

**ANNEXURE P:  
SUMMARY OF URANIUM RUSH SEA**



## 1.1 SUMMARY OF URANIUM RUSH SEA

Cumulative impacts are difficult to deal with on a project SEIA level, since they may occur outside of the geographical area of the particular project being assessed and thus require the collaboration of other institutions, and involve broader social, economic and biophysical considerations outside the scope of the specific project-level assessment. The fact that several other mining companies have been pursuing uranium interests in the Erongo Region emphasized the need for a holistic approach, by means of a strategic or sectoral level assessment. Such a Strategic Environmental Assessment (SEA) of the so-called “Central Namib Uranium Rush” (Uranium Rush) was recently undertaken by the South African Institute for Environmental Assessment, commissioned by the Ministry of Mines and Energy of the Government of Namibia. This section provides a summary of the SEA sections applicable to cumulative impacts.

The SEA (SAIEA, 2010) provides a bird’s eye view of cumulative environmental impacts in the Erongo region brought about as a result of the Uranium Rush (and other directly linked developments, and potential developments, such as desalination and chemical plants), and advises on how to avoid negative cumulative impacts and to enhance opportunities for positive impacts, within the uranium sector and between mining and other industries. It should be noted that for some aspects of the environment available data was lacking, such as for biodiversity, and that attaining a level of comprehensive data would be an undertaking of many years. To wait for such a time before development could continue would be unreasonable, and the SEA therefore proceeded with information at hand. The SEA found that the cumulative impacts resulting from the Uranium Rush are not limited to the Erongo region, but are wide-ranging, affecting the southern African region as a whole, particularly the Namibian and South African economies.

The second medium-growth mine development scenario, of the four possible scenarios that the SEA developed, has been used as a departure point to describe cumulative impacts that are relevant to this SEIA Phase 2 for Rössing Uranium’s expansion project. This scenario is described as being “in-line with expectations”, which is an expected total of 5 to 7 mines operating in the Erongo region by the year 2020. The four mines that currently possess mining licences, and one or two additional mines, are included and predicted to be operating by 2013 in this scenario, as well as the acceptance that existing mines will proceed with planned expansion projects and that uranium prices will be optimistic. The uranium mines included are Rössing Uranium (with expansions) Langer Heinrich (Stages I, II and III), Trekkopje, Valencia, Rössing South (Husab Project) and the Etango Project. Furthermore, one additional non-uranium mine was considered as part of this growth scenario. The other industrial developments that were considered that are directly linked to the uranium mining industry are the two desalination plants by Trekkopje and NamWater, a 400MW coal-fired or compressed natural gas power station at Walvis Bay and the Gecko mining and chemicals operations.

As far as the SEIA Phase 2 process for Rössing Uranium’s expansion project is concerned, the following impacts that have emerged as having cumulative social and environmental implications on the receiving environment have been considered in this SEIA Phase 2, and recommendations have been provided. The recommendations provided below are applicable to the cumulative situation, i.e. to the Uranium Rush industries as a whole, and not specifically to Rössing Uranium. Hence only those recommendations specific to Rössing Uranium and within its control have been carried forward to the SEMP formulated during this SEIA process. Although specific references to the SEA were made under the impact discussions above, this summary is provided for ease of reference.

### 1.1.1 SOCIAL – CUMULATIVE IMPACTS ON TOWNS

Impacts on four areas of the receiving environment of towns (including amongst others Arandis, Swakopmund and Walvis Bay) have been considered, namely the town's sense of place, incidents of crime, issues around property availability and effects on prices, and waste management (domestic, special and hazardous).

### 1.1.2 EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT SUCH AS

- Sense of place: This will be altered in many towns, generally becoming more urbanised/ industrialised and populated, although the holiday character of central Swakopmund could be maintained. Many smaller towns such as Arandis will welcome the urban development, but it needs to be predicted and properly planned.
- Crime: An increase in crime is expected, due to an influx of labour and an increase in revenue and disposable income, but furthermore, the types of crimes committed could change.
- Property: Housing shortages (owned and rented) and escalating prices are expected, which is likely to lead to more informal settlements and more pressure on service delivery from the municipalities. In the longer term, property availability and prices should stabilise as current property development plans come to fruition.
- Waste: It is not expected that the mines and industries will directly contribute much to an increase in domestic waste, but indirectly, the expected increase in population will cause a rise in this waste stream. Special waste, such as obsolete machinery and scrap metal, is produced in large quantities by mines, but much of this is re-used or recycled. Disposal sites, including that in Arandis, have been designed for waste from towns only, but low volumes of special waste is expected to derive from the mines, and the sites currently have ample capacity and are expandable at minimal cost. Hazardous waste can only be disposed of at two sites in Namibia (Walvis Bay and Windhoek). The estimated hazardous waste expected to be generated by the mines and industries for Scenario 2, is unknown, but the Walvis Bay site is currently approximately 25 % full and has been designed to expand.

### 1.1.3 PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

- Sense of place: The ideal condition of the sense of place of the towns, with the Uranium Rush Scenario 2 in play, would be that the towns develop, but do not lose their character or attractiveness, thereby not causing a decline in quality of life.
- Crime: Towns should remain as safe as they currently are, or become safer.
- Property: Stands and houses should be available and affordable.
- Waste: Despite re-using, recycling and minimizing of waste, the remaining waste should be disposed of at the existing licensed disposal sites, without causing air, water or soil pollution.

### 1.1.4 RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

- Sense of place: Competent town planning is the cornerstone to achieve the desired state of sense of place and should be supported by the mines and related industries. Zoning restrictions should be in place and upheld to avoid conflicting land-use, fast-tracking and "loopholing" processes should be guarded against and infrastructure such as schools and health facilities should keep abreast with urbanisation.
- Crime: Community initiatives in crime-fighting and prevention should be promoted and supported by the Uranium Rush industries, in collaboration with the police services.

- **Property:** Town planning is again essential in ensuring sufficient housing is made available in the Erongo towns, in particular serviced erven. In terms of property prices, estate agents should advise clients in a responsible and realistic manner, mining companies should not be allowed to manipulate prices by monopolising preferred areas and investment in less desirable areas should be encouraged. Building inspectors should ensure that structures are built in a structurally sound manner, and raw materials required for building should be made available in appropriate areas without causing environmental damage.
- **Waste:** Sufficient disposal capacity should be planned by all municipalities, taking into account expected waste generation by the Uranium Rush related industries. All waste operating staff should be trained and competent to manage sites safely, responsibly and legally. All new sites should undergo an EIA and be licensed before operating, and a sustainable waste recycling depot should be established in the central Namib (possibly Arandis) to reduce the volume of waste being disposed of at landfill sites.

#### 1.1.5 **SOCIAL – CUMULATIVE IMPACTS ON THE MACRO ECONOMIC ENVIRONMENT**

The focus under this section is the potential economic benefits that Namibia could derive from the Uranium Rush on its Gross Domestic Product (GDP), potential income to government, national employment effects, salaries and wages, and income distribution, including issues pertaining to mining industry rehabilitation funds.

#### 1.1.6 **EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT**

- **GDP:** In 2008, uranium mining contributed 3.3% of total GDP. Running at 90% production capacity, Scenario 2 could see this figure increase to a peak in 2012 of 7.2% (NAD 4.6 – 8.3 billion), which represents a GDP growth rate of 5.1% in 2008, to 8.2% in 2012. These calculations were made using a minimum price of USD50 and a maximum of USD 90 per pound of uranium oxide. Hence, if prices drop below this figure, the sector's contribution to GDP will decline, and vice versa if prices increase above USD 90. Similarly, the overall performance of the economy influences each sector and an average annual 5.1 % growth rate is assumed. Should the economy perform better or worse, the uranium sector's contribution will also fluctuate. Furthermore, an increase in one economic sector influences the demand for services in another sector, such as transport. For every extra dollar of value added in the uranium sector, another dollar is added to the whole economy.
- **Imports and exports:** The value of uranium mining exports at 90% production capacity, increases from 13% (NAD 5.4 billion) of total exports in 2008, to an expected peak of 54% (NAD 22.7 billion) in 2015. Similarly, import requirements will increase, expected from a 2.2% share of total imports in 2008 (NAD 979 million) to a peak of 9.2% in 2015 (NAD 4.1 billion). The increase in exports will boost Namibia's foreign reserves, help keep the currency exchange rate of 1:1 between the NAD and the South African Rand, which will improve import cover (a country's ability to pay imports). The outflow of money as dividends to foreign stakeholders in the mines, is not expected to have a significant negative impact on the import cover.
- **Government revenue:** The contributions to government revenue include corporate taxes, royalties, and individual income tax. Uranium mining companies can become a significant source of income to the government, presenting a total contribution of 3.2% (NAD 697 million) in 2008 to a peak of 8.2% in 2015 (NAD 3 billion), the growth rate peaking in 2013 at 9.6% compared to 8.3% in 2008. In terms of social security contributions, uranium mines could

contribute between NAD 3.6 and 6 million by 2020. However, should the government grant any more Export Processing Zones (EPZs) to new uranium mines, the expected benefits in terms of government revenue could be undermined. Companies with an EPZ status such as Trekkopje, are exempt from paying corporate, import or sales tax, and stamp and transfer duties on goods and services needed for EPZ activities, amongst other benefits. Government's aim is to attract manufacturers and investors through this piece of legislation, with a concomitant inflow of technology, capital, skills development, as well as the creation of jobs.

- Income distribution: Mining activities are highly capital intensive and employ mainly skilled and semi-skilled workers. Therefore, an increase in the uranium mining industry will mostly benefit these two factors of production. Subsequently, unskilled workers, and rural households, will benefit the least. Government could mitigate this by increasing social spending and the mining industries could become more involved in social projects to assist less fortunate communities.
- Corporate social responsibility: Companies' social commitments tend to increase the longer they are in existence and as their bonds to local communities become stronger. Rössing Uranium spent approximately NAD 30 million per annum on social projects between 2005 and 2010. To try and channel corporate social investments to sectors mostly in need of support, and not basing investment decisions on popular trends or self-interest, the established SEMP office should, in conjunction with stakeholders, compile a list prioritising support.
- Opportunity costs: The main economic sectors in the Erongo Region are mining, tourism, fisheries and agriculture, around which a number of service industries have developed. The overall impact of the Uranium Rush on these linked industries is the generation of a great number of opportunities and benefits and despite the increased consumption of water and energy, the Uranium Rush has already contributed to solving existing problems, and will continue to do so.
- Natural resource taxation: The resource rent regime in Namibia is based on the output-based royalty regime, and licensing fees, taxes and royalties go directly to the state revenue fund and are included in the national budget. Based on a study by Lange (2003a), Namibia was less efficient in capturing resource rent than Botswana (42% compared to 76%) and in a comparison of Namibia's royalty rates with a range of other countries', Namibia's rates are low. There is thus scope for Namibia to improve its mineral taxation regime and increase income so derived from the Uranium Rush.
- Rehabilitation fund: There are currently over 200 abandoned and un-rehabilitated mines in Namibia with no plans or funds to rehabilitate. These are a threat to the natural environment, to public health and safety and to game and livestock. The Namibian Mine Closure Framework (NMCF) developed by the Chamber of Mines, and adopted by the mining industry, provides guidance on how to develop relevant, practical and cost effective closure plans, which includes for financial provision. However, no detail is given as to the nature of such provisions and due to the costly nature of rehabilitation measures, planning should be done early by both government and mines. The primary problem remains the unavailability of funds from either government or mines. The cumulative impact of the Uranium Rush could be a proliferation of mines that have been inadequately closed and left in unstable states that combined could have significant negative impacts on the environment.

#### 1.1.7 PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

To maximise the potential economic benefits that Namibia could derive from the Uranium Rush without lowering of standards.

### 1.1.8 **RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT**

- The creation of a Sovereign Wealth Fund (“Uranium Fund”) for royalties and other revenue from the uranium industry. The fund could be used for specific development projects that ensure sustainable social and economic development post the Uranium Rush, thereby ensuring long term benefits for future generations.
- Mining legislation needs to include the specific requirements and standards of rehabilitation and find a financial mechanism for rehabilitation as proposed in the Mineral Policy 2002. Thorough studies need to be undertaken by the Uranium Rush industries, but setting up a rehabilitation fund would require start-up capital from government (as rehabilitation costs are incurred as soon as the development of a mine commences) and mechanisms put in place to ensure that government is reimbursed with the inflow of income as mining production progresses.
- The objective of the NMCF remains the internalisation of the cost of closure by mines. Each mine should provide a closure strategy and plan, with costs for the rehabilitation borne by the company that causes the damage to the environment, which should encourage prevention of damage as first objective. In addition, the provision of the Income Tax Amendment Act will provide further incentive to mines to contribute to funds that aim to remedy damage caused. Efforts should be co-ordinated to put a consistent framework in place.
- A review of the maximum penalty of N\$ 100,000 for environmental damages could also be considered.
- Namibia needs to consider environmental and tax legislation in countries competing with her for foreign investment, but cautioning against lowering of standards to attract investment.
- The Rehabilitation Fund could be placed under the management of the Ministry of Mines and Energy, rather than each mining company self-regulating.
- Mining companies could contribute to a Social and Environment Investment Fund to address negative impacts incurred by the environment, society or other economic sectors.
- The Ministry of Mines and Energy should publish any tax alleviation agreements with mining industries, in the annual Accountability Report to increase overall good governance.
- Namibia’s regulatory framework could be reviewed in comparison with international best practice in order to fully benefit from its natural resources.

### 1.1.9 **SOCIAL – CUMULATIVE IMPACTS ON EDUCATION AND SKILLS**

The Uranium Rush industries and developments are expected to result in a number of impacts on education and skills in the Erongo Region and nationally. The primary issues, the cumulative impacts of which could be positive or negative, are an increased demand for skilled human resources, access to education for school-aged children and the quality of education.

### 1.1.10 **EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT**

- Skills: Namibia has a very low level of skilled or trained workers in relation to unskilled workers. This ratio is also reflected in the Erongo region. The unfortunate result is that local people are unable to fully utilise job opportunities created by the Uranium Rush industries, and industries are forced to resort to either poaching skilled workers from each other or from government sectors, or employing higher paid non-Namibians to satisfy their skills needs. The negative impacts caused by these actions are destabilisation and distortion of the job market, the undermining of the ability of government to manage the Uranium Rush and the potential for xenophobia.

- Education/training access: The Uranium Rush will have a considerable impact on the lives of people in the Erongo region, representing an additional 6,000 permanent direct jobs in the Uranium Rush industries, which could result in approximately 48,000 new jobs in the Namibian economy. It is not known how many of these could be filled by locals and how many will migrate into the Erongo Region, and therefore the number of children requiring school placements is also not known. What is known is that inward migration has already placed pressure on schools and education facilities in the Erongo region, especially at the coast, and that thus far the government has coped with this influx due to adding classrooms to existing schools. A factor of this inward migration is parents from other regions increasingly sending their children to education facilities at the coast due to their good reputation and relatively low fees. Only one new school is planned in the region, which is for Walvis Bay. The Uranium Rush will simply add to the existing pressing need for additional education facilities and teachers.
- Education/training quality: In the 2001 census, only 21% of learners over the age of 15 completed secondary school and less than 6% have a tertiary qualification. One of the reasons is a lack of sufficient places in senior secondary schools. Another could be the lack of effort that has been put into primary education, where preparation is made for the next level. Expanding education facilities without employing adequately qualified teachers and providing appropriate resources such as libraries and science laboratories could cause a decline in education standards which will impact negatively on the Erongo region, particularly socio-economic development. This could also influence the decisions of potential new employees of relocating to the area.

#### 1.1.11 **PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT**

Affordable and improved access to basic, secondary and tertiary education should be available to all, to enable development and improvement of skills and to take advantage of economic opportunities. All children should at least have the opportunity to attend school and be provided with adequate facilities and resources and the quality of education (and teachers) should improve to allow learners to obtain a senior secondary certificate. Adequate training facilities and opportunities for tertiary learning should be provided so that the demand for skills by the Uranium Rush industries can largely be met by local expertise.

#### 1.1.12 **RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT**

- Skills: In the short term, Uranium Rush industries and trainers should work together to provide the standard and level of training required by the job market. The Namibian Industry for Mining Technology (NIMT) is located in Arandis but its output cannot satisfy the current, let alone the Uranium Rush, demand, and the scope of training provided needs to be expanded into other fields such as geology. A satellite campus should be established in Walvis Bay, and/or a similar accessible and flexible training institution should be established, which should be supported by the Uranium Rush industries by means of funding and skilled trainers.
- Education/training access: To meet the preferable state of education in terms of sufficient facilities taking the expected surge of learners into account, new schools will need to be built, as well as expanding existing schools. To achieve this, a high level political and economical decision is needed to spend disproportionately on school building in the Erongo region specifically, in the next 5 to 10 years. The investments required could be achieved through public-private partnerships. The Uranium Rush industries should contribute to existing supplementary educational initiatives such as those provided by the Rössing Foundation, NIMT and private institutions, rather than starting new programmes.

- Education/training quality: The biggest investment required to achieve the desired level of educational quality, is the construction and resourcing of government schools. The Namibian Government should provide incentives to uranium industry companies and donors to generously contribute to bursaries and scholarships for Namibians who show an aptitude for becoming teachers. The Rössing Foundation has already built centres at Arandis and Swakopmund to improve levels of learner performance and provide training to school principals. New mining industries could add to the efforts being made by Rössing Uranium.
- Demand for work: Staff directly employed by new mines only represent a fraction of the possible economic and employment benefits as a result of the Uranium Rush. Opportunities will arise for micro, small and medium businesses that will require extra support in view of the relative scarcity of entrepreneurs. The Uranium Rush industries could therefore contribute to the Namibian agencies that currently support the development of these enterprises.

#### 1.1.13 **SOCIAL – CUMULATIVE IMPACTS ON COMMUNITY HEALTH**

Large-scale mining always has health consequences, positive and negative, for workers and the community. Negative health impacts on workers are most commonly accidents, dust-related lung disease and metal toxicity, and positive impacts are related to better economic prospects but sometimes this comes with a separation from family. Negative health impacts on the public include new diseases and social problems carried by the influx of population but again, balanced against this, is the increased prosperity and health care brought by the mining industry.

#### 1.1.14 **EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT**

More mining activity brings more people, dust, radiation exposure and more accidents. Most of these will not have a negative impact on the health of workers and the community if appropriate safety measures are implemented. The greatest cumulative impacts on health as a result of the Uranium Rush will therefore be from the spread of disease and road accidents.

- Health care facilities: With the influx of people expected, there will be a significant impact on the provision of adequate health care facilities, which are already under pressure, unless additional facilities are built and staffed with suitably trained medical personnel.
- Community health: The primary affected communities are Arandis, Swakopmund, Walvis Bay and Henties Bay. Health concerns are radiation exposure, transportation of uranium oxide (yellow cake), spills of chemicals such as sulphuric acid and general road traffic accidents. Impacts due to the increase in radiation exposure will be negligible and levels will remain well below the internationally accepted limit. Impacts due to increased amounts of uranium oxide being transported also pose no danger as the drums in which they are transported provides an effective barrier, except in the event of an accident in which case emergency measures will be taken as with any other hazardous chemical (similarly for accidental spills of chemicals). Traffic on the roads is expected to increase significantly due to the Uranium Rush, much of this being buses and heavy vehicles. In combination with poor visibility conditions and the current poor state of the road infrastructure, accidents are expected to become more frequent. Another concern is the impact on health due to the influx of large numbers of people, including direct employees of the Uranium Rush mining-related industries and associated services industries, and their families. The negative impacts include an increase in infectious diseases, but positive effects could be increased wealth, improved housing and healthcare, and health education at the work place.
- Occupational health: Cumulative radiation exposure is unlikely to affect the exposure of workers at individual mines.

### 1.1.15 **PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT**

The main objective for health is that workers and the public do not suffer significantly increased health risks as a result of the Uranium Rush.

### 1.1.16 **RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT**

- In order to cope with population influx, the currently inadequate medical services in the Erongo region will need to be improved and expanded.
- The Atomic Energy Board should urgently complete its upgrade to the national cancer registry, in association with the Namibian Cancer Association, to provide a solid baseline against which the future impacts on cancer from the Uranium Rush can be assessed.
- Accidents, occupational and road, should be counteracted with a variety of preventative measures detailed in each mine's health and safety plan (and see section on transport below).
- Inhalation of dust can be a problem but can easily be controlled by wearing masks in the case of industry workers. To control the increased public dust exposure, industry should implement dust suppression methods at all exposed sources, and it is further recommended that the C28 gravel road is tarred between the Swakopmund turnoff and Langer Heinrich mine.
- Local authorities should embark on a major health awareness and disease prevention campaign and all Uranium Rush industries should be obligated to support this effort with their own health programmes and preventative efforts.
- All mines should design and implement a management and monitoring system that conforms to international standards for the protection of the public and their employees.
- All mines should follow international and national guidelines on the radiological protection of employees.
- The two currently operating uranium mines (Rössing Uranium and Langer Heinrich) both have a zero harm objective for their workers. They have comprehensive medical services and have excellent safety records. These standards should be maintained, and all new mines should use this as a benchmark to implement the same level of standard.
- Mines should implement the series of actions prescribed by the Namibian Atomic Energy Act for occupational health services, including health assessments, record keeping, dealing with accident and over exposures, and ensuring that workers are fully informed of hazards.
- Each mine, according to legislation, should publish a radiation management plan.

## 1.2 **TRANSPORT – CUMULATIVE IMPACTS ON ROAD, RAIL, PORT AND AVIATION INFRASTRUCTURE**

### 1.2.1 **EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT**

- Road: Road infrastructure is struggling to cope with current traffic volumes and major developments are required until 2013 to accommodate traffic volumes anticipated during construction activities of the Uranium Rush industry development. The Roads Authority has a number of projects planned, but these may be too late to adequately cater for the construction period. In general, the new/expanded industries will bring with them increased traffic volumes and the need for new roads. Increased traffic loads cause a range of impacts such as road deterioration, dangerous driving conditions, greater pressure on services such as emergency response, police and traffic and congestion delays. The main concern with the building of

new roads is biodiversity habitat disturbance and fragmentation. Other impacts include dust, noise and pollution.

- Rail: The major function of the existing railway line from Walvis Bay is for the transfer of goods from Walvis Bay Port to inland destinations, and vice versa for export purposes. Rössing Uranium has a spur line that connects to this main line to enable raw materials such as sulphuric acid and fuel to be imported, and uranium oxide to be exported. Rail transport is usually one of the options considered by industries as a means to transfer goods, and some mines are also investigating rail-road and rail-pipe transport. Increased rail traffic will have similar impacts to roads, including noise, pollution (spillages), accidents and congestion. New railway infrastructure will have more severe impacts on the environment, especially if in the Naukluft National Park (NNP) and will include habitat destruction and fragmentation, as well as those mentioned for increased road traffic.
- Port: Walvis Bay is the only deep-sea harbour in Namibia and has seen strong growth in the volume of goods passing through. However, the volume of cargo handled by the Port associated with the uranium mines is relatively small compared to the total volume, and the increase expected will therefore not have a major impact on the Port. NamPort is, however, considering its options to cater for expanded activity, particularly in the light of the fact that the Port is reaching its full operating capacity this year. The potential impacts from increased port activity include congestion, which brings about a range of secondary impacts including economic impacts. New or expanded port facilities, in conjunction with other coastal developments such as desalination plants, will definitely have a range of impacts, the most serious of which will be on the marine environment.
- Aviation: Similar to the Port, air cargo and passengers related to the uranium industries is small in comparison to overall aviation activity and therefore any increase due to the Uranium Rush is expected to have a minimal impact on airport infrastructure. However, there could be an increase in flights, bringing more noise but also more flexibility, and scenic flights in the tourism industry may decrease or change flight paths due to negative aesthetics caused by the mining and industrial infrastructure.

### 1.2.2 PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

The ideal condition of transport infrastructure would be an adequate and well maintained state to encourage economic development, public access and safety, without compromising biodiversity functioning.

### 1.2.3 RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

- Roads:
- The D1984 road to the east of the dunes should be upgraded to a two-lane tar road, and the B2 between Swakopmund and Arandis should be upgraded to a 4-lane highway as soon as possible;
- all heavy traffic should be directed onto the upgraded D1984;
- the unsurfaced sections of the C28 up to the Etango turnoff should be tarred;
- access to the Rössing South mine should be from the B2 (i.e. from the north) and not from the south;
- the road to the Welwitschia Flats should be restricted to tourist traffic only once the new Rössing South access road is in place;
- Certain tourist roads in the NNP should be restricted to tourist traffic only;

- Traffic officials should regularly check vehicle weights at the existing weigh bridge in Walvis Bay to monitor vehicle loading;
- Additional traffic officials will be required to maintain law and order on the roads;
- Additional ambulances and emergency response vehicles need to be purchased and be on standby to cope with accidents and chemical spills;
- Access roads to the mines should follow the shortest feasible route from the nearest existing road to minimise new disturbance; and
- Mine access roads should to be tarred to minimise dust and noise.
- Rail:
  - A cost-benefit analysis should be conducted (which should include environmental aspects) to determine whether new rail links to the mines are desirable and feasible and these lines would need to be privately built, owned and operated;
  - If railways are desirable and feasible, the routes should as far as possible follow existing infrastructure such as roads and pipelines;
  - Careful planning will be required for the appropriate location of the rail-road or rail-pipe transfer facilities to reduce the visual, noise and pollution impacts;
  - Technologically up-to-date loading and offloading facilities should be installed at bulk material transfer points and pollution control measures should be implemented; and
  - To alleviate the high number of buses on the roads during peak hours, consideration should be given to the use of railways for commuter transport. As with the freight lines, such a new venture would have to be a private or private-public partnership.
- Port: No additional recommendations, except for the already envisaged expansion plans.
- Aviation: The passenger terminal at Walvis Bay airport may need to be expanded and upgraded and scenic flight tourism operators should amend their flight paths to avoid the high level visual impact from the mining and industrial operations.

### 1.3 WATER – CUMULATIVE IMPACTS ON WATER SUPPLY, QUALITY AND BULK INFRASTRUCTURE

#### 1.3.1 EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT

- Supply: For a medium growth scenario, there is sufficient water from the existing NamWater groundwater sources to supply domestic users until 2020, but only if excess water generated by the envisaged Gecko Chemicals desalination plant is taken into account. However, there is not enough for the operational needs of existing mines, and therefore also not any new or expanded developments. The Khan and Swakop aquifers can also not satisfy the operational needs of the mines, but may be able to provide for short-term constructional needs within safe limits. The only feasible option for adequate water supply is desalination. The high cost of this water should not be passed on to the domestic consumer while groundwater is sufficient to meet their needs and the mining and related industries should reduce water usage as far as possible to minimise cost of purchasing desalinated water. The potential cumulative impact in terms of water supply is over-abstraction of water from aquifers, which will affect dependant vegetation (and knock-on effects on animals dependant on this vegetation for survival) and functioning of ecosystems, as well as water abstraction yields for farming.
- Infrastructure: Some of the existing pipeline infrastructure, installed in the 1970's, is showing signs of wear and new pipelines will be required to supply the Uranium Rush industries. If new pipelines are not planned properly, the result could be a number of pipelines criss-crossing the desert, bringing with it physical land disturbance, a significant visual impact, as

well as interruption of animal movement corridors which could affect population numbers due to starvation or dehydration.

- Quality: The risk is pollution of primary water sources due to seepage and spillages, having a serious effect on all water users. Mines have many potential sources of pollution, all on a very large scale, which include tailings facilities, heap leach pads, rock dumps, stockpiles and processing plants. Ideally, all these facilities, except the rock dumps, should have protective liners and mines should have a policy of zero-discharge. Related industries also have a high potential of pollution in terms of toxic effluent spillages.

### 1.3.2 PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

- Supply: There should be an adequate and reliable supply of water at reasonable cost for all consumers.
- Bulk infrastructure: The water reticulation network should be optimally planned so as to minimise negative impacts.
- Quality: Water quality should not be compromised so as to cause it to be unusable for its current purposes.

### 1.3.3 RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

- Supply:
  - All mines should use desalinated water for mine operations, but should first strive to reduce water consumption as far as possible by re-use and recycling;
  - Irrigation with saline groundwater should be avoided as soil is becoming more saline; and
  - Groundwater can be used in exploration and mine construction phases as long as abstraction is based on a detailed hydrogeological investigation supporting such abstraction.
- Infrastructure: Comprehensive planning is required to avoid or minimise haphazard placement of pipelines and associated facilities.
- Quality:
  - A Strategic Environmental Management Plan (SEMP) office should be established and standards and protocols for pollution monitoring should be developed by this office.
  - Future monitoring should take into consideration the vertical variation in groundwater quality, particularly in the saline downstream areas, as well as the likely mine process chemicals and ore body characteristics in determining the list of parameters to be monitored so that the signature of mine-related pollution can easily be detected. All future monitoring should also include sampling and analysis of important uranium daughter elements at certain monitoring stations.
  - The monitoring data collected should be evaluated and used for regular reporting by the SEM office.
  - The monitoring data should also be maintained in a central database at the SEM office and a hydrogeological information system should be developed to facilitate reporting, response to requests and the implementation of groundwater policies and management.
  - Mines should locate tailings dams appropriately, away from water courses and flow paths.
  - Mines should adopt best practice methods for seepage control and detection around potential pollution sources such as heap leach pads.
  - Mines should construct suitably sized and separate stormwater collection drains for 'clean' and 'dirty' stormwater.

- Mines should conduct regular monitoring and reporting.
- Mines should rehabilitate all disturbed areas as soon as they are decommissioned.
- Each mine (in conjunction with all suppliers) should develop a Code of Conduct to prevent spillage from vehicles transporting products and wastes along all roads (both public and mine site), including an emergency plan to deal with any such spillages.

## 1.4 ENERGY – CUMULATIVE IMPACTS ON ENERGY SUPPLY AND BULK INFRASTRUCTURE

### 1.4.1 EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT

- Supply: Namibia has only three (3) power generation sources linked to the national power grid with a total maximum capacity of 384 MW. These are the Ruacana hydro-power station on the Kunene River (capacity 240 MW, but only 50% availability), the Van Eck coal-fired power station in Windhoek on a standby basis (capacity 120 MW), and the Paratus diesel generator facility in Walvis Bay also on a standby basis (capacity 24 MW). Namibia's peak demand for electricity in 2010 was in the order of 550 MW, which creates a deficit of approximately 166 MW. A demand for the mines alone of 231 MW is predicted. When related industries and urban growth is factored in, a demand of 333 MW is predicted. It is therefore clear that a new base load power source is required to avoid serious power shortages in the long term and NamPower is investigating alternatives, one of these being a coal-fired power station near Walvis Bay. In the shorter term, other options such as importing energy, could be used to bridge power needs until a more reliable base load source is available.
- A new base load power supply will bring with it a range of cumulative impacts, depending on the type of fuel used (diesel, compressed natural gas or coal).
- Burning of coal will cause the greatest environmental impacts and will contribute to global greenhouse gas emissions and global warming, and to an already high level of sulphur in the air in the Walvis Bay area which could have negative impacts on human and biodiversity health. A cumulative negative aesthetic could result, depending on where the facility is located. Other possible cumulative effects could be caused as a result of additional dust emissions, traffic load during construction, demand on port facilities, and labour requirements.
- Infrastructure: Capacity of transmission infrastructure needs to be kept abreast of supply capacity to ensure that bottlenecks are not encountered. NamPower has a number of projects, some in the implementation stage and some in the planning stages, to ensure that this happens. Approximately 228 km of new power lines is expected to be required to meet the needs of the Uranium Rush industries. As for new water pipelines, power lines and substations in addition to those existing, will have a major cumulative visual impact, particularly on the vistas of the Namib Naukluft Park. A further cumulative impact is physical footprint disturbance brought about by construction vehicles that leave vehicles track scars on the desert surface for many years. This tends to encourage unauthorised access of sensitive areas to the detriment of the environment and the experience of eco-tourists. Bird collisions with power lines is known as a typical impact, but the combined effect of a number of power lines on bird populations, in particular bustards, korhaans and vultures, is cause for concern.

### 1.4.2 PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

- Supply: There should be an adequate and reliable supply of energy at reasonable cost for all consumers, when it is needed, and as far as possible without compromising the state of the environment. However, seen as part of this statement, demand side management should be

effectively implemented to reduce pressure on grid electricity and alternative sources of energy should be promoted.

- Supply infrastructure: The electricity reticulation network and associated facilities such as substations should be optimally planned so as to minimise negative impacts.

#### 1.4.3

### **RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT**

- Power demand management should be actively encouraged in all sectors, including mines. Measures to be considered include: solar water heaters, passive heating and cooling in building designs to create energy efficient buildings, use of 'waste' heat from boilers and other industrial plants to generate electricity on site, solar panels for borehole pumps and other installations that can use solar energy.
- The proposed new power station should be fitted with the latest technology to reduce CO<sub>2</sub>, SO<sub>2</sub> and NO<sub>x</sub> emissions to the atmosphere, particularly if it is coal-fired.
- The new power station should be located such that it does not negatively affect tourism and view points.
- The port expansion should be completed before the power station is commissioned to ensure efficient and safe handling of the relevant bulk fuel import.
- New power lines should preferably follow existing infrastructure routes. Where this is not possible, lines need to be carefully routed to avoid tourist routes, view points and bird flight paths.
- Where possible old lines should be removed and replaced with a higher voltage line so as to avoid a number of parallel lines.
- Bird diversion measures should be placed on all power lines that cross river crossings and bird flyways. Lines should also be routed away from the lappet-faced vulture breeding areas at Ganab.
- Substations should be located and designed so that they have a minimal impact on views and biodiversity.

#### 1.4.4

### **RECREATION AND TOURISM – CUMULATIVE IMPACTS**

The tourism industry is of the utmost importance to the Namibian economy, providing over 18,000 direct jobs and earning NAD 1.6 million per annum revenue (3.7% of Gross Domestic Product). Tourism products offered in the central Namib include adventure, business, consumptive and eco-tourism.

#### 1.4.5

### **EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT**

The natural beauty and uniqueness of the desert environment will be compromised by the development associated with the uranium industry. The main issues of concern for stakeholders in the tourism industry are public health due to radiation exposure, noise and visual impacts altering the sense of place, access to tourism sites becoming restricted and the actual, or perceived, loss of unique biodiversity. These issues are supported by the following primary cumulative impacts expected to result from the Uranium Rush industries: visual and noise impacts affecting sense of place, loss of access to tourism and recreational sites, pressure on road infrastructure due to increased traffic, and on social and physical infrastructure brought about by an increase in the population.

#### 1.4.6 **PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT**

In line with MET's vision, "a mature, sustainable and responsible tourism industry that contributes significantly to the economic development of Namibia" is the ideal situation for the recreation and tourism industry. However, to achieve this, environmental conditions need to be conducive to such activities and an alluring, unique sense of place represents many other environmental aspects such as low noise levels, healthy and uncompromised biodiversity, and good services.

#### 1.4.7 **RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT**

Negative impacts resulting from Uranium Rush industries on recreation and tourism, should be avoided or mitigated. Important areas should be flagged as such and mining licences in these areas should be considered with the utmost care, but avoided if at all possible. Areas that are not yet affected by mining activities should be left untouched if at all possible. These include areas such as the Messum Crater, Spitzkoppe, the Moon Landscape and the Welwitschia Plains. Other untouched areas that are popular for recreation and tourism activities, but that may be able to be offset with a similar alternative to avoid a net loss, include campsites and roads within the Namib-Skeleton Coast National Park, and areas along the Erongo coastline and rivers.

To reach the desired state of a level of synergy between the tourism/recreational and mining industries, a range of potential measures can be employed:

- All prospecting and mining should conform to Best Practice;
- Wherever possible, support infrastructure should be established in defined 'corridors';
- There should be closer co-operation between MET and MME, so that new licences are carefully scrutinised before they are granted;
- In terms of their management plans, coastal parks should each have a multi-stakeholder consultative forum, designed to support the Government in the running of each park, and these forums could advise on future prospecting and mining licences, as well as assist with monitoring tasks;
- A functioning SEMP office should be established (as mentioned earlier) which could provide input into the decision-making process, opportunities for stakeholder dialogue and monitoring; and
- Capacity building of MME and MET staff is required to enable confident interaction with prospecting and mining companies or the Government may wish to contract professional service providers to provide an advisory/review service.

In particular, the Uranium Rush industries should support and involve themselves in activities that are a means to the preferable condition of the recreation/tourism industry. Such engagement can include:

- Supporting coastal conservation efforts;
- Supporting public awareness campaigns about the desert and the importance of conservation;
- Establishing new roads to various tourist attractions;
- Establishing new, replacement tourist attractions (e.g. an alternative Moon Landscape);
- Assisting local and national authorities with maintaining key infrastructure;
- Assisting local authorities to expand and maintain public open spaces;
- Assisting local authorities and the police in combating crime;

- Boosting local economies, with the resultant socio-economic spin-offs; and
- Making compromises and developing offsets as part of the social 'licence' to mine or prospect, especially in a national park and important tourism area.

#### 1.4.8 BIODIVERSITY – CUMULATIVE IMPACTS

The habitats in which plants and animals occur, the species which are most vulnerable due to endemism or threatened status, the ecological processes which support life in the central Namib, and the areas of high biodiversity value, have been considered in terms of how these will be affected by the combined impacts expected from the Uranium Rush industries. Impacts on biodiversity will have a negative impact on tourism and recreation as well as a number of other significant secondary and tertiary impacts such as public health issues in the case of a predatory species controlling a disease vector such as mosquitoes.

#### 1.4.9 EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT

- Habitats: Habitat loss, degradation and fragmentation due to pollution, physical destruction such as earth-moving and land clearing as well as damage to the biological soil crust due to vehicles and dust smothering;
- Species: Threats to specific (endemic and threatened) fauna and flora due to noise, poaching, disturbance of birds on their nests, illegal plant collection, power line mortalities, and coastal development;
- Ecological processes: Deterioration of water quantity and quality for biodiversity and ecosystem functioning due to pollution, over-abstraction, water course blockages or diversions; and
- Biodiversity areas: Areas of high value in terms of habitats, species and ecological processes, sensitive to all of the above impacts.

#### 1.4.10 PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

That the ecological integrity and diversity of fauna and flora of the central Namib is not compromised by the Uranium Rush.

#### 1.4.11 RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

Every uranium mine, and associated industry, should adopt the four important principles of mitigation in all activities. These are firstly to try to avoid negative impacts, secondly to mitigate where impacts are unavoidable, and thirdly to rehabilitate where damage is incurred. Most importantly, where possible, these industries should strive for a net positive impact where possible, by for example offset areas. Notwithstanding these basic principles, specific recommendations include:

- Each potential new exploration and mining activity should carry out detailed surveys and research to determine the presence and biogeography of conservation priority species and a combined and concerted effort should be made to prevent increased illegal activities from threatening the sustainability of animals and plants.
- Fences and linear services such as power lines should be designed and mitigated in such a way as to minimise habitat fragmentation, impacts on animal movement and deaths.
- Areas of relatively high biodiversity value that are sensitive to mining and prospecting activities should be identified and mapped and mining licences in these areas should be considered with the utmost care, but avoided if at all possible.

- Keeping mining activity footprints to a minimum;
- Respecting the protected area status of national parks and conservation priorities of communal conservancies;
- Creation of infrastructure corridors to cluster linear services and associated facilities;
- Measures should be taken to prevent groundwater pollution affecting people, animals and plants;
- The activities of uranium mines and industries can contribute to and exacerbate criminal activities such as tracks being used for access routes to poach. These industries should therefore recognise their responsibility in such illegal activities and contribute towards improved law enforcement measures.
- Uranium industries should contribute to independent monitoring and research of environmental indicators and action should be taken if deteriorating situations are detected.
- In the restoration of damage, industries should collaborate with local organisations and research institutes and start restoring damage as soon as possible given the slow rate of recovery in arid climates.
- Uranium mines should offer educational programmes to the community, make positive contributions to conservation organisations and contribute as far as possible to add to the database on which biodiversity management decisions are based.

#### 1.4.12 **ARCHAEOLOGICAL HERITAGE – CUMULATIVE IMPACTS**

The types of archaeological sites that are vulnerable to damage by mining activities include graves, rock shelters with evidence of occupation, scatters of stone artifacts, battlefields and historical mines. Archaeological heritage is differentiated into two types, ie sites and landscapes, the latter being a collection/group of related sites similar in particular characteristic(s) (generally referred to as sites in this section). The Erongo region has four National Monument sites (all rock art sites) but none affected by the Uranium Rush Scenario 2. Some sites are virtually invisible and therefore it is very difficult for mining activities to avoid damage if a specialist study is not undertaken and the sites identified.

As a large part of the Erongo region is either currently under uranium exploration or mining licenses, or has renewals pending, detailed studies have been carried out for a large part of the area. These form a good basis to identify archaeological landscapes that can be flagged as areas of differing archaeological significance (similar to tourism and biodiversity) where specific care would need to be taken in considering applications for mining activities.

#### 1.4.13 **EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT**

Namibian archaeological heritage has a legacy of being poorly protected in the past, with mining activities, as well as road construction and borrow pits, causing much damage. Roads and borrow pits are responsible for more damage to archaeological heritage than mining activities. Associated with the Uranium Rush mines, pipelines, power lines and other industry construction will also contribute to the cumulative threat of archaeological damage, and the combined loss of resources increases the value of those remaining.

Cumulative impacts due to the Uranium Rush industries can be categorised into direct impacts entailing physical destruction either outright or over time, negative impacts on archaeological heritage landscapes due to damage of sites within these landscapes, negative impacts due to increased and uncontrolled access to sites and positive impacts due to the expanding knowledge base of the

Namibian archaeological heritage due to specialist surveys undertaken by the Uranium Rush industries.

#### 1.4.14 **PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT**

The preferable condition is for the Uranium Rush industries and all related activities, to have as little negative impact on archaeological resources as possible.

#### 1.4.15 **RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT**

- Due to a lack of formal regulations to the National Heritage Act, it is important for archaeological experts and the uranium industries to act in a responsible manner, ensuring that assessments and recommendations are robust and sound.
- The establishment of the Uranium Stewardship Council should set a common standard for members to implement conservation strategies.
- There is a general lack of education regarding archaeological/historical resources in Namibia and the increase in knowledge brought about by the uranium industries' surveys is an opportunity to improve the general awareness about Namibia's heritage.
- If mining applications occur in areas that are identified as high or medium significance in terms of cumulative negative impacts, and damage cannot be avoided, such companies should invest in archaeological offset benefits such as archaeological conservation and research efforts.
- The Namib Desert Archaeological Survey Project combines the results of the numerous surveys that have been done for mining applications, allowing for a general assessment of archaeological resources, research opportunities and identification of potential offset reserves. This in turn not only provides physical offsets in the form of reserve areas, but also creates a "knowledge offset". One of the key functions is to characterise the regional archaeological value of heritage resources so that mitigation measures for cumulative impacts can be applied in a broader fashion than to the individual mine or related industry.

### 1.5 **AIR QUALITY – CUMULATIVE IMPACTS**

This section considers the cumulative impacts in relation to the existing air quality conditions in the central Namib with regards to dust, which includes the coarse particles called Total Suspended Particles (TSP), as well as the finer particles called PM 10. TSP is more nuisance-causing, while PM 10 particles are fine enough to be inhaled and potentially cause health problems. TSP and PM 10 were monitored at various receptor points in the Erongo region to monitor current levels. In general, TSP deposition through the Erongo region is slight, but PM 10 levels can be high, depending on meteorological conditions and human activities such as traffic movement.

The main sources of dust emissions from mining operations are:

- Excavation, crushing and screening, materials transfer, and drilling and blasting;
- Vehicle (equipment) movement on paved and unpaved roads;
- Wind erosion from tailings storage facilities, waste dumps and other stock piles; and
- Stacks from processing operations (e.g. acid plant, bag house, scrubber).

### 1.5.1 EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT

Possible air quality impacts were modelled for Scenario 2, covering the entire Erongo region with residential areas and small-scale farming locations included as sensitive receptors and taking into account expected activities from the mining industries, as well as traffic activity on all trunk, main and district roads, and windblown dust.

The predicted cumulative impact results for the increased activities associated with the Uranium Rush industries show that wind erosion and traffic volumes on roads remain the main sources of ground level concentrations (GLC) of PM 10 and dust fallout at the various receptors. Increases predicted in particulate levels at receptor communities are due to increased traffic volumes on roads, except at Goanikontes where the PM 10 increase is primarily due to the Etango Project mining activities. Rössing Uranium is the main mining source impacting on Arandis, while other mines impact on receptors to which they are in closer proximity.

### 1.5.2 PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

Particulate air concentrations in the Erongo region should not exceed the particulate threshold at which adverse health effects will be experienced. This threshold is the World Health Organisation's IT-3 guidelines for PM10, which correlates with the South African National Standards (SANS) that developed a limit based on conditions similar to the Namibian environment. Similarly, TSP levels (dust fallout) should not exceed the SANS limit for residential areas.

### 1.5.3 RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

- Ambient monitoring of PM 10 concentrations and dust fallout (TSP) should be conducted for a period of at least one year to inform the Baseline Scenario and to provide a comprehensive dataset for dispersion model results evaluation. A permanent continuous on-line PM 10 sampler should be implemented at Swakopmund, as a minimum, with an additional one at Henties Bay.
- An accredited meteorological station, measuring as a minimum hourly average wind speed, wind direction, temperature, humidity, rainfall and solar radiation, should be implemented in Swakopmund. The wind monitor should be a high performance, accurate wind sensor to cover a wind speed range of up to 60 m/s, including gusts.
- Further research should be conducted into the quantification and simulation of wind erosion from natural sources as the difference in particle size distribution between soil types resulted in noticeable differences in wind erosion predictions.
- Ambient air quality guidelines and targets should be developed for the Erongo Region (and eventually Namibia) taking into consideration risks to health, technological feasibility, economic considerations, and other political and social factors. The WHO and SANS guidelines mentioned above should be adopted in the interim.
- Mines should implement best practice mitigation measures for known dust generating sources. These should include as a minimum:
  - Chemical suppressants on permanent haul roads and water sprays (in combination with chemicals to optimise water utilisation) on non-permanent unpaved roads;
  - Water sprays at material transfer points; and
  - Full or semi-enclosure of crushing and screening operations.
- Key performance indicators against which progress may be assessed should form the basis for all effective environmental management practices. Performance indicators are usually

selected to reflect both the source of the emission directly and the impact on the receiving environment.

- Dust fallout buckets provide a cost effective tool to measure dust fallout trends and to determine the improvements made as a result of mitigation measures. It is recommended that all the mines implement dust fallout networks to be operated throughout the life of mine.

## 1.6 RADIATION – CUMULATIVE IMPACTS

This section considers the cumulative impacts of the Uranium Rush industries in relation to the existing background radiation levels in the region on the general public. The main public receptor groups considered were permanent non-farming, non mine-worker urban residents, tourists and smallholding farmers in the river valleys. The baseline (background) levels of human exposure to natural radiation and to man-made sources of radiation (excluding mining) for the Erongo region compared to the world as a whole, show that the total average human exposure for the Erongo region (2.01 mSv/a) falls below that of the average global human exposure (2.74 mSv/a). Furthermore, in both cases, exposure from man-made sources is insignificant compared to exposure levels from natural radiation sources.

Radiation emanates from various sources, including from the sun, from soils and rocks, from the medical field such as x-rays and cancer treatments, and from uranium mines. Uranium occurs in two forms of ore deposits, ie alaskites and carnotites. These deposits can be mined via open pits, which significantly reduce adverse health impacts that are found in underground uranium mines, but which also increases the contribution to overall dust and radon exposure in the area.

In the Namibian environment, the two main ways in which radio-nuclides can be transmitted to public receptors is via the air or via water. The extraction, processing, handling and storage operations of open-pit uranium mines increases the amount of dust in the air, and therefore the amount of radio-nuclides within that dust, as well as increasing exposed surface areas that emit radon. Tailings storage and heap leach facilities present a risk of seepage, even with complex management prevention measures, and radio-nuclides could reach water pathways in this manner.

### 1.6.1 EXPECTED IMPACTS ON ENVIRONMENTAL ASPECT

Health impacts associated with radiation exposure can manifest in a number of ways in living beings, depending on the type of radiation, the dose and the duration of exposure, which include blood destruction and death from large doses, burns, and cancer. Uranium's health hazards are not only related to its radioactivity, but also to its chemical toxicity as a heavy metal, which is comparable to that of lead. Therefore ingesting uranium carries with it a combined potential hazard, from radiation emitted and from chemical toxicity. However, studies suggest that an acute dose in humans would have to be very large for noticeable effects to occur.

From information available, which is far from complete, the levels of human exposure to natural radiation and to man-made sources of radiation (including the Uranium Rush mining activities) for the Erongo region compared to the world as a whole, show that the total average human exposure for the Erongo region (2.29 mSv/a) still falls below that of the average global human exposure (2.74 mSv/a). The globally accepted standard of 1mSv/a excludes natural background radiation. If the Erongo region's background (baseline) natural radiation of 1.97mSv/a is excluded from this figure, the result is 0.32 mSv/a, significantly less than the globally accepted standard.

### 1.6.2 PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

There is no safe level of radiation, but there is also nowhere on earth which is free of radiation. Therefore, any radiation should be managed in accordance with the internationally recognised guidelines of the International Commission for Radiological Protection (ICRP), which is reflected in Namibia's national standards. Namibia's draft regulations to its Atomic Energy and Radiation Protection Act, have been developed in line with the ICRP and the International Atomic Energy Agency (IAEA) guidelines and recommendations.

### 1.6.3 RECOMMENDATIONS TO ACHIEVE PREFERABLE CONDITION OF ENVIRONMENTAL ASPECT

- Increases in uranium radio-nuclides in air and water originating from uranium mines, should not cause the 1 mSv/a accepted public dose limit to be exceeded.
- Increases in radiation exposures of workers and employees should not cause the accepted limit of 20 mSv/a to be exceeded.
- Disposal and storage facilities should be designed, constructed and operated in accordance with the procedures for radioactive waste management reflected in Namibia's regulations (which accords with international guidelines).
- Transport of radioactive material should be in accordance with the procedures reflected in Namibia's regulations (which accords with international guidelines).
- Uranium mines should be closed, stabilised and rehabilitated in accordance with the procedures reflected in Namibia's regulations (which accords with international guidelines).
- Research and quantification of the cumulative radiological dose should continue, which includes the installation of more meteorological stations in and north of Swakopmund, refinement of the dust dispersion models based on better weather data, refinement of the background radon emissions based on longer term data, additional research on uranium fingerprinting in the alluvial aquifers of the Khan and Swakop Rivers, and the calculation of the total radiological dose through groundwater for the smallholding farmers and residents receptor groups.
- A comprehensive air and water monitoring programme should be set up and results posted on the SEMP office website.
- The Namibian drinking water quality standards need to be amended to reflect the updated WHO guideline value for drinking water quality, particularly for uranium.

### 1.7 INSTITUTIONS AND GOVERNANCE – CUMULATIVE IMPACTS

Managing the Uranium Rush will be a considerable challenge for Namibian institutions, be they government, para-statal, regional and local authority, private sector or civil society. In combination with strong leadership, transparency and consistency in decision making will ensure that the Uranium Rush is a blessing and not a curse. The bottom line is governance. This section provides an overview of the most important institutions relevant to the Uranium Rush.

#### MINISTRY OF MINES AND ENERGY (MME)

Issue of Concern	Recommendations
Inadequate care in allocation of prospecting and mining rights, especially in protected areas.	<ul style="list-style-type: none"><li>• MME should ensure that proper safeguards are in place before prospecting and mining rights are issued.</li><li>• Maintain the moratorium on issuing new prospecting licences until the approval procedures for new mineral</li></ul>

	licence applications in high and medium sensitivity areas have been formalised.
Capacity shortage	<ul style="list-style-type: none"> <li>• Quickly and significantly widen capacity building programmes, both internally and with cooperation partners.</li> </ul>
Inadequate monitoring and enforcement, causing some prospecting and mining proponents to ignore set environmental safeguards	<ul style="list-style-type: none"> <li>• MME should work more closely with MET to improve monitoring and enforcement.</li> <li>• Improve cooperation and coordination with MET.</li> <li>• MME should consider using external experts to assist them with monitoring (inspections) – the mining/prospecting companies should be expected to pay for this.</li> <li>• MME and MET invest in adequate modern monitoring equipment and ensure training of staff members to monitor the uranium industry.</li> </ul>

#### MINISTRY OF ENVIRONMENT AND TOURISM (MET)

Issue of Concern	Recommendations
Inadequate environmental awareness	<ul style="list-style-type: none"> <li>• Improve awareness amongst high-level decision makers (within MET) about the fragility of the Namib and the need for consistency in decision making.</li> <li>• MET needs to sensitise other government institutions and the private sector about the importance of the environment and its link to livelihoods and the economy.</li> <li>• MET needs to be more proactive and supportive of civil society organisations that are or could be valuable partners in environmental awareness building.</li> </ul>
Inadequate legislation	<ul style="list-style-type: none"> <li>• Strengthen the Environmental Management Act of 2007.</li> <li>• Improve and pass the Parks and Wildlife Management Bill of 2009.</li> <li>• Amend the Minerals Act of 1992.</li> <li>• Increase enforcement and proper implementation of current laws.</li> </ul>
Escalating habitat destruction from prospecting and mining.	<ul style="list-style-type: none"> <li>• MET needs to reassert itself at high level so that MME improves its governance in awarding of concessions.</li> <li>• MET needs to involve field staff more pro-actively in considering concession applications and in setting conditions.</li> <li>• MET should work with MME to agree on which important conservation/sensitive areas can be restricted in terms of prospecting and mining activities.</li> <li>• Use independent experts to help guide and evaluate EIAs.</li> <li>• Improve post-implementation monitoring, auditing and enforcement.</li> </ul>

<p>Sensitive and ecologically important areas inadequately protected</p>	<ul style="list-style-type: none"> <li>• Proclaim Namib-Skeleton Coast National Park.</li> <li>• Apply legally binding zonation (e.g. strict protection) of sensitive areas.</li> <li>• MET should be supportive of civil society groups that provide a range of voluntary services aimed at conserving important conservation areas.</li> </ul>
<p>Inadequate capacity in MET to enforce existing and emerging legislation</p>	<ul style="list-style-type: none"> <li>• MET needs to involve field staff more pro-actively in considering concession applications and in setting conditions.</li> <li>• Improve post-implementation monitoring (could use independent experts to help with this task).</li> <li>• Form partnerships with Civil Society and international NGOs – they can help MET to undertake a variety of tasks. The idea of ‘Honorary Park Wardens’ merits consideration.</li> <li>• Create opportunities for the general public to be more involved in conservation.</li> </ul>

#### NATIONAL HERITAGE COUNCIL (NHC)

Issue of Concern	Recommendations
<p>Inadequate capacity within the NHC</p>	<ul style="list-style-type: none"> <li>• Hire more professional staff.</li> <li>• Make more use of independent experts.</li> <li>• Consider appointing Honorary Heritage Inspectors.</li> </ul>
<p>Important archaeological landscapes and sites threatened by prospecting and mining.</p>	<ul style="list-style-type: none"> <li>• NHC should work with MME to agree on which important archaeological areas can be excluded from prospecting and mining activities (sensitive areas).</li> </ul>

#### MINISTRY OF AGRICULTURE, WATER AND FORESTRY (MAWF)

Issue of Concern	Recommendations
<p>Potable water quality standards are less stringent than international norms</p>	<ul style="list-style-type: none"> <li>• Department of Water Affairs (DWA) needs to update water quality standards.</li> </ul>
<p>Regulations concerning the discharge of industrial effluents are not gazetted</p>	<ul style="list-style-type: none"> <li>• Regulations need to be gazetted.</li> </ul>
<p>Inadequate due diligence in allocating water abstraction permits</p>	<ul style="list-style-type: none"> <li>• More caution required: <ul style="list-style-type: none"> <li>- No abstraction of groundwater should be allowed for mining operations in the central Namib uranium province; and</li> <li>- Groundwater abstraction for construction only to be permitted if thorough research shows proven</li> </ul> </li> </ul>

	resources and sustainable yield.
Inadequate capacity in DWA to carry out monitoring of pollution and enforcement of laws and regulations	<ul style="list-style-type: none"> <li>• Increase technical capacity in DWA to carry out inspections.</li> <li>• Create partnerships between DWA and other organisations so that the inspectorate role is shared between many organisations.</li> <li>• Use consultants to fill capacity gaps (short term).</li> </ul>

#### MINISTRY OF LOCAL AND REGIONAL GOVERNMENT, HOUSING AND RURAL DEVELOPMENT (MLRGHRD)

Issue of Concern	Recommendations
Regional Councils (RCs) do little/no development planning or environmental management	<ul style="list-style-type: none"> <li>• Closer cooperation between RCs and line ministries is needed to reduce 'the battle of the plans' – where sector plans sometimes undermine each other.</li> </ul>
RCs structures are not functioning optimally.	<ul style="list-style-type: none"> <li>• Improve capacity of RCs, but not only through appointing new/more officials. Forging strategic partnerships with other GRN agencies, NGOs, private sector and experts may yield positive results.</li> </ul>

#### LOCAL GOVERNMENT (LOCAL AUTHORITY COUNCILS – MUNICIPALITIES, TOWNS, VILLAGES)

Issue of Concern	Recommendations
Inadequate legislation regarding town planning and conservation	<ul style="list-style-type: none"> <li>• Complete and enact the draft Urban and Regional Planning Bill.</li> </ul>
Fast growing towns promote inappropriate and unsustainable development	<ul style="list-style-type: none"> <li>• Promote the development of Structure Plans that each consider environmental/sustainable development considerations.</li> <li>• Ensure good governance in the implementation of structure plans.</li> <li>• LAs should promote civil society participation – reduce the current trend of secrecy and poor transparency.</li> <li>• Ensure consistent use of EIA.</li> </ul>

#### MINISTRY OF TRADE AND INDUSTRY (MTI)

Issue of Concern	Recommendations
Inadequate knowledge of environmental issues in MTI, resulting in failure to guide investors appropriately. Whilst the Foreign Investment Act has a discretionary clause that could be used by the	<ul style="list-style-type: none"> <li>• Sensitise MTI staff about environmental issues and the sensitivity of the environment. MTI needs to be more consistent so that it does not cause intersectoral tensions by not fully disclosing national requirements to investors.</li> <li>• MTI should be more pro-active in commissioning</li> </ul>

Minister (of MTI) to ensure that an EIA is conducted for certain projects, it is thought not to have been used to date.	Strategic Environmental Assessments for, <i>inter alia</i> , EPZs that will contain a number of different industries that might result in cumulative impacts.
Interaction between MME, MTI, MET, MFMR and DWAF to be improved	<ul style="list-style-type: none"> <li>• MTI should be more pro-active in seeking the advice of appropriate line ministries regarding the avoidance/mitigation of environmental impacts resulting from projects that it facilitates.</li> </ul>

1.7.1

**MINISTRY OF WORKS, TRANSPORT AND COMMUNICATION (MWTC)**

Some important parastatals fall under this ministry, including the Roads Authority, TransNamib and Namport – all of which are key stakeholders in the Uranium Rush. As already noted, there is an urgent need to upgrade a number of roads in the central Namib, whilst the harbour and rail systems need substantial expansion. An opportunity exists for public-private partnerships to be established to develop new railways for the transport of uranium-related inputs and outputs, as well as commuters.