting a monetary value on ecosystems and the services they provide is a very controversial practice. Some value systems are devised to accommodate and protect certain traditional users of such ecosystem services and this leads to an under-valuation of the particular ecosystem and a high degree of biodiversity loss. An obvious solution to the problem would be to convince these communities of the value of biodiversity and the contribution it can make to their livelihood. For example, by conserving enough resources, a crisis can be avoided during times of drought. However, it remains a challenge to convince people who are set in their ways of the importance of biodiversity and to educate them so that they will reduce their impacts on the environment. In spite of the difficulties, it is still preferable to put a value on biodiversity than none at all (Turpie, 2009: 50).

3.2 The status of biodiversity in South Africa and the challenges it faces.

3.2.1 Biodiversity in South Africa: Direct Challenges

Direct drivers of change or direct impacts can be identified and measured according to the following categories:

- Changes in land use and land cover,
- Fragmentation and isolation,
- Extraction, harvest, or removal of species,
- External inputs such as emissions, effluents, chemicals,
- Disturbance,
- Introduction of invasive, alien and/or genetically modified species, and
- Restoration (UNEP, 2005:10).

These factors will directly influence the surrounding environment and even have an impact on a more regional or global scale depending on its severity. The following are direct drivers of change within the South African context.

3.2.1.1 Land Degradation and Habitat fragmentation

Article 1(f) of the UNCCD (United Nations Convention to Combat Desertification) (1994) defines land degradation as the: "...reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as: soil erosion caused; by wind and/or water; deterioration of the physical, chemical and biological or economic properties of soil; and long-term loss of natural vegetation...".

Hoffman et al, (1999: 2) holds the view that land degradation has been an issue for more than a century in South Africa, and there has also been clear parallels with international developments surrounding the issue. Land degradation dates back to 1873 when a Mr. Shaw in the region of the Nama-Karoo was concerned about the impact of heavy stocking of merino sheep throughout the region. He wrote; "...the persistent and greedy system of overstocking farms has changed the flora, introduced and given undue influence to worse herbage, and bids in fair time to change the climate and, with this, the whole character of the vegetation". He added that "...the plants of the Karoo commenced to travel northwards (as a result of overstocking with merino sheep), and added their energies to the extirpating of the indigenous and proper flora of the region...extending even into the Vaal region."

DEAT (2007) and Hoffman et al (1999: 4) perceive a gap concerning reliable information as far as a holistic view of the status of land degradation in South Africa is concerned. This is because degradation was historically perceived to be limited to the Karoo region. However, enough information exists to show that areas of severe degradation and desertification in South Africa correspond closely with the distribution of communal rangelands, specifically in the steeply sloping environments adjacent to the escarpment in Limpopo, KwaZulu-Natal, and the Eastern Cape. Many communal areas in the Limpopo, North West, Northern Cape, and Mpumalanga Provinces are also severely degraded.

Other problems associated with land degradation concern soil and vegetation degradation. Soil degradation is most severe in communal areas where croplands, grazing lands, and settlement cause sheet and gully erosion extending over an area of 0.72 million hectares. Vegetation degradation inevitably follows soil degradation where the effects of overgrazing, afforestation and erosion cause shrub, bush encroachment and changes in the natural species composition since indigenous species are forced out, and alien invasive plant species take over (DEAT, 2005: 13).

In general, land degradation results in the following negative consequences: undermining of the productive potential of land and water resources, lowering of the quality of catchment areas, a negative effect on the quantity and ecological integrity of surface water resources (soil erosion causes siltation of dams and estuaries and *decreases* the stability of river banks), and an increase in the invasion by alien species due to habitat destruction of natural species.

3.2.1.2 *Alien invasive species*

DEAT (2007) estimated that over 10 million hectares of the country have been invaded by approximately 750 tree species and 8 000 herbaceous species. Of these a 1000 introduced species have now been established in the environment and 200 of these are now considered invasive. Of the listed alien vegetation 20% are categorized as 'major invaders'⁴, and a further 15% as 'emerging invaders'⁵. Of all species, plants constitute the majority of invasives in the country. They constitute 62% of the 319 species listed as harmful and threaten 55% of the Red Data-listed plants in the country. Apart from the alien

⁴ The term refers to those invaders that have widespread or localised influence, have been established over a certain period and have a significant impact on the local biodiversity in its area (Nel *et al*, 2004: 55).

⁵ Refers to those species that have only recently been introduced in a specific region be it a large or local area and fast establishing itself as a dominant species (Nel *et al*, 2004: 56).

vegetative species, there are also freshwater (e.g. Small mouth yellow fish) and marine aquatic (e.g. Mediterranean mussel), animal (e.g. Fallow Deer), fish and bird (e.g. Mallard Duck) species.

3.2.1.3 *Degradation of rehabilitated land*

Successful mine rehabilitation is dependent on many factors, two of the major issues being the short and long-term stability of the rehabilitated landform. In the short-term, erosion can lead to increased sediment loads and transport of other contaminants in downstream waterways. Long-term landform stability is also important, especially if the containment of harmful substances is necessary in the case of tailing storage facilities which contain a mix of heavy metals and other substances (Hancock, Grabham, Martin, Evans, & Bollhofer, 2006: 104)⁶. There are several contributing pre-rehabilitation practices specifically pertaining to topsoil management that can affect the resilience of these areas e.g.:

- Topsoil is stored for an extended period and rehabilitation is only attempted once the overall operation has essentially been completed. Stockpiled soil is rendered relatively sterile on account of loss of viability of propagates, oxidation of organics and hence nutrient loss (South African National Biodiversity Institute (SANBI), 2006: 9)
- When topsoil is stockpiled, it can be expected that there will not be sufficient topsoil for covering the same surface area that has been stripped. A common practice is therefore to strip a proportion of the B-horizon with the topsoil in a ratio of up to 60:40 of A:B. The soil is stored as a mixture of the A- and B-horizons. When this soil is replaced it is therefore less fertile than when it was removed (SANBI, 2006: 9)
- Soil replacement is effected by the use of heavy machinery, which leads to a degree of soil compaction. Soil compaction would reduce infiltration and plant-available water (SANBI, 2006: 9)

Post-mining land uses certainly pose the greatest threat to rehabilitated land under the following circumstances:

- Rehabilitated land is misused by the new owners or lease holders, usually farmers. They tend to heavily overgraze land and then often blame the

⁶ Originally cited from Schumm *et al* (1984).

mine in an attempt to access government compensation (Limpitlaw, Aken, Lodewijks, & Viljoen, 2005: 5).

- Rehabilitation of dumps presents an enormous challenge. They are not geologically stable landforms and in addition to the problems experienced by other rehabilitated surfaces, soil erosion is a critical factor on dumps influenced by basal cover, land use and slope (Limpitlaw, Aken, Lodewijks, & Viljoen, 2005: 6).
- Depending on the underlying geological structures and soil types, subsidence presents a danger to rehabilitated areas where sinkholes can occur and destroy large areas (Limpitlaw, Aken, Lodewijks, & Viljoen, 2005: 6).
- Water related impacts are also typically associated with dumps. These impacts are usually in the form of acid mine drainage (AMD) which can sterilise an entire area if left untreated (Limpitlaw, Aken, Lodewijks, & Viljoen, 2005: 6).
- When seed mixtures (specifically grass species) are selected for areas under rehabilitation it may happen that the species selection is wrong for a specific climatic region, resulting in low to minimal seasonal and annual growth.
- Compaction may arise in the top layer of soil due to a lack of organic matter, making it almost impossible for natural seeding to occur after the first growth season.

Where no post-monitoring and maintenance occur during the crucial first five years after rehabilitation, serious damage may occur in these areas in the form of erosion, alien invasive infestation and even uncontrolled grazing from surrounding local farmers.

3.2.2 Biodiversity in South Africa: Indirect Challenges

Indirect drivers of change are those activities or impacts, which, in an indirect way, have a (positive or negative) influence on the surrounding environment. These indirect drivers can also influence the outcomes of direct drivers'. Legislative measures that govern the use of biodiversity provide a good example of this phenomenon. These measures can have a positive effect on the conservation of specific species where traditional use or exploitation is limited by a set of criteria or they can negatively affect those communities that rely on the biological resources

for sustenance. Indirect drivers of change or indirect impacts can be identified and measured in the following groupings:

- Demographics in a society,
- An economic situation or measures,
- Socio-political influences within a community or society,
- Cultural beliefs and practices, and
- Technological processes or interventions (UNEP, 2005:10).

Indirect drivers of change within the South African context are discussed in the following section.

3.2.2.1 *Climate change*

Climate change is the sixth element that should be included in the HIPPO model. It is not a destructive element like overgrazing, but a slow and steady and sometimes violent altering element that indirectly influences the patterns, occurrence and behaviour of biodiversity across the world.

Due to rising temperatures that result from international climate change, South Africa is becoming an increasingly more attractive destination for alien invasive species. Turpie *et al* (2002: 7) contend that warming and acidification trends will result in shrinkage of the country's biomes to between 38-55% of their current combined area. Rising CO₂ levels will encourage bush encroachment, and in combination with higher minimum temperatures this will lead to a change from grassland to woodlands and savannas that will in turn cause a loss of grassland species. The study they conducted indicates that the biggest losses are occurring in the western half of the country. Their findings suggest a complete loss of the unique succulent Karoo biome by 2050, an area which is home to 5500 endemic species.

Research has shown that 17% of the 179 studied have expanded their ranges, while 80% displayed range contractions of up to 98%, and only 3% did not respond to climate change. The most significant cause of contractions was the eastward retreat from aridification in the western half of the country. Major losses of species are predicted in the Kruger National Park, with 66% probability of extinction for all the species, including 97% of bird species. However, because the models that were used in their study did not allow for the habitation of uninhabited areas due to range shifts, their estimations are much

too pessimistic (Turpie *et al*, 2002: 9). However, DEAT (2007) also contends that there is a real risk that biomes could shrink by 40% by 2050. See figure 2 for the predicted reduction of South Africa's natural biomes.

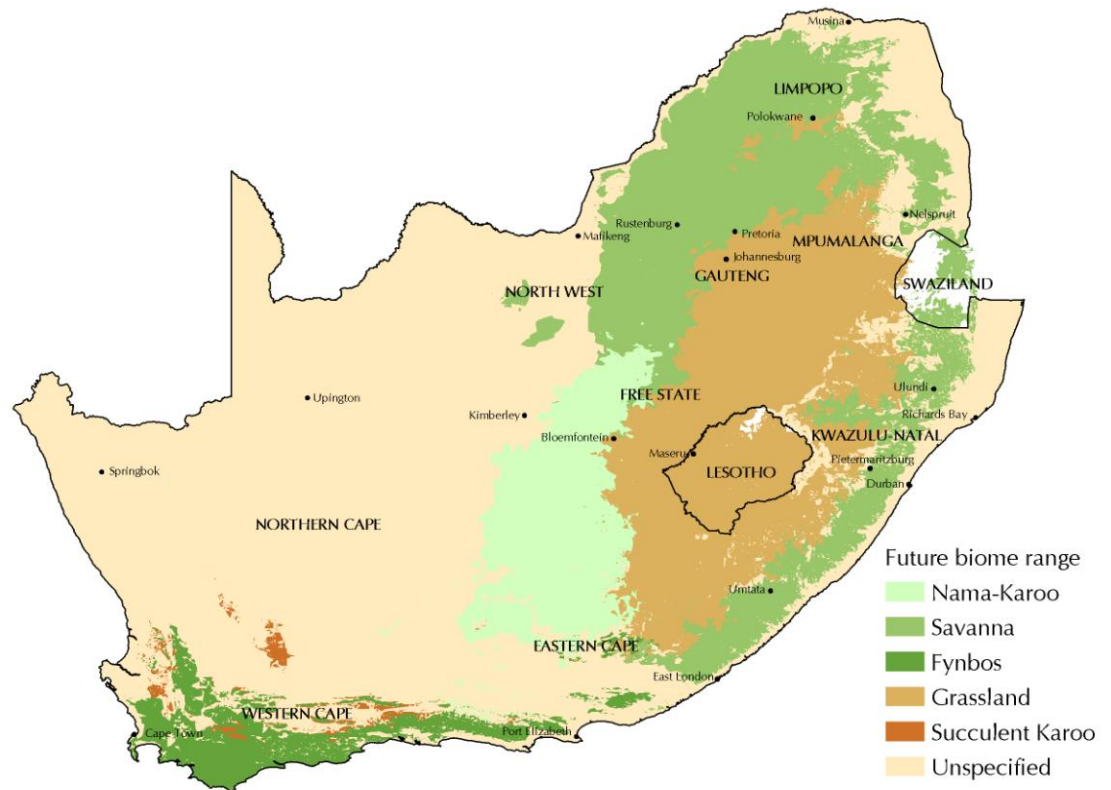


Figure 2: Predicted reduction of biomes in South Africa (DEAT, 2007)

3.2.2.2 Overexploitation

Wynberg (2002: 238) asserts that South Africa's biological resources provide a vast array of goods and services. These include the direct use of resources, for example the gathering, harvesting or hunting of animals and plants for food, medicine, shelter, fuel and fibre. It can also refer to the direct use of ecosystems and the service they provide, such as its use for the purpose of grazing, for croplands, mining, recreation and tourism.

Overexploitation is considered to be an indirect impact since all the impacts that result from it are indirectly concerned with the daily survival of humans. Thousands of rural communities depend on biological resources for their sustenance. Access to these natural capital resources enables the communities to make a living instead of succumbing to poverty. It has been a veiled economy for an extensive period, and has enabled those who utilise it to generate a substantial income. For example, the informal medicinal plant trade

is estimated to generate a total of R21 million per annum in the Witwatersrand area alone (Wynberg, 2002: 238). According to DEAT (2007), approximately 20 000 tons of medicinal plants are traded each year in the country, with a market value of R270 million.

Some of the activities that involve overexploitation include:

- **Human settlements**

Over exploitation within human settlements typically occurs with the over-*abstraction* of freshwater for domestic and agricultural purposes, deforestation for timber products, and agricultural over-exploitation of soils (DEAT, 2007).

- **Subsistence use of resources**

In South Africa and other African countries, rural and local communities use natural resources for subsistence. This places *ecosystems* under significant pressure. This form of over-exploitation would typically include unsustainable levels of grazing by livestock, harvesting of wood for fuel, collection of building materials (e.g. thatch, wood and reeds), obtaining meat through hunting and setting of traps, and medicinal plant harvesting (DEAT, 2007).

Over-exploitation on community level can have a severe effect on biodiversity. The cumulative effects of deforestation and subsistence agriculture are expected to destroy or partially damage natural woodlands in communal areas in southern Africa by 2020. This effect will spread to other natural systems. However, this type of decline is not evenly spread across the Southern African ecosystems. It is currently focused in the forests, grasslands, KwaZulu-Natal coastal belt and in the Cape Floristic Region. Biodiversity in these areas are under serious threat and conservation should be regarded a high priority (DEAT, 2007).

- **Commercial over-harvesting**

Harvesting for the purpose of subsistence and commercial over-harvesting of indigenous plants are driving some *species* to extinction, locally and nationally. Those species most affected are the rare and slow-growing species with medicinal value, such as endemic bulbs and succulents. Other taxa that are threatened include cycads, colophon beetles, the Knysna Seahorse and the Southern Bluefin Tuna. Most of these species

are being harvested or collected as “bush meat”, for their medicinal value, for bioprospecting⁷, as part of the pet trade or purely for their rarity value (e.g. colophon beetles) (DEAT, 2007).

The country’s coastal and marine environments are of great commercial value, but have in some cases been the object of direct over-exploitation. Species such as *Abalone* are presently facing a severe crisis, and decisive management measures are imperative. In an attempt to prevent the targeted species, *Haliotis midae*, from becoming commercially extinct measures have indeed been implemented (DEAT, 2007).

- **By-catching**

By-catching refers to the practice of catching unwanted marine creatures in nets while fishing for another species, which leads to incidental mortality of non-target species. By-catching by commercial fishers poses a serious threat to the marine environment. The rate of non target species per total catch varies between 5-70%. One of the serious consequences of by-catching is the mass mortality among seabirds killed by long-line operations (DEAT, 2007).

According to Wynberg (2002: 238), the wildlife trade demonstrates the difficulties of practising sustainable use, especially in South Africa. The country plays *host* to major illegal and legal wildlife trade within the Southern African region, yet it lacks the capacity, budget and means to effectively manage the industry. South Africa did, however, play a prominent role in negotiating proposals of the Convention on International Trade in Endangered Species (CITES) and is a consigning party to the CBD.

These conventions led to the promulgation of excellent laws (i.e. the National Environmental Management Biodiversity Act 10 of 2004 and the National Environmental Management: Protected Areas Act 57 of 2003) and since Wynberg’s statement, government has obtained the muscle and means to manage the sustainable use of biological resources. However, the relevant departments are still plagued by under-funding, mismanagement and a lack of capacity.

⁷ Bioprospecting refers to any research on, or development or application of, indigenous biological resources for commercial or industrial exploitation (National Environmental Management Biodiversity Act, 10/2004).

3.3 The status of biodiversity at Impala Platinum's lease area and the challenges it faces

3.3.1 The unique setting of Impala platinum – the concept of lease area management

The following statement by Hilson (2002: 65) captures the essence of communal land issues in the mining industry; *"Perhaps no single industry has precipitated more disputes over land use than mining."* Although mining brings with it a large economic injection into a district and country where its operations are based, the pressures placed on the land being utilised often cause severe community disruption and hinder the development of other small and medium enterprises. Furthermore, intensive mining activity (especially opencast operations) can cause major environmental issues, which in turn can render land unsuitable for a number of other important industrial applications such as farming and forestry after closure and reclamation.

Disputes over land often arise between mine management and community groups especially where land is shared according to contractual lease agreements. Many of these conflicts are unforeseeable from the outset because few mining companies have appropriate land use policies (i.e. social and labour plans) for conflict resolution in place.

Circumstances are most grievous in developing countries, due to a lack of governmental intervention, incomplete regulatory frameworks, and either incomplete or ineffective support schemes for community and industrial groups. The situation is aggravated by the fact that a number of these countries' governments, having aggressively promoted foreign investment in their minerals sectors in recent years, will almost certainly side with mining companies on key land use issues. Ultimately the responsibility lies with mining companies to resolve land use disputes and to ensure that mechanisms are in place to prevent further disputes that arise from a clear lack of governmental cooperation and assistance (Hilson, 2002: 65).

Impala Platinum's situation is not very different from the circumstances described above. Although the mine exercises control over their lease area, they don't however have control over the activities taking place in between their mining areas on their lease area by the RBN. This is because the land belongs to the people of the RBN. This creates a very unique and very difficult situation for the company. It limits their intervention into the uncontrolled utilisation of the natural resources in the area.

3.3.2 *The status of biodiversity at Impala Platinum's lease area*

Before a specific denotation can be made of what the RBN's impacts are, an overview must be given of the other activities and their impacts. Almost half (41.7%) of the natural vegetation of the greater RBN area has been lost due to transformation (i.e. cultivation, mining and quarrying) (see Table 2). Cultivation (historical and current) has had the greatest impact on natural vegetation in the area, and contributes to almost a third of the total habitat transformation (see Table 2). Transformations that take place due to due to mining and quarrying, urbanisation and current cultivation have all contributed to the transformation of vegetation in the area. The major historical cause of vegetation transformation is cultivation and in the case of the greater RBN area just over a quarter of the surface area had previously been cultivated (Hoare, 2008: 30-31).

Table 2: Land cover of the greater RBN area (Hoare, 2008: 30)

Description	Area (ha)	Proportion of area (%)
Current cultivation	3 355	3.3
Previously cultivated areas	26 851	26.2
Urban / built-up land	9 480	9.2
Plantations & woodlots	28	0.03
Mines & quarries	2 520	2.5
Artificial waterbodies	508	0.5
Natural vegetation (including degraded)	59 902	58.3
TOTAL	102644	100.00

The impacts on rehabilitated areas in the Impala lease area are quite similar to those of other sites across the country i.e. trampling and excessive grazing of vegetation by cattle, erosion and uncontrolled fires. The impacts are largely caused by the RBN and possibly a lack of post-rehabilitation maintenance on the part of Impala. The community's cattle are allowed to graze freely on the lease area and therefore damage is caused to vegetation before it has had a chance to establish properly.

Due to cultural traditions or beliefs and vandalism or carelessness the veld is burned either in winter months (due the former) or periodically (due to the latter) throughout the year. These veld fires combined with trampling and over grazing cause erosion. When all binding material has been scorched, grazed or trampled only barren ground remains allowing either wind or water to cause extensive damage to these sensitive and recovering areas.

The area is also subjected to other significant impacts. According to the ecosystem status of the various vegetation types in the greater RBN area provided in Table 3 (see Table 2 for threshold values for determining status and Figure 3 for a visual representation), the vegetation type which causes most concern is the Marikana Thornveld. It has been classified as “Endangered” both on a national scale and within the area. Moot Plains Bushveld (occurring in the greater RBN area) has also been classified as “Endangered”, but is considered “Vulnerable” throughout its distribution range. The Zeerust Thornveld has been classified as “Endangered” within the area, but as “Least Threatened” throughout the entire distribution range. The remaining vegetation types within the area are all considered “Least Threatened” (Hoare, 2008: 31-32).

Table 3: Ecosystem status of vegetation types in the greater RBN area (Hoare, 2008: 32)

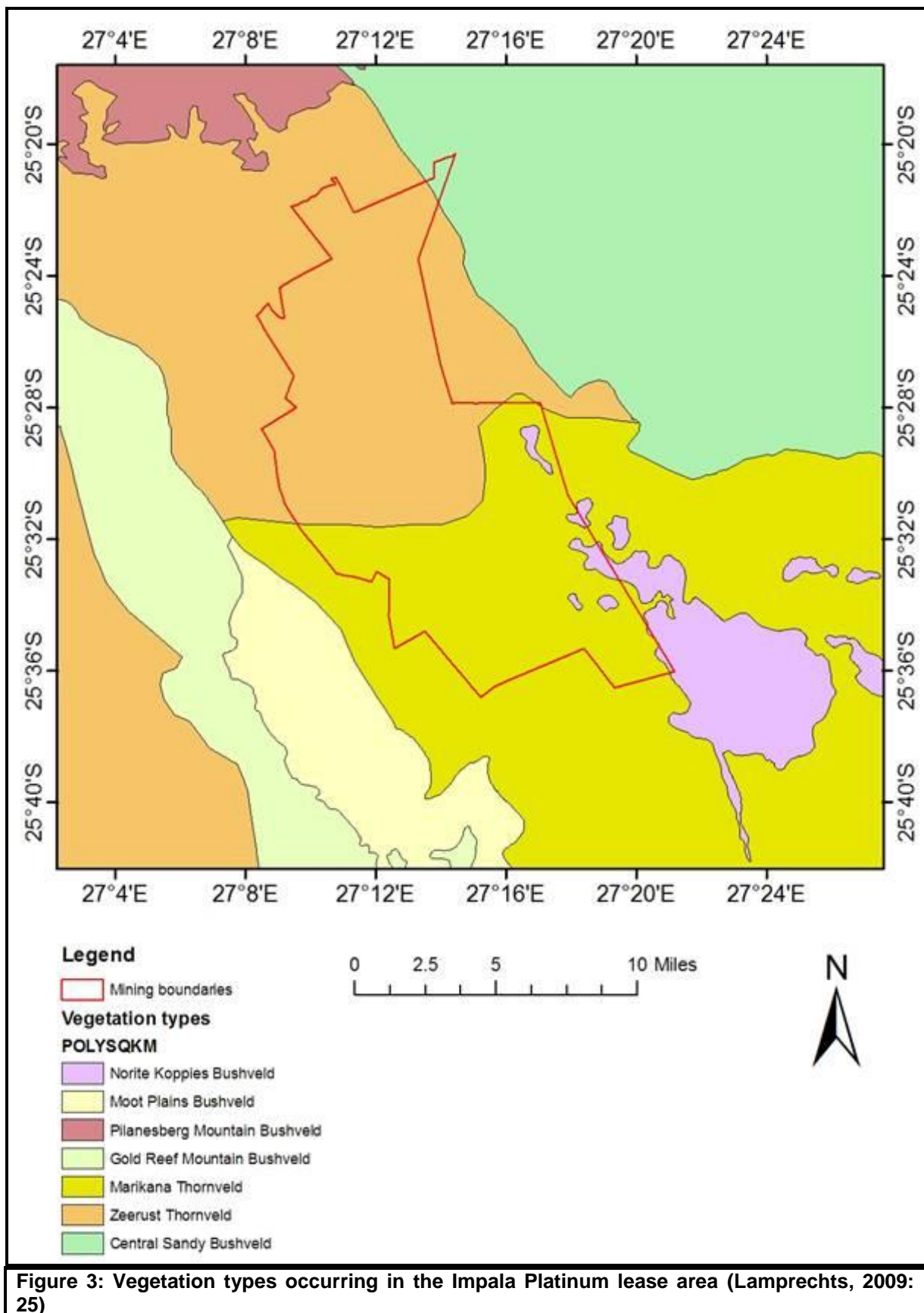
Vegetation type	Status in the study area	National status
Central Sandy Bushveld	LT	VU
Gold Reef Mountain Bushveld	LT	LT
Marikana Thornveld	EN	EN
Moot Plains Bushveld	EN	VU
Norite Koppies Bushveld	LT	VU
Zeerust Thornveld	EN	LT

Hoare (2008: 32) stipulates that the Elands River and its tributaries that constitute part of the riparian and wetland vegetation of the area have been classified as “Critically Endangered” on a national scale⁸. The wetland and riparian vegetation associated with the perennial and non-perennial drainage lines are considered to be of high conservation importance for the following reasons:

- The indigenous vegetation of riverine wetlands within the Highveld region is in danger of being completely replaced by alien invasive species⁹. Any areas of indigenous wetland vegetation must therefore be regarded as of high conservation importance;

⁸ Hoare (2008: 32) refers to information supplied by *Driver et al.* (2005).

⁹ Here Hoare (2008: 32) refers to Henderson and Musil (1997), and Rutherford and Westfall (1994).



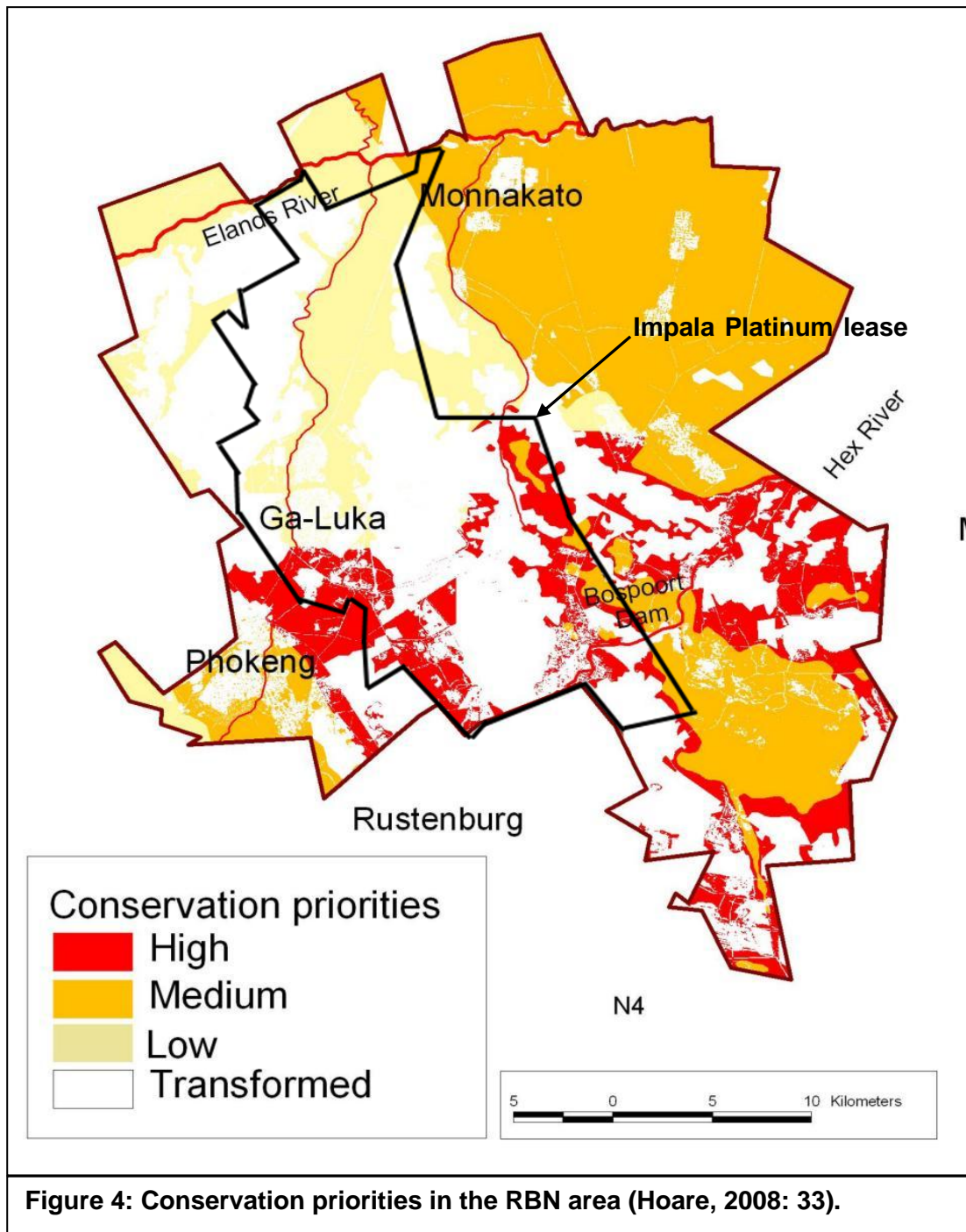
The riparian and wetland vegetation shows large variations in species composition and vegetation structure across short distances and is therefore very diverse;

- Due to the natural flow of rivers, their status at any point will be reflected by the conditions upstream, but the adjacent and upstream catchment areas also have an effect. Any impact on the wetland area within the mining area is therefore also likely to impact on downstream wetlands;
- Riparian and wetland vegetation are composed of highly diverse species, which is restricted to these habitats. For this reason, these areas must be regarded as being of considerable importance as far as their conservation is concerned (Hoare, 2008: 32).

To spatially preserve, represent and demarcate these hydrological systems, a 500m buffer was generated around the Elands River, a 200m buffer around all its major tributaries, including the Hex River, a 100m buffer around other main sub-tributaries and a 20m buffer around the remaining non-perennial drainage lines. It must be kept in mind that these zones may be wider than are legally required. Because of the high sensitivity of these areas, their conservation must be regarded as a high priority. Furthermore, due to their legal protection under the National Water Act No 36 of 1998, the landowner is obliged to take due care of these wetland and riparian areas (Hoare, 2008: 32).

As far as threatened species are concerned, the most important habitats, the wetland and riverine habitats, followed by Magaliesberg, the Norite koppies, and the Moot Plains. A conservation priority map (Figure 4) was compiled for the RBN area using the expressed information in the sections above in conjunction with observations made in the field to provide information on the location of sensitive features. The map (Figure 4) shows that the Marikana Thornveld and all wetlands and riparian zones¹⁰ have “HIGH” conservation value and that the Central Sandy Bushveld and Moot Plains Bushveld have MEDIUM conservation value (Hoare, 2008: 34-35). Although this map shows the greater RBN area, it can be used as a possible template for the Impala Platinum lease area. However, it may be necessary for the mine to conduct a more in-depth land-care map.

¹⁰ Although the Marikana Thornveld and all wetlands and riparian zones are not specifically indicated on the map they are included in the areas coloured red. The same goes for Central Sandy Bushveld and Moot Plains Bushveld which is represented by the colour orange.



3.3.3 Environmental Risk Assessment

An Environmental Risk Assessment was undertaken (see Appendix C) to evaluate the raw risks identified in the EMP's and Closure plan. The raw risks were then further scrutinised by analysing the proposed management actions in the EMP's and Closure plan to ascertain the residual risk, which indicates the risk factor with the current proposed measures of control in place.

Only the risks identified in the EMP's and Closure plan are discussed, since the focus of the study is the evaluation of the ability and effectiveness of these documents to manage biodiversity threats; therefore no other sources were included. Impala Platinum has eleven EMP's and one Closure plan. View section 1.3 for the risk assessment process.

The majority of these EMP's have been compiled in accordance with the requirements of the Environment Conservation Act No. 73 of 1989, which also regulated the first Environmental Impact Assessment (EIA) regulations. According to Glazewski (2005: 236) the key provisions of the Act are contained in Part 5 of the Act titled "*Control of Activities which may have a Detrimental Effect on the Environment*". Under this provision in section 21 three sets of regulations were promulgated with one set of rules. Within the first set of regulations only eleven activities were identified that will have a detrimental effect on the environment and therefore require an EIA. Between 1989 and 2004, the scope of EIA's and subsequently EMP's was very limited. Experience in compiling and evaluating these documents was lacking. Therefore, the evaluation of Impala Platinum's ECA driven EMP's revealed a lack of substantive management and preventative measures. It was only in the later EMP's (2000 – 2004) that the prescribed management measures became more mature and effective.

When NEMA came into effect it included some, but not all of the provisions contained in ECA. The omission of Part 5 which contains the environmental assessment provisions, was specifically noticeable. However, NEMA introduced a new era of EIA, since Chapter 5 (and particularly section 24), stipulates that EIA's are required for specific listed activities (Glazewski 2005: 244). Under NEMA three lists of identified activities were compiled and it was subsequently updated to include a fourth list. The first list of activities requires a Basic Environmental Impact Assessment and the second a Comprehensive/ Full Environmental Impact Assessment. The third list contains a set of rules for Strategic Environmental Assessments and the fourth prescribes the administrative measures to be followed when compiling, submitting and evaluating the various documents. Therefore the second EIA regime which has been in effect since 2004 has become more comprehensive and detailed. This was evident in Impala Platinum's EMP's after 2004.

In Chapter 4 the findings of a more detailed gap analysis are given. The effectiveness of the various requirements for biodiversity management enforced at Impala Platinum is measured against international, national and regional standards.

From the Risk Assessment six main types of impacts have transpired, four of which are direct environmental challenges and one indirect. These impacts are described below.

3.3.4 Biodiversity at the Impala Platinum lease area: Direct Challenges

The impacts in the greater RBN area are similar to those described under 3.2. The issues described below are more unique to the area and include bush encroachment and alien invasive species, overgrazing, urbanisation, lack of institutional capacity and involvement, mining, climate change etc. It must however be stressed that the description given at 3.2 refers to the entire RBN area and is not restricted to the part that is currently leased by Impala Platinum. However, this study will give a good indication of the current land uses/impacts that occur within the area. The impacts/uses are also relevant to the Impala Platinum lease area and must therefore be addressed.

3.3.4.1 Habitat transformation

Hoare (2008: 30) made use of land cover data supplemented with topocadastral data (1:50 000 series from the Surveyor General), aerial photographs, satellite data (Landsat TM and SPOT) and field verification to produce a land cover map of the greater RBN area. He used this data to recalculate transformation of habitat in the area and to provide information on the degree of transformation per vegetation type. A summary of land cover within the study area is given in Table 2 and illustrated in Figure 5.

Urban areas, including rural settlements, residential and commercial areas and roadways, constitute just over 9.2% of the greater RBN area. These consist of a number of urban nodes scattered throughout the study area (see Figure 5). Cultivation currently constitutes 3.3% of the area; however, on the basis of topocadastral information, an additional 26.2% of the study area was previously cultivated. Mines and quarries are the final major transformation types and make up 2.5% of the surface area of the study area (Hoare 2008: 30).

3.3.4.2 Transformation within different vegetation types

Almost half (41.7%) of the natural vegetation of the study area has been lost due to transformation (see Table 2). Cultivation has had the greatest impact on natural vegetation in the study area, contributing towards almost a third of the total habitat transformation (see Table 2). Transformations that can be ascribed to mining and quarrying, urbanisation and current cultivation have all

contributed to the transformation of vegetation in the study area (see Figure 5). The most important historical factor which led to vegetation transformation is cultivation and in the case of the greater RBN area just over a quarter of the surface area had previously been cultivated (Hoare, 2008: 30-31).

The degree of transformation differs from one vegetation type to another (Table 4). Gold Reef Mountain Bushveld is least prone to transformation, followed by Central Sandy Bushveld and Norite Koppies Bushveld (Table 4). The vegetation types with the highest degree of transformation are Marikana Thornveld, Zeerust Thornveld and Moot Plains Bushveld (Table 4) (of which the Marikana and Zeerust Thornveld occur within the Impala lease area) (Hoare, 2008: 32).

In the case of Marikana Thornveld and Zeerust Thornveld, primarily historical cultivation caused the transformation (Table 4), although most of these areas are no longer cultivated and have developed secondary vegetation cover. The largest factor contributing to transformation within Moot Plains Bushveld is urbanisation (Table 4), which has also had a significant impact on Marikana Thornveld and Zeerust Thornveld (Hoare, 2008: 32).

Mining and quarrying have an increasing impact on natural areas primarily within the Marikana Thornveld and Zeerust Thornveld, although less than 4% of both vegetation types is affected (Table 4) (Hoare, 2008: 32).

The vegetation in parts of the area is highly fragmented, especially the Marikana Thornveld and Moot Plains Bushveld. Remaining vegetation in these areas consists of fragments of various sizes with limited amounts of continuity caused by a combination of cultivation, urbanisation and mining / quarrying (Hoare, 2008: 32).

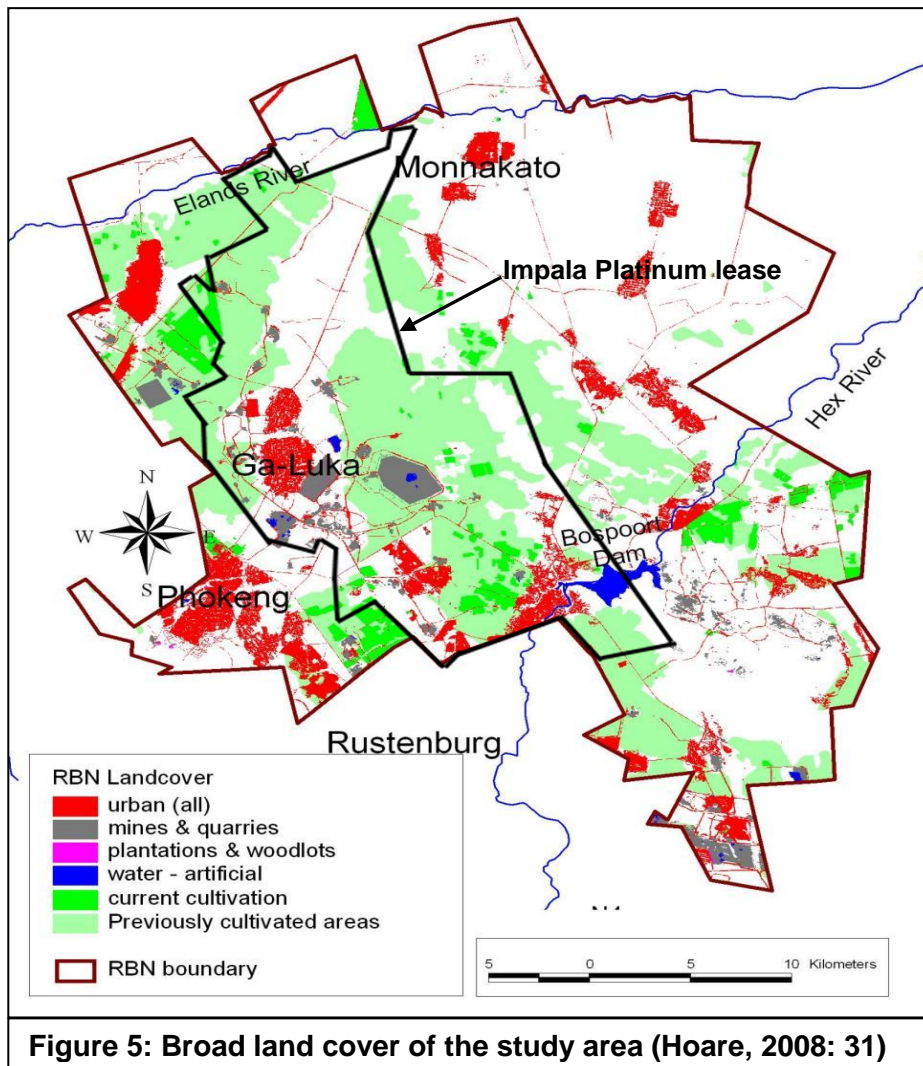


Table 4: Areas and proportion of vegetation types transformed within the greater RBN area and the major factors of transformation (Hoare 2008: 32)

Vegetation Type	Area in RBN (ha)	Cultivation	Urban	Mines & quarries	Previous cultivation	Water-bodies	Natural
Central Sandy Bushveld	26013	210 (0.8%)	1429 (5.5%)	3 (0.0%)	389 (1.5%)	1 (0.0%)	23981 (92.2%)
Gold Reef Mountain Bushveld	734	0 (0.0%)	4 (0.5%)	2 (0.3%)	22 (3.0%)	0 (0.0%)	706 (96.2%)
Marikana Thornveld	34047	2125 (6.2%)	3666 (10.8%)	1140 (3.3%)	13347 (39.2%)	404 (1.2%)	13365 (39.3%)
Moot Plains Bushveld	3604	20 (0.6%)	1710 (47.4%)	11 (0.3%)	140 (3.9%)	4 (0.1%)	1719 (47.7%)
Norite Koppies Bushveld	7884	10 (0.1%)	271 (3.4%)	315 (4.0%)	57 (0.7%)	40 (0.5%)	7191 (91.2%)
Zeerust Thornveld	30362	990 (3.3%)	2402 (7.9%)	1049 (3.5%)	12924 (42.6%)	60 (0.2%)	12937 (42.6%)

3.3.4.3 Overgrazing

Cattle farming is an agricultural activity occurring extensively throughout the North West Province and in the furthest portion of the western part of the greater RBN area. The areas surrounding Rustenburg and Brits are fertile, mixed-crop farming areas with maize and sunflower being the most important crops throughout the region. Subsistence cultivation is a prominent activity occurring on the Impala Platinum lease area and especially within rurally-based communities with domestic livestock being the main characteristic feature in communal areas (Hoare, 2008: 37).

Commercial cultivation is currently practiced on a limited scale within the RBN area and the lease area. The land-use information (Table 4) indicates that only 3.3% of the land surface of the greater RBN area is currently being cultivated (i.e. subsistence cultivation), whereas 26.2% was previously cultivated. This indicates that only about 11% of areas previously considered suitable for cultivation are currently being cultivated (Hoare, 2008: 37).

Subsistence agriculture is one of the largest activities on the land within the area, and is especially widespread throughout the adjacent rurally-based communities, while domestic livestock is mainly kept in the communal areas. Large herds of cattle occur on communal rangelands, which have significance beyond mere agricultural production. These large herds exceed the veld's carrying capacity, resulting in overgrazing and large-scale land degradation. This has become an important issue to address for future maintenance of the production potential of the landscape (Hoare, 2008: 38).

3.3.4.4 Alien plant species

Forty declared alien invasive species are naturalised or may potentially become naturalised in the RBN area. These species are listed in Table 5 and Annexure B. Table 5 lists all recorded 'Declared Weeds and Invaders' and 'Proposed Declared Weeds and Invaders', together with their respective legal categories.

Table 5: List of the declared alien invasive plant species occurring in the RBN area (Hoare, 2008: 27)

Species	Vernacular name	Legal Status
<i>Acacia melanoxylon</i>	Australian blackwood	Declared Invader (Category 2)
<i>Acacia mearnsii</i>	Black wattle	Declared Invader (Category 2)
<i>Achyranthes aspera</i>	Burweed, chaff flower	Declared Weed (Category 1)
<i>Agave americana</i>	American agave	Proposed declared invader
<i>Agave sisalana</i>	Sisal	Declared Invader (Category 2)

<i>Araujia sericifera</i>	Moth catcher	Declared Weed (Category 1)
<i>Argemone ochroleuca</i>	White-flowered Mexican poppy	Declared Weed (Category 1)
<i>Arundo donax</i>	Giant reed	Declared Weed (Category 1)
<i>Canna indica</i>	Indian shot	Declared Weed (Category 1)
<i>Cereus jamacara</i>	Queen of the night	Declared Weed (Category 1)
<i>Datura ferox</i>	Large Thorn-apple	Declared Weed (Category 1)
<i>Datura stramonium</i>	Thorn apple	Declared Weed (Category 1)
<i>Eucalyptus camaldulensis</i>	Red River Gum	Declared Invader (Category 2)
<i>Eucalyptus grandis</i>	Gum Trees	Declared Invader (Category 2)
<i>Grevillea robusta</i>	Australian Silky Oak	Declared Invader (Category 3)
<i>Ipomoea purpurea</i>		Declared invader category 2
<i>Jacaranda mimosifolia</i>	Jacaranda	Declared Invader (Category 3)
<i>Lantana camara</i>	Lantana	Declared Weed (Category 1)
<i>Ligustrum vulgare</i>	Common privet	Declared Invader (Category 3)
<i>Melia azedarach</i>	Seringa or Persian Lilac	Declared Invader (Category 3)
<i>Morus alba</i>	White mulberry	Declared Invader (Category 3)
<i>Nerium oleander</i>	Oleander	Declared Weed (Category 1)
<i>Nicotiana glauca</i>	Wild Tobacco	Declared Weed (Category 1)
<i>Opuntia ficus-indica</i>	Sweet Prickly Pear	Declared Weed (Category 1)
<i>Parkinsonia aculeata</i>	Jerusalem thorn	Proposed declared invader
<i>Pennisetum clandestinum</i>	Kikuya grass	Proposed declared invader
<i>Pennisetum setaceum</i>	Fountain Grass	Declared Weed (Category 1)
<i>Populus x. canescens</i>	Match Poplar or Cottonwood	Declared Invader (Category 2)
<i>Ricinus communis</i>	Castor-oil plant	Declared Invader (Category 2)
<i>Salix babylonica</i>	Weeping willow	Declared Invader (Category 2)
<i>Schinus molle</i>	Pepper Tree	Proposed declared invader
<i>Senna didymobotrya</i>	Peanut butter cassia	Declared Invader (Category 3)
<i>Sesbania punicea</i>	Red sesbania	Declared Weed (Category 1)
<i>Sorghum halepense</i>	Johnson or Columbus grass	Declared Invader (Category 2)
<i>Spartium junceum</i>		
<i>Tamarix ramossisima</i>	Pink tamarisk	Declared Invader (Category 3)
<i>Tipuana tipu</i>	Tipu Tree	Declared Invader (Category 3)
<i>Tithonia rotundifolia</i>	Red sunflower	Declared Weed (Category 1)
<i>Xanthium strumarium</i>	Large cocklebur	Declared Weed (Category 1)

Some of the recorded species have become a serious environmental threat that is transforming the indigenous vegetation. Many of the recorded species are planted ornamentals, ruderal and agrestal weeds or minor environmental weeds. A few species are, however, problematic in disturbed areas and can become dominant. The most serious invasions occur in drainage lines, where the natural vegetation is usually completely replaced by alien plants. The most problematic species in this regard are *Acacia mearnsii*, *Eucalyptus camaldulensis*, *Melia azeradach*, *Populus canescens*, *Salix babylonica* and *Morus alba*. There may be additional species that have not been previously collected or recorded before.

3.3.4.5 Industrial and/or domestic pollution of natural areas

Platinum mining has become the main industry in the North West Province over the past 20 years. This increase resulted in sales increment of R2.5 billion in 2000. The greatest demand for platinum stems from jewellery and automotive manufacturers.

Impala's operations stretch over an area of 26 000 ha, making it one of the largest operational areas in the area (NWDACE, 2008: 89). One of the largest tailing storage facilities in the country is situated within their operational area (see Figure 6). It covers an approximate area of 750 ha and will have a height of 120 meters at the end of its lifetime. This structure is certainly the largest source of pollution on the mining area (SRK, 1997: 4).

Figure 5 reflects the built-up areas of mining activities at the Impala Platinum mine near Rustenburg. The darker halo areas represent urban areas; especially notable are the two large tailing storage facilities. This shows how close in proximity the mining infrastructure and storage structure are to human settlements. Apart from ecological disturbances, mining activities can have a great impact on human well-being. These urban areas are located in such close proximity to the mine due to the number of people working on the mine. Other sources of pollution include the plant, Omnia, the townships and many more, which are discussed extensively in the environmental risk assessment (see Appendix C)

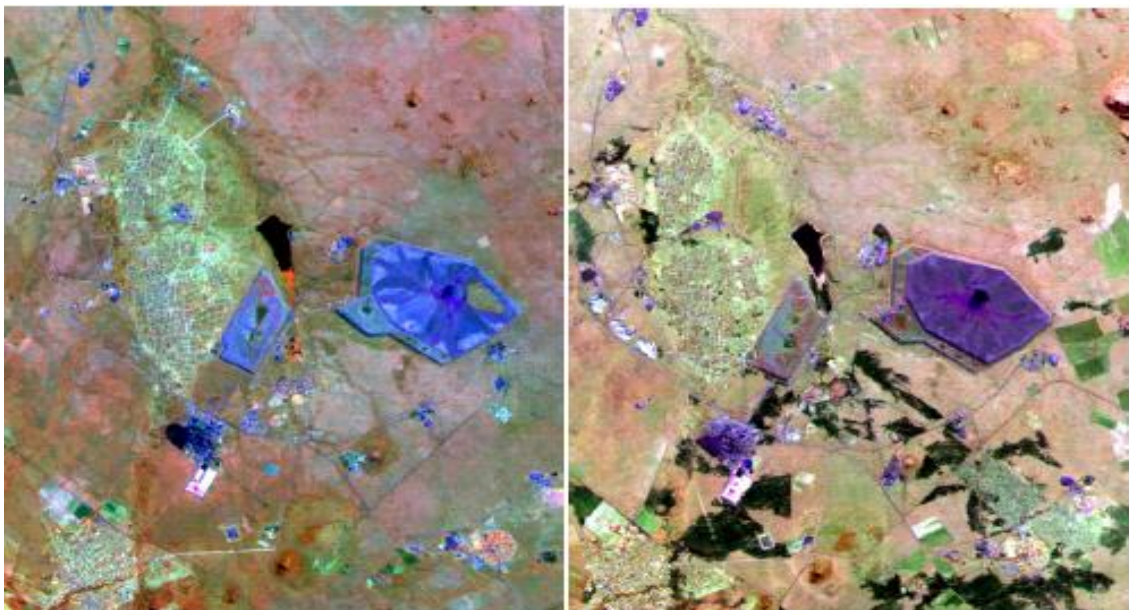


Figure 6: Phokeng urban settlement and Impala Platinum mine taken by the Landsat satellite (NES, 2005: 155)

The main impacts that were identified in Impala's EMP's and Closure Plan has been identified in the Environmental Risk Assessment (see Appendix C).

3.3.5 Biodiversity at the Impala Platinum lease area: Indirect Challenges

3.3.5.1 Other social threats

Other socially induced pressures that compromise the integrity of the function of ecosystems are (these threats are described in more detail in 3.2.1 & 3.2.2):

1. Selective harvesting of woody plants,
2. Selective harvesting of medicinal plants, and
3. Hunting of target animal species.

4 Chapter 4: Recommendations for improvement

The following discussion will focus on the limitations of Impala's EMP and Closure plan in addressing biodiversity impacts as well as the limitations of EMP's and Closure plans in general. The discussion will centre on the research questions. By analysing the data in the gap analysis (below) and risk assessment, the various limitations in Impala Platinum's EMP's and Closure Plan can be highlighted and recommendations for improvement can be made.

It must be kept in mind that one cannot manage biodiversity as such, due to its ability to adapt and the fact that nature managed itself quite effectively over the past millennia. The focus should be on managing human activity. Because of our society and the complex nature of society in general, it is a challenging task, but a lesser challenge than attempting to manage nature. The proposed initiatives will attempt to provide the necessary guidance to effectively address the gaps identified in the mine's main management tools. There are three main factors that need to be addressed; decision-making, management action and closure, each of which requires their own separate tools to support them. The various direct and indirect challenges are addressed within the scope of these various tools and processes. In Appendix D the various tools that have been identified in this chapter have been applied in addressing the gaps that have been found in the mine's EMP's and Closure plan.

4.1 Decision-making

This section will focus on tools that can improve biodiversity-related decision-making in the Impala Platinum lease area.

4.1.1 Biodiversity (inclusive) impact assessment

As the drivers of biodiversity loss (e.g. over-exploitation, habitat change, pollution, invasive alien species and climate change discussed above) intensify and the links between economic development, human well-being and environmental integrity become more ostensible, the conservation of biodiversity becomes more pressing. EIA has received wide recognition as a planning tool that addresses the biophysical, social and environmental impacts of development. However, it fails biodiversity in the sense that it does not adequately address the functional relationships within biological systems and between biophysical and socio-economic systems. As a result, EIA has become deficient in terms of providing clear criteria for assessing

impact significance and incorporating prescriptions for positive planning for biodiversity during the development process (Rajvanshi *et al.*, 2008: 26).

Knowledge of critical biodiversity issues is an essential prerequisite if the project is to have any lasting value and for sound decision-making. Biodiversity-inclusive impact assessment emerged as a harmonising tool for addressing biodiversity-related concerns in the planning of development projects, programmes and policies. It ultimately provides for the strongest impetus for mainstreaming the goals of biodiversity conservation into economic sectors and development models, policies and programmes (Rajvanshi *et al.*, 2008: 26 & 27). The most important reasons to pay attention to the effective incorporation of biodiversity in environmental assessment and to commit to an impact assessment process aimed exclusively at this aspect, are summarised below:

- **Legal and international obligations:** A simple and straightforward reason to pay particular attention to biodiversity in EIA is a legal or international obligation to do so (UNEP, 2005: 32).
- **Facilitation of stakeholder identification:** It is evident that people are largely dependent on the services that ecosystems provide, and thus supply a very strong tool to identify potentially affected groups of people. By taking an ecosystem services approach (described below) in describing biodiversity, stakeholders who are both directly and indirectly affected can then be identified to participate in the EIA (UNEP, 2005: 33).
- **Safeguarding livelihoods:** - Identifying the relevant stakeholders will create an understanding of how the livelihoods of people, especially people living in rural areas who depend on biodiversity, will be affected. These groups are usually less affluent and less well-educated and ultimately go unnoticed due to the lack of capacity to participate meaningfully in the EIA process (UNEP, 2005: 33).
- **Sound economic decision-making:** Ecosystem services such as erosion control, water purification and supply, and recreational potential can be costed to provide an economic point of view needed to calculate the monetary benefits and losses of including or excluding ecosystem services in the planning of new projects (UNEP, 2005: 33).
- **Cumulative effects on biodiversity** are better anticipated and addressed, making it easier to set levels of acceptable change or desired levels of environmental quality at a strategic (i.e. top management) level (UNEP, 2005: 33).

- **Maintaining the genetic base of evolution for future opportunities and generations:** The objective of the conservation of biodiversity for future generations highlights two essential elements of biodiversity conservation: firstly, biodiversity represents a wealth of yet unknown potential uses. Secondly, maintaining the capacity of biodiversity to adapt to changing environments (e.g. climate change) and to continue to provide essential services is critical to human survival (UNEP, 2005: 33).

A long-term biodiversity assessment must make provision to safeguard the biodiversity capacity to adapt because this attribute that maintained existence can very easily be curtailed to the point of extinction and with it our unappreciated life insurance.

4.1.2 Good environmental governance

According to the King III report (as cited in the IOD guidance document (2009: 11)), good governance is in essence about effective leadership. Such leadership is characterised by transparency, ethical values, accountability and fairness. Such leadership will steer a company towards sustainable economic, social and environmental performance. For example, by making use of the Biodiversity Action Steering Committee as a management tool (discussed in 4.2.2.2), good environmental governance can be achieved because it utilizes effective leadership characterised by transparency (i.e. representatives from all the stakeholders are members of the board), ethical values guided by principles, and being accountable to those whom they represent. The issue with current decision-making, especially in a developing country such as South Africa, is that it frequently fails to adhere to the principles of sustainable development, due to a number of possible reasons:

- Decision-makers' personal and/or professional opinions often count more heavily than the facts (Brownlie *et al.*, 2006: C-5);
- Decision-making is often characterised by being 'short-term and reactive' thinking which ignores the long-term consequences of irreversible impacts on ecosystem services (Brownlie *et al.*, 2006: C-5);
- Personal bias and subjectivity are often exacerbated by impact assessment reports that are biased due to a lack of supporting information. This causes decisions to be neither in line with the objectives of sustainable development, nor transparent or objective, which ultimately leads to inconsistency in decision-making (Brownlie *et al.*, 2006: C-6);

- Changes to the environment caused by a proposed development are frequently compared to the current situation, rather than to a desired state (i.e. pristine) of the environment (Brownlie *et al.*, 2006: C-6); and
- The cumulative effects to the environment caused by changes are seldom considered (Brownlie *et al.*, 2006: C-7).

Table 6 below provides some guidance on decision-making by suggesting decision-making criteria that can be followed when dealing with ecological and social issues in order to try and prevent the above constraints.

Integrating the three fundamental elements of good environmental governance (i.e. the biosphere, economy, and social system) through utilising the 14 principles of the ecosystems approach and the precautionary principle, forms a solid foundation for executive biodiversity decision-making.

4.1.3 *The precautionary approach*

Principle 15 of the Rio Declaration describes the precautionary principle as follows: “*Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*” (UNGA, 1992). In other words, action might in some cases be required to avert serious or irreversible environmental damage before scientific certainty of the harm exists. Taking no action due to a lack of certainty is not an excuse, since it may be too late to take action once one waits for all the facts to be ascertained (Brownlie *et al.*, 2006: B-13).

The following statement by Brownlie *et al.* (2006: B-13) highlights the challenge management and decision-makers face when attempting to address anthropogenic threats to biodiversity: “*The combination of uncertainty and the risk of irreversible effects or loss of irreplaceable resources...*” creates a “*...challenge to decision-makers regarding the sustainable use and development of natural systems.*”

The main reason for the above statement is that there is no clear-cut list of management practices for different risks and affected parties in particular, in order for them to choose the level of risk that they are prepared to accept. This is where the precautionary principle is of great value; because where there is uncertainty pertaining to the probable impact or its significance, what is acceptable to the affected parties and the environment and where even the opportunity costs¹¹ of

¹¹ Opportunity cost is the net benefit to society that could be obtained by the ‘next best’ development alternative (Brownlie *et al.*, 2006: 1-2).

choosing a particular path could be high, it is wise to apply caution in decision-making (Brownlie *et al.*, 2006: B-14).

Table 6: Applying the precautionary principle (Brownlie *et al.*, 2006: B-16)

Situation	Action to be taken
<p>Where:</p> <ul style="list-style-type: none"> • Critically endangered or endangered ecosystem or species, a protected ecosystem or species, a previously unrecorded species or species about which little is known occur, • Ecosystems or species that play a significant role in supporting livelihoods occur, and • Impacts could be of high significance, irreversible, lead to irreplaceable loss of natural capital, and/or there is little prior experience or scientific confidence about the outcome. 	<p>The precautionary principle should in such situations be strictly followed.</p> <p>Impacts should be confined to be completely reversible, and only those activities that have been shown to pose negligible risks to biodiversity should be permitted.</p> <p>Mitigation action must totally and reliably compensate for impacts on biodiversity to ensure no change in conservation status, and providing for a margin of error where there may be uncertainty as to the effectiveness of the conceived mitigation action.</p>
<p>Where vulnerable ecosystems and/or species, and/or which play a role in supporting livelihoods occur and where impacts could be long term and significant.</p>	<p>Only those activities that pose low risk to biodiversity should be permitted. Impacts should be mitigated in full and, in the most high-risk cases endangered environments' status must be offset in order not to change it (either this, than total extinction). Where there is uncertainty as to the likely effectiveness of mitigation, a margin of error should be provided.</p>
<p>Where there exists an ecosystem and/or species that is currently not threatened and/or not known that plays a role in supporting livelihoods.</p>	<p>Activities that pose some risk to biodiversity should be permitted. However, impacts must be mitigated and offset as far as practicable.</p>

4.2 Management action

There may be several role-players and/or groups whose involvement in the design and implementation of a biodiversity management tools will be important to ensure its fairness and success. These stakeholders may be indigenous peoples, local communities and / or rural dwellers, who are pursuing livelihoods based on farming, hunting, ecotourism or other biodiversity-related activities, or who have particular cultural ties with biodiversity (e.g. aesthetic, spiritual or religious values) (BBOP, 2009: 11).

It is important to pay special attention to local stakeholders for the following reasons:

- Negative impacts created by a project may directly or indirectly affect the livelihoods and amenities (e.g. recreational, aesthetic and spiritual values) of the local communities. This will call for a need to compensate and restore those lost

resources through offsetting them or anticipating them and ultimately minimising or mitigating the impacts (BBOP, 2009: 11),

- By offering affected stakeholders a viable and attractive sustainable-use alternative will be a key consideration for them if a company wants to ensure their willing involvement and achieving successful long-term conservation outcomes (BBOP, 2009: 11), and
- For companies to undertake voluntary biodiversity alternatives or offsets is to attain a '*social license to operate*' from the stakeholders, through building a good relationship with communities. To attain such a label it is important not to negatively impact on biodiversity and in turn peoples' livelihoods (BBOP, 2009: 11).

This section will focus on providing suitable management tools that will link with the tools provided in Section 4.2.1. The focus will be on proper stakeholder engagement and managing the affected communities that could influence ecosystems functioning. By using the ecosystems approach and applying its principles, management action can be steered through a representative Biodiversity Action Steering Committee. The decisions emanating from this committee must be structured and guided by proper stewardship principles into a systematic conservation plan for the mining area that addresses all the issues raised by the various stakeholders and the shortcomings identified in the EMP and closure plan.

4.2.1 *The ecosystems approach*

The ecosystems approach can aid in identifying the various stakeholders that are dependent on biodiversity in the area where operations take place. The first task will be to define the problem or problems that need to be addressed (e.g. the control of alien invasive species, controlling veld fires etc.). If the problems identified are more complex, they can be divided into several smaller issues, where each of them can be addressed individually to ultimately solve the collective problem. For example, to conserve a wetland ecosystem while facilitating its sustainable use, it might be necessary to address (i) ecological degradation resulting from unsustainable use of wetland resources, and (ii) community well-being such as health, education, food security, and cultural values that are dependent on the ecosystem. After identifying the issues, the next step is to ascertain what tasks would allow the problem to be addressed (UNEP, 2009). There are twelve principles that can be used to assess the issues in order to identify a plan of action. An additional two principles have been

added that are deemed appropriate for the context of sustainable use. The following fourteen principles are complementary and interlinked:

- Principle 1: Adopt a policy on social issues and develop capacity.
- Principle 2: The objectives of management of land, water and living resources are a matter of societal choice.
- Principle 3: Management should be decentralised to the lowest appropriate level.
- Principle 4: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
- Principle 5: Recognising potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.
- Principle 6: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target.
- Principle 7: Ecosystem must be managed within the limits of their functioning.
- Principle 8: Identify stakeholders and acknowledge the legitimacy of their perspectives.
- Principle 9: Management must take into account the appropriate spatial and temporal scales when engaging with other land users in managing activities affecting biodiversity.
- Principle 10: Recognising the varying temporal scales of ecosystem processes, objectives for ecosystem management should be set for the long term.
- Principle 11: Management must recognise that change is inevitable.
- Principle 12: The appropriate balance between, and integration of, conservation and use of biological diversity must be attained.
- Principle 13: Consideration must be given to all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
- Principle 14: All relevant sectors of society and scientific disciplines should be involved (principle 12 and 9 are interrelated).

4.2.2 *Biodiversity Action Steering Committee (BASC)*

A biodiversity steering committee must be established to effectively manage biodiversity on the lease area. The objective of the steering committee will be to govern all activities taking place on the lease that have the potential/likelihood of/or are having a current impact on biodiversity

Rationale

The BASC is a governing body, which will aim to reduce, in an innovative and large-scale manner, the threats posed by agriculture, mining, industrial and communal activities to biodiversity of global significance. The goal of the BASC is to contribute to preserving genetic, species and ecosystem diversity within the lease area through social upliftment, policy enforcement, and possible transformation of the local economy by moving towards more sustainable practices.

The first three and main sustainable practices that should be focused on are:

- Starting with conservation initiatives by training key members of the community in conservation practices in order for them to further educate community members,
- Educating and training the small-scale farmers on the property on sustainable agricultural practices (especially the combating of overgrazing), and
- Identifying possible conservation areas (i.e. the Norite Koppies/Ridges) that can serve as starting points for a greater conservation area that is managed by the RBN, which will bring in a sustainable income through eco-tourism.

Composition and role of the steering committee

The steering committee ought to consist of members of Impala Platinum's executive council, executive members of the RBN, community leaders from the neighbouring communities, an executive member from Omnia, a member from the Rustenburg Local Municipality, a member from the North West Province's Department of Agriculture, Conservation and Environment, a member of the Department of Land Affairs, a member from the Department of Agriculture and an ecological specialist. This composition will provide for ample representation from the various stakeholders that have a direct influence on all matters that concern biodiversity.

Powers of the committee

The committee must have the power to enforce the decisions made during meetings and stakeholders that are represented by the committee members must adhere to such decisions.

Implications for Impala Platinum

The implication for Impala Platinum is that biodiversity must have a permanent item on the agenda at each month's Executive Council meeting, otherwise all decisions taken by the committee or the environmental department will have no effect.

However, there is still a need to attain sound sustainable management practices through proper stewardship, closure planning and sustainable mine planning, which will be discussed in the sections to follow.

4.2.3 Sustainable biodiversity management practices through conservation planning

Most of the current modern mining operations incorporate a commitment towards continuous progress on environmental performance in comparison with past mining practice. Nevertheless, these past unsound practices still persist and even the best modern operations still lead to undesirable environmental impacts,. Improved performance will ultimately allow for the perseverance of natural capital, the enhancement of ecosystems where possible, and the contribution of mineral wealth to the nett environmental continuity. The challenge is to define where, resources can be targeted in the short and medium term to ensure the best chance of meeting these objectives in the future (IIED & WBCSD, 2002: xxi). A good place to start is in the following areas:

4.2.3.1 Biodiversity Action Plans (BAP)

Biodiversity Action Plans and policies have been formulated to allow for innovative designs and operational management systems. Such actions are encouraging, but are still largely restricted to companies with foresight and capital (IIED & WBCSD, 2002: xxi).

4.2.3.2 Stewardship and Land Care: Tools for building a conservation initiative

The Department of Agriculture (DoA) launched a new strategy called Land Care Area Wide Planning (AWP), which is being implemented by various provincial departments. The rationale for LandCare AWP is that to effectively address many natural resource issues (such as the degradation of soil by water and wind erosion, pollution of drinking water, alien invasive plant infestation etc.), planning must be

carried out on a scale larger than an individual farm. Because of this, the DoA has adopted a strategy for larger scale planning than the individual farm plan scale, in which local people identify and address the concerns of their community while striving to improve or maintain the status of their natural environment. LandCare AWP uses the Integrated Development Planning (IDP) process within a municipality as the vehicle to obtain these goals (Cape Nature, 2007: 5-6).

The AWP process is led by the community with the assistance of the DoA. It starts by mapping the natural resources in the area on a 1:10 000 scale, in order to get detailed and accurate land use information (e.g. waterways, natural veld, agricultural land, old fallow lands, mining land etc.). The second step is to gather the necessary information from the various landowners on what their current land use issues are, as well as what their future land use plans are. All of this information is then be plotted on a detailed GIS map, which will show the various current and future land uses (a good example of this is a spatial development framework). This map will reveal potential areas of conflict between conservation and agricultural plans for the area of study, but will, however, not affect the future legal status of portions of land or necessarily ensure that critical ecosystems are conserved and not developed. Stewardship can here offer the necessary legal instrumentation to secure conservation-worthy land with landowners, in addition to benefits and extension services to the willing landowners (Cape Nature, 2007: 6). In combination, stewardship and land care can be implemented in the form of informal voluntary conservation areas.

4.2.3.3 Conservation Plans

The main course of action that will need to be taken, as mentioned before, is to create a conservation plan. This can be done through the process of systematic conservation planning. Systematic conservation planning (SCP) is distinguished by its commitment to mainstreaming by means of spatially explicit products that can support conservation action by non-specialists (De Villiers *et al.*, 2008: 2). SCP has become a widely used and accepted practice to achieve conservation targets in South Africa as well as in many other parts of the world (Maze *et al.*, 2004: 7). SCP is relevant for the mining sector for at least three reasons:

- a. It provides clear and reliable information on biodiversity priorities to effectively negate negative impacts:
- b. It provides an opportunity for the mining sector to be involved as a stakeholder in the conservation planning process:

- c. It provides guidance to mining companies on how they can contribute directly to the achievement of conservation targets:

Mining's conservation efforts can extend beyond damage control. The sector can contribute directly to meeting conservation targets by participating in innovative conservation initiatives, such as the establishment of multi-owned protected areas. There is no reason why conservation should be confined exclusively within state-owned formal protected areas. Private enterprise, conservation agencies, private and communal landowners can work together to achieve conservation targets on privately-owned land (Maze *et al.*, 2004: 13).

The following section proposes various management actions that can be taken to start with a conservation effort on the mining lease area:

- a) Buffer zones

Buffer zones are areas that surround an ecologically sensitive area to safeguard it from adjacent anthropogenic activities. Within these areas, no development may take place and must be regarded as a 'no-go zone'. For this reason, buffer zones need to be established between ecologically sensitive areas and any rail or road network and any operations that are currently taking place and or which are envisaged to be developed. Buffer zones surrounding water bodies are essential for the proper function of invertebrates. Such a buffer zone would have a minimum width of 200-500 meters (NWDACE, 2004: 104).

- b) Corridors

It is recommended that ecological corridors be established between fragmented habitats and water sources to allow for gene flow between the targeted *Lepidoptera* and other invertebrate species. These areas can be any width; however, regular monitoring is necessary to ensure that there are no obstructions that prevent species from migrating between areas. This will, however, be subjected to more in-depth research to identify the corridors where they are needed (NWDACE, 2004: 104).

- c) Wetland areas

The following are recommendations regarding preliminary conservation provisions for wetland areas:

- No development may take place within the a wetland habitat or 1:50 year flood line;

- No development may take place within the hydromorphic grassland areas;and
- The control and eradication of alien invasive plant species should be undertaken especially within wetland systems (NWDACE, 2004: 112).

This all necessitates a buffer zone surrounding identified wetland areas. The width of these zones must be established by the relevant specialists.

d) Ridges

No development may take place on any ridge with a slope greater than 5°, which is the minimum slope gradient that has been recommended by the Departmental Policy Development: Guidelines for Ridges in Gauteng. Varied topography has been identified as one of the most powerful influences contributing to high levels of biodiversity in South Africa. The interplay that takes place between topography and climate over a long time span has led to the evolution of rich biodiversity (NWDACE, 2004: 113).

4.2.4 Biodiversity Offsets

BBOP (2009:6) defines biodiversity offsets as “...*measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people’s use and cultural values associated with biodiversity*”.

Therefore, in short, the aim is to provide a biodiversity offset to compensate for negative impacts on biodiversity that remains after mitigation measures have been taken into account (DEADP, 2007: 7). The following could comprise part of one or more of the mitigation measures:

- Securing habitat for conservation either on the area of operations or away from the area of operations.
- The provision of a financial guarantee for a specified period of time, during which the proponent could pursue the securing of habitat for conservation. Should the proponent fail in doing so, the financial guarantee would be used by the State or designated organisation to secure habitat. Or

- Providing monetary compensation for the destruction of a habitat (DEADP, 2007: 7).

There are those who oppose the idea of offsets and challenge its merit of 'net gains' for biodiversity. Their main argument is that secondary impacts are not considered in the establishment of offsets, although these can be quite significant in sectors such as mining (and to varying degrees beyond the control of companies). Another argument is that offsets serve as a convenient 'smokescreen' to enable companies to develop in areas that would otherwise be off-limits. This promotes and facilitates damage incurred to biodiversity that would otherwise have been unacceptable to decision-makers (ICMM, 2006: 99-100).

When considering offsets, caution should be taken when examining possible designs in order to ensure that their full beneficial potential is achieved in practice. The following are some basic factors that should be considered:

- Offsets should not be used as a scapegoat to justify or compensate for poor environmental management practices.
- Protected areas that were selected as compensators must be ecologically similar, be equivalent in value, equal or larger in size than the disturbed area and preferably be in the same area as the original natural habitat.
- Where possible, offsets should complement governmental conservation programmes and be responsive to conservation priorities outlined in international, national, regional and local initiatives that aim to implement the CBD.
- Offsets must be designed in such a way that these will result in a positive net gain of biodiversity, taking into account the timeframes of ecological processes. To ensure this, these areas should be evaluated by peer-reviewed scientific studies.
- Offsets must be lasting by continuing to function past the lifetime of the project and beyond.
- Offsets must be quantifiable where impacts, limitations and benefits can be reliably estimated and mitigated.
- They should be goal-driven by striving to equal or better the ecosystems they replace.

- They should be supplementary to already funded conservation programmes and not be funded under a separate programme.
- They should be enforceable through the development of consent conditions and/or licence conditions.
- When developing offsets, proper consultation must be entered with the relevant stakeholders (ICMM, 2006: 100).

4.3 Mine closure planning

The aim of this section is to identify a course of action for Impala Platinum when planning for closure in order to have an optimal return in the form of social relationships, saving money and optimising closure in such a way that it will benefit the environment. The focus will be on a detailed closure plan. Since the mine already possesses a conceptual closure plan, which does not adequately address the issues present on the operational area as it only focuses on rehabilitation aspects (i.e. dismantling of structures, seed amelioration, etc) and does not include social aspects, a detailed closure plan will be required.

The mining process can have several impacts, including socio-economic and ecotoxicological impacts. These impacts are continuous and will persist after closure (e.g. acid rock drainage, seepage from tailing facilities etc.) or arise due to closure, for example, local people who were dependent on the mine for employment and provision of services are left without both (Warhurst & Noronha, 2000: 24).

These types of impacts have to be anticipated and addressed in a mine's closure plan. The result of such a plan would be to address impacts that persist after closure or due to it by either avoiding it, or reducing it by addressing the impacts during the mine's operational phase so that at its closure the effects will be reduced significantly, and which in turn would ultimately lower the costs of closure and the extent to which remediation is required (Warhurst & Noronha, 2000: 24).

This is one good reason for closure planning to take place at the earliest opportunity. The earliest possible time to start would be at exploration, but it may not result in an operational mine. In this circumstance, planning for a closure outcome that leaves a positive legacy may realistically be to move towards environmental restoration of drill sites and tracks and the dismantling or handover of infrastructure, such as exploration camp facilities, after exploration. There are three basic steps to developing an effective closure plan should a mine decide to make closure planning part of its operational

philosophy. These steps should blend into each other over time rather than being distinctive stages (ICMM, 2008:10).

1. The first step

During this phase a conceptual closure plan that possesses targets for closure outcome and goals must be developed. This plan forms part of the exploration, pre-feasibility, feasibility/design and construction phases in order to guide the direction of activities. Depending on the time span of the phases, the lifetime of this plan may be three to five years. If the plan is well defined and developed in addition to making proper provision for stakeholder engagement, the need for change may not be necessary during this time (ICMM, 2008:10).

2. The second step

This step involves the ongoing development and implementation of a detailed closure plan. It will encompass an increased understanding and detail of specific goals and milestones as well as the needed actions and outcomes of activities to meet these goals. It will be used continuously during the mine's operational lifetime and will last as long as the period of operation. Because of this, continuous updates will be necessary due to changing conditions, changing impacts, changing of stakeholders' expectations and a possible change of the mine's operational plan (ICMM, 2008:12).

If the plan is well planned and defined at the start of operations, specific goals are less likely to change much during the life of the operation. Nevertheless, it will be likely that the detailed closure plan will evolve in line with changing circumstances. The detailed closure plan is in effect a more detailed version of the conceptual closure plan (ICMM, 2008:12).

3. The third step

The final step is the effective transition to closure. This plan is known as the decommissioning and post-closure plan. Its active life will remain many years after the mine's closure depending on post-closure responsibilities. If proper planning has taken place in step two, there should be minimal residual risk to the company, and the community should realise benefits that will continue to exist without further input from the company (ICMM, 2008:12).

As stated by the ICMM (2008: 12), *"Successful closure depends on setting, continually reviewing and validating and finally meeting closure goals that align with company and stakeholder requirements"*.

5 Chapter 5 - Model illustrating compliance with biodiversity related guidelines, legislation, norms and standards

UNEP (2005:10) refers to the Millennium Ecosystem Assessment, which states that it is essential for the design of interventions that these should enhance positive and minimize negative impacts. This can best be achieved by understanding the factors that cause changes in ecosystems and ecosystem services. These factors are called drivers of change and can be natural or human induced. Most impact assessments are primarily concerned with human-induced drivers, however natural drivers of change are equally important to obtain a complete estimate of what drives change within an area.

The aim of the biodiversity impact assessment process is such that the full range of factors that cause changes in biodiversity is considered specifically to be direct and indirect drivers of change¹². There are also other forms of drivers which can be identified through the way they can be influenced by a decision-maker (endogenous driver), and others which may be beyond the control of a particular decision-maker (exogenous drivers) (UNEP, 2005:10). The impacts resulting from drivers of change can best be assessed at each level of diversity in terms of the effect on one of the following aspects of biodiversity:

- a) **Composition:** What there is and how abundant it is. Often impact assessment does not go beyond the description of effects on species composition of higher plant and animal species and those species that have an extensive impact on the functional interaction of ecosystems are overlooked (UNEP, 2005:11).
- b) **Structure:** How biological units are organised in time and space in relation to the scale of the human intervention:
 - The scale of human intervention may be small in relation to the scale of an ecosystem (e.g. local erosion within a river basin, or a minor development within an extensive ecosystem) or large (e.g. a major dam in that river basin) (UNEP, 2005:11).
 - Foodweb structure and interactions have an immediate consequence for the functioning of the entire system. For example, the introduction of an alien invasive species into an ecosystem, has the potential to upset the entire ecosystem (UNEP, 2005:11).
 - Corridors between ecosystems that create an important link for the movement and exchange of the different levels of diversity (UNEP, 2005:11).

¹² To see the description of what direct and indirect drivers of change are see par. 3.2.1 and 3.2.2.

- c) **Key ecological processes:** What natural and/or human-induced processes are of key importance for the creation and / or maintenance of ecosystems? For example, a key biological process is the grazing pattern in savannahs, or predation of coral reefs by starfish. Key processes may be driven by external factors (e.g. climate), or by internal ecosystem processes (e.g. nutrient and energy flow). Human-induced processes can be of key importance for example flood control through flow regulation in dams (UNEP, 2005:11).

It is important to note it is possible to identify those potential impacts, which may arise on account of biodiversity without having complete knowledge of biodiversity in a study area. If an intervention is expected to result in changes in biodiversity or key processes, it can be expected that ecosystems and their services will be affected. Further studies can be focussed on expected aspects that are envisioned to affect biodiversity and related ecosystems. The advantage of this approach is that costly data collection efforts focus on the relevant aspects of biodiversity and thereby avoiding reiterative lengthy studies of all biodiversity aspects (UNEP, 2005:11).

5.1 Model for the evaluation of the effectiveness of EMP's and Closure plans

The proposed model for the evaluation of biodiversity management effectiveness for mines is based on the concepts of direct and indirect drivers of change and the Deming cycle and is an elaboration of the model proposed by UNEP and the International Association of Impact Assessment. The model focuses on both the natural and anthropogenic drivers that may affect biodiversity. The difference is that this model has been designed specifically for the platinum mine sector, although further studies may attempt to apply the model in the other mining sectors. It prescribes a framework of assessment guides the user in evaluating an operations EMP(s) and /or Closure Plans through six phases (See Figure 7 and 8). The aim is not to apply the model in this study but only to provide a framework for evaluation.

5.1.1 Phase 1: Planning

During the planning phase it must be determined which methods will be used in assessing the impacts and gaps on the study area. There are several risk identification and assessment methods available.

5.1.2 Phase 2: Appraisal to considering impacts [Plan] – HIPPO

During this phase, it is important to either engage in a Risk Assessment or conduct a comprehensive Biodiversity Impact Assessment in order to identify activities that

relate to the five major causes (HIPPO) of species decline and premature extinction within the EMP of a mine. Actions/Objectives for a Closure plan will focus on the maintenance of the objectives set within the EMP and consultation with relevant stakeholders. It is necessary to identify the various legislative and other best practice guidelines that apply to the criteria that are being assessed in order to have a measure to which the criteria can be evaluated against. The other aim of this phase is to identify priorities which require urgent attention and management action.

5.1.3 *Phase 3: Assigning a value to biodiversity [Plan]*

Although arguments would suggest that it is necessary first to identify the value of biodiversity, the counter-argument suggests that the status quo must first be determined to determine the value of the natural resources of the study area. A dual assessment need to be undertaken through qualitative and quantitative assessments methods. These assessments must be conducted throughout the life of mine and prior to closure to cognises the status of ecosystems and natural function in the area.

When calculating the qualitative value of biodiversity it is necessary to involve stakeholders, as various parties will have various perceptions of how they value biodiversity in a particular area. Therefore, a common perceived value for a specific area through the combination of views and values must be ascertained.

Quantifying biodiversity is much easier as there are several equations and methods of assigning a physical or monetary value to biodiversity. This can aid a board or top management in identifying what monetary and human inputs will be required after the various priorities have been identified in Phase 1.

5.1.4 *Phase 4: Determining physical and economical interventions [Plan]*

This phase aims to identify physical, social and economic interventions that may lead to negative direct drivers of change (biophysical¹³ changes and changes to ecosystems) and indirect drivers of change (social changes¹⁴ and human impacts¹⁵) as well as the positive influences (e.g. education) in order to enhance and utilise them. These interventions are the root cause of the impacts in a specific area can last over a short, medium or long term depending on the scale of impact. For example, unemployment may lead to a greater dependence on natural resources

¹³ Biophysical and ecosystems changes include: Changes in soil composition, structure and chemistry, changes in water quality and quantity, changes in air quality and changes in fauna migration patterns as well as faunal and floral diversity and species richness.

¹⁴ Social changes may be in the form of unemployment, economic development, upliftment etc.

¹⁵ Human impacts refer to the physical exploitation of natural resources.

over the medium to long term than would have usually been the case, thereby leading to the depletion and even extinction of certain species in an area.

Physical, social and economic interventions lead to biophysical and social changes, each of these potentially leading to higher order changes. Some social changes may lead to biophysical changes. Within their range of influence and depending on the type of ecosystem under influence, biophysical changes may influence different aspects of biodiversity. If these impacts are significant, this will have an impact on the ecosystem services provided by biodiversity. Impacts on ecosystem services will lead to a change in the valuation of these services by various stakeholders in society, thus affecting human well-being. People may respond to these changes in the value of ecosystem services and act accordingly, thus leading to new social changes (UNEP, 2005: 13).

The loops in this framework of thinking can in principle be endless good participatory scoping and the application of best available scientific and local knowledge, have to result in the most relevant impacts and associated cause-effect chains that need to be studied / managed (UNEP, 2005: 13)

This phase can be combined with Phase 1. Nonetheless, its focus is more on social impacts and their interventions on a specific area rather than the physical impacts of a specific activity (i.e. a plant or open cast mining operation) Therefore a social impact assessment study is required to determine which social drivers of change influence the surrounding environment.

It must be noted that social changes are not necessarily the only factor that can indirectly or directly influence ecosystems functioning. Climate change is the second component that needs to be considered as it is already influencing species migration and ecosystems changes through change in micro and probably macro climatic patterns.

5.1.5 *Phase 5: Mitigation [Do]*

Phase 4 focuses on providing mitigation measures (which are driven by the precautionary principle) for negative changes that may occur because of interventions taking place. This may be done by either avoiding/preventing or reducing/minimizing the effects of the identified changes that may occur.

This is where the physical documents (EMP's and Closure plans) will change. After identifying what all the aspects and impacts are, it can be determined whether the current measures provided in an EMP or Closure plan is adequate through a gap

analysis (Appendix D). EMP amendments through the Department of Mineral Resources is not uncommon and by improving on the EMP and providing even better achievable goals the co-operation and mutual understanding between the two parties will improve.

5.1.6 Phase 6: Alternatives and Re-establishment [Do]

For those changes that are not manageable, other alternatives must be sought. This can be done by biodiversity offsets in other less affected areas where ecosystems can be re-established as replacement for areas beyond repair. This must however, be the final and last resort. Rather exhaust all options before continuing with biodiversity offsets as offsets can be used as a scapegoat to justify or compensate for poor environmental management practices (see point 4.2.2.4).

5.1.7 Phase 7: Evaluation of the proposed measures [Check]

Evaluation must take place before it can be properly implemented. This can be done by initiating pilot projects or trials to evaluate the effectiveness of the proposed measures. It can even be done through a desktop feasibility study, EMP, or Closure plan performance assessments.

5.1.8 Phase 8: Management and maintenance [Act]

All the identified mitigation measures and alternatives must be regulated through proper management action that is directed by the implementation of policies, procedures and commitment towards objectives and targets. These management actions will result in the maintenance of physical (e.g. rehabilitated and conservation areas) and social (community education and upliftment) drivers. These drivers will continually evolve, which will require continuous adjustment of the various management actions.

Good management action can be guided by standards such as ISO 14001 where the top management of a company can agree to commit to continual environmental improvement. If companies do not wish to engage and implement this standard they can employ the tools provided under 4.2.1 to aid them in making more sound decisions.

Direct and Indirect Drivers of Change Impact Assessment Framework

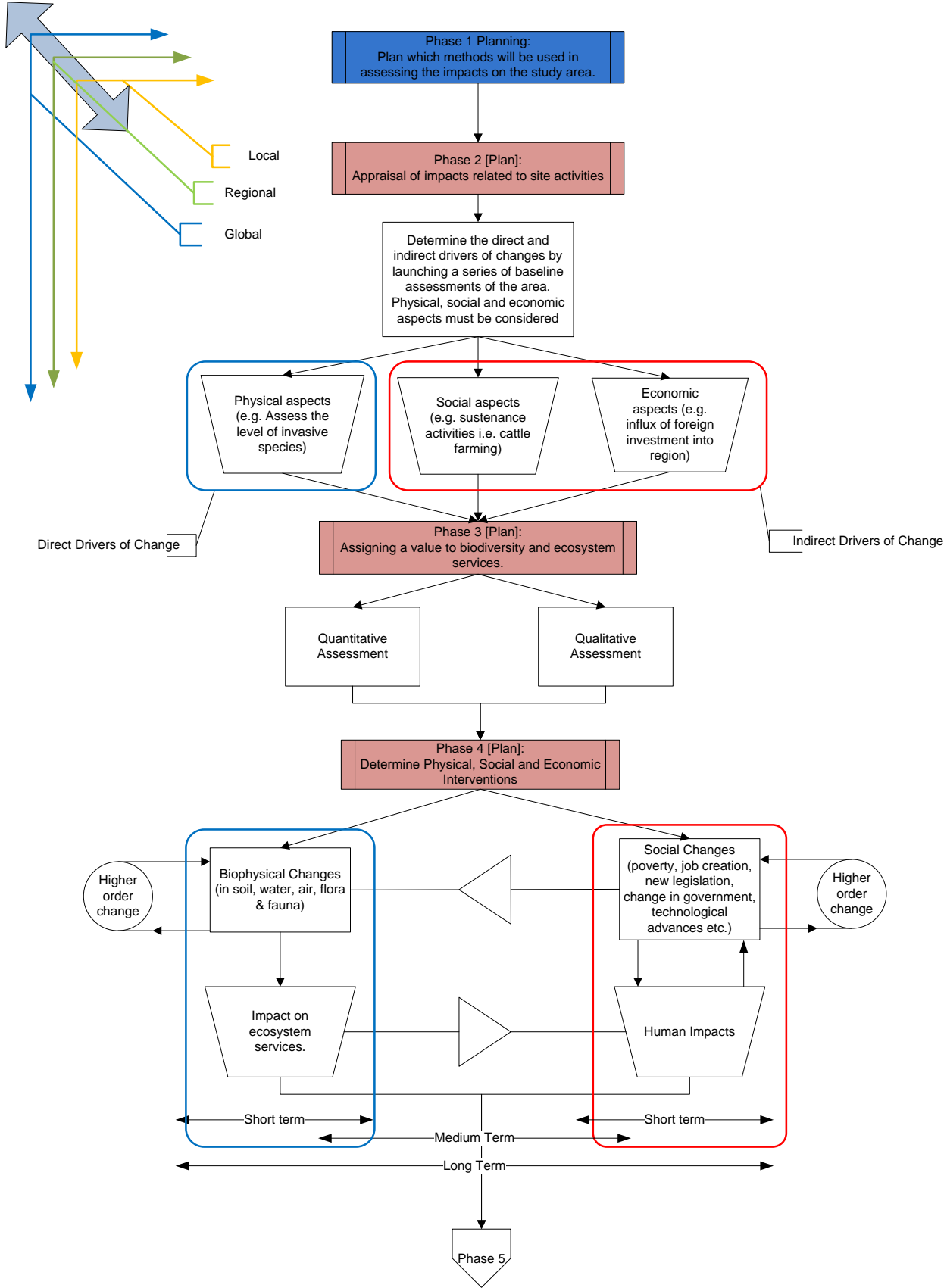


Figure 7: Direct and Indirect Drivers of Change Impact Assessment Framework

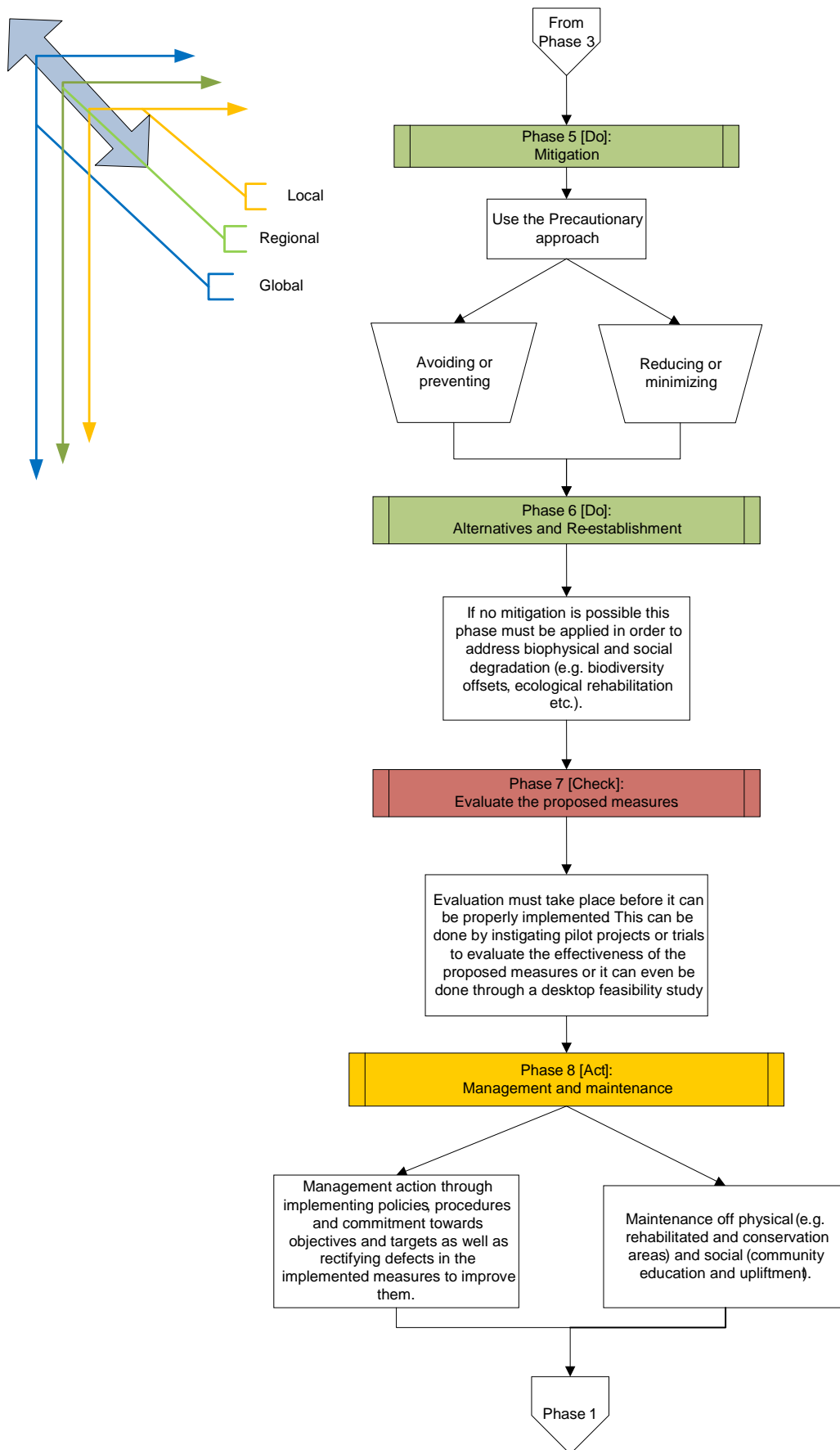


Figure 8: Direct and Indirect Drivers of Change Impact Assessment Framework (Cont.)

6 Conclusion

One of the greatest challenges facing the world today is integrating economic activity with environmental integrity, social concerns, and effective governance systems. This integration forms the core of sustainable development (i.e. the triple-bottom-line). The ideal of maximising social upliftment has been emphasised several times in the preceding chapters. The contribution to the well-being of communities in a way that ensures equitable distribution of its resources and the costs of obtaining them, without compromising the livelihood of future generations, is the ideal that must be strived towards. To achieve this will mean a long-term investment and commitment in comprehensive objectives to deal with environmental and social issues created by the minerals sector (IIED & WBCSD, 2002: xvi)

To achieve and implement an operational programme that steers a company in the direction of sustainable development will require the development of an integrated tool set capable of combining the array of diverse principles and objectives into a single manageable decision-making structure. As indicated in the preceding chapters (specifically Chapter 5), there exists an array of instruments, including assessment, regulatory, fiscal, educational, and institutional tools. However, these instruments need to be effective; administratively feasible; cost-efficient, with incentives for innovation and improvement; transparent; acceptable and credible to stakeholders; reliable and reproducible across different groups and regions; and equitable in the distribution of costs and benefits (IIED & WBCSD, 2002: xvii).

As stated in Chapter 4, biodiversity is a key element that was neglected even more in the past than were social issues. Ecosystems form the basis of all natural goods and services upon which sustainable livelihoods and food security depend. Historically, mining companies did not recognise ecosystems service, which resulted in the destruction of or radical alterations to whole ecosystems. In such cases, full recovery may take several decades and depending on the type of ecosystem, possibly even millennia. This caused the mining sector to be associated with large-scale biodiversity destruction and degradation. Current best practice attempts to avoid negative impacts and, where necessary, the restoration of damaged environments. This is essential if the sector is to move and contribute towards sustainable development in South Africa (Limpitlaw, 2004: 1).

In conclusion, a summarised account of the preceding chapters (2-5) together with the findings will now be provided.

6.1 Chapter 2

The aim of Chapter 2 was to assess the current legal instruments addressing impacts on biodiversity with the goal of seeing how Impala Mine's EMP's and Closure plan link up with the requirements of the various statutory requirements for biodiversity on an international, national, regional and local legal level. This evidently led to a gap analysis to identify the various shortcomings in the EMP's and Closure plans management actions for the identified impacts. To achieve this, a definitive line was drawn from international requirements to local requirements in order to learn whether the mine's EMP's and Closure plan were in line with those requirements. This inadvertently led to an environmental risk assessment listing all the issues and management actions, which was used in Chapter 3. The chapter was divided into four sections.

1. The first section identified all the international obligations regarding biodiversity. The regulatory documents that were identified and that were deemed to be of the greatest relevance were:
 - Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
 - Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR);
 - Convention on Biological Diversity (CBD);
 - Convention on the Conservation of Migratory Species of Wild Animals (Bonn);
 - Convention to Combat Desertification (UNCCD);
 - World Heritage Convention (WHC);
 - Stockholm Convention on Persistent Organic Pollutants;
 - 1992 Rio Declaration on Environment and Development;
 - The African Charter on Human and People's Rights;
 - The Convention on the Conservation of Nature and Natural Resources (CCNRR); and
 - The Protocol on Wildlife Conservation and Law Enforcement (PWCLE).
2. The second section identified all national requirements. The legal instruments that were identified were:

- The Constitution of the Republic of South Africa Act 108 of 1996;
 - The National Environmental Management Act 107 of 1998;
 - The National Environmental Management: Biodiversity Act 10 of 2004;
 - The Genetically Modified Organisms Act No. 15 of 1997 (GMOA),
 - The National Forests Act 84 of 1998 (NFA);
 - The Conservation of Agricultural Resources Act 43 of 1983 (CARA);
 - The Plant Improvement Act 53 of 1976;
 - The Agricultural Pests Act 36 of 1983 (APA);
 - The National Veld and Forest Fire Act 101 of 1998;
 - The National Environmental Management: Protected Areas Act 57 of 2003;
 - The Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA);
 - The National Water Act 36 of 1998 (NWA);
3. The third section identified regional obligations regarding biodiversity. The documents identified were:
- The National Spatial Biodiversity Assessment (NSBA);
 - The National Biodiversity Strategy and Action Plan (NBSAP);
 - The North West Biodiversity Site Inventory & Database Development;
 - The Rustenburg Strategic Environmental Assessment; and
 - The Rustenburg Local Municipality Integrated Environmental Management Policy.
 - The Rustenburg Local Municipality Integrated Environmental Management Policy,
 - Northwest Province Environment Outlook: A report on the state of the environment (2008),
 - Rustenburg Local Municipality State of the Environment Report (2007),
 - Provincial Fact Sheet: Land degradation North West (1999),
 - North West Province State of the Environment Report: Overview (2002),

4. The fourth section gave an account of Impala Platinum's EMP's and Closure plan's requirements for managing impacts on the lease area. This environmental risk assessment listed the various management requirements for the identified impacts in the EMP's and Closure plan.

This chapter aided in answering the first question: *What are the requirements for managing biodiversity on an international, national, regional and local level?* , as well as the third question: What measures do Impala Platinum apply in conserving biodiversity? Moreover, it also partially helped to answer Question 4 viz. whether Impala Platinum currently complies with all requirements related to biodiversity.

The main issue that emanated from all exclusions in the EMP and the closure plan was that the environmental standards, management objectives and priorities that were developed (specifically the EMP) do not contingently and specifically reflect conditions relating to the environmental and developmental context to which they apply. Some of the objectives provided in the EMP are too tolerant and do not allow for concise decision and action. For example, the following objective, viz: *"Remove topsoil and subsoil from the site. Establish areas for the topsoil and subsoil stockpiles and design the stockpiles so that the topsoil can be used for rehabilitation purposes when the sites is decommissioned (MEE, 1999: (6-1))"* in the No. 14 Shaft EMP leaves a great deal to be desired as no reference is made to specifics such as compaction alleviation, specific stockpile heights, placement methods etc.

The closure plan, on the other hand, was a regurgitation of the same unimaginative objectives focusing on remedying past legacies instead of providing a lasting solution for sustaining and improving the environmental conditions left by the mine. Most importantly, it does not address the social issues that could affect the mine after closure. It can therefore be declared that the objectives set out for this chapter have been met by comparing the conditions of the EMP and Closure Plan with the international, national, regional and local obligations regarding biodiversity and identifying the shortcomings regarding biodiversity in the mine's management tools.

6.2 Chapter 3

Chapter 3 aimed at identifying the direct and indirect impacts on the mine's lease as identified through its EMP's and Closure plan. To put the biodiversity issues in the study area into the mine's broader context these were related to the issues on a broader national and regional scale. The issues in these contexts have a direct or indirect link to the issues occurring on the lease area. The five major factors

contributing to decline and loss of biodiversity were clearly defined in the HIPPO model above and were summarized accordingly in no specific order. The direct hazards that were identified for Impala were:

1. Habitat transformation,
2. Transformation within the different vegetation types,
3. Overgrazing, and
4. The infestation of alien invasive plant species.

The indirect impacts included:

5. Climate change
6. Over-exploitation
7. Selective harvesting of woody plants,
8. Selective harvesting of medicinal plants, and
9. Hunting of target animal species,

However, it was necessary to contextualise the value of biodiversity in order to grasp the severity of the impacts on it. An account of the valuation methods was provided as well as the necessity to value biodiversity. It does not form part of this study to give the full account of what the particular calculated value is of biodiversity on the Impala Platinum lease area. This can form part of future research in applying these methods in the prescribed model in Chapter 5. Nonetheless, one can deduce what the value is when accounts are given of the status of biodiversity in South Africa and the Impala Platinum Lease area.

This chapter allowed Question 2 to be answered, viz: *What are the typical direct and indirect impacts of a platinum mine such as Impala Platinum on biodiversity?*

6.3 Chapter 4

This chapter attempted to answer the second part of Question 4, i.e. *What additional measures should be implemented?* This was achieved by proposing several management tools and management adaptations that could be used by the mine in order to effectively manage activities that affect biodiversity. This chapter was divided into three sections (4.1 – 4.3), where Section 4.1 focused on decision-making, Section 4.2 on management action and Section 4.3 on Closure planning. The proposed initiatives included:

- a) Biodiversity Inclusive-Impact Assessment.
- b) Good environmental governance.
- c) The application of the precautionary principle.
- d) The ecosystems approach.
- e) Implementing a Biodiversity Action Steering Committee.
- f) Sustainable biodiversity management practices through conservation planning.
- g) Offsets.
- h) Mine Closure planning.

It was shown that an integrative approach is needed to optimise the management of human activities in order to achieve sustainable biodiversity management practices. The past mentality of only focusing on one or two aspects of the triple bottom line (usually fiscal benefits and to an extent social issues) must be discarded and started afresh, by adopting a new mindset in managing all aspects in the operational area. Should one or even two of the legs be ignored it will be disastrous. Managing activities affecting biodiversity will require the management of social needs and malpractices as well as the employment of a more stable and sound budgeting protocol that takes into account not only operational, but also social and environmental needs.

6.4 Chapter 5

In this final chapter, a model with eight phases was developed that effectively answers the final question, viz. *From the biodiversity management requirements, which criteria can be used to develop a model by which the adequacy and efficacy of a platinum mine's biodiversity protection measures can be determined?* The model can be used in evaluating the effectiveness of a Platinum Mines' EMP(s) and Closure plan to address biodiversity impacts. It is based on the concepts of direct and indirect drivers of change, the Deming cycle and is an elaboration on the model proposed by UNEP and the International Association of Impact Assessment. The model focuses on both the natural and anthropogenic drivers that may affect biodiversity. The Deming cycle forms the basis of the model, which ensures that a closed cycle is formed where continual improvement in biodiversity management can be achieved.

6.5 Closing remarks

Limpitlaw (2004: 3) refers to Swart (2003) who states that prior to the passing into law of the Minerals Act No. 50 of 1991 and now the Mineral Petroleum Resource

Development Act No. 28 of 2002, many mining companies “*used irresponsible mining methods with no regard towards protecting the environment and had often shirked their responsibility towards environmental rehabilitation by leaving an area unrehabilitated prior to them being liquidated or leaving the country*”.

This has changed to a large extent, in recent years, but there are still some mining companies that deliberately refuse to invest the necessary time and money in local communities. Environmental issues pertaining to post-mining regeneration priorities for South Africa include:

- Restoration of land surface of sufficient quality to support pre-mining land use potential;
- Restoration of the ecological function of mined land and in the case of previously degraded land, the ecological function must be improved;
- Efficient alternative use of mine infrastructure should be encouraged where this can be economically justified; where no economic alternative uses exist, mine infrastructure must be removed and the site rehabilitated to pre-mining condition;
- Southern Africa in general, and South Africa in particular, experiences water shortages and therefore minimisation of current and potential future impacts on water quality and supply is imperative;
- Job creation, through skills and literacy training to stimulate economic activity to ensure communities acquire other resources than biodiversity to sustain themselves;
- The initiation of development projects to enable equitable participation in post-mining economies by all members of the community; and
- Enhancement of leadership capacity within the community and local government may be required to ensure that development continues post closure in a sustainable way that will not influence strides that have already been made in conserving biodiversity.

When examining these priorities it is clear that Impala Platinum does in general invest in controlling and managing its environmental issues, which evidently shows its responsibility towards environmental stewardship. However, what also can be deducted is that the social aspects surrounding and forming part of the mining operations forms part of the problem and is in conjunction with Impala one of the greatest contributors to the majority of the biodiversity issues in the area.

The question, How is biodiversity managed in a diverse developing country mining context? may be answered firstly through the application of section 28(1) of NEMA that requires the Duty of Care, i.e. *“Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment”*

Secondly, it can be answered by adopting the concept of Integrated Environmental Management by creating a holistic management framework of tools that can be embraced by all stakeholders for the assessment and management of environmental impacts and aspects associated with their activities, taking into consideration the concept of sustainable development. Ultimately, it can be stated unequivocally that the integrated management approach is in line with the five strategic objectives required by the NSBAP. This was achieved through setting objectives for:

- The integration of biodiversity management objectives into economic objectives;
- The enhancement of institutional effectiveness and efficiency through ensuring good governance regarding biodiversity;
- The integration of terrestrial and aquatic management systems to minimise the impacts of threatening processes on biodiversity, enhancing ecosystem services and improving social and economic security;
- The enhancement of human development and well-being through the sustainable use of biological resources and equitable sharing of the benefits; and
- The establishment of conservation areas that protect a representative sample of biodiversity or maintain key ecological processes.

This integrative approach is in aligned with the requirements of the NBSAP and is crucial not only to achieve compliance with international, national, provincial and local requirements for biodiversity, but also to ultimately achieve a high degree of social and corporate social responsibility.

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8 Appendices

8.1 Appendix A: International and Regional Convention and Treaties applicable to biodiversity

Convention / Treaty	Status	Description	Requirements and objectives
<p>Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)</p>	<p>Signed: 3 March 1973 Ratified: 15 July 1975 (DEAT, 2002).</p>	<p>The main objectives of this convention are the protection of endangered species prominent in international trade through appropriate trade control measures and monitoring the status of such species (DEAT, 2002). It is also applicable to the sustainable utilization of species especially hunting, for medicinal use and use for research.</p> <p>The species covered by CITES are listed in three Appendices, according to the degree of protection they need:</p> <ul style="list-style-type: none"> • Appendix I include species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances. • Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to ensure sustainable utilization. <p>Appendix III contains species which have been identified by countries that</p>	<p>The main conditions that must be met are in CITES (1973) are:</p> <ul style="list-style-type: none"> • The export/import of species may not be detrimental to its survival. • The acquisition of specimens may not be in contravention of the particular states laws in which it is being obtained (in South Africa's case it would be NEMBA). • The shipment of specimens must be in such a way that the risk to injury, damage to health or cruel treatment is minimised. <p>Then there is a list of other requirements for:</p> <ul style="list-style-type: none"> • Specimens in transit or being transhipped, • Specimens that were acquired before CITES provisions applied to them, • Specimens that are personal or household effects, • Animals that were bred in captivity, • Plants that were artificially propagated, • Specimens that are destined for scientific research, • Animals or plants forming part of a travelling collection or exhibition, such as a circus.

Convention / Treaty	Status	Description	Requirements and objectives
		need protection, but they require the assistance of other countries to regulate their trade (CITIES, 1973).	
Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR)	Signed: 12 March 1975 Ratified: 12 March 1975 (DEAT, 2002).	<p>In essence this convention aims to stem the loss and promote the sustainable use of wetlands. The convention addresses a major issue in the country i.e water loss by promoting its conservation. Through the provisions of this convention South Africa designated 16 sites to the List of Wetlands of International Importance.</p> <p>Wetlands provide a range of essential ecological services needed for the survival of not only biodiversity but also humans. They are the repositories of indispensable ecological treasures. The conservation and sustainable use of wetlands are therefore in the interest of all South Africans</p> <p>The convention encourages the conservation of wetland habitats, and provides a framework for international cooperation for wetland conservation because many of these systems cross the boundaries of countries (DEAT, 2002).</p>	<p>The Ramsar Contracting Parties, have committed themselves to implementing the “three pillars” of the Convention which is:</p> <ul style="list-style-type: none"> • To designate suitable wetlands for the List of Wetlands of International Importance (“Ramsar List”) and ensure their effective management; • To work towards the wise use¹⁶ of all their wetlands through national land-use planning, appropriate policies and legislation, management actions, and public education; and • To cooperate internationally concerning transboundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands (RAMSAR, 1971)

¹⁶ The “wise use” concept is the driving force of implementing the provisions of the convention. It substantiates the maintenance of wetland’s ecological character, through the implementation of ecosystem approaches, within the context of sustainable development”. The main outcome is conservation and sustainable use of wetlands and their resources, for the benefit of humankind (RAMSAR, 1971).

Convention / Treaty	Status	Description	Requirements and objectives
Convention on Biological Diversity (CBD)	Signed: June 1993 Ratified: 2 November 1995 (DEAT, 2002).	<p>This is certainly the most important convention that is used for the conservation of biodiversity. Its principal objectives are:</p> <ul style="list-style-type: none"> – the conservation and sustainable use of biological diversity, and – the fair and equitable sharing of benefits arising from its utilisation. <p>The guiding objectives of convention are contained in Articles 6 to 20. These key provisions contained in the articles are:</p> <ul style="list-style-type: none"> • Measures for the conservation of biological diversity, • In situ and ex situ conservation; • Incentives for the conservation and sustainable use of biological diversity, • Research and training; • Public awareness and education; impacts assessment of the projects; • Regulating access to genetic resources; • Access to and transfer of technology; and • The provisions of financial resources (CBD, 1992). 	<p>Although this convention is compiled for countries most of its requirements are also applicable to private organizations. The following articles contained in the CBD (1992) are deemed most important to an organisation such as Impala Platinum:</p> <ul style="list-style-type: none"> • Article 6. General Measures for Conservation and Sustainable Use: <ul style="list-style-type: none"> – Develop national strategies, plans or programmes for the conservation and sustainable use of biodiversity, and – Integrate, as far as possible and as appropriate, the conservation and sustainable use of biodiversity into relevant sectoral or cross-sectoral plans, programmes and policies. • Article 7. Identification and Monitoring: <ul style="list-style-type: none"> – Identify components of biodiversity important for its conservation and sustainable use – Monitor, through sampling and other techniques, the components of biodiversity paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use, and – Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biodiversity, and monitor their effects through sampling and other techniques. • Article 8. In-situ Conservation: <ul style="list-style-type: none"> – Establish a system of protected areas or areas where special measures need to be taken to

Convention / Treaty	Status	Description	Requirements and objectives
			<p>conserve biodiversity,</p> <ul style="list-style-type: none"> - Develop, where necessary, guidelines for the selection, establishment and management of protected areas, - Regulate or manage biological resources important for the conservation of biodiversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use, - Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in the environment, - Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas, - Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, through the development and implementation of plans or management strategies, - Establish or maintain measures to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biodiversity, taking also into account the risks to human health, - Prevent the introduction of, control or eradicate alien species which threaten ecosystems, - Respect, preserve and maintain knowledge, innovations and practices of indigenous and

Convention / Treaty	Status	Description	Requirements and objectives
			<p>local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biodiversity and promote their wider application with the approval and involvement of such and encourage the equitable sharing of the benefits arising from the utilization of such knowledge,</p> <ul style="list-style-type: none"> - Maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations, - Where a significant adverse effect on biodiversity has been determined regulate or manage the relevant processes and activities; and - Cooperate in providing financial and other support for in-situ conservation. <ul style="list-style-type: none"> • Article 9. Ex-situ Conservation: <ul style="list-style-type: none"> - Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions, - Regulate and manage collection of biological resources from natural habitats for ex-situ conservation purposes so as not to threaten ecosystems and in-situ populations of species, except where special temporary ex-situ measures are required, and - Cooperate in providing financial and other support for ex-situ conservation outlined in subparagraphs above and in the establishment and maintenance of ex-situ conservation facilities. • Article 10. Sustainable Use of Components of

Convention / Treaty	Status	Description	Requirements and objectives
			<p>Biodiversity:</p> <ul style="list-style-type: none"> – Integrate consideration of conservation and sustainable use of biological resources into decision-making, – Adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biodiversity, – Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements, – Support local populations to develop and implement remedial action in degraded areas where biodiversity has been reduced, and – Encourage cooperation between authorities and private sector in developing methods for sustainable use of biological resources. <ul style="list-style-type: none"> • Article 11. Incentive Measures: <ul style="list-style-type: none"> – Adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biodiversity. • Article 12. Research and Training: <ul style="list-style-type: none"> – Establish and maintain programmes for scientific and technical education and training in measures for the identification, conservation and sustainable use of biodiversity and its components and provide support for such education and training for the specific needs, and – Promote and encourage research which contributes to the conservation and

Convention / Treaty	Status	Description	Requirements and objectives
			<p>sustainable use of biodiversity.</p> <ul style="list-style-type: none"> • Article 13. Public Education and Awareness: <ul style="list-style-type: none"> – Promote and encourage understanding of the importance of, and the measures required for, the conservation of biodiversity, as well as its propagation through media, and the inclusion of these topics in educational programmes; and – Cooperate with other organisations in developing educational and public awareness programmes, with respect to conservation and sustainable use of biodiversity. • Article 14. Impact Assessment and Minimizing Adverse Impacts: <ul style="list-style-type: none"> – Introduce appropriate procedures requiring environmental impact assessment of proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects, – Ensure that the environmental consequences of programmes and policies are duly taken into account, and – Promote arrangements for emergency responses to activities or events, which present a grave and imminent danger to biological diversity and encourage cooperation to supplement such efforts. • Article 17. Exchange of Information: <ul style="list-style-type: none"> – Organizations shall facilitate the exchange of information, from all publicly available sources, relevant to the conservation and sustainable use of biological diversity, and – Such information shall include results of

Convention / Treaty	Status	Description	Requirements and objectives
			<p>technical, scientific and socio-economic research, as well as information on training and surveying programmes, specialized knowledge, indigenous and traditional knowledge</p> <ul style="list-style-type: none"> • Article 20. Financial Resources: <ul style="list-style-type: none"> – In accordance with its capabilities, an organization shall provide financial support and incentives in respect of those activities which are intended to achieve the objectives of this Convention, in accordance with its own and national plans, priorities and programmes.
Convention on the Conservation of Migratory Species of Wild Animals (Bonn)	Acceded: December 1991 (DEAT, 2002).	The main objective of this convention for nations to cooperate in the conservation of animals that migrate across their borders. These include terrestrial mammals, reptiles, marine species and birds. Special attention is paid to endangered species. South Africa is a major partner in this convention as it is the terminus for many of the migratory species, both to the Palaeoartic (birds) and the Antarctic species (whales and birds) (DEAT, 2002)	Conserve and promote the conservation of migratory species. Although the Lesser Flamingo is not listed in the Bonn Convention it remains a migratory species that must be protected.
Convention to Combat Desertification (UNCCD)	Signed: 9 January 1995 Ratified: 30 September 1997	This convention seeks to drive local communities and their associations, NGOs, researchers and experts, legislators, financial and technical cooperation agencies to take on environmental degradation, which include land degradation, deforestation, loss of biodiversity and	The main requirements expressed in the UNCCD (1992) which are applicable to an organisation such as Impala Platinum are: <ul style="list-style-type: none"> • Article 4: <ul style="list-style-type: none"> – Adopt an integrated approach addressing the physical, biological and socio-economic aspects of the processes of desertification and drought, – Integrate strategies for poverty eradication into

Convention / Treaty	Status	Description	Requirements and objectives
		<p>global warming. It drives the above mentioned stakeholders to integrate its principles into their policies, programmes and strategies for sustainable long-term development (DEAT, 2002).</p>	<p>efforts to combat desertification and mitigate the effects of drought,</p> <ul style="list-style-type: none"> - Promote cooperation among affected parties in the fields of environmental protection and the conservation of land and water resources, as they relate to desertification and drought, - Cooperate within relevant intergovernmental organisations, <ul style="list-style-type: none"> • Article 5: <ul style="list-style-type: none"> - Give due priority to combating desertification and mitigating the effects of drought, and allocate adequate resources in accordance with their circumstances and capabilities, - Establish strategies and priorities, within the framework of sustainable development plans and/or policies, to combat desertification and mitigate the effects of drought, - Address the underlying causes of desertification and pay special attention to the socio- economic factors contributing to desertification processes, - Promote awareness and facilitate the participation of local populations, particularly women and youth, with the support of governmental and non-governmental organisations, in efforts to combat desertification and mitigate the effects of drought, and - Provide an enabling environment by strengthening relevant existing legislation and, where they do not exist, establishing long-term policies and action programmes, • Article 19: <ul style="list-style-type: none"> - Provide training for decision makers, managers, and personnel who are responsible for the

Convention / Treaty	Status	Description	Requirements and objectives
			<p>collection and analysis of data for the dissemination and use of early warning information on drought conditions, and</p> <ul style="list-style-type: none"> - Organize awareness campaigns for the general public, • Article 20: <ul style="list-style-type: none"> - Taking into account financial capabilities, organizations must undertake to mobilize adequate financial resources for the implementation of their action programmes.
World Heritage Convention (WHC)	Ratified: 10 July 1997 (DEAT, 2002).	The convention aims to promote cooperation among nations to protect natural and cultural heritage, which is of such outstanding universal value that its conservation is of concern to all people (DEAT, 2002).	<p>The main requirements expressed in UNESCO (1972), which are applicable to an organisation such as Impala Platinum are:</p> <ul style="list-style-type: none"> • Article 5: <ul style="list-style-type: none"> - Ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage situated on its territory. - Adopt a general policy which aims to give the cultural and natural heritage a function in the life of the community and to integrate the protection of that heritage into comprehensive planning programmes, - to set up within its territories, where such services do not exist, one or more services for the protection, conservation and presentation of the cultural and natural heritage with an appropriate staff and possessing the means to discharge their functions, - to take the appropriate legal, scientific, technical, administrative and financial measures necessary for the identification, protection, conservation, presentation and rehabilitation of this heritage,

Convention / Treaty	Status	Description	Requirements and objectives
			<ul style="list-style-type: none"> • Article 6: <ul style="list-style-type: none"> – To undertake not to take any deliberate measures which might damage directly or indirectly the cultural and natural heritage, • Article 27: <ul style="list-style-type: none"> – Organisations shall undertake to strengthen appreciation and respect by local communities for cultural and natural heritage by means of educational and information programmes, and – Keep the public broadly informed of the dangers threatening local and national heritage.
Stockholm Convention on Persistent Organic Pollutants	Signed: 23 May 2002 Ratified: 4 September 2002	<p>The objective of this Convention is to protect human health and the environment from the effects of chemical pollutants commonly known as persistent organic pollutants¹⁷ (POPs). Resulting from incontrovertible evidence from decades of scientific research twelve of these substances have been targeted for immediate action due to their capability of doing enormous harm to humans and the environment (DEAT, 2002). At its fourth meeting held from 4 to 8 May in 2009, the Conference of the</p>	<p>The main requirement of the convention is to stop the use and production of the following chemicals in the listed three categories according to UNEP (2001):</p> <ol style="list-style-type: none"> 1. Pesticides: <ul style="list-style-type: none"> • Aldrin, • Chlordane, • DDT, • Dieldrin, • Endrin, • Heptachlor, • Hexachlorobenzene, • Mirex, • Toxaphene • Chlordecone,

¹⁷ According to UNEP (2010) POPs are organic chemical substances that are carbon-based and possess a particular combination of physical and chemical properties such that, once released into the environment, they:

- Remain intact for long several years;
- Become widely distributed throughout the environment as a result of natural processes involving soil, water and, air;
- Accumulate in the fatty tissue of living organisms including humans, and are found at higher concentrations at higher levels in the food chain; and
- They are toxic to both humans and biodiversity.

Convention / Treaty	Status	Description	Requirements and objectives
		Parties (COP) identified nine additional POPs (UNEP, 2010)	<ul style="list-style-type: none"> • Alpha hexachlorocyclohexane, • Beta hexachlorocyclohexane, • Lindane, and • Pentachlorobenzene; <p>2. Industrial chemicals:</p> <ul style="list-style-type: none"> • Hexachlorobenzene, • Polychlorinated biphenyls (PCBs)¹⁸ • Hexabromobiphenyl, • Hexabromodiphenyl ether, • Heptabromodiphenyl ether, • Pentachlorobenzene, • Perfluorooctane sulfonic acid, • Its salts, • Perfluorooctane sulfonyl fluoride, • Tetrabromodiphenyl ether, and • Pentabromodiphenyl ether; <p>3. By-products:</p> <ul style="list-style-type: none"> • Hexachlorobenzene, • Polychlorinated dibenzo-p-dioxins, • Polychlorinated dibenzofurans (PCDD/PCDF), • PCBs, • Alpha hexachlorocyclohexane, • Beta hexachlorocyclohexane, and • Pentachlorobenzene.
1992 Rio Declaration on Environment and Development	International conference held in Rio de Janeiro from 3 to 14 June 1992.	The Rio Declaration on Environment and Development, also known as the Rio Declaration, was a short document produced at the 1992 United Nations Conference on	The main principles applicable to Impala platinum are as indicated in UNGA (1992): <ul style="list-style-type: none"> • Principle 1: Humans are at the centre of concerns for sustainable development and are entitled to a healthy and productive coexistence

¹⁸ PCBs are primarily used in transformer oil. From the early 1970s companies have started to produce PCB-free oil. Transformer oil today contains no PCBs and is marked that they don't contain the substance.

Convention / Treaty	Status	Description	Requirements and objectives
		<p>Environment and Development (UNCED) (or the Earth Summit). Its main goal is to create a new partnership between states and international organisations and key sectors to create an understanding on the need for harmonising development and the environment</p> <p>Out of this conference 27 principles were created intended to guide sustainable development around the world (UNGA, 1992)</p>	<p>with nature.</p> <ul style="list-style-type: none"> • Principle 2: States or organisations have the right to develop and exploit their resources as long as their activities do not extend their boundaries of jurisdiction. • Principle 3: Everyone has the right to development as long as it meets developmental and environmental needs of present and future generations. • Principle 4: Environmental protection must from an integral part of development in order to achieve sustainable development. • Principle 5: All entities shall strive to eradicate poverty as an indispensable requirement for sustainable development. • Principle 7: All entities shall strive to restore and protect degraded and vulnerable ecosystems. • Principle 10: Environmental issues are best handled with the full participation of all those that have a direct concern with development. • Principle 11: The environmental standards, management objectives and priorities that are developed must reflect the environmental and developmental context to which they apply. • Principle 15: In order to protect the environment, the precautionary approach shall be applied. Where there are threats of serious or irreversible harm, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. • Principle 16: Companies should internalise environmental costs and the use of economic instruments, taking into account the approach that

Convention / Treaty	Status	Description	Requirements and objectives
			<p>the polluter should, in principle, bear the cost of pollution.</p> <ul style="list-style-type: none"> • Principle 17: Conduct environmental impact assessments for those activities that are deemed detrimental to the environment. • Principle 18: Timely notify those affected of environmental disasters. • Principle 21: Promote sustainable development education among youth. • Principle 22: Make use of indigenous knowledge because it can have a great contribution to environmental management.
<p>The African Charter on Human and People's Rights (ACHPR).</p>	<p>Adopted by the eighteenth Assembly of Heads of State and Government, on June 1981 in Nairobi, Kenya (ACHPR, 2010).</p>	<p>This document applies to all the African States and members of the Organisation of African Unity. It recognises that fundamental human rights stem from the attitudes of human beings, which justifies their international protection and on the other hand that the reality and respect of peoples' rights should necessarily guarantee human rights (ACHPR, 1981).</p>	<p>The main article of this document that needs to be taken in to consideration is Article 24, which states: <i>"All peoples shall have the right to a general satisfactory environment favourable to their development."</i> (ACHPR, 1981). This statement is of great importance because it is incorporated in legislation of several African countries and even South Africa's own constitution in section 24.</p>
<p>The Convention on the Conservation of Nature and Natural Resources (CCNRR)</p>	<p>Adopted in Algiers, Algeria, on 15 September 1968, and entered into force on 16 June 1969 (CHRUP, 2010).</p>	<p>African countries recognize that natural (water and soil) and biodiversity capital are of vital importance to humans. They affirm through this convention that it their duty to harness the natural and human capital of Africa for the advance of African's livelihoods. They however do acknowledge that natural resources from an economic,</p>	<p>The following articles are of great importance to Impala Platinum. Their main requirements are indicated as follows in OAU (1968: 4-11).</p> <ul style="list-style-type: none"> • Article VI Land and soil: Effective measures must be taken to prevent land degradation, and to that effect shall develop long-term integrated strategies for the conservation and sustainable management of land resources, including soil, vegetation and related hydrological processes. In areas affected by land degradation, plan and

Convention / Treaty	Status	Description	Requirements and objectives
		<p>nutritional, scientific, educational, cultural and aesthetics' preservation and sustainable utilisation is of great importance to achieve this goal (OAU, 1968: 1)</p>	<p>implement mitigation and rehabilitation measures</p> <ul style="list-style-type: none"> • Article VII Water: Measures must be taken that are designed to: <ul style="list-style-type: none"> – Maintain water-based essential ecological processes as well as to protect human health against pollutants and water-borne diseases, – Prevent harm that could affect humans and environments in neighbouring regions – Prevent excessive abstraction, to the benefit of downstream communities, and – Implement policies for the planning, conservation, management, utilization and development of underground and surface water. • Article VIII Vegetation cover: Take all necessary measures for the protection, conservation, sustainable use and rehabilitation of vegetation cover by adopting scientifically-based and sound traditional conservation, utilization and management plans for forests, woodlands, rangelands, wetlands and other areas with vegetation cover, taking into account the social and economic needs of the peoples concerned, the importance of the vegetation cover for the maintenance of the water balance of an area, the productivity of soils and the habitat requirements of species • Article IX Species and genetic diversity: Ensure the conservation of species and their habitats within the framework of land-use planning and of sustainable development by: <ul style="list-style-type: none"> – Managing plant and animal populations inside conservation areas, – Managing harvestable populations outside such areas in a sustainable manner, compatible with

Convention / Treaty	Status	Description	Requirements and objectives
			<p>and complementary to other sustainable land uses,</p> <ul style="list-style-type: none"> - Establishing and/or strengthening existing facilities for ex situ conservation to perpetuate animal or plant species of particular interest, - Managing and protecting aquatic environments, whether in fresh or brackish water, with a view to minimise deleterious effects of any water and land use practice which might adversely affect aquatic habitats, - Undertaking to generate inventories of faunal and floral species and prepare maps of their distribution and population size, and conduct regular reviews to facilitate the monitoring of the status of such species and their habitats. <ul style="list-style-type: none"> • Article X Protected species: Identify the factors that are causing the depletion of animal and plant species which are threatened or which may become so, whether they are terrestrial or aquatic. • Article XII Conservation areas: Assess the potential impacts and necessity of establishing conservation areas and in order to ensure the long term conservation of biological diversity to conserve ecosystems which have a high degree of biodiversity and have a high aesthetic and scientific value. • Article XIII Processes and activities affecting the environment and natural resources: Individually or jointly, take all appropriate measures to prevent, mitigate and eliminate the detrimental effects on the environment, in particular from radioactive, toxic, and other hazardous substances and wastes.

Convention / Treaty	Status	Description	Requirements and objectives
			<p>For this purpose, organisations shall harmonise their policies with national and international policies and programmes.</p> <ul style="list-style-type: none"> • Article XVI Sustainable development and natural resources: <ul style="list-style-type: none"> – Take all necessary measures to ensure that development activities and projects are based on sound environmental policies and don't have adverse effects on natural resources and the environment. – Monitor the state of natural resources as well as the impact of development activities and projects upon such resources. • Article XVII Traditional rights of local communities and traditional knowledge: <p>Take measures to enable active participation by the local communities in the process of planning and management of natural resources on which they depend in order to create incentives for the conservation and sustainable use of those resources.</p> • Article XX Capacity building, education and training: <p>Organisations shall promote environmental education, training and awareness creation at all levels in order to enhance local communities' appreciation of their close dependence on natural resources and their understanding of the reasons and rules for the sustainable use of these resources.</p>
Protocol on Wildlife Conservation and Law Enforcement (PWCLE)	Adopted on 18 August 1999 Maputo, Mozambique (SADC, 1999)	The primary objective of this document is to establish within the SADC region and within the framework of the respective national laws of each party, common	<p>The two most relevant Articles in this document applicable to Impala is Articles 7 & 10.</p> <ul style="list-style-type: none"> • Article 7 Wildlife management and conservation programmes: <p>Organisations shall:</p>

Convention / Treaty	Status	Description	Requirements and objectives
		<p>approaches to the conservation and sustainable use of wildlife resources and to assist with the effective enforcement of laws governing those resources (SADC, 1999).</p>	<ul style="list-style-type: none"> - Establish management programmes for the conservation and sustainable use of wildlife and integrate such programmes into development plans, - Assess and control activities which may significantly affect the conservation and sustainable use of wildlife so as to avoid or minimise negative impacts, - Measures to ensure the conservation and sustainable use of wildlife shall include: <ul style="list-style-type: none"> ➤ The protection of wildlife and wildlife habitats to ensure the maintenance of viable wildlife populations, and ➤ The prevention of over-exploitation and extinction of species, - Establish or introduce mechanisms for community-based wildlife management and shall, as appropriate, integrate principles, and techniques derived from indigenous knowledge systems into management policies and procedures. - Develop programmes and mechanisms to educate the general public and raise public awareness concerning issues of the conservation and sustainable use of wildlife, - Promote community-based conservation and management of wildlife resources (SADC, 1999) • Article 10 Capacity building for effective wildlife management: Organisations shall: <ul style="list-style-type: none"> - Make an effort to incorporate into existing training programmes, techniques such as: <ul style="list-style-type: none"> ➤ Community-based natural resources

Convention / Treaty	Status	Description	Requirements and objectives
			<ul style="list-style-type: none"> management and administration, ➤ Indigenous knowledge systems, and ➤ Current practices in both the wildlife management and wildlife law enforcement fields (SADC, 1999)

8.2 Appendix B: National, provincial and local legislation, policies and programmes

Law / policy / programme	Description	Requirements
Constitution of the Republic of South Africa Act 108 of 1996	<p>The Constitution is South Africa's most supreme piece of legislation in the country. It makes provision for all forms of governance in the country in chapter 2 the Bill of Rights provision is made for the drafting and implementation of environmental legislation (South Africa, 1996).</p> <p>Section 24 of the constitution is certainly the most important right regarding the environment. Although not an explicit requirement if anyone who has an impact on the environment should consider this when exercising their activities to ensure sustainable practices that not only benefits the surrounding communities but also the surrounding environment.</p>	<p>Section 24(a) & (b) of the Constitution states that everyone has the right to:</p> <ul style="list-style-type: none"> • An environment that is not harmful to their health or well-being; and • Having the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that <ul style="list-style-type: none"> – Prevent pollution and ecological degradation – Promote conservation and; – Secure ecologically sustainable development and use of natural resources whilst promoting justifiable economic and social development (South Africa, 1996).
National Environmental Management Act 107 of 1998	<p>NEMA is the primary framework for environmental legislation in South Africa therefore making most of its provisions relevant to biodiversity (Glazewski, 2005: 281). The primary function of the Act is to promote national environmental interests through the provision of institutional structures and legal mechanisms to provide for environmental protection and sustainable utilisation (Glazewski, 2005: 135).</p>	<p>Although one could cite the whole act as provision for managing biodiversity. The following requirements can be considered most important in South Africa (1998a):</p> <ul style="list-style-type: none"> • S2(4)(a)(i): The disturbance of ecosystems and loss of biological diversity must be avoided, or, where they cannot be altogether avoided, are minimised and remedied (Precautionary principle). • S2(4)(a)(vi): The use and exploitation of non-renewable¹⁹ natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource. • S2(4)(b): Environmental management must be

¹⁹ Although platinum is a non-renewable resource biodiversity is cab become a non-renewable resource. Thus, the direct consequences and impact associated with extracting a non-renewable resource such as platinum must be taken into account and how it affects a potential non-renewable resource such as biodiversity.

Law / policy / programme	Description	Requirements
		<p>integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.</p> <ul style="list-style-type: none"> • S2(4)(h): Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means. • S2(4)(r): Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure. • S23(2)(a) & (b): Integrated environmental management must be achieved in order to integrate all the principles set out in section 2 of the act into decision-making that will affect the environment. This will enable parties to identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management in section 2. • S28(1) & 30(4): If a person or organization has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing

Law / policy / programme	Description	Requirements
		<p>or recurring even if it has been authorised by law. Some of these measures²⁰ include:</p> <ul style="list-style-type: none"> - The investigation, assessment and evaluation of the impact on the environment, - The education of employees on the environmental risks associated with their tasks, - Cease, modify or control any act, activity or process causing the pollution or degradation - Contain pollutants, - Eliminate the source of pollution, - Remedy the effects of pollution, and - Assess the immediate and long-term effects of the incident on the environment and public health. <ul style="list-style-type: none"> • S30(3) & (5): The person responsible for pollution or degradation must report it to the relevant authorities.
National Environmental Management: Biodiversity Act 10 of 2004.	<p>NEMBA was promulgated in June 2004 and most of its provisions came into effect on the 1st of September 2004. The Act revolutionised the way biodiversity was regulated in South Africa (Glazewski, 2005: 268). The main and overall purpose of the Act is:</p> <ul style="list-style-type: none"> • To provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA, • The protection of species and ecosystems that warrant national protection, • The sustainable use of indigenous biological resources, • the fair and equitable sharing of benefits arising from bioprospecting involving 	<p>As with the NEMA one could cite the whole act as provision for managing biodiversity, however the following requirements can be considered most important in South Africa (2004):</p> <ul style="list-style-type: none"> • S40(1)(a): The Minister or the MEC for environmental affairs in a province may determine a geographic region as a bioregion if that region contains whole or several nested ecosystems and is characterised by its landforms, vegetation cover, human culture and history. This is however important, because the NWDACE and SANBI is working in a collaborative effort develop and implement a bioregional plan by the end of 2010 (NWDACE, 2008: 122). Should this plan take effect the mine should strive to integrate its management principles with the requirements of this plan. • S43 (1) & (2): Any person, organisation or organ of state

²⁰ S28(3)

Law / policy / programme	Description	Requirements
	<p>indigenous biological resources,</p> <ul style="list-style-type: none"> The establishment and functions of a South African National Biodiversity Institute (South Africa, 2004). 	<p>desiring to contribute to biodiversity management may submit to the Minister for his or her approval a draft management plan for critically endangered ecosystems, endangered ecosystems, vulnerable ecosystem, protected ecosystem and for critically endangered species, endangered species, vulnerable species, protected species and for migratory species to give effect to the country's obligations in terms of an international agreement binding on the country (South Africa, 2004).</p> <ul style="list-style-type: none"> S44: The Minister may enter into a biodiversity management agreement with any suitable person or organisation regarding the implementation of a biodiversity management plan, or any aspect of it (South Africa, 2004). S49: The Minister must designate monitoring mechanisms, set indicators to determine the conservation status of various components of South Africa's biodiversity; and any negative and positive trends affecting the conservation status of the various components, and require any person and organisation to report regularly to the Minister on the results of such monitoring mechanisms measured against predetermined indicators. Should this happen and the Minister requires the mine to report on the status of the ecosystems surrounding its activities they must report to him/her on the set indicators (South Africa, 2004). S53: The Minister may identify threatening processes i.t.o section 53 of the Act and require the identified processes to conduct an EIA i.t.o section 24(2)(b) of the NEMA. It is the mine's duty to ensure that none of its activities falls under such listed activities which are usually listed in GN.R. 386 and 387 of the EIA regulations. S56: I.t.o this section the Minister may publish a list of

Law / policy / programme	Description	Requirements
		<p>critically endangered species, endangered species, vulnerable species and protected species. The implication of this is that any person or organisation may not carry out an activity that involves such species (Glazewski, 2005: 273).</p> <ul style="list-style-type: none"> • S57: A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7 of the Act. If one looks at the definition of a restricted activity it highlights activities currently taking place on the lease area by the inhabitants. The main activities highlighted in the definition is: <ul style="list-style-type: none"> – Hunting, catching, capturing or killing any living specimen of a listed threatened or protected species by any means, method or device whatsoever, including searching, pursuing, driving, lying in wait, luring, alluring, discharging a projectile or injuring with intent to hunt, catch, capture or kill any such specimen, – Gathering, collecting or plucking any specimen of a listed threatened or protected species, – picking parts of, or cutting, chopping off, uprooting, damaging or destroying, any specimen of a listed threatened or protected species, and – Having in possession or exercising physical control over any specimen of a listed threatened or protected species (See Annexure E for the lists of Critically Endangered, Endangered, Vulnerable and Protected Species) (South Africa, 2004). • S65 & 67: A person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 or without a permit issued i.t.o. S65(1). This explicitly applies to rehabilitation, where certain grasses and other floral species are used for

Law / policy / programme	Description	Requirements
		<p>rehabilitation. The mine must ensure that they don't use any form of alien species for rehabilitation purposes (South Africa, 2004).</p> <ul style="list-style-type: none"> • S69(4): Should an alien species establish itself in nature as an invasive species because of the actions of a specific person, a competent authority may hold that person liable for any costs incurred in the control and eradication of that species. This is because even if you don't hold a permit (i.t.o. S65(1)) you must take due care and take all required steps to prevent or minimise harm to biodiversity through controlling and prevent the release of such species (South Africa, 2004). • S71(1): A person may not carry out a restricted activity involving a specimen of an invasive species without a permit issued in terms of Chapter 7 or without a permit issued i.t.o. S71(1). A list of invasive species is provided in three categories under the Conservation of Agricultural Resources Act 43 of 1983 (South Africa, 2004). • S73(1): Should an invasive species establish itself in nature as an invasive species because of the actions of a specific person, a competent authority may hold that person liable for any costs incurred in the control and eradication of that species (i.t.o. S72(4)(b)). This is because even if you don't hold a permit (i.t.o. S71(1)) you must take due care and take all required steps to prevent or minimise harm to biodiversity through controlling and prevent the release of such species (South Africa, 2004). • S73(2): A person who is the owner of land on which a listed invasive species occurs must <ul style="list-style-type: none"> – Notify any relevant competent authority, in writing, of the listed invasive species occurring on that land, – Take steps to control and eradicate the listed invasive species and to prevent it from spreading,

Law / policy / programme	Description	Requirements
		<p>and</p> <ul style="list-style-type: none"> - Take all the required steps to prevent or minimise harm to biodiversity (South Africa, 2004). <ul style="list-style-type: none"> • S75(1)-(3): The control of invasive species must take place by means of the following: <ul style="list-style-type: none"> - Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs, - Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment, and - The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner (South Africa, 2004). • S76(4): It is usually required in the RODs²¹ of EIAs or EMPS of a company to compile an alien invasive species monitoring, control and eradication plan. Such plans must include: <ul style="list-style-type: none"> - A detailed list and description of any listed invasive species occurring on the relevant land, - A description of the parts of that land that are infested with such listed invasive species, - An assessment of the extent of such infestation, - A status report on the efficacy of previous control and eradication measures,

²¹ A record of Decision is issued after an EIA has been approved. These documents contain provisions that the applicant must abide by as part of the condition of approval.

Law / policy / programme	Description	Requirements
		<ul style="list-style-type: none"> - The current measures to monitor, control and eradicate such invasive species, and - Measurable indicators of progress and success, and indications of when the control plan is to be completed (South Africa, 2004). • S81(1)(a): This relates specifically bioprospecting. The mine must especially be careful when allowing trials taking place on its area of operations where bioprospecting may take place. Bioprospecting (i.t.o S1) in relation to indigenous biological resources, means any research on, or development or application of, indigenous biological resources for commercial or industrial exploitation, and includes: <ul style="list-style-type: none"> - The systematic search, collection or gathering of such resources or making extractions from such resources for purposes of such research, development or application, - The utilisation for purposes of such research or development of any information regarding any traditional uses of indigenous biological resources by indigenous communities; or - Research on, or the application, development or modification of, any such traditional uses, for commercial or industrial exploitation. (South Africa, 2004). • The Act stipulates no person may, without a permit issued in terms of Chapter 7 engage in bioprospecting involving any indigenous biological resources (South Africa, 2004).
Genetically Modified Organisms Act No. 15 of 1997 (GMOA).	The South African legislature incorporated some of the biosafety of the CBD when passing the GMOA. The Act is administered by the Department of Agriculture under the	This Act is applicable when conducting rehabilitation trials and rehabilitation itself. The mine must ensure they are using registered vegetation species when conducting such activities

Law / policy / programme	Description	Requirements
	<p>sub-directorate Plant Genetic Resources. The Act is applicable in the following three cases:</p> <ul style="list-style-type: none"> • The genetic modification of organisms (GMOs), • The development, production, release, use and application of GMOs, which includes viruses and bacteriophages, and • The use of gene therapy (Glazewski, 2005: 281) 	<ul style="list-style-type: none"> • S71: Users shall ensure that appropriate measures are taken to avoid an adverse impact on the environment which may arise from the use of genetically modified organisms.
<p>National Forests Act 84 of 1998 (NFA).</p>	<p>The NFA places emphasis on the conservation of biodiversity. Its main aims are to:</p> <ul style="list-style-type: none"> • Promote the sustainable management and development of forests for the benefit of all, • create the conditions necessary to restructure forestry in State forests, • Provide special measures for the protection of certain forests and trees, • Promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes, • Promote community forestry, and • Promote greater participation in all aspects of forestry and the forest products industry by persons disadvantaged by unfair discrimination (South Africa, 1998b). 	<p>This is applicable to the mines employees and the Royal Bafokeng who may cut indigenous trees for firewood or collect them with intent to sell i.t.o. South Africa (1998b):</p> <ul style="list-style-type: none"> • S7(1): No person may: <ul style="list-style-type: none"> – Cut, disturb, damage or destroy any indigenous tree in a natural forests; or – Possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any tree, or any forest product derived from a tree an indigenous tree except in terms of: <ul style="list-style-type: none"> ➢ A licence issued tinder subsection (4) or section 23 of the Act, or ➢ An exemption from the provisions of this subsection published by the Minister in the Gazette on the advice of the National Forests Advisory Council. <p>See Annexure F for the list of protected tree species.</p>
<p>Conservation of Agricultural Resources Act 43 of 1983 (CARA).</p>	<p>This is South Africa's main piece of agricultural legislation; it contains a number of control measures of relevance to biodiversity, which the most important is the control of weeds and invader plants (Glazewski,</p>	<p>The following requirements are the most important:</p> <ul style="list-style-type: none"> • S5(1)(a) & (b): No person shall: <ul style="list-style-type: none"> – Sell, agree to sell or offer, advertise, keep, exhibit, transmit, send, convey or deliver for sale, or exchange any weed for anything or dispose of to

Law / policy / programme	Description	Requirements
	<p>2005:285). The objective of the Act include:</p> <ul style="list-style-type: none"> • The provision for control over the utilization of the natural agricultural resources of the country in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith (South Africa, 1983a). 	<p>any person in any manner for a consideration, or</p> <ul style="list-style-type: none"> – In any other manner whatsoever disperse or cause or permit the dispersal of any weed from any place in the Republic to any other place in the Republic. This requirement is specifically applicable to products the mine may sell or use regarding rehabilitation (e.g. seed mixtures or aggregates containing seeds). <ul style="list-style-type: none"> • S5(5): Any person who removes any weed from seed, grain, hay or any other agricultural product or from an animal in terms of any order under subsection (2) or (3) shall deal with it in such manner as will ensure that it will not be able to reproduce itself (South Africa, 1983a). <p>Regulations:</p> <p>The Cara Regulations currently lists 198 species which are divided into three categories, where each of them is subjected to different levels of regulation:</p> <ul style="list-style-type: none"> • Category 1: This is a list of plant species that may not be grown anywhere in South Africa, other than “biological control reserves” and which must be eradicated. • Category 2: This is a list of plant species which may only be grown with a permit under controlled circumstances. • Category 3: This is a list of plant species which may be grown but not planted, propagated, imported or traded (Glazewski, 2005: 285). <p>In addition to these lists of species the regulations also regulates the control and eradication methods of weeds and invader plants in Regulation 15E. This regulation gives prescribes the method to be used relevant and appropriate to the species of plant and the ecosystem it occurs in. The most important aspect to take into account is that all actions must be undertaken with due care as to cause the least amount of damage to the surrounding environment. CARA and its regulations is being reviewed by government and will</p>

Law / policy / programme	Description	Requirements
Plant Breeders' Rights Act 15 of 1976	<p>The purpose of this Act is to lay down a system for the granting of plant breeders rights to breeders of certain varieties of plants. The Act's main pivotal point is S20 which stipulates the rights and obligations of plant breeders. Central to these rights are that the Act applies to every kind of plant, only if it's new, distinct, uniform and stable (Glazewski, 2005: 287). This act is applicable should the mine decide to cultivate certain species for rehabilitation purposes.</p>	<p>ultimately be replaced by the Sustainable use of Agricultural Resources Bill (Glazewski, 2005: 286 & 287).</p> <ul style="list-style-type: none"> • S1: For clarification a breeder is in relation to a variety referred to in section 2 a: <ul style="list-style-type: none"> – Person who bred, or discovered and developed, the variety; – The employer of the person referred to in paragraph above, if that person is an employee whose duties are such that the variety was bred, or discovered and developed, in the performance of such duties; or – Successor in title of the person referred to in paragraph point 1 or the employer referred to in paragraph in point 2 (South Africa, 1976a). • S2(2)(a)-(d): This section stipulates to which variety of plants that are to be bred. A variety shall be deemed to be: <ul style="list-style-type: none"> – New if the propagating material or harvested material thereof has not been sold or otherwise disposed of by the breeder for a stipulated period of time (Glazewski, 2005: 287), – Distinct if at time of filing for application for a plant breeder's right, it is distinguishable from any other variety of the same kind of plant, the existence of which is a matter of common knowledge, – Uniform if, subject to the variation that may be expected from the particular features of the propagation thereof, it is sufficiently uniform with regard to the characteristics of the variety in question, and – Stable if the characteristics thereof remain unchanged after repeated propagation or, in the case of a particular cycle of propagation, at the end

Law / policy / programme	Description	Requirements
Plant Improvement Act 53 of 1976	According to Glazewaki (2005: 288), this Act complements the Plant Breeder's Rights Act by providing a regulatory regime for the sale and distribution of certain plants and propagating material. Should the mine decide to start a business that will sell plants or propagating material ²² they need to register the business under this Act.	<p style="text-align: center;">of each such cycle (South Africa, 1976a).</p> <ul style="list-style-type: none"> • S13(1) These are the requirements relating to sale of plants and propagating material. Plants and propagating material shall only be sold for purposes of cultivation: <ul style="list-style-type: none"> a) If the plants and propagating material are of a variety which is entered in the varietal list, b) Under the denomination entered in respect thereof in the varietal list, c) If no qualifying term or reference is added to or used in connection with the denomination referred to in paragraph (b); d) If the plant or propagating material, as the case may be, complies with the requirements prescribed in respect thereof; and e) If, in the case of: <ul style="list-style-type: none"> i. Propagating material, the material is pre-packaged or is packed in containers which comply with the prescribed requirements and are sealed and branded, marked or labelled in the prescribed manner with the prescribed information, or ii. A plant, the prescribed information appears on a label affixed to the plant or on the container in which the plant grows or is packed (South Africa, 1976b).
Agricultural Pests Act 36 of 1983 (APA).	This Act provides for measures to control plants and prevent plant diseases (Glazewaki, 2005: 289). This will also be applicable to rehabilitation practices and general veld management.	<ul style="list-style-type: none"> • S5: A user of land shall forthwith notify the nearest officer of the department or an authorized person if flying locusts or voetgangers have appeared on the land concerned or if flying locusts have deposited eggs thereon or roosting or breeding swarms of red-billed quelea are present thereon, describe to him as accurately as possible where

²² Propagating material means any material of a plant that can be used for the propagation of a plant (South Africa, 1976).

Law / policy / programme	Description	Requirements
		<p>on such land the flying locusts, voetgangers, eggs or red-billed quelea occur, and give him such further relevant information as he may request (South Africa, 1983b).</p> <p>Regulations: There exists a number of regulations that were promulgated under this Act that covers:</p> <ul style="list-style-type: none"> • The importation of various controlled goods (GN.R. 109, 27 January 1984), • Control measures to prevent and control the spreading of pathogens, insects and exotic animals (GN.R. 110, 27 January 1984), • Permitting (GN.R. 111, 27 January 1984), • Controlled goods i.r.o. which permits for importation may not be issued (GN.R. 846 12 April 1985), and • Importation of GMOs (GN.R. 584 22 March 1991) (Glazewski, 2005: 290).
National Veld and Forest Fire Act 101 of 1998.	<p>The purpose of this Act is to prevent and combat veld, forest and mountain fires throughout the Republic and provides for a variety of institutions, methods and practices for achieving the purpose.</p> <p>This is of vital importance because fires have a wide and detrimental impact on the function of ecosystems.</p>	<p>The following sections stipulated in South Africa (1998c) indicates the requirements regarding the preparation and maintenance of firebreaks:</p> <ul style="list-style-type: none"> • S12(1): Every owner on whose land a veld fire may start or burn or from whose land it may spread must prepare and maintain a firebreak on his or her side of the boundary between his or her land and any adjoining land. • S12(2)(a): If an owner referred to in subsection (1) intends to prepare and maintain a firebreak by burning, he or she must determine a mutually agreeable date or dates with the owners of adjoining land for doing so, and inform the fire protection association for the area, if any. • S12(2)(b): If agreement cannot be reached, such owner must give to the owners of adjoining land and the fire protection association for the area, if any, at least 14 days written notice of the day or days during which he or she intends burning firebreaks, fire danger permitting.

Law / policy / programme	Description	Requirements
		<ul style="list-style-type: none"> • S12(3): An owner of adjoining land who has agreed on a day in terms of subsection (2)(a) or who receives a notice in terms of subsection (2)(b) must: <ul style="list-style-type: none"> – S12(3)(a): Burn his or her firebreak on the boundary concerned on the same day or days, or – S12(3)(b): Be present at such burning or have his or her agent attend, and – S12(3)(c): Ensure that a sufficient number of persons are present on his or her side of the boundary to prevent any spread of fire when the firebreak is burned. • S12(4): An owner may not burn a firebreak, despite having complied with subsection (2), if: <ul style="list-style-type: none"> – S12(4)(a): The fire protection association objects to the proposed burning, or – S12(4)(b): A warning has been published in terms of subsection 10(1)(b) because the fire danger is high in the region, or – S12(4)(c): The conditions are not conducive to the burning of firebreaks. • S12(5): The owner must inform the owners of adjoining land and the fire protection association, if any: <ul style="list-style-type: none"> – S12(5)(a): If burning cannot be done on the agreed day or days referred to in subsection (2)(a) or any of the days referred to in subsection (2)(b), and – S12(5)(b): Of the additional days on which he or she intends to burn because of the failure to do so on the day or days set in terms of subsection (2)(a) or (b). • S12(6): It is not necessary for the owner to give 14 days' notice of the additional days. • S12(7): Owners of adjoining land may agree to position a common firebreak away from the boundary. • S12(8): Should an owner intend to be absent for a period

Law / policy / programme	Description	Requirements
		<p>longer than 14 days during the period or part of any period in which burning normally takes place, he or she must give all owners of adjoining land an address and telephone number, if any, at which he or she may be contacted.</p> <ul style="list-style-type: none"> • S12(9): If an owner of adjoining land: <ul style="list-style-type: none"> – S12(9)(a): is not present on the agreed or notified day or days, or – S12(9)(b): has not given an address and telephone number, if any, as required in subsection (8), the owner may proceed with the burning in his or her absence. • S13: An owner who is obliged to prepare and maintain a firebreak must ensure that, with due regard to the weather, climate, terrain and vegetation of the area that: <ul style="list-style-type: none"> – S13(a): It is wide enough and long enough to have a reasonable chance of preventing a veld fire from spreading to or from neighbouring land, – S13(b): It does not cause soil erosion, and – S13(c): It is reasonably free of inflammable material capable of carrying a veld fire across it. • S16: The right or duty to prepare and maintain a firebreak in terms of this Chapter (4) prevails over any prohibition in any other law on the cutting, disturbance, damage, destruction or removal of any plant or tree, except that the owner must: <ul style="list-style-type: none"> – S16(a): Where possible, transplant any plant which is protected in terms of any law, or – S16(b): Where it is safe and feasible, position the firebreak so as to avoid such plant or tree.
National Environmental Management: Protected Areas Act 57 of 2003.	The main objective is to provide for a national system of protected areas in South Africa as part of a strategy to manage and conserve its	Section 48 deals specifically deals with prospecting and mining activities in protected areas. The requirements here stipulate:

Law / policy / programme	Description	Requirements
	<p>biodiversity. By doing this it will strive to ensure that the protection of the entire range of biodiversity, referring to natural landscapes and seascapes (Glazewski, 2005: 340).</p>	<ul style="list-style-type: none"> • S48(1): Despite other legislation, no person may conduct commercial prospecting or mining activities: <ul style="list-style-type: none"> – S48(1)(a): In a special nature reserve, national park or nature reserve, – S48(1)(b): In a protected environment without the written permission of the Minister and the Cabinet member responsible for minerals and energy affairs, or – S48(1)(c): In a protected area referred to in section 9(b) (world heritage sites), (c) (marine protected areas) or (d) (specially protected forest areas, forest nature reserves and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998)) (South Africa, 2003).
<p>Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA).</p>	<p>This Act came into effect in May 2004 and is the central piece of legislation regulation mining activities in the country. It places great emphasis on sustainable development and environmental protection (Glazewski, 2005: 466). This is explicitly expressed in objective (h) and (i) of the Act which states:</p> <ul style="list-style-type: none"> • To give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development, and • To ensure that holders of mining and production rights contribute towards the socio-economic development of the areas in which they are operating (South Africa, 2002). 	<p>The most important Section of this Act is section 37 which relates to the environmental management principles. These stipulated in South Africa (2002) are:</p> <ul style="list-style-type: none"> • S37(1): The principles set out in section 2 of the National Environmental Management Act, 1998 (Act No.107 of 1998) apply to all prospecting and mining operations, as the case may be, and any matter or activity relating to such operation; and serve as guidelines for the interpretation, administration and implementation of the environmental requirements of this Act (Specifically refer to the principles noted above in the requirements of NEMA). • S37(2): Any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations

Law / policy / programme	Description	Requirements
<p>National Water Act 36 of 1998 (NWA)</p>	<p>The NWA repeals and replaces various previous Acts that deals with water. In conjunction with the Water Services Act the country now has a holistic and cohesive regulatory body for water (Glazewski, 2005: 432).</p> <p>The main purpose of this Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors:</p> <ul style="list-style-type: none"> • The meeting of basic human needs of present and future generations, • The promotion of equitable access to water, • The redressing of past racial and gender discrimination; • The promotion of efficient, sustainable and beneficial use of water in the public interest, • The facilitation of social and economic development, • The provision for growing demand for water use, • The protection of aquatic and associated ecosystems and their biological diversity, • The reduction and prevention of pollution and degradation of water resources, • The meeting of international obligations, • The promotion of dam safety; • The managing of floods and droughts (South Africa, 1998d). 	<p>The following provisions and requirements stipulated in South Africa (1998d) are the most important to take into account:</p> <ul style="list-style-type: none"> • Part 2: All stakeholders must give their cooperation regarding the catchment strategy that has been developed by the catchment's catchment management agency. • S19(1) & (2): An owner of land, a person in control of land or a person who occupies or uses the land on which any activity or process is or was performed or undertaken; or any other situation exists, which causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. <p>The measures to prevent or clean up pollution may include:</p> <ul style="list-style-type: none"> – Ceasing, modifying or controlling any act or process causing pollution, – Complying with any prescribed waste standard or management practice, – Containing or preventing the movement of pollutants, – Eliminating any source of pollution; – Remedying the effects of pollution, and – Remedying the effects of any disturbance to the bed and banks of a watercourse. <ul style="list-style-type: none"> • S20(3) & (4): The responsible person, any other person involved in an incident or any other person with knowledge of an incident must, as soon as reasonably practicable after obtaining knowledge of the incident, report to the Department, the South African Police Service or the relevant fire department; or the relevant catchment management agency. The reasonable person (guilty party) must then do the following: <ul style="list-style-type: none"> – Take all reasonable measures to contain and

Law / policy / programme	Description	Requirements
		<p>minimise the effects of the incident,</p> <ul style="list-style-type: none"> - Undertake clean-up procedures, - Remedy the effects of the incident, and - Take such measures as the catchment management agency may either verbally or in writing direct within the time specified by such institution. <ul style="list-style-type: none"> • S21(a)-(k): Water use includes the following. A water use must be licensed unless it is listed in Schedule 1: <ul style="list-style-type: none"> a. Taking water from a water resource, b. Storing water, c. Impeding or diverting the flow of water in a watercourse, d. Engaging in a stream flow reduction activity contemplated in section 36, e. Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1), f. Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit, g. Disposing of waste in a manner which may detrimentally impact on a water resource, h. Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process, i. Altering the bed, banks, course or characteristics of a watercourse, j. Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people, and k. Using water for recreational purposes. • Notice 470 of 2000 Request to Register a Water Use North West: In addition to the above provisions for registering a water

Law / policy / programme	Description	Requirements
		<p>use in the North West Province stipulates the extent of the water use to be registered that includes:</p> <ul style="list-style-type: none"> - The taking of more than 25 cubic metres from surface water or 10 cubic metres from groundwater on any given day for any given purpose - Storing of more than 10 000 cubic metres of water on any separately registered property or parcel of land. - The taking of groundwater at a rate that exceeds 2,5 litres per second - The taking of groundwater at a distance not greater than 50 metres from the edge of a watercourse or body of water. <p>Exclusions from this provision include:</p> <ul style="list-style-type: none"> - Schedule 1 uses in terms of the national water act (essentially domestic use), - Water use by members of an irrigation board, water user association and government water scheme in a distribution system where they are supplied by the board or association or scheme, and - The taking of water from a bulk supplier or a communal scheme, where the bulk use will be registered as a whole. (the bulk supplier, that is, the water board or local authority will register). <ul style="list-style-type: none"> • S37: The following is controlled activities that have been declared so due to their impact on the environment and water quality. Such activities must be authorised in terms of S37(2): <ul style="list-style-type: none"> - Irrigation o any land with waste or water containing waste generated through any industrial activity or by a waterworks, - An activity aimed at the modification of atmospheric precipitation, - A power generation activity which alters the flow

Law / policy / programme	Description	Requirements
		<p>regime or a water resource,</p> <ul style="list-style-type: none"> - Intentional recharging of an aquifer with any waste or water containing waste, and - An activity which has been declared as such under section 38. <ul style="list-style-type: none"> • S118(1): This section deals with requirements regarding dams with a safety risk. Such dams pose a great risk not only to human safety but also a great risk to surrounding environments. Depending on their content they can destroy and / or cause extensive damage and / or pollution. Therefore they must be approved and registered under section 120 of this Act. The requirements for such dams are that the owner of a dam must: <ul style="list-style-type: none"> - Within the period specified, provide the Minister with any information, drawings, specifications, design assumptions, calculations, documents and test results requested by the Minister; or - Give any person authorised by the Minister access to that dam, to enable the Minister to determine whether: <ul style="list-style-type: none"> ➢ That dam is a dam with a safety risk, ➢ That dam should be declared to be a dam with a safety risk; ➢ A directive should be issued for specific repairs or alterations to that dam, or ➢ The owner has complied with any provisions of this Act applicable to that dam. • S117(c): The definition of a dam with a safety risk is any dam: <ul style="list-style-type: none"> - Which can contain, store or dam more than 50 000 cubic metres of water, whether that water contains any substance or not, and has a wall of a vertical height of more than five metres, measured as the

Law / policy / programme	Description	Requirements
		<p>vertical difference between the lowest downstream ground elevation on the outside of the dam wall and the non-overspill crest level or the general top level of the dam wall, and</p> <ul style="list-style-type: none"> - Belonging to a category of dams declared under section 118(2) to be dams with a safety risk, or - Declared under section 118(3)(a) to be a dam with a safety risk. <p>Also see the Regulations on Use of Water for Mining and Related Activities aimed at the Protection of Water Resources. These regulations are aimed controlling the contamination of water by mining activities and specifically contamination by structures such as fine residue storage facilities. All these provisions contemplated in these regulations are applicable to the mine. Although it does not directly exercise control over the management of biodiversity it is important to note that the controls specified in these regulations indirectly protect aquatic biota.</p> <p>Also see General Authorisations for Disposing of waste in a manner which may detrimentally impact on a water resource, and Discharge of waste or water containing waste into a water resource through a pipe, canal, sewer or other conduit; and disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process. These general authorisation permits the discharge and disposal of waste within certain specified limits. They are also applicable to the mine. But will not be discussed because they do not directly deal with biodiversity conservation as with the regulations mentioned above. But they also control activities that indirectly affect biodiversity. It is therefore the mine's responsibility to stay within the parameters that are provided and even strive to achieve limits that are below the prescribed limits.</p>

Law / policy / programme	Description	Requirements
National Spatial Biodiversity Assessment (NSBA)	The NSBA was commissioned by the DEAT as part of the National Biodiversity Strategy and Action Plan. This document presents consist of four components, dealing with terrestrial, freshwater, estuarine and marine environments. Each of these components' current status and protection levels is assessed and priorities for conservation are identified. The conservation actions to be taken are not limited to protected areas but it includes the wise management of land and natural resources throughout the landscape and seascape (Driver <i>et al</i> , 2005: v).	<p>Out of the four components the terrestrial and river components' are the components that are found on Impala Platinum's lease area. The following management actions out of these components are applicable as mentioned in Driver <i>et al</i> (2005: 18-20 & 24).:</p> <p>1. Terrestrial Biodiversity:</p> <ul style="list-style-type: none"> • Work with production sectors: Although applicable from a governments perspective it also applicable to the mining sector. The mining sector can work in collaboration with other major land users (i.e. agriculture, other mining activities, property development), to develop sector-specific best practice guidelines to minimise loss of habitat and threatened species and protect ecosystem functioning. • Strengthening bioregional programmes: These programmes are multisectoral instruments that provide a framework for collaborative conservation across sectoral boundaries. These programmes can include 'fine-scale' biodiversity planning initiatives especially in highly sensitive or damaged areas. • Minimise loss of habitat in threatened ecosystems: The plan suggest two mechanisms that can be used i.e: <ul style="list-style-type: none"> – Promote stewardship among private and communal landowners. Stewardship involves practices such as sustainable grazing practice and combating alien invasive plant species, – Using the regulations provided in NEMBA to restrict certain land uses in vulnerable areas. • Prevent and manage alien invasive species: By collaborating with government (DWAF) in programmes such as the Working for water programme to combat alien invasive plant species. <p>2. River biodiversity</p> <ul style="list-style-type: none"> • Integrate land and water management policies into

Law / policy / programme	Description	Requirements
		<p>an integrated strategy: Although the Department of Water Affairs and Forestry and Department of Environmental Affairs and Tourism have been fused into one department i.e. Department of Water and Environmental Affairs they still issue different regulatory mechanisms addressing water (water use licenses and integrated waste and water management plans) and other environmental issues (environmental management plans). However, companies can cooperate with government to integrate such issues into one regulating document that can address both water quality and the quality of the biodiversity's existence in water.</p>
National Biodiversity Strategy and Action Plan (NBSAP)	<p>The NBSAP sets out a framework and a plan of action for the conservation and sustainable use of South Africa's biological diversity and the equitable sharing of benefits derived from this use. This document was prepared by the DEAT, from 2003 to May 2005 (DEAT, 2005: 4).</p> <p>The result of this study is a set of strategic objectives, outcomes and activities needed to achieve the goals of conservation, sustainable use and equity. An implementation plan was developed that sets out high priority activities which are needed to achieve the objectives. Also the lead agents, partners, targets and indicators are also indicated. Long-term, fifteen year targets have been set for the strategic objectives, while five-year objectives have been set at the outcome level (DEAT, 2005: 4).</p>	<p>It is required that biodiversity programmes, plans and policies are aligned with the NBSAP. Therefore, although all these targets and requirements are directed towards national, provincial and local governments most of them will also be applicable on a smaller or medium scale (depending on an organisations size) to organisations that have an impact on biodiversity. There exist five overall strategic objectives (SOs) with each possessing specific outcomes or targets. The following objectives and targets are applicable to Impala Platinum:</p> <p>SO1: An enabling policy framework must be established that will integrate biodiversity management objectives into economic objectives (DEAT, 2005: 29).</p> <ul style="list-style-type: none"> • Outcomes: <ol style="list-style-type: none"> 1. The value of biodiversity to the organisation and to people's lives must be quantified and monitored to inform policy, strategy and action. 2. Biodiversity considerations must be integrated into fiscal policies.

Law / policy / programme	Description	Requirements
	<p>The main objective of the strategy is: Conserve and manage terrestrial and aquatic biodiversity to ensure sustainable and equitable benefits to the people of South Africa, now and in the future (DEAT, 2005: 28).</p>	<p>3. Biodiversity considerations must be integrated into resource management policies.</p> <p>4. Biodiversity planning and assessment framework must inform all decisions regarding land and resource use and spatial development (DEAT, 2005: 29-30).</p> <p>SO2: Enhanced institutional effectiveness and efficiency must be developed to ensure good governance regarding biodiversity (DEAT, 2005: 29).</p> <ul style="list-style-type: none"> • Outcomes: <p>1. Institutions with biodiversity-related responsibilities and programmes must be effective, efficient and adequately capacitated.</p> <p>2. Financial resources for biodiversity management must be adequate, and be effectively and efficiently used.</p> <p>3. Information management systems, research priorities, and monitoring and evaluation frameworks must be in place to effectively support biodiversity management.</p> <p>4. A comprehensive and proactive communication, awareness raising and advocacy strategy must reach targeted communities to facilitate conservation and wise use of biodiversity.</p> <p>5. Proactive engagement and co-operation with the community must be aimed to enhance conservation and sustainable use of shared resources and important biodiversity (DEAT, 2005: 30).</p> <p>SO3: Integrated terrestrial and aquatic management systems must be established to minimise the impacts of threatening processes on biodiversity, to enhance ecosystem services and improves social and economic security (DEAT, 2005: 29).</p> <ul style="list-style-type: none"> • Outcomes: <p>1. Initiatives that are initiated to manage terrestrial and aquatic ecosystems must be co-ordinated, developed and implemented with full stakeholder participation to</p>

Law / policy / programme	Description	Requirements
		<p>contribute to sustainable socio-economic development.</p> <ol style="list-style-type: none"> 2. Key production sectors and industries must integrate biodiversity into their production and service standards. 3. Effective management and control measures must be implemented to minimise the potential risks to biodiversity posed by GMOs. 4. Effective waste management and pollution control measures must limit the impacts of pollution on biodiversity. 5. Developed research and monitoring programmes must support integrated management of terrestrial and aquatic ecosystems (DEAT, 2005: 29-30). <p>SO4: Human development and well-being must be enhanced through sustainable use of biological resources and equitable sharing of the benefits (DEAT, 2005: 29).</p> <ul style="list-style-type: none"> • Outcomes: <ol style="list-style-type: none"> 1. An equitable access, rights and responsibilities regime promotes sustainable use of biological resources. 2. Partnerships must be established between government, the private sector, organised civil society and communities to encourage entrepreneurship, innovation, investment and action at local level. 3. The ecological and social sustainability of extractive use of biological resources must be researched, assessed and monitored, and opportunities for improvement must be identified and implemented. 4. The use of biological resources must be well managed to maximise sustainable benefits (DEAT, 2005: 29-30). <p>SO5: Conservation areas that conserve a representative sample of biodiversity must be established to maintain key ecological processes (DEAT, 2005: 29).</p> <ul style="list-style-type: none"> • Outcomes: <ol style="list-style-type: none"> 1. Biodiversity must be effectively managed in key

Law / policy / programme	Description	Requirements
		<p>ecological corridors and high priority fragments of natural habitat.</p> <ol style="list-style-type: none"> 2. Management plans for species of special concern must be developed to ensure their long-term survival in the wild. 3. Research and monitoring programmes must be developed to support the establishment and effective management identified and established conservation areas (DEAT, 2005: 30).
<p>North West Biodiversity Site Inventory & Database Development (NWBSID).</p>	<p>This document was the response to international and national requirements for managing land in a sustainable manner by using sound environmental management practices. The project was administered by Strategic Environmental Focus (SEF) and the Finish Environmental Institute (SYKE) for the North West Provincial Government (NWDACE, 2004: 11).</p> <p>A synergistic approach was used to focus on species and ecosystems diversity to quantify these entities in an electronic database. There wasn't such a coherent database for species distribution within the North West Province. Therefore, the project had a pragmatic approach to collate, classify, and extrapolate the existing data to specific taxa (flora, mammals, avifauna, herpetofauna, ichthyofauna, macro-invertebrates and Lepidoptera) (NWDACE, 2004: 11).</p>	<p>The following requirements are set for the specific taxa:</p> <ol style="list-style-type: none"> 1. Mammals: <ul style="list-style-type: none"> • Limit and combat overgrazing, and • Increase knowledge and develop databases containing knowledge and management practices for mammals especially for small mammals (NWDACE, 2004: 101). 2. Herpetofauna: <ul style="list-style-type: none"> • Record site specific localities of these species to enhance spatial knowledge and aid future development (NWDACE, 2004: 102). 3. Flora: <ul style="list-style-type: none"> • Implement a hills and ridges conservation policy due to the rich species diversity that occurs on these high lying areas, • Unspoiled and intact vegetation nodes in especially highly developed agricultural areas must enjoy high conservation priority, • Implement conservation initiatives in wetland areas, • High priority must be given to the Zeerust Mountain Bushveld habitat type (NWDACE, 2004: 102-103). 4. Avifauna: <ul style="list-style-type: none"> • The removal of specifically exotic species of vegetation must be carefully evaluated because such vegetation creates new habitats for indigenous

Law / policy / programme	Description	Requirements
		<p>species (NWDACE, 2004: 103).</p> <p>5. Lepidoptera:</p> <ul style="list-style-type: none"> • Buffer zones must be created between built-up areas and natural habitats not limit the impact on faunal and floral species especially butterflies, and • Corridors that connect fragmented habitats must be established to ensure gene flow between target Lepidoptera and other invertebrate species (NWDACE, 2004: 104-105). <p>6. Aquatic fauna:</p> <ul style="list-style-type: none"> • Organisations should develop wetland policies to protect the aquatic biota existing within these sensitive ecosystems (NWDACE, 2004: 105).
<p>Rustenburg Strategic Environmental Assessment (RSEA).</p>	<p>Due to Rustenburg's increase in growth and development the pressure is increasing on the natural and human resources which is results in both social and environmental problems such as growth in informal settlements, sub optimal infrastructure, pressure on the boundaries of the Kgaswane Mountain Reserve and a loss of biodiversity ad heritage resources. It is because of these threats that strategic environmental planning must be undertaken to ensure sustainable development (Eco assessments, 2003a: 2). The outcome was a Strategic Environmental Assessment or (SEA). These strategic documents focuses on integrating environmental issues into the formulation of plans and programmes in order to proactively strengthen the consideration of environmental issues into strategic decision-making (Eco assessments, 2003a: 2).</p>	<p>The following requirements are to be taken in to account regarding the various entities listed:</p> <p>1. Surface water quality:</p> <ul style="list-style-type: none"> • Quality of water in streams, rivers and dams must be improved to such an extent that it is potable, and • Water resources should comply with the minimum requirements set by the water quality guidelines (Eco assessments, 2003b: 91). <p>2. Ecological systems:</p> <ul style="list-style-type: none"> • Connector areas must be protected against development damage and disturbed areas must be rehabilitated, and • Riverine vegetation must be conserved and sufficient buffer areas must be maintained (Eco assessments, 2003b: 92). <p>3. Birds:</p> <ul style="list-style-type: none"> • The habitats and potential occurrence of sensitive bird species should be assessed before development takes place. Suitable habitats should be conserved where possible or mitigation measures provided to decrease impacts.

Law / policy / programme	Description	Requirements
		<p>4. Herpetofauna:</p> <ul style="list-style-type: none"> Habitats should be assessed for the occurrence of such species before development can take place and assessed for sensitive species (Eco assessments, 2003b: 93-94). <p>5. Lepidoptera:</p> <ul style="list-style-type: none"> Habitats should be assessed for the occurrence of such species before development can take place and assessed for sensitive butterfly species (Eco assessments, 2003b: 94). <p>6. Other invertebrates:</p> <ul style="list-style-type: none"> The habitats and potential occurrence of sensitive invertebrate species should be assessed before development takes place (Eco assessments, 2003b: 94). <p>7. Mammals:</p> <ul style="list-style-type: none"> Habitats' carrying capacity must be assessed for their means to provide shelter and food for identified mammals to identify such areas for conservation before development takes place and provide mitigation measures to decrease impacts (Eco assessments, 2003b: 94). <p>8. Riverine Wetlands:</p> <ul style="list-style-type: none"> This sensitive vegetation unit which is described as Tall Closed Grassland/Seasonal Marsh must be protected from alien vegetation and disturbed sites must be rehabilitated (Eco assessments, 2003b: 96). <p>9. Endorheic Pan Wetlands:</p> <ul style="list-style-type: none"> Developments should not be allowed to encroach upon pans, Buffers areas must be created to protect pans from surrounding land uses and activities, and Pans must not be drained or used for stormwater runoff collection points (Eco assessments, 2003b: 96).

Law / policy / programme	Description	Requirements
		<p>96).</p> <p>10. Exotic Vegetation:</p> <ul style="list-style-type: none"> • Exotic vegetation should be removed and / or contained where it occurs, and • It should be strictly controlled along water courses (Eco assessments, 2003b: 97). <p>11. Sensitive plants (Red Data, Protected and Medical Plants):</p> <ul style="list-style-type: none"> • Red Data, plant and medicinal plant species must be protected <i>in situ</i>, and • Their habitats must be preserved without degradation (Eco assessments, 2003b: 98).
<p>The Rustenburg Local Municipality Integrated Environmental Management Policy (RIEMP)</p>	<p>Integrated Environmental Management (IEM) is a philosophy that is concerned with finding the right balance between development and the environment (Bembani, 2005: iv).</p> <p>An IEM Policy is a set of guidelines, principles of action that enables the Rustenburg Local Municipality to commit itself to safeguard and protect the environment. It provides target levels for environmental responsibility and performance which is required for the Municipality to reach. In addition to this, it provides a broad framework for addressing environmental issues across different sectors, which is represents a collective statement by all the residents and other stakeholders of the Municipality of their commitment to improving their region's environmental performance (Bembani, 2005: v).</p>	<p>The following objectives are set by the municipalities IEM policy that is applicable to Impala Platinum:</p> <p>1. Waste management:</p> <ul style="list-style-type: none"> • Improve the effectiveness of pollution and waste management activities in order to improve the quality of the environment and human health (Bembani, 2005: 17). • Improve the quality of the environment and human health by minimizing the amount of solid waste, liquid and gaseous waste generated through effective waste management (Bembani, 2005: 17). <p>2. Pollution Management:</p> <ul style="list-style-type: none"> • Improve the quality of the environment and human health through the adoption of the principle of pollution prevention planning (Bembani, 2005: 19). • Improve the quality of water resources by effective regulation of waste disposal and discharge into freshwater systems and to effectively manage freshwater systems in a sustainable manner (Bembani, 2005: 19). <p>3. Air quality:</p> <ul style="list-style-type: none"> • Manage air quality in order to improve ambient air quality in areas of poor quality, and maintain ambient air quality

Law / policy / programme	Description	Requirements
		<p>in areas of good quality (Bembani, 2005: 20).</p> <p>4. Biodiversity:</p> <ul style="list-style-type: none"> • Protection of habitats for certain Red Data plant and animal species during development (Bembani, 2005: 21). • Preventing developments in areas with slopes of ecologically sensitive gradients, e.g. ridges (Bembani, 2005: 21). • To have due considerations for the future by ensuring that ecological limits are not exceeded. (Bembani, 2005: 20). • To engage all sectors of the community in a dialogue on formulating best management practices for managing activities that have an impact on biodiversity (Bembani, 2005: 22).

8.3 Appendix C: Environmental Risk Assessment Based on the Requirements of EMP's and Closure Plan

ID	HAZARD SOURCES	HAZARDS OR NEGATIVE ASPECTS	INCIDENTS/ONGOING CONDITION	ARE THEIR ANY VULNERABLE RECEPTORS?	RISK EFFECT OR IMPACT	Severity Y-axis	Probability X-axis	Raw risk estimation	Current level & classification of controls or combinations of controls	Effectiveness of current combinations of controls	Applicable Legal Requirements	Compliant?	Applicable Other Requirements	Compliant?	Severity Y-axis	Probability X-axis	Residual risk estimation
Merensky and UG2 Opencast																	
1	Soil stripping, pit excavation and daily operations.	Loss of soil resources (MEE, 2005: viii).	Disturbance will continue throughout the life of the project.	Vegetation, small mammals and insects.	About 520.1 ha of land will be disturbed by the project. With insufficient management measures this resource may be lost (MEE, 2005: viii).	C	L	I	<p>The following control measures will be employed:</p> <ul style="list-style-type: none"> The top 900mm of soils will be conserved where possible. Topsoil will be stockpiled separately during stripping. Concurrent rehabilitation will take place as to minimise topsoil loss. Impala has a topsoil management procedure in place (MEE, 2005: viii). 	Impala's management measures are sufficient for the shaft complexes. Nonetheless, the other areas are being degraded by overgrazing, which will cause even more erosion because these open areas are larger in size than the shaft complexes.	<p>The following legal requirements apply:</p> <ul style="list-style-type: none"> Constitution S24(a) & (b). NEMA S2(4)(a)(vi), S2(4)(b), S2(4)(h), S2(4)(r), S23(2)(a) & (b), S28(1) & 30(4), S2(4)(a)(i), S30(3) & (5). MPRDA S37(1) & (2). NWA S19(1) & (2). 	Yes	<p>The following non-legislative requirements apply:</p> <ul style="list-style-type: none"> CBD Art. 8 - 14, 17 & 20. UNCCD Art. 4, 5, 19, & 20. Rio Declaration Art. 2, 3, 4, 7,15,16,17,18, 21, 22. CCNR Art. 6, 8, 13, 16, 17, 20. NSBA Component 1. NBSAP SO. 1 -5. RSEA's requirements for Ecological systems. RIEMP's requirements for Waste management and Pollution Management. 	No	D	J	A
2		Soil may become sterile and compacted if stockpiling is not done correctly and hamper vegetation growth during rehabilitation (MEE, 2005: x).	This will be an ongoing incident, depending on the frequency and time continuous rehabilitation takes place.	Microbial life in the soil	Changes in soil structure, vegetation composition and possible sterile areas.	D	J	A	Impala's soil procedure will be followed no additional measures are required (MEE, 2005: x).	See comment 1.	See requirements above in section 1.	Yes	See the requirements set out in Section 1.	No	D	I	M
3		Soil Erosion.	This may be an incident that can occur regularly if not controlled.	Vegetation.	Loss of soil resources on stockpiles and areas not stripped yet.	D	J	A	<p>Impala will introduce the following measures:</p> <ul style="list-style-type: none"> Vegetation establishment in disturbed areas will be undertaken as soon as is practical. Where disturbed areas can't be re-vegetated during the life of the project appropriate measures will be taken to control erosion. Erosion control measures will be included in the designs of linear infrastructure. The linear 	See comment 1.	<p>The following legal requirements apply:</p> <ul style="list-style-type: none"> Constitution S24(a) & (b). NEMA S2(4)(a)(vi), S2(4)(b), S2(4)(h), S2(4)(r), S23(2)(a) & (b), S28(1) & 30(4), S2(4)(a)(i), S30(3) & (5). NFA S7(1). NVFA S12(1)-(9), (13) & (16). MPRDA S37(1) & 	Yes	See the requirements set out in Section 1.	No	D	I	M

ID	HAZARD SOURCES	HAZARDS OR NEGATIVE ASPECTS	INCIDENTS/ONGOING CONDITION	ARE THEIR ANY VULNERABLE RECEPTORS?	RISK EFFECT OR IMPACT	Severity Y-axis	Probability X-axis	Raw risk estimation	Current level & classification of controls or combinations of controls	Effectiveness of current combinations of controls	Applicable Legal Requirements	Compliant?	Applicable Other Requirements	Compliant?	Severity Y-axis	Probability X-axis	Residual risk estimation
									<p>infrastructure will be inspected on a weekly basis to ensure that erosion is effectively controlled.</p> <ul style="list-style-type: none"> Erosion prevention measures will be monitored for a period of five years after rehabilitation is complete (MEE, 2005: ix). 		<ul style="list-style-type: none"> (2). NWA S19(1) & (2). 						
4		Soil contamination	This may be an incident that can occur regularly if not controlled.	Underground and surface water resources, vegetation and microbial life in the soil.	<p>Soil can be contaminated through the following sources:</p> <ul style="list-style-type: none"> Ammonium nitrates from blasting residues, Sewage from inadequate sanitary facilities, Fuel and oil from repairing vehicles, equipment, workshops and fuelling stations. Hazardous and non-hazardous waste that is not placed in the appropriate collection and disposal facilities. Diffuse pollution sources (unplanned and unmanaged storage and spillage) (MEE, 2005: ix). 	C	L	I	<p>The following control measures will be employed:</p> <ul style="list-style-type: none"> Impala will dispose of all waste as required by the EMPs and procedures. All water collected in the pit will be pumped to a lined pollution control dam. All vehicle maintenance areas, chemical and hydrocarbon storage areas will have the appropriate control measures such as bunding, oil and silt traps and concrete diversion canals. There will be an incident management system in place including procedures and training on dealing with incidents. All major incidents will be reported to the applicable authorities (DWE, DWA, DMR and DoA). If contamination occurs the appropriate remedial measures will be employed. If necessary, serious contaminated soil will be classified as hazardous waste and disposed of accordingly at a designated hazardous waste site. The remaining areas will then be reshaped and rehabilitated (MEE, 2005: ix). 	The measures are suitable and the precautionary principle is applied.	<p>The following legal requirements apply:</p> <ul style="list-style-type: none"> Constitution S24(a) & (b). NEMA S2(4)(a)(vi), S2(4)(b), S2(4)(h), S2(4)(r), S23(2)(a) & (b), S28(1) & 30(4), S2(4)(a)(i), S30(3) & (5). NVFA S12(1)-(9), (13) & (16). MPRDA S37(1) & (2) NWA S19(1) & (2). 	Yes	See the requirements set out in Section 1.	No	D	J	A

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5		Loss of approximately 520 ha land capability.	Disturbance will continue throughout the life of the project.	None	The economic benefits (agriculture) from the area after rehabilitation might change. This will result in the communities harvesting, grazing or planting in other more diverse areas.	B	L	I	All project sites except the contractors yard and rail spur No. 5 Shaft will be rehabilitated to grazing potential. The contractors yard and rail spur No. 5 Shaft will be reserved and used for future project. These areas will be rehabilitated at the end of the opencast mining project or at the end of other envisioned future projects to grazing potential (MEE, 2005: x).	Impala is doing what was deemed suitable at that time and even today this is seen as good practice. However, one would prefer to revert back to a state of wilderness/ natural habitats. This would even improve the previous condition the area was found in.	<p>The following legal requirements apply:</p> <ul style="list-style-type: none"> • Constitution S24(a) & (b). • NEMA S2(4)(a)(vi), S2(4)(b)S2(4)(h), S2(4)(r), S23(2)(a) & (b), S28(1) & 30(4), S2(4)(a)(i), S30(3) & (5). • NVFA S12(1)-(9), (13) & (16). • MPRDA S37(1) & (2). • NWA S19(1) & (2). • NEMBA S57, S65 &67, S69(4), S71(1), S73(1), S73(2), S75(1)-(3), S76(4) &S81(1)(a). • APA S5.- CARA S5(5). • GN R. 1048 under CARA. 	Yes	<p>The following non-legislative requirements apply:</p> <ul style="list-style-type: none"> • CBD Art. 6 - 14, 17 & 20. • UNCCD Art. 4, 5, 19, & 20. • Entire Stockholm Convention. • Rio Declaration Art. 1-7, 10, 11, 15,16,17,18, 21, 22.- CCNR Art. 6, 8, 9, 12, 13, 16, 17, 20. • NSBA Component 1. • NBSAP SO. 1 -5. • RIEMP's requirements for Waste management and Pollution Management. • NWBSID's requirements for floral diversity. • RSEA's requirements for Ecological systems, Riverine wetlands, Endorheic pans, Exotic vegetation and Sensitive plants. 	Yes	D	J	A

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6		Loss in floral diversity.	Disturbance will continue throughout the life of the project.	Vegetation, bird, mammal, Lepidoptera and insect species.	<p>The following impacts may occur:</p> <ul style="list-style-type: none"> Loss in natural vegetation types. Loss in diversity due to the destruction of the natural habitat. <p>It must be noted that the area has a relative flat topography.</p>	D	J	A	<p>Disturbance to vegetation will be kept to a minimum as follows:</p> <ul style="list-style-type: none"> Restrictions will be made to the movement of machinery so that movement will be kept to a minimum outside the mining boundary. All personal on all levels will be briefed on the importance on following the above mentioned requirements and procedures. Waste disposal will not take place in or around the site. Impala will ensure that no mining activities will disturb or encroach the areas surrounding the Norite koppie near Block UG4. Topsoil placement will be done in such a way that it will be placed in areas where there is no alien invasive plant species as to prevent contamination of soil with invasive plant seeds. Impala will appoint a vegetation specialist that will conduct annual investigations to determine whether Impala impacts on the surrounding area unnecessarily. The following seed mixture will be used on rehabilitated areas: <i>Cynodon dactylon</i>, <i>Digitaria enantha</i>, <i>Cenchrus cilians</i> and <i>Hyparrhenia hirta</i> (will be used as a stabiliser) (MEE, 2005: xii). 	<p>These are very good rehabilitation measures to follow. But referring to comment 1, the overgrazing that is taking place in the area will sometime or another affect the rehabilitated areas in such a way that the rehabilitation will revert back to a state of damaged and even contaminated land if this issue is not addressed properly.</p>	See requirements above in section 5.	Yes	See the requirements set out in Section 5.	Yes	D	J	A

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7		Increase in invader plant species	Disturbance will continue throughout the life of the project.	Other indigenous plant species.	Disturbed soil is synonymous with alien invasive plant species. These species may hamper the growth of seedlings after the first growth season during rehabilitation.	D	J	A	<p>Impala will employ the following measures:</p> <ul style="list-style-type: none"> • Impala will appoint a qualified vegetation specialist who will check the vegetation on an annual basis to investigate possible encroachment of invasive species. • A weed control programme will be implemented throughout the life of the project until all rehabilitation is completed. The area will be monitored on a regular basis up until three years after rehabilitation (MEE, 2005: xiii). 	This is good measures to apply to non-disturbed areas. Rehabilitated areas must be intensively managed for at least 3-5 years where the vegetation is managed in such a way that alien invasive species' competition will be too great with the established natural grasses and other vegetation that it would be naturally controlled.	<p>The following legal requirements apply:</p> <ul style="list-style-type: none"> • Constitution S24(a) & (b). • NEMA S2(4)(a)(vi), S2(4)(b), S2(4)(h), S2(4)(r), S23(2)(a) & (b), S28(1) & 30(4), S2(4)(a)(i), S30(3) & (5). • NVFA S12(1)-(9), (13) & (16). • MPRDA S37(1) & (2). • NWA S19(1) & (2). • NEMBA S57, S65 & 67, S69(4), S71(1), S73(1), S73(2), S75(1)-(3), S76(4) & S81(1)(a). • CARA S5(5). • APA S5. • GN R. 1048 under CARA. 	Yes	See the requirements set out in Section 5.	No	D	I	M
8		Loss in faunal diversity	Disturbance will continue throughout the life of the project.	Small mammals, insects, reptiles and birds.	During the excavation of the area the natural habitat will be destroyed resulting in the loss of natural faunal diversity (MEE, 2005: xiii). However, the operation will be limited to a single vegetation and habitat type. It falls within an area of low conservation value. The area also doesn't fall contain habitats that are conducive for any red dot animal species (MEE, 2005: xiii). The project will however impact on the domestic animals in the area that grazes in and around the site (MEE, 2005: xiii).	C	L	I	<p>Impala will minimise the impact on faunal life by following the mitigation measure described above for vegetation (MEE, 2005: xiii). The impact of blasting will be low if the correct blasting techniques are followed (MEE, 2005: xiii).</p>	See comment 7. If natural vegetation is properly managed and protected, all forms of animal and insect life will return. By regularly analysing the ecological function of rehabilitated areas and even natural areas through a technique such as Land Function Analysis (LFA) one will get a good idea of the self-sustaining potential of these areas.	<p>The following legal requirements apply:</p> <ul style="list-style-type: none"> • Constitution S24(a) & (b). • NEMA S2(4)(a)(vi), S2(4)(b)S2(4)(h), S2(4)(r), S23(2)(a) & (b), S28(1) & 30(4), S2(4)(a)(i), S30(3) & (5).- NVFA S12(1)-(9), (13) & (16).- MPRDA S37(1) & (2). • NWA S19(1) & (2). • NEMBA S56, S57, S65 & 67, S69(4), S71(1), S73(1), S73(2), S75(1)-(3), S76(4) & S81(1)(a). • CARA S5(5).- APA S5. • GN R. 1048 under CARA. 	Yes	<p>The following non-legislative requirements apply:</p> <ul style="list-style-type: none"> • CBD Art. 6 - 14, 17 & 20.- UNCCD Art. 4, 5, 19, & 20. • Entire Stockholm Convention. • Rio Declaration Art. 1-7, 10, 11, 15, 16, 17, 18, 21, 22. • CCNR Art. 6 -10, 12, 13, 16, 17, 20. • PWCLE Art. 7 & 10. • NSBA Components 1 and 2. • NBSAP SO. 1 - 5.- RIEMP's requirements for Waste management, Pollution Management, and Biodiversity. • NWBSID's 	No	D	J	A

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													<ul style="list-style-type: none"> requirements for floral diversity, Mammals, Herpetofauna, Avifauna, Lepidoptera, Aquatic fauna. RSEA's requirements for Ecological systems, Riverine wetlands, Endorheic pans, Exotic vegetation, Sensitive plants, Mammals, Herpetofauna, Avifauna, Lepidoptera, and Aquatic fauna. 				
9		Deterioration of groundwater quality and quantity	Disturbance will continue throughout the life of the project and may continue for some years afterwards.	Vegetation.	<p>Quantity: Due to large scale dewatering that has already taken place due to the underground mining operations, the opencast will not have a large effect on the underlying aquifer (MEE, 2005: xiv).</p> <p>Quality: Minor contamination may take place by Ammonium Nitrates that originates from explosives used for blasting (MEE, 2005: xiv).</p>	F	L	A	<p>It is not expected that the project will have an effect on groundwater quantity due to the fact the area has been dewatered by already existing underground operations. However, Impala will continue to monitor the water quality at the required monitoring boreholes and include the project area in the annual water quality review to Department of Water Affairs. In addition the following measures will be implemented:</p> <ul style="list-style-type: none"> Groundwater levels will be recorded on a regular basis to detect any changes or trends. If groundwater is intercepted, flow rates from dewatering drains will be recorded on a monthly basis and management plan and water use license application will be compiled for discharge or re-use of water. Existing monitoring boreholes between the proposed development and the Luka settlement will be used to monitor any changes in groundwater levels and quality. Groundwater from selected boreholes will be 	The measures are suitable and the precautionary principle is applied.	<p>The following legal requirements apply:</p> <ul style="list-style-type: none"> Constitution S24(a) & (b). NEMA S2(4)(a)(vi), S2(4)(b), S2(4)(h), S2(4)(r), S23(2)(a) & (b), S28(1) & 30(4), S2(4)(a)(i), S30(3) & (5). MPRDA S37(1) & (2). CARA S5(5). - NEMBA S57, S65 & 67, S69(4), S71(1), S73(1), S73(2), S75(1)-(3), S76(4) & S81(1)(a). NWA S19(1) & (2), S20(3) & (4), S21(a)-(k). Notice 470 of 2000 Request to Register a Water Use North West. 	Yes	<p>The following non-legislative requirements apply:</p> <ul style="list-style-type: none"> The entire RAMSAR convention. CBD Art. 8, 13, 14 & 17. UNCCD Art. 4, 5 & 20. The entire Stockholm Convention. Rio Declaration Art. 1-7, 10, 11, 15, 16, 17, 18, 21, 22. CCNNR Art. 7, 13, 16 & 20. ACHPR Art. 20. NSBA Components 1 & 2. NBSAP SO. 1-5. NWBSID's requirements for Flora and Aquatic fauna. RSEA's requirements for Surface water quality, Ecological systems, Riverine wetlands, 	Yes	D	I	M

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									<p>sampled on a regular basis and analysed by an accredited laboratory for parameters specified in the water use license conditions.</p> <ul style="list-style-type: none"> The existing management plan for the handling and storage of explosives will be complied with as to minimise the chances of pollution. Regular inspections will be carried out to detect any leakages or spillages at the diesel storage tanks. All water entering the pits will be considered dirty or contaminated water and will be pumped to a temporary settling facility (MEE, 2005: xiv-xv). 			<p>Endorheic Pan Wetlands & Exotic vegetation.</p> <ul style="list-style-type: none"> RIEMP's requirements for Waste management and Pollution management. 					
10		Deterioration of Surface water quality	Disturbance will continue throughout the life of the project and may continue for some years afterwards	Vegetation, fish, amphibians, humans and small mammals.	<p>The following impacts are expected:</p> <ul style="list-style-type: none"> Suspended solids from erosion or disturbed soils may cause silt build-up in natural drainage lines (MEE, 2005: xv). Ammonium Nitrates from blasting residues may contaminate runoff (MEE, 2005: xv). Oil spillages from equipment and vehicles in the pits can contaminate the surface runoff (MEE, 2005: xv). Spills from silt traps can contaminate surface water should they overflow (MEE, 2005: xv). 	D	K	I	<p>Impala will employ the following measures:</p> <ul style="list-style-type: none"> Impala will ensure proper storm water management facilities are designed as required by Regulation 704 under the National Water Act No. 36 of 1998. Impala will aim to avoid soil contamination and employ remedial measures where necessary. The water balance of the project will be refined and updated regularly to check whether the areas water capacity requirements are adequate. All storm water control measures will be inspected on a weekly basis during rainy seasons. The proposed project will be included in Impala's existing surface monitoring programme. All data will be documented and all reports and incidents will be submitted to the Department of Water Affairs as required (MEE, 2005: xv). 	The measures are suitable and the precautionary principle is applied.	<p>The following legal requirements apply:</p> <ul style="list-style-type: none"> Constitution S24(a) & (b). NEMA S2(4)(a)(vi), S2(4)(b), S2(4)(h), S2(4)(r), S23(2)(a) & (b), S28(1) & 30(4), S2(4)(a)(i), S30(3) & (5). MPRDA S37(1) & (2). CARA S5(5). NEMBA S57, S65 & 67, S69(4), S71(1), S73(1), S73(2), S75(1)-(3), S76(4) & S81(1)(a). NWA S19(1) & (2), S20(3) & (4), S21(a)-(k). Notice 470 of 2000 Request to Register a Water Use North West. 	Yes	<p>The following non-legislative requirements apply:</p> <ul style="list-style-type: none"> The entire RAMSAR convention. CBD Art. 8, 13, 14 & 17. UNCCD Art. 4, 5 & 20. The entire Stockholm Convention. Rio Declaration Art. 1-7, 10, 11, 15,16,17,18, 21, 22. CCNNR Art. 7, 13, 16 & 20. ACHPR Art. 20. NSBA Components 1 & 2. NBSAP SO. 1-5. NWBSID's requirements for Flora and Aquatic fauna. RSEA's requirements for Surface water quality, Ecological systems, Riverine wetlands, Endorheic Pan Wetlands & 	Yes	D	J	A

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													<ul style="list-style-type: none"> Exotic vegetation. RIEMP's requirements for Waste management and Pollution management. 				
<p>The EMP requirements for the Smelter and the Central and UG2 concentrators' expansion will be done concurrently due to the fact the issues and management actions are the same in certain areas. Where there is differences it will be noted as such.</p>																	
11	Construction, operation and decommissioning.	Loss of soil resources	This will be a single incident that will take place during the smelters expansion.	Natural vegetation, small mammals and insects.	<p>The following impacts are expected:- There may be loss of soil through erosion if vegetation is not established as soon as possible.- If double handling of soil occurs during initial placement and replacement during rehabilitation soil volumes can be lost.- Soil compaction can occur if the soil is stacked higher than 2 meters.- Compaction may occur if topsoil is stripped and placed in wet conditions.- Topsoil contamination may occur if topsoil is placed on already contaminated soil.- Soil contamination through reagent spillages onto soil, material and tailings spillages on unlined surfaces and discharge of contaminated water.</p>	D	K	I	<p>The following management measures are proposed:</p> <ul style="list-style-type: none"> Topsoil will be stripped and stored with as little compaction as possible and not in wet weather.- Stockpile dimensions will not exceed 2 meters in height if practically possible. Single handling will be practised where possible. Stockpiles that are likely to remain undisturbed for 12 months or more will be revegetated. The proper topsoil placement procedures will be followed as required by the EMP and the standard operating procedures. Where topsoil is not available for rehabilitation of land, special care will be taken to ensure that the ability of the surface medium (subsoil or mine residue deposits) to support plant communities is restored. A specific site will be designated to store topsoil. The topsoil will be allocated to specific rehabilitation sites where decommissioning has taken place. Demolition of infrastructure will be done in consultation with land owners as required in the lease agreements to ascertain whether they want to retain the infrastructure or not (Pulles Howard & De Lange, 2000: (6-3) - (6-4)). <p>Addition:</p>	See comment 1.	See requirements above in section 1, 3 & 4.	Yes	See the requirements set out in Section 1.	Yes	D	J	A

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									<ul style="list-style-type: none"> In the concentrator areas the tank cells and other infrastructure have been placed on concrete slabs, which will prevent soil contamination. All surface runoff from these areas will be caught in storm water drains and diverted to pollution control dams to prevent possible contamination (Pulles Howard & De Lange, 2001: (5-9)) 								
12		Loss in land capability.	This will be a permanent change.	The surrounding communities and biodiversity.	<p>The following impacts may arise:</p> <ul style="list-style-type: none"> There will be a temporary or permanent loss of agricultural land. With the loss of the agricultural potential of the land communities might or will be pressed to rely upon the biodiversity in the area to sustain them, which may lead to overexploitation of natural resources. 	C	K	I	<p>The following management measures are proposed:</p> <ul style="list-style-type: none"> On closure of the smelter, land will be rehabilitated to its pre-disturbance potential and the entire structure will be removed. During the operational phase, land capability of surrounding, undeveloped and will be maintained through ensuring judicious soil conservation practices as described above (Pulles Howard & De Lange, 2000: (6-4)). 	See comment 1.	See requirements above in section 5.	No	See the requirements set out in Section 5.	No	D	J	A
13		Loss of natural habitats.	This will be a permanent change.	Vegetation, animal life and insect life.	<p>The following impacts may arise:</p> <ul style="list-style-type: none"> During the construction phase and to a limited extent during the operational phase vehicle movement outside the operational area may cause damage to the surrounding natural habitats. Post closure land uses may be directed towards agricultural practices rather aiming towards going back to a wilderness/natural pre-operational land use. 	C	K	I	<p>The following management measures are proposed:</p> <ul style="list-style-type: none"> Avoidance of unnecessary disturbance of patches of indigenous vegetation, including the movement of vehicles off-road. Disturbed land will be rehabilitated to appropriate land uses that are determined with land owners, the surrounding communities and planning authorities. The rehabilitation practices outlined above will be implemented. Rehabilitation of disturbed land will be performed in such a manner as to limit the spread of invasive species (Pulles Howard & De Lange, 2000: (6-5)). 	See comments 5 & 6.	See requirements above in section 1, 6 & 8.	Yes	See the requirements set out in Section 1, 5 & 8.	No	D	J	A

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14		Surface water contamination.	Will continue throughout the life of the project and some years afterwards.	Fish, amphibians, insects, animals, humans and birds.	<p>The following impacts may arise:</p> <ul style="list-style-type: none"> Heavy metal concentration can occur with the ecological cycle. The water body where the water is being discharged in may become polluted to such an extent that a large stretch of the stream may become sterile. The downstream users may become sick due to exposure of pollutants. <p>It must be noted that Impala Platinum is not the only possible source of pollution the Omnia complex that is situated adjacent to the smelter is also a possible and serious source of polluted runoff.</p>	C	L	I	<p>The following management measures are proposed:</p> <ul style="list-style-type: none"> To ensure that the operation doesn't result in the deterioration of water quality in the Leragane Stream beyond the parameters that are listed in the EMP through the discharge of effluent or storm water. In the event that Impala can't achieve the listed objectives it will initiate a complete waste load allocation study to determine the existing and future impacts. All rain water that falls within classified dirty areas will be re-circulated and reused in the processes in order to minimise the effluent entering the natural water courses and minimise the dependence on natural raw water. All storm water that doesn't comply with the water quality parameters listed in the EMP will be contained on site and excess water will be diverted to an emergence storage dam that will have a minimum of 0.5 meters free board. The main storm water discharge points will be continuously monitored during the rainy seasons to determine when the water is uncontaminated and will then be diverted away from the emergence storage dam and into the Rockwall Dam. The Rockwall Dam will always be managed in such a way that it will have a 40% capacity to ensure sufficient storage during the diversion of water into the dam (Pulles Howard & De Lange, 2000: (6-6)-(6-7)). 	The measures are suitable and the precautionary principle is applied.	See requirements above in section 10.	Yes	See the requirements set out in Section 10.	Yes	D	J	A

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15		Groundwater contamination.	Will continue throughout the life of the project and some years afterwards.	Vegetation and humans.	Contaminated groundwater may leach into surface water resources and cause residual seepage in these resources, which in turn can have a compounded environmental effect where the above mentioned surface water impacts may arise. There is historical seepage from the old central concentrator before the current upgrade and before there was a concrete slab. Leachate from this source has caused poor groundwater qualities in the Rockwall Dam (Pulles Howard & De Lange, 2000: (5-11)).	E	K	A	The following management measures are proposed: <ul style="list-style-type: none"> Virtually the entire surface area of the smelter has been covered with a concrete pad, effectively reducing the amount of seepage, which may occur from spillages and surface runoff. Should any excavation occur on site, process water spillages and storm water runoff will be prevented from entering these workings. The same precautions as listed under surface water will be implemented to prevent groundwater contamination (Pulles Howard & De Lange, 2000: (6-8)). 	The measures are suitable and the precautionary principle is applied.	See requirements above in section 9.	Yes	See the requirements set out in Section 9.	Yes	E	J	M
The EMP requirements for No. 14 and No. 12 North Shaft will be done concurrently due to the fact the issues and management actions are the same in certain areas. Where there is differences it will be noted as such.																	
16	Soil stripping, road construction, shaft excavation and the construction of ancillary infrastructure.	Loss of soil resources.	Will only occur during the construction and operational phases (to a lesser extent).	Vegetation, animal life and microbial soil life.	The following impacts have been identified: <ul style="list-style-type: none"> Significant soil compactions could occur should constructions activities not be limited to the specific projects area. Restriction on water infiltration will result in a significant loss of growth potential in the soil. Clearing of vegetation for the installation of the project related infrastructure. Significant soil erosion (SES, 2001: (5-5)). Addition: <ul style="list-style-type: none"> Loss of topsoil due to mixing with subsoil. About 95% of the black turf soils have been stockpiled but could be lost if not managed appropriately (MEE, 1999: (6-1)). 	D	K	I	The impact on the soil is limited to the area directly associated to the surface infrastructure, as most of the operation will take place underground. The extent of the impact is limited to the site while the intensity remains low and the duration is short term. Care should thus be taken to limit soil compaction to and within the construction boundaries (SES, 2001: (5-5)).	See comment 1.	See requirements above in section 1, 3 & 4.	No	See the requirements set out in Section 1.	No	D	J	A

ID	HAZARD SOURCES	HAZARDS OR NEGATIVE ASPECTS	INCIDENTS/ONGOING CONDITION	ARE THEIR ANY VULNERABLE RECEPTORS?	RISK EFFECT OR IMPACT	Severity Y-axis	Probability X-axis	Raw risk estimation	Current level & classification of controls or combinations of controls	Effectiveness of current combinations of controls	Applicable Legal Requirements	Compliant?	Applicable Other Requirements	Compliant?	Severity Y-axis	Probability X-axis	Residual risk estimation
17		Loss or change in land capability.	Will continue throughout the life of the project and some years afterwards.	Surrounding communities, vegetation, animal life, insects and birds.	<p>No impacts are envisaged with respect to land capability as the affected area is less than 1.7 ha. The risk sources during the construction phase can be considered to be as follows:</p> <ul style="list-style-type: none"> • Infrastructure position may reduce productivity of the agricultural land and interference with adjacent agricultural managed land. • Natural habitats will be disturbed - natural vegetation will be destroyed to a certain extent, which will influence the migration and the continuation of animal life and other forms of biodiversity. • There will be a reduction and loss in grazing land due to the footprint of the activities. • The disturbance will possibly cause soil erosion (SES, 2001: (5-6)) <p>Addition:</p> <ul style="list-style-type: none"> • Approximately 2 ha of Norite Black turf veld will be destroyed by excavations for the infrastructure. Much of this land was already impacted by mining activities due to its close proximity to the shaft infrastructure. 	D	J	A	<p>The surface of the land is owned by the Royal Bafokeng Administration and is used for limited grazing. Any further activities are considered to be of limited significance due to the already disturbed area. Cognisance should be taken of the existing mining activities in the region and the vicinity of the proposed No. 12 North Shaft (and No. 14 Shaft) complex and the anticipated loss will be limited to the areas comprising the new infrastructure (SES, 2001: (5-6))</p>	See comments 1, 4 & 5.	See requirements above in section 5.	Yes	See the requirements set out in Section 5.	No	D	I	M

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18		Loss in natural vegetation.	Will only occur during the construction and operational phases (to a lesser extent).	Vegetation, animal life, insects and birds.	<p>The following impacts have been identified:</p> <ul style="list-style-type: none"> The destruction of natural vegetation in the actual footprint area on the infrastructure. Introduction of alien plant species through building material and vehicular traffic. Herbicide application for vegetation clearing. Pollution may potentially result from the construction activities in the form of littering and fuel and chemical spills (SES, 2001: (5-6)-(5-7)) 	D	J	A	Due to the large areas covered by each vegetation type and the expected low alpha diversity over the majority of the site, it is not expected that the destruction of the vegetation within the footprint of the infrastructure will be significantly detrimental to the environment. It can thus be assumed that is very unlikely that because of the relatively low habitat diversity that the affected environment has a low sensitivity. The addition of No. 12 North shaft complex will have a limited impact on the already disturbed vegetation. It can be concluded that the proposed activity will only have an impact on the local vegetation for the proposed surface infrastructure (SES, 2001: (5-7))	See comment 6. The same measures will be followed throughout all the projects as best practice will be part of the rehabilitation procedures of the mine.	See requirements above in section 6.	Yes	See the requirements set out in Section 5.	Yes	D	I	M
19		Loss in animal diversity.	Will only occur during the construction and operational phases (to a lesser extent)	Animal life.	<p>The following impacts are anticipated:</p> <ul style="list-style-type: none"> Destruction of fauna in the shafts footprint area. Fire hazards associated with operations may possibly destroy vegetation and spread to other areas (SES, 2001: (5-8)). 	D	J	A	The limited nature of the surface disturbance will result in no significant disturbance of the animal life. It must be noted the construction site will be in an isolated area where small animals may occur. In addition, some of these animals may be rare, endangered, and classified as red data species. The project will restrict grazing to areas outside the fenced-off operations area (SES, 2001: (5-8)).	See comment 7 & 8.	See requirements above in section 8.	Yes	See the requirements set out in Section 8.	Yes	D	I	M
20		Loss in surface water quality and quantity.	Will occur throughout the life of the project and even a few years after closure.	Fish, amphibians, insects, animals, humans and birds.	<p>The following impacts are anticipated:</p> <ul style="list-style-type: none"> Increased erosion from the disturbed areas leading to an increase in the total suspended solids in the runoff. Contamination of runoff by spillage of fuel. Hydrocarbons, chemicals and waste generated at the site could be washed away during the rain and contaminate surface water. It is not anticipated that the operation will affect the surface water as part of the Leragane River Catchment, should the 	D	K	I	<p>The following mitigation measures have been identified:</p> <ul style="list-style-type: none"> Clean and dirty water separation. Storm water diversion works and control measures will be employed at all the surface infrastructure. Clean water will flow in the trench along the natural contours of the surrounding landscape, to dissipate naturally without any resultant erosion, Berms will be constructed to contain any contamination resulting from the operations area. Surface water reaching the road and railway line 	The measures are suitable and the precautionary principle is applied.	See requirements above in section 10.	Yes	See the requirements set out in Section 10.	Yes	D	J	A

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					necessary management measures be applied. It is also not envisaged that the operation will significantly change the catchment yield or the water quality in the catchment. This is due to its location in the landscape and the limited size of the disturbance (SES, 2001: (5-8)-(5-9)).				<ul style="list-style-type: none"> from upslope shall be contained and dispersed in erosion proof channels and allowed to discharge slowly and naturally. Limiting vehicular traffic to designated surface roads on site. Controlling the spillages from refuelling and maintenance areas. Constructing concrete bunded walls around storage tanks containing fuels. Maintenance of rehabilitated surfaces. Scarifying and roughening the surface along contours to increase the water filtration rate. Implementing diversion trenches and grassed waterways to intercept runoff. All culverts in the road and railway line must have inversion at the water base flow level (SES, 2001: (5-8)-(5-9)) 								
21		Loss in groundwater quality and quantity	Will occur throughout the life of the project and even a few years after closure.	Vegetation and humans.	<p>The anticipated impacts are the following:</p> <ul style="list-style-type: none"> There will be an impact on the recharge of the underground water sources due to continuous dewatering taking place. Possible contamination can occur through surface contaminant Leachate (SES, 2001: (5-10)). 	D	K	I	The significance of the impacts on the groundwater resources will be low due to the small extent of the operation (SES, 2001: (5-10)).	The ventilation shafts are very small and will fill up with water up to the natural recharge level of the underground aquifer after closure. There is very little doubt that these structures will have a significant impact on the underground water resources.	See requirements above in section 9.	Yes	See the requirements set out in Section 9.	No	D	J	A
<p>The EMP requirements for the Main EMP, No. 20, No. 16 Shafts as well as 1A, 1B, 11C, 14B ventilation shafts and No. 6 Dryer-Concentrator will be done concurrently due to the fact the issues and management actions are the same in certain areas. Where there is differences it will be noted as such.</p>																	
22	Soil stripping, road construction, shaft excavation and the construction of ancillary infrastructure.	Loss of a soil resource.	Will only occur during the construction and operational phases (to a lesser extent).	Vegetation, animal life and microbial soil life.	<p>The soils on the project site are uniform and are generally considered to be poor agricultural soil due to their rigid and strong structure, highly expansive nature, high clay content and poor drainage characteristics. Nonetheless, the soil does have a grazing potential and it is therefore important that</p>	D	J	A	<p>The subsoil in the study area generally has a high rehabilitation potential. The tendency of the soils to self mulch enhances its rehabilitation potential. The nutrient rich organic matter and indigenous seeds are distributed from the topsoil to the subsoil during the mulching process (SRK, 1997: (5.13))</p> <p>The soil conservation guide that</p>	See comment 1. These measures are even more advanced than the earlier EMP versions. This may be due to the fact that the National Environmental Management Act No. 107 of 1998	See requirements above in section 1.	Yes	See the requirements set out in Section 1.	Yes	D	I	M

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					<p>the top 600mm to 1500mm of soil is conserved where possible (GCS, 2004: (5-4)).</p> <p>It is anticipated that a total of about 25 hectares of land will be disturbed by the construction and operation of the main access and ventilation shafts and associated infrastructure (GCS, 2004: (5-4)).</p>				<p>will be followed during the project will be based on the steps outlined in the EMP. The main factors to considered which is described in more detail in the EMP include:</p> <ul style="list-style-type: none"> • Location. • Storm water controls. • Footprint and height of stockpiles. • The designation of areas. • Topsoil placement during stockpiling. • The stripping of topsoil. • Vegetation establishment and erosion control. • Waste. • Compaction. • Placement of topsoil. • Fertilisation. • Erosion control (GCS, 2004: (6-4)). <p>It must be noted that the soils will be stockpiled and systematically placed for rehabilitation purposes. It will not be necessary to form a berm upslope of the facilities concerned to act as a cut off divide between clean and dirty water. The stockpiles will be vegetated to reduce erosion by wind or water (GCS, 2004: (6-5)).</p>	was promulgated and that the new EIA regulations were first promulgated in 2004 when some of these EMPs where written.							
23		Soil Erosion.	This may be an incident that can occur regularly if not controlled.	Vegetation.	<p>All land is susceptible to erosion when vegetation is removed. The natural gradient at the sites are not significant and the soils have high clay content and are thus cohesive. The erosion potential is therefore low. There is nonetheless a high potential of erosion along linear infrastructure (i.e. roads, railways etc.) and where there are concentrated discharges of water (GCS, 2004: (5-5)).</p>	D	J	A	<p>The following management actions are proposed:</p> <ul style="list-style-type: none"> • Vegetation establishment will be undertaken as soon as possible. • On areas where vegetation is not possible other control measures such as the grading of surfaces to prevent rapid run-off of storm water and energy dissipaters will be implement. • Erosion control measures will be included in the designs of all linear infrastructure and points of water discharge. Such infrastructure will be inspected regularly to determine the control measures' effectiveness (GCS, 2004: (6-5)). 	See comment 6 and 20.	See requirements above in section 3.	Yes	See the requirements set out in Section 1.	Yes	D	J	A

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24		Soil pollution.	This may be an incident that can occur regularly if not controlled.	Vegetation, animal life, humans, birds and insects.	<p>The low rainfall coupled with the high clay content of the soils in the area and the gentle slope gradient reduces the potential for erosion of soils (SRK, 1997: (5.14)).</p> <p>The following impacts have been identified:</p> <ul style="list-style-type: none"> Leaching into the soil from the waste rock dumps could lead to pollution of the soils. (studies have however indicated that there is no danger of acid mine drainage). Petrochemicals will be stored on site and may be spilled thereby polluting the soil. Contaminated water may flow across the site and further contaminating other soil resources (GCS, 2004: (5-5) - (5-6)). <p>Of the above mentioned contamination, the contamination of water is of the most concern. It is believed that contamination of soils by contaminated water is likely to be confined to drainage lines in the upper reaches of the Leragane catchment and up to the confluence of the Legadigdat Stream with the Leragane Stream (SRK, 1997: (5.15)).</p>	D	L	I	<p>The following management actions are proposed:</p> <ul style="list-style-type: none"> The waste rock dump will be lined with a 300mm compacted clay liner. The storage and handling of petrochemicals and its spills will be done in accordance with the mine's relevant standard operating procedures. Oil contaminated water from the workshops will be de-oiled before recycling and the captured oil will be removed in sealed containers (GCS, 2004: (6-6)). <p>Addition:</p> <ul style="list-style-type: none"> Drums containing chemicals will be stored upright in a secure bunded area with an impermeable surface. Vehicles will be regularly serviced to a pre-planned maintenance programme. There will be an incident management system, including procedures and training on how to deal with incidents. If an incident occurs the proper remedial action will be followed. If deemed necessary the soils will be classified as waste and taken away to the appropriate waste site and the area will be rehabilitated (GCS, 2003: (6-5)). 	See comment 20.	See requirements above in section 4.	Yes	See the requirements set out in Section 1.	Yes	D	J	A
25		Loss of land capability.			Land will be disturbed by the development of the shafts, waste rock dumps and associated infrastructure and access roads. The grazing capacity of the land will be hampered by the developments (GCS, 2004: (5-7)).	C	K	I	<p>The following measures will be implemented in an effort to restore the pre-mining land capability (note, only the measures will be highlighted, for a more detailed description see the various EMPs):</p> <ul style="list-style-type: none"> Surface preparation through green manuring. Physical amelioration (i.e. ripping and disking of the area to loosen the soil). Chemical amelioration (i.e. application of organic mulch, limestone ammonium nitrate (LAN) and a NPK fertiliser 	See comments 1, 4, 5 & 20. One can see that more careful and proactive thinking went into these measures as there is now a target to restore the area to the pre-mining land capability.	See requirements above in section 5.	Yes	See the requirements set out in Section 5.	Yes	D	J	A

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									like 2:3:2). • Seeding with a mixture of six grass species (GCS, 2004: (6-6) - (6-10)).								
26		Loss in floral diversity.	Will occur throughout the life of the project and even a few years after closure.	Vegetation.	<p>All plant cover within the shaft complexes, ventilation shafts and along the access route and rail line will be removed. Where areas of poor quality vegetation are disturbed, the impact will not be as significant as for areas where ecological superior vegetation prevails. None of the areas developed are considered to be of high ecological value due to the species diversity present. The only two endangered species listed are <i>Asciepias fallax</i> and <i>erythorphysa transvaalensis</i>.</p> <p>Addition: The only rare species are <i>Frithia pulchra N.E.Br.</i> and <i>Aloe pegleraeand</i> (GCS & GAA, 2004: 69).Neither of these two species was found during the various surveys conducted. (GCS, 2004: (5-8) - (5-9)) & (GCS & GAA, 2004: 69).Because there will be a decrease in species diversity. It is expected that pioneer species will establish themselves on small areas (GCS, 2004: (5-9)).</p> <p>Addition: The following impacts are expected:</p> <ul style="list-style-type: none"> • Loss or disturbance of natural vegetation cover. • Potential destruction of rare and endemic species. • Potential destruction of sensitive landscapes or features. • Destruction of natural vegetation. • Fragmentation of existing natural habitats. 	C	K	I	The measures described in loss of land capability will be implemented to prevent the loss of vegetation.	See comment 23.	See requirements above in section 6.	Yes	See the requirements set out in Section 5.	Yes	D	J	A

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					<ul style="list-style-type: none"> Uncontrolled spread of exotic vegetation (GCS, 2003: (5-8)). 												
27		Invasion of weeds and alien plant species.	Will occur throughout the life of the project and even a few years after closure.	Vegetation.	The areas disturbed in the process of development will be susceptible to the invasion of invasive plant species. These species will colonise areas that have been disturbed and in the absence of appropriate controls these species will continue to compete with indigenous species and ultimately deteriorate the ecological quality of the site (GCS, 2004: (5-9)).	E	K	A	The potential for alien invasive plants will be managed by: <ul style="list-style-type: none"> Follow-up controls to prevent the infestation of alien vegetation. Annual inspections through the annual environmental audit of the grass cover and the alien plant growth. The burning of grass will be avoided as far as possible within the first three years of vegetation establishment (GCS, 2004: (6-14)). 			No	See the requirements set out in Section 5.	No	E	K	A
28		Loss of animal diversity	Will occur throughout the life of the project and even a few months after closure.	Animals, birds and insects.	<p>Existing mining operations within the area, the encroachment of human activity as well as the availability of habitat has permanently altered the ecosystem in such a manner that any additional development will have no significant impact (GCS, 2004: (5-10)).</p> <p>The impacts on the animal life are related to the loss of habitat and to the increased levels of human presence and activity. Due to the limited presence of any fauna on site, the impact during the construction and operational phases will be insignificant (GCS, 2004: (5-11)).</p>	D	K	I	With construction, human activity will cause most of the animals to flee from the immediate project area. The total ecological footprint area to be disturbed will be kept to a minimum (GCS, 2004: (6-15)).	This is not a very well thought through measure. Although it is true that animals will 'flee' the site with the start of the operation. There is no careful thought in bringing in measures like buffer zones to minimize the effect of the day to day operations on faunal functioning.	See requirements above in section 8.	No	See the requirements set out in Section 8.	No	D	K	I
29		Loss of surface water quality and quantity.	As long as the operations continue the impacts can occur. There may even be a latent after pollution effect should rehabilitation not be done effectively.	Aquatic biota and downstream water users.	<p>It must be noted that Minpro and Omnia are currently contaminating the Leragane Stream. Omnia is not part of Impala Platinum, therefore Impala is not in the position to precisely identify the sources of pollution emanating from Omnia and to ensure that appropriate management measures are implemented (SRK, 1997: (5.25)).</p> <p>It is believed that Omnia is the source of the phosphates, fluorides, acid,</p>	D	J	A	<p>Impala is willing to go into a joint effort with Omnia to address the problem of the high counts of the various pollutants (SRK, 1997: (5.25)).The following other management actions are suggested:</p> <ul style="list-style-type: none"> Channelling of clean runoff around those areas that may impact on the water quality.- ongoing water quality monitoring. To monitor, measure and control the surface water runoff that may affect the catchment and downstream users and insure that the 	This is a very controversial point, where a company accuses another of compounding the effects of the pollution caused in a natural watercourse. However, what is positive is the fact the Impala is willing to cooperate with Omnia in finding a solution for the	See requirements above in section 10.	Yes	See the requirements set out in Section 10.	Yes	D	I	M

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					<p>calcium sulphate, suspended solids and radionuclides. There is a specific concern on the high concentrations of phosphates and fluorides found in the Rockwall Dam. Phosphate is relatively nontoxic but is a problem because it can cause eutrophication of water bodies. Fluoride can cause discolouration of teeth and bone lesions (SRK, 1997: (5.26)).</p> <p>The following impacts have been identified:</p> <ul style="list-style-type: none"> Scour may occur where storm water runoff is concentrated, i.e. In channels and at their outlets. If scour occurs close to structures, undercutting may occur. The in situ material is resistant to scour. The affected areas are relatively small and located far away from the watercourse. The impact on surface water quality is therefore assessed as low (SRK, 1997: (5.26)). The loss will commence with the construction of the projects and continue throughout the operational phase till closure. The expected impact is medium (GCS, 2004: (5-12) - (5-13)). 				<p>runoff complies with legislative requirements and the objectives of the water management system.</p> <ul style="list-style-type: none"> Impala has adopted a zero contaminated discharge policy, which implies all contaminated water will be contained and recycled. The construction of cut-off trenches and berms are required to ensure clean and dirty water separation (GCS, 2004: (6-17)). 	serious pollution problem in the Leragane Stream.								

30		Loss of groundwater quality and quantity.	As long as current measures are implemented and even improved the impacts may be minimal.	None	<p>The following impacts have been identified:</p> <ul style="list-style-type: none"> The studies conducted concluded that the lithologies that were sampled has a low to zero potential of creating acid mine drainage. There will be no serious effect on the yield of the groundwater resources due the presence of a syenite dyke. 	D	J	A	<p>The following management actions are suggested:</p> <ul style="list-style-type: none"> Clean water will be diverted. Run-off will be contained. The contained run-off will be re-used or evaporated out. The liner for the waste rock dump will consist of a 300mm compacted clay liner (GCS, 2004: (6-18)). 	The current controls are deemed effective as long it is maintained and upgraded should expansions take place.	See requirements above in section 9.	Yes	See the requirements set out in Section 9.	Yes	D	I	M
Impala Platinum Closure Plan																	
31	Surrounding communities	Misuse of rehabilitated land.	Will occur after rehabilitation takes place.	None.	Degradation of rehabilitated areas through overexploitation and overgrazing.	D	J	A	<p>Agreements will have to be reached with interested and affected parties on the future land use of the various areas before rehabilitation and closure takes place. As no details of any formal agreements on the future land use were available at the time the closure plan was compiled (Redco, 2006: 13).</p>	<p>Although the principles are good, they lack decent management actions to re-establish and attract small mammals, birds and insects. These species are good indicators of ecosystems functioning especially the presence of insects. The closure plan needs to be updated with more extensive and long term management actions for rehabilitated areas.</p> <p>Even with the current proposed management actions, the mine cannot meet the various basic requirements of legislation, let alone international best practice.</p>	<p>The following legal requirements apply:</p> <ul style="list-style-type: none"> Constitution S24, NEMA S2(4)(a)(i), S2(4)(b), S2(4)(h), S2(4)(r), S23(2)(a) & (b) & S28(1) & 30(4). NFA S7(1). NWA S19(10 & (2)). 	No	<p>The following non-legislative requirements apply:</p> <ul style="list-style-type: none"> CBD Art. 6 - 14, 17 & 20. UNCCD Art. 4, 5, 19 & 20. WHC Art. 5, 6 & 27. Rio Declaration Art. 1-7, 10, 11, 15,16,17,18, 21, 22. ACHPR Art. 24. CCNNR Art. 6, 8, 9, 10, 12, 13, 16, 17 & 20. PWCLE Art. 7 & 10. NSBA Components 1 & 2. NSBAP SO. 1 - 5. RIEMP's requirements for Waste management, Pollution Management, and Biodiversity NWBSID's requirements for floral diversity, Mammals, Herpetofauna, Avifauna, Lepidoptera, Aquatic fauna. RSEA's requirements for Ecological systems, Riverine wetlands, Endorheic pans, Exotic vegetation, Sensitive plants, Mammals, Herpetofauna, Avifauna, Lepidoptera, and Aquatic fauna. 	No	D	J	A

32	Opencast areas.	Loss of land capability at opencast areas.	This will continue throughout the life of the project and even after rehabilitation.	None.	Loss of arable, grazing and wilderness potential due to unsound rehabilitation practices and poor post-closure maintenance.	D	J	A	The following mitigation and management actions are proposed: <ul style="list-style-type: none"> Practice Concurrent rehabilitation at the open cast mining areas. As the work progresses, areas that are mined out are backfilled and re-vegetated. Minimise visual impact. Ensure the area is safe for humans and animals. Return as far as possible to its pre mining state, suitable for a post closure land use of grazing. After backfilling, make sure that no high walls remain. If so, lower the slope angle to at least 18 degrees. Ameliorate (if required) and establish vegetation by seeding the area with 15 kg/ha of the typical seed mixture) (Redco, 2006: 13 & 27). 	See requirements above in section 5.	No	See the requirements set out in Section 5.	No	D	J	A
33	The dismantling or steel structures, demolishing of buildings and related civil structures, the sealing/plugging of shafts and inclines and the rehabilitation of sludge dams and other earth dams	Los of land capability at shaft areas.	This will continue throughout the life of the project and even after rehabilitation.	None	The following impacts can occur: <ul style="list-style-type: none"> There may be loss of soil through erosion if vegetation is not established as soon as possible. Soil contamination through reagent spillages onto soil, material and tailings spillages on unlined surfaces and discharge of contaminated water. 	D	J	A	The following management actions have been proposed: <ul style="list-style-type: none"> Minimise the visual impact of these structures, Mitigate safety hazard that structures may pose to humans and animals, and Establish sustainable vegetation, suitable for a post closure land use of grazing General surface rehabilitation including the establishment of vegetation (Redco, 2006: 27). 	See requirements above in section 5.	No	See the requirements set out in Section 5.	No	D	J	A
34	Waste Rock Dumps.	The area may become sterile and a possible source of acid mine drainage.	This will continue throughout the life of the project and even after rehabilitation.	None	The following impacts can occur: <ul style="list-style-type: none"> Soil contamination through leaching of acid mine drainage onto soil. Vegetation may be severely degraded due to acid mine drainage. Possible groundwater pollution due to leachate from the dump. 	D	J	A	There is currently 16 waste rock dumps (WRD's) at the Rustenburg Operations. At 2A shaft, the WRD has been removed and only the unrehabilitated footprint remains. Results of an investigation conducted by specialists indicated no potential for Acid Mine Drainage (AMD) (Redco, 2006: 17). <p>Specific Closure Objectives for the waste rock dumps include:</p> <ul style="list-style-type: none"> Minimise the visual impact, Ensure long term structural and ecological stability of the landform, and No long term aftercare (Redco, 2006: 17 & 19). 	See requirements above in sections 4, 5, 8, 9 & 10.	No	See requirements above in sections 1, 5, 8, 9 & 10	No	D	J	A
34	Tailings facilities and slag dump.	Toxic compounds in the slurry may cause serious ecological damage.	This will continue throughout the life of the project and even after rehabilitation.	None	The following impacts can occur: <ul style="list-style-type: none"> If vegetation is not established speedily severe erosion may occur on the tailings facilities and slag dump, which can also lead to severe dust pollution. 	C	K	I	Specific Closure Objectives for the tailings dams are: <ul style="list-style-type: none"> Minimise water and wind erosion, Minimise impact on ground- and surface water. Minimise the visual impact, Ensure long term structural and ecological stability of the landform, 	See requirements above in sections 1, 3, 4, 5, 7, 8, 9 & 10.	No	See requirements above in sections 1, 5, 8, 9 & 10	No	D	J	A

					<ul style="list-style-type: none"> Long term groundwater pollution can occur if the water on top of the facilities is not kept under control. Surface water contamination and severe ecological degradation may occur should the tailings dam wall break. 				<ul style="list-style-type: none"> No long term aftercare, Comply with legislation. In-depth research has been conducted to successfully establish sustainable vegetative cover on the slopes of the Impala tailings dams. Vegetation can be successfully established directly on the tailings material, thus no topsoil or cover layer is required on the side slopes or top of the tailings dam. A sustainable vegetative cover will minimise wind and water erosion and limit the generation of dust, which is required by legislation. Much of the proposals for the rehabilitation of the tailings dams are based on this research (Redco, 2006: 14-15). <p>Impala is in the process of reclaiming the slag. All the slag should be removed within a period of 5 years. Once it has been removed, only the footprint will remain to be rehabilitated (Redco, 2006: 29).</p>							
35	The Rockwall Dam	Contamination of surface water resources.	This may occur throughout the life of the dam.	Fish, amphibians, birds, mammals and humans.	The following impacts can occur:- Chemicals or low pH in the dam may cause the death of fish, birds, amphibians and sickness in small mammals and humans.- Leachate from the dam cause further groundwater pollution.	D	K	I	<p>Polluted water from various sources, including decant water from the No 3 & 4 tailings dams was channelled in to the Rockwall dam. Recent, changes to the return and surface water drainage systems now only allows surface water to drain into the dam. Over time, pollutants have precipitated in the sediments. This has caused the formation of stabilised and hybrid ecosystem in and around the dam (Redco, 2006: 29).</p> <p>It is proposed by Redco (2006: 30) that the Rockwall dam remains in place after mine closure. Little action is required to rehabilitate the dam. If the dam wall remains in place and other sources of pollution upstream of the dam are either removed or rehabilitated, the quality of the water in the dam will become better over time as the water in the dam is supplemented by clean runoff from the upstream areas. Furthermore, the water in the dam can be a valuable source of water to the local communities and can serve as a recreational facility (Redco, 2006: 30).</p>	See requirements 9 & 10.	No	See requirements 9 & 10.	No	D	J	A
36	Roads, railways, power lines and	Loss of land capability.	This will continue throughout the life of the project and even	None	There may be a loss in the arable potential of the area and these structures may	D	J	A	The following management actions are proposed: <ul style="list-style-type: none"> Primary roads or tarred 	See requirement 5.	Yes	See requirement 5.	No	D	I	M

	fences.		after rehabilitation.		block the movement of animals, birds and insects should they remain.				<p>roads may remain intact for future utilisation. If no agreements can be reached for the future use of secondary and haul roads, they must be rehabilitated,</p> <ul style="list-style-type: none"> • There are more than 90 km of private railway lines on the property. If no agreements exist on the future use of the railway lines, they must be removed, • It is proposed that facilities such as power lines and telephone lines not be demolished but rather used to provide or upgrade the services to surrounding communities, and • Unless alternative agreements have been reached with communities, all the fences must be removed, salvaged and possibly sold to third parties. • The removing of fences must be timed with the rehabilitation of the area in order to prevent access to potential unsafe areas (Redco, 2006: 31). 								
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8.4 Appendix D: Gap analysis of Impala's EMPs and Closure plan

No.	Section of a international, national, provincial or local policy or law not considered	Gaps in the EMP and Closure Plan	Recommendations
1	<ul style="list-style-type: none"> • The Rio Declaration Principle 15, • NEMA S2(4)(a)(i), and NWA S19(1) & (2). 	<p>There is limited reference to the precautionary approach/principle in the various EMPs when addressing issues. The majority of the objectives in the EMP's are constricted to taking action after harm has taken place i.e. 'crises control'. Nonetheless, it seems as though the majority of the post-ECA EMP's started focusing in implementing the precautionary principle.</p>	<p>A biodiversity inclusive impact assessment (BIIA) is needed to deduce what the current state of affairs is before immediate action can be taken. During the next EMP revision the focus must be placed on applying pre-emptive measures that aim at preventing impacts based on the findings made in the (BIIA)</p>
2	<ul style="list-style-type: none"> • The Main objective of the Ramsar convention, • Rio Declaration Principle 4, • The NEMA S2(4)(r), and CBD Article 8. 	<p>The EMP doesn't elaborate on how sensitive, vulnerable, highly dynamic or stressed ecosystems, such as wetlands, will receive specific attention in management and planning, especially where they are subject to significant human resource usage and development pressure (for example in the section sensitive landscapes one of the actions are: "<i>To protect the sensitive riparian zones associated with watercourses in the mining lease area</i>" (SRK, 1997:20)).</p>	<p>If it is decided that the EMP will provide non-specific management actions then provision must be made for policies, plans and programmes that focus on the identified management actions in more detail. This can be in the form of either a Biodiversity Action Plan or Conservation Plan.</p>
3	<ul style="list-style-type: none"> • The CBD Article 6, 8, 9, 10 & 13, • The UNCCD article 4, 5, 19 & 20, • The WHC Article 5 & 27, • The Rio Declaration Principles 4 ,7 & 10, • The CCNRR Article XIII & XX, • The PWCLE Article 7, • The NEMA S2(4)(a)(i) & (vi), S2(4)(h), S57, 	<p>Hoare (2008, 48 & 50) identified that overgrazing takes place within the lease area. Continued non-selective grazing can lead to permanent change in species composition and loss of vegetation cover to a point where the landscape has a reduced grazing capacity and productive ability. This can lead to soil erosion, increased storm-water flows, reduced water quality in wetlands and a reduction in the ability of the landscape to store and retain water. In addition to this, are a number of species that are hunted for food or medicinal purposes (i.e. bioprospecting), which forms part of the natural species composition of the landscape. Loss of populations of</p>	<p>There is a need to create a programme that can educate local farmers in sustainable grazing practices. This will not only increase the quality of the environment, but also boost the local farmers' income.</p> <p>Through the implementation of the Biodiversity Action Steering Committee (BASC), proper education and consultative programmes must be initiated to educate those that take part in such unsustainable</p>

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	<p>S81(1)(a),</p> <ul style="list-style-type: none"> • The NWBSID requirement 1-5, • The Rustenburg SEA requirement 2-8 & 11, and • The RIEMP requirements under Biodiversity. 	<p>these species can result in the conservation status of the species being negatively changed. It will also result in the species no longer being available for the purposes for which it is being used.</p> <p>No provision is made for the development of educational and public awareness plans, policies, programmes and services in order to encourage the importance and understanding of (i.e. community members or staff trained in conservation) the threats (i.e. overgrazing and overexploitation), ex-situ conservation methods and sustainable use of biodiversity and natural heritage resources.</p>	<p>practices and aid them in obtaining other more sustainable sources of sustenance. One mechanism that can flow from the BASC is a Stewardship and Land Care programme that provides local communities with a sense of custodianship over the area they utilise.</p> <p>There is also a need for financial provision, which is crucial, because the RBN, in cooperation with the mine, will need to drive the programmes that have been started by the BASC. This merits the establishment of a biodiversity trust that makes financial provision for sustained conservation of biodiversity after closure.</p>
4	<ul style="list-style-type: none"> • The NFA S7(1) and CBD article 8. 	<p>The EMPs don't provide sufficient management actions to properly regulate or manage the relevant processes and activities that have significant adverse effect on biodiversity (i.e. To limit habitat disturbance and rehabilitate disturbed land). This seems however to also be limited to the ECA era EMP's.</p>	<p>As discussed in point 1, there is a need for specific policies and programmes that will address the broader management actions in the EMP's in detail. The mine must consult with the Department of Mineral Resources to update and consolidate its EMP's. This will ease implementation because there will be one document to refer to.</p>
5	<ul style="list-style-type: none"> • The CBD Article 10, 11 & 14, • The UNCCD article 19, • The WHC article 27, • The Rio Declaration Principle 22, and • The CCNRR Article XVII. 	<p>The EMP does not make provision for utilising and encouraging the customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements and modern scientific knowledge. There is also no effort made in making provision for economic or social incentives for the communities to develop and</p>	<p>Through proper consultation and community projects, such customs can play a part by assigning those that engage in such practices to be conservation champions among community members and to educate their local members in the concept of sustainable utilisation.</p>

No.	Section of a international, national, provincial or local policy or law not considered	Gaps in the EMP and Closure Plan	Recommendations
		implement remedial action in degraded areas where biodiversity has been reduced. This will in turn alleviate the pressure from the mine from meeting such objectives and promote transparency and underlying support amongst the mining industry and the authorities.	
6	<ul style="list-style-type: none"> • The CBD articles 7 &14, • The WHC article 6, • The Rio Declaration principle 17, • The CCNRR Article XVI, and • The PWCLE article 7. 	The EMPs does not provide for any procedures that proactively trigger biodiversity impact assessment for proposed projects, and policies or programmes, which may significantly affect the conservation and sustainable use of biodiversity to avoid or minimise negative impacts, and ultimately control such activities.	Also, see Point 1. Through the implementation of proper procedures, certain activities must be identified that will trigger biodiversity impact assessments. Such activities may include the building of roads and pipelines through sensitive areas. This must be done even if it does not trigger an EIA under regulation to show proactive thought and a commitment to conservation.
7	<ul style="list-style-type: none"> • The CBD article 14, • The UNCCD article 5, • The Rio Declaration Principle 18, • The NEMA S 28(1) & 30(3)-(5), APA S5 of, and • The NWA S20(3) & (4) &S117(c). 	No provision is made for an emergency response procedures aiming at the mitigation or minimisation of incidents (such as drought or fire), which present a grave and imminent danger to biodiversity through cooperation with those that also benefit from such resources.	<p>There is a need for biodiversity response plans that indicate action to be taken in the event of veld fires, drought, and even poaching. This is usually done through the creation and implementation of standard operating procedures.</p> <p>In the event of unrepairable damage to an ecosystem (only as a last resort) a fund must exist (it can be part of the rehabilitation provision fund) that enables the mine to make a biodiversity offset in another area that is similar to the one destroyed.</p>
8	<ul style="list-style-type: none"> • The main objective of the Bonn Convention. 	No provision is made for pre- and post-conservation of migratory bird species especially the lesser flamingo that occurs in very large numbers on the mine's property.	An eco-toxicological assessment must be conducted on the birds to determine whether the substances occurring in the

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			<p>water on the tailings dam directly affect them.</p> <p>If not, measures must be employed to co-exist with these birds on the dam, To ensure that they are not harmed by the day-to-day activities taking place. There is, however, a need for a long-term management plan to conserve the birds after the mine closes down. This is where a probable offset can be instigated to create a suitable habitat for them to use instead of the dam.</p>
9	<ul style="list-style-type: none"> The CNNRR Article VI. 	<p>The EMP lacks the specific provision for the development of long-term integrated strategies for the conservation and sustainable management of land resources, including soil, vegetation and related hydrological processes.</p>	<p>See point 1 and 4</p>
10	<ul style="list-style-type: none"> The CCNR Article VIII. The NEMA S2(4)(b). 	<p>There is lack of scientific measures in the proposals made within the closure plan regarding establishment of indigenous or endemic vegetation species for rehabilitation. By establishing indigenous or endemic species the natural and indigenous animal, bird and insect species will establish in a faster pace with greater variety than with only the limited species being proposed.</p> <p>Secondly, there is lack of provision for aftercare in the closure plan and the EMPs of rehabilitated areas. There is a need to implement a long-term management plan for rehabilitated areas, as they are sensitive and quickly degrade if not managed effectively. Closure and/or rehabilitation plans in general focuses largely on trying to stabilise an effected environment with as little as possible resources while not addressing and making provision for</p>	<p>The whole closure plan must be revisited and should make provision for both social and ecological measures, as described above. Closure planning should be done as described in section 4.3.</p>

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		landscapes surrounding the effected environment and preserving and or improving their quality. This is incidentally an indirect contravention of S2(4)(b) of NEMA, which requires companies that engages in environmental management to take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.	
11	<ul style="list-style-type: none"> • The GMOA S71. 	The EMP and closure plan does not make provision for the control of GMO's. This is specifically applicable to the use of certain seeds for rehabilitation and agents used for bio-remediation.	The mine must make provision for the development of a proper policy regarding the use of their seed mixtures for rehabilitation to ensure that these mixtures are provided by a reputable source and that they only contain indigenous species that are not genetically altered in any way or harvest the seeds themselves from the surrounding natural areas.
12	<ul style="list-style-type: none"> • The NFA S7(1) 	There is no explicit reference made in either the various EMPs or the Closure Plan for preventing, managing and controlling seasonal or deliberate fires during and after operation. This is of the utmost importance as arson is one of the main reasons of vegetation destruction on the lease area (refer to the discussion of the National Veld and Forest Fire Act on how to manage fires). These provisions form a critical part of any land management plan and/or strategy.	See point 7.
13	<ul style="list-style-type: none"> • The Rio Declaration Principle 15, • The NEMA S2(4)(a)(i) & S28(1) & 30(4), • The NWA S19(1) & (2), and 	SRK (1997: 17) identified that there is runoff, decant water, drainage water and seepage from No. 4 Tailings Dam Complex that needs to be rerouted to the plant. Should this not be done contamination of the Leragane Stream, upstream and downstream of the Rockwall Dam can occur, which is an impact of high significance.	It is proposed that drainage trenches be constructed around the complex that relay the contaminated water with water draining in the penstocks back to the plant for re-use. This will limit the impact on the aquatic biodiversity and terrestrial

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	<ul style="list-style-type: none"> The ACHPR, CCNRR Article VII. 	<p>Contamination of the upper reaches of the Leragane Stream can be stopped, but contamination of Leragane Stream downstream of the Rockwall Dam is more difficult to prevent. Nonetheless, it is unlikely that Impala has significant impacts on the quality of water draining to the Bospoort Dam, but it is still important that monitoring is undertaken to test the extent and concentration of the pollution as there is joint contamination taking place from Impala Platinum and Omnia.</p>	<p>biodiversity in the vicinity of the structure. OR That a water purification plant be constructed to possibly provide clean water to nearby local municipalities (the water can be sold to cover costs) and discharge water into the Leragane stream to increase the quality of water and increase volumes to downstream water users. OR A smaller purification plant in combination with an artificial wetland can be constructed. The wetland can purify secondary effluent that has already been put through the purification system. This will decrease costs as well as increase the ecological value of the area.</p>