ENVIRONMENTAL IMPACTS OF PROSPECTING AND MINING IN NAMIBIAN NATIONAL PARKS: IMPLICATIONS FOR LEGISLATIVE COMPLIANCE

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I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

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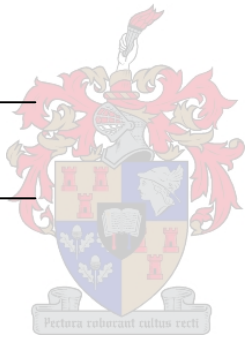

ABSTRACT

Namibia's environmental legislation is fragmented and outdated, and in particular mining and prospecting in parks of Namibia is poorly legislated. This problem was analysed with the Skeleton Coast Park being chosen as the study region, as it was considered to be a representative example for parks in Namibia. The Skeleton Coast Park offers both pre-mining and post-mining characteristics; therefore affording the possibility to ascertain the environmental impacts that mining and prospecting have on the environment.

The aims of the study were to illustrate the gaps in legislation in regard to mining and prospecting in parks of Namibia and to provide management guidelines for mining and prospecting in these parks. Objectives of this study included gathering baseline environmental information for the Skeleton Coast Park; creating and analysing a spatial database for the occurrence and type of current prospecting and mining activities in the Skeleton Coast Park; analysing and documenting techniques currently practiced for prospecting and mining; and identifying shortcomings in legislation and policy guidelines regulating these activities.

The study results highlight the extraordinary sensitivity and uniqueness of the natural environment in terms of physiography, ecological functioning and vulnerability to human interference of the life forms occurring here. Results confirm that mining and prospecting techniques can have detrimental environmental effects given the poor management practices recorded. Also, prospecting in the Skeleton Coast Park indicates no lucrative source of diamonds. Even though currently the entire coast line is given out to Exclusive Prospecting Licences, results do not indicate that any company is undertaking serious active prospecting. Regarding regulation it is evident that new, more encompassing legislation has been drafted, but that the promulgation of the legislation is hampered by the non-finalisation of the process. Several new draft bills currently in place contradict each other and need proper alignment.

OPSOMMING

Namibië se omgewingswetgewing is gefragmenteer, verouderd en, veral ten opsigte van mynbou en prospektering in Namibiese parke, swak omskryf. Hierdie probleem is in die Skedelkuspark as verteenwoordigend van Namibiese parke as studiegebied ondersoek. In die Skedelkuspark kom ongerepte natuurgebiede en mynbou-versteurde gebiede voor, sodat die omgewingsimpakte van mynbou- en prospekteringsaktiwiteite ontleed kan word.

Die doel van die studie was om gapings in wetgewing met betrekking tot mynbou- en prospektering in Namibiese parke uit te wys en om bestuursriglyne vir die bedryf van mynbou en prospektering in die parke te verskaf. Daarvoor is die doelwitte gestel en bereik om verwysingsvlak-inligting rakende omgewingstoestande in die park te versamel; ’n ruimtelike inligtingstelsel oor die voorkoms en tipes van alle huidige mynbou en prospekteringsaktiwiteite daarin te ontwerp en ontleed; huidige mynbou- en prospekteringsmetodes te boekstaaf en ontleed; en die tekortkominge in wetgewing en beleid wat hierdie aktiwiteite moet reguleer te identifiseer.

Studieresultate beklemtoon die buitengewone sensitiwiteit en uniekheid van die natuurlike omgewing betreffende die fisiografie, ekologiese funksionering en kwesbaarheid vir menslike aktiwiteit van lewensvorme in die park. Resultate bevestig die nadelige omgewingsimpak wat mynbou en prospektering weens aangetekende swak bestuurspraktyke kan hê. Verder lewer prospekteringsresultate in die Skedelkuspark geen bewys van winsgewende diamantbronne nie. Hoewel die hele kuslyn tans onder Eksklusiewe Prospekteerlisensies toegeken is, kon geen bewyse van ondernemings wat ernstig en aktief prospekteer gevind word nie. Betreffende regulering blyk dit dat nuwe, meer omvattende wetgewing reeds ontwerp is, maar dat promulgering draal weens ‘n stadige proses. Verskeie nuwe konsepwette wat tans opgestel is is teenstrydig en benodig behoorlike onderlinge belyning.

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ACRONYMS

CDM	Consolidated Diamond Mines
CFCs	Chlorofluorocarbons
CITES	Convention on the International Trade in Endangered Species
DEA	Diretorate of Environmental Affairs
DMS	Dense Media Separation
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPL	Exclusive Prospecting License
ERL	Exclusive Reconnaissance License
FCCC	Framework Convention on Climate Change
GDP	Gross Domestic Product
GIS	Geographic Information System
GPS	Global Positioning System
HWM	high water mark
I&AP	Interested & affected Parties
LWM	low water mark
MC	Mining Claim
MDRL	Mineral Deposit Retention License
MET	Ministry of Environment and Tourism
ML	Mining Licence
MME	Ministry of Mines and Energy
MRC	Mineral Rights Commission
MSDS	Material Safety Data Sheet
MTI	Ministry of Trade and Industry
NDP	National Development Plan
NGO	Non-governmental Organisation
NNDC	Northern Namibia Development Corporation
NPC	National Planning Commission
ORV	Off-road Vehicle
PVC	Polyvinyl chloride
SAIEA	Southern African Institute for Environmental Assessment
SCP	Skeleton Coast Park
SDC	Sustainable Development Commission
UN	United Nations
WRMA	Water Resources Management Act

CHAPTER 1 MINING: OPPORTUNITY OR PROBLEM IN NAMIBIA?

Mining is the most lucrative industry in Namibia with the highest contribution to the Gross Domestic Product of the country. However, supported by the National Constitution, Namibia's biodiversity is of national importance and warrants the conservation thereof. This is where a conflict or rather a disparity arises when mining and conservation occupy the same space.

The research problem is detailed below, and is indicated by the lack of specific legislation and guidelines for both the mining and conservation sectors to deal with effective management. The aims and objectives of the research are to illustrate the gaps and short comings in the current situation regarding the legislative state in environmental law, specific to mining in parks of Namibia, as well as to provide management guidelines for the mining industry active in parks of Namibia.

A variety of data sources were made use of – the base was a GIS database from the Ministry of Mines and Energy (MME) representing all mines in Namibia. This was complemented by literature sources and fieldwork. The section on research methodology illustrates the methods employed to gather the data.

As a representative park in Namibia, the Skeleton Coast Park (SCP) was chosen as the case study. This decision was made on the basis that the park would be a valid representative of other parks, and that a good pre-mining state could be indicated, as well as a good current mining state can be shown.

The research design is illustrated and described in this Chapter and the report structure is outlined.

1.1 MINING VS CONSERVATION IN NAMIBIA

The Government, well aware of the importance of mining to Namibia's economy, has brought in a substantial package of incentives designed specifically to encourage mineral exploration. These cover issues such as taxation, land access and rights of tenure. In addition, an excellent range of high quality geological information is readily available to exploration companies. At the same time the MME is striving to improve the technical infrastructure in what has become one of Africa's most attractive exploration and mining environments. The Directorate of Mining is currently streamlining license procedures and bringing license holdings into an accessible GIS-based format.

The Geological Survey in Namibia is already in possession of one of the most extensive geological archives in Africa – including a complete inventory of previous exploration work that stretches back almost a century. It is currently incorporating the results from modern surveys in order to optimise information on the country's geological potential.

Parks in Namibia comprise 14.1 % of the total surface area. This is likely to be enlarged soon by the addition of the old Sperrgebiet diamond mining concession, which will result in the largest national park in Africa covering some 72,600km^2. Once the park is created there will be a continuous conservation area stretching over an area of about 100,500km^2 from the Orange to the Kunene Rivers (Mendelsohn et al 2002). Figure 1.1 below shows all national protected areas in Namibia.

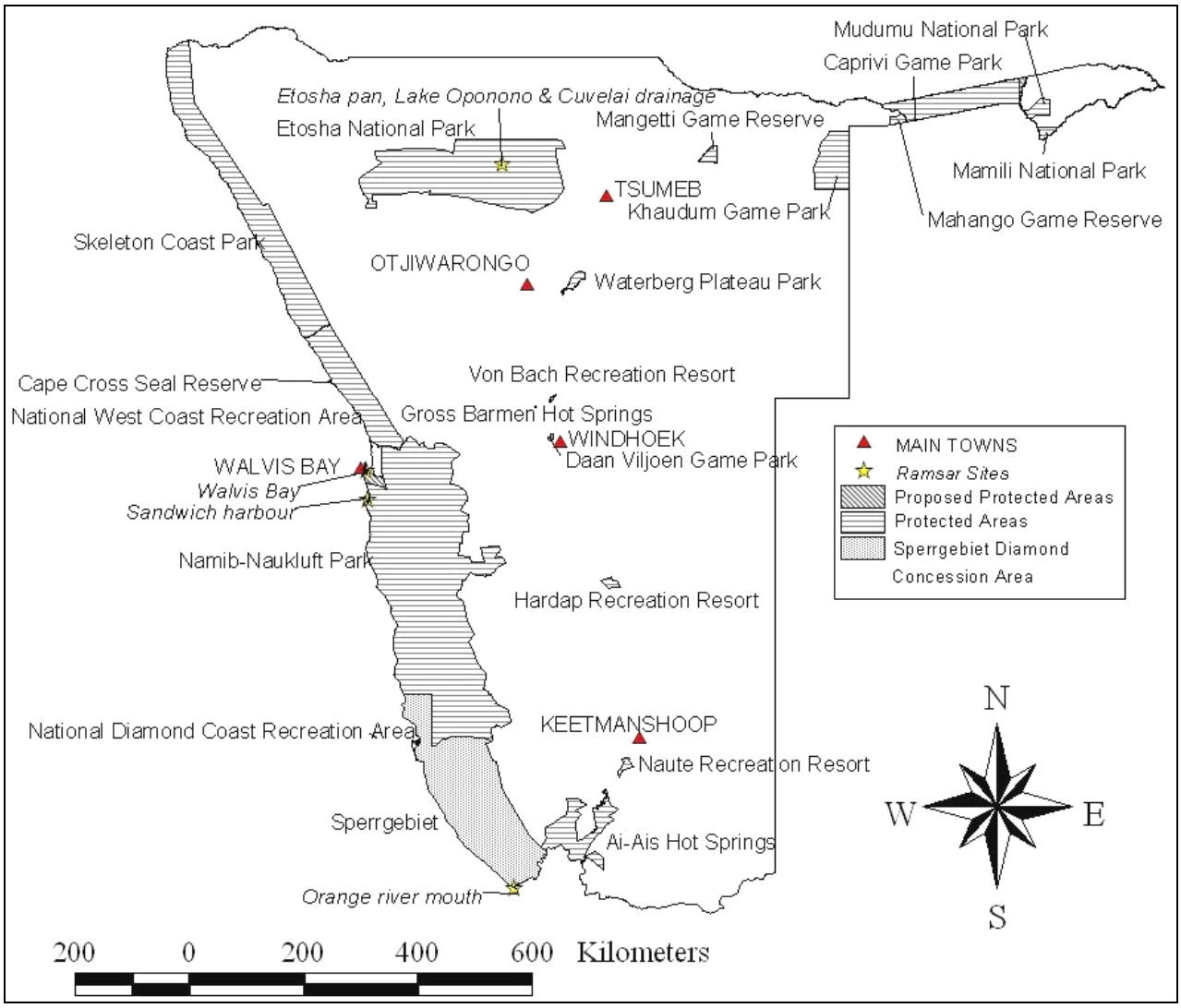


Figure 1.1 Conservation areas of Namibia

The levels of conservation along the coast vary, with angling and other tourism ventures being freely practised from Sandwich Harbour to Terrace Bay in the Skeleton Coast. Truly unspoilt areas can only be found in the Skeleton Coast Park today, as coastal areas in the Sperrgebiet have been exploited and altered in the past by mining activities.

Mining and tourism continue to be active landuses in Namibian parks, which have until recently not found themselves having to share the same areas. As this changes and becomes more prevalent, it is also necessary for the laws of the country to change and adapt. In Namibia, the main pieces of environmental legislation all predate Independence (1994), and in most cases date back long before then. Legislation is outdated and not stringent enough to ensure sustainable practises.

1.2 THE RESEARCH PROBLEM

Presently the Ministry of Environment and Tourism is working in an ad hoc manner regarding mining activities in Parks. Specific guidelines need to be created to improve the management of valuable resources. Thorough research needs to be conducted, as little background data is available before such guidelines can be drafted.
Namibia's parks, especially the Skeleton Coast Park (SCP), have until recently constituted largely pristine landscapes, most of which were used exclusively for tourism.

In 1998, parks were opened for prospecting activities, and at this time a white paper for Mining and Prospecting in Parks and Monument Areas was drafted. This document however has not yet been promulgated by Cabinet.

This White Paper is already outdated and does not offer strict enough guidelines for the regulators to implement. The Namibian Directorate of Environmental Affairs recognises the shortcomings of the document and indicated a review of the White Paper was needed to ensure better control of prospecting and mining activities in Parks and Monument Areas.

Prospecting for minerals such as diamonds occurs by bulk sampling, where at least five tons of earth is screened per hour. Massive trenches up to 400m long, 10m deep and 3m wide remain as the scars if rehabilitation is not undertaken. Aesthetic rehabilitation is very difficult due to the nature of the landscape, and hence the potential for the future use for tourism is hampered.

The current situation is that only mining for minerals, that constitute a national interest are allowed in Parks of Namibia. The lack of guidelines that specify the conditions under which prospecting

may occur and those where it may not, is problematic. Decisions regarding whether clearance is given or not is at present an ad hoc process, and consistent decision making guidelines need to be established. Disregard for the environment shown by prospectors and mining companies in the past has resulted in significant environmental impacts and often in unrehabilitated mines. A recent example is the Namib Lead Mine in the National West Coast Recreation Area, which was abandoned and three years later the Ministry of Environment and Tourism (MET) together with the MME, had to oversee an operation of removing toxic chemicals as well as securing the premises. Rehabilitation of the site will be extremely costly and not feasible for the Ministries. Legislation should pre-empt such situations to ensure that they do not occur in the future.

A century of mining with little or no planning to reduce environmental damage has impacted heavily on large areas in Namibia, especially the Namib Desert. There are currently approximately 40 abandoned, unrehabilitated mines in Namibia, of which 16 are in nature reserves. In some cases, these remnants can be exploited as tourist attractions (e.g. Kolmanskop), but in others (e.g. Skeleton Coast Park), they present significant obstacles to other, more sustainable forms of land use. At least one abandoned mine (Oamites) has resulted in health problems for nearby residents (Tarr 1999).

Prospecting has now been authorised along the entire SCP coast line, though not all prospecting companies have actually done any physical prospecting work. Should at some stage all companies be active on the ground at the same time, what would the cumulative impact of this be on the park? What would the impact be on the fauna and avifauna, where would they be forced to go?

1.3 RESEARCH AIM AND OBJECTIVES

The aims of this research are to illustrate the gaps and shortcomings in the current legislative framework regarding environmental law, specifically mining in parks of Namibia. Further, the research aimed to investigate the current practise of mining and prospecting activities in national parks of Namibia and the requirements for future sustainable land uses, as well as to provide management guidelines for mining in the parks of Namibia.

The objectives of this report are as follows:

- Gather baseline environmental information on issues relevant to mining activities, such as ambient noise levels, species lists (including red data species) and climate for the Skeleton Coast Park as a representative park for Namibia.

- Create and analyse a spatial database for the occurrence and type of current prospecting and mining activities in the Skeleton Coast Park.
- Analyse and document techniques currently practiced for prospecting and mining, as well as the alternatives that could have been considered.
- Identify shortcomings in the stipulations and policy guidelines.
- Recommend changes to the legislation and possible alternatives to current prospecting and mining activities.

1.4 DATA SOURCES

GIS data is available from the MME as well as the Directorate of Environmental Affairs (DEA). MME has the spatial data for all Exclusive Prospecting Licenses (EPLs) as well as Mining Claims and Mining Licenses. These data includes shape files, which are linked to a database in Microsoft Access. The database has all relevant information concerning who, where and what is prospected or mined. Available secondary literature, including information on policies in other countries regarding mining and prospecting in parks, were analysed in order to identify previously used methods in successful management of parks. Other secondary materials include Environmental Impact Assessments (EIAs) done in the area by mining companies.

Spatial data sources include the Surveyor General's office as well as the databases of the Information and Communications Unit of the DEA. This directorate has relevant GIS data compatible with Arcview, the platform that is utilized. Use was also made of aerial photography, where appropriate, available from the Office of the Surveyor General.

The Geological Survey of Namibia was contacted regarding geological and economic data on previous findings and workings. Review of all available data at libraries and institutes in Namibia was also done, to ensure a comprehensive review of records. Generic sources on environmental management and policy regarding impact management from mining in other countries and development realms that may inform processes and solutions in Namibia were researched.

Access was granted to the researcher to review all data at the DEA. All Environmental Impact Assessments and Environmental Management Plans submitted to the DEA were reviewed and relevant data was analysed. All other prospecting reports submitted by prospecting companies were utilised; however most information regarding the prospecting results is not made public and hence access could not be obtained. Reports submitted to the DEA by the companies included

environmental questionnaires, screening questionnaires and bi-annual reports, all of which were reviewed.

1.5 RESEARCH METHODOLOGY

The research was undertaken initially as a desktop study, with plenty of time spent gathering background data. This data needed to be verified and supplemented with field surveys and further secondary sources. In the process of gathering the various sources of data and conducting the fieldwork, many problems were encountered as illustrated in Section 1.5.2. Obtaining relevant data often proved a challenge.

1.5.1 Field survey and secondary sources

Surveys in the study area, the SCP, had to be undertaken in a four wheel drive vehicle, due to the rough terrain encountered in the park. All necessary supplies needed to be taken into the Park as no firewood, water or fuel is readily available. Due to the remoteness of the study area, only three survey trips were conducted. The harshness of the area and its remoteness played a role in the few surveys.

On the three surveys to the Skeleton Coast Park, all current EPL Areas were inspected in order to gather first-hand survey information on operational impacts on the environment. The findings were recorded using aspect photographs, GPS location readings and by taking notes of interviews. Data was collected on the biophysical environment in the study area.

Interviews were conducted with the concession holders in the area, the three park wardens and the prospecting companies currently active in the park. A literature survey on the potential effects due to prospecting activities was conducted.

All companies had already filled in an environmental questionnaire (see Appendix A); these were used for analysis. Mining companies that apply to operate in Parks need to conduct an EIA and the information available in those EIAs was closely reviewed.

All published and unpublished secondary data available, for example that relating to fauna, avifauna and flora in the study area were reviewed. Also reviewed were data on earlier prospecting activities in the parks.

All legislation that has bearing on the environment in Namibia was analysed. A complete list of all environmental legislation in Namibia was compiled through meticulous archival research and review of the Government Gazette; this also included personal communication with legal drafters, government staff and those involved in the compiling of the draft legislation.

1.5.2 Problems encountered with data surveys

Due to the extremely harsh conditions and the lack of people once north of the research station Möwe Bay, travelling alone is not recommended. During the first survey in May 2002, on route to the Kunene mouth, between the two vehicles four tyres were lost to punctures and blow-outs. After loosing too much time on changing tyres, the opportunity to travel during low tide on the beach was lost, and the journey was continued on the dunes. The constant dune riding, resulted in the one vehicle losing its clutch. Just beyond Rocky Point it was decided that it would be safer to return to Möwe Bay.

On the second survey in February 2003, several punctures were again incurred. On this survey a convoy of four vehicles was en route to the Kunene mouth. Due to the extra tyres, water and wood taken, the vehicle was heavily laden, including the roof rack. Driving along the beach, trying to cover as far a distance as possible during low tide, the roof rack came crashing off, as it was too heavily loaded. Leaving several items behind and marking them on the GPS, the convoy continued.

On the third survey two punctures were again endured, and problems were encountered in trying to organise the park warden to accompany the survey. The logistical arrangements for ensuring that all is in place with remote areas, such as the parks in Namibia are difficult. Until recently no phone lines were available, and when trying to make use of them this time, they were out of order.

1.5.3 Data relevance

Some data were easy to get hold of, such as the shape files for current mining locations. Information regarding historical prospecting and mining in the Skeleton Coast was harder to get hold of as these are currently being digitised and were taken out of the archive. It was possible for the researcher to obtain certain information but it is not certain if everything was obtained and reviewed.

It was difficult to obtain information from the prospecting companies as they did not want to begin dialogue or continue any dialogue concerning environmental matters. In most cases no response was obtained from requests for further information from the companies. A further problem was

locating copies of still relevant pieces of legislation in Namibia. Certain Acts such as the Nature Conservation Ordinance is no longer kept by the Gazette, yet if a copy is required it can be obtained from the National Archives. Several pieces of legislation, even though still valid in Namibia and not repealed, could only be located at the National Archives, who took several weeks to locate them upon request.

1.6 THE CASE STUDY APPROACH

Parks in Namibia have been a popular destination for tourists from all over the world for a long period of time. Impacts from tourism especially in remote areas, which could be seen to be pristine or virgin land, can be high and extensive. Parks such as the |Ai-|Ais Hot Springs Game Reserve, which has recently seen a dramatic increase in prospecting and mining, already has a high number of visitors to the park. In the |Ai-|Ais Hot Springs Game Reserve, other impacts also need to be factored in when trying to establish the impact of mining within the park, which would include tourism, farming, commuters and poaching. It would be difficult to establish the real impact of mining and prospecting, as the park is already being impacted upon. The same principles can be applied to many other parks in Namibia that have seen an increase in mining and prospecting, such as the Namib Naukluft National Park.

The rationale for selecting the Skeleton Coast Park as a case study was that, while tourism is allowed in the Park, it is confined to the mid to southern areas. Prospecting has been granted to take place in areas where no-one has been allowed, besides researchers and Park Wardens. Prospecting has started in areas which have, until recently, been able to recover from previous intrusive actions. No other activities could be blamed for impacts and direct effects can therefore be observed.

The principles that would regulate the mining and prospecting sector in the SCP would be the same in any park in Namibia. It is the researcher's opinion that if prospectors in the SCP could be monitored effectively, then it should be possible in any other park.

1.7 RESEARCH DESIGN

Prospecting and mining in Namibia is analysed, followed by a description of the environmental impacts that mining operations can cause. This discussion is followed by the legal framework under which these mining and prospecting companies would be liable, were they operational in parks. This is in the general and national sense. Offset in between these chapters are chapters specific to

the case study on the environment specific to the Skeleton Coast Park, and prospecting and mining specific to that park.

The research design shown below in Figure 1.2 illustrates the two separate scales that this report

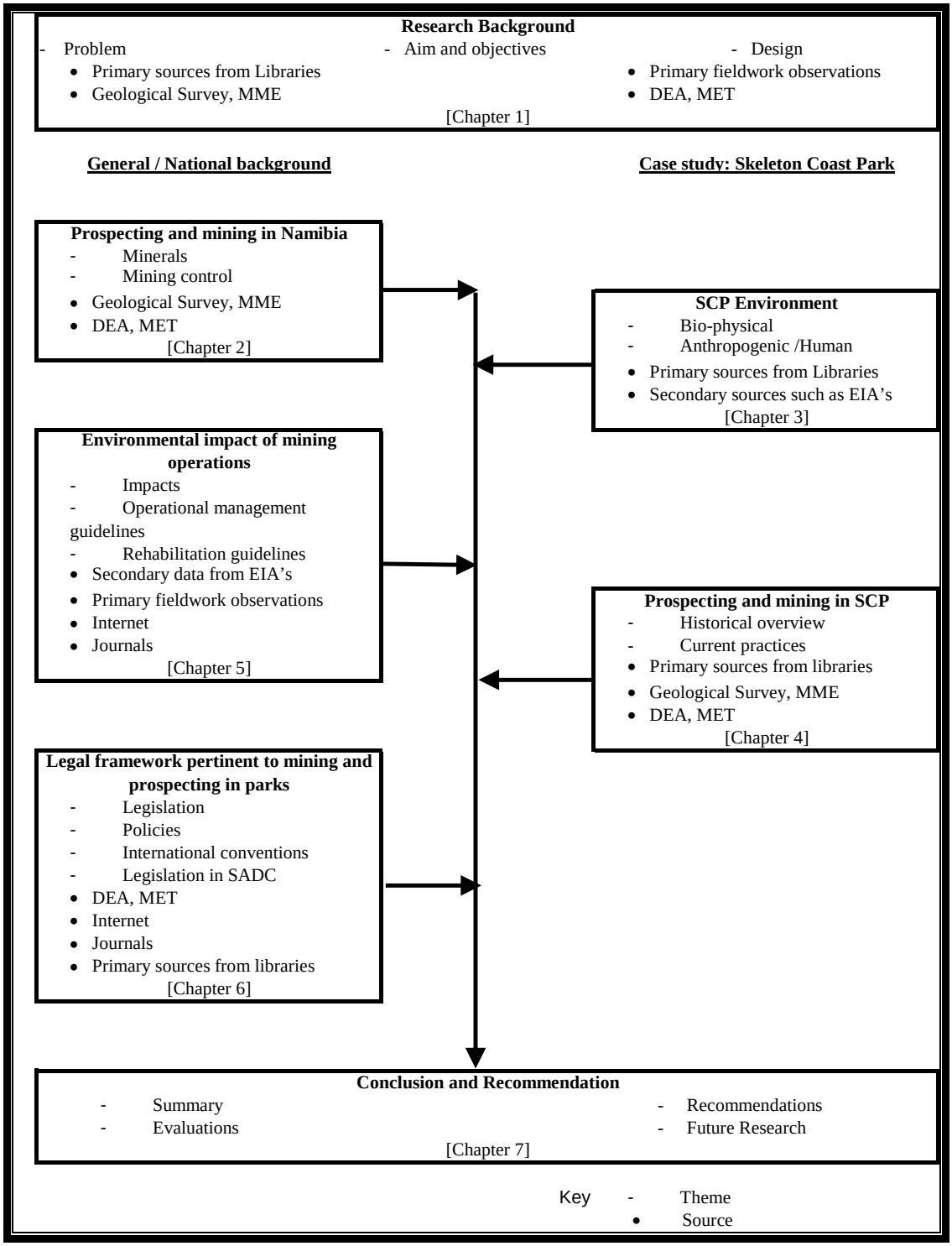


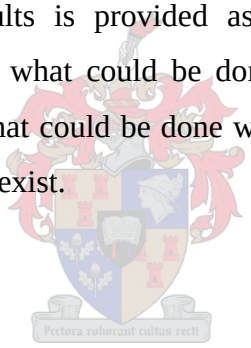
Figure 1.2 Research design

addresses. The report addresses mining and prospecting in the national and general sense, whilst also more specifically looking at it in a case study, the Skeleton Coast Park.

The design indicates the systematic progress from an introduction or background chapter, which provides the background and basis for the research, culminating in the conclusion and the recommendations. As the arrows indicate, the general chapters on generic mining practice impact and legislation, combined with the analytical results from the real-world case study lead to the conclusion and recommendations in the final chapter.

1.8 REPORT STRUCTURE

The report is structured to allow the reader to move from mining and prospecting, the general background (Chapter 2), to the specific environment (Chapter 3), and then to the blend between the two in the resultant environmental impacts that may occur (Chapter 5). Detail regarding the SCP and the prospecting and mining taking place there currently and in the past is provided in Chapter 4. Once the reader has become familiar with mining and prospecting and the environment it is taking place in, the Namibian legislative environment is described and analysed in Chapter 6. Lastly in Chapter 7, an evaluation of the results is provided as well as a summary of conclusions. Recommendations are given regarding what could be done to better manage the environmental impact of the mining operations and what could be done with respect to gaps and shortcomings in environmental legislation that currently exist.



CHAPTER 2 THE PROSPECTING AND MINING INDUSTRY IN NAMIBIA

Mineral exploitation in Namibia is an important industry, which is both a large employer as well as a significant contributor to the national economy. Namibia is diversified as to the minerals that are being mined. The Government of Namibia is the regulatory agency for all minerals being exploited, as the mineral rights are vested with the State. Various options for exploration or mining exist in Namibia and several application routes need to be followed in order to comply with the law.

2.1 MINERAL EXPLOITATION IN NAMIBIA

Namibia's mining sector is the fifth largest in Africa after South Africa, Ghana, Tanzania, Zimbabwe and Zambia. Namibia's minerals contribute about 15% of national GDP, the sector is the main contributor to Namibia's Gross Domestic Product and mining products produce up to 50% of Namibia's annual export earnings. The mining industry employs approximately 10,000 people directly (MTI 2003; Mbendi 2003).

Although the mining industry plays a vital role in Namibia's economy, the sector has experienced a decline in growth over the past few years. This has mainly been as a result of several mining ventures closing down due to diminishing ore reserves and low commodity prices (Mbendi 2003).

Besides investment in the exploration for and exploitation of resources, investment opportunities also exist in mineral processing and manufacturing operations.

2.2 THE MINERALS

A number of minerals are mined in Namibia, including arsenic tri-oxide, diamonds, cadmium, copper, gold, lead, silver, pyrite, zinc, tin, quartz, lithium, fluorspar, salt, uranium, semi-precious stones, and industrial minerals (Namibian Foundation 1998). This section summarises the occurrences and location of these minerals.

2.2.1 Mining activity locations

All the major mines as well as the mineral that is being exploited and the mining companies are outlined in Table 2.1. Figure 2.1 shows the location of the mines highlighted in Table 2.1, and also indicates the parks and protected areas in Namibia.

Table 2.1 The main mines in Namibia, their locations and minerals mined

Location	Mineral	Owner
Oranjemund Auchas Elizabeth Bay	Diamonds	Namdeb Diamond Corporation (Pty) Ltd
Rössing Mine	Uranium oxide	Rössing Uranium Ltd
Tsumeb Mine Otjihase Kombat	Blister copper	Ongopolo Mining and Processing (Pty) Ltd
Navachab	Gold	Anglo American
Rosh Pinah Mine	Zinc and lead concentrate	Imcor Tin (Pty) Ltd
Skorpion Zinc	Zinc	Anglo American
Okorusu Mine	Fluorspar concentrate	Okorusu Fluorspar Ltd
Otjosondu Mine	Manganese	Purity Manganese Cranford
Offshore diamond mining	Diamonds	Ocean Diamond Mining Holdings Ltd
Offshore diamond mining	Diamonds	Namibian Minerals Corp.
Salt mines at Cape Cross	Coarse salt	Salt and Chemicals (Pty) Ltd
Salt mines at Walvis Bay	Coarse and refined salt	Salt Company (Pty) Ltd

The main minerals mined are uranium, zinc, copper, diamonds, gold and salt. The larger mines are dispersed throughout Namibia. The only accumulation of mines is in the diamond sector, most of which are found in the south of the country, along the coast. Fortunately the largest operations are located outside of the parks.

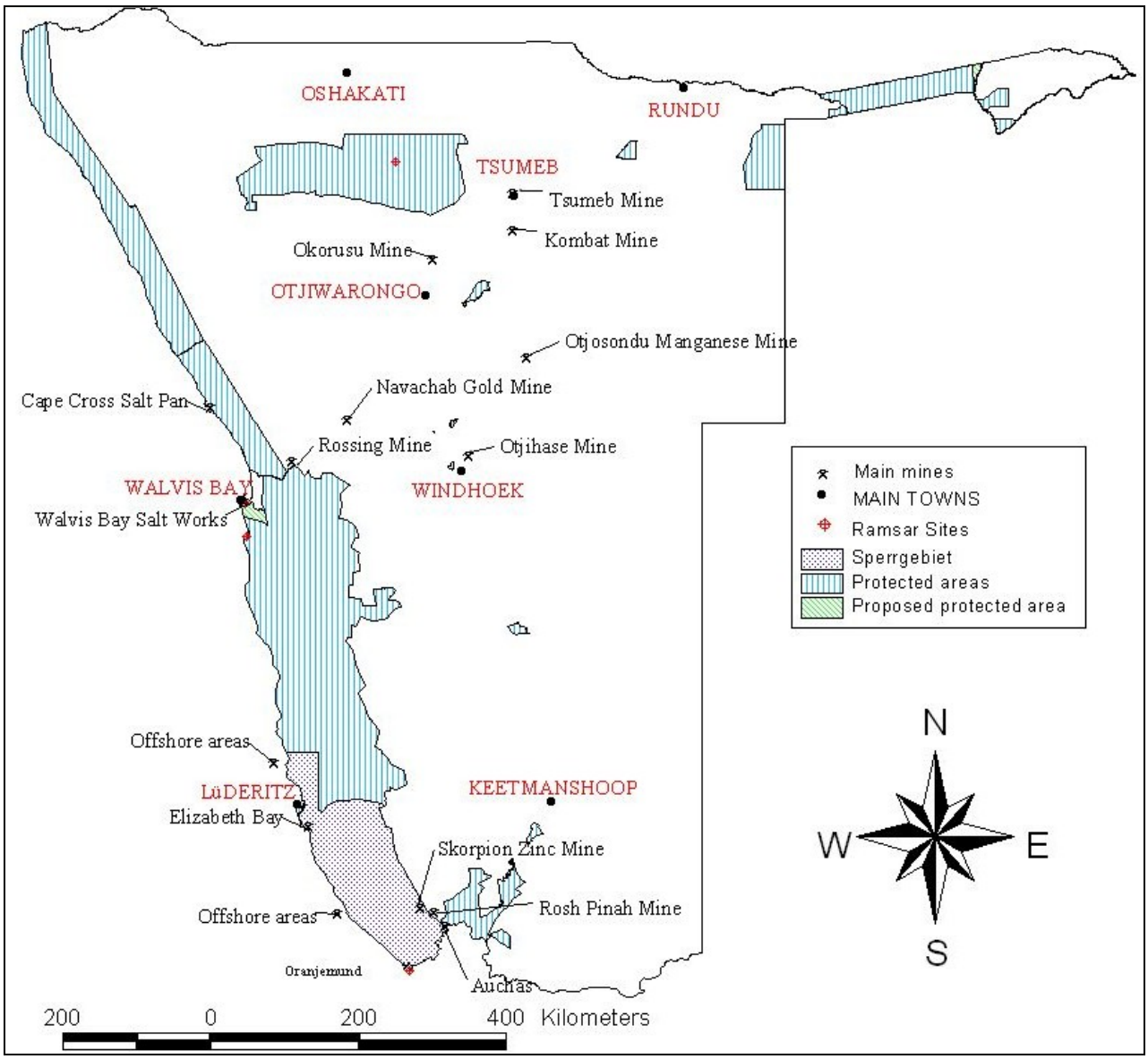


Figure 2.1 Main mines and protected areas in Namibia

2.2.2 Diamonds

Namibia hosts alluvial deposits of some of the finest gemstone-quality diamonds in the world. Diamond mining dates the accidental discovery of a diamond by a railway worker at Kolmanskop station near Lüderitz in 1908; this was followed by a diamond rush. By 1913 the Namibian diamond fields accounted for 20% of world production (Namibian Foundation 1998).

In 1920, the various companies holding numerous claims were amalgamated by De Beers into Consolidated Diamond Mines (CDM), a company which was to form the mainstay of the Namibian diamond industry for many years. In 1994, CDM entered into a joint venture with the Namibian Government to form Namdeb Diamond Corporation Ltd (Namibian Foundation 1998).

Namibia's diamonds are of high quality and sought after as Figure 2.2 illustrates. They have good crystal shapes with curved faces; octahedral, macles and dodecahedra are common. They show very little abrasion. The percentage of industrial stones is very low and more than 95% of all stones are of gem quality (Schneider & Miller 1992).

Figure 2.2 Rough uncut Namibian diamonds

Today, diamonds are mined most lucratively in the Sperrgebiet area around Oranjemund by Namdeb. However the search for the precious jewel takes prospectors up the Orange River and into the Skeleton Coast. The only other extremely productive source of diamonds has been offshore and Namibia is the world leader in marine diamond production (Mendelsohn et al 2002).

2.2.3 Uranium

Uranium is mined near the coast at Arandis in the Namib by Rössing Uranium Ltd., currently the second largest low-grade uranium mine in the world (Nambia Foundation 1998). Production at the mine dropped considerably after independence as a result of international decline in nuclear power demands and the availability of stocks from former communist countries. Currently the Rössing mine is the only one actively mining uranium, but a mining license for a new mine (Langer Heinrich – owned by Paladin Resources) some 80km from Swakopmund, also in the Namib, was granted on 11 August 2005.

2.2.4 Base metals

Zinc is mined in the south near Rosh Pinah by Skorpion Zinc (owned by Anglo American). Also at Rosh Pinah is the Rosh Pinah mine operated by Imcor Tin (Pty) Ltd which produces zinc and lead. One of the most interesting and diverse ore bodies to have been discovered lies at Tsumeb, where originally this ore body was exploited for many minerals such as copper, lead, and silver. Today however Ongopolo Mining and Processing only mine copper from this ore body.

2.2.5 Precious metals

Gold is mined at Karibib by Navachab, another Anglo American project. Many prospecting licenses have been granted to companies seeking other gold reserves that could be viable for exploration.

2.2.6 Industrial minerals

Namibia produces a wide variety of industrial minerals including marble, granite, and fluorspar, but these only contribute a small part of overall mining output. Fluorspar from the Okorusu mine is exported to Europe. Marble is predominately mined around Karibib, by Marmorwerke and Rhino White Marble. Granite is mined mainly around the Spitzkoppe by African Granite (Pty) Ltd, around Walvis Bay by Damara Granite (Pty) Ltd and Marlin Granite Namibia (Pty) Ltd, and near Swakopmund by Stone Africa (Pty) Ltd (Namibia Foundation 1998). The aforementioned mines are the larger ones, but smaller dimension stone operations, as well as prospecting operation exist, which, in principle differ little from mining.

For a long time Namibia has been an exporter of marble and granite to Europe and the Far East. Initially only one company, Marmorwerke, in Karibib produced value added finished dimension stone products. They mainly polish dimension stone into slabs and tiles. Recently a second manufacturer opened up in Omaruru, also dealing in the polishing of mainly slabs and tiles.

2.2.7 Salt

Salt is mined along the coast between Walvis Bay and the Ugab River, with the major mines being at Walvis Bay. The salt pans lie below the low water mark and are naturally refilled with salt water from the ocean. Once the water has evaporated, the salt that remains is then mined out, at which point the pans are refilled with water and the process begins again.

2.3 MINING CONTROL

The Government has an active role to play in the regulation and control of all mineral exploitation in Namibia. In its effort to regulate the exploration of minerals, a variety of licences need to be issued by government in order to comply with national laws and regulations.

2.3.1 The role of government

The Government of Namibia, through the MME, is the sole regulatory agency for exploration and mining in the country. All mineral rights are vested in the State, so that prospecting and mining may only be undertaken under a license issued by the Mining Commissioner.

The Government has no legal powers to acquire an interest in a mining property or other mineral operations against the wishes of the owner, and can only participate at the request of the company concerned. Ownership rights held by both domestic and foreign companies are protected against expropriation by the Namibian constitution (Forrest, Jones & Walker 1997).

While the State holds all mineral rights in Namibia, vast tracts of land are owned privately. There are three major categories of landowners: central government (which owns 56% of the land surface area), local authorities (which own 1%), and private individuals or companies (who own the remaining 43%) (Mendelsohn et al 2002). Thus, exploration and mining on privately held land requires permission of access from the owner. The Namibian Chamber of Mines has drawn up a model agreement for companies and landowners to assist in negotiations. An Ancillary Rights Commission within the MME has also been established under the Minerals Act, to provide arbitration in disputes.

Modest annual licence fees do not present a barrier to exploration and mining. Fees range from N$50 for mining claims to N$1,000 for an exclusive prospecting license covering an area of 100km^2. Mining license fees range from N$1,000 for a mine with a gross annual revenue of less than N$10 million, to N$5,000 for those with a gross revenue exceeding N$10 million.

2.3.2 Mining claims

A Mining Claim (MC) application is intended for small-scale miners, where the average size of a claim is 600m by 300m. Claims are available only to Namibian citizens for the development of small-scale mines and mineral deposits, and are valid for three years. Two-year extension periods

are possible providing that the claim is being developed or worked. A maximum of ten claims can be held at any one time by any individual or company. The claims must be registered within 21 days from the date of pegging.

2.3.3 Reconnaissance licences

Reconnaissance Licences (RL) are designed for regional, mainly remotely sensed exploration, and is valid for six months on a non-renewable basis. This licence facilitates the identification of exploration targets and is only exclusive in special areas.

2.3.4 Exclusive prospecting licences

Exclusive Prospecting Licences (EPL) are three-year licences which allow systematic prospecting in areas of up to 1,000km^2. An EPL gives exclusive exploration rights to the land and may be extended twice for two-year periods if demonstrable progress is shown. Renewals beyond seven years require special approval from the Minister. Each time an extension is granted, the area of the EPL must be progressively decreased, starting with 25% of the original area on the first renewal to 50% of the remaining license area on the second renewal. At all times an environmental clearance is required prior to granting of an EPL by the MME. However, the conditions under which the clearance will be granted depend on various factors, determined by a screening procees by where the prospector completes an environmental questionnaire, unless the prospector intends operating in a protected area, when a full EIA and EMP will be required at all times.

2.3.5 Mining licences

Mining Licences (ML) give the holder the exclusive mining rights in the license area for a period of 25 years or the life of the mine, with renewals valid for 15-year periods. The holder is required to demonstrate the financial and technical ability to develop and operate a mine. A ML also gives the holder the exclusive right to approve the development of other mines on the same property. There is no limit to the size of the area but the Minister will only grant a ML over the area in which a mineable ore reserve has been proven.

2.3.6 Mineral deposit retention licences

Mineral Deposit Retention Licences (MDRL) allow an exploration company, in certain circumstances, to retain tenure on a prospecting licence, mining licence or mining claim without

mining obligations. It is valid for five years, with two-year renewal periods. The license holder must, however, meet work and expenditure obligations and submit regular project reviews.

Against this institutionalised background enabling resource exploitation in general but also in parks, the SCP environment in natural and human settlement terms needs to be contemplated. This is the environment potentially exposed to the impacts of mineral extraction and general human exploitation.

CHAPTER 3 THE SKELETON COAST PARK ENVIRONMENT

The Skeleton Coast comprises an area of approximately 17,400 km^2 in the northern Namib Desert, extending from the Kunene River in the north to the Ugab River in the south. The creation of the Skeleton Coast Park dates back to 1963 when, primarily for political reasons, the narrow tract of coastal desert, 500 kilometres long and 30 to 40 kilometres wide, was set aside as a future nature reserve (Schoeman 1988). In 1973 it was proclaimed as a park, with the northern section of the Park designated to be managed as a wilderness reserve. This chapter aims to illustrate the uniqueness and sensitivity of the fauna and flora that is evident in the Park, as well as the present state of relatively undisturbed natural landscapes. It is also the intention of the chapter to illustrate the environmental footprint in the SCP resulting from human settlements and activities, past and present. Figure 3.1

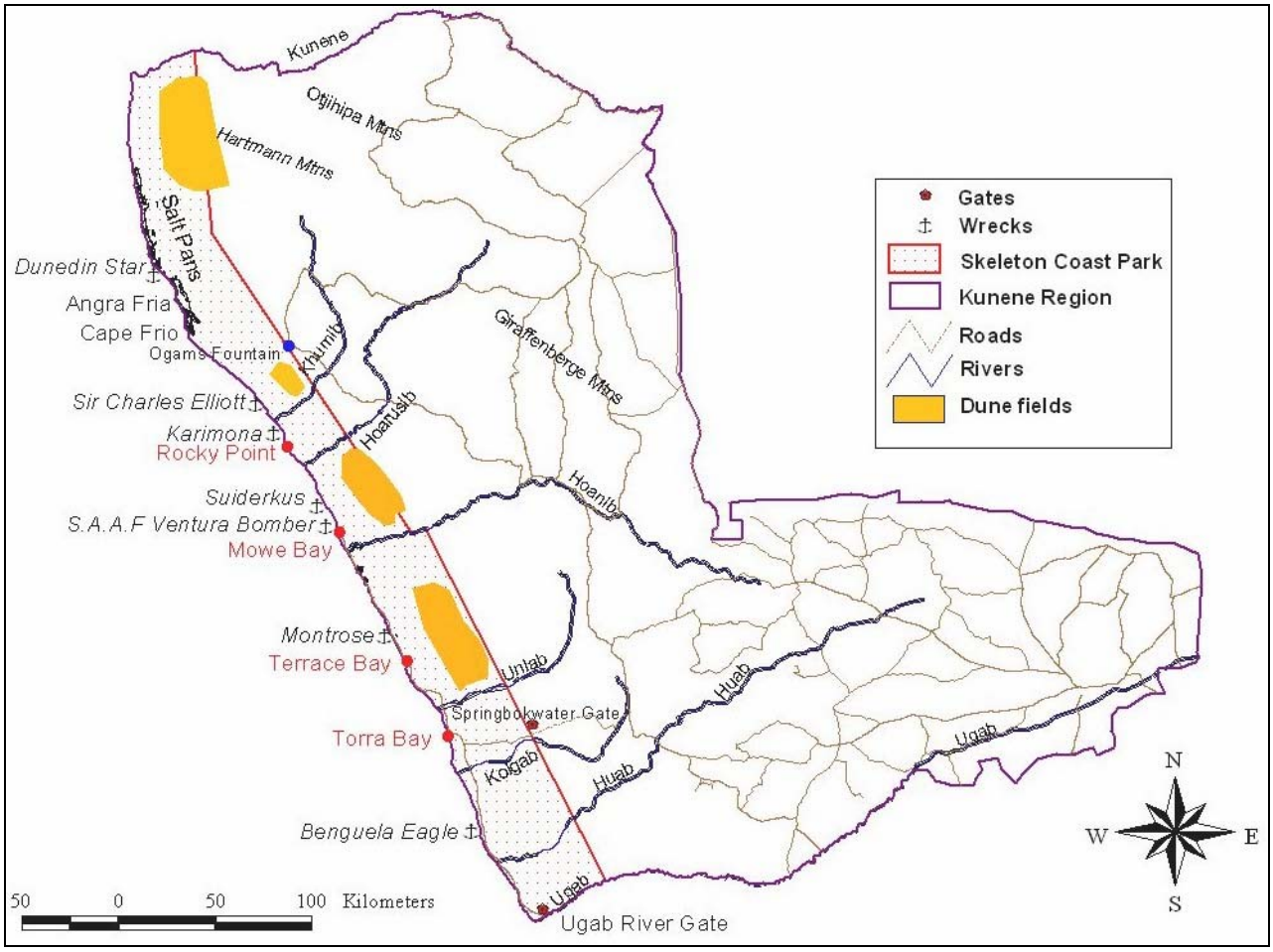


Figure 3.1 Physiography of the SCP

gives a representation of the SCP as a narrow belt along the coast of the Kunene Region, and indicates the rivers, ship wrecks, bays and settlements, as well as access gates. It provides the spatial setting for much of the chapter.

This chapter aims to describe both the biosphysical and human activity footprint in this highly sensitive and vulnerable setting. It does so in two separate, yet complementary main sections.

3.1 BIOPHYSICAL ENVIRONMENT

The description of the biological diversity of the SCP given in this section initially focuses on features and systems that influence the living environment, such as the morphology, climate and drainage patterns. Finally the fauna and flora in the SCP are placed in context.

3.1.1 Morphology

The geological foundation of the area provided the structure upon which climate acted to build unique landscapes and drainage patterns. These themes are developed in the rest of Section 3.1.1.

3.1.1.1 Topography and landscape

Relief near the coast is generally low, the result of planation by repeated transgression of the sea up to ten kilometres inland and windblown sand erosion. Low hills (± 100m high) and fault-controlled ridge systems of Damaran and Karoo rocks have survived this levelling process, acting in turn as obstacles to aeolian transport. Localised extensive dune systems with heights of up to 50 meters have developed. Wind deflation in flatter, more open terrain results in denudation of surficial material leaving flat expanses of pebbles and cobbles (Hutton & Palfi 2003).

Saltpans occur sporadically all the way up the coast. The larger ones are at Cape Cross and Cape Frio, where an extensive brine-pan complex covers an area almost 90 kilometres long (Loutit 1988).

Dunes are a living and integral part of the Skeleton Coast. A captivating formation is the barchan, a crescent-shaped dune that forms where sand is relatively scarce. Built by the strong southwest winds, barchans move in a north-easterly direction at speeds varying from two to three metres a year, covering and uncovering whatever lies in their path.

Sand Dunes developed from the transport of beach sands inland and saltpans evolved in fault-related depressions near enough the sea, inter-connected by aquifer systems. Sand seas, thought to

date to the establishment of the Benguela System were generated by the onshore transport of sand from the beaches inland by wind (Hutton & Palfi, 2003).

3.1.1.2 Geological structure and history

The oldest rock types found at the Skeleton Coast are mica schist, gneiss and granite. These are part of the Damara sequence which was formed between 1,000 and 700 million years ago. Today the granites are clearly visible at Möwe Bay as a striking mosaic of grey granite, cut by grey dolerite dykes and pink feldspar gravels. Behind the dune belt, between the Khumib and the Hoarusib Rivers, large flat, blue–grey tables of gneiss emerge, veins with white quartz (depicted in Figure 3.2 below) or studded with pink feldspar, laying more or less level with the surface sometimes occur. Just south of the Hoanib River, low ridges of a reddish–brown gneiss appear and, running parallel to the coast, cut across the Hoanib and Khumib Rivers past Ogams Fountain and through to the Hartmann Valley (Schoeman 1988).

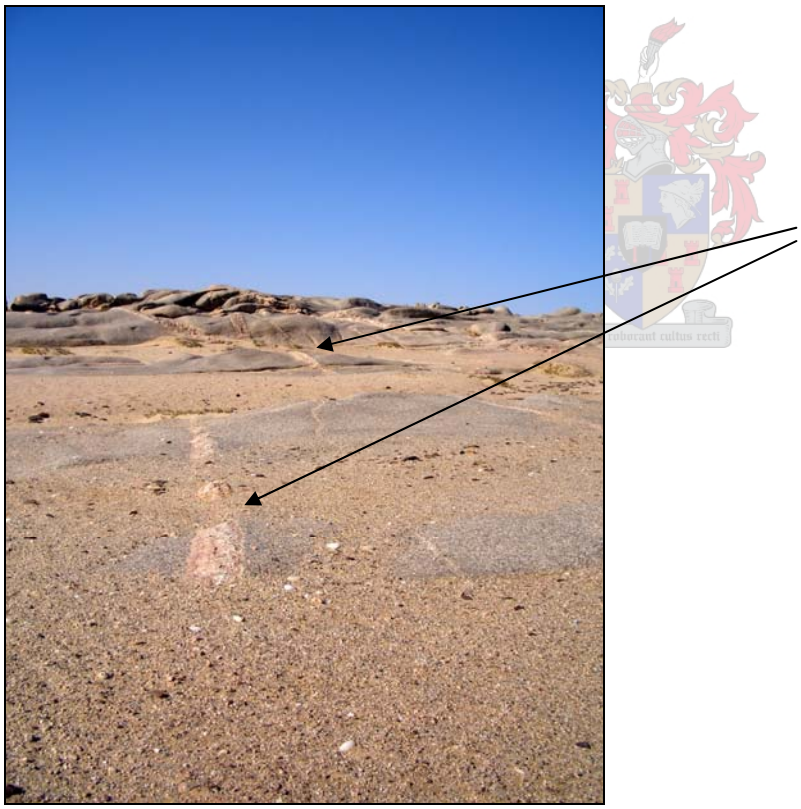


Figure 3.2 Gneiss with white quartz vein.

About 200 million years ago, during the early Jurassic period, the first layer of windblown sand was deposited. These early dunes hardened to form yellowish–brown sandstone which can be seen in the Huab Valley and around Cape Frio.

In younger Mesozoic times, about 120 to 170 million years ago, Gondwanaland began to break apart as the African and South American continents slowly drifted away from each other. During this rifting, deep fissures opened in the crust of the earth and vast quantities of lava were emitted, to spread over the Namib platform. These flood lavas or Karoo basalts are called the Etendeka lavas and can clearly be seen from the air. These lavas appear along the coast at Terrace Bay and again just north of Möwe Bay through Rocky Point up to Cape Frio. They run parallel to the coastline as low lying ridges, while further inland they form towering flat-topped mountains (Schoeman 1988).

3.1.1.3 The coast and beaches

Beaches and storm terraces tend to be sandy. However where beaches are bordered by lavas and basalts, they tend to be stony, while the storm terraces consist of oblong pebbles.

The dunes of the Skeleton Coast are the result of wind deposition of sand churned out onto the beaches by Atlantic waves and seized by the prevailing south and southwest winds. Where longitudinal dunes stretch parallel to the prevailing wind direction, transverse dunes lie across the path of the wind, like waves in an ocean, while oblique dunes are divergent or slanting in relation to the wind. Along the coast where the prevailing southwest wind is very strong the dunes are formed transversely.

3.1.2 Soils

Soils are very poorly developed to non-existent along the coast, owing to aridity, lack of biomass and the near constant scouring of wind. Plants and localised wind obstructions collect fine material around them into very primitive and deficient sandy soils. Better quality silt-soils are developed in drainages between flood events. The weathering of volcanic rocks provides minerals. Salt and mechanical sand weathering are the main source of the sediments. Deflation areas are marked by the development of armoured pebble surfaces. The abundance of gypsum, calcrete and salts blown inland from the sea has cemented sediments near the coast, with the extensive development of gypcrete and calcrete (Hutton & Palfi 2003).

3.1.3 Drainage patterns

As Fig 3.1 shows, the Uniab and Koigab are the shortest of the rivers which reach the Skeleton Coast of Namibia and only episodically come down in flood. As the crow flies the source of the Uniab River is 96km from the coast and that of the Koigab River is 97km. In contrast, the larger

rivers are the Huab (250km), the Ugab (365km), the Hoanib (175km), and the Hoarusib (180km) (Van Zyl & Scheepers 1992).

The Hoanib River only reaches the sea on very rare occasions recently it has been recorded in only 1982 and 1995. This river has an extensive floodplain. The Hoarusib River twists through narrow canyons and gorges in its upper regions. The Ugab River comes down in fairly regularly, reaching the sea every one or two years (Schoeman 1988).

The Uniab River does not produce a lagoon wetland at its mouth because it crosses higher coastal terrain and falls through a small canyon to the sea, but it does have several small permanent pools within five kilometres of the coast (Noli-Peard & Williams 1990).

The Kunene River forms an east–west linear oasis of permanent freshwater which crosses the Namib Desert to the sea. Sandbars developed from both northern and southern shores which narrow the mouth of the river, except during or just after large scale flood surges; however these do not close off the river flow to the sea. Nevertheless, at high tide the river is dammed back and forms a lagoon of up to two kilometres wide and one kilometre upstream. Tidal influence is felt up to four kilometres upstream (Braine 1990).

3.1.4 Climate

The Skeleton Coast as we know it today is very much the product of its climate. The dense coastal fogs and cold sea breezes, caused by the cold Benguela current and the hot, dry bergwinds from the interior, generate the arid desert biome climate (Schoeman 1988).

Concerning **temperature** the coast is cool throughout the year with mean annual winter and summer temperatures ranging between 18 - 25° C. However, on those days during the winter months bergwinds (from the east) occasionally blow to raise temperatures higher than those in summer. Figure 3.3 indicates the dusty ferocity with which these bergwinds do occur along the Skeleton Coast.

Figure 3.3 Bergwind conditions on the Skeleton Coast

The **wind** blows almost continuously as can be seen from the graph in Figure 3.4. The southwest wind blows an average of 300 days/annum at up to 60 km/h (Hutton & Palfi 2003) and peaks in the early summer months from October to December.

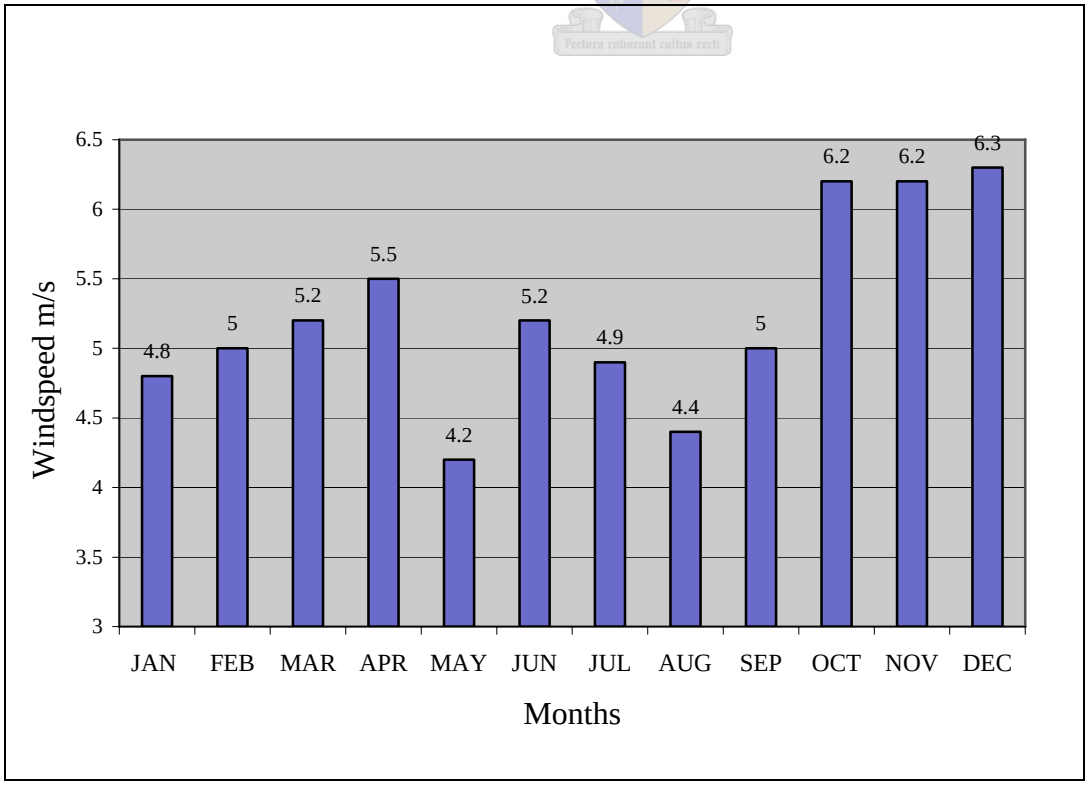


Figure 3.4 Average monthly surface windspeed at Möwe Bay (1987–1997)

A windrose from monthly averages for 1987 to 1997 was created to graphically represent (see figure 3.5) the prevailing wind direction. It shows the absolute dominance of the prevailing wind from a south and southwest in terms of both frequency and strength.

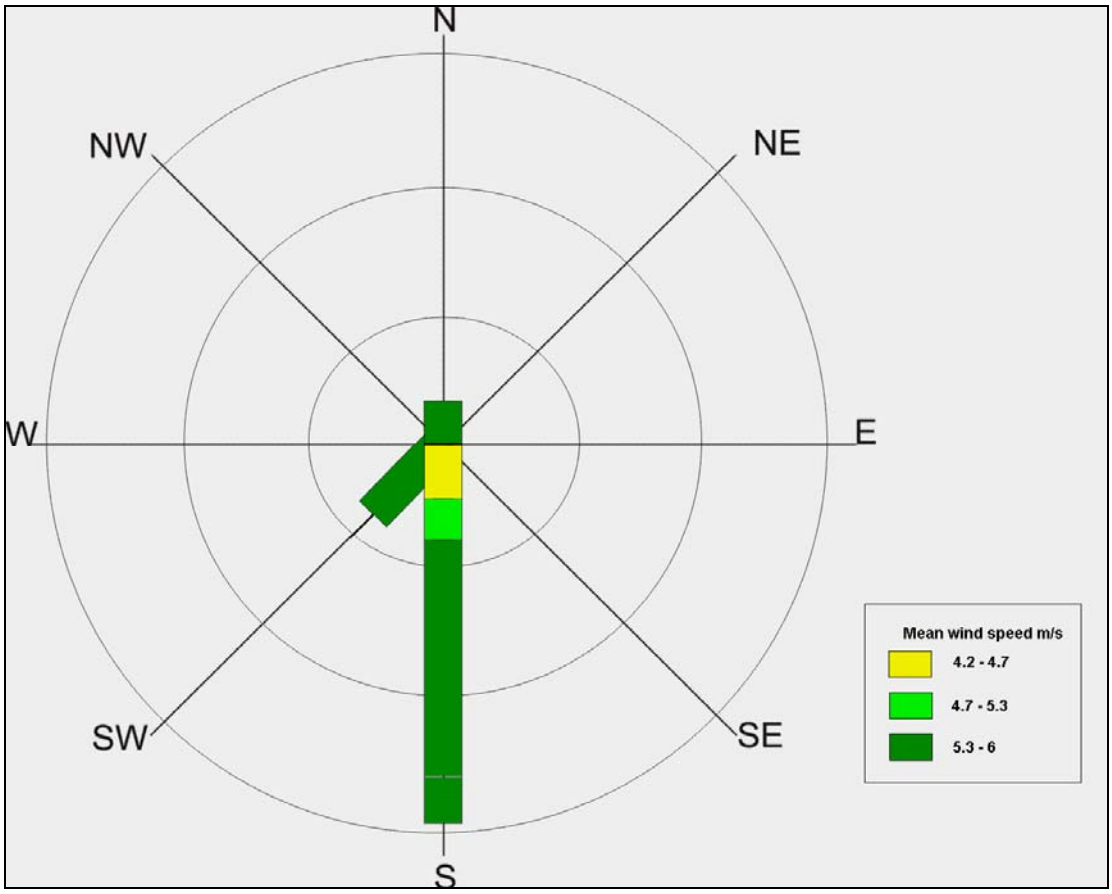


Figure 3.5 Prevailing wind direction at Möwe Bay (frequency windrose)

Concerning **rainfall** the SCP lies west of the 100mm isohyet, and hence experiences irregular precipitation at 5–20mm per annum (Mendelsohn et al 2002). Some precipitation is obtained nightly from the fog generated off the coast. According to the information obtained from the national weather bureau from 1995 to 2004, the **humidity** for most months was found to be >80%. During summer months humidity is slightly lower at ~75% (MWTC 2004).

3.1.5 Fauna

The fauna of the SCP has become specially adapted to the unique and severe physiographical characteristics of the area. Whilst some species are endangered or even on the Red Data Species list and for that reason are protected, all species in the park deserve full protection as they have managed to adapt to this extremely hostile environment. Mammals, reptiles and avifauna often get

all the attention as they are more visible, yet insects and fish deserve to be given as much attention in environmental management.

3.1.5.1 Mammals and reptiles

Despite the severe conditions, a wide range of uniquely adapted mammals roam the SCP. The brown hyena is an endangered species which enjoys total protection status here. Other species of big game which frequent the park are lion (*Panthera leo)*, black-backed jackal (*Canis mesomelas)*, brown hyaena (*Parahyaena brunnea*), giraffe (*Giraffa camelopardalis)*, mountain zebra (*Equus zebra)*, kudu (*Tragelaphus strepsiceros)*, gemsbok (*Oryx gazella)*, springbok (*Antidorcas marsupialis)* and the desert dwelling elephant (*Loxodonta africana)*. Another game animal, which is even more endangered, is the desert dwelling black rhinoceros (*Diceros bicornis)* (Loutit 1982).

Seals are found along the coast in the park, with the largest community at Cape Frio, which has up to 20,000 frequenting the site. The seals found in the park are Cape fur seals, *Arctocephalus pusillus*, the largest of the world's nine fur seals that breeds only along the west coast of southern Africa (Schoeman 1988).

A range of smaller reptiles like lizards, geckos and chameleons occur in the SCP, but the larger riverine species attract most attention. The linear oasis effect of the Kunene has enabled populations of Nile crocodiles (*Crocodylis niloticul*), Nile monitors (*Varanus niloticus*), and Nile soft-shelled terrapins (*Trionys triunguis*) to reach this coastal wetland which is also frequented by marine green turtles (*Cheonia mydas*) (Braine 1990). The aggregations of the Nile soft-shelled terrapins along the river are found at the southern limit of its range and nowhere else in Namibia. The river also hosts the largest concentration of marine green turtles in Namibia (Griffin & Channing 1991).

3.1.5.2 Avifauna

The SCP, despite its apparent bleak environment, hosts a rich and highly vulnerable bird population – sensitive to human interference. At this time, 314 species of birds have been identified in the SCP (see Appendix B for a list of all species). Of those, 21 are Red Data Species. Three of those species are critically endangered, eight are endangered and the remaining 10 are considered vulnerable according to their Red Data status (see Table 3.1 below).

Table 3.1 Red Data Species occurring in the Skeleton Coast Park.

Roberts' No	Species	Latin name	Red Data Status
3	Jackass Penguin	Spheniscus demersus	Critically endangered
6	Great Crested Grebe	Podiceps cristatus	Critically endangered
49	White Pelican	Pelecanus onocrotalus	Endangered
53	Cape Gannet	Morus capensis	Endangered
59	Crowned Cormorant	Phalacrocorax coronatus	Endangered
84	Black Stork	Ciconia nigra	Endangered
89	Marabou Stork	Leptoptilos crumeniferus	Vulnerable
93	Glossy Ibis	Plegadis falcinellus	Vulnerable
96	Greater Flamingo	Phoenicopterus ruber	Endangered
97	Lesser Flamingo	Phoeniconaias minor	Endangered
120	Egyptian Vulture	Neophron percnopterus	Critically endangered
132	Tawny Eagle	Aquila rapax	Vulnerable
140	Martial Eagle	Polemaetus bellicosus	Vulnerable
146	Bateleur	Terathopius ecaudatus	Endangered
148	African Fish Eagle	Haliaeetus vocifer	Vulnerable
244	African Black Oystercatcher	Haematopus moquini	Vulnerable
247	Chestnut Banded Plover	Charadrius pallidus	Vulnerable
316	Hartlaub's Gull	Larus hartlaubii	Vulnerable
322	Caspian Tern	Hydroprogne caspia	Vulnerable
324	Swift Tern	Sterna bergii	Vulnerable
334	Damara Tern	Sterna balaenarum	Endangered

At least 80 species of wetland birds have been recorded at the Kunene River mouth alone. The maximum count of intra-African migrants is 440 individuals and of Palearctic waders just over 2,000 individuals (Braine 1990). The most significant conservation feature of this wetland is the regular use of the area by Damara terns, a species which is listed in the African Red Data Book. The maximum numbers occurring in the wetland were 2,000 individuals of the same species (Noli-Peard & Williams 1990).

The Damara tern (*Sterna balaenarum)* is a rare, near-endemic breeder along the southwestern coast of Africa. Found predominately in Namibia, its world population was once believed to be 4,000. Population surveys in the northern Namib Desert have recently estimated that 12,000 adults exist (Simmons, Cordes & Braby 1998). The commonest habitat for the Damara tern is gravel plain. During surveys conducted by Simmons, Cordes and Braby in the SCP the following results were obtained; 29 nests found concurrently, of which 59% occurred on gravel plain. The second most common substrate, salt pan (22% by area) held only 3% of all nests. The third commonest substrate, rock (15% by area), held 17% of all nests. This was the only region in Namibia where terns were found nesting in rocky substrate, and in no areas were terns found on dune or hummock substrates (Simmons, Cordes & Braby 1998).

The terns are vulnerable to vehicular movements as they lay their well camouflaged eggs on the open gravel plains. Also it was found by Johnson (1979) that breeding terns did not recur in the same areas as they had prior to mining.

3.1.5.3 Fish

Common small pelagic fish off Namibia's northern coast include sardine (*Sardinops sagax*) (known as pilchard (*Sardinops ocellatus*) in Namibia), juvenile Cape horse mackerel (*Trachurus capensis)*, anchovy (*Engraulis capensis*), and Whitehead's round herring (*Etrumeus whiteheadi*). Less common elsewhere in Namibia's waters, yet regularly found in the waters south of the Angolan border are chub mackerel (*Scomber japinicus*) and sadinellas (*Sardinella aurita* and *S. maderensis*). All the above species generally occur within the 200m depth contour, and are often found very close inshore, just beyond the surf zone (Molloy & Reinikainen 2003).

Snoek (*Thyrsites atun*), silver kob (*Argyrosomus inodorus*), West Coast Steenbras (*Lithognathus aureti*), blacktail (*Diplodus sargus*), galjoen (*Coracinus capensis*) and dusky kob (*A. coronus*) are all important near-shore species, which are commonly targeted by anglers.

3.1.5.4 Insects

The SCP is home to several rare and endangered Red Data Species of insect. The gravel plains host numerous forms of insect life, including scorpions, beetles and numerous smaller insects specially adapted to the harsh desert habitat (Loutit, 1982). Black and white tenebrionid beetles collect

around dwarf shrubs. The species which have become adapted to this extreme biotope may be defined and referred to by the term ultra-psammophilous[1], for they no longer depend on active plant life, but live anywhere in the barren wastes of sand, without necessarily being attracted by plants, or gravitating towards any other central object (Koch 1965). These small beetles (Figure 3.6) and

Figure 3.6 Examples of tenebrionid beetles

fish moths, found throughout the Skeleton Coast, shelter under and feed on the wind blown detritus that collects on mounds, which are characteristic and can be seen around all low vegetation along the windy Skeleton Coast (Nature Conservation 1996). In such a barren, exposed environment all surface disturbance by human activity, especially that of mining, threaten insect life and habitat.

3.1.6 Flora

Subjected to extremes in temperature, strong winds and encroaching sands, plants here have ensured their survival by developing a wide spectrum of ingenious adaptations, which involve the acquisition, retention and storage of atmospheric moisture. The vital life-giving fog is pushed 40 to 50 km inland, and creates a relatively cool and moist zone all the way up the coast. When on the rare occasion it does rain, ‘barren’ plains come to life within days with grass cover, a variety of succulents and new growths appearing as if from nowhere. Other flora has consistent growth due to an underground water source, most likely located along riverine systems. Finally, only the larger species of algae or seaweeds and their respective kelp have been addressed in the sections below.

[1] Ultra-psammophilous can be described as loving vegetationless (ultra-desertic) sand (Koch 1965).

3.1.6.1 Succulents, grasses and riverine growth

As can be expected under these harsh conditions, plant life is delicate and scant, yet well-adapted and hence vulnerable to all operational disturbance. The Bushman's Candle (*Sarcocaulon mossamedense*) retains moisture in its resin-like tubular stems, while the outlandish Elephant's Foot (*Adenia pechuelii*) conserves moisture in its pachypodous trunk. Along the coast in the park are coastal hummocks (Figure 3.7), which are comprised of vegetation such as the succulent shrubs

Figure 3.7 A field of coastal hummocks

Arthraerua leubnitziae and *Salsola nollothensis* (Seely 1992). Apart from being important vegetation 'islands' they form a migration corridor for small mammals, reptiles and many invertebrate species. They also provide shelter for scavenging jackals and hyenas.

A well known example of a living fossil plant, *Welwitschia mirabilis* (see Figure 3.8), grows in dry river courses (Nature Conservation 1996). This member of the conifer family only occurs in the

Figure 3.8 *Welwitschia mirabilis*

Namib Desert, and absorbs moisture through millions of stomata on its leaf surfaces. The Commiphora species, most of which grow as squat, low spreading shrubs and have aromatic resins, produce leaves only when it has rained, shedding them soon after.

Grasses are not abundant in the northern Namib, but where the substrate is suitable, species such as *Stipagrotis ramulosa* have found a foothold. The sand dunes support occasional tufts of *Eragrotis cyperoides* as well as the annual *Brachiaria psammophila*, which appears after rains.

Riverine vegetation is not typical for the desert environment, yet is an integral part of the parks' ecosystem. Trees evident in the few riverine systems are wild tamarisks (*Tamarix usneoides*), mopane (*Colophospermum mopane*), leadwood (*Combretum imberbe*), ana tree (*Faidherbia albida*), camelthorn (*Acacia erioloba*), green-thorn (*Balantines welwitschii*), and the mustard tree (*Salvadora persica*). The most common species are the ana tree, which are also the most valuable for food for game (Schoeman 1988).

The rarely occurring springs in the dry river beds have comparatively lush vegetation, in comparison to the sparsely vegetated surrounding environment. A mix of grass, reeds and trees make these springs oases. The Poker plant (*Typha capensis*), fluitjiesriet (*Phragmites australis*) and

the reed (*Schoenoplectus littoralis*) are the most common species found around springs. These springs fulfil an important function as they not only provide a source of freshwater, but also lush vegetation as a food source, and breeding sites for many different species.

3.1.6.2 Lichens

On the gravel plains and exposed rock surfaces, lichen fields predominate. There are many species of these, such as *Teloschistes capensis* (see Figure 3.9), *Santessonia hereroensis*, *Caloplca indurata*, and *Xanthoparmelia* species. *Wanderflechten* (‘wander lichen’) like *Xanthomaculina* convolute and *Parmelia hueana* cover large areas in wind depressions. *Xanthorea* lichens grow upon loose pebbles. Various forms of algae are found on the surface material (Hutton & Palfi 2003).

Figure 3.9 *Teloschistes capensis* (Orange Lichen)

Lichens occur throughout Namibia, with more than 100 species identified so far. In the desert, these plants are considered the first colonists of bare habitats and therefore form a groundcover that prevents wind and water erosion (Craven & Marais 1986).

Lichens form the predominant component of the perennial plant biomass in the coastal Namib and play a major role in the ecology of this desert habitat. Lichens are very important in stabilizing soil and protecting it from wind erosion. However, some of the terricolous lichen communities may be endangered from off-road and other heavy vehicles which destroy the delicate lichen cover and promote soil movement (Wessels & van Vuuren 1986). Lichens cannot maintain an imbalance in

water potential between their tissue and the surrounding atmosphere for long periods of time, as there is no separation between organs for water uptake and water loss. Under dry air conditions, the moist thalli of lichens loose water and after dehydration they enter the state of latent life. Hydration of these organisms takes place through water uptake of the total thallus surface. As a result, the times when hydration allows photosynthetic metabolism are usually short for lichens in semi-arid and arid habitats. Thus, the primary production of lichens is low compared to that of homoiohydric higher plants (Lange et al 1989). On balance, this vegetation type is extremely sensitive to human intrusion.

3.1.6.3 Seaweed

Offshore vegetation do occur and is vulnerable to any offshore mining activity. Algae or seaweeds consist of three main groups: green, red and brown algae. Seaweeds are important as they are a major source of food for marine animals, they provide shelter and buffer against the effects of wave action, and from a substratum on which many organisms may live. In the waters along the coast of the SCP, the species *Caulacanthus ustulatus*, *Nothogenia erinacea*, *Nothogenia ovalis* and *Chondria capensis* dominate the littoral zone (Molloy & Reinikainen 2003). Kelp is a large brown seaweed that dominates the subtidal areas of rocky shores and offer refuge to juveniles and other small marine organisms. The dominant large kelp is the hollow-striped *Laminaria pallida schinzii* (Barnard 1998).

3.2 THE HUMAN ENVIRONMENTAL FOOTPRINT

Due to the uniqueness of the SCP and its remoteness, the area north of Möwe Bay had been kept restricted to the public and maintained in a near natural state for research purposes. The areas south of Möwe Bay have been open to the public for activities such as angling and exploring, and accommodation is provided for in two camps. This section describes the nature of human settlement and associated activities around them that may affect this delicate environment. The settlements, communication infrastructure and tourism attractions appear on Figure 3.1.

3.2.1 Permanent settlements

There are two tourist camps in the SCP which are open to the public – Torra Bay and Terrace Bay. Torra Bay is only open in December and January for use by the public, and is usually booked out months in advance, due to the good fishing in the vicinity. Terrace Bay in contrast has no camping facilities and is open all year round. A third settlement exists in the park at Möwe Bay, though this is a research base staffed by MET personnel.

The name **Torra Bay** originated in the 16th century, when Portuguese navigators named it Dark Hill/Mountain after the dark capped hills visible in the surrounding areas which they explored in their search for water. A primitive campsite has been established at the bay with field (long-drop) toilets. No water, wood or petrol is available except in the December holiday season, when water and light refreshments from a kiosk are sold. No alternative accommodation is available at any time of the year.

An old mining settlement, **Terrace Bay**, has been converted into a rest camp of two-bed cottages. Here, petrol, water and basic repair facilities are available and a shop allows you to replenish basic supplies and buy mementoes of a Skeleton Coast trip. A restaurant and a bar are also on site. The cottages each have two beds, which can be increased to three, and a bathroom with shower, toilet and basin.

Möwe Bay is a research station that was built in the late 1960's, after the initial research station constructed at Angra Fria became unsuitable. With assistance from Sarusas (a mining company operating in the area), the station at Möwe Bay was constructed. This remains the most northerly part of the park that a 2x4 vehicle can reach. Möwe Bay is inhabited by two park wardens and one assistant; there is also a camp site for visiting researchers, as well as a guest house. Also sited at Möwe Bay is a police station with a few police officers. The responsibility of the wardens here is to oversee all park functions such as animal welfare and human activities (angling and prospecting). Other wardens are based at the Springbokwater Gate, Ugab Entrance Gate, and Terrace Bay, yet the Chief Park Warden and the second in charge are both based at Möwe Bay.

3.2.2 Communications

Due to the isolation of the Skeleton Coast, very little development has taken place since its proclamation as a national park. The roads to the two tourist camps are in good condition, yet the links north to the station at Möwe Bay deteriorates. The wardens decided that as only wardens and researchers should go beyond Terrace Bay, there was no real reason to make the ride comfortable (Awob 2005, pers. comm.). Further north from Möwe Bay no official roads exist, and use of existing tracks is made or more commonly routes are made over sand dunes or along beaches.

Access to the Skeleton Coast is only possible by permit. This permit can be obtained at the entrance gates, should one only want to pass through the Park or has a booking at one of the camps. Should one want to enter the area north of Terrace Bay, a research permit must be applied for, in Windhoek

prior to departure, specifying time in the area, number and names of people visiting and vehicle registration.

Communications in this remote area have until recently only been possible via two-way radio, motor car or airplane. The MET has installed satellite phone connections now, and all camps and stations are in constant contact. This means a direct link up via fax, email and telephone operates. This not only increases the safety of staff in these remote areas but also makes the logistics of their work much easier and better, as close collaboration with many other offices is essential to them working effectively. The control over mining and exploration should in principle be much improved.

3.2.3 Recreation and tourism activities

Until recently, the remoteness of the Park helped to ensure that research could be conducted without outside influences. The northern part of the SCP was the last area in Namibia that was both a sanctuary for fauna and flora, as well as a pristine study ground for scientists from all over the world. This is no longer the case, with mining and exploration being a major external influence.

Other than research, the main activity of the Park has been shore fishing or angling. During the December school vacation, both camps – Torra Bay and Terrace Bay – are always fully booked by anglers. The coastline in the SCP is renowned for its excellent fishing (the four main species are kob, steenbras, galjoen and blacktail) for those that make the long journey to the park. Unfortunately, prospecting and/or mining for precious minerals may conflict with angling, as trespassing on licensed areas is prohibited by the Minerals Act for security reasons. Conflict is likely as both the prospecting/mining areas are located in the same areas as the popular fishing grounds as Figure 3.10 shows.

The last activity that currently occurs in the park is tourism. There are three types of tourists that travel to the park, anglers, day tourists and holiday-makers. Day tourists tend to travel through the park as a perceived ‘short cut’, from Damaraland to the coast (usually Swakopmund) or vice versa. These tourists enter or leave the Ugab River Gate in the south, and then enter or leave through the Springbokwater Gate in the east. The permit they receive at the gate only authorises travel on the route between the gates and the journey must be completed in a single day. Many stop along the way at lookout points to take photos of the dunes, the landscape or the ship wrecks. The third type

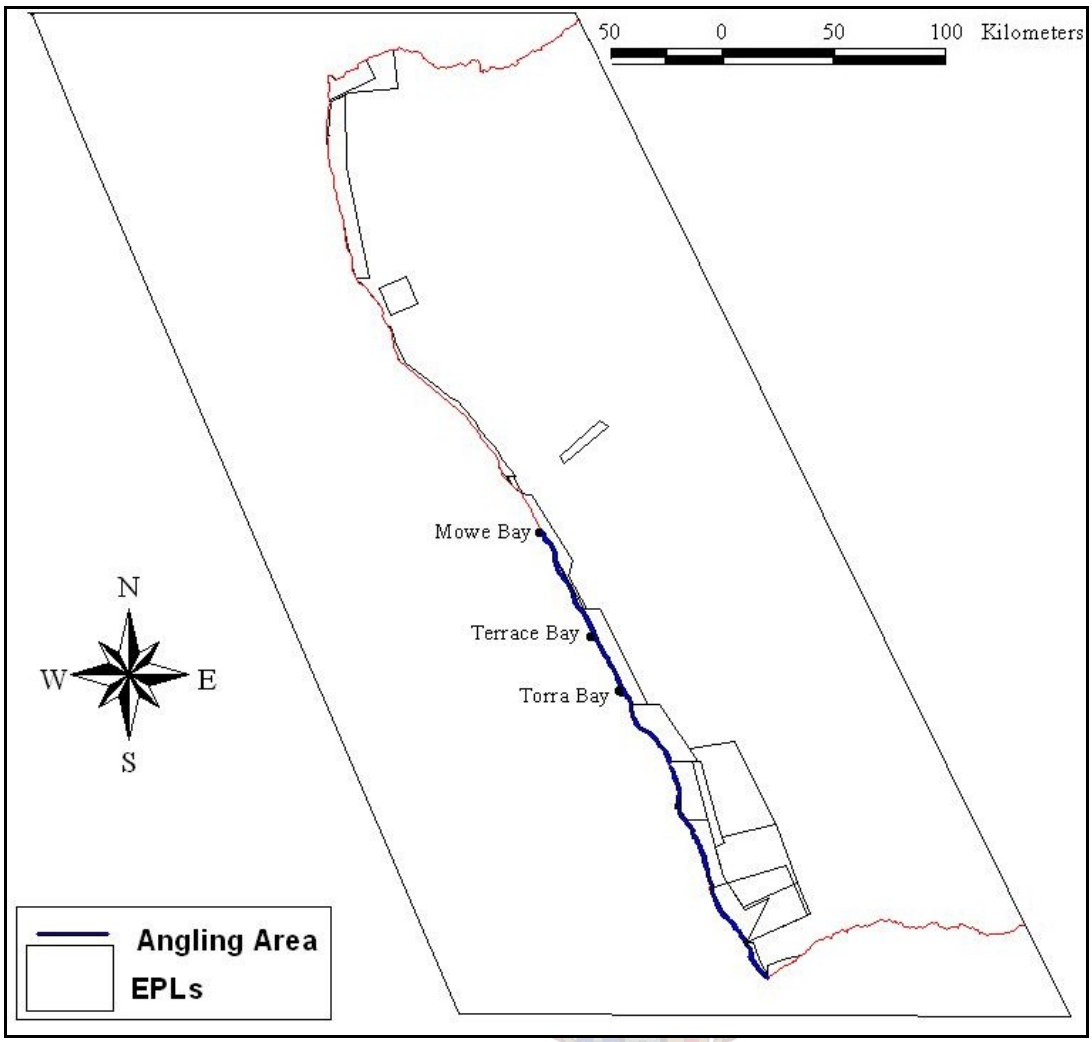


Figure 3.10 Angling sites and EPLs in the SCP

of tourist enters the park with the concession holder Wilderness Safaris and has an extended trip through the park, which takes the visitor north of Möwe Bay to Angra Fria, and then east to Orupembe in Damaraland.

3.2.4 Shipwrecks of the SCP

A final section that warrants inclusion deals with the shipwrecks for which this harsh coastline is famous and that may attract tourist activity and hence further disturbance. Due to the extremely rough seas and the frequent fogs, many ships have run aground along the Skeleton Coast. The heavy seas and high salt spray content along with the constant gale force winds mean that very little remains of these wrecks.

The Skeleton Coast's best known shipwreck is that of the Dunedin Star, a British cargo vessel which ran aground some 40 kilometres south of the Kunene River mouth in November 1942. This

set a lengthy series of rescue attempts in motion, ending in disaster for several of the aircraft, ships and vehicles involved.

A relatively well preserved wreck is that of the Montrose, which stranded in June 1973 and today lies embedded on a sandy beach near Terrace Bay. Just north of Möwe Bay, washed up on a pebbly beach, is the hull of the Suiderkus shown in Figure 3.11. She beached on her maiden voyage in

Figure 3.11 Wreck of the Suiderkus just north of Möwe Bay

1976, and further north are the burnt remains of the fishing boat, Karimona, wrecked in September 1971. Twenty-five kilometres north of the Ugab River mouth is the disintegrating hull of the Benguela Eagle, wrecked in 1975 (Von Schumann 1982).

With the portrait of the natural environment of the SCP and the human footprint upon it exposed, the attention next shifts to the reality of mining activity and its impacts in the park.

CHAPTER 4 PROSPECTING AND MINING IN THE SKELETON COAST PARK

Since the late 1920's an interest in diamond mining has existed along the Skeleton Coast. Mining and prospecting for diamonds continued along the entire coastline from the Kunene River to the Ugab River from then until the mid 1980's. None of the companies operating in the SCP ever found sufficient diamonds to make their operations profitable. Thus, after the last company withdrew in the 1980's mining was no longer allowed in the SCP. Exclusive Prospecting Licenses were once again issued for diamonds in the SCP in 2002. Applications for EPLs in the SCP have increased steadily in recent years. This chapter sketches geological theory underlying perceived mineral deposition and outlines historical and present mining and prospecting activities in the park.

4.1 GEOLOGICAL THEORY FOR PROSPECTING IN THE SCP

The diamonds that occur in the SCP are all alluvial, that is, found in marine terraces, which were formed by the sea between about 8 - 20 million years ago. These diamonds originated far inland in diamond pipes and fissures, which were gradually eroded and washed down to the sea. Together with other gravels and boulders, the diamonds were deposited in marine terraces, which normally lie parallel to the coastline (Schoeman 1998). In the past exploration and investigation by companies focussed on raised marine beaches and other gravel terraces, with little or no understanding of the geological forces behind the occurrence of diamonds in particular gravel horizons at specific places.

Diamonds arrived on the coast 15 million years ago, tumbling along the rivers and into the sea. As in all alluvial deposits, river currents carried off the smallest diamonds, leaving caches of larger gems that were heavy enough to settle. This is the reason that alluvial deposits produce higher per carat values than would be found in a typical kimberlite mine – the rich deposits of alluvial diamonds is not tainted by the lower values of tiny stones. When sea levels receded, the diamonds that had flowed into it remained behind in beach deposits. Others lie farther out, embedded in gravels on the ocean floor (Hart 2001).

So, theories of occurrence depend on understanding where the paleo-rivers flowed. Various geologists have proposed that the present-day rivers once drained a far greater inland area, and hence once carried a much larger alluvial load. This implies that not only did these rivers once drain

the Angolan/Congo craton, but also eroded tillites and basal conglomerates of Karoo and Kalahari ages (refer to Figure 4.1).

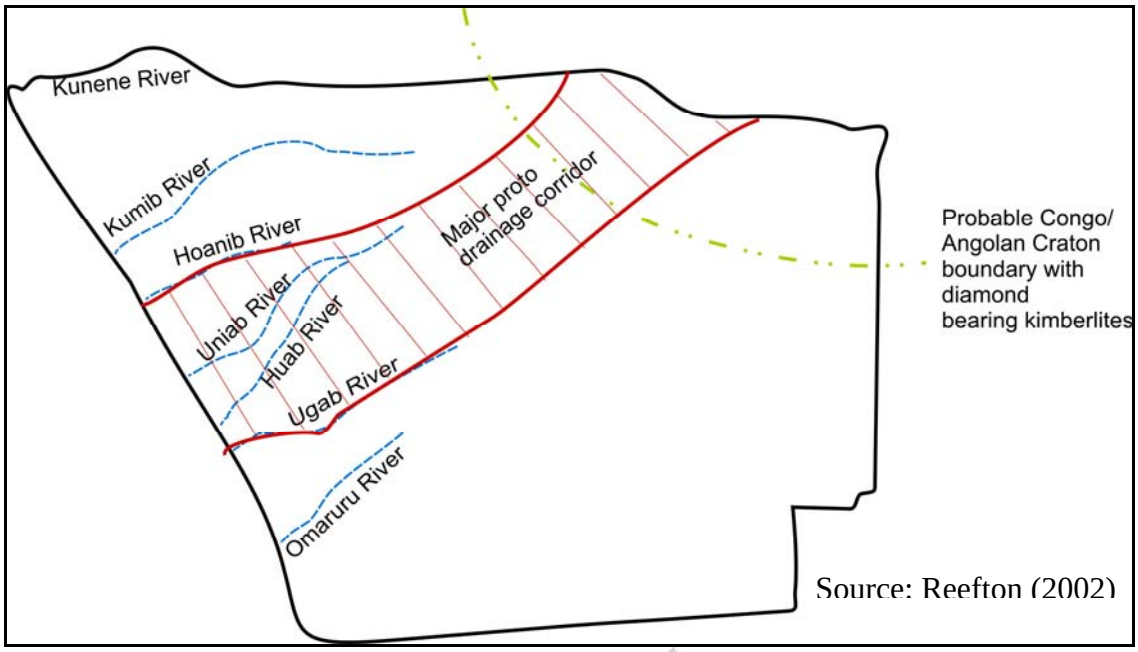


Figure 4.1 Sketch of northern Namibia with probable paleo-river courses & Congo/Angola craton

From this theory the assumption is made that the SCP must have received diamonds via this route. This is confirmed by another theory proposed by a geologist working for Northern Namibian Development Company, Grobbelaar (2001) that: 'the Kunene River is an old river system and positive signs of gravels deposits were found higher up in the catchment area. It is therefore possible that these gravel deposits might be diamondiferous'.

However generally it might be safer to say that there is a high level of uncertainty as evidenced by the following statement by the Storm Diamond Mining Company geologist and technical director for Reefton in Australia: 'the source of Skeleton Coast diamonds is unknown' (MSW Namibia 2002) that seems to be a common prospecting theory. These three approaches were the only ones that could be obtained from mining companies that have or planned to prospect in the SCP.

What evidence is there for diamonds? Although a few largish stones have been found, the Skeleton Coast diamonds are on average very small, approximately six to eight stones to the carat. The quality of these diamonds is good – 80 per cent or more are gem quality, while the rest are used for industrial purposes. Although small gemstones are now in demand, as large stones have become too expensive, mining them at the Skeleton Coast is not an economic proposition. They occur only in small pockets, and reserves are not substantial enough to justify the expense (Schoeman 1998).

4.2 HISTORICAL OVERVIEW OF ACTIVITIES

In this section an overview of early prospecting and mining activities is given, the production output achieved and profiles of the main operating companies are provided. The geographical landmarks and features referred to in this section are shown in Figure 4.2. It becomes evident that

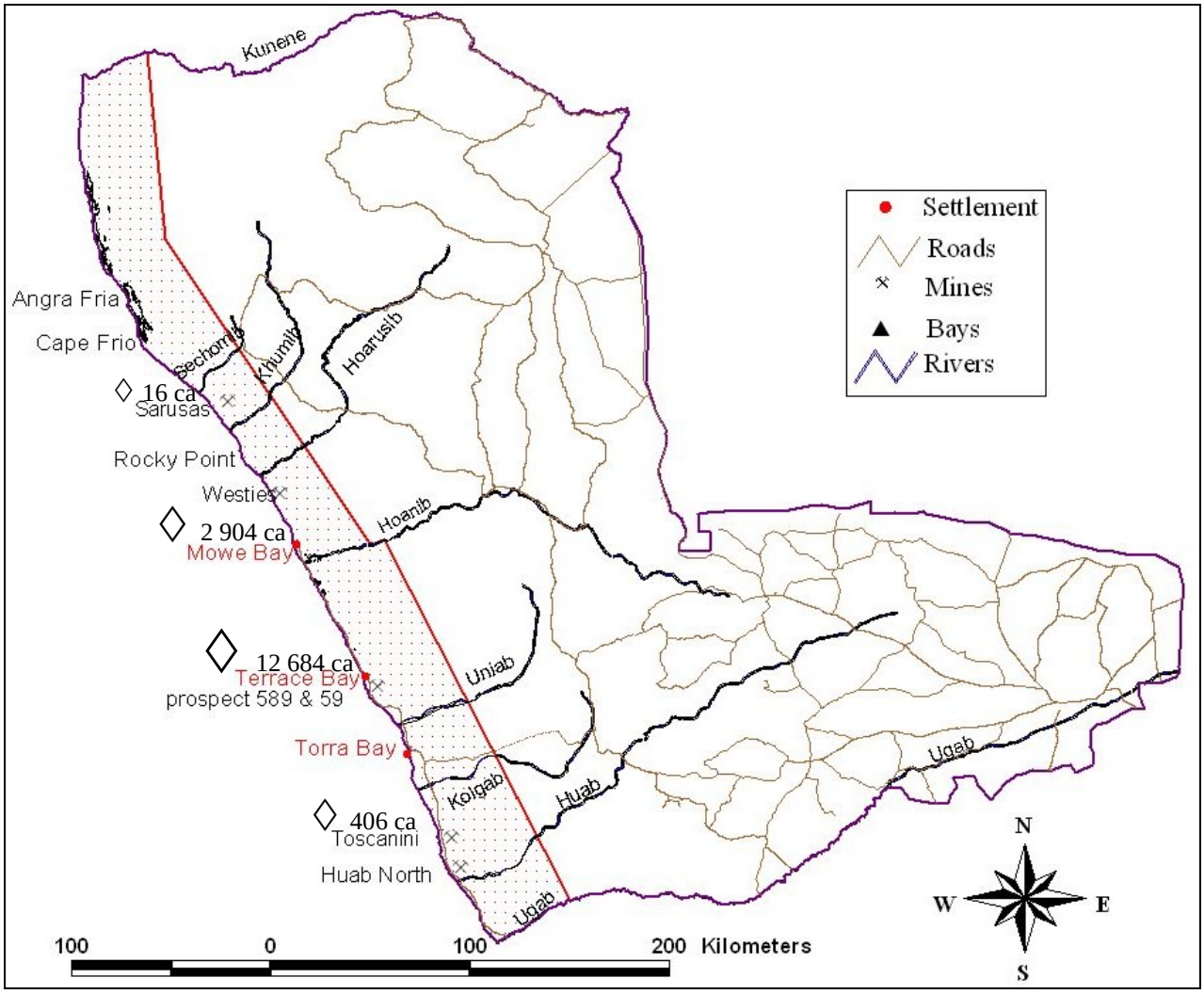


Figure 4.2 Mining in the SCP

mining and prospecting in the SCP has been concentrated more to the south of the park, but has later moved right up to the north.

4.2.1 Early prospectors and miners

Most of this section is based on information obtained from Schoeman (1988). The first prospector to acquire a mineral concession in the Skeleton Coast was Jack Levinson in 1959. After battling with the elements and the logistics of the operation for nearly a year he eventually found diamonds between the Hoanib and the Hoarusib Rivers.

In 1961, three brothers, Jasper, Koos and Fanie van der Westhuizen and a cousin, Jannie van der Westhuizen, farmers from the Keetmanshoop district, inspired by stories of diamond deposits on the Skeleton Coast, obtained a prospecting concession for diamonds between the Ugab and the Uniab Rivers. They found diamonds at Toscanini, and also further northwards. Not having sufficient funds, they formed a consortium for which a company Westies Minerals (Pty) Ltd was formed, with which they bought Jack Levinsons' mineral rights. The company started working the terraces near the existing Levinson camp, and found small quantities of small diamonds of good quality. These they disposed of through the De Beers Central Selling Organisation. After two years of prospecting, Westies Minerals became part of a new company called the Sarusas Development Corporation, a consortium of which several large and financially strong companies such as SANLAM, the Industrial Development Corporation, Volkskas and the General Mining and Finance Corporation were also shareholders.

Ben du Preez and Colonel Jack Scott were active further south at Toscanini between the Ugab and the Uniab Rivers where they were operating a large and very expensive diamond processing plant. Evidence of these early prospectors can still be seen, especially their waste site where the image in Figure 4.3 was taken in 2005 of a magazine with the heading 'Ted and Joan Kennedy on the

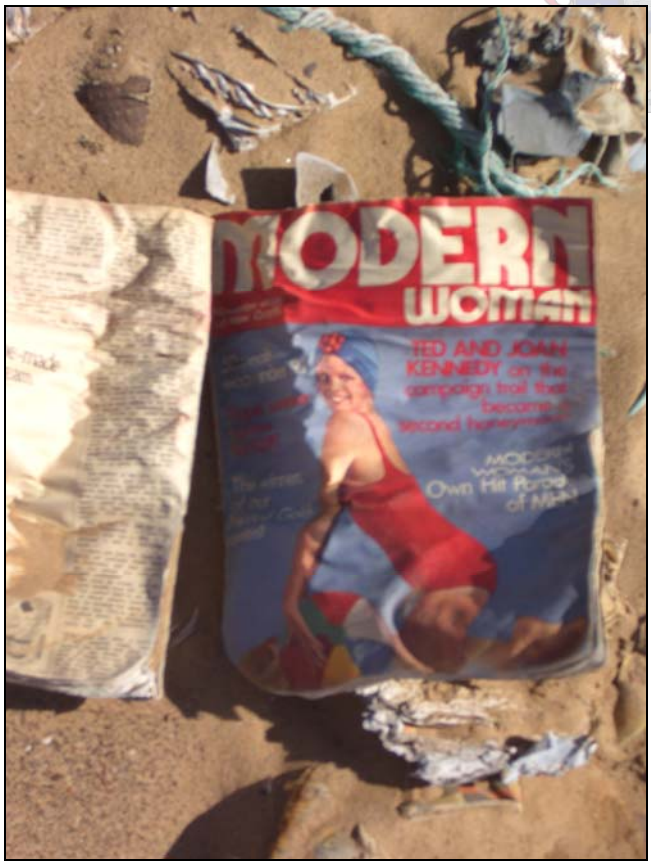


Figure 4.3 Forty-year old magazine found at old waste site at Toscanini

campaign trail that became the second honeymoon'. They apparently believed that even small diamonds could be lucrative if the diamondiferous gravels were handled in bulk quantities. When, inevitably the company ran into financial difficulties, the Department of Nature Conservation and tourism bought their accommodation buildings at Terrace Bay and converted them into facilities for anglers, while the plant was sold as scrap.

The Consolidated Diamond Mining Company (CDM), also prospected in the Skeleton Coast from 1957 to 1964. Having acquired a prospecting concession for the area between the Uniab and the Hoanib Rivers, operations were conducted from a base camp at Terrace Bay. "A considerable amount of exploration work was devoted to the area, but owing to the natural difficulties, condition of the roads and tracks and the supply of water, not much trenching has so far been done", was reported by Levinson (1962).Although diamonds were found, they were considered too small and the occurrence too sporadic to be mined economically and CDM eventually gave up the concession voluntarily.

In the early 1980's, the then director of Nature Conservation, Swart engaged in negotiations with the Department of Economic Affairs to discontinue the granting of mineral rights for prospecting in park areas. In 1983 the last prospecting concession expired and all prospecting ceased in the Skeleton Coast Park. In 2000, under a new administration, new prospecting licenses were once again issued.

4.2.2 Mining output

A seperate earlier extensive investigation, between 1943 and 1947, by CDM of the beach gravels between the Ugab and Kunene River mouth, was undertaken. Trenches were dug every 400m at right angles to the coast, wherever gravels were located. Exactly 2,354 diamonds weighing 295.4 carats were recovered during these prospecting operations. The best areas were those called Huab North, Terrace Bay and the so-called prospects 589 and 59, although grades in these areas were low. Only isolated deposits were found to be present between the Sechomib River mouth, the northern most occurrences, and the Hoanib River (Heath & Linning 1963).

Test mining by CDM between 1957 and 1959 of the areas with the best grades confirmed prospecting results and it was consequently decided to confine further mining activities to the Terrace Bay area. This took place between 1960 and 1966, and again between 1970 and 1971.

The alluvial river gravels at the mouth of the Huab and the Uniab Rivers were extensively sampled in the late 1970's but found to be barren. Total mining and prospecting results are tabulated in Table 4.1 indicating carat yield per year. Certain years were not included in the table as no activity was conducted in those years. It shows large variation annually, with yields reaching >10 000 carats to nearly nothing, but averaging around 1000 carats per year – not encouraging results.

Table 4.1 Total diamond production from 1943 to 1983 in the Skeleton Coast Park

Year	Total Carats
1943–1947	3,020.00
1956	10,525.92
1957	3,888.30
1958	2,099.25
1959	2,238.50
1960	773.75
1961	569.35
1962	1,543.17
1963	1,608.69
1964	1,714.15
1965	568.25

Year	Total Carats
1966	277.45
1967	1,290.75
1968	3.25
1970	1,031.40
1971	1,513.40
1973	22.00
1981	70.27
1982	356.40
1983	13.80
Total	33,128.05

Source Schneider & Miller, Stocken, Levinson

4.2.3 Main mining and prospecting companies

Different mining and prospecting operations entered the SCP, of which only three companies seemed to undertake serious prospecting. The largest of these was CDM, followed by Sarusas Development Corporation and Westies Minerals. Their operations are considered more closely here.

4.2.3.1 Consolidated Diamond Mining Company

Exploration of the Skeleton Coast by CDM initially ran from 1943 to 1947. This campaign recovered a total of 2,354 carats of diamonds. In 1960 CDM began a test mining program at Terrace Bay and continued this until 1972.

The CDM exploration campaign between the Ugab and the Kunene River mouth consisted of mapping outcropping beach gravels along the coast, followed by sampling of trenches dug

perpendicular to the coast at 400m intervals (Stuart-Williams & Walker 2003). Remnants of two main raised marine terraces occur frequently along the Skeleton Coast. The lower terrace occupies a position about three to five metres above sea level, whereas the upper is between eight and ten metres above sea level. Very few diamonds have been recovered from the lower terrace, but stretches of the upper terrace are diamond bearing. A few remnants of raised marine terraces occur at elevations of 15 and 23m above sea level, but none of these has yielded diamonds. The best development of the upper of the two main terraces, clearly seen in Figure 4.4, extends from about

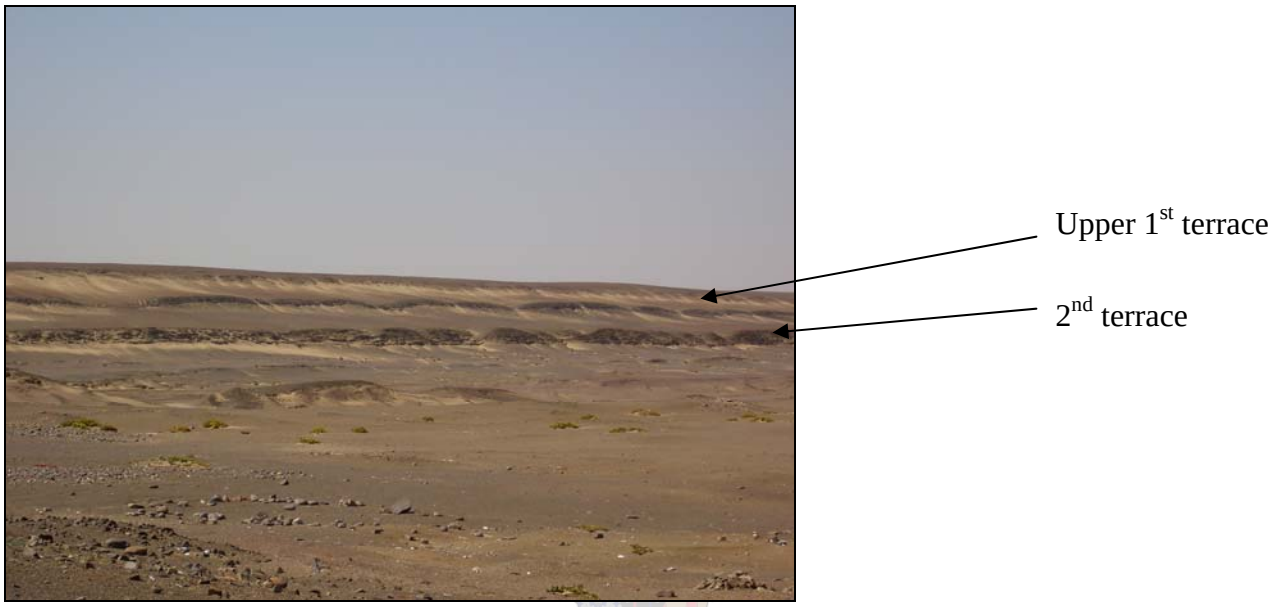


Figure 4.4 The terraces at Terrace Bay

13km north of the Uniab River mouth to eight kilometres south of the Hoanib River mouth. It only extends some 6.5km north of the Hoanib (Heath & Linning, 1963).

Seven reconnaissance sample pits were sunk behind the metre storm beach at Terrace Bay. Five were excavated at approximately 90 metre intervals immediately behind the storm beach and two were excavated between the shore line and the western mine block line. All pits were four metres in diameter and were sunk to the bedrock (Sullivan 1964).

Prospecting was continued the following year at Terrace Bay, 60 km south of the Hoanib River. Fifteen reconnaissance sample pits were sited along the present-day stormbeach and 684.7 loads of gravel were excavated and treated. Nine diamonds weighing 0.65 carats were recovered. In addition, 26 sections of a trench were completed, but no diamonds were recovered (Stocken 1964).

For the remainder of 1964 prospecting operations consisted of bulk sampling on Beach 11 between trenches 65.1E and 65.1G in Grant Area M4/4/27 where 6,739 loads were excavated, 1,489 loads of gravel were treated and 159 diamonds weighing 13.35 carats were recovered (Stocken 1965b). “Diamonds were obtained at eight to the carat, and in the late 1950’s and early 1960’s these had an average value of R15 per carat. In general the deposits are of a poor grade”, reports Stocken (1965a), the resident geologist of CDM.

As can be seen in Table 4.2, over a period of eight years CDM spent R350,138.00 and only recovered 9,812.30 carats. At the market value at that time they would have only obtained R147,184.50, implying a loss of R202,953.50 on the operations.

Prospecting operations continued at Terrace Bay in 1965. Eight reconnaissance pits were sited along the present-day stormbeach and 286.8 loads of gravel were excavated and screened. From the 26.7 cubic feet of screened gravel treated 13 diamonds weighing 0.80 carats were recovered (Stocken 1965a).

Table 4.2 CDMs Diamond results for the period 1957–1964

Year	Diamonds	Carats	Working Costs (ZAR/annum)
1957	17,117	2,136.15	32,172
1958	10,225	1,449.50	34,326
1959	10,398	2,015.50	47,832
1960	6,768	771.75	39,532
1961	5,587	569.35	46,985
1962	12,104	1,070.75	52,416
1963	12,751	1,245.05	52,973
1964	5,306	554.25	43,902
Totals	80,256	9,812.30	350,138

(source: Schneider & Miller 1992).

In the period January to December 1966 prospecting did continue in grant area M46/3/10 but no diamonds were recovered. During the period January to June 1967 on the same grant area no prospecting operations were carried out. In conclusion it is clear that these operations caused extensive environmental damage and yielded very unprofitable returns.

4.2.3.2 Sarusas Development Corporation

Beginning January 1970 prospecting holes, one meter wide and two meters long, were made on the northern bank of the Hoanib River for a distance of 10km, by Sarusas Development Corporation. This prospecting continued until the end of 1970. According to the prospecting results at the end of June 1970, there are 6,000–7,000m^3 of gravels potentially available, yielding 900 - 1,000 carats of diamonds. Yields range from 12 to 14 per carat, with an average price of R6.00 per carat. Thus it was not viable for Sarusas to exploit the gravels in the prospected areas. A further attempt was made in 1972 to examine the gravels, but they were unprofitable, and prospecting was halted again (Sarusas 1971; 1975).

4.2.3.3 Westies Minerals

Westies Minerals believed that the actual riches of a 25km stretch lay north of the Hoanib River, not at the inland terraces, but in the newly formed see terrace, the area between the high- and low-water mark and approximately a further 30m inland. A total of 980.79 carats were recovered between December 1962 and August 1963 (Westies Minerale 1963).

Exploration and investigation by other companies had always been orientated around the investigation of raised marine beaches and other gravel terraces with little or no understanding of the geological controls behind the occurrence of diamonds in certain gravel horizons at certain places. Westies believed their approach armed with this new geological theory would lead them to successful results. However, "prospecting revealed extremely limited ore reserves in the potholed coastal plain and a grade of some 3.34 carats per 100 tons of pothole gravel", was later reported by Lyle (1983:2).

4.2.4 Main mining and prospecting sites

Several other small companies and individuals prospected and mined sporadically at other locations north of the Ugab river mouth in the 1947 to 1983 period, recovering 18,078 carats.

At **Toscanini** three terraces occur. The middle one is diamondiferous; the diamonds are concentrated in that part of the terrace where weathered and fragmented boulders are slightly submerged. Grades of up to 26 carats/100t occur here. In 1962 and 1963, a total of 405.84 carats were recovered (Le Riche 1963). In 1972, a new recovery plant was erected at Toscanini; however, not a single diamond was recovered.

The highest concentrations of diamonds on the Skeleton Coast were found on the northern edge of **Terrace Bay**. Test mining at Terrace Bay between 1957 and 1959 confirmed the exploration results and commercial production began there in 1960 and continued to 1966 and again between 1970 and 1971 (Heath & Linning 1963). During this 11 year production period 12,684 carats were recovered. A dense media separation plant was erected at Terrace Bay, and dump as well as terrace material was treated. Some 2,528 carats were recovered in this way between 1970 and 1971. The plant has since been dismantled and only the mine dump remains. Table 4.3 gives a break down of all yields retrieved on the SCP from the 1950's to 1983, specific to area of occurrence.

Table 4.3 Diamond production at individual sites

Year	Terrace Bay	Möwe Bay	Toscanini	Sarusas
	Production(carat)			
1950's		2,283		
1955		20		
1956				
1957	2,136.55			
1958	1,499.50			
1959	2,015.50			
1960's		161		
1960	773.75			
1961	569.35			
1962	1,070.75		405.84	
1963				
1964	1,245.30			
1965	568.25			
1966	277.45			
1970	1,015.00			16.4
1971	1,513.00			
1972			0	
1981		70.24		
1982		356.40		
1983		13.80		
Total	12,684.4	2,904.44	405.84	16.4

In the 1950's Levinson, recovered 2,283 carats and, in the 1960's, Westies obtained some 161 carats at **Möwe Bay**. A dense media separation plant was commissioned here in 1981, by Rocky Point Diamond Resources. Very patchy gravels, generally less than one metre thick, from trenches south of Möwe Bay were treated here until 1983. The production of Rocky Point Diamond Resources from their operations at Möwe Bay and Rocky Point totalled 440.44 carats.

At **Rocky Point**, the oldest terrace lies up to 13m above high tide level. It is underlain by two barren younger terraces. A rounded ridge of gravel within the oldest terrace contains the best diamond values. Some 100 stones weighing approximately 20 carats were recovered during CDMs prospecting operations in 1955. The largest stone weighed 1.5 carats (Rabie 1955). Diamonds were again recovered at Rocky Point between 1981 and 1983.

Initial prospecting operation started in **Sarusas** in 1970, when some 16.4 carats of diamonds were recovered. A plant, similar to the one at Möwe Bay, was built in 1980 north of the Khumib River, some 100m from the beach. It was, however, never completed and was dismantled again in 1981 (Schneider & Miller 1992).

4.3 CURRENT PROSPECTING ACTIVITIES

In order to obtain a license to prospect or mine a specific mineral, a sound geological theory needs to be advanced explaining the choice of locality, prospecting method, and the prospecting programme that will be undertaken. Also accompanying the application for the EPL should be proof of nationality of the applicant, either individual or company directors or major shareholders. When an EPL is granted, the holder has to actively prospect the area. Currently only prospecting for diamonds is active in the SCP, although the EPLs have been granted for a larger variety of minerals. Therefor only the various types of diamond licenses are discussed here.

4.3.1 Exclusive prospecting licenses

This section concerns current status of all the EPLs granted in the SCP since 2002. A list of all EPL applicants granted and pending was obtained from the MME, and compared to the MET database to establish compliance and status. The EPLs were then divided into categories according to their status of exploration and licence validity.

From 2000 to 2005, 26 EPLs have been granted, of which only 10 have been actively prospected. The 26 EPLs have been granted to 18 companies of which only ten are actively prospected by five companies in the park.

Of the 26 EPLs granted, three (EPL 2699, EPL 2700, EPL 2742)[2] are pending renewal, and a further two (EPL 2876, EPL 2959) have lapsed without any prospecting ever having been undertaken. Seven are new applications, of which six are offshore applications in possible intertidal areas.

As of July 2005, of the 26 EPL applications lodged at the MME only 10 applications for Environmental Clearance have been submitted to the DEA. Six Environmental Clearances have been issued and three letters of permission to prospect have been provided. One company, Smartis Diamond Recovery, undertook prospecting activities without clearance. All other 13 companies have obtained their EPL without obtaining Environmental Clearances, or compiling EIAs or EMPs, to the knowledge of the DEA. It is possible that the seven pending EPLs remain pending as they are conducting environmental assessments. However, this would not be in keeping with the trend observed to occur in the SCP since its reopening for prospecting. Most companies needed to be coaxed into conducting any form of EIA and EMP, while others failed to comply altogether. The next five sections provide a status breakdown of EPLs in 2005.

4.3.1.1 Overview of EPLs

Of the 26 issued by 2003 only 19 active Exclusive Prospecting Licenses were valid within the Skeleton Coast Park. The minerals that were prospected for were mostly precious, with some holders opting to also prospect for semi-precious minerals. At that time only Northern Namibia Development Company (NNDC) was prospecting on EPL 2633, near the Kunene River mouth. The Environmental Assessment Unit at the DEA had been informed however, that Oshifukwa Mining Corporation, Smartis Development and Reefton were all looking at either starting or continuing with activities within their EPLs. A summary of all the above EPLs and their details have been set out in Table 4.4.

[2] EPL numbers are issued by the MME and is continuous, in other words it increases by one with every application received for an EPL in Namibia.

Table 4.4 Overview of all EPLs issued for the SCP since 2002

EPL	NAME	EIA	EMP	ScrQ	EnvQ	Clearance	EPL Issued	EPL Expiry	Mineral[3]	Status[4]
2564	Nambib Mineral Resources	X	X	X	X	Permission to prospect	2002/09/06	2005/09/05	PS	A
2565	Nambib Mineral Resources	X	X	X	X	Permission to prospect	2002/09/06	2005/09/05	PS	A
2566	Nambib Mineral Resources	X	X	X	X	Permission to prospect	2002/09/08	2005/09/07	PS	A
2633	Northern Namibia Development Company	X	X	X	X	X	2003/10/04	2005/10/03	PS, SPS	A
2696	Nambib Mineral Resources	X				X	2003/01/24	2005/01/23	PS, PM	A
2699	Storm Diamond Mining Company / Reefton	X	X	X	X	X	Pending	2004/11/22	PS	A
2700	Storm Diamond Mining Company / Reefton	X	X	X	X	X	Pending	2004/11/22	PS	A
2742	Crater Mining (Pty) LTD			X	X		Pending	2003/05/09	PS	A
2876	Nam India Mineral Dev Corp.				X		Lapsed	Xxxx		L
2926	Tiko Ventures	X	X	X	X	X	2004/09/02	2006/09/11	PS	A
2934	Smartis Diamond Recoveries				X		2002/06/03	2005/06/02	B&RM, PS	A
2959	Oshifukwa Mining Corporation				X		Lapsed	Xxxx		L
2961	B Shaanika Development & Mining cc				X		2002/07/11	2005/07/10	PS, SPS	Ia
3010	August 26 Holding Company				X		2002/06/11	2005/06/10	IM, PS	Ia
3011	August 26 Holding Company				X		2002/06/11	2005/06/10	IM, PS	Ia
3028	Tradeline Namibia (Pty) LTD	X		X			2002/07/11	2005/07/10	PS	Ia
3029	Tradeline Namibia (Pty) LTD	X		X			2002/07/11	2005/07/10	PS	Ia
3113	Precious Stones Explorers cc						2003/10/22	2006/10/21	PS	Ia
3130	SAAN Diamonds (Pty) LTD						2004/04/19	2007/04/18	PS	Ia
3196	Storm Diamond Mining Company (Pty) LTD						Pending		B&RM, IM, PM, PS, SPS	P
3234	Fast Grow Mining cc						Pending		IM, PS	P
3237	Storm Diamond Mining Company (Pty) LTD						Pending		B&RM, IM, PM, PS, SPS	P
3240	Kaneka Diamonds (Pty) LTD						Pending		B&RM, PM, PS, SPS, NNF	P
3266	Samicor Diamond Mining (Pty) LTD						Pending		PS	P
3297	Samicor Diamond Mining (Pty) LTD						Pending		PS	P
3306	Amakutuwa Joses Malakia						Pending		B&RM, IM, NF, PM, SPM	P

[3] PS = Precious Stones; IM = Industrial Metals; SPS = Semi-precious Stones; NNF = Non-nuclear Fuel; NF = Nuclear Fuel; PM = Precious Metals; B&RM = Base & Rare Metals

[4] A = Active; Ia = Inactive; P = Pending; L = Lapsed

Before an EPL is granted to an individual or a company specific conditions have to be met, these vary depending on various factors such as location, mineral to be explored and socio-economic factors. For the purpose of this research only the conditions related to prospecting or mining in parks will be considered. In order to obtain an EPL, an environmental clearance needs to be obtained from the DEA. Upon application for environmental clearance the applicant will complete an environmental questionnaire, to provide background information for the Directorate. Completion of a screening questionnaire might also be required, however in most cases for prospecting and mining in parks, an EIA will be required immediately. Clearance will only be granted once the EIA has been conducted and indicates no fatal flaws, after which a comprehensive EMP is put in place, that will ensure best environmental practises at all times. After receiving the environmental clearance it becomes the holders' responsibility to complete and return bi-annual reports to the DEA, on all the operations that have occurred in the previous six months.

By July 2005 the 26 EPLs that have been issued could be shown in Figure 4.5. A detailed

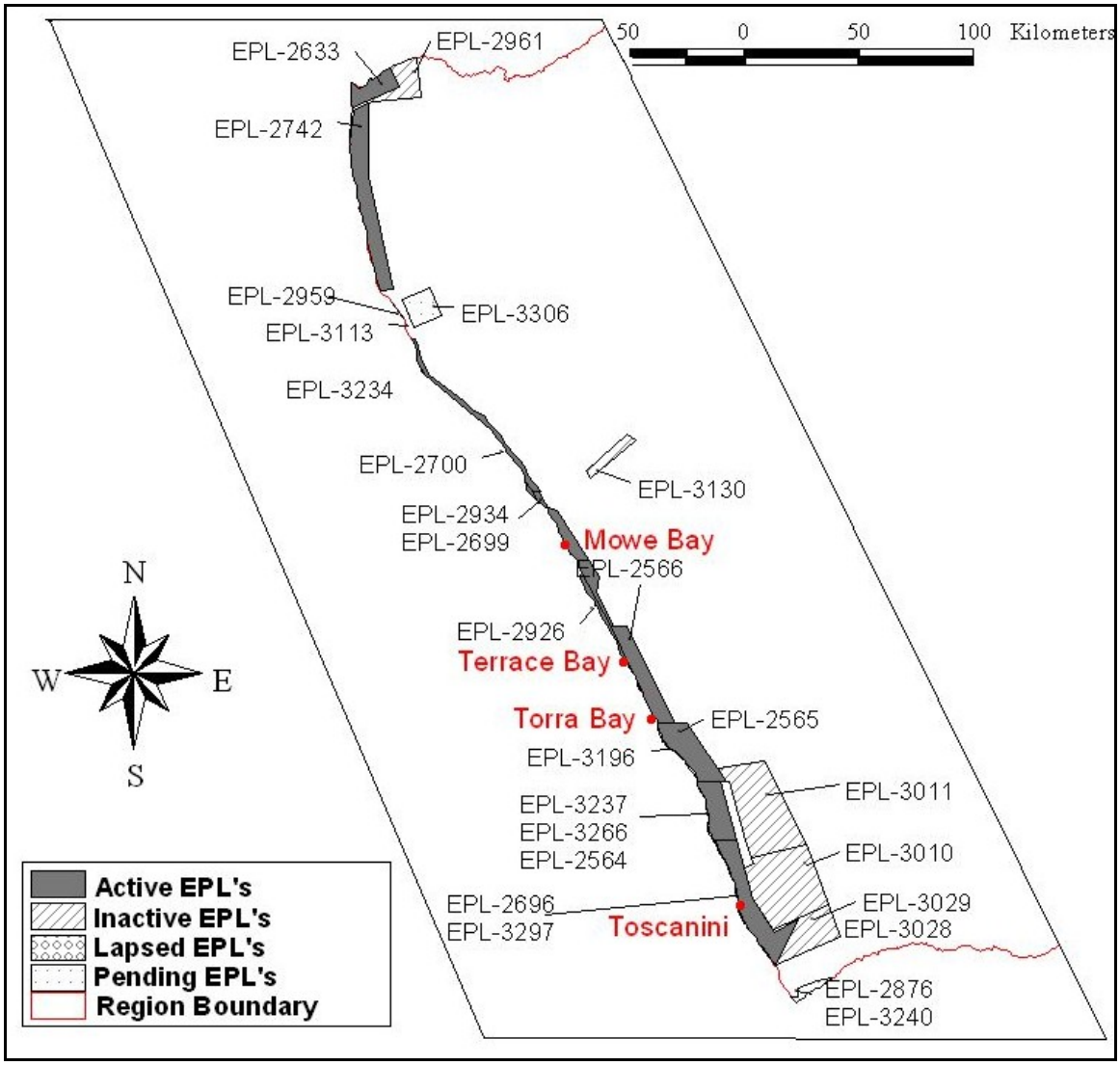


Figure 4.5 Exclusive Prospecting Licenses in the SCP

description of what information could be gathered as to their compliance and activities of each EPL is provided below. The EPLs below are discussed on a case by case scenario, to indicate how each case did not reach compliance nor enforcement regulations discussed in chapter 6. On a survey in July 2005, the only evidence of active prospecting was found at Storm Diamonds Mining Company, though a warden at Möwe Bay indicated that Northern Namibia Development Company was also still present on their EPL.

4.3.1.2 Active EPLs

The EPLs **2564, 2565** and **2566** were granted to Safuan Resources, which were sold and now belong to Nambib Resources (still under the same management as Safuan Resources). The EPLs were granted in September 2002, and since then, Safuan Resources have been submitting biannual reports to the DEA for the period January 2000 until December 2001. A screening questionnaire and an environmental questionnaire were also completed. Despite the fact that no Environmental Clearance was issued for these EPLs, a letter of permission to prospect was issued by the Director of the DEA in 2000. The biannual reports indicate that no prospecting work had been conducted on EPL 2564 between January 2000 and December 2001. The trenches dug were limited to less than $100m^2$ along the beach terraces. This information was obtained in a biannual report handed in for the period December to June 2002.

In 2003 Nambib submitted an EIA with some management principles. The EIA was prepared in house by the company geologist. The EIA does not fulfil the minimum requirements of the Namibian Environmental Assessment Policy and could barely be seen as a scoping report.

Bulk sampling as well as grab sampling was undertaken on EPL 2564. New tracks were also made by heavy trucks and movement of other mining equipment to and from the sampling pits and main sorting area. In April 2005, Nambib Resources wanted to evacuate their EPL and required a letter from the MET signing off on the rehabilitation of the prospected areas. According to a letter of correspondence by the principle ranger of the park (Engelbrecht 2005), dated April 19 2005: ‘Although a rehabilitation attempt was made at most of the areas where bulk sampling took place no attempt was made to rehabilitate the tracks made by the heavy trucks and other mining equipment … more work still needs to be done to smooth and re-landscape the areas where rehabilitation has been attempted.’ The camp area was not rehabilitated.

According to the EMP drafted by Nambib Resources (Hutton & Palfi 2003), the company undertook to rehabilitate all areas to ensure 'near visual obliteration of tracks and scars'. A definite problem exists when impossibilities are stated in EMPs, which can not be delivered on or enforced. The EMP should never have been accepted by the authorities, due to its obvious shortcomings. This has resulted in an outcome making it hard for park authorities to get the mining company to undertake a minimum of rehabilitation.

Nambib Resource has not demolished either its camp or the fencing erected as perimeter for security purposes, as the company was sold to a new owner who insisted that the infrastructure be kept. No application of the new owner was available at the DEA nor the MME and the current EPL expires on 5 September 2005 should the new owner of Nambib Resources decide not to prospect the EPL, MET will have to complete the rehabilitation. This commentary is prompted because EMPs and closure plans are required to be set up prior to commencement of prospecting and mining, yet SCP is scattered with the legacy of abandoned, unrehabilitated mining areas.

NNDC (Northern Namibia Development Company) has obtained the rights for EPL **2633** for precious and semi-precious stones. In their EIA and EMP, they make reference to both diamonds and rubies. In the case of this EPL, clearance was granted before the EIA was approved and a year later a substandard EIA was submitted to the DEA, together with an equally poorl EMP. Neither documents meet minimum standards and are riddled with errors. No attempts have been made to put a workable EMP in place to facilitate proper monitoring and auditing nor could any biannual reports be found on file at the DEA.

During a 2003 survey, concern was raised about NNDC constructing an airstrip. The strip was compacted by spraying and pumping salt water onland and then compacting by a front end loader. There was also concern that fishing trips to the Kunene River mouth were being organised in return for monetary payment, which cannot be classified as 'fishing for the pot' legal. NNDC was given allowance to fish for food, however not to fish for commercial tourism purposes.

During the survey, no evidence of prospecting was detected. A few grab pits were on display, but these were small in size and did not warrant the expense of obtaining an EPL in such a remote area. The onsite geologist did refer to further explorations that have taken place in the Kunene River channel, but no evidence of this was evident. All mining equipment was reported to be off site for repairs at the time of the survey!

A status report, on 22 February 2004, by the senior warden stated that: ‘during a discussion…they said they had extensively sampled the river gravels and even pumped gravel out of the river channel itself. These operations had produced no results and consequently they believe that these gravels do not carry any diamonds’(Patterson 2004).

The Kunene River mouth forms an integral part of the proposed Transfrontier Park between Namibia and Angola. A combining of the Skeleton Coast Park and the Iona National Park in Angola is planned to occur in the near future as well as the declaration of the mouth as a Ramsar Wetland of international importance.

Safuan Resources obtained EPL **2696** and have provided both an EIA and an EMP to the DEA. In August 2002, the principal game ranger (Engelbrecht 2002) of the SCP wrote a letter to the DEA stating that the area was satisfactorily rehabilitated, except for the camp and the refuelling area. The refuelling area was the responsibility of the supplier (Shell) according to the Ranger. Yet, in the EMP provided, the decommissioning procedure were to entail:

- Checking all excavations to ensure that filling in and surface rehabilitation has been satisfactorily completed.
- Checking that all vehicle tracks made during ongoing operations have been adequately rehabilitated.
- Checking that oil and fuel spillage spots are adequately corrected.
- Removal and dismantling of all structures built during exploration operations, accompanied by burial of all rubble.
- Removal of fuel depot accompanied by clean up of any spilt fuel.
- Removal of any remaining scrap metals and household wastes.
- Final inspection and meeting with the Chief Nature Conservation officer to ensure satisfactory decommissioning.

The above points were accepted by the company in their EMP as part the decommissioning plan, this in turn was accepted by the DEA. Once decommissioning begins it is unacceptable for parties not to rehabilitate accordingly, even less unacceptable is it for the regulators to not enforce the agreed documents.

During the initial survey in May 2002, the camp was found to be in the same state as described by the ranger previously. During a later survey in 2003 the site had still not undergone any

rehabilitation, concrete slabs had still not been broken up and buried and roads had not been ‘adequately’ rehabilitated. No effort had been made to fill in and flatten any trenches. On the final survey undertaken in July 2005, no progress had been made, showing a clear disregard by Safuan Resources (or Nambib Resources) of their own EMP.

The EPLs **2699** and **2700** were initially applied for by Reefton Exploration, and have since been transferred to Storm Diamond Mining Company. Currently, both EPLs are pending according to the MME database; this would be as if they had expired and are awaiting decision on renewal. Storm Diamonds have applied for an extension period on the prospecting license for another two year period; this should result in a reduction of the license area.

Detailed exploration programmes were handed to the DEA by Storm Diamond Mining Company. An EIA and EMP were also submitted, however these documents are not considered to meet the Namibian EA policy standard. Clearance was given for the EPL, after which the company submitted a biannual report for the period July to December 2003. The EIA, prepared by MSW Namibia (Pty) Ltd, states that there is only very occasional vegetation present and the impact on flora would be minimal. The document also states that, after discussions with MET staff, it was indicated that no rare or endangered species of fauna were present.

Approximately 10 trenches and several pits had been dug, of which some had been rehabilitated according to the biannual report. Also according to the report no impact occurred as: ‘the trenches and pits are on dune sand or gravel terraces with no vegetation and therefore very rare animals; not even ants live in these environments’ (Hemming 2003: 5).

A biannual report was handed in to the DEA for the period January to June 2004. According to this report, 62 trenches had been dug, though no indication was made as to any rehabilitation taking place. As to any additional remarks: ‘the trenches and observation pits are on dune sand and gravel terraces with no visible fauna and flora’ (Hemming 2004: 5).

The EPL **2742** belongs to Crater Mining (Pty) Ltd, who in turn is owned entirely by Rusina Mining Ltd (an Australian company). According to the Rusina webpage (Barras 2003) they entered into a joint venture with Reefton. Reefton purchased 80% of this EPL in October 2003 for prospecting. The only documentation handed to the DEA since Crater had applied for the EPL is a screening questionnaire and an environmental questionnaire. Crater had however been granted their EPL, and

their current application for renewal is pending. Whilst an EPL is pending renewal, it may be prospected, according to the Minerals Act of 1992.

Tiko Ventures initially received EPL **2926** in 2001, and renewed it on September 2, 2004. The clearance initially given by the DEA in 2001 did not include any activities below the low water mark, and also was given with no EIA or EMP in place. However as the type of operation shifted from land based to shallow water (intertidal), the DEA insisted on an EIA prior to allowing any further prospecting to continue. This change in operation occurred due to a change in ownership within the company.

Shallow water operations such as the one described in the EIA (Envirosolutions 2004), if not managed correctly can have major environmental impacts. The EIA and EMP were not of an acceptable standard. The EMP was not a working document, not for in-house monitoring nor for auditing by MET staff. The EMP was merely set up to comply with the request from the DEA, however was not of any quality that would be acceptable for any operation prospecting within a protected area.

Expert review of the EIA was provided to the DEA by a colleague from the Ministry of Fisheries and Marine Resources (MFMR). The review raised concerns regarding whether prospecting should be permitted, “as the area under consideration is a spawning ground for sardine, anchvy and horse mackerel, as well as a nursery for juvenile horse mackerel. Furthermore the area serves as the main feeding area of silver kob and west coast steenbras. It should also be mentioned that this is a rocky area which is the main feeding/breeding area for galjoen and blacktail” (Mbako 2004). This information was provided prior to environmental clearance being given, for the prospecting operation to go ahead.

Smartis Diamond Recoveries applied for environmental clearance, completed the environmental questionnaire and supplied information as to their prospecting activities on EPL **2934**. They did not want to undertake an EIA since they believed it to be too costly, and according to the company, their activities would not be too intrusive. The reason for not complying with legislation and conducting an EIA was given as: ‘we would like to know if there are any diamonds in the area before we have to spend a rather huge sum of money’ (Smit 2002). No clearance was ever given as they never complied, however they did obtain their EPL on June 3, 2002.

Smartis Diamond Recoveries did conduct some prospecting activities in the park. Their activities were limited as it seems they worked on a small budget. There was no further contact between Smartis and the DEA after the company was instructed to conduct an EIA. Smartis did not hand in Environmental Reports nor enter into any Environmental Contract with the MET. No EMP or closure plan was ever set up to the knowledge of the DEA. Prospecting has been completed and according to the warden in the Park rehabilitation was done satisfactorily. During the last survey in July 2005 the EPL was located and tracks were followed across the EPL, however due to a lack of information provided no trenches or pits were located to inspect the rehabilitation process.

4.3.1.3 Inactive EPLs

EPL **2961** was initially applied for by J. A Strauss, and now belongs to B Shaanika Development & Mining cc. The DEA was approached for Environmental Clearance and an environmental questionnaire was completed; no further documents were received from the applicant. No EIA or EMP were undertaken or set up to ensure compliance with national legislation. No environmental clearance had been given to the applicant; however Shaanika Development & Mining is in possession of an EPL issued 11 July 2002.

For the EPLs **3010** and **3011**, environmental questionnaires have been completed by August 26 Holding Company; however no further information or documentation was lodged by them at the DEA. The company is in possession of prospecting licenses, issued on 11 June 2002 though it has not obtained environmental clearances from the DEA. The licenses were issued for precious stones and industrial minerals.

For the EPLs **3028** and **3029**, Tradeline Namibia submitted an EIA and a screening questionnaire to the DEA as its application for environmental clearance. The EIA was not conducted in accordance with the Namibian EA Policy. No Environmental Clearance was given to Tradeline, yet they have received their Exclusive Prospecting License dated 11 July 2002 for precious stones.

Precious Stones Explorers cc were granted EPL **3113** on 22 October 2003. It is an offshore EPL, however according to the GIS spatial information from MME it appears to be close to shore.

SAAN Diamond (Namibia) (Pty) Ltd was granted EPL **3130** on 19 April 2004. The EPL is offshore, yet its exact boundaries are uncertain and it appears to be close to shore. Due to a lack of information and no record of the above mentioned two EPLs (3113 and 3130), at the DEA it is of concern that they could be prospecting or intending to prospect in the intertidal zone. Again this

would be of concern as was pointed out by the expert reviewer from the MFMR, for the possible impact on spawning, feeding and breeding of various fish species.

4.3.1.4 Lapsed EPLs

For the EPL **2876**, besides the environmental questionnaire handed in by Nam India Mineral Development Corporation, no further information was located. This application seems to have lapsed, as it is no longer on the MME database. No prospecting ever took place.

As per requirements for the EPL **2959**, Oshifukwa Mining Corporation applied for clearance, filled out the environmental questionnaire, but never proceeded further. They never obtained environmental clearance, and also did not undertake any prospecting.

4.3.1.5 Pending EPLs

Storm Diamond Mining Company (Pty) Ltd has applied for offshore EPL **3196** which is still. According to GIS spatial information from MME it appears to be close to shore. It is assumed that no application has been lodged with the DEA, as no record has been located; again the concern is of the high impact on the intertidal zone that diamond prospecting may have if not monitored closely. The company have also applied for EPL **3237**, and the same concerns regarding intertidal prospecting are raised for this application.

Fast Grow Mining cc has applied for EPL **3234** which is still pending, and is also an offshore EPL. Once again, according to MME GIS spatial information, it appears to be close to shore. No record of application has been located at the DEA. Concerns regarding the potential high impact on the intertidal zone diamond prospecting may have are again raised.

Kaneka Diamonds (Pty) Ltd have applied for the EPL **3240** which is still pending. No application has been lodged with the DEA as no records could be located. As soon as an application for an EPL is handed in, the applicant is informed that an environmental clearance is required from the DEA. Not contacting the DEA should delay the application process for an EPL, resulting in the application being denied.

Samicor Diamond Mining (Pty) Ltd has applied for two offshore EPLs – **3266** and **3297**, both of which are still pending. No application has been lodged with the DEA as no record has been located; again the concern is the impact on intertidal zone prospecting.

Amakutuwa Joses Malakia lodged an application for onshore EPL **3306**. It is still pending and no application for clearance has been lodged with the DEA.

The EIA's that have been reviewed for the active EPLs in the SCP were not in compliance with the Namibian Environmental Assessment Policy. Three surveys had been conducted to establish the level of compliance with the EPL holders, and these had always resulted in non-compliance in regard to information provided to the DEA. EPL holders who are not active in the SCP should have their licenses cancelled, as being a holder who is not actively prospecting contravenes the Minerals Act.

4.3.2 Prospecting method

There is little difference between mining of and prospecting of alluvial diamonds, except that prospecting is smaller in scale and more selective in site selection, to ensure a representative sampling. The historical prospecting method of the 1960s and 1970s were similar to those used today, and were based on very similar geological theories. Three different methods of prospecting are highlighted in the following sections.

4.3.2.1 Trenching on land

Trenches are excavated down to the bedrock mainly by front-end loader, so the depth can vary anywhere from one to 10 metres. Trench lengths vary depending on the mining company involved. For instance, Storm Diamonds' exploration program states that trenches would be 0.8– 1.0m wide (some may become 10m wide for access purposes) and 100–300m long; Nambib Resource's average trench will be 50m wide and about 400m long (the width may increase to 100m in case of shallow deposits).

The typical prospecting and sorting operation is profiled in Figure 4.6. Material excavated from the trenches is screened in the field and undersized (sand and finer material) and oversized material is eventually returned to the trenches. The intermediate fraction – the portion containing the diamondiferous gravels – is transported by trucks to the recovery plant.

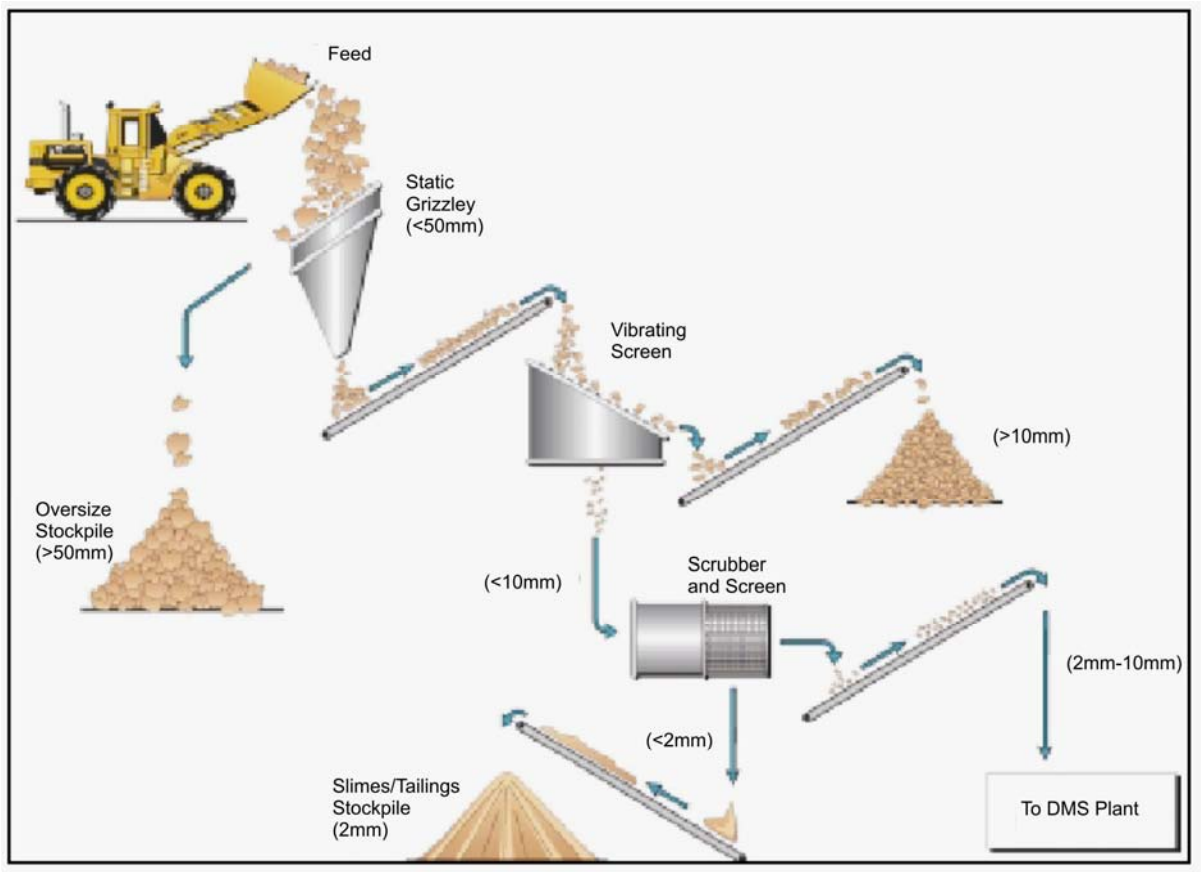


Figure 4.6 Sorting process of excavated material

The initial screening is expected to remove as much as 80% of the material as oversize (+50mm) and sand (±2mm). The Static Grizzley (an initial sorter) separates out all oversized material larger than 50mm, the Vibrating Screen separates out all undersized material, smaller than 10mm. The Scrubber is designed to remove any dirt that may be sticking to the outside of the stones and hopefully any diamonds for recovery. The material then runs through a Dense Media Separation (DMS) plant. This plant uses an environmentally inert dense media (generally ferro-silicon[5]) to create a dense fluid in the plant. Light minerals and rocks 'float' in this liquid and are discarded. Heavy minerals, such as diamonds, sink and are collected as a concentrate from the base of the dense media. This concentrate is collected at regular intervals and sorted for diamonds.

4.3.2.2 Beach mining

At present only one company has undertaken any prospecting in the intertidal zone – Tiko Ventures on EPL 2926 – though their operation is similar to that described in the next section. However,

[5] Ferro-silicon is chemically unstable in an oxidising environment. When exposed to the atmosphere the reaction is:

$$2FeSi_{(solid)} + 5O_{2(gas)} >>> 2FeO_{(solid)} + 2SiO_{2(solid)}$$

seven EPLs likely to be granted are still pending in the SCP, and while no evidence is available as to what type of setup they might operate, it is likely to be beach mining operations.

Beach mining operations are typically conducted between the high water mark (HWM) and the low water mark (LWM). Mining targets are gravel beds underlying the beach sand, gravel overlying bedrock, as well as gravel in gullies and/or potholes in the bedrock. Depending on the degree of sand inundation on the beaches at the time of mining, the overburden layer may vary in thickness from less than one metre to as much as three metres.

Heavy machinery such as bucket shovels, bulldozers or front end loaders are used to rapidly expose gravels during low tide periods. The underlying gravels are subsequently extracted using one of three basic approaches, distinguished by scale of operation only:

Small-scale beach mining

As Figure 4.7 depicts, excavators dig down to reach the diamondiferous beach gravels and sea

Figure 4.7 An example of small-scale beach mining operations.

walls are constructed with the overburden to provide shelter for divers and equipment from waves and the rising tide. The excavations are filled with water; divers with suction hoses remove the diamond bearing gravels, which are then bagged and transported by a tip-truck to a central sorting facility.

Medium-scale beach mining

Sea gravels are extracted by excavator and bucket shovels, where it is transferred to dump trucks (see Figure 4.8). The trucks transport the gravel along the beach and deposit it into a second

Figure 4.8 An example of a medium-scale mining operation.

excavation, centrally located and protected by a large sea wall. Here a sorter removes diamondiferous materials.

Large-scale beach mining

In large scale operations gravel is extracted by bucket shovel and transferred to dump trucks. A rock-stabilised seawall protects the whole mine area and especially the sorter (see Figure 4.9).

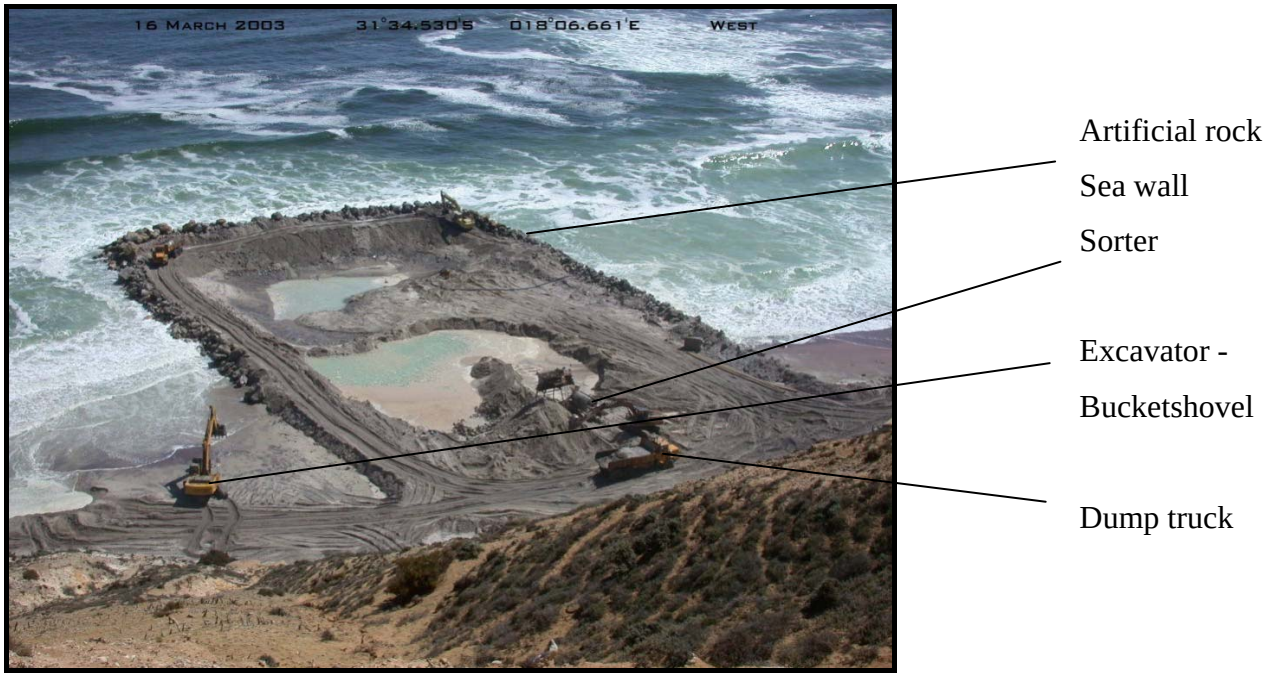


Figure 4.9 An example of a large-scale 24 hour beach mining operation.

While this type of operation is mechanically similar to smaller operations, the impact on the landscape is logically much more pronounced.

4.3.2.3 Shore-based mining

This last type of operations are confined to small bays, and are typically conducted using small-scale, diver-assisted suction equipment. A shore-based operation typically consists of between two and four divers, their assistants, and a tractor-driven classifier. Divers guide the suction hose into the gravel deposits, which are sucked up and delivered directly to the classifier. Target ore bodies are subtidal gravels residing in gullies and potholes, and to gain access to these the divers often have to move large rocks and boulders.

Having considered much of the mechanics involved in getting prospecting and mining operational along the Skeleton Coastline, the next chapter gauges the potential environmental impacts that might result from such operations.

CHAPTER 5 MINING IMPACTS AND ENVIRONMENTAL MANAGEMENT

Mining by definition is an unsustainable industry. Although mines provide considerable employment and earn valuable foreign currency, all ore bodies are finite and every mine will close eventually. When that happens, the land may be utilised for some other purpose if post-mining rehabilitation has taken place, or else join with a barren wasteland of unrehabilitated mines.

This chapter deals with the various impacts that the mining operations have or could potentially have on the environment. The Oxford Dictionary provides the definition for impact as: ‘strong effect or influence’ (Allen 1984). Any activity including mining and/or prospecting operations variously influences its surrounding. Spheres that may be influenced include the national economy, local economies, local industry and many others; each could warrant a separate study.

Impacts and the management thereof are often dependent on many factors, especially the type of operation and its location. This chapter is based on specific case study observations made regarding the mining operations and their impacts. Use of other examples is made where relevant to better demonstrate the situation at hand. Operational management guidelines, as well as rehabilitation and restoration guidelines set out in this chapter, are based on basic industrial standards and meeting basic minimum requirements.

5.1 INSTRUMENTS FOR IMPACT PREVENTION

One way of anticipating future environmental impacts and designing ways to avoid or minimising such impacts, is to do an Environmental Assessment (EA) prior to undertaking an activity, such as mining or prospecting. EAs are common practice throughout the world. Most responsible mining houses conduct EAs as a matter of routine, while some even have their own corporate environmental policy. The level of detail for EAs depends on a number of factors, including the nature and scale of the intended operation, the sensitivity of the environment in the specific area, the potential conflicts with other forms of land uses, and an initial estimate of the expected environmental impacts.

It is becoming standard practise to have an Environmental Management Plan in place prior to prospecting or mining a target area. Too often, however, the importance of having a well structured,

all encompassing plan is still not recognised by those in the mining industry. In some areas, such as the remote Skeleton Coast, it would be advisable to have a qualified environmental consultant set up an Environmental Management System that aids management in responsible and feasible planning.

At the commencement of exploration programmes, each on-site employee should be issued with a simplified outline of the requirements of the EMP. On issuing this document, it must be made clear to employees that they are expected to follow this plan (MSW Namibia 2002).

Rehabilitation is the general term used for measures taken in removing infrastructure and cleaning pollution that has occurred. Some mitigation and other processes such as replanting or grassing of areas, or sloping of tailings are examples of rehabilitation. Restoration goes beyond rehabilitation, it is the process of reinstating the habitats, environmental conditions, and plants and animals that were there before any disturbances took place (Burke, 2005).

5.2 DOMESTIC AND INDUSTRIAL WASTE

Waste is produced as a by-product of every mining operation; the waste can be of a domestic or industrial nature depending on the process at that particular stage. It is important to identify the waste and to be able to correctly predict the potential impact of waste prior to it occurring. Once these potential impacts have been identified it is essential to establish operational management guidelines for these, and ultimately rehabilitation and restoration guidelines.

5.2.1 Waste typology and potential impacts

As soon as temporary or permanent housing is erected and occupied, waste is created. Waste from offices, kitchens, canteens and other buildings is continuously produced, as is sewage from ablution facilities. Depending on how the domestic waste is disposed of, litter can very easily accrue, if a careless attitude is taken. ‘There will be a long term although probably negligible impact associated with the ‘long-drop’ toilets, with the shower drains and with any kitchen drains,’ according to MSW Namibia (2002).

Industrial waste is a given by-product of any mining operation. The type and extent of industrial waste created depends largely on the nature and location of an operation. A diamond prospecting operation at the Skeleton Coast requires large amounts of diesel, a variety of lubricants and oils for machinery and vehicles. Ferro-silicon, the only chemical reagent used in the Dense Media

Separation Plant is chemically unstable in an oxidising environment and hence does not pose a high environmental risk. Other by-products include discarded batteries, tyres, cables, used rags, and materials from the workshop where the machinery and vehicles are maintained. Any item that has been contaminated by hydro-carbons becomes industrial waste.

5.2.2 Operational management guidelines

Non-biodegradable and biodegradable refuse should be stored in a container and collected on a regular basis and disposed of at a recognised disposal facility. Precautions should be taken to prevent any refuse spreading on and from the camp site. The waste container should be covered with a mesh 'lid' to control access by animals (De Vincentiis 2000).

Both waste and **new hydrocarbons** (diesel, paraffin, grease, waste oils, etc.) should be stored in suitable containers in a demarcated section of one of the temporary waste storage areas. Waste hydrocarbons should be removed from site regularly to ensure that the temporary waste storage area is never full (MSW Namibia 2002).

Certain **domestic waste**, such as the kitchen and canteen waste, in many circumstances is recommended to be stockpiled and utilised for compost. This practise is only viable if enough water is present and the compost can ultimately be utilised. It is not a useful practise in the SCP. The available flora does not benefit from it and no alien flora may be established. In addition, scavenging animals such as jackals and hyena would rummage through the compost mound at night. It is recommended that all kitchen and canteen waste be accumulated with the other domestic waste.

Certain items could be removed from the waste stream and recycled – including glass, cans/tins and paper. The viability of separating waste is uncertain as most prospecting operations in the SCP are often fairly small, and the logistics of stockpiling different waste streams in remote areas does pose problems. Further, if recycling were to occur, recyclable materials would have to be transported to either Walvis Bay or Windhoek as these are the only known collection points for such materials. Figure 5.1 shows an example of poor waste collection – hydro-carbon and domestic waste together all in one bin, with no recycling taking place.

Figure 5.1 Waste collection point at EPL 2700 (Storm Diamonds)

Wastes need to be contained in animal-proof drums which are secured to the ground and with a solid lid. It is advised that the drums be in an enclosed, preferably fenced, area to prevent windblown debris from escaping, and scavenging animals from toppling and rummaging through the waste.

Various types of **toilets facilities** are used, but in most circumstances a French drain system is most suitable. Chemical toilets are also suitable, as long as biodegradable chemicals are used. Prior to the construction of the French drain, consultation with the local park warden is paramount, as underground waterways are often present and have to be avoided.

Hydro-carbons, like diesel is either brought in 200*l* drums or in large 23,000*l* steel storage tanks, or both. Lubricants and oils are stored in drums and similar containers. Other reagents and solvents required also need to be stored in a secure and sound manner. As most companies only set up temporary facilities they do not construct correct bunding facilities[6] for their hydro-carbons or for their reagents and solvents. Most companies use a container as a storage facility. This is inadequate,

[6] Bunding refers to an impervious barrier that is constructed around the area of concern, e.g. a storage area or workshop area. The usual material used for bunding should be concrete, however for temporary situations strong PVC sheeting can also be used.

as their management plans invariably do not provide for spillages and accidents. Also, the cost of correct plant closure and terrain rehabilitation increases with time, where spillages or accidents had occured and nothing was done about it at the time. All areas, not only those most exposed to pollution, must be remediated at closure, but if spillages or accidents had occurred, this could become very costly and time consuming.

For a temporary base camp impervious PVC sheeting should be deployed as flooring and covered with sand, to absorb spillages (as seen in Figure 5.2). A bund wall needs to be constructed at the

Figure 5.2 Oil drums stored on a PVC liner

entrance to containers to prevent spillage from the container. Should spillages occur, contaminated sand needs to be removed and stored in a drum, to be later removed to an approved disposal site. When soil has become contaminated by oil, it should be spread thinly in the sun in a designated soil management area, and regularly aerated to allow break up of the hydrocarbons.

Other **by-products** such as old batteries, tyres, cables, rags, and anything that has been contaminated by hydro-carbons, needs to be stockpiled and removed to approved waste sites. An example of a poor waste collection point is seen in Figure 5.3; here contaminated materials as well as salvaged goods lie dumped together.

Figure 5.3 Storm Diamonds Scrap yard at EPL 2700

Depending on the nature and amount of waste created, each operation should reach an agreement with the Park Management on what waste can be deposited at a demarcated waste site in the park, or if it needs to be removed to designated sites outside the park. The nearest industrial waste site to the SCP is in Walvis Bay, the other in Windhoek. Under no conditions should any waste be buried or burned on site.

5.2.3 Rehabilitation and restoration guidelines/principles

If correct waste management principles are applied, little to no rehabilitation would be necessary for domestic waste streams. If waste is disposed of in properly secured bins, no litter should have been generated, hence no clean up should be required. If the French drain system is properly dug and constructed, it should only need to be filled in, covered and raked. The French drain depicted in Figure 5.4 is an example of a very poor construction of an unacceptable standard. The outflow is at the surface, flowing from a higher to a lower point. The soakaway which is enlarged in the insert should be a minimum of 1m x 1m x 1m and below the incoming pipe. The stone infill should surround the pipe and extend approximately 100mm above it. An impervious layer such as thick polythene, tarpaulin, or even a bed of concrete should then be placed on the stone. Topsoil should

Figure 5.4 French drain on EPL 2700 (Storm Diamonds)

then be placed on top of this layer to restore the level. This ensures that there is enough space for the effluent to flow into and soak away. The stone infill helps with the filtering. The mere hole in the sand depicted in Figure 5.4 would not be sufficient.

All drums and containers need to be removed at closure, and all contaminated soil needs to be rehabilitated or removed. Oil spills can be broken down by sun exposure, but this process takes a very long time unless the soil is turned and aerated every couple of days. The soil also needs to be thinly spread in order for this natural process to be effective. If these procedures cannot be followed, the soil must be removed and disposed of at an approved hazardous waste site.

5.3 AIR POLLUTION

Mining operations create emissions and these need to be identified and treated as potential impacts. To combat these impacts operational management measures are required in final rehabilitation and restoration guidelines.

5.3.1 Waste typology and potential impacts

Vehicular movement creates dust, but this is not always so severe that it can be considered as air pollution. The hot and dry environment, the loose, sandy nature of the substrate and low vegetation cover, cause ambient fugitive dust levels in this area to be high (EnviroSolutions 2004). Due to the high and consistent prevailing wind speeds sand particles are persistently suspended in the air, so vehicles at moderate speeds would not be considered as major dust pollution agents.

Other air pollution agents are gaseous emissions from diesel generators and other earthworking and excavating machinery. If these are not serviced regularly and fitted with filters, emissions can be excessive and concern should be raised.

5.3.2 Operational management guidelines

Regular maintenance of vehicles and machinery is essential to keep costs of repairs low, and also to ensure that air pollution by vehicles is restricted to acceptable levels. Due to the prevailing wind conditions, the vast open spaces and lack of habitation, air pollution is of little concern, however sound environmental management should be practised at all times.

5.3.3 Rehabilitation and restoration guidelines/principles

Once air pollution damage is done it can not be reversed or mitigated. It can only be prevented from occurring in the future. At closure, air pollution usually becomes a non-factor as the activity ceases (machinery stops working thus there are no further emissions). Prior to closure, besides the correct management principles as detailed in the previous sub section, little can be done in the way of rehabilitation.

5.4 SOIL POLLUTION

As waste is produced at almost every stage during an operation, incorrect operational management guidelines inevitably lead to soil pollution. In order to prevent soil pollution, operational management guidelines to avoid potential impacts should be established. Ultimately rehabilitation and restoration guidelines will be needed for when operational guidelines are not followed.

5.4.1 Waste typology and potential impacts

Chemical and hydro-carbon spillages on the soil are the main causes of soil pollution associated with mineral prospecting in the SCP. The main areas where spillages occur are in the so-called

'workshop' area, where machinery and vehicles are maintained, and/or vehicle alterations are undertaken. Another area that is commonly heavily polluted is the refuelling bay, which usually has bulk storage of diesel or other fuels, as well as storage for a range of lubricants.

Topsoil contains the majority of the living soil organisms and the organic material, as well as the seeds of plants. The living components – which include fungi, insects and microbes – ensure that nutrients are broken down and become available to the plants, and retain moisture in the soil (Burke 2005).

Soils in arid areas may be disturbed through the disruption of the surface microtopography or through compaction[7] and modification of the subsurface layers. Both of these impacts would result from the uncontrolled passage of vehicles – including earthmoving equipment – across a prospecting area. In an arid climate such as the SCP, the recovery of soils from compaction as a result of vehicle tracks may take 50 years (EnviroSolutions 2004).

Mining activities, such as stockpiling of soil and incorrect management of topsoil, result in the loss of the natural vegetation seedbank and the ultimate sterilisation of the soil. After a prolonged period of stockpiling, the soil becomes barren and has lost its natural nutrients and seedbank, meaning what may have been useful topsoil is now part of the rock overburden. This results in the area becoming permanently denuded of vegetation, and hence exposed to wind erosion.

Contamination from sewage and mineral processing, extraction and recovery processes can affect large areas. 'There will be minor salination of the sand below the scrubber and the DMS plant's tailings/sand dam due to the downward movement of the seawater during the time the plant operates… ,' according to MSW Namibia (2002).

5.4.2 Operational management guidelines

To minimise the areas where the soil surfaces is compacted through vehicular movement, it is important that, prior to commencement of any mining activities, all routes for vehicles are clearly marked. Prospecting sites or mining areas will have been identified by the geologist as the first step of any mining exploration. The project coordinator or mine manager, together with the park warden,

[7] Webb (1983) describes compaction as the 'application of forces to a soil mass, which results in an increase in bulk density and soil strength'.

should take those identified sites on a map, and clearly demarcate routes. It is important to demarcate these before the construction or mining teams arrive, as no member of the mining company should ever drive off road, but should at all times stick to the demarcated routes. This makes rehabilitation easier as a smaller area is impacted, as well as saving habitat and protecting soil from compacting.

Once mining commences, the topsoil needs to be removed and stockpiled. A common argument is that in this desert environment there is not much (or any) topsoil available, any topsoil that can be removed is valuable and is therefore worth stockpiling. This soil needs to be covered to prevent it from being windblown. A problem with stockpiling topsoil is that it becomes ‘stale’ if it is stored for too long. After a few months, the soil should be used in rehabilitation of a trench or hole, before a new one is dug. If the soil is not used within six months, the soil conditions deteriorate and the seeds stored become unviable (Burke 2005).

Hydro-carbon spillages are almost inevitable. However, should proper planning and management have taken place during the construction phase and prior to mining commencing, any serious impacts should be avoidable. All areas where hydro-carbon spillages and pollution are frequent such as in the workshop areas and refuelling bays, must be bunded. Also all hydro-carbon products need to be stored in a bunded area, even when empty, to avoid any accidental spillages. Where oils, lubricants or fuels are stored the bund needs to be able to contain 110% of all the materials stored, in case of an accidental spillage or leakage. A good example of a diesel tank with a well constructed bund that would be able to contain 110% of the diesel in the tank, is provided in Figure 5.5.

Figure 5.5 An example of an appropriately bunded diesel tank

In areas where ad hoc, unforeseen, spillages occur such as a burst hydraulic pipe, a spill kit[8] needs to be available to deal with the spill immediately. If the spill is not cleaned straight away, further negative impacts such as groundwater pollution can be caused. Contaminated soil needs to be removed and taken for remediation or containment. Once the soil has been successfully treated it can be reused for coverage in areas around the camp or in the mining area. Soil that has not been treated needs to be stored in a bunded area and disposed of at an approved hazardous waste site.

'All machinery will be properly maintained to ensure the minimisation of oil leaks, etc. This will be achieved by regular minor maintenance on site by the operator and local mechanics. The service area will consist of a sand covered heavy duty PVC sheet (with raised edges) to ensure that any spill in the area is contained. The generator and the diesel tank on site will be placed on areas that have an impermeable base and raised sides (e.g. PVC covered in fine sand) to ensure that any leaks or spills of hydrocarbons are contained …' (MSW Namibia 2002).

5.4.3 Rehabilitation and restoration guidelines/principles

Hydro-carbon contaminated soil needs to undergo remediation immediately to avoid further knock-on effects, such as water pollution. The contaminated soil needs to be treated either by adding bacteria, which break down the spilled hydro-carbon, or by simply distributing the soil thinly in direct sunlight and then turning this soil regularly, so that the sun can naturally break down the hydro-carbons. The latter option is cheaper, but is more labour intensive and needs careful monitoring to ensure correct handling and remediation of the soil. The former option, of adding bacteria, is more expensive but easier to control and effective.

5.5 SURFACE WATER POLLUTION

Surface water pollution can have serious long term consequences for the environment. Rectifying this type of pollution can be very problematic and costly so it is the best to prevent the pollution from ever occurring.

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[8] Spill Kit: 1 x wheelie bin; 2 x loose absorbent fibre (5kg); 1 x absorbent micro-boom; 1 x supersorb pads (50); 1 x pair elbow length PVC gloves; 1 x pair anti-mist goggles; 1 x polyprop shovel;1 x stiff broom; 5 x heavy-duty plastic bags and ties.

5.5.1 Waste typology and potential impacts

Soil pollution can lead to surface water pollution if, through precipitation or other means, water passes over the polluted surfaces into established waterways. Once hydro-carbons are evident in waterways, addressing this problem can be very costly and difficult, especially in desert environments.

Pollution of surface or sea water by accidental spillages of substances such as petrol, diesel, oil or grease is possible through, for example, bulk tank failure, spillages, or equipment failure such as burst hydraulic oil hoses (EnviroSolutions 2004).

Pumping of effluent can also contaminate surface water. Surface water pollution becomes a much larger concern in an environment that has more water than the SCP; and where mining operations require tailings dams and where tailings and waste water are often a source of surface water pollution (e.g. in copper mining).

5.5.2 Operational management guidelines

All effluent water from camp washing facilities should be disposed of in a properly constructed French drain situated as far as possible, but not less than 50m, from a stream, river, pan, dam or borehole. Only domestic-type wash water should be allowed to enter the drain. Any effluents containing oil, grease or other industrial substances should be collected in a suitable receptacle and removed from the site, either for resale or for appropriate disposal at a recognised facility (De Vincentiis 2000).

Occasionally direct contamination of the water bodies might take place, either through spillages from fuel or lubricant containers. In these cases it is advised to use a rope or rags tied together and float these across the surface to soak up the spill. This would only be effective if the spill was small, and action was taken quickly. Once the contamination drifts to the riparian zone or is found on the rivers edge, or anywhere near plants and rocks and soil, cleaning to remove the pollutant would become very difficult and almost impossible.

To prevent accidental spillages from occurring, the following recommendations are made:
Provide and maintain adequate bunding (i.e. impervious concrete slabs or plastic linings, drip trays, traps, sumps, etc.) where hazardous materials are stored and handled (e.g. at diesel generators and refuelling bays). Bunds should be adequately sized and capable of containing 110% of the

substances they are intended for. Bund walls must be constructed, for example around bulk diesel tanks. Always use a bunded area when refuelling or doing maintenance work on vehicles, machinery or equipment, or when transferring hazardous substances from one container to another. Used fuels, oils, hydraulic fluids, paints, solvents and grease should be stored in drums or other suitable containers in a bunded area.

In the event of a hazardous spill, whether accidental, deliberate or through negligence, on site or during transportation of these substances to/from site:

- Immediately implement actions to stop or reduce and contain the spill;
- Report the spill to the site manager and the Park Warden at Möwe Bay;
- Collect contaminated soil, water and other materials and dispose of it at an approved site (EnviroSolutions 2004).

The best environmental management principles to apply to mitigate against hydro-carbon pollution in surface water is to avoid all storage and handling of hydro-carbons near waterways, and to immediately clean all spillages on contaminated soils. At no times should pumping of any waste be allowed directly or indirectly into any waterway or water body. All waste outlets, such as sewage and tailings should be far away from any drainage lines and open water sources. No dumping of solid waste should occur near to any surface water. No ablution facilities may be constructed upstream from any water source.

5.5.3 Rehabilitation and restoration guidelines/principles

Surface water pollution is difficult to rehabilitate and often ceasing the polluting activity and then allowing time and nature to rehabilitate is the only feasible option. Surface hydro-carbon spills should be cleaned as far as possible by using ropes and rags. It is important that these ropes and rags then be disposed of in drums and taken to a hazardous waste site, either at Walvis Bay or Windhoek.

Water samples should be taken and tested regularly. Should any pollution be found, the source should be located immediately and rectified. In remote areas such as the SCP, no surface water pollution should occur, due to the lack of available open water. Should any pollution occur it would have grave consequences that would be almost impossible to rehabilitate without intervention.

5.6 GROUNDWATER POLLUTION

Groundwater pollution can have serious long term consequences, and rectification can be very problematic and costly.

5.6.1 Waste typology and potential impacts

Groundwater in Namibia is a very scarce resource. This section discusses two major potential impacts on groundwater resulting from prospecting activities – pollution of groundwater and changes in the water table resulting from excessive extraction of water. An important impact to consider is change in the water table due to excessive water extraction. Should large quantities of water be extracted upstream, significant effects downstream can occur, e.g. where the groundwater feeds a surface inception source such as a fountain; over-extraction could also lead to change in microhabitats and biodiversity downstream. Consideration of the particular system, the duration of extraction and the recharge capability would have to be included in order to understand what a safe extraction volume would be. Impacts of over-extraction would include the drying up of fountains and aquifers downstream, which usually are vital to the survival of ecosystems in specially adapted environments.

Hazardous chemical spillages not only pollute soils but, through seepage, also have the potential to pollute groundwater sources. If contaminated soil is not dealt with immediately, groundwater contamination is likely.

5.6.2 Operational management guidelines

For any mining operation, a minimum of fresh water is required for drinking and for ablution purposes. Certain mining and mineral processes also require fair amounts of fresh water. In remote and water scarce areas, careful planning as to sourcing of water is of utmost importance. Drilling and abstracting from nearby river beds is both illegal and extremely irresponsible environmental behaviour. Some mining operations truck in water, when distance from main roads and access allow. Other operations use small on-site desalination plants, though this depends on their proximity to sea water supplies. Some mining companies operating in the SCP have applied to abstract their water supply. In these cases, the amount being extracted needs to be closely monitored, to ensure safe yields limiting downstream impacts. Figure 5.6 depicts a fresh water

Figure 5.6 Spring in the Hoanib river with gemsbok in the background

spring in the Skeleton Coast Park. Should the mining operation expand, safe yields may be exceeded. Another management principle for the competent authority to adhere to is that of cumulative impact – the safe yield would change should another operation abstract from the same system further up- or down-stream.

Any spillages, soil pollution and/or surface water pollution need to be reported to the park wardens immediately, followed by sampling to ensure that nearby groundwater has not been polluted. This measure should not be carried to excess. Small spills contaminating small areas and not penetrating the soil more than a few centimetres, need not lead to expensive groundwater sampling. If extensive hydro-carbon pollution has taken place or has taken place over a prolonged period, and/or if chemicals are discharged, it is advised that a monitoring program of groundwater sampling at regular intervals be implemented.

5.6.3 Rehabilitation and restoration guidelines/principles

Should poor environmental management have occurred and excessive abstraction taken place, this would only be noticed due to the consequences downstream and the damage would already have been done. Any attempt to try and curb this problem at this stage would be fruitless, except to prevent further excessive extraction.

Recharge of the springs in the SCP occurs naturally, fed by underground rivers which receive their water from far inland. The system would only return to normal after several seasons of normal rainfall, during which time vegetation may have died and animals may have migrated elsewhere. Again, human intervention to solve the problem would not be timely, except to cease abstraction immediately.

5.7 VISUAL POLLUTION

The main damage in terms of visual pollution, is aesthetic damage to the landscape, which is extremely hard to quantify (MSW Namibia 2002). Certain structures are erected and these need to be identified and seen as potential impacts. For these impacts, operational management guidelines need to be set in place, together with final rehabilitation and restoration guidelines.

5.7.1 Waste typology and potential impacts

In a country like Namibia where the national tourism slogan is ‘a land of wide open spaces’, visual impacts are of high concern, specifically because parks generate income from tourism. Namibia markets its desert and semi-desert environments as unspoilt and wild; with the implication that the parks in Namibia are pristine areas of nature, not spoilt by modern exploration. Mining as landuse conflicts directly with activities such as tourism due to noise pollution from drilling and blasting, earthworks, vehicular movements, and mineral processing. Other conflicts can arise from the visibility of structures, open trenches and stockpiles, vehicles and haulages and the dust generated by activities (Hutton & Palfi 2003).

Tracks in soft dune sand can be covered up within hours, whilst tracks made on lichen fields, salt plains, and interdune valleys are known to remain visible for many years as Figure 5.7 shows (Seely & Hamilton 1978). It is for this reason that it is important to have designated routes and to stick to these (see the section on soil pollution for further discussion regarding soil compaction resulting from off-road driving). Tracks made at high speed are less visible than those at low speed, and tend to recover faster (Daneel 1992).

Figure 5.7 Evidence of vehicle tracks

Correct siting of all mining infrastructure is equally important. Siting of the infrastructure such as the buildings and processing plant, should be planned in advance so as to minimise the visual impact. This also applies to the construction of waste dumps, tailings dams and stockpiles.

5.7.2 Operational management guidelines

Off-road driving is prohibited in Namibia's parks, yet the scarred landscape does not get a chance to recover as more tracks continue to be added. Mining companies should add a clause prohibiting off road driving into the code of conduct that all employees must sign when on site. The park warden could then fine the mining company and the mining company can hold the individual responsible in a disciplinary hearing if they were found to have driven off demarcated tracks/roads. It is important to make it clear to all employees during their induction how fragile the desert gravels are and what impact and scarring off-road driving can cause.

The correct siting of roads and mining infrastructure in collaboration with the park warden should be done before any work is undertaken. Park wardens know the movements of other park users, and hence locate the infrastructure to minimise visual impact. Another reason to involve wardens in site layout is their local knowledge, for example of the prevailing wind conditions and other unknowns that occur in later seasons, which could make life unpleasant.

Siting of roads should avoid the traversing of tops of ridges, and if possible always use existing roads rather than creating new ones. In areas close to the beach, driving should confined to the high and low water marks, and routes should be clearly demarcated so that no accidental diversion off of them is possible.

In order to minimise visual impact mining infrastructure such as the buildings should be sited in depressions, not on hill tops or rises, and should not be visible from any major tourist roads or lookout points. Figure 5.8 illustrates the visibility of Toscanini camp from far away, due its location

Figure 5.8 Camp at Toscanini seen from a distance

upon a rise. As to the stockpiles and waste rock heaps, current practise is to not have a management plan but to simply dump during mining. A sound environmental management plan should be in place that focuses on the constant rehabilitation of mined areas, so that stockpiles are constantly being backfilled. This minimises the area affected and reduces the amount of stockpiles and waste rock piled about.

The above are all management principles that should be in place and agreed upon by the MET and the mining company before any mining commences, to minimise the potentially conflicting land uses of mining and tourism. Driving past a small mining site in an area like the Skeleton Coast Park would not be a huge distraction from the magnificence of the area, however should most of the park where tourists drive be disturbed and lie unrehabilited, a clear conflict arises. In parks it is difficult

to see these two industries as being able to exist symbiotically, yet neither should suffer the unchecked behaviour of the other.

In production trenches should be filled by front end loader. Mined and processed material should be returned to the trench and the trench carefully filled. The excavator or backacter should be used to compress the trench material. When each trench is completely filled and compressed as described, all vehicle tracks, excavator marks, screening stockpile areas, etc., must be raked out and the surface restored and shaped back to the original profile. This action should start at the far end of the trench working back towards the access road. After completely restoring and rehabilitating a trench, the access road must be closed back to the pre-existing access as agreed with MET. Tracks should be removed by dragging used tyres behind a vehicle (MSW Namibia 2002).

5.7.3 Rehabilitation and restoration guidelines/principles

All tracks in the desert need to be rehabilitated. A highly effective, cheap and simple method is to rake the track, a very effective yet extremely labour intensive and time consuming process. A more popular option with mining companies is to drag tyres, weighing down a grid (picture of this contraption can be seen in Figure 5.9) behind a light off-road vehicle, and smoothing tracks out in this manner. This is a faster technique, and though not as effective as raking, it can have satisfactory results.

Figure 5.9 ‘Tyre and grid’ contraption for smoothing disturbed surfaces

Once trenches and holes have been backfilled with overburden and waste rock, topsoil should then be distributed on top to facilitate plant regrowth. In order to smooth this out, the mined area then also gets flattened by the 'tyre and grid' method. Care should be taken that the tyre and grid should be dragged perpendicular to the prevailing wind condition in order to facilitate some natural smoothing from the wind; this encourages seeds to get trapped in the depressions created.

Rehabilitation for plant and accommodation should include the removal of all construction equipment, surplus material and temporary structures, fences and works of every kind, including all scrap and other plant and equipment. Breaking up of all bunds and all other concrete slabs and removing these, together with all waste concrete, to a recognised waste dump is also necessary. The surface of all actively used roads should be broken up (scarified) to alleviate compaction and its associated visual impact (EnviroSolutions 2004). Toilets will require filling and shower drains closing. Parking and plant areas will require scarifying/raking to aid post closure recovery (MSW Namibia 2002).

The above principle should also be used for rehabilitation of roads. In some cases the park wardens would like certain roads to remain as these have become too compacted, or useful for park management. As for the mining buildings, these should be removed completely, including any permanent structures such as concrete slabs. Everything that was brought into the park should be removed.

5.8 VEGETATION IMPACTS

In fragile ecosystems, vegetation is easily disturbed, which often means that any disturbance to the environment will result in the loss of flora. It is therefore important to identify species present, understand them and then try and minimise impact upon them, with operational management guidelines. Ultimately rehabilitation and restoration guidelines should be set in place to allow the species to reestablish themselves.

5.8.1 Potential impacts

The most obvious impact on flora is direct loss due to soil removal, predominantly through digging and trenching. As topsoil is removed and overburden is stripped away, flora usually gets removed and buried. The topsoil that does get stockpiled for future rehabilitation purposes, may not be stockpiled for prolonged periods of time (in a desert environment ideally not longer than three

months), or the seed bank in the stockpile becomes old and useless. Most of the mining operations observed in the SCP do not remove the topsoil separately but remove the topsoil along with the overburden, and hence the seed bank is lost anyway as Figure 5.10 illustrates.

Figure 5.10 Old topsoil stockpiles totally devoid of vegetation (picture taken at Toscanini in 2005)

In a desert environment many species for example, lichens, go unnoticed. They are slow growing and ecologically very important, as they prevent wind and water erosion by holding the soil together (Lange et al. 1989). Daneel (1992) notes that the lichen cover reduces by as much as 80% after disturbance.

In the SCP, plant species have become highly adapted to the harsh climatic conditions, making them also very vulnerable. Increased movement in vehicular activities and the destructive nature of mining inevitably impacts vegetation and cause loss of habitat for flora to establish themselves, and loss of endemic and protected species.

Kelp is often cut by divers to provide access to prospecting sites. This activity causes a localised impact, the severity and duration of which depends on the extent and frequency of kelp cutting and the age of the plants. Kelp sporelings settle most successfully at or near the holdfasts of adult kelp plants, and recovery of kelp beds proceeds from the fringe of the cut area. Therefore, the greater the area cut, the slower the recovery. Many animals utilise the kelp bed habitats during the juvenile stage of their lives, and the loss of this habitat could have a small but important cascade effect (EnviroSolutions 2004).

5.8.2 Operational management guidelines

Having set up and in keeping with the Environmental Management Plan with respect to the off-road driving policy referred to earlier and correct siting of roads, damage to flora from vehicles should be minimised. Siting of roads in order to avoid any endemic and red data species is crucial, with species such as the Welwitschia, and lichen fields, given particular consideration here.

Similarly when trenching and digging for minerals, care should be taken to avoid endemics and Red Data Species. If at all possible, vulnerable and endangered plant species should be uprooted and relocated, though it is understood that this process is difficult with desert plants as often any disturbance causes them to die. Care should be taken to minimise destruction, especially if the activity is only of a prospecting and not of a mining nature. A geologist should be consulted with respect to the viability of moving the trench to avoid destruction of the fragile species. Established vegetation, in particular the coastal hummocks, must not be destroyed during on-shore activities, and should be avoided at all costs (EnviroSolutions 2004).

Certain micro-systems, such as hummocks of the coastal environment, should be protected at all costs, as they sustain a large biodiversity. These systems should be mapped as no-go areas, and should remain off limits, especially during prospecting. Should the operation progress to the mining phase and a mineral deposit has been proven, the impact of removing the hummocks should be investigated first – certain habitats are too valuable to loose!

In order to minimise the impact of kelp cutting, it is vital that pockets of kelp remain untouched in the area being prospected. This also includes restricting the width of the lane of kelp cut, discouraging clear cutting and discouraging repeated cutting. This will allow kelp beds to reestablish themselves after prospecting activities cease (EnviroSolutions 2004).

5.8.3 Rehabilitation and restoration guidelines/principles

In certain environments, little can be done to mitigate or minimise damage as far as flora is concerned. In this desert environment, species such as lichen can not be relocated or planted anew after mining is complete. The species are endemic and are extremely slow growing, so once lost they take an extremely long time to recover. In order to mitigate against plant loss, the only solution would be the no-go option, preventing any mining in these remote and fragile ecosystems. As mining is allowed and is taking place, the second best option is to identify particularly valuable species and then try to avoid areas in which they occur.

5.9 FAUNAL IMPACTS

In fringe habitats fauna are easily distressed, which can mean that any disturbance to the environment will result in the loss or change in behaviour of the fauna. It is therefore important to identify the species, understand them and then try and minimise impact on these as much as possible, with operational management guidelines. Ultimately rehabilitation and restoration guidelines should be set in place to allow the species to reestablish themselves.

5.9.1 Potential impacts

Mining activities can result in loss of habitat such as those of coastal hummocks. These hummocks provide a multitude of functions to fauna in the area; supporting many organisms with food, shelter, and breeding grounds. These unique micro-habitats are in danger of being bulldozed or removed if in the way of mining trenches or pits. Impacts are most commonly found to affect insects and rodents living in the hummocks, reptiles feeding, and jackals and hyena that seek shelter from harsh weather conditions. Removal of these micro-systems will have disastrous impacts on fauna.

Another direct impact of mining on fauna is that of noise. The noise of mining activities penetrates the area which animals habituate, and forces them to move away to more marginal environments, often making survival even harder. Smaller animals such as rodents can also become casualties during the mining operations – falling into trenches, becoming trapped, resulting in death. They can also get crushed by the vehicles, and/or their burrows get covered up.

Indirect impacts also impact on fauna, for example litter encourages scavenging behaviour in and around camps. Any litter blown into the surrounding environment can prove to be a death trap to any animal, it can be ingested and cause internal injury or the animal can be trapped or injured by objects like plastic bags and tins.

The effects of marine mining are particularly devastating for immobile marine organisms, which can be partly or completely destroyed by the combination of high turbidity and fine-particle sedimentation. Clouds of turbidity impair marine life by reducing insulation, lowering the available oxygen level due to oxidation of suspended particles, affecting phytoplankton productivity and zooplankton feeding and can obstruct the respiratory passages of marine organisms, possibly even poisoning them with trace metals. Mobile marine fauna evade the polluted environment by moving off, but are nonetheless unable to prevent the destruction of their spawning grounds (EnviroSolutions 2004).

5.9.2 Operational management guidelines

During construction of a camp, planning needs to account for a park environment with wild animals roaming. All the ‘strange’ smells that are emitted by the camp will attract scavengers such as jackals and hyenas. It is important not to disturb the natural path and behaviour of these animals, and at no point in time should humans interfere with their activity patterns. It is necessary that all waste containers in the camp should be animal proof. Employees’ codes of conduct should also include a clause prohibiting hunting or trapping, or interfering in any manner with any fauna whilst working in the park.

Mine working hours should be restricted to daylight hours when ambient noise levels are higher. No heavy equipment should be utilised at night when ambient noise levels are low and noise travels further, and hence has a higher impact.

The following steps need to be taken to protect the fauna in mining/prospecting areas:

- Strict disciplinary measures should be applied to staff members poaching or attempting to trap wildlife;
- Strict disciplinary measures should be applied to staff members intentionally disturbing seals;
- Litter should be prevented and domestic wastes should be adequatly disposed of to prevent attracting scavenging animals, particularly the black-backed jackal which are prolific in SCP;
- No feeding of wild animals should be allowed, particularly the black-backed jackal; and
- Speed restriction should be enforced on all mining haul roads to prevent accidents with animals (EnviroSolutions 2004).

It is recommended that the prospector identifies areas to be prospected along the coast and that prospecting not be concentrated in one area. For example, the prospector should prospect a one kilometre stretch, then skip to an area at least ten kilometres further. After completion of a cycle along the coastline with sites ~10km apart, a new cycle may be initiated (EnviroSolutions 2004). This ensures that natural rehabilitation can occur as smaller areas within the EPL are impacted upon at a time, and not one larger area which takes longer to recover naturally.

5.9.3 Rehabilitation and restoration guidelines/principles

Removing all man made objects and waste and letting the environment return to a natural state, and hence allowing animals resume their natural behaviour patterns is the ideal rehabilitation procedure. To practise sound environmental management whilst mining and prospecting is important so as to mitigate impacts as much as possible. With mining, certain activities unavoidably create negative impacts which only disappear once operations cease. Thus, it is important to ensure that the area is left in a condition as close as possible to that in which it was found.

5.10 OTHER IMPACTS

5.10.1 Invasive species

It is illegal to bring any plants or animals into Namibian parks, yet alien flora and fauna occur in most parks. In the SCP, alien plants were found to be confined to the major, periodically flowing river courses within the area. The following species were encountered: *Argemone ochroleuca, Datura innoxia, D. stramonium, Nictianaglauca, Opuntia ficus-indica, Prosopis spp.* and *Ricinus communis* (Tarr & Loutit, sd). It is thought that these have been washed down rivers when in flood, and have survived near fresh water sources. In other parks where mining has taken place for longer, aliens are more common fast growing, such as in the |Ai-|Ais Hot Springs Game Reserve. Here, mining companies have planted aliens to provide greenery and shade (Figure 5.11).

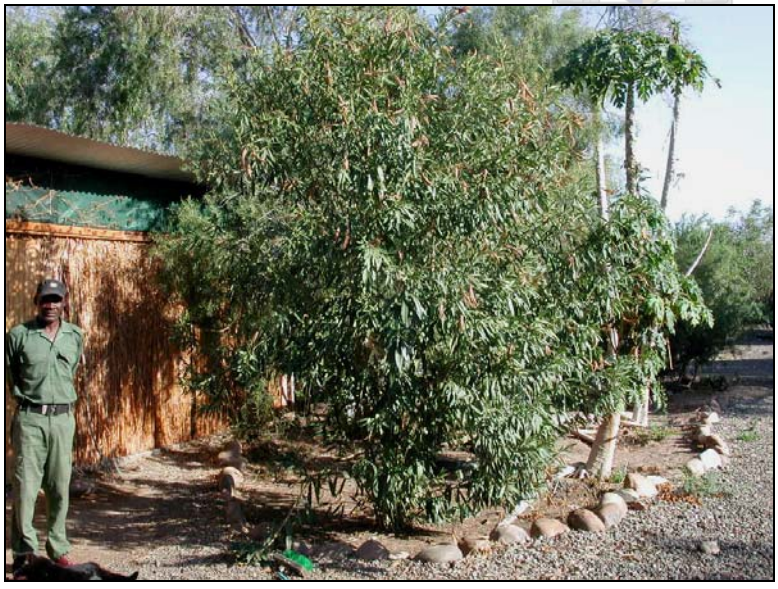


Figure 5.11 Alien plants introduced to the |Ai-|Ais Hot Springs Game Reserve

The introduction of domestic animals into parks is also forbidden, yet still occurs. Evidence of this was detected in the |Ai-|Ais Hot Springs Game Reserve where a miner had brought a cat to the

mining camp. The cat, at the time of inspection, was not fed, but was self sufficient. Large numbers of such predators could be expected to have major impacts on rodent and bird populations in such park environments.

Angling is illegal in parks, unless it is undertaken with a permit and in designated areas. Inspection at Storm Diamonds, uncovered fishing rods (Figure 5.12) - a clear violation of the park rules and

Figure 5.12 Fishing rods located on EPL 2699 (Storm Diamonds)

the Nature Conservation Amendment Act, of 1984. The collection of all plant material (wood), stones (agates) or artefacts is also illegal. Removal of items for personal collections detracts from the park and also alters the natural environment. Collecting of plant material has a larger impact as nutrients cannot return to the soil as part of the natural cycle.

5.10.2 Illegal activities

It is a punishable offence to bring any plants or animals into a park. The mining company is made aware of this in its contract with the MET; thus all employees of the mining company should sign and agree to this in the code of conduct. If any plants or animals are brought into the park, these need to be removed immediately.

Angling, plant material, stone or artefacts collection in a park are punishable offences. The mining company is made aware of this in its contract with MET. All employees of the mining company should sign and agree to these clauses in their code of conduct. All firewood and fuels must be brought to the campsite from outside the park, as it is prohibited for any employee to collect firewood or any other flora on or around the site (MSW Namibia 2002).

5.10.3 Impacts on heritage sites and artefacts

Large areas of Namibia are designated as protected, and for many years mining has not been permitted. Large stretches of these parks have not been surveyed and mapped for their archaeological record. The SCP has a greater potential for hiding artefacts – potential negative effects are enormous, as many artefacts have been buried by sand and are not visible to the layman. During earthworks, digging or trenching, artefacts could easily be crushed and damaged. Other areas such as shell middens could simply be lost if not properly mapped and demarcated as off limits prior to mining commencing

The mining company should be aware of legislation governing the discovery of any archaeological findings. Should any item of interest be located, all activities need to cease immediately at that location, and the National Monuments Council needs to be notified. The area would need to be secured (fenced off, or simply declared off limits), until an inspector or directive arrives from the Monuments Council regarding the discovery. A decision could include excavation and removal of artefacts, to continuing mining or to ensure the site remains off limits.

Archaeological sites and artefacts are protected by law and include shell middens, ancient whalebones and ship wrecks. No such relics may be collected in any way or removed from their original location. Should these restrictions be adequately enforced, no impact to such archaeological sites will result (EnviroSolutions 2004).

To regulate against the environmental impacts due to mining activity alluded to in this chapter, a range of legislative and policy instruments are available or in the process of being formulated in Namibia. The next chapter provides a summary of these regulatory tools.

CHAPTER 6 LEGAL FRAMEWORK RELEVANT TO MINING IN NAMIBIAN PARKS

'Namibia's environmental legislation is largely outdated, badly fragmented and incomplete', Brown (1993: 4) stated in Namibia's 12 point plan for integrated and sustainable environmental management. In this chapter, relevant national environmental legislation and policies and relevant international conventions are identified to assess the validity of this statement, twelve years later, with particular reference to mining in Namibian parks. A comparative reference is also made to international agreements and environmental legislation and constraints experienced in three SADC countries that may inform Namibian legislative reform.

6.1 PROMULGATED LEGISLATION

Some legislation such as the Nature Conservation Amendment Act of 1986 (Ord. 4 of 1975) predates independence and was written for the then South African mandate of South West Africa. Following independence, Namibia adopted all laws relevant to then South West Africa, so all pre-independence laws which have not been repealed are still valid in Namibia, even though they may have been repealed in South Africa. The legislation listed below is presented in order of relevance and importance, in particular to mining in parks.

6.1.1 The Constitution of the Republic of Namibia of 1990 (Act 1 of 1990)

The high importance of environmental protection in Namibia is borne out by the Namibian Constitution, in which, Article 91 determines the functions of the Ombudsman and Article 95 protects people's welfare through environmental maintenance. The clauses relevant to the environment stipulate:

> Article 91: Functions of the Ombudsman
> The functions of the Ombudsman shall be defined and prescribed by an Act of Parliament and shall include the following:
>
> > (c) The duty to investigate complaints concerning the over-utilisation of living natural resources, the irrational exploitation of non-renewable resources, the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia.

> Article 95: Promotion of the welfare of the people
>
> The State shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at the following:
>
> (l) Maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future. In particular, the Government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian territory (Namibia 1990).

Article 91 stresses the importance of sustainable development through the appointment of the Ombudsman to investigate the over-utilisation and exploitation of the country's natural resources. Article 95 provides clear focus for the promotion and the maintenance of the country's biodiversity, whilst under the same article, clear emphasis is placed on the Government's role to protect the country against becoming a dumping ground for dumping or recycling of nuclear toxic waste.

Ensuring sustainable development in Namibia, and the use of sustainable methods and techniques of resource utilisation, is a fundamental right of the people and is thus stated as such in the Constitution. Emphasising sustainable development and the rights of future generations to the environment of Namibia in the Constitution, provides lawmakers with a strong foundation to draft environmental legislation. Not only does the Constitution provide a strong base for environmental legislation to be created upon, but it also sets an example for industries like mining. Mining, especially in parks and around national monuments, must at all times occur in such a manner that the land does not become a wasteland, but can be utilised for other sustainable uses, for future generations to benefit from.

6.1.2 The Minerals (Prospecting and Mining) Act (Act 33 of 1992)

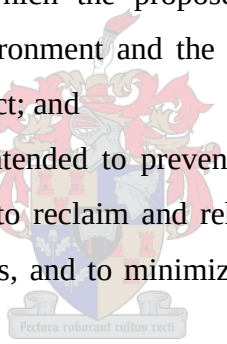
This Act provides for the reconnaissance, prospecting and mining as well as disposal of, and the exercise of control over, minerals in Namibia; and to provide for matters incidental thereto.

Section 50(f)[9] makes provision for any mining or prospecting company to conduct an Environmental Impact Assessment (EIA) and if necessary to draft an Environmental Management Plan (EMP). Furthermore, Section 50(g)[10] makes provision for the review of the EMP should it be necessitated by any change in circumstances.

The Mining Commissioner decides on the need for an EIA and/or an EMP, as a requirement to obtain a Mineral License, based on the information obtained from the mining or prospecting company in the application.

According to Section 91(f) the application by any person for a mining licence should include particulars of:

> (i) the condition of, and any existing damage to, the environment in the area to which the application relates;
> (ii) an estimate of the effect which the proposed prospecting operations and mining operations may have on the environment and the proposed steps to be taken in order to minimize or prevent any such effect; and
> (iii) the manner in which it is intended to prevent pollution, to deal with any waste, to safeguard the mineral resources, to reclaim and rehabilitate land disturbed by way of the prospecting and mining operations, and to minimize the effect of such operations on land adjoining the mining area.



The construction or erection of auxiliary works for use in the Mineral License area, may only take place with the written permission of the Commissioner. The Act does hold the Mineral License

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[9] (f) prepare in such form as may be determined in writing by the Commissioner for the approval of the Commissioner –

(i) an environmental impact assessment indicating the extent of any pollution of the environment before any prospecting operations or mining operations are being carried out and an estimate of any pollution, if any, likely to be caused by such prospecting operations or mining operations;

(ii) if any pollution is likely to be so caused, an environmental management plan indicating the proposed steps to be taken in order to minimize or prevent to the satisfaction of the Commissioner any pollution of the environment in consequence of any prospecting operations or mining operations carried on by virtue of such mineral licence.

[10] (g) from time to time as circumstances change to revise such environmental management plan either out of his or her own motion or if required by the Commissioner;

holder responsible for damage caused by any prospecting operations and mining operations, to the surface of, and the environment on, the land of the area in question (Namibia 1992).

An agreement has been reached between the MME and the MET that, prior to any mining or prospecting licenses being approved, applications will be sent to the DEA for an Environmental Clearance. Only once this clearance has been obtained may the application be processed. This agreement has been set in place in 2000, and hence is not reflected in the (much older) Act.

Part IV of the Act refers to the Minerals Board of Namibia, the function of which is to advise the Minister. According to the legislation, eight people should be nominated to the Board, none of whom are from the MET. Should a person be co-opted to the board from the MET, this person would not be entitled to vote on any matters before the board (Namibia 1992).

A Mineral Rights Committee (MRC) has been set up to deal with all applications submitted to the MME. Representatives from the MME, Geological Survey, Chamber of Mines and MET are present at these meetings. It is at these meetings that environmental concerns can be raised concerning particular mines or areas, and recommendations made regarding whether the Mining Commissioner should request EIAs and/or EMPs for particular activities and on what grounds. Given the absence and scattered nature of legislation available, active participation at this forum is the first step in initiating environmentally sound management by government.

Through the enforcement of the Minerals Act and the agreement between the MET and the MME, mining in parks should only take place after satisfactory EIAs and EMPs have been developed. Enforcement should not only be performed by the Mining Commissioner and the DEA, but also by the Minerals Board and the MRC.

6.1.3 The Nature Conservation Amendment Act, 1986 (No. 4 of 1975)

This Act was known as the *Nature Conservation Ordinance of 1975 (Ord. 4 of 1975)*, and was given the above short title after all amendments were made in 1986. The Act serves to consolidate and amend laws relating to the conservation of nature, the establishment of game parks and nature reserves, the control of problem animals, and to provide for matters incidental thereto (South Africa 1986).

This Act is presently the main environmental legislation in Namibia. It needs to be pointed out however that this act is primarily geared towards nature conservation hence one could argue that

this is no true environmental piece of legislation. Several new draft documents have been written, however none have been promulgated yet. This Act has since been repealed in South Africa.

Section 18 of the Act refers to 'restriction of right to enter game parks and nature reserves and prohibition of certain acts therein'. It states that 'no person shall without the written permission of the Executive Committee[11]: … enter or reside in a game park or a nature reserve; … wilfully or negligently cause any veld fire or any damage to any object of geological, ethnological, archaeological, historical or other scientific interest within a game park or a nature reserve; … ' (South Africa 1986).

Section 19 stipulates the purposes for which permission to enter game parks and nature reserves may be granted. The permission to enter and reside in a game park or a nature reserve mentioned in section 18 (l) (a) may be granted only for the purposes of: health, study, recreation or other incidental matters; transacting any lawful business.

According to the Act, prospecting or mining in a park would require the direct permission from the MET for residing in the park, conducting research and business. Under Section 63 (Obstruction of persons in the performance of their duties), any person who:

> (a) hinders, impedes or obstructed a nature conservator or the owner or lessee of land or any other officer or person in the exercise of the powers or the performance of the functions or duties granted to or imposed on him by or in terms of this chapter; shall be guilty of an offence.

The above Section applies to all areas of Namibia where nature conservation officers have the authoritative control over fauna and flora, and is not exclusive to parks.

Section 73 regulates the picking and transport of protected plants, and the conditions under which permits would be required:

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[11] The Executive Committee refers to the Administration, as referred to in section 6 of the *South West Africa Constitution Act, 1968 (Act 39 of 1968).*

(1) No person other than the lawful holder of a permit granted by the Executive Committee shall at any time pick or transport any protected plant, provided that:

(a) the owner of a nursery licensed under section 75 may without such a permit pick and transport any protected plant cultivated on the premises of such nursery and cause such protected plant to be picked and transported;

(b) the owner or lessee of land may on that land without such a permit pick the flower of a protected plant for use as a decoration in his home;

(c) the owner or lessee of land may without such permit pick a protected plant on that portion of such land –

(i) which he needs for cultivation of lands, the erection of a building, the construction of a road or airfield, or any other development which necessitates the removal of vegetation; or

(ii) on which such protected plant has been specially cultivated.

Section 74 deals with the sale, donation and removal of protected plants:

(1) No person other than the lawful holder of a permit granted by the Executive Committee shall sell, donate or export or remove from the territory, any protected plant; Provided that the owner of a nursery licensed under section 75 may without such permit sell or donate and export and remove from the territory any protected plant cultivated on the premises of such nursery.

(2) Any person who contravenes or fails to comply with any provision of subsection (1) or any condition, requirement or restriction of a permit granted there under shall be guilty of an offence (South Africa 1986).

This Act has no direct bearing on the activity of mining and prospecting, yet it has direct bearing on the access and peripheral activities of mining companies in parks. The conservation of flora and fauna is addressed in this Act, as are the rights of mining and prospecting companies once they have entered a protected conservation area.

The Nature Conservation Ordinance outlines institutional arrangements which have not been elaborated on here, since the MET currently provides different institutional bodies which will be

elaborated on under legislation not yet promulgated (see Section 6.2). Other sections without bearing on mining deal with wild animals, hunting, game parks and nature reserves, problem animals and fish in inland waters and are therefore not discussed here.

6.1.4 The Water Resources Management Act, 2004 (Act 284 of 2004)

Until December 2004, Namibia operated under the auspices of the *Water Act 54 of 1956*. The new Water Resources Management Act (WRMA) brings with it new institutional arrangements such as Water Resources Management Agencies, a Water Advisory Council, Basin Management Committees and a Water Regulatory Board. Together with these new agencies and boards, new licenses, such as the integrated license for abstraction and discharge of water, are introduced.

Part VII of the Act provides for a license to abstract and use water. Section 33[12] prescribes the application procedures for a license to the Minister, for the permission to abstract and use water. It highlights all the items that need to accompany the application, as well as all information required by the Ministry of Agriculture, Water and Rural. Sections 34, 35 and 36 also deal with the consideration, criteria and contents of the abstraction of water licenses. Section 37[13] also indicates the terms and conditions under which the license is issued to the applicant; and Section 38[14]

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[12] 33. (1) A person who wishes to abstract and use water may apply to the Minister for a licence to abstract and use water in the prescribed manner and form, which application must include–

(2) An applicant for a licence to abstract and use water must, at least 60 days before he or she submits the application to the Minister, issue a notice in the Gazette –

(3) An application for a licence to abstract and use water must be accompanied by–

[13] 37. A licence to abstract and use water is issued subject to–

(a) the achievement of the goals and objectives of the Master Plan;

(b) the protection of the environment and water resource from which the abstraction will be made, the stream flow regime, and other existing and potential use of the water resource, including uses by virtue of customary rights and practices, by-

(c) proper water management, by–

(d) the proper discharge or disposal of any return flow or effluent, by–

(e) the accommodation of reasonable requirements of any traditional community.

[14] 38. (1) A licence containing terms and conditions referred to in section 37 may be issued as a combined licence to abstract and use water and to discharge effluent.

(2) A person in possession of a combined licence referred to in subsection (1) does not require a separate effluent discharge permit referred to in section 60.

outlines the combined license to abstract and use water, as well as to discharge effluent, that can be applied for (Namibia 2004).

Part IX regulates the control and protection of groundwater. Sections 45 to 49, and 52 deal with the permit to drill boreholes or to engage in borehole drilling programmes, and the conditions attached. Section 51 refers to aquifers and its management as well as safe yield abstraction (Namibia 2004c).

Part XI, titled Water Pollution Control, regulates discharge of effluent by permit. Sections 56 and 57 deal with the conditions under which permits are not required, and under which conditional exemption is granted. The application for permit to discharge effluent or construct an effluent treatment facility or a disposal site is detailed in Section 59. Sections 60 to 71 refer to various aspects of the permit (terms and conditions; duration of the permit) to 'discharge effluent or construct effluent treatment facilities or disposal sites'(Namibia 2004c).

Part XII of the Act regulates protection of water resources. In Section 72 water management area declaration is stipulated, while Section 73 covers the effect of these management areas.

Further issues the Act deals with include internationally shared water resources, water use, conservation and efficient water management practises, dam safety and flood management, water regulatory board provisions, determination of water effluent pricing policy, and recovery of charges, fees and tariffs, servitudes, water tribunals and arbitration and mediation of disputes, and institutional arrangements. These parts of the Act were analysed but were judged as not having any direct bearing on mining in parks.

The Act has many implications for the mining industry. In some ways the processes have been streamlined, as in the new integrated license for abstraction and discharge, which now require only one license. However, the Act was promulgated with such haste that no associated regulations have been drawn up or even considered yet. The Ministry of Agriculture, Water and Rural Development has two years to affect transition from the old to the new Act, hence regulations from the old Act will remain enforceable in the interim. Further, the department is not yet able to issue the integrated license for abstraction and discharge, and persist with separate licenses as in the past. Discussions at the Department of Water Affairs confirmed that 'the staff would for the time being [January 2005] still be working according to the old Act as this would be more practicable at present' (De Klerk, 2005 pers. comm.) Other issues arising include the Acts permit requirements for disposal sites in Part XI which do not clearly indicate whether solid waste or liquid waste sites are referred to. The

apparent conflict in the draft proposed legislation from the MET that also proposes permit requirements for waste disposal sites, could not be explained.

Mining or prospecting companies need to take cognisance of this Act. For most type of mining operations, water is required and frequently, due to the remoteness of activities, drilling a borehole and abstracting water for own use is the most cost-effective method. Any mining and prospecting operation creates effluent. Depending on the size and the number of people on site, an application under the Act would need to be filed to establish whether a discharge permit exemption could be obtained or not.

6.1.5 The Atmospheric Pollution Prevention Ordinance (Ord. 11 of 1976)

This Act is actually still an Ordinance dating from 1976. The Ministry of Health and Social Services administers this Ordinance and the certificates referred to within. Sections (5)[15] to (8)[16] refer to the air pollution control certificate required (South Africa 1976). This certificate is required in order to be allowed to emit 'noxious or offensive' gases into the atmosphere. However, the certificates are no longer issued by that Ministry and no inspections are undertaken by Ministry officials. Upon contacting the Ministry to enquire about the current required procedure, the response was that it would be considered courteous if the Ministry could be notified of any activities in writing, and that this would be considered as best practise. The conclusion is, therefore, that the notification of emissions to the Ministry of Health and Social Services is not a legal obligation!

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[15] 5(1) No person may within a controlled area–

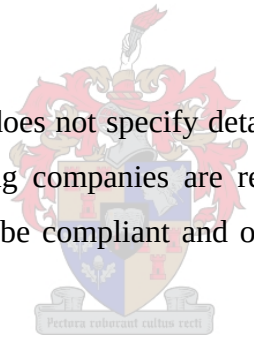
(a) carry on a scheduled process, unless he or she holds a current registration certificate authorising him or her to carry on that process.

[16] 8(1) A registration certificate is issued, subject to the condition that all plant and apparatus used for the purpose of carrying on a scheduled process, and all appliances for preventing or reducing to a minimum the escape of noxious or offensive gases into the atmosphere, must at all times be properly maintained and operated and that the holder of a certificate will ensure that all other necessary measures are taken to prevent the escape into the atmosphere of noxious or offensive gases(South Africa, 1976).

Section 28 (2)[17] deals with mine closure and the issuing of a certificate of closure by the Director declaring that the necessary steps have been taken to prevent atmospheric pollution by dust arising from any matter emanating from the mine site. This certificate is no longer issued by the Ministry of Health and Social Services.

6.1.6 The Hazardous Substances Ordinance (Ord. 14 of 1974)

The Hazardous Substances Ordinance deals with the selling, storing and using of hazardous materials. Under this Act, specific licenses must be obtained in order to purchase and store certain groups of hazardous substances. The aspect under this Act that has environmental implications is that of the storing of the substances. Sections 4[18] to 8 deal with the licenses and the conditions, including storage, under which they are issued. Safe storage of hazardous substances ensures that should any accident and/or spillages occur, environmental risks are minimised. If the substances are securely bunded, any environmental hazard arising, such as run-off into a waterway, is avoided. Standard procedure is for the bund to be able to hold 110% of the chemical or substance stored in the bunded area.



The Hazardous Substances Ordinance does not specify details for storage or bunding, as the Act is too old. Today mining and prospecting companies are required to follow the MSDS (Material Safety Data Sheets) sheets in order to be compliant and obtain their licenses. The sheets provide instructions for storage.

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[17] 28(2). Notwithstanding the provisions of the *Mines, Works and Minerals Ordinance 20 of 1968*, the owner of any mine who, after the date of receipt of any notification in terms of the above, without the consent of the Executive Committee disposes of mine assets before he or she is furnished with a certificate by the Director to the effect that the necessary steps have been taken to prevent the pollution of the atmosphere by dust arising from any matter emanating from the mine, deposited on any land in respect of which the said owner is the holder of rights granted in terms of any law relating to mining or prospecting for minerals, to carry on mining or prospecting, will be guilty of an offence.

[18] 4.1 (b) Furthermore, no person may use, operate or apply any Group III hazardous substances unless it is registered in terms of Section 5 (b), and must do so subject to the conditions prescribed or determined by the Director.
(c) No person may keep installed any Group III hazardous substance on any premises unless the premises registered in terms of Section 5(c), must do so subject to the conditions prescribed or determined by the Director (South Africa, 1974).

6.1.7 The National Heritage Act, 2004 (Act 27 of 2004)

All archaeological and palaeontological objects belong to the State. This is not only true of objects found in parks, but anywhere in Namibia, as Section 55 (3)[19] stipulates. The implication for activities in parks is that the likelihood that operators will encounter artefacts, especially if the operation is of a mining nature, are greater. Once such an artefact has been discovered all operations are required to cease, the area needs to be cordoned off, and the National Monuments Council needs to be notified of the find as per section 4[20]. Section 7[21] provides specifics of various situations under which persons would contravene if they were to, in any way, interfere with the artefact without being in possession of a permit.

The parks of Namibia are rich in artefacts, as are many other localities in Namibia. The Namibian coastal areas are strewn with historical shipwrecks and prehistoric shell middens. Due to the harsh

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[19] 55. (3) All archaeological and palaeontological objects and meteorites are the property of the State, except such an archaeological or palaeontological object, the private possession and ownership of which–
(a) was acquired not in contravention of section 12 of the *National Monuments Act, 1969 (Act No. 28 of 1969)* or a law repealed by that Act; or
(b) is acquired by virtue of a consent issued under this section.

[20] (4) A person who discovers any archaeological or palaeontological object or meteorite must as soon as practicable report the discovery to the Council.

[21] (7) Unless authorised by a permit under section 52, a person must not, without a consent issued under subsection (8) –
(a) use an archaeological or palaeontological object or meteorite for the purpose of study, conservation or presentation;
(b) uncover or expose, or move from its original position, any archaeological or palaeontological object or meteorite;
(c) carry out an investigation or survey of any land for the purpose of finding any archaeological or palaeontological object or meteorite;
(d) alter or develop any land on or in which an archaeological or palaeontological site or a meteorite is believed to be located;
(e) carry out an act likely to endanger an archaeological or palaeontological object or meteorite;
(f) within the area of a registered archaeological site be in possession of any excavation equipment or equipment designed or used for the detection of metals or archaeological or palaeontological objects or meteorites; or
(g) whether as principal or agent –
(i) buy or sell;
(ii) export or attempt to export from Namibia;
(iii) have in his or her possession for the purpose of sale or export, any archaeological or palaeontological object or any meteorite (Namibia, 2004).

climatic conditions along the coast, many of the artefacts are likely to have been covered up by sand and dispersed by strong winds over time. Mining activities in these coastal areas are bound to uncover such artefacts during the overburden removal process. Once notified of the discovery it is at the discretion of the National Monuments Council to require the mining/prospecting company to apply for a permit under this Act, to cease operations, or to stipulate actions to be taken. However, notification of the discovery of any artefact is paramount, to ensure safekeeping of all-important Namibian heritage.

6.2 LEGISLATION NOT YET PROMULGATED

Bills to replace inherited and redundant legislation have been in draft format for several years. The MET regards the finalisation and promulgation of these Acts as urgent and of great importance. It is imperative that these legislative drafts be finally promulgated. As at July 2005, the Environmental Management Bill appears to have undergone further changes, is now the Environmental Management and Assessment Bill, and is due to be tabled in Parliament. Other bills, including the Parks and Wildlife Bill that the Ministry seems to consider most important and next to be tabled, hinges on the promulgation of the Environmental Management and Assessment Bill.

6.2.1 The Environmental Management Bill (1998)

The purpose of this Bill was to: ‘give effect to Article 95 (l) of the Namibian Constitution by establishing general principles for the management of the environment and natural resources; to promote the co-ordination and integrated management of the environment; to give statutory effect to Namibia’s Environmental Assessment Policy’ (MET 1998a).

Section 2[22] refers to the right of current and future generations to an environment conducive to health and well-being, and equitable access to Namibia’s resources. It is this section that gives effect to Article 95 (l) of the Namibian Constitution. Part IV of the Bill deals with Environmental Assessments in sections 17 to 27. These sections give statutory effect to the Namibian Environmental Assessment Policy.

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[22] 2. Inter-generational equity: Current and future generations of Namibians have the right to an environment conducive to health, well being and security as well as to equitable access to the nation's resources including genetic resources and all people and Government Institutions have a duty to protect and conserve Namibia’s environment.

Furthermore the Bill has a schedule attached wherein it has listed all activities that require an Environmental Impact Assessment, according to Part IV of the Bill. Under Section 3(a) it lists:
3. Resource extraction, manipulation, conservation and related activities – (a) prospecting, quarrying, mining, mineral extraction or mineral beneficiation activity.

Part 2: Principles of Environmental Management, begins with Section 6 that lists the 12[23] principles that government institutions and private persons shall comply with when planning and implementing activities that are likely to have an impact on the environment. Principles (6), (7), (10), (11) and (12) bear directly on the mining industry and due notice should be taken of these. The other principles should by no means be ignored as they too are principles of environmental management that can and should be implemented by all, including the mining industry. Principle 11, 'the polluter pays principle' is intentionally emphasises the mining industry, since in its simplicity, this principle provides the basis for the demand for impact avoidance, mitigation and rehabilitation, as well as drafting of environmental management plans by operators (MET 1998a).

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[23] 6. Principles of Environmental Management
In planning and implementing acts likely to have a significant effect on the Namibian environment, Government Institutions and private persons shall apply the following principles:
(1) renewable resources shall be utilised on a sustainable basis for the benefit of current and future generations of Namibians;
(2) community involvement in natural resource management and sharing in the benefits arising there from shall be promoted and facilitated;
(3) public participation in decision-making affecting the environment shall be promoted;
(4) fair and equitable access to natural resources shall be promoted;
(5) equitable access to sufficient water of acceptable quality and adequate sanitation shall be promoted and the water needs of ecological systems shall be fulfilled to ensure the sustainability of such systems;
(6) the precautionary principle and the principle of preventive action shall be applied;
(7) there shall be prior environmental assessment of projects and proposals which may significantly affect the environment or the use of natural resources as provided for in Part 4 below and other legislation;
(8) sustainable development shall be promoted in land-use planning;
(9) Namibia's movable and immovable cultural and natural heritage including its biological diversity shall be protected and respected for the benefit of current and future generations;
(10) generators of waste and polluting substances shall adopt the best practicable environmental option to reduce such generation at source;
(11) the polluter pays principle shall be applied;
(12) reduction, re-use and recycling shall be promoted.

Part 4 of the draft Act covers Environmental Assessments. Sections 17 to 28 deal with the various aspects related to conditions and circumstances related to conducting an Environmental Assessment. Section 33 specifies the conditions under which an appeal may be lodged against the decision taken in response to the environmental assessment submitted to the environmental commissioner.

Schedule 1 to the Bill lists activities that require an environmental assessment, with the provisions of Part 4 of this bill:

> 2. (a)(iv) The rezoning of land from use for nature conservation or zoned open space to any other land use;
> 3. (a) prospecting, quarrying, mining, mineral extraction or mineral beneficiation activity (MET1998a).

The relevance of this Bill for mining in Namibian parks is significant. It directly addresses the issues of mining and mineral extraction, and also addresses the aspect of land use in a conservation area. It also addresses the aspect of conducting an EIA for the activity of mining or prospecting in a park. Control over mining and prospecting in parks will be significantly tightened through the enactment of this Bill.

By December 1998, a sixth and 'final' draft of the Bill had been negotiated with the key stakeholders, but by June 2003, the Bill had still not been submitted to Parliament. The main reason for the delay is a lack of consensus over whether the new Act should be administered by the proposed Office of the Environmental Commissioner located within the MET and overseen by a proposed Sustainable Development Commission (SDC), or whether there should be a more neutral 'Namibian Environment Agency' located outside of Government, but still contracted to it (Tarr, 2003). At present, this Bill is being redrafted to deal with these institutional arrangements and the Ministry is planning to call it the Environmental Management and Assessment Act, 2005. The planned tabling of the Bill is scheduled for October 2005, but no draft of this document could be obtained.

The main foci of this draft are to regulate environmental impact assessments, and to establish environmental management principles. At present the MET has limited authority in Namibia, since it relies on the Nature Conservation Act of 1976 with its dearth of emphasis on governance.

6.2.2 The Parks and Wildlife Bill (2002)

The Bill was drafted to give effect to paragraph (l) of Article 95 of the Namibian Constitution by establishing a legal framework to provide for:

- the maintenance of ecosystems, essential ecological processes and the biological diversity of Namibia;
- the utilization of living natural resources on a sustainable basis for the benefit of Namibians, both present and future;
- the promotion of the mutually beneficial co-existence of humans with wildlife;
- giving effect to Namibia's obligations under relevant international legal instruments including the Convention on Biological Diversity and the Convention on International Trade in Endangered Species of wild fauna and flora; and
- incidental matters.

The purpose of this Bill is to provide a regulatory framework for the protection, conservation and rehabilitation of wildlife and wildlife habitats, the sustainable use and management of wildlife and wildlife habitats, and equitable access to benefits derived from them. Under the Bill a National Conservation Council will be created. This council as well as the Department of Wildlife and National Parks will have an active role in the management and control of parks.

According to section 35 (1)(2)[24] of this Bill, prospecting and mining activities in protected areas would only be allowed with authorisation from the Minister, and under specific conditions. One of

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[24] (1) No person shall undertake any prospecting or mining activities of any nature within a protected area except under and in accordance with a written authorization from the Minister.
(2) The Minister shall not grant any permit under subsection (1) in respect of land included in any protected area unless:
(a) a detailed assessment of the potential environmental impacts of the proposed activities has been undertaken during a procedure that made adequate provision for public participation; and
(b) the Minister is satisfied that proposed activities will not significantly prejudice the attainment of the management objectives for that protected area; and
(c) the permit is subject to appropriate, effective and enforceable terms and conditions to avoid the risk of adverse effects and to ensure that any adverse effects that may occur as a consequence of the activities taking place are adequately mitigated and rectified (MET, 2002).

these conditions is the approval of a detailed environmental assessment. It is currently unclear if, under this Bill, the Directorate of Parks and Wildlife would have to accept the decision taken by the Directorate of Environmental Affairs regarding this EIA, or if they too would want to review and take their own decision, make their recommendation and have that submitted together with that of the DEA, to the Minister for a final decision regarding the environmental assessment (MET 2002).

This draft legislation does overlap and differ in some regards from the draft Environmental Management Act, which makes allowances for mining in parks, pending the decision after the completion of an EIA, in close cooperation with the MME.

Another aspect of concern is the creation of the National Conservation Council. Should prospecting and mining be proposed in a park, after the current draft of the Environmental Management Act and the Parks and Wildlife Bill have been promulgated, the applicant would have to obtain permission from several bodies, i.e. the MRC (Mineral Rights Commission), the Sustainable Development Commission, the NPC (National Planning Commission) and possibly the National Monuments Council.

Other sections also have relevance to a mining/prospecting company entering a park for its activities. Section 36 deals with the 'restriction on entry into or residence in a protected area, and prohibition of certain acts in a protected area'. This sets out the rules and guidelines under which a person may enter or reside in a protected area, and also under which conditions this permission would be granted. Section 39 will similarly have great relevance in future. The 'regulations concerning protected area' lists various issues for which the Minister may make regulations, but is not limited mining/prospecting. As this Bill is still in draft form, and no date is foreseen for promulgation, no regulations have been drafted yet (MET 2002).

The Environmental Management Act and the Parks and Wildlife Bill are important legislation addressing environmental issues urgently in need of attention. Promulgation is required to assist the effective governance of the country, yet institutional discrepancies hamper the process of passing these bills. Of even greater concern is that separate Directorates within the same Ministry are unable to reach consensus, even though they strive for the same end goal – environmental protection.

6.2.3 The Pollution Control and Waste Management Bill (1998)

This Bill would repeal the Atmospheric Pollution Prevention Ordinance No 11 of 1976 and the Hazardous Substances Ordinance No 14 of 1974 in their entirety. This Bill, according to the MET

(1998b): promotes sustainable development; provides for the establishment of a body corporate to be known as the Pollution Control and Waste Management Agency; prevents and regulates the discharge of pollutants to the air, water and land; makes provision for the establishment of an appropriate framework for integrated pollution prevention and control; regulates noise, dust and odour pollution; establishes a system of waste planning and management; and enables Namibia to comply with its obligations under international law in this regard.

Under this Bill there are several licenses that would need to be obtained by a mining operation in order to be compliant. Sections 21 and 22 deal with the requirements, specifications and application procedures respectively for an air pollution license. Similarly, Sections 35 and 36 deal with the application and requirements of a water license. Requirements for the Integrated Pollution Control License are spelt out in Sections 44 to 50. This license is to be applied for when a process creates a risk of polluting more than one environmental medium (e.g. water and air). Section 58 makes provision for a waste management license, while Sections 59 to 61 provide for a waste site license (MET 1998b).

Part 5 deals specifically with noise, dust and odour pollution. Section 52[25] unequivocally labels these pollutants as nuisance substances. Noise and dust can be serious nuisance factors in parks as they not only disturb the fauna, but also detract from the expanse and the solitude for the visitors'/tourists' experience (MET 1998b).

All waste and/or emissions of any activities in Namibia would fall under direct jurisdiction of this Bill. Therefore this Bill has direct implications for mining and prospecting companies in parks, since all such operations create waste and emissions.

6.3 POLICIES WITH RELEVANCE TO MINING IN NAMIBIAN PARKS

The following policy documents were drafted and legislated after independence, when it was established that definite shortcomings existed in environmental legislation. These policies were

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[25] Nuisance 52. (1) No person may cause, permit or carry out any activity that gives rise to noise, dust or odour to the extent that, in the opinion of the competent authority, it creates or is likely to create a nuisance.
(2) For the purposes of this Part, 'competent authority' in relation to the control of noise, dust and odour means:
(a) the local authority council in relation to noise, dust and odour generated within the boundaries of its jurisdiction; and
(b) the Agency in relation to noise, dust and odour generated in all other areas.

drafted to assist regulatory processes. The three policies highlighted in this section have been identified as having direct bearing on mining in parks in Namibia.

6.3.1 Policy for Prospecting and Mining in Protected Areas and National Monuments (1999)

This policy was drawn up in 1999 by the MET in response to the increase of mining and prospecting of minerals in parks and monument areas. It was created via a consultative process and finally accepted by the MET, MME and the National Monuments Council.

The policy aims at promoting sustainable development in Namibia by providing guidelines for prospecting and mining in the country's protected areas. However, the policy is not all-embracing and consequently should be adjusted to meet specific situations (Namibia 1999). The policy states that no mining claim may be pegged in a park or on national monument terrain, but that it is permissible for an exclusive prospecting license and a mining license to be granted. It allows mining of all minerals defined in Schedule 1[26] of the Minerals Act, except dimension stone. Another limitation is that the mineral to be mined should be of national interest in terms of the Minerals Act of 1992. Therefore any prospecting license or mining license should only be granted once evidence is provided that the mineral deposit that will be explored or exploited would be of such a nature that it would make a difference to the nation. An example of such a mine in Namibia would be Skorpion Zinc in the south of Namibia. Initially the mine was going to be located on the edge of the proposed Sperrgebiet, however due to the known ore reserve rezoning of the Sperrgebiet was undertaken. Skorpion zinc today contributes no less than 4% to Namibian annual GDP.

The policy defines the various types of licenses required for mining and the conditions of operation within protected areas. Prospecting and mining in protected areas can take place after the MET and the MPMRC are satisfied with the credentials of the relevant company. Whether the exploration company is required to conduct an EIA and EMP is decided on a case by case scenario by the MET and MPMRC. According to the policy, the MET then makes recommendations to the MME on whether a license should be approved or rejected. The final decision lies with the MME.

[26] Schedule 1 of the Minerals Act lists all minerals, elements and rocks known to occur in Namibia, without exclusions.

The policy has not been passed by Cabinet, but was instead accepted and signed by the National Monuments Council, the MME and the MET. Since this policy has not yet been passed by Cabinet or been superseded by an Act that would render it redundant, this policy stands and is still in practice.

Any EIA/EMP that is conducted in Namibia needs to consider the possibility of archaeological finds. However, on both State and privately owned land, full EIAs in adherence to the policy are hardly ever undertaken. EIAs undertaken are more often than not of a desktop nature. Little information is available on the distribution of artefacts, given the shortage of expert knowledge on this matter, and therefore desktop studies are severely limited and inadequate.

6.3.2 Namibian Environmental Assessment Policy (1994)

Shortly after Independence, the MET initiated a consultative process that, in 1994, led to the development and acceptance by Cabinet of an Environmental Assessment Policy for Namibia. This policy sets out the rationale for Environmental Assessments in Namibia, the principles underpinning the policy, the approach to be taken in conducting EIAs, the process to be followed and the minimum standards required.

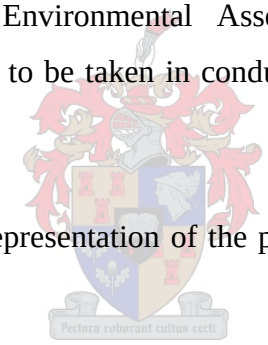

Figure 6.1 provides a diagrammatic representation of the process to be followed in conducting an environmental assessment in Namibia.

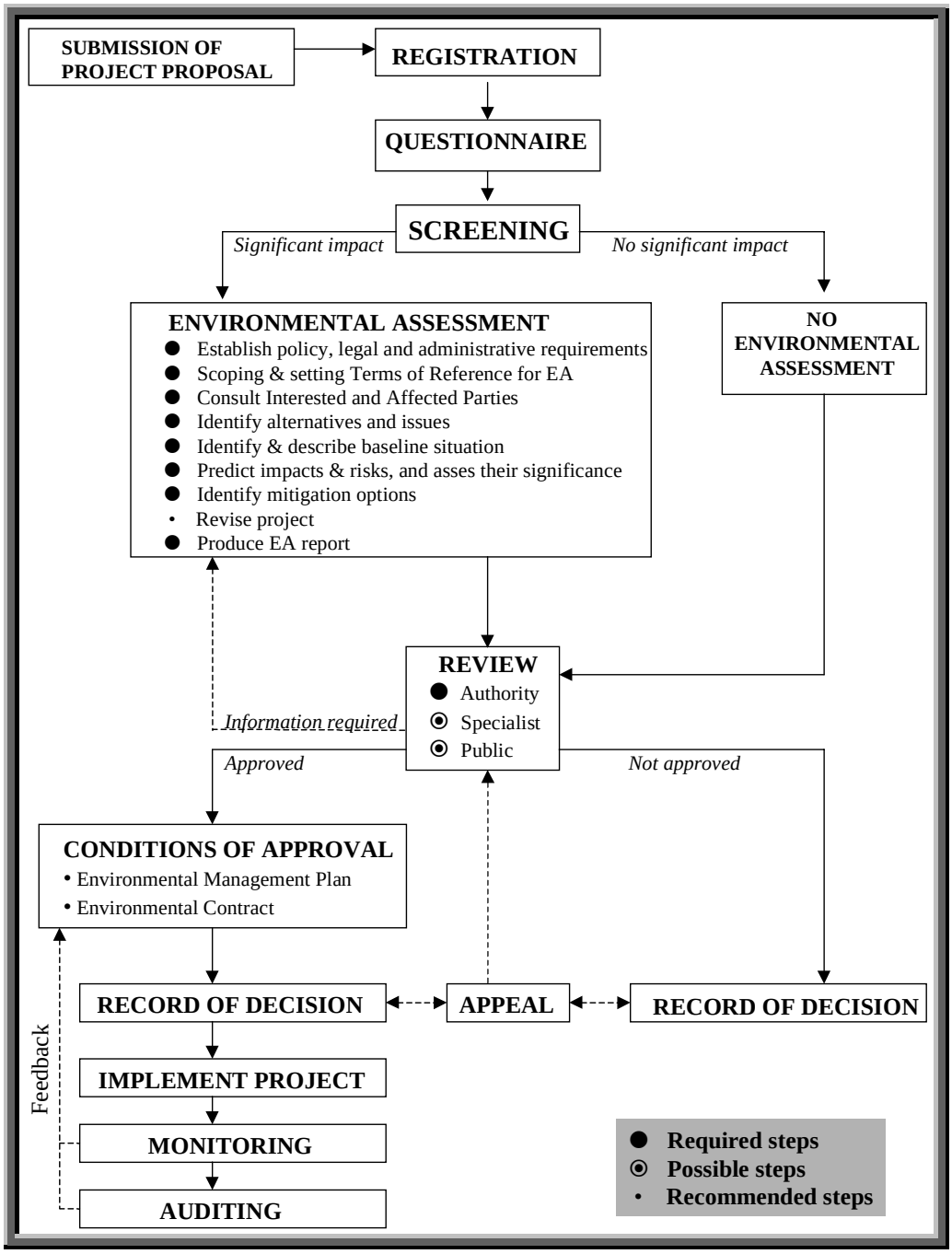

Figure 6.1 Environmental Assessment Procedure as in Appendix A of the Policy

Appendix A of the policy details the sequential steps, from submission of a policy, programme or project proposal, through production of the scoping study, report formulation, review process, decision-making and finally to possible appeals regarding the record of decision. Also included are details on monitoring and audits to be undertaken in this policy should a proposal be approved based on an environmental assessment. Appendix B also lists a number of activities that require EIAs, among which number 11 specifies ‘mining, mineral extraction and mineral beneficiation’ (Namibia 1994).

This policy is very specific regarding how environmental assessments are to be conducted, yet gives the competent authority a great deal of leeway in deciding when to request a formal assessment and when not to. Appendix B is all-encompassing and if the Authority strictly adheres to that list, virtually all projects could require a formal assessment. Such stringency would, in practices, hamper development severely. Effective enforcement of this policy without legislation and specific regulations in place would be difficult to enforce and regulate.

Environmental Impact Assessments can be defined as scientific and social studies carried out before a proposed development takes place, to establish what affect the development will have. Their purpose is to ensure that environmental consequences of development proposals are understood and adequately considered in the planning and decision-making process. All proposals for activities stipulated in Appendix B of the policy are to be accompanied by completed environmental questionnaires and must be handed to the MET. Based on the questionnaire the authority decides on whether an EIA is required or not. If no EIA is required an Environmental Clearance can be issued immediately, with or without condition (Namibia 1994). Should an EIA be required, the process indicated in Figure 6.1 needs to be followed.

In regard to mining and prospecting in Parks, the Minerals Act, the Environmental Management Bill and the Parks and Wildlife Bill all require an EIA to be conducted, prior to any licenses being granted. It would be in accordance with this policy that EIA would have to be conducted.

6.3.3 Minerals Policy (2004)

The mission statement in the policy reflects the constitution and the sustainable use of resources:
‘The Ministry of Mines and Energy (MME), as the custodian of Namibia’s rich endowment of mineral and energy resources, facilitates and regulates the responsible development and sustainable utilisation of these resources for the benefit of all Namibians’. Section 2.2.4 deals with prospecting and mining in protected in areas and states the following: ‘Emphasis is placed on the Government to ensure that mining does not jeopardise the potential for long-term sustainable development in tourism … In order to reconcile the objectives of mineral exploitation and environmental protection, it is essential that the negative impacts of prospecting or mining activities on the environment be avoided, minimised and mitigated in accordance with national policy and legislation, and international best practise. Commitments, in respect of prospecting and mining activities, have been made in line with national policies and strategies developed for environmental protection’ (Namibia 2004a).

Section 2.2.5 deals with mine closure, according to which no mining license should be granted before a final mine closure plan, together with a funding mechanism for this plan, is described and provided. This closure plan should deal with matters such as groundwater pollution, soil degradation, wind pollution and infrastructure planning (either removal or final usage). Section 5 specifically deals with effective operational environmental management, rehabilitation, waste management, and health and safety issues (Namibia 2004a).

The policy emphasises better coordination and cooperation between the MET and MME in regard to better environmental practises being employed. It also places greater emphasis on Government's role in monitoring activities to ensure compliance. This policy directly emphasises mining and prospecting in parks and its effect on the environment. It is important to note that this policy is highly significant for the mining sector and even more so for those active in parks, since heavy emphasis is placed on closure plans with effective environmental management.

6.4 INTERNATIONAL CONVENTIONS

Since independence in 1990, Namibia has become signatory to several international conventions. Namibia is blessed with unique biodiversity and areas of world heritage importance. It is for safeguarding these resources that the various conventions discussed in this section have been ratified. Namibia sees itself as an integral part of the greater African biosphere, of which the Namibian government is a custodian of a small part in the south western corner.

6.4.1 Ramsar Convention on Wetlands (1971)

The Convention on Wetlands of International Importance especially as Waterfowl Habitat, drafted in Ramsar, Iran in 1971, and as amended in 1982 and 1987 (Ramsar Convention Bureau 1996) is generally known as the Ramsar Convention. It recognizes the importance of wetlands as regulators of water regimes and as habitats supporting significant species of plants and animals, especially water birds which provide a reliable indicator of the health of wetlands.

The broad aims of this convention are to stem the loss and to promote wise use of all wetlands. One of the most important implications is the conservation of the country's water supplies, for both the use of natural and human environments. The convention encourages the conservation of wetland habitats, and provides a framework for international cooperation for wetland conservation. Because

water birds migrate across international borders, and even between continents, their conservation and the protection of their habitat is seen as an international issue.

Namibia became signatory to this convention in 1995 and has, to date, declared four Ramsar sites: Orange River Mouth (jointly with South Africa), Sandwich Harbour, Walvis Bay Lagoon and Etosha Pan. The Kunene River Mouth has been proposed as a future Ramsar Site. Despite its relative shortage of wetland habitats, Namibia hosts a vast number of migratory birds each year. The reason for including this convention in this discussion is that all four Ramsar sites are located in designated conservation areas. Currently, active mining is taking place in the direct vicinity of the Orange River mouth, prospecting is active at the Kunene River mouth, and salt is being mined in the Walvis Bay Lagoon. As the Government's stance to mining in parks has changed in recent years, mining and prospecting companies should also take cognisance of international conventions prior to commencement of their activities.

6.4.2 Convention on Biological Diversity (1992)

The Namibian president signed this convention at the Rio Earth Summit in 1992. Its main objectives are 'the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and appropriate funding' (UNEP 2001). An underlying principle of this convention is that states have the sovereign right to exploit their own resources, but that activities within a country should not cause damage to their environments and those of other states.

Namibia's Constitution addresses these issues in Article 95, and, in Article 100, claims sovereign ownership of all natural resources. The country has furthermore embarked on a number of biodiversity programmes which effectively constitute compliance of its obligations under this convention. The relevance for mining companies in parks is that parks have been designated as such for the conservation of biological diversity. In the light of the country's fragmented and outdated legislation, this convention becomes highly significant to ensure the protection of biological diversity. One of the prime impacts of mining and prospecting on the natural environment is the potential loss and disturbance of naturally occurring biodiversity.

6.4.3 Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1973)

CITES is an international agreement between governments, the main objectives of which are the protection of endangered species prominent in international trade through appropriate trade control measures and monitoring the status of such species.[27] Namibia became the 108th signatory member in 1990 and brought the convention into force the following year.

Due to the trade in wild animals and plants crossing international borders, the effort to regulate them requires international cooperation to safeguard certain species from over-exploitation. CITES was conceived in the spirit of such cooperation. CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction from the sea of species covered by the convention has to be authorized through a licensing system. Each party to the convention must designate one or more management authorities in charge of administering that licensing system.

This convention has little direct bearing on mining or prospecting. The reason for inclusion here is that some parks in Namibia are located on borders and along the coast, and hence make them vulnerable to uncontrolled movement of species. It is not the intention to imply that mining or prospecting companies trade in these, or that they participate in illegal activities, but it is a possibility that must be guarded against. The inclusion of this convention here is rather to raise awareness of mining companies and their employees to this issue.

6.4.4 Basel Convention on the Control of Transboundary movements of Hazardous Wastes and their Disposal (1992)

As of August 22, 2005, 166 member countries had become signatory to this convention. Namibia became a signatory in 1995. Objectives of the convention are the reduction of the production of hazardous waste and the restriction of transboundary movement and disposal of such waste. It also aims to ensure that any transboundary movement and disposal of hazardous waste, when allowed, is strictly controlled and takes place in an environmentally sound and responsible way. Improved international cooperation has resulted in better control of hazardous waste movement and complete transparency in cases where such movement does take place (UNEP 1989).

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[27] The text of the convention can be found at http://www.cites.org/eng.disc/text.shtml

Mining companies in certain instances can, depending on the process employed and the mineral being exploited, produce hazardous waste. All mining and prospecting companies produce industrial waste that can be termed as hazardous. Examples of such substances would be hydro-carbon polluted material, used vehicle batteries, etc. The problem in Namibia is that a limited number of waste sites are available for the disposal of such wastes. One such site is the hazardous waste cell Kupferberg outside Windhoek and another is located near Walvis Bay. It is thus of importance for mining companies to be aware of this conventions status, should they not be able to discard their waste within Namibia, and need to export their waste elsewhere.

6.4.5 United Nations Framework Convention on Climate Change (1992)

The first World Climate Conference was held in 1979, followed by a number of more specific meetings and, in 1990, the establishment of a UN sponsored Intergovernmental Negotiating Committee (INC), which was tasked with establishing the finer details of the Framework Convention on Climate Change (FCCC). The convention was duly completed and signed by 154 governments, including Namibia, at the Earth Summit at Rio de Janeiro in 1992. The main objective of the convention is to 'stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous, man-made interference with the climatic system'. It hopes to achieve this as quickly as possible, thereby allowing ecosystems time to adapt naturally to gradual climatic change. The FCCC emphasised the responsibility of developed countries in reducing and stabilizing greenhouse gas emissions to 1990 levels by 1995. They are furthermore expected to transfer technology to developing countries so as to enable the latter to meet their own commitments (UN 2005).

Although Namibia is not a significant source of greenhouse gases, it is vulnerable to climate change, as a large proportion of its people depend on agriculture and fisheries for their existence. Namibia should reduce exhaust emissions and seek alternatives to fossil fuels for energy generation. By harnessing solar and other forms of renewable energy, the country would be making a small but important contribution to the world's environmental stability (Du Plessis 1999).

When adopting the Convention on Climate Change, governments' recognised that their commitments would not be sufficient to seriously tackle climate change. In 1995, in a decision known as the Berlin Mandate, a new round of talks to decide on stronger and more detailed commitments for industrialized countries was therefore launched. After two and a half years of intense negotiations, the Kyoto Protocol to the United Nations Framework Convention on Climate

Change was adopted in Kyoto, Japan in 1997. This Protocol shares the convention's objective, principles and institutions, but significantly strengthens the convention by committing Annex I Parties to individual, legally-binding targets to limit or reduce their greenhouse gas emissions. Only parties to the FCCC that have also become parties to the Protocol (i.e. by ratifying, accepting, approving, or acceding to it) will be bound by the Protocol's commitments. The individual targets for Annex I Parties are listed in the Kyoto Protocol's Annex B. These add up to a total cut in greenhouse-gas emissions of at least five per cent from 1990 levels in the commitment period 2008–2012 (UNFCCC 1997).

In a country like Namibia where only insignificant quantities of greenhouse gases are emitted, it is important to target the relevant sectors that are the causes of emissions. The mining sector, not only through their processing units (smelters), but also through their machinery required to exploit the minerals, is a source of greenhouse gases. The relevance of this convention does not only rest on mining and prospecting companies in parks, but in all of Namibia. However, due to their impact on the nation's biodiversity, these companies should continually strive to reach targets set in Annex B of the Kyoto Protocol.

6.4.6 Vienna Convention for the Protection of the Ozone Layer (1985)

The implementation of this convention followed the adoption of the Vienna Convention in 1985, the Montreal Protocol in 1987 and the London Amendment in 1990. The convention recognizes the need to protect the ozone layer from harmful emissions caused by humans and requires international cooperation and action based on ongoing scientific research and technological considerations. Its main purpose is to protect human health and the environment from increased ultra-violet solar radiation. Adverse impacts include increasing skin cancer, damage to crops and die-offs of plankton in the ocean which, in turn, affect the fishing industry. It requires that governments reduce their reliance on ozone depleting substances, and that collaborative research be undertaken to find alternatives to harmful substances such as chlorofluorocarbons (CFCs) and halons. The convention specifically urges governments to assist developing countries through technology transfer, research and training (UNEP 2004).

Although Namibia does not significantly contribute to the destruction of the ozone layer, it became a signatory to the treaty in 1993 and is therefore obliged to assist where possible and appropriate in finding solutions to the ozone problem. It is furthermore obliged to submit statistics on the production and/or use of CFCs in its industrial activities.

6.4.7 United Nations Convention to Combat Desertification (1994)

Namibia signed this Convention in 1994 and ratified it on 16 May, 1997; its date of entry into force was 14 August, 1997. The Convention focuses especially on the plight of Africa, and aims specifically to address issues such as food security, environmental conservation and sustainable development. The objective of this convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective action at all levels, supported by international cooperation and partnership arrangements, in the framework of an integrated approach which is consistent with Agenda 21, with a view to contributing to the achievement of sustainable development in affected areas (UN 1994).

Namibia is prone to drought and a large portion of the country is either classified as desert or semi-desert environment, so mining and prospecting that takes place in Namibia, if not managed correctly with sound environmental management plans in place, can have serious consequences resulting in increased desertification rates.

6.5 ENVIRONMENTAL LEGISLATION IN SOUTHERN AFRICAN DEVELOPMENT COMMUNITY COUNTRIES

The environmental legislation in place of three Southern African Development Community (SADC) countries, namely Botswana, South Africa and Tanzania were consulted for this overview. Attention was paid specifically to constraints identified and experienced by these countries that prevent effective implementation of existing legislation or legislative shortcomings that need to be addressed to ensure environmentally sustainable practises.

The above three mentioned countries were chosen as they might aid for comparison purposes. South Africa is the most logical choice due to the close links shared between the two countries (Namibia and South Africa), historically and today economically. Botswana was chosen as a comparison as it was a neighbour, it shares a similar climate and it too is a country whose economy is heavily dependant on the mining sector. Botswana too places a strong empasis on the maintenance of its protected areas. Tanzania was chosen as it too was a country within the SADC with a strong emphasis on mining. Again Tanzania has a strong tourism industry with an emphasis on its protected areas.

6.5.1 Botswana

Legislation in Botswana reflects influences from various institutions and involved parties, among which are international conventions and treaties, non government organisations (NGOs), international donors, the tourism industry, industrial development concerns, community participation structures, the government's Vision 2016 policy statement for governing the country up to that year, the eighth National Development Plan (NDP 8) and the livestock industry.

Botswana has 25 environmental statutes in force that combine civil, criminal, and administrative elements. Civil law principles underlie many of the environmental management statutes and administrative measures are used to regulate the use of natural resources. Finally, criminal sanctions are used to punish transgressions in an effort to change behaviour.

International conventions have started to influence legislation increasingly. NGOs have a more limited role in Botswana than in other developing countries and are limited to one of commentator rather than collaborator. However, there seems to be scope for the involvement of NGOs to become more significant in the future (Fink 2000).

6.5.2 South Africa

The Government of South Africa is constituted as having distinct, but interdependent and interrelated national, provincial and local spheres. The constitution allocates legislative and administrative functions to all these spheres of government, giving a wide range of government agencies responsibility for environmental management. Most of South Africa's environmental laws are found in acts passed by the national parliament, but there are also environmental regulations in: regulations passed under national statutes; provincial ordinances passed by provincial authorities; and by-laws passed by local authorities.

Different government departments administer all these laws. With so many different government departments, it is often difficult to establish who the competent authority is, especially at provincial level (Glazewski & Wroe-Street 1993). Mining is dealt with solely under the Minerals Act. This Act also deals with the safety and health of workers in mines; and the restoration of land disturbed by mining.

6.5.3 Tanzania

There is no provision in the *Wildlife Conservation Act of 1976* for mining in game reserves. However, even when obtaining licenses from the Department of Mineral Resources, permission must still be obtained from the Directorate of Wildlife. Under current legislation, mining is permitted in National Parks with written notice to the Governor. Both the Mining Ordinance (CAP 123) and the Mining (Mineral Oil) Ordinance (CAP 399) give more protection to conservation areas than the National Conservation Act Ordinance.

Future plans in Tanzania include prohibiting all mining in national parks and the Ngorongoro Conservation Area, to protect the potential income gained from tourism. Strict conditions will also be set up in regard to mining in game reserves. The Director of Wildlife will give consideration to the undertaking of mining for precious metals and gemstones in game reserves. The Director will only agree to the exercising of a mineral right by a large or small-scale mining firm, which will extract the mineral efficiently and with minimal pollution and limited environmental damage. All mining operations will be preceded by an Environmental Impact Assessment which will require an assessment of restorative measures that will be taken to return the mining zone back to its natural state upon cessation of the mining operation.

6.5.4 Constraints faced in ensuring effective environmental governance

With the exception of South Africa, existing environmental legislation in SADC countries is out of date or covers only a small portion of contemporary problems. The legislation is also highly fragmented and uncoordinated, making it difficult to enforce and control activities. A particular department may propose some environmental management or protection legislation when several other agencies actually have jurisdiction over, effective use of, or administer the resources or systems involved. None of the relevant overlapping agencies are typically involved in or are even consulted when a related agency's legislation is prepared. Some of them may be simultaneously drafting legislation dealing with the same resource problem from a different perspective.

The initiative for new or reformed environmental legislation typically comes from resource managers or technicians. Legal talent is scarce and one lawyer may have to argue government cases, represent the country in international meetings, and review legal drafts submitted by environmental agencies. This often results in environmental proposals remaining untouched for lengthy periods due to other more pressing issues.

There is a general lack of personnel, budgetary resources and motivation to implement and enforce existing legislation. Further, public consciousness is not yet sufficient to force political leaders to correct even the most damaging abuses of the environment. A lack of critical mass to ensure effective enforcement of legislation is a significant constraint. This is experienced in a lack of capacity and adequately qualified professionals in Government structures, as the private sector lures quality staff with its better benefits. Another important factor is that, due to fragmented legislation, government units that should be working together on resource problems may be physically scattered in various buildings in the capital, distant and isolated from each other, or spread throughout the country.

The constraints and problems faced by governments to enforce their current environmental legislation, as well as update their legislation, are ones that face most developing countries. The only way to try and break the debilitating cycle that seems to occur in these countries is to try and deal with one constraint at a time. Over the last decade Botswana, Tanzania and Namibia have all been in the process of drafting and promulgating new environmental legislation, yet none have their legislation up to date. Severe shortages in qualified personnel to enforce current legislation plague all countries surveyed. Perhaps this would be the first area to address, before more environmental damage occurs.

6.6 EVALUATION OF LEGISLATION AND POLICY ADEQUACY

Namibia currently finds itself very much in a typical developing country scenario in regard to its environmentally related legislative processes. Its legislation is fragmented and has a range of authorities dealing with overlapping issues. There is no single competent authority designated to coordinate environmental affairs with final consequential decision-making capabilities for all environmental issues. Further, a severe shortage in capacity exists within the government departments that deal with environmental concerns.

In Namibia use is currently being made of draft legislation in order to ensure environmentally sound practises. This is of course not the most efficient way of operating. In many instances, particularly where contentious issues are raised, the competent authority has to compromise given the lack of relevant and appropriate legislation to provide backup.

In 2000, the MET drafted the Pollution Control and Waste Management Bill, under which the MET would become a regulatory authority for waste management. Yet, since then the MAWRF has

promulgated a new Water Resources Act (2004) which appoints itself as the regulatory authority on waste. Upon enquiry from the MAWRF for clarification of the type of waste referred to in their Act, no clarity could be provided. Conflict in delegation of responsibility for various aspects of the environment creates uncertainty. Without workshops and stakeholder participation to clarify jurisdictions and responsibilities, Bills should not be promulgated. Similar discord has been identified in other draft legislation proposed by the MET, where different directorates have failed to discuss all aspects prior to drafting legislation. This difficulty in reaching compromise and agreement manifests in injudicious promulgation of legislation.

Government units that should be working together are physically scattered in various buildings in Windhoek, isolated from each other, or spread throughout the country. An example of this is the Environmental Assessment Unit of the Directorate of Environmental Affairs at the MET. At present this unit deals, to a large extent, with applications for Environmental Clearance for mining and prospecting licences, and needs to liaise closely with the Directorate of Mining, at the MME. Yet these two departments are located so far apart that vehicle transport is needed to visit colleagues in the other department, creating problems when documents need to be physically moved from one office to the other. Such courier facilities are simply not available to government employees.

Namibia is a country accommodating a small body of professionals. It is therefore a difficult task for the government to muster the necessary professionals capable of performing the required tasks. Often, when the individuals are adequately trained and capable of performing their duties, they migrate to the private sector where they can earn much higher salaries. In the context of mining in parks the most critical unit of the MET is the Environmental Assessment Unit. It needs to review all applications, EIAs and EMPs and make technical recommendations to the Director of Environmental Affairs as to whether an activity should be allowed to take place. Until recently, only one dedicated staff member, trained on the job with no prior qualifications, was delegated to this unit. Since then this person has departed for the private sector, to be replaced by two part-time staff – one an administrative functionary, the other actually still in charge of a different unit. This has been the situation for six months and the permanent, full-time post in the unit has still not even been advertised (August 2005). With this unit dysfunctional in ensuring environmental regulation of the mining industry, the function in government is simply not performed. Promulgating new legislation will have little effect if enforcement offices for the legislation are not staffed or adequately trained.

The constraints mentioned above, and problems facing the authorities in Namibia do not necessarily paint a scenario of doom devoid of solution. However, many NGOs and the public at large are gravely concerned that government might not consider the protection of the environment one of its important functions. Improved cooperative governance concerning all relevant environmental regulatory authorities remains essential. Good cooperative governance is only possible with the proper capacity provided in all offices concerned. These changes would then be complemented by updated and newly promulgated legislation.

Should the above not be a realistic way forward as is argued by many for the third world, as the environment will not feature as an important governmental political drive, an independent environmental agency should be established. One that would not be politically compromised, and could serve with only one purpose, to protect the environment. The question remains, however: would this agency not become too powerful were it to function effectively in a third world context.

CHAPTER 7 SUMMARY AND CONCLUSIONS

In the developed world, where living standards are relatively high and the natural environments have become rare, the balance in the scales now generally favours conservation, but in developing countries, priorities are different. Here, getting the balance right between development and environmental protection is particularly important; indigenous resources must be exploited as part of overall economic development, but the results of careless exploitation of natural resources can be disastrous.

7.1 SUMMARY OF RESEARCH RESULTS

Namibia is a country that has many parks and vast tracks of land declared as conservation areas. This is not because the land is barren and nothing else could be done with the land, but the land was conserved for its uniqueness and sensitivity and hence needed protection. A good example of this is the Skeleton Coast Park, as it has many unique characteristics, is environmentally extremely sensitive and needs protection from outside influences. In order to effectively be able to protect the park the status quo of all activities in the park, including mining and prospecting, needs to be understood.

Once all mining and prospecting is understood, the extent of impacts can be fully gauged and appropriate management guidelines can be set out to minimise necessary impacts and prevent unnecessary impacts from occurring. To effectively manage mining and prospecting operations, legislation and policy measures for management need to be addressed and revised accordingly.

7.1.1 Uniqueness and sensitivity of the SCP environment

The SCP is situated in the northern part of the Namib Desert. The Namib Desert is argued by many to be the oldest desert in the world and many of its fauna and flora have become specialised and uniquely adapted to live in this hostile, remote area.

Flora such as the lichen fields, *Welwitschia mirabilis* and the variety of succulents that make this park so unique and special have adapted fantastically to survive a very harsh climate. However, even though these flora are able to survive in this climate, they remain extremely vulnerable to external influences.

Similarly many species of fauna have had to adapt in some manner in order to survive. The lack of human influence within the park meant species sought refuge in the park for breeding, nesting or mating as this was still a 'safe' environment, e.g. the Red Data Species, the Damara Tern. These terns have four breeding sites in Namibia – they nest most often on gravel plains – of which three are in the SCP (one just south of Möwe Bay, one near the Huab River and the last one at the Ugab River) (Simmonds, Cordes & Braby 1996).

Other 'charismatic megafauna' such elephant, rhinoceros and lion also make their way into the park. Sitings of lion hunting and scavenging on the beach for seals have been reported by park wardens, as these are rare. Elephant and rhinoceros are more evident in the outer eastern parts of the park where more trees and vegetation are present.

7.1.2 Status quo of prospecting and mining in the SCP

The EPLs issued within the SCP appear to change in ownership frequently. The reasons for this can only be speculated upon – in some cases the EPL is sold to another prospecting company, in others the EPL owner starts a new company and shifts the EPL ownership to the new company. A popular theory regarding this constant new ownership of the same EPLs is that of making the companies look more attractive to investors hence increasing the share value.

Another question that needs to be answered by authorities is how could so many EPLs have been granted without Environmental Clearances? Of the 27 EPLs in the SCP, only six obtained Environmental Clearance, that is only 18% of applications comply with the legislative process, at least as far as the environment is concerned.

Many applications for EPLs are made, and then no prospecting ever takes place. According to the *Minerals Act of 1992* if no prospecting occurs then the prospecting license will be taken away by the state, though this has not yet happened in one case. This trend again tends to let one speculate as to the motive of attaining an EPL: if prospecting is not the intention, could it be simply to enhance some company profile?

An argument that has been presented by the Directorate of Mines and Energy is that they forward the Environmental Clearance application to the DEA in good time, but the DEA does not deal with the application for months. This delay can cost the Namibian government dearly as it discourages investments and, more directly, as no mining can take place therefore no royalties can be claimed. It is for this reason that the MME often takes its overriding power to issue the licenses without

environmental clearances as stated in the Minerals Act, so as to stimulate its industry and promote growth. Though this may be a valid reason, it does nothing for the protection of the environment.

Past mining activities in the SCP (between 1943 and 1983) yielded only 33,128.05 carat of diamonds; much of which were of a poor grade (Stocken 1965a+b). Prospecting techniques employed then and now do not differ vastly, though today the process does not rely on hand sorting. Trenching and pitting seems to occur in the same manner as it did in the 1950s and 1960s, and the separation of coarse and fine material occurs in a similar manner. Today, instead of having a good recovery process with the use of screens and then hand sorting, the use of x-ray defractors and DMS plants, the recovery process is considered to be 100% accurate and widespread.

Within the SCP, many of the same areas have been repeatedly prospected. Not only have the areas been prospected and mined, in some cases by CDM and other major mining houses in the 1960s and 1970s, all their results have been published and indicate that no worthy gravel deposits exist. However, these areas have more recently been re-opened by new mining and prospecting houses who appear to be prospecting at a loss. It is assumed that this is one of the reasons for the high turnover of EPL ownership. Another reason for this assumption is the limited amount of time that is spent by some companies actually prospecting, if any prospecting does take place.

Several reports from geologists in the 1960s and 1970s have stated that no significant deposits, if any, are evident in the higher marine terraces along the Skeleton Coast. It had already been remarked that better results and a more successful prospecting area is the ‘new’ sea terrace located between the low and high water mark, and some 100m inland. It would seem that an integral part of prospecting is to identify previous work done, and not to duplicate this.

7.1.3 Impacts and guidelines for management

The revival of prospecting and mining activities in the SCP, particularly in the northern section, will undermine the ‘sense of place’ of the park. It is interesting to note that a number of development proposals elsewhere in the world have been shelved for threatening ‘sense of place’. The best known example in southern Africa was the proposed heavy metals mine in the dunes around the St Lucia wetlands in northern Kwa-Zulu Natal (MET 1999).

Potential negative impacts that cause concern in the SCP are visual impacts such as indiscriminate tracks, unsightly setting up of prospecting camps, and the scarring of the landscape due to poor rehabilitation. Another impact of high concern, which occurs continuously during prospecting and

mining, yet is not quickly identified, is biodiversity loss. A gradual loss in plant cover, especially lichens will be noted over time. Initially on vehicle tracks and where prospecting takes place, localised loss of vegetation occurs. Over time, all these localised areas start to form one larger area that has been impacted upon. It is this larger area that will have lost a variety of biodiversity and will hence struggle to naturally rehabilitate. The main problem identified in this research is that intervention is difficult in fringe environments such as the Skeleton Coast. In this desert biome, once basic flora such as lichens are damaged and/or lost, it becomes difficult to restore the area. The same applies for hummock vegetation – once these are removed and flatted for a trench they can not be relocated or replanted.

7.1.4 Legislative and policy measures for management

Namibia currently finds itself very much in a typical scenario of developing countries with regard to its legislative processes concerning the environment. Its legislation is fragmented and has many authorities dealing with similar issues. There is no one competent authority for all environmental issues.

7.2 LEGISLATIVE AND POLICY RECOMMENDATIONS

Existing Namibian environmental legislation is out of date and covers only a small portion of the current problems, in an uncoordinated fashion. Use is currently being made of draft legislation in order to ensure environmentally sound practices. This, of course, is not the most efficient way of operating. In many circumstances, when a contentious issue is raised, often government or the competent authority has to compromise environmental integrity, as relevant and appropriate legislation is not available.

Environmental legislation makes a difference. It establishes binding policies and standards, provides the basis for substantive and procedural regulations, and creates institutions at least theoretically capable of implementing policies and enforcing rules.

7.3 EVALUATION OF RESEARCH

Mining is an activity based on the exploitation of a non-renewable resource, and if mining is not managed correctly it can be of a very invasive nature. With high short-term benefits that can be derived from mining, it is necessary to make sure that other land use activities do not become precluded and that mining, especially in parks, use sustainable methods.

One of the main industries in Namibia is tourism. Parks in Namibia offer great diversity to tourists, particularly pristine undisturbed landscapes. Government needs to ensure that current short- and medium-term endeavours (i.e. mining) do not jeopardise the potential for long-term sustainable development (i.e. tourism).

The two ministries directly involved in this area are the MME and the MET. It would be of great value to both ministries if a clear picture of the current situation were available, so as to enhance planning capabilities for the future. As was done for the SCP, similiarly a clear picture should be created for all protected areas in Namibia.

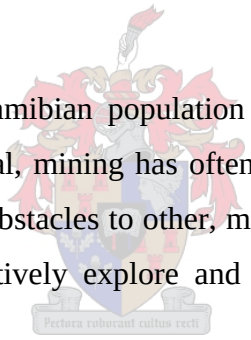
The intention of the research was to obtain clearer insight into how and why mining and prospecting companies begin to prospect in areas such as the SCP. As important in answering the above question is what can be done in carefully regulating these companies to minimise their impact? With the analysis of legislation and the identification of short-comings thereof – in particular with specific examples to what is occurring in the mining and prospecting industry – it is hoped that this study can potentially lead to some positive changes in the way EPLs are granted; preventing those without any or limited environmental management in place. Another intention is to start a debate on when an area has been proved as not being worthy of mineral exploitation, how many mining companies need to duplicate results in order to reach a final conclusion. Should an area be deemed not viable for exploitation it should be withdrawn and not be reopened for renewed mining or prospecting in the future.

7.4 FUTURE RESEARCH

While this study has gone a long way towards understanding the vital interaction between a uniquely sensitive, vulnerable environment and mining and prospecting as an industrial activity, the task of science is never complete. A range of priority issues requiring future research in Geography, Environmental Studies and related disciplines comes to mind and are suggested here as priority concerns:

- Develop understanding and theories about regional mineral genesis and deposition further to enhance mechanisms and the probabilities of finding and locating profitable mining resources in environmentally vulnerable areas like the SCP. This should serve to provide a solid basis against which to draft exploration and mining proposals in the industry and for purposes of screening by authorities.

- The impacts of mining related activities on life forms and natural processes in the arid coastal environment are only partially understood and require continued and refined study. The variant and possibly cumulative impacts in specific environmental domains (e.g. fauna, flora) and terrain settings (e.g. marine, beach, coastal, inland, riverine, dune fields) should be closely researched and understood. Such studies also need to be conducted in the various other biomes of Namibia to ensure that unique and biome-specific influences and impacts are properly anticipated.
- Continued scientific monitoring of the effect and efficiency of existing and new legislation, agreements, policies and regulations to manage negative impacts of resource exploitation in various settings to ensure adherence to the principles of sustainability and to inform and encourage continuing regulatory transformation.
- Recording and monitoring of international best practice in environmental monitoring concerning resource exploitation in different developmental settings to ensure that future Namibian generations reap the benefits of sound environmental management by wise and insightful current conduct.



Although a high proportion of the Namibian population is bound to remain reliant on natural resource use for their economic survival, mining has often, and more so in environments like the SCP, proven to "…present significant obstacles to other, more sustainable forms of land use" (Tarr 2003: 151). Namibia needs to innovatively explore and develop such options towards a more sustainable future development horizon.

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PERSONAL COMMUNICATIONS

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APPENDIX A ENVIRONMENTAL QUESTIONNAIRE FOR PROSPECTING TO BE COMPLETED BY APPLICANTS

REPUBLIC OF NAMIBIA

ENVIRONMENTAL QUESTIONNAIRE FOR PROSPECTING IN NAMIBIA

BEING APPENDIX A TO THE ENVIRONMENTAL CONTRACT

1. Background information

1.1 Companies (or individuals) applying for a **EXCLUSIVE PROSPECTING LICENSE (EPL)** must complete this questionnaire.

1.2 The answers provided in this questionnaire shall be regarded as commitments which will become part of the **Environmental Contract** between the prospector and the Government of the Republic of Namibia, duly represented by the Ministry of Environment and Tourism (MET) and the Ministry of Mines and Energy (MME).

1.3 Once the prospector has completed this questionnaire the MET and MME will either accept / reject / request further information regarding the environmental commitments made therein. The MET and MME reserve the right to add further conditions.

1.4 Once agreed to by all parties concerned, the completed questionnaire shall form part of the **Environmental Contract**.

1.5 Please attach a map of the prospecting area and a copy of the EPL application.

2. Holder details

2.1	Name of Holder	
2.2	Name of Chief Executive Officer (if a company)	
2.3	Telephone, Fax, E-mail and/ or Cell phone	Tel: Fax: E-mail: Cell phone:
2.4	Postal Address Residential/ Registered address	
2.5	Reference Number of the licence	EPL no: Expiry:
2.6	Locality of prospecting area, district and Region	
2.7	Minerals to be explored	

2.6 Please explain the proposed prospecting activities according to the different phases.

2.7 How many people do you expect to employ during the prospecting phase, what work will they do, and will they be resident (living on site) or periodic visitors?

Number of persons to be employed	The work they will do	Will the persons live on site (yes/no)	If non-resident, how often will they visit

3. Holder's environmental commitments

3.1 Pollution and Waste

3.1.1 Do you intend using any **toxic** or **hazardous substances ?**
Yes ☐ No ☐ Unsure ☐

3.1.2 If "yes" above, list the substances you intend using and their purpose

Substance	Purpose
1	
2	
3	

3.1.3 If "yes" for (3. 1. 1), explain how you will store and dispose of such substances ?

Storage of substance	Disposal of substance
1	
2	
3	

3.1.4 What will you do with **normal litter** (e.g. Kitchen spoils, cans, bottles, paper, etc.)

3.1.5 What **industrial waste** will be generated and how this will be disposed (e.g. old machinery, vehicles, building rubble, batteries, paint, thinners, vehicle oil, etc.)

3.1.6 Describe what type of **toilet facilities** will be provided

3.2 Vehicles, earthmoving equipment, drilling and blasting :

3.2.1 List the type and quantity of vehicles, earthmoving equipment, drilling equipment, and other machinery likely to be used during the prospecting phase.

Vehicles:

Earthmoving equipment:

Drilling equipment:

Other equipment or machinery:

3.2.2 Describe the environmental damage that is likely to result from the use of vehicles and machinery within the prospecting area. (e.g. on the landscape in general, soi1, vegetation, noise, dust, etc....)

3.2.3 How will you control the movement of **vehicles and machinery** in order to minimise

Environmental damage?

3.2.4 Which routes will be used by vehicles to get to your site and state whether you intend to create new roads or tracks (both to your site and within your site)?

3.2.5	Will you do any blasting during your prospecting operation?	Yes ☐	No ☐ Unsure ☐

3.2.6 If "yes" above, explain how you intend minimising environmental impacts, including the safety of humans, livestock and wildlife ?

3.3 Water

3.3.1 How much water do you intend using for various activities (e.g. Human use, washing of equipment, washing sand/stones, recreation, dust control, gardens, etc.) and state how you intend saving water within each category of use?

Activity or category of use	Quantity of water needed per month (litres)	Water saving methods

3.3.2 Where will you get your water (e.g. river, own borehole, water affairs connection, etc)?

3.3.3 Explain how you will minimise or completely avoid polluting any water source, including underground water?

3.4 Relations with neighbouring communities and/or the general public

3.4.1 Are there any people living in or near your prospecting area ? Yes☐ No☐ Unsure☐

3.4.2 If "yes", explain where these people live and describe their economic activities.

3.4.3 If "yes" in (3.4. 1) explain what you will do to maintain a good relationship with such people.

3.4.4 Will your prospecting activities restrict the movement of other people in the area ? (e.g. the general public, tourists, farmers, local people, etc.) Yes☐ No☐ Unsure☐

3.4.5 If "yes" for 3.4.4. please explain why their movements or access will be restricted

3.5 Protection of plants and wildlife

3.5.1 How will you ensure that your prospecting operation and the activities of your staff / sub-contractors, will not cause unnecessary damage to **plants and wildlife** in or near your prospecting area (e.g. hunting, plant collecting, fishing, etc.)?

3.6 Historical, archaeological and cultural heritage

(e.g. Rock art, graves, monuments, fossils, sacred sites, historical buildings, etc.)

3.6.1 Are there any historical, archaeological or culturally important sites within your prospecting area (tick one box)? Yes☐ No☐ Unsure☐

3.6.2 If "yes" above, please describe these briefly

3.6.3 If such sites are known, how will you avoid damaging them ? .

3.6.4 If such sites are discovered after you have begun your prospecting operation, would you accept new conditions to this contract so that they can be properly protected ? Yes ☐ No ☐ Unsure ☐

3.7 Rehabilitation

3.7.1 When will you rehabilitate the environmental damage done during prospecting ? (tick appropriate box) I have no intention of rehabilitating any damage ☐ On a continuous basis (i.e. simultaneous with prospecting) ☐ Only after all prospecting has finally been completed ☐ Don't know ☐

3.7.2 Describe how you will rehabilitate damage caused by prospecting:

4. Existing Damage

Describe what environmental damage exists in your site/prospecting area now, in other words, damage caused by someone else before you began prospecting in the area. (Where possible, provide evidence such as photo's, statements, etc.)

I hereby declare that the information provided in this questionnaire is, to the best of my knowledge, accurate and correct, and that this company is prepared to keep to the commitments stated therein.

……	……	……
Holder or Authorised Representative	Place	Date

APPENDIX B: BIRD SPECIES OBSERVED IN THE SCP

Roberts'	Species	Latin name
1	Ostrich	Struthio camelus
3	Jackass Penguin	Spheniscus demersus
6	Great Crested Grebe	Podiceps cristatus
7	Blacknecked Grebe	Podiceps nigricollis
8	Dabchick	Tachybaptus ruficollis
10	Wandering Albatross	Diomedea exulans
11	Shy Albatross	Diomedea cauta
12	Blackbrowed Albatross	Diomedea melanophris
14	Yellownosed Albatross	Diomedea chlororhynchos
17	Southern Giant Petrel	Macronectes giganteus
18	Northern Giant Petrel	Macronectes halli
21	Pintado Petrel	Daption capense
32	Whitechinned Petrel	Procellaria aequinoctialis
34	Cory's Shearwater	Calonectris diomedea
37	Sooty Shearwater	Puffinus griseus
44	Wilson's Storm Petrel	Oceanites oceanicus
49	White Pelican	Pelecanus onocrotalus
53	Cape Gannet	Morus capensis
55	Whitebreasted Cormorant	Phalacrocorax carbo
56	Cape Cormorant	Phalacrocorax capensis
57	Bank Cormorant	Phalacrocorax neglectus
58	Reed Cormorant	Phalacrocorax africanus
59	Crowned Cormorant	Phalacrocorax coronatus
60	Darter	Anhinga melanogaster
62	Grey Heron	Ardea cinerea
63	Blackheaded Heron	Ardea melanocephala
64	Goliath Heron	Ardea goliath
65	Purple Heron	Ardea purpurea
66	Great White Egret	Egretta alba
67	Little Egret	Egretta garzetta
68	Yellowbilled Egret	Egretta intermedia
69	Black Egret	Egretta ardesiaca
71	Cattle Egret	Bubulcus ibis
72	Squacco Heron	Ardeola ralloides
74	Greenbacked Heron	Butorides striatus
76	Blackcrowned Night Heron	Nycticorax nycticorax
79	Dwarf Bittern	Ixobrychus sturmii
81	Hamerkop	Scopus umbretta
83	White Stork	Ciconia ciconia
84	Black Stork	Ciconia nigra
85	Abdim's Stork	Ciconia abdimii
89	Marabou Stork	Leptoptilos crumeniferus
93	Glossy Ibis	Plegadis falcinellus
95	African Spoonbill	Platalea alba
96	Greater Flamingo	Phoenicopterus ruber
97	Lesser Flamingo	Phoeniconaias minor

Roberts'	Species	Latin name
101	Whitebacked Duck	Thalassornis leuconotus
102	Egyptian Goose	Alopochen aegyptiacus
103	South African Shelduck	Tadorna cana
105	African Black Duck	Anas sparsa
106	Cape Teal	Anas capensis
107	Hottentot Teal	Anas hottentota
108	Redbilled Teal	Anas erythrorhyncha
112	Cape Shoveller	Anas smithii
113	Southern Pochard	Netta erythrophthalma
117	Maccoa Duck	Oxyura maccoa
118	Secretarybird	Sagittarius serpentarius
120	Egyptian Vulture	Neophron percnopterus
123	Whitebacked Vulture	Gyps africanus
124	Lappetfaced Vulture	Torgos tracheliotus
125	Whiteheaded Vulture	Trigonoceps occipitalis
126	Black Kite/Yellowbilled Kite	Milvus migrans/parasitus
127	Blackshouldered Kite	Elanus caeruleus
131	Black Eagle	Aquila verreauxii
132	Tawny Eagle	Aquila rapax
134	Lesser Spotted Eagle	Aquila pomarina
135	Wahlberg’s Eagle	Aquila wahlbergi
136	Booted Eagle	Hieraaetus pennatus
137	African Hawk Eagle	Hieraaetus spilogaster
140	Martial Eagle	Polemaetus bellicosus
142	Brown Snake Eagle	Circaetus cinereus
143	Blackbreasted Snake Eagle	Circaetus pectoralis
146	Bateleur	Terathopius ecaudatus
148	African Fish Eagle	Haliaeetus vocifer
149	Steppe Buzzard	Buteo buteo
152	Jackal Buzzard	Buteo rufofuscus
153	Augur Buzzard	Buteo augur
157	Little Sparrowhawk	Accipiter minullus
159	Little Banded Goshawk	Accipiter badius
161	Gabar Goshawk	Micronisus gabar
162	Pale Chanting Goshawk	Melierax canorus
167	Pallid Harrier	Circus macrourus
168	Black Harrier	Circus maurus
169	Gymnogene	Polyboroides typus
170	Osprey	Pandion haliaetus
171	Peregrine Falcon	Falco peregrinus
172	Lanner Falcon	Falco biarmicus
173	Hobby Falcon	Falco subbuteo
174	African Hobby Falcon	Falco cuvierii
178	Rednecked Falcon	Falco chicquera
179	Western Redfooted Kestrel	Falco vespertinus
181	Rock Kestrel	Falco tinnunculus
182	Greater Kestrel	Falco rupicoloides
183	Lesser Kestrel	Falco naumanni

Roberts'	Species	Latin name
186	Pygmy Falcon	Polihierax semitorquatus
194	Redbilled Francolin	Francolinus adspersus
200	Common Quail	Coturnix coturnix
201	Harlequin Quail	Coturnix delegorguei
203	Helmeted Guineafowl	Numida meleagris
205	Kurrichane Buttonquail	Turnix sylvatica
212	African Crake	Crex egregia
213	Black Crake	Amaurornis flavirostris
223	Purple Gallinule	Porphyrio porphyrio
224	Lesser Gallinule	Porphyrula alleni
226	Moorhen	Gallinula chloropus
227	Lesser Moorhen	Gallinula angulata
228	Redknobbed Coot	Fulica cristata
230	Kori Bustard	Ardeotis kori
232	Ludwig's Bustard	Neotis ludwigii
236	Rüppell's Korhaan	Eupodotis rueppellii
237	Redcrested Korhaan	Eupodotis ruficrista
239	Whitequilled Korhaan	Eupodotis afraoides
240	African Jacana	Actophilornis africanus
242	Painted Snipe	Rostratula benghalensis
244	African Black Oystercatcher	Haematopus moquini
245	Ringed Plover	Charadrius hiaticula
246	Whitefronted Plover	Charadrius marginatus
247	Chestnutbanded Plover	Charadrius pallidus
248	Kittlitz's Plover	Charadrius pecuarius
249	Threebanded Plover	Charadrius tricollaris
250	Mongolian Plover	Charadrius mongolus
253	Lesser Golden Plover	Pluvialis fulva
254	Grey Plover	Pluvialis squatarola
255	Crowned Plover	Vanellus coronatus
258	Blacksmith Plover	Vanellus armatus
262	Turnstone	Arenaria interpres
263	Terek Sandpiper	Xenus cinereus
264	Common Sandpiper	Actitis hypoleucos
266	Wood Sandpiper	Tringa glareola
269	Marsh Sandpiper	Tringa stagnatilis
270	Greenshank	Tringa nebularia
271	Knot	Calidris canutus
272	Curlew Sandpiper	Calidris ferruginea
274	Little Stint	Calidris minuta
281	Sanderling	Calidris alba
283	Broadbilled Sandpiper	Limicola falcinellus
284	Ruff	Philomachus pugnax
288	Bartailed Godwit	Limosa lapponica
289	Curlew	Numenius arquata
290	Whimbrel	Numenius phaeopus
294	Avocet	Recurvirostra avosetta
295	Blackwinged Stilt	Himantopus himantopus

Roberts'	Species	Latin name
297	Spotted Dikkop	Burhinus capensis
298	Water Dikkop	Burhinus vermiculatus
299	Burchell’s Courser	Cursorius rufus
300	Temminck’s Courser	Cursorius temminckii
301	Doublebanded Courser	Smutsornis africanus
307	Arctic Skua	Stercorarius parasiticus
309	Pomarine Skua	Stercorarius pomarinus
310	Subantarctic Skua	Catharacta antarctica
312	Kelp Gull	Larus dominicanus
315	Greyheaded Gull	Larus cirrocephalus
316	Hartlaub’s Gull	Larus hartlaubii
318	Sabine’s Gull	Larus sabini
322	Caspian Tern	Hydroprogne caspia
323	Royal Tern	Sterna maxima
324	Swift Tern	Sterna bergii
326	Sandwich Tern	Sterna sandvicensis
327	Common Tern	Sterna hirundo
328	Arctic Tern	Sterna paradisaea
334	Damara Tern	Sterna balaenarum
337	Black Tern	Chlidonias niger
338	Whiskered Tern	Chlidonias hybridus
339	Whitewinged Tern	Chlidonias leucopterus
344	Namaqua Sandgrouse	Pterocles namaqua
347	Doublebanded Sandgrouse	Pterocles bicinctus
349	Rock Pigeon	Columba guinea
352	Redeyed Dove	Streptopelia semitorquata
353	Mourning Dove	Streptopelia decipiens
354	Cape Turtle Dove	Streptopelia capicola
355	Laughing Dove	Streptopelia senegalensis
356	Namaqua Dove	Oena capensis
361	Green Pigeon	Treron calva
365	Rüppell’s Parrot	Poicephalus rueppellii
367	Rosyfaced Lovebird	Agapornis roseicollis
373	Grey Lourie	Corythaixoides concolor
375	African Cuckoo	Cuculus gularis
380	Great Spotted Cuckoo	Clamator glandarius
386	Diederik Cuckoo	Chrysococcyx caprius
392	Barn Owl	Tyto alba
395	Marsh Owl	Asio capensis
396	Scops Owl	Otus senegalensis
397	Whitefaced Owl	Otus leucotis
398	Pearlspotted Owl	Glaucidium perlatum
401	Spotted Eagle Owl	Bubo africanus
402	Giant Eagle Owl	Bubo lacteus
405	Fierynecked Nightjar	Caprimulgus pectoralis
406	Rufouscheeked Nightjar	Caprimulgus rufigena
411	European Swift	Apus apus
413	Bradfield’s Swift	Apus bradfieldi

Roberts'	Species	Latin name
415	Whiterumped Swift	Apus caffer
417	Little Swift	Apus affinis
418	Alpine Swift	Apus melba
421	Palm Swift	Cypsiurus parvus
425	Whitebacked Mousebird	Colius colius
426	Redfaced Mousebird	Urocolius indicus
428	Pied Kingfisher	Ceryle rudis
429	Giant Kingfisher	Megaceryle maxima
439	Olive Bee-Eater	Merops superciliosus
440	Bluecheeked Bee-Eater	Merops persicus
445	Swallowtailed Bee-Eater	Merops hirundineus
447	Lilacbreasted Roller	Coracias caudata
449	Purple Roller	Coracias naevia
451	Hoopoe	Upupa epops
452	Redbilled Woodhoopoe	Phoeniculus purpureus
453	Violet Woodhoopoe	Phoeniculus damarensis
454	Scimitarbilled Woodhoopoe	Rhinopomastus cyanomelas
457	Grey Hornbill	Tockus nasutus
458	Redbilled Hornbill	Tockus erythrorhynchus
459	Southern Yellowbilled Hornbill	Tockus leucomelas
462	Monteiro’s Hornbill	Tockus monteiri
465	Pied Barbet	Tricholaema leucomelas
486	Cardinal Woodpecker	Dendropicos fuscescens
487	Bearded Woodpecker	Thripias namaquus
493	Monotonous Lark	Certhilauda passerina
498	Sabota Lark	Certhilauda sabota
500	Longbilled Lark	Certhilauda curvirostris
502	Karoo Lark	Certhilauda albescens
506	Spikeheeled Lark	Chersomanes albofasciata
507	Redcapped Lark	Calandrella cinerea
511	Stark’s Lark	Spizocorys starki
514	Gray’s Lark	Ammomanes grayi
515	Chestnutbacked Finchlark	Eremopterix leucotis
516	Greybacked Finchlark	Eremopterix verticalis
518	European Swallow	Hirundo rustica
520	Whitethroated Swallow	Hirundo albigularis
522	Wiretailed Swallow	Hirundo smithii
526	Greater Striped Swallow	Hirundo cucullata
529	Rock Martin	Hirundo fuligula
530	House Martin	Delichon urbica
532	Sand Martin	Riparia riparia
533	Brownthroated Martin	Riparia paludicola
541	Forktailed Drongo	Dicrurus adsimilis
543	European Golden Oriole	Oriolus oriolus
547	Black Crow	Corvus capensis
548	Pied Crow	Corvus albus
552	Ashy Tit	Parus cinerascens
555	Carp’s Black Tit	Parus carpi

Roberts'	Species	Latin name
557	Cape Penduline Tit	Anthoscopus minutus
563	Pied Babbler	Turdoides bicolor
564	Barecheeked Babbler	Turdoides gymnogenys
567	Redeyed Bulbul	Pycnonotus nigricans
574	Yellowbellied Bulbul	Chlorocichla flaviventris
580	Groundscraper Thrush	Turdus litsitsirupa
583	Shorttoed Rock Thrush	Monticola brevipes
586	Mountain Chat	Oenanthe monticola
587	Capped Wheatear	Oenanthe pileata
589	Familiar Chat	Cercomela familiaris
590	Tractrac Chat	Cercomela tractrac
592	Karoo Chat	Cercomela schlegelii
615	Kalahari Robin	Erythropygia paena
621	Titbabbler	Parisoma subcaeruleum
628	Great Reed Warbler	Acrocephalus arundinaceus
631	African Marsh Warbler	Acrocephalus baeticatus
635	Cape Reed Warbler	Acrocephalus gracilirostris
643	Willow Warbler	Phylloscopus trochilus
651	Longbilled Crombec	Sylvietta rufescens
653	Yellowbellied Eremomela	Eremomela icteropygialis
657	Grey-backed Bleating Warbler	Camaroptera brevicaudata
662	Rockrunner	Achaetops pycnopygius
664	Fantailed Cisticola	Cisticola juncidis
665	Desert Cisticola	Cisticola aridula
669	Greybacked Cisticola	Cisticola subruficapilla
672	Rattling Cisticola	Cisticola chiniana
685	Blackchested Prinia	Prinia flavicans
689	Spotted Flycatcher	Muscicapa striata
695	Marico Flycatcher	Melaenornis mariquensis
697	Chat Flycatcher	Melaenornis infuscatus
701	Chinspot Batis	Batis molitor
703	Pririt Batis	Batis pririt
710	Paradise Flycatcher	Terpsiphone viridis
711	African Pied Wagtail	Motacilla aguimp
713	Cape Wagtail	Motacilla capensis
714	Yellow Wagtail	Motacilla flava
716	Richard’s Pipit	Anthus cinnamomeus
717	Longbilled Pipit	Anthus similis
731	Lesser Grey Shrike	Lanius minor
732	Fiscal Shrike	Lanius collaris
733	Redbacked Shrike	Lanius collurio
739	Crimsonbreasted Shrike	Laniarius atrococcineus
741	Brubru	Nilaus afer
743	Threestreaked Tchagra	Tchagra australis
746	Bokmakierie	Telophorus zeylonus
760	Wattled Starling	Creatophora cinerea
761	Plumcoloured Starling	Cinnyricinclus leucogaster
764	Glossy Starling	Lamprotornis nitens

Roberts'	Species	Latin name
770	Palewinged Starling	Onychognathus nabouroup
788	Dusky Sunbird	Nectarinia fusca
791	Scarletchested Sunbird	Nectarinia senegalensis
798	Redbilled Buffalo Weaver	Bubalornis niger
799	Whitebrowed Sparrowweaver	Plocepasser mahali
801	House Sparrow	Passer domesticus
802	Great Sparrow	Passer motitensis
803	Cape Sparrow	Passer melanurus
804	Greyheaded Sparrow	Passer diffusus
806	Scalyfeathered Finch	Sporopipes squamifrons
810	Spectacled Weaver	Ploceus ocularis
812	Chestnut Weaver	Ploceus rubiginosus
814	Masked Weaver	Ploceus velatus
815	Lesser Masked Weaver	Ploceus intermedius
816	Golden Weaver	Ploceus xanthops
821	Redbilled Quelea	Quelea quelea
824	Red Bishop	Euplectes orix
826	Golden Bishop	Euplectes afer
834	Melba Finch	Pytilia melba
846	Common Waxbill	Estrilda astrild
847	Blackcheeked Waxbill	Estrilda erythronotos
856	Redheaded Finch	Amadina erythrocephala
870	Blackthroated Canary	Serinus atrogularis
878	Yellow Canary	Serinus flaviventris
879	Whitethroated Canary	Serinus albogularis
885	Cape Bunting	Emberiza capensis
886	Rock Bunting	Emberiza tahapisi
887	Larklike Bunting	Emberiza impetuani