Ministry of Mines and Energy

Strategic Environmental Management Plan (SEMP) for the Central Namib Uranium Province 2018-2019 Report

September 2020

Prepared by

Geological Survey of Namibia

Project Management:	Ministry of Mines and Energy, Geological Survey of Namibia, Division of Engineering and Environmental Geology
Status of Data Received:	September 2020
Compiled by:	Norwel Mwananawa (GSN) and Sandra Müller (NUA)
Contributions from:	Geological Survey of Namibia (Israel Hasheela, Norwel Mwananawa, Michelle Hailonga, Giesberta Shaanika)
	DWA (Anna David)
	MEFT (Hiskia Mbura)
	Namibian Uranium Association (Frances Anderson, Carlene Binneman, Werner Ewald, Sandra Müller, Jacklyn Mwenze, Katrin Kaerner and Ingrid Scholz)
	NamWater (Erwin Shiluama, Selma Muundjua)
	NERMU (Elbé Becker and Theo Wassenaar)
	NRPA (Joseph Eiman)
	Walvis Bay Municipality (Nangula Amutenya)
Final editing:	Norwel Mwananawa, Sandra Müller and Giesberta Shaanika

Citation

Geological Survey of Namibia (2020): Strategic Environmental Management Plan (SEMP) for the Central Namib Uranium Mining Province, 2018-2019 Report. Ministry of Mines and Energy, Windhoek, Republic of Namibia

Additional Information and queries to:

Mr. Norwel Mwananawa
Coordinator
Geological Survey of Namibia
Ministry of Mines and Energy
Private Bag 13297
Windhoek, Namibia
Tel: +264-61-2848157
Email: Norwel.Mwananawa@mme.gov.na

EXECUTIVE SUMMARY

The Strategic Environmental Management Plan (SEMP) for the Namibian uranium province is a public-private collaborative initiative housed within the Geological Survey of Namibia, Ministry of Mines and Energy. The SEMP is an over-arching framework and roadmap to address the cumulative impacts of existing and potential developments, within which individual projects have to be planned and implemented. Annual SEMP reports measure the performance around twelve Environmental Quality Objectives (EQOs) that show the extent to which uranium mining is impacting the central Namib. Each EQO articulates specific goals and targets that are monitored by a set of key indicators.

The SEMP is a living document that has to be amended to keep up with development. Over the years, some goals, targets and indicators have been added, changed or deleted to better represent the intention of the SEA. It has become clear that many indicators were formulated under the assumption that the "uranium rush" that triggered the SEA would lead to the development of quite a few new mines. The current mining scenario, which closely resembles the base case, was not foreseen in the SEA. There are only two operating mines, Rössing and Husab, while Langer Heinrich was mothballed in 2018. All the other projects are still awaiting improved market conditions.

Seeing that the uranium rush was revealed as a short-lived phenomenon, the impact on the environment and the demand for social services in the Erongo Region will evidently not continue rising as a result of uranium mining. The SEMP Steering Committee has therefore decided to extend the reporting period so that the current report covers the two years 2018 and 2019.

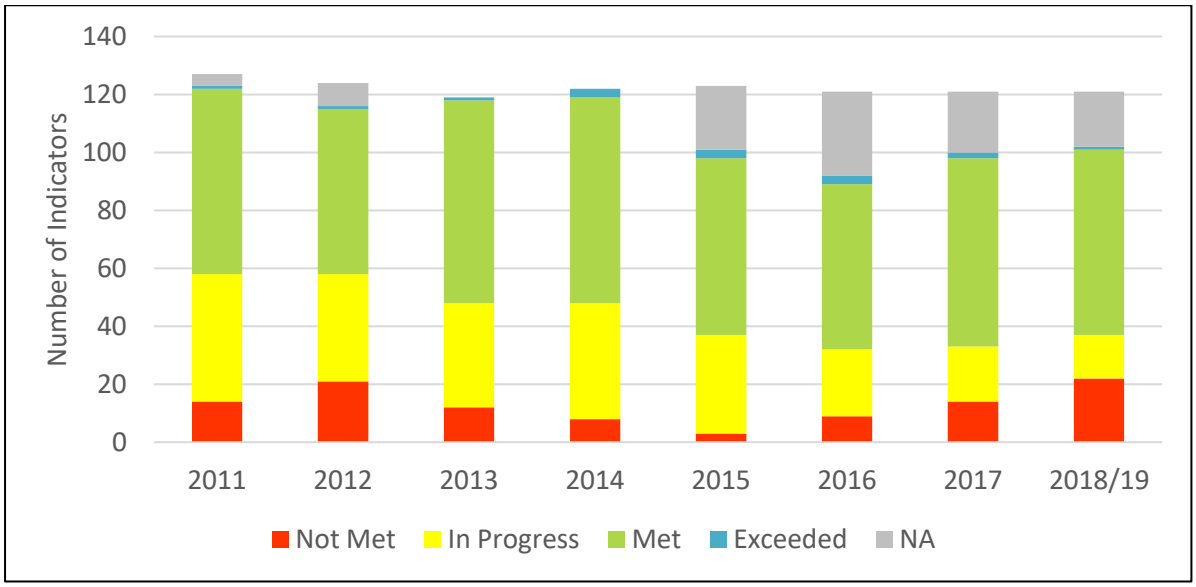


Figure 1: EQO Performance Trends over Time

Figure 1 shows the EQO performance trend since 2011. The total number of indicators **Met** was 64 in 2018/2019 compared 65 in the previous year, while only one indicator was **Exceeded**. The number of indicators that were **Not Met** increased from 14 to 22, while the indicators **In Progress** dropped from 19 to 15. In 2018/2019, 19 indicators were **Not Applicable** because the relevant activities did not take place.

The number of indicators **Met** in 2018/2019 was the same as the initial figure in 2011. The best result of 71 indicators **Met** was achieved in 2014, while the lowest number was 57 in 2012 and 2016. The lack of improvement was at least partly due to the significant number of indicators that could not be assessed (**Not Applicable**).

On the other hand, there was a definite increase in the number of indicators that were **Not Met.** The persistently high number of outstanding issues suggests that more resources will be required if the desired outcome of the SEMP is to be achieved. Recommended actions to rectify the deficiencies have been included in the SEMP action plan in the next chapter.

There were fewer indicators **In Progress** in 2018/2019; this came about because 1) projects were completed or 2) it became clear that the indicator should be moved into the **Not Met** category or 3) it was found to be **Met**. A more stringent approach was taken to avoid assessing an indicator as **In Progress** when no real advancement could be shown.

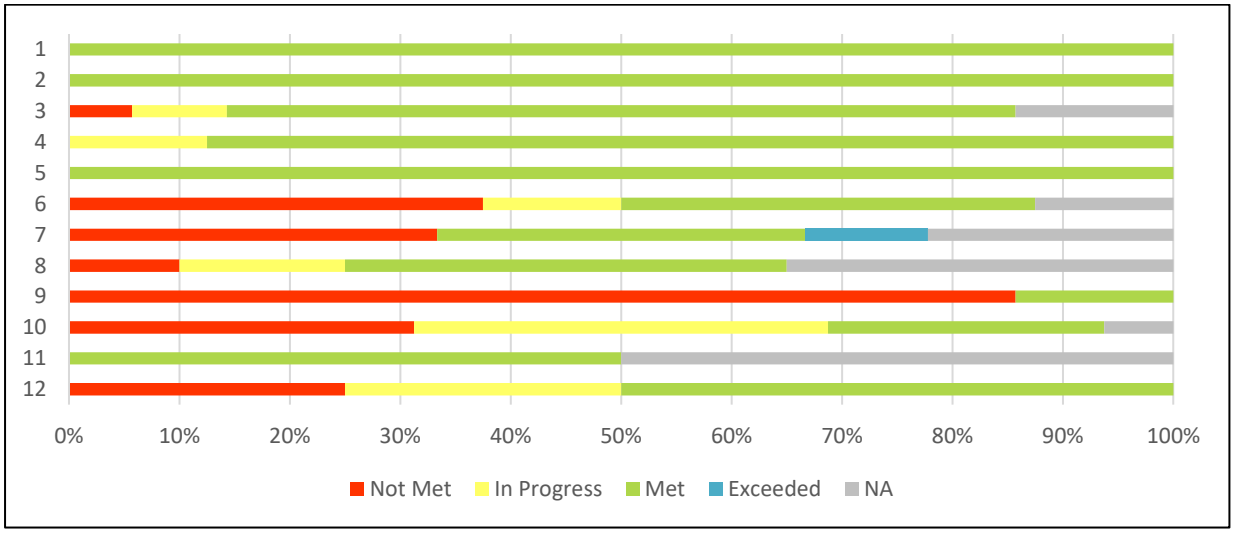


Figure 2: Performance per EQO in 2018/2019 in %

The latest performance ratings of each EQO are displayed in Figure 2 and can be summarised as follows:

- Four EQOs were 100% **Met**: Socioeconomic Development (EQO 1), Employment (EQO 2), Air Quality (EQO 5) and Heritage (EQO 11), except for some indicators that were not applicable.
- The Water (EQO 4) indicators were mostly **Met** with a small percentage **In Progress**.
- Mixed results ranging from **Met** to **Not Met** were obtained for the following EQOs: Infrastructure (EQO 3), Effect on Tourism (EQO 7), Ecological Integrity (EQO 8), Governance (EQO 10) and Mine Closure (EQO 12).
- The worst performing EQOs were Health (EQO 6) and Education (EQO 9) with a high number of indicators **Not Met**.
- One indicator was **Exceeded** in EQO 7 regarding tourists' expectations of their visual experience in the Central Namib.

In view of the cyclical nature of commodity markets it is expected that the demand for uranium will increase in future. The implementation of the EQO targets remains critical to ensure that the region is well positioned for future uranium mining projects. The most important actions to address the shortcomings that have been identified in this report are summarised in Table 1 on the next page.

Table 1: High-level Actions to Achieve SEMP Compliance

EQO 3: Traffic volume on the B2 has increased so that the road has become unsafe (Roads Authority)	• Upgrade the road to double lanes or create passing lanes at least up to Arandis
EQO 3: Optimum use of rail infrastructure (TransNamib)	• Upgrade the railway line so that bulk freight (e.g. fuel) can be shifted from the road
EQO 4: Continuous availability of desalinated water to meet the mines' demand (NamWater, NUA)	• NamWater to upgrade their wellfields and mines to increase their water storage capacity to be able to keep operating during sulphur outbreaks
EQO 6: Number of healthcare professionals and facilities (MHSS)	• Employ the number of healthcare professionals identified in the SEA, add or enlarge healthcare facilities
EQO 8: Implementation of biodiversity offsets (MEFT, NUA)	• MEFT to create enabling legislation for the lasting protection of offsets • Mines to offset damage to important biodiversity areas
EQO 9: Improvement of school performance in the region (MEAC)	• Improve teacher to learner ratio and performance in Grade 10 and 12 exams
EQO 10: Allocation of mineral licences in protected areas	• MPMRAC to consider the red and yellow flag status of areas before issuing mineral licences
EQO 12: Lack of mine closure regulations (MME)	• Complete MRCF, update Minerals Act and regulations for mine closure

Two-yearly reporting will maintain the function of the SEMP as a long-term monitoring and decision-making tool that highlights potential risks so that measures can be introduced in time to avoid unnecessary consequences or mitigate unavoidable impacts. A continuing aim of the SEMP process is to increase the commitment of key government institutions, the uranium industry and NGOs to undertake whatever actions will take the Erongo Region towards the desired future state where communities and industry are able to co-exist in harmony.

CONTENTS

List of Figures

List of Tables

ABBREVIATIONS

AA	Affirmative Action
BH	Borehole
Bq/m^3	Becquerel per Cubic Metre
CoM	Chamber of Mines
DWA	Department of Water Affairs
DWSSC	Directorate Water Supply Sanitation Co-ordination, DWA
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPL	Exclusive Prospecting Licence

EQO	Environmental Quality Objective of the SEMP
GIS	Geographical Information System
GRN	Government of the Republic of Namibia
GRTC	Gobabeb Research and Training Centre
GSN	Geological Survey of Namibia
IAEA	International Atomic Energy Agency
ISO	International Standards Organisation
JSC	Junior Secondary Certificate
m	Metre
m^3	Cubic Metre (1,000 litres)
$mg/m^2/day$	Micrograms per Square Metre per Day
$\mu g/m^3$	Micrograms per Cubic Metre
Mm^3/a	Million Cubic Metres per Annum (year)
m/s	Metres per Second
mSv/a	Millisieverts per Annum
MAWLR	Ministry of Agriculture, Water Affairs and Land Reform
MHSS	Ministry of Health and Social Services
MLIREC	Ministry of Labour, Industrial Relations and Employment Creation
MME	Ministry of Mines and Energy
MEAC	Ministry of Education, Arts and Culture
MoF	Ministry of Finance
MRCF	Mine Rehabilitation and Closure Framework
NamWater	Namibia Water Corporation (Pty) Ltd
NACOMA	Namibian Coast Conservation and Management
NBSAP2	National Biodiversity Strategy and Action Plan 2
NERMU	Namib Ecological Restoration and Monitoring Unit
NIMT	Namibian Institute of Mining and Technology
NNNP	Namib Naukluft National Park
No.	Number
NRPA	National Radiation Protection Authority
NSA	National Statistics Agency
NSSC	National Senior Secondary Certificate
NTA	National Training Authority
NUA	Namibian Uranium Association
NUST	National University of Science and Technology
Pers. comm.	Personal Communication (interview or e-mail)
PM_{10}	Inhalable dust with particles smaller than 10 micrometres
SA NDCR	South African National Dust Control Regulations
SEA	Strategic Environmental Assessment
SEMP	Strategic Environmental Management Plan
SSS	Swakopmund Secondary School
UNAM	University of Namibia
VET Levy	Vocational Education and Training Levy
WHO	World Health Organisation

SEMP BACKGROUND

A Strategic Environmental Assessment (SEA) was undertaken in response to a "uranium rush" that occurred when the spot market price started rising in 2005 and reached over US$120 per pound in 2007. An unprecedented wave of exclusive prospecting licence applications covered much of the western Erongo Region (Figure 3), until the Ministry of Mines and Energy (MME) announced a moratorium on the issuing of licences for nuclear fuel in 2007. The aim of the moratorium was to give the authorities and stakeholders time to consider the pros and cons of uranium mining and to develop a management plan. The "rush" ground to a halt when the uranium price started dropping, especially after the Fukushima disaster in 2011. A number of companies however proceeded with exploration activities, feasibility studies, process development and applications for mining licences. Of all the projects mooted in 2007, only one new mine has started up at the time of writing.

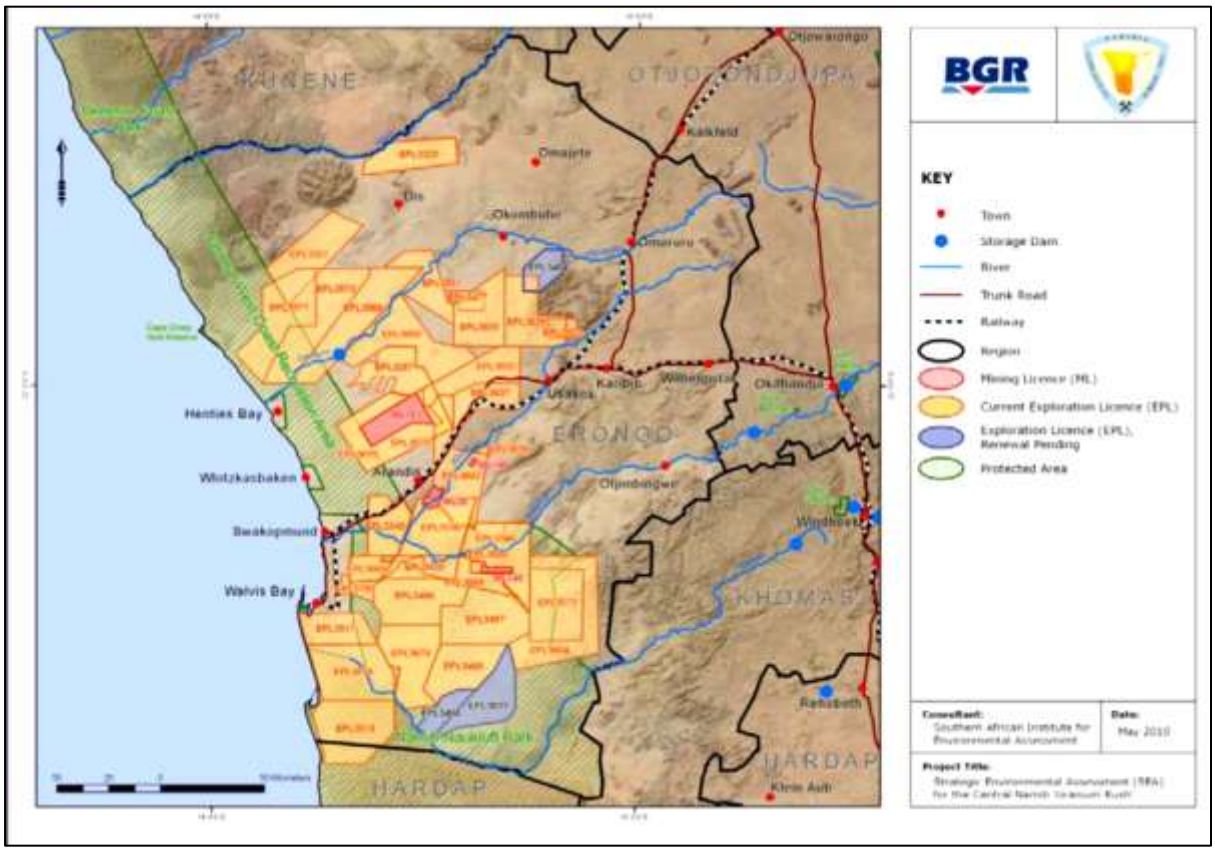


Figure 3: Uranium EPLs in the Erongo Region 2010

Namibia generally welcomes investment in mining because it leads to increased revenue for the state, socio-economic development and job creation. However, at the height of the exploration boom, members of the public and government institutions raised concerns about the impact that uranium prospecting and mining could have on the affected communities and the environment. They questioned whether infrastructure, housing and social services in the Erongo Region would be able to accommodate the establishment of new mines and the associated massive influx of job seekers. At the same time, the mining industry realised that unscrupulous miners could tarnish Namibia's reputation as a responsible uranium supplier and decided to establish the Namibian Uranium Association as a self-regulating body.

To address these concerns the Ministry of Mines and Energy in cooperation with the German Geological Survey (BGR) commissioned a strategic environmental assessment (SEA). This type of assessment

allows decision makers to integrate the full spectrum of benefits and environmental considerations within the planning process, to provide vision and to generate a culture of collaboration among the mining industry, government, and the public. The SEA was carried out by Southern African Institute of Environmental Assessment in 2009-2010 and included a number of stakeholder consultation meetings. Concerns and recommended mitigation measures were documented in the SEA report.[1] The most important expected positive outcomes were:

- Strong economic growth of towns in the Erongo Region and improved quality of life
- Through careful stewardship of revenue and taxes from mining, the government will be able to address poverty and improve the lives of all Namibians
- Major impact on the macroeconomic indicators of Namibia
- Many direct and indirect new jobs, more opportunities for skills development and training
- Opportunity to fund scientific research and improve the body of scientific knowledge about the Namib environment and heritage resources
- Support the establishment of a Namibian nuclear energy industry including the beneficiation of uranium and the construction of a nuclear power station

These expected benefits could be threatened or offset by negative impacts if the development of new mines and associated infrastructure were not well managed. Note that the concerns listed below reflect public perceptions and do not necessarily reflect what is actually expected to happen.

- Mining is not sustainable; it extremely vulnerable to fluctuations in the exchange rate and uranium prices
- There will be no added value to the country from uranium beneficiation; revenue will leave Namibia because of foreign ownership of mines
- Negative impact on the tourism industry could affect livelihoods of many people at the coast
- Escalating property prices will make houses unaffordable
- The existing infrastructure will not be able to cope and government will not be able to maintain it or upgrade it in time
- Insufficient water and power, power will cost more and outages will become more common
- The current waste disposal systems will not be able to cope with additional waste, especially hazardous waste and radioactive waste
- Influx of employees and job seekers causes a rise in diseases, especially HIV/AIDS and TB; will affect social cohesion, crime, crowding and informal housing areas; pressure on social services and amenities will result in the deterioration of these services and facilities
- Farmers may lose their land or be unable to farm anymore because of mine-related impacts
- Unethical companies may exploit workers
- Impact on health due to dust, exposure to radiation, increased traffic causing more accidents, higher risk of spills of hazardous materials in transit, groundwater pollution
- Noise and visual impact affect “sense of place” in the desert; loss of access to favourite recreation and tourist areas in the Namib
- Cumulative impact on water resources; biodiversity including the lichen fields; air quality and radiation; soil; marine environment (desalination plants); integrity of the National Park; increase in poaching, fishing and illegal harvesting
- Mines will not provide sufficient funding for effective closure measures; closure will not be adequate in the long-term resulting in long-term impacts on the environment

[1] MME (2010): Strategic Environmental Assessment for the Central Namib Uranium Rush. Ministry of Mines and Energy, Republic of Namibia, Windhoek

The Strategic Environmental Management Plan (SEMP) that was developed in the SEA identifies measures to avoid or mitigate the listed impacts. The SEMP consists of twelve environmental quality objectives (EQO) as shown in Table 2.[2]

Table 2: SEMP Environmental Quality Objectives

Icon	Issue	Aim of the Environmental Quality Objective
	1. Socio-economic Development	Uranium mining improves Namibia´s and the Erongo Region's sustainable socio-economic development and outlook without undermining the growth potential of other sectors.
	2. Employment	Promote local employment and employment equity.
	3. Infrastructure	Key infrastructure is adequate and well maintained, thus enabling economic development, public convenience and safety.
	4. Water	Ensure that the public have the same or better access to water in future as they have currently; quantity and quality of groundwater are not adversely affected by mining activities.
	5. Air Quality	Workers and the public do not suffer significant increased health risks as a result of exposure to dust emission from uranium mines.
	6. Health	Adequate health services are available to all; workers and the public do not suffer significant increased health risks from uranium mining.
	7. Effect on Tourism	The natural beauty of the desert and its sense of place are not compromised unduly by uranium mining; prevent conflicts between tourism and mining, so that both industries can coexist in the Central Namib.
	8. Ecological Integrity	Ecological integrity, flora and fauna are not compromised by mining; mines form conservation partnerships.
	9. Education	Erongo residents continue to have affordable and improved access to basic, secondary and tertiary education.
	10. Governance	Regulators and industry protect Namibia's reputation as a responsible uranium producer by means of ethical conduct and environmentally, socially and financially responsible practices.
	11. Heritage	Uranium exploration and mining will have the least possible negative impact on archaeological and palaeontological heritage resources.
	12. Mine Closure and Future Land Use	Maximize the sustainable contribution to society mines can make post-closure; minimize social, economic and biophysical impacts of mine closure.

[2] "Environmental quality objectives" are the SEA equivalent of recommended mitigation measures in EMPs.

The SEA concluded that the uranium rush presented significant opportunities for Namibia in terms of growth and development. The benefits would however come at a price because the uranium deposits are partly located in a proclaimed national park and one of the most popular tourist destinations in the country. Unless it was well managed and the necessary safeguards put in place, the uranium rush would negatively affect the environment and tourism on which livelihoods depend. To enhance the benefits and overcome these major challenges and constraints all tiers of government, state-owned enterprises and mining companies must successfully implement the necessary measures outlined in the SEA and SEMP. The desired outcome of the SEMP is that the utilization of Namibia´s uranium resources significantly contributes to the goal of sustainable development for the Erongo Region and Namibia as a whole.

The SEMP is thus an over-arching framework to address the cumulative impacts of existing and potential new developments. Implementation of the SEMP is guided by a steering committee that is chaired by the SEMP Office at the Geological Survey of Namibia (GSN), Ministry of Mines and Energy. Members include the Department of Water Affairs and Forestry (DWA) in the Ministry of of Agriculture, Water and Land Reform (MAWLR), the Ministry of Health and Social Services (MHSS), which includes the National Radiation Protection Authority (NPRA), the Ministry of Environment, Forestry and Tourism (MEFT), the Gobabeb Research and Training Centre's Namib Ecological Restoration and Monitoring Unit (NERMU) and the Namibian Uranium Association (NUA).

The SEMP Office coordinates regular monitoring and sampling and ensures that data on environmental performance indicators are collected. This involves consultation with authorities and organisations such as Ministry of Education, Arts and Culture, Ministry of Finance, Ministry of Labour, Erongo RED, NamPort, NamPower, NamWater, Roads Authority, Swakopmund and Walvis Bay Municipality.

Desired Outcome 1.1.	**Income and economic opportunities from uranium mining are optimized.**			
Target 1.1.1.	**Contribution of mining to the economy increases over time.**			
Indicator 1.1.1.1.	**Royalties are paid in full by mining companies.**			
Data Source	**SEMP Office/MoF/NUA**			
Status:	**NOT MET**	**IN PROGRESS**	**MET**	**EXCEEDED**

Figure 4: Example of SEMP Indicator and Rating Options

The aims of the twelve EQOs in Table 2 are broken down into desired outcomes, targets and indicators (Figure 4). The indicators are monitored throughout the year and evaluated in annual SEMP reports to measure the positive and negative impact of uranium mining on the Erongo Region. Each indicator is assessed according to a four-tiered colour-coding system that indicates whether it has been exceeded, met, not met or is still in progress. Recently many indicators had to be rated not applicable because the pertinent activity did not take place in the year under review. The SEMP Office prepares annual SEMP reports in co-operation with NERMU and NUA. These reports are published on the MME/GSN website which is accessible to stakeholders and the public.

URANIUM MINING SCENARIO IN 2018-2019

Kazakhstan and Uzbekistan, Canada and Australia, historically the world's top uranium producers (Figure 5) [3], are still in the lead, but Namibia now ranks fifth with production figures similar to Niger and Russia. Namibia is expected to join the ranks of the major producers when Swakop Uranium's Husab Mine reaches nameplate capacity.

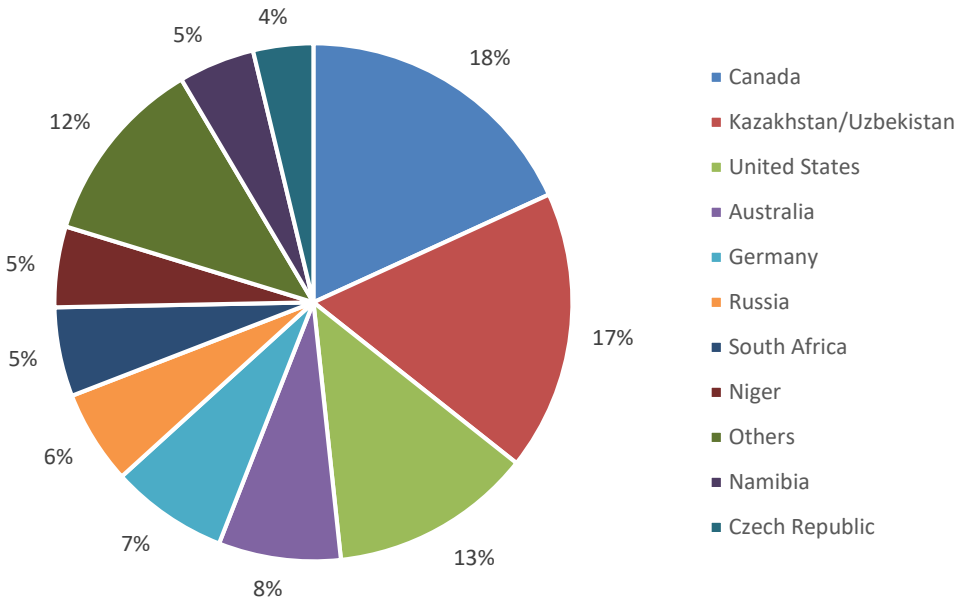


Figure 5: Historic World Uranium Producers 1945-2019

The international uranium sector was besieged by continued uncertainty resulting from the United States' nuclear policy and sanctions of the Iranian civil nuclear power programme. Utilities were concerned that developments in the US may lead to critical constraints in uranium production, conversion, enrichment and fabrication of nuclear fuel. The expected recovery of the uranium price did not take place, despite Kazakhstan's announcement that its uranium production will remain curtailed by 20% in 2019 and 2020. The spot market price stood at US$ 24.88 per pound at the end of 2019. [4]

By the end of 2019, 450 nuclear power reactors were in operation worldwide, totalling 398.9 GW(e) in net installed capacity, an increase of 2.5 GW(e) since the end of 2018. Nuclear power generated around 10% of the world's electricity in 2019, or almost one third of all low carbon electricity, and was set to remain the second largest source of low carbon electricity after hydropower.

Uranium demand in 2020 was forecast to be 68 240 tonnes, while 53 500 tonnes were produced in 2018, and 2019 levels were forecast to be in a similar range. The opening gap between supply and demand should increase the uranium price, supporting increased production in Namibia. Companies in the Namibian uranium sector, including the two mines in care and maintenance, are therefore positioning themselves for a time when prices will enable them to produce economically.

[3] www.world-nuclear.org/information-library/nuclear-fuel-cycle/mining-of-uranium/world-uranium-mining-production.aspx

[4] www.uxc.com/p/prices/UxCPriceChart.aspx?chart=spot-u3o8-full

Namibia currently hosts two operating uranium mines, Rössing and Husab, and two mines in care and maintenance, Langer Heinrich and Trekkopje. The exploration projects of Bannerman Resources, Marenica Energy, Reptile Mineral Resources and Exploration, Valencia Uranium and Zhonghe Resources are in advanced stages of exploration and recovery test work. Development of these projects into fully-fledged mining operations is subject to an increase in the uranium price, as is the case with the Trekkopje and Langer Heinrich Mines, which had to be put on care and maintenance in 2013 and 2018 respectively (Table 3). Figure 6 on the next page shows the location of mines and exploration areas. [5]

Table 3: List of Uranium Mines and Projects

Full company name	Parent company	Mine site name(s)
China National Nuclear Corporation Rössing Uranium (Pty) Limited	China National Uranium Corporation (China)	Rössing Mine
Swakop Uranium (Pty) Limited	Taurus Minerals (China)	Husab Mine
Langer Heinrich Uranium (Pty) Limited	Paladin (Australia)	Langer Heinrich Mine
Orano Mining Namibia (Pty) Limited	Orano (France)	Trekkopje Mine
Bannerman Mining Resources Namibia (Pty) Limited	Bannerman (Australia)	Etango, Ondjamba, Hyena
Marenica Minerals (Pty) Limited	Marenica (Australia)	Marenica
Reptile Mineral Resources and Exploration (Pty) Limited	Deep Yellow Limited (Australia)	Tumas, Tubas, Ongolo, MS7, INCA
Valencia Uranium (Pty) Limited	Forsys Metals (Canada)	Norasa
Zhonghe Resources (Namibia) Development (Pty) Limited	China Uranium Corporation (China)	Zhonghe (ML 177)

The following paragraphs summarise the activities of mining and exploration companies during the 2018-2019 review period. [6]

Rössing Uranium

Rössing Mine, the longest operating open cast uranium mine in the world, was nearing the end of its mine-life when Rio Tinto and China National Uranium Corporation Ltd (CNUC) concluded the sale of Rio Tonto's 68.92% stake in Rössing Uranium Ltd on 16 July 2019. The sale opened up a significant market in China and gave the company a new lease of life, with an expected positive impact on the Erongo Region and the country at large.

Swakop Uranium

Swakop Uranium's Husab Mine is owned by China General Nuclear & China Africa Development Fund (90%) and 10% by Namibia's Epangelo Mining. The design mining capacity is 15 million tonnes of ore per year, with 100 million tonnes of rock mined from two open pits.

[5] Geological Survey of Namibia, 2020
[6] Based on Namibian Uranium Association 2019 Annual Review

The ore is fed to a processing plant with a design capacity of 6 000 tonnes of uranium oxide per year. Husab Mine has gradually increased its production from 3 571 t in 2018 to 4 010 t in 2019 and is aiming for 5 000 t in 2020. Most of the product is supplied to nuclear power plants in China.

Langer Heinrich Uranium

Langer Heinrich Mine was placed under care and maintenance in 2018 with the aim of preserving the equipment and the asset as a whole. A study to determine the feasibility of a restart completed during 2019 resulted in a business improvement model with improved economics and greater potential for capacity expansion. However, a restart of the mine will depend on the conclusion of a uranium term-price contract with an appropriate level of return to stakeholders.

Orano Mining Namibia

Orano Mining Namibia's Trekkopje Mine has been under care and maintenance since 2013, with a small core team maintaining the site. The company also owns the Erongo desalination plant that supplies water to the Namibian Water Corporation's central Namib supply scheme.

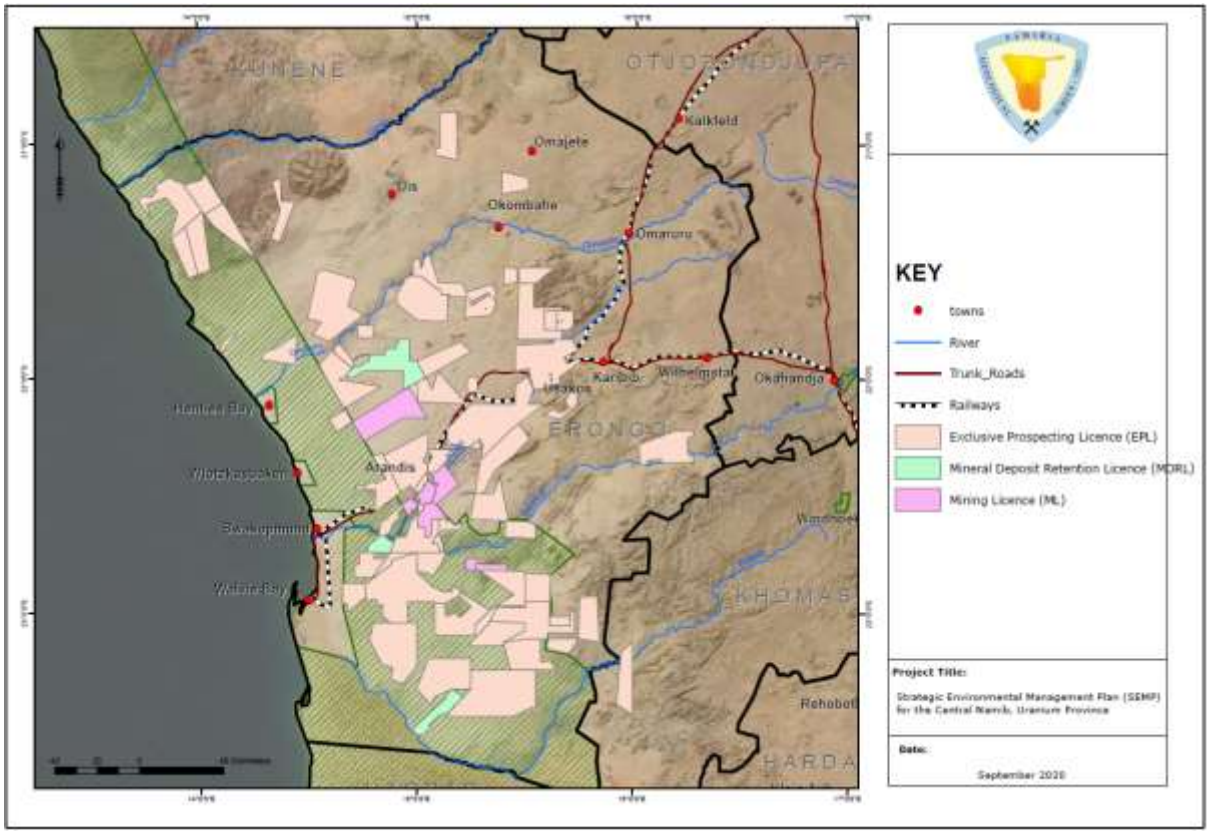


Figure 6: Nuclear Fuel Mining Licence and Exploration Areas in the Erongo Region

Exploration Projects

Bannerman Resources continued to focus on mine and process optimisation at its flagship Etango Project. The Heap Leach Demonstration Plant was re-commissioned in 2019 to prepare pregnant liquor solution for use in advanced membrane test work. At the adjacent exploration licence, reconnaissance drilling at the Ombepo prospect established the down dip extension of uranium mineralisation.

Marenica Energy, who own the patented *U-pgrade*™ process and the Marenica uranium deposit under a Mineral Deposit Retention License, have developed into the largest uranium tenement holder in Namibia during 2018-2019. Drilling results on one of their licenses have recently revealed exceptional uranium mineralisation.

Reptile Mineral Resources & Exploration remained the most active explorer with extensive drilling programmes carried out on the Reptile and adjoining Nova JV projects. New discoveries during the current evaluation of the highly prospective Tumas palaeochannel system resulted in a threefold increase in resources compared to three years ago. This has enabled the company to complete a positive scoping study in January 2020 and initiate a pre-feasibility study. At the NOVA joint venture project, Reptile and its partner, Japanese Oil, Gas and Metals National Corporation (JOGMEC) drilled both palaeochannel and basement targets.

The Valencia uranium deposit has a definitive feasibility study and a mining licence in place, and is therefore construction-ready once the uranium price increases. Zhonghe Resources' activities were focused on potential resource evaluation and economic re-assessment for mining development.

EVALUATION OF THE ENVIRONMENTAL QUALITY OBJECTIVES

EQO 1. Socio-Economic Development

Aims of this EQO: Uranium mining improves Namibia and the Erongo Region's sustainable socio-economic development and outlook without undermining the growth potential of other sectors.

Mining plays a prominent role in the Namibian economy. In 2019, the mining sector made a direct contribution of 9.3% to the GDP of the country (1.4% from uranium mining).[7] There are various sources of revenue to countries that host uranium mines (Figure 7), including corporate taxes, royalties and export levies paid by mining companies, as well as income tax on employees' salaries. If government owns shares in a mine, which is the case in the Namibian diamond industry, it will also receive dividends and part of the retained earnings.

Mining company profit/loss		Revenue for host state
Uranium export value	→	Mining royalties
Employment costs	→	Employee taxes
Other production costs	→	Custom duties, VAT
Taxable profit	→	Corporate income tax
Dividend to shareholders	→	Tax on dividend
Retained earnings	→	Government stake in mining company

Figure 7: Sources of Revenue from Uranium Mining

This income stream can be used in support of national development plans. The aim of EQO 1 is to ensure that the uranium industry contributes its fair share to the socio-economic development of the country. The indicators of this EQO measure the fiscal revenue generated through royalties and corporate taxes, as well as local procurement of goods and services within Namibia.

An additional opportunity of earning income through local beneficiation of raw materials is often mentioned in this context and promoted by the Namibian government. This is however not an option for the uranium industry due to the complexity and cost of uranium conversion and enrichment. There are only a few commercial uranium enrichment facilities around the world, but they have more than enough capacity to produce all the nuclear fuel that is needed.

[7] National Statistics Agency, Annual National Accounts 2019

Desired Outcome 1.1.	**Income and economic opportunities from uranium mining are optimized.**
Target 1.1.1.	**Contribution of mining to the economy increases over time.**
Indicator 1.1.1.1.	**Royalties are paid in full by mining companies.**
Data Source	**SEMP Office/MoF/NUA**
Status:	**Met**

Mining royalties are levied as a percentage of the export value of the commodity that a mine produces. For uranium (nuclear minerals) royalties are 3% of the sales price, which means that some revenue goes to the state even if a mining company does not make a taxable profit. Operating mines paid the royalties that were levied in 2018 and 2019 as reported by MME (Table 4).

Table 4: Royalties Paid by Uranium Mining Companies (Million N$)

Company	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Langer Heinrich Ur.	56.3	65.2	60.7	61.7	40.6	16.1	
Rössing Uranium	85.2	56.8	54.3	80.4	77.8	87.5	77.6
Swakop Uranium	No uranium production				9.1	62.2	225.3
Total royalties	**141.5**	**122.0**	**115.0**	**142.1**	**127.5**	**165.8**	**302.9**

Since Langer Heinrich Uranium was placed on care and maintenance in 2018 no royalties were due in 2019. Rössing Uranium's royalties increased in 2018 because of higher production before dropping back to the 2017 level in 2019. Swakop Uranium's ramp-up towards full production was reflected in significant royalty payments in 2018 and 2019.

Motivation of status: The target and indicator were **Met** because the operating mines fully paid the royalties claimed by MME, and the total amount has increased over time.

Indicator 1.1.1.2.	**Increasing economic contribution by uranium mines over time.**
Data Source	**SEMP Office/MoF/NUA**
Status:	**Met**

The evaluation of this indicator was based on information in the Chamber of Mines 2019 annual review that contains data from 2013-2019. Comparing the economic contribution derived from uranium mining at 2010 constant prices (to correct for inflation) results in a generally rising trend, notwithstanding some fluctuations caused by the low uranium price (Figure 8).

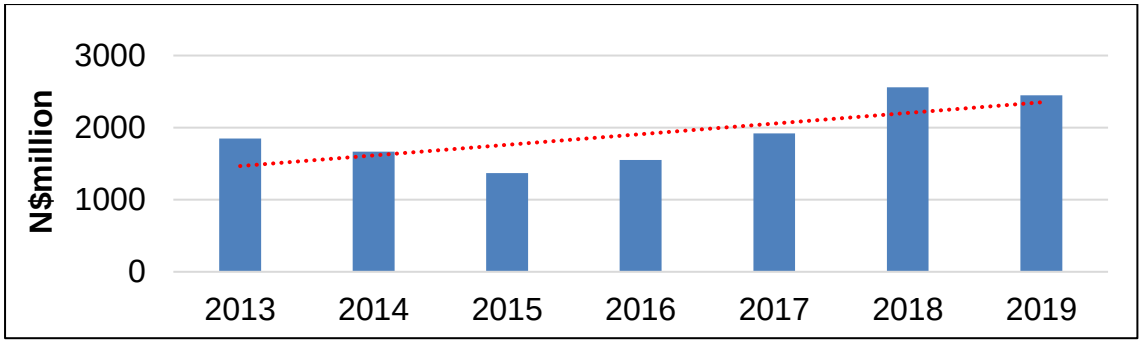


Figure 8: Value Added by Uranium Mining Companies (2010 Constant Prices)

Motivation of status: The indicator was **Met** because the economic data indicate a rising contribution by uranium mines since 2013, mostly due to the start-up of the Husab Mine.

Indicator 1.1.1.3.	**Increasingly, inputs that can be sourced locally are not imported.**			
Data Source	**NUA**			
Status:			**Met**	

The indicator measures the percentage of total procurement spent locally within Namibia. Table 5 provides figures for the last six years to see whether procurement from Namibian suppliers is increasing over time. 'Local procurement' in this indicator includes Namibian utilities and Namibian-registered foreign companies, since there are only a few international suppliers of mining equipment, tyres and chemicals.

Table 5: Local Procurement of Goods and Services by Operating Uranium Mines

	Local procurement of goods and services as % of total procurement					
Company	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Langer Heinrich	71%	85%	84%	91%	92%	
Rössing Uranium	68%	73%	77%	74%	77%	77%
Swakop Uranium			(49%)	68%	65%	84%
Average	**70%**	**79%**	**81%**	**78%**	**78%**	**81%**

The average figures of 78% in 2018 and 81% in 2019 indicate a positive trend towards increasing local procurement. Figure 9 on the next page shows a breakdown of local and foreign buying at Rössing Uranium and Swakop Uranium in 2019. The total amount these two companies spent within Namibia was N$4.5 billion in 2018 and N$6.5 billion in 2019.

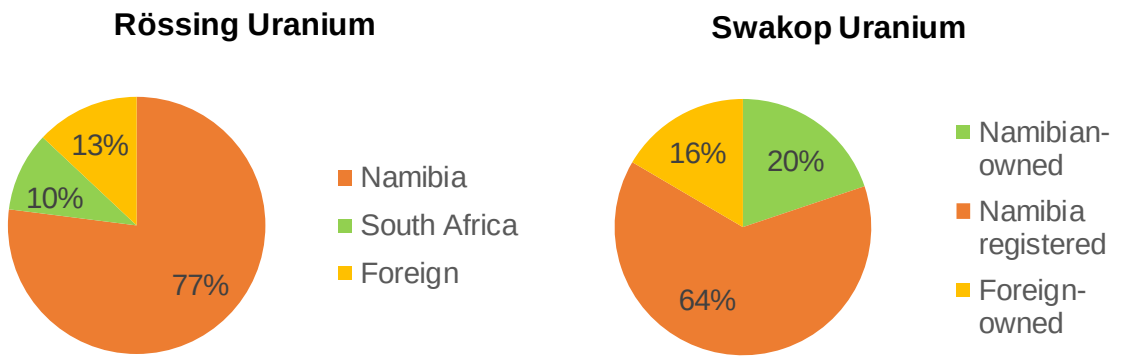


Figure 9: Rössing Uranium and Swakop Uranium Procurement Split in 2019

Figures for exploration companies and mines under care and maintenance are not included in Table 5 because the indicator only applies to operating mines. It is however worth mentioning that Langer Heinrich Uranium, Orano Mining Namibia, Bannerman Mining Resources Namibia and Reptile Mineral Resources and Exploration purchased over 90% of their goods and services locally.

Motivation of status: The indicator was **Met** because the percentage of local procurement has increased from 70% in 2014 to 81% in 2019, and more importantly, the total amount of money spent in the local economy has increased substantially now that the Husab mine is in operation.

Indicator 1.1.1.4.	**Processing companies connected to uranium mines are not granted EPZ/SEZ status.**			
Data Source	**SEMP Office**			
Status:			**Met**	

There were no existing or new uranium-processing companies with EPZ status in 2018/2019. The Ministry of Finance announced in March 2018 that the Export Processing Zones Act (Act 9 of 1995) will be repealed and Special Economic Zones (SEZ) will be introduced. The indicator has been updated to include SEZ.

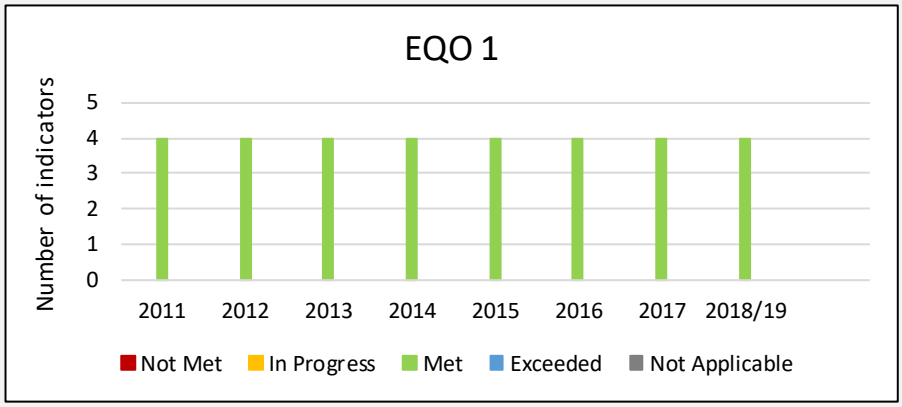
Motivation of status: The indicator was **Met** because there were no uranium processing companies with EPZ/SEZ status in 2018/2019.

****

Summary of performance over time: EQO 1

Total no. indicators assessed 4				
2018/2019	**Not Met**	**In Progress**	**Met**	**Exceeded**
Number of indicators in class	0	0	4	0
Percent of indicators in class	0%	0%	100%	0%

Overall performance: The four indicators of socioeconomic development cover the payment of royalties and taxes, local procurement and EPZ status for processing companies. All indicators were **Met** in every year since the inception of the SEMP report in 2011 (see graph below).



****

EQO 2. Employment

Aims of this EQO: Promote local employment and employment equity.

The aim of EQO2 is to create jobs and to promote equity by adhering to the requirements of the Affirmative Action (Employment) Act. Uranium mining companies are expected to give preference to Namibian citizens, especially people residing near the mine. Government aims to encourage local and foreign investment, as well as promotion of growth to increase the number of jobs, alleviation of poverty and income inequality. The Affirmative Action (Employment) Act No. 29 of 1998 was intended to address labour market inequalities by enhancing the integration of previously disadvantaged groups in the labour market and promoting equal opportunities and gender equality, e.g. by employing women at all levels of mining companies.

Despite all these efforts, the unemployment rate increased from 28% in 2014 to 33% in 2018[8] and this remains a grave concern. In 2018, the mining industry provided jobs to 9045 permanent and 498 temporary employees, as well as 6681 employees of subcontracting firms[9]. Though only 1.5% of the country's total workforce were employed in the mining industry, their purchasing power makes a sizeable contribution to the economy economic because mine employees are generally better paid than those in other sectors. The multiplier effect in service industries is estimated to support over 110 000 additional jobs according to the Namibian Chamber of Mines.

The media have in the past often criticised mining companies for employing foreigners in top management positions. This picture has changed in the last few years, so that most CEOs are now local citizens and companies such as Debmarine, Dundee Precious Metals, Orano Mining Namibia, QKR and Skorpion Zinc are headed by formerly disadvantaged Namibians. Figure 10 shows the president, vice presidents and some council members of the Namibian Chamber of Mines in support of this statement. Managing directors of operating and mothballed uranium mines companies were 50% Namibians and 50% non-Namibians in 2018.

Figure 10: Chamber of Mines Members

[8] National Statistics Agency (2019): The Namibia Labour Force Survey 2018 Report, www.nsa.org.na
[9] Chamber of Mines of Namibia 2018 Annual Review

Desired Outcome 2.1.	**Mainly locals are employed.**			
Target 2.1.1.	**Uranium companies hire locally where possible.**			
Indicator 2.1.1.1.	**During operational phase all mining companies to comply with their employment equity target (certificate).**			
Data Source	**SEMP Office/EEC/NUA**			
Status:			**Met**	

All operating mines employed predominantly Namibian staff. They submitted employment equity compliance reports and received certificates or conditional approval for the reporting period. The percentage of local employees varied from 95% at Langer Heinrich Uranium (in 2018), 96% at Swakop Uranium to 98.5% at Rössing Uranium (both 2019). Exploration companies with fewer than 25 employees are not required to obtain employment equity compliance certificates. They have however confirmed that most of their employees were Namibian as well.[10]

Langer Heinrich Uranium resolved in April 2018 to put the mine on care and maintenance due to the continued low uranium price. The main production activities ceased on 13 May 2018 and 266 employees were retrenched. A compliance certificate was issued by the Office of the Labour Commissioner after conclusion of the collective retrenchment process confirming the process complied with the provisions of the Labour Act. None of the other companies reported any retrenchments during the reporting period.

Another important aspect mentioned in the SEA report but not taken up in the indicator is the question whether contractor companies employed at uranium mines meet the employment equity target. In 2018, Langer Heinrich Uranium reported that 100% of their contractor companies complied with the provisions of the Act, while the relevant figures for Rössing Uranium were 71% (2018) and 75% (2019). Swakop Uranium does not require AA certificates to be submitted with vendor applications, hence this information was not readily available.

Motivation of status: The operational mines complied with the provisions of the Affirmative Action (Employment) Act and **Met** their employment equity targets.

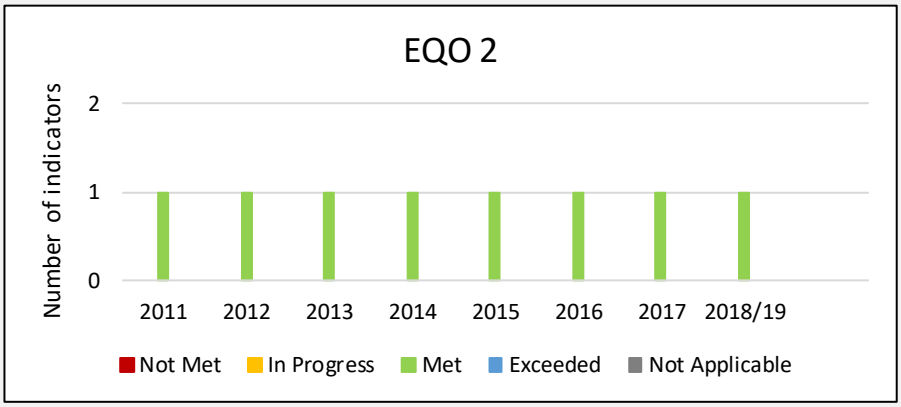
[10] NUA input to 2018/2019 SEMP report

****

Summary of performance over time: EQO 2

Total no. indicators assessed	1			
2018/2019	**Not Met**	**In Progress**	**Met**	**Exceeded**
Number of indicators in class	0	0	1	0
Percent of indicators in class	0%	0%	100%	0%

Overall performance: The only indicator of EQO 2 has always been **Met**, because most of the permanent workers and contractors at uranium mines were Namibian citizens and companies have received AA compliance certificates.



****

EQO 3. Infrastructure

Aims of this EQO: Key infrastructure is adequate and well maintained, thus enabling economic development, public convenience and safety.

Poor infrastructure impedes a nation's economic growth and international competitiveness. Infrastructure has a bearing on a country's attractiveness to foreign investors and on its ability to compete with other countries. It ensures that people, goods and services can be moved in the most effective ways possible. Failure to invest in infrastructure means a failure to sustain and develop Namibia's social and economic wellbeing. Investment in infrastructure is an ongoing process as there are always changes in technology and the business environment. The growing economy drives new needs, while existing infrastructure must be maintained, updated or replaced.

The aim of this EQO is to ensure that key infrastructure in the Erongo Region is adequate to meet all users' requirements and well maintained, thus enabling economic development, public convenience and safety, whilst minimising environmental impacts. Amongst the relevant infrastructure developments are good housing, social services and amenities, water and electricity supply and an efficient and safe transportation system.

The 31 indicators of the infrastructure EQO examine each of these points, which are mostly in the public domain or concern linear infrastructure that public utilities use to supply water and electricity to mines. The topic of waste management mostly concerns landfill sites and recycling systems managed by urban centres, though it includes mine-specific indicators referring to the environmentally sound management of mineral waste too. Experience has shown that the creation of mining towns and hostel compounds in towns or on mines will cause problems during operation and especially after mine-closure. The first target therefore states that employees should be housed in existing proclaimed towns.

Desired Outcome 3.1.	**Existing, proclaimed towns are supported and mine employees are integrated in society.**			
Target 3.1.1.	**Most employees are housed in proclaimed towns.**			
Indicator 3.1.1.1.	**Mines do not create mine-only townships or suburbs.**			
Status:			**Met**	

Operating mines and exploration projects are currently housing their employees in proclaimed towns and confirmed that they were not planning to establish mine-only townships or suburbs.

Motivation of status: The indicator was **Met**.

Indicator 3.1.1.2.	**There are no on-site hostels during the operational phase of a mine.**
Data Source	**SEMP Office/NUA**
Status:	**Not Met**

Swakop Uranium has approximately 200 contractors staying at the Husab Mine construction camp and the company has applied to MEFT for permission to keep using the camp in future.

Motivation of status: This indicator was **Not Met** because one operating mine uses permanent on-site accommodation for some of its contractors.

Desired Outcome 3.2.	**Roads in Erongo are adequate for uranium mining and other traffic.**
Target 3.2.1.	**Roads are well maintained; traffic frequency is acceptable for tourism/ other road users and traffic is safe.**
Indicator 3.2.1.1.	**Surfaced roads are adequate and safe for traffic frequency.**
Data Source	**Roads Authority (RA)**
Status:	**Not Met**

This indicator was added because the existing indicators only addressed gravel roads and traffic safety on surfaced roads was highlighted as an issue in the 2016 SEMP report. The mining industry and other stakeholders such as the Erongo Regional Road Safety Council, consider that the traffic volume on the T0202 (former B2), especially the number of heavy vehicles, has increased to the extent that the road has become unsafe. A recommendation was therefore made to the Roads Authority to upgrade the road to double lanes or create passing lanes at least up to Arandis. In 2016/17 the Roads Authority budgeted for the detailed design of the Karibib-Swakopmund road upgrade to two-plus-one lane.[11] Budgets for the following years however only allocated funds to two projects in 2018/19[12]:

- Swakopmund-Henties Bay-Kamanjab road upgrading (402 km): N$145,790,000
- MR44 Swakopmund-Walvis Bay road upgrading (44km): N$205,822,000
- Swakopmund-Walvis Bay road rehabilitation (30 km): no budget allocated
- Upgrading to 2+1 cross-section, T0202 Karibib-Swakopmund: no budget allocated

NUA's Services working group has approached the Walvis Bay Corridor Group who confirmed that the T0202 Karibib-Swakopmund upgrade has been designed, but the Roads Authority was still trying to secure funding for the project. This appeared unlikely to materialise by the end of 2019.

Motivation of status: The indicator was **Not Met** because there was no progress in 2018/2019.

[11] Roads Authority: Five Year Budget For The Period 2017/18 To 2021/22 Financial Year
[12] Roads Authority: Five Year Budget For The Period 2018/19 To 2022/23 Financial Year

Indicator 3.2.1.2.	All key gravel roads are maintained timeously to avoid deterioration.
Data Source	RA/NUA
Status:	Met

The Roads Authority (RA) has a maintenance programme for key gravel roads, such as the M52, M44 and the M36 road from Walvis Bay into the Namib-Naukluft National Park (NNNP). Within the national park Bannerman Mining Resources continued in 2018 to grade the road along the Moon Landscape to the Welwitschia Drive every two months and once a year grades the entire road. Swakop Uranium has appointed a contractor to grade the Welwitschia Drive from the C28 turn-off to the Husab exploration campsite. This was done once a month in 2018 and 2019, expect for a short period in the second half of 2018 when the grader was broken and the internal process delayed approval for the work to go ahead. The road was graded more frequently during the demobilisation of Ida Camp.

Motivation of status: This indicator was **Met** because the key gravel roads used by mining companies and tourists were mostly maintained in a reasonable condition.

Indicator 3.2.1.3.	Un-surfaced roads carrying >250 vehicles per day need to be tarred.
Data Source	RA
Status:	In Progress

The RA confirmed that all gravel roads with traffic of more than 250 vehicles per day should be upgraded to bitumen standard, but because of insufficient funds not all such roads can be tarred immediately. Most of the C28 road from Swakopmund to the Langer Heinrich mine turn-off has already been tarred, while the tarring of the MR44 from Swakopmund to Walvis Bay east of the dunes was completed in 2019. The gravel road from Swakopmund to Uis via Henties Bay is also being upgraded to bitumen standard. There are plans to tar the MR36 (C14) gravel road in future, though not within the next five years.

Motivation of status: Due to insufficient funds for road upgrading the Roads Authority has not yet been able to tar all roads carrying >250 v/d. Because plans are in place and good progress was made in 2018/2019 the indicator was rated **In Progress**.

Indicator 3.2.1.4.	The B2 tar road is free of pot-holes and crumbling verges.
Data Source	RA
Status:	Met

The Roads Authority reported that the T0202 (former B2) tar road was free of potholes and crumbling verges and in reasonably good condition between Swakopmund and the Arandis turn-off. Part of this section was resealed in early 2018. Maintenance work on crumbling verges was performed when required throughout 2018 and 2019.

Motivation of status: The Roads Authority is continuously repairing potholes and crumbling verges on the B2 in the uranium province, resulting in this indicator being **Met**.

Indicator 3.2.1.5.	**Road markings and signage are in place and in good condition.**
Data Source	**SEMP Office/RA**
Status:	**Met**

Road signs and markings were in place, but the cat's eyes that were used on the B2 in the past have not been replaced. This makes it difficult to see the road edges at night and in heavy fog, contributing to the heavy traffic hazards experienced on this road. The NUA Services Working Group recommended to the Erongo Road Safety Committee that cat's eyes should be fitted between Swakopmund and Arandis to make the road safer.[13]

Motivation of status: Signage along the roads was in place and in generally good condition, the indicator was therefore **Met**.

Indicator 3.2.1.6.	**MR44 previously known as D1984 (Swakopmund to Walvis Bay east of dunes) is tarred.**
Data Source	**SEMP Office/RA**
Status:	**Met**

Upgrading of the MR44 road to a dual carriageway and bitumen standard was mostly completed in 2019. A "massive interchange" with a bridge and two on and off-ramps (instead of four) was built where it crosses the B2 outside of Swakopmund.

Motivation of status: The indicator was **Met**.

Indicator 3.2.1.7.	**90% of traffic on the B2 coastal road (Swakop-WB) is light vehicles.**
Data Source	**SEMP Office/RA**
Status:	

Now that the MR44 road has been tarred it will be possible to ban heavy vehicle traffic from the B2 coastal road. The indicator will be evaluated in the next SEMP report.

Motivation of status: The indicator was **Not Applicable** because bitumen work on the MR44 road was only completed towards the end of 2019.

[13] NUA 2017

Indicator 3.2.1.8.	**Mining traffic on predominantly tourist roads meets agreed conditions.**
Data Source	**NUA**
Status:	**Met**

The 'agreed conditions' mentioned in this indicator are that 1) the traffic frequency is acceptable for tourists and other road users and 2) that traffic is safe. Langer Heinrich Mine are using an upgraded, mostly tarred section of the C28 road in the Namib-Naukluft Park, while Swakop Uranium have constructed their own access road to avoid interference with tourist traffic. Swakop Uranium reported that all traffic to Husab Mine is directed via the permanent access road and unauthorised usage of the NNNP roads is not allowed. Traffic on NNNP roads was limited within their mining licence and EPL areas to geology activities and the relevant environmental and radiation monitoring as well as decommissioning activities at the Husab and Ida camps that were underway in 2018/2019. All personnel are inducted on the usage of these roads and security check points are in place to restrict access. In general, there has been a significant reduction in mining traffic on tourist roads during the last five years due to the slowdown in uranium exploration activities.

Motivation of status: Seeing that the mine-related traffic frequency was acceptable, and no safety incidents were reported it can be concluded that the agreed conditions have been **Met**.

Desired Outcome 3.3.	**Optimum use of rail infrastructure.**
Target 3.3.1.	**Most bulk goods are transported by the existing railway.**
Indicator 3.3.1.1.	**80% of all bulk goods (all reagents and diesel) delivered to mines and associated industries, are transported by rail.**
Data Source	**NUA/Transnamib**
Status:	**Met**

Rössing Uranium, the only mine with railway access, transported 91% of its bulk goods (sulphuric acid) by rail from Tsumeb and Walvis Bay. Some reagents that are used in smaller quantities were transported by road (Table 6). Transnamib started to upgrade the line between Walvis Bay and Usakos.

Table 6: Transportation Mode of Bulk Goods to Mining Companies

Company	Tonnes by rail	Tonnes by road	% by rail
Rössing Uranium	351 941	36 141	91%

Motivation of status: The indicator was **Met** because 91% of Rössing Uranium's bulk goods were transported by rail in 2018.

Desired Outcome 3.4.	**Walvis Bay harbour is efficient and safe.**
Target 3.4.1.	**The harbour authorities provide reliable, accessible and convenient loading, offloading and handling services.**
Indicator 3.4.1.1.	**Average loading rate for containers is >25 containers per hour.**
Status:	**Met**

Indicator 3.4.1.2.	**Average waiting time for ships to obtain a berth is <12 hours.**
	Met

Walvis Bay, Namibia's largest port is promoted as a gateway to other countries in the southern African region. To deal with higher levels of throughput, Namport has constructed a new container terminal that was inaugurated in August 2019. The terminal provides ground slots for 3,875 containers and its advanced cargo-handling facilities move about 250,000 containers per annum.[14] The container terminal addresses both indicators of reliable, accessible and convenient loading, offloading and handling services.

Motivation of status: The average loading rate of 25 containers per hour and time to obtain a berth were already met or exceeded in 2017 and will continue to be **Met** well into the future.

Indicator 3.4.1.3.	**No oil/chemicals/contaminants/sewerage spills enter the Ramsar site.**
Data Source	**Namport**
Status:	**Met**

Namport's EMS & QMS Coordinator reported that the port expansion acts as a buffer that keeps oil spills out of the lagoon Ramsar site.[15] No chemicals, other contaminants or sewerage enter the lagoon in 2018/2019. An internet search of the Namibian media turned up two reports on oil spills. The first one in March 2018 washed ashore at Afrodite Beach and was traced to two ships anchored in the bay. The Minister of Works and Transport issued a statement on the successful completion of the clean-up. The second spill of heavy fuel oil occurred in May 2019 from a tanker ship anchored in the port. A spill response team from the Directorate of Maritime Affairs controlled the oil slick by deploying inflated booms (Figure 11) and pouring on biodegradable absorbent material.[16] Some of the oil washed ashore at Langstrand, but neither of the two spills affected the lagoon.

[14] NamPort website www.namport.com.na
[15] Pers. comm. Namport, 2018
[16] Report and photo by Floris Steenkamp in the Namib Times of 14 May 2019

Figure 11: Oil Spill at Namport in May 2019

Motivation of status: The indicator was **Met** because spills did not affect the Ramsar site.

Desired Outcome 3.5.	**Electricity is available and reliable.**			
Target 3.5.1.	**The public do not suffer disruptions in electricity supply as a result of uranium mining.**			
Indicator 3.5.1.1.	**No disruptions in electricity supply as a result of mining.**			
Data Source	**NamPower**			
Status:			**Met**	

Namibia's electricity consumption is strongly correlated to GDP growth. To address the increase in demand for electricity, and to complement NamPower's initiatives, the Ministry of Mines and Energy prepared a National Integrated Resource Plan for the next 20 years. The plan spells out the electricity generation projects Namibia could pursue to meet its growing electricity demand. MME further drafted the Renewable Energy Policy, the Independent Power Producer Policy, and the National Energy Policy. These policies will help the country towards realising energy security in the future.

In 2018 and 2019, NamPower was able to meet the electricity needs of all sectors of the economy. Continuous maintenance of the network ensured that the availability of the transmission lines and generation plants exceeded the planned target. No significant interruptions in supply to the Erongo Region were reported. NamPower continued encouraging independent power producers to bring their projects on board under the REFIT programme.[17]

Motivation of status: This indicator was **Met** because there were no disruptions in electricity supply arising from uranium mining in 2018/2019.

[17] NamPower Annual Report 2018, www.nampower.com.na.

Indicator 3.5.1.2.	Industrial development is not delayed by electricity shortage.			
Status:			Met	

Indicator 3.5.1.3.	No investment decision deferred because of electricity shortage.			
Data Source	NamPower/Municipalities/Erongo Regional Council			
Status:			Met	

To prevent electricity shortage and secure the supply to consumers NamPower supplements its energy requirements with imports from utilities in the Southern African Power Pool (SAPP). However, this supply comes at a high cost that may well delay industrial development. The Ministry of Trade stated in October 2019 that "the high input costs, such as water, electricity, transport and wages, which are prevalent in the country will negate efforts to grow business." [18]

NamPower signed a five-year power purchase agreement with Eskom in 2017 for the firm supply of 200 MW, supplementing its requirements with additional energy on day-ahead basis. [19] Several other import agreements will expire in 2020 and NamPower is planning to expand its domestic power-generation capacity to close the gap between supply and demand.

Motivation of status: These two indicators were **Met** because enough electricity was available, even though the high electricity cost may be to blame for delays in Namibia's industrial development.

Indicator 3.5.1.4.	Electricity quality of supply meets ECB standard.			
Data Source	Electricity Control Board (ECB)/Erongo RED			
Status:			Met	

The Electricity Control Board (ECB) confirmed that Erongo RED complied with their electricity supply and safety standards. The quality of supply aspect of technical performance plays an important role for the utility in ensuring that the revenue requirement is not lost through poor performance standards. Network losses play a major role amongst the distribution companies. Erongo RED outperformed other REDs, maintaining their losses below the allowed loss threshold. Erongo RED's performance of 9% in technical losses in relation to the benchmark standards is notable and will be continuously monitored under the existing licensee compliance system.[20]

Motivation of status: Based on the above information this indicator was **Met**.

[18] "Tight business regulations, costly utilities hinder business growth" by Nghinomenwa Erastus in The Namibian of 11 October 2019
[19] NamPower Annual Report 2018, www.nampower.com.na
[20] Electricity Control Board 2017 Annual Report

Indicator 3.5.1.5.	Electricity provision does not compromise human health.			
Data Source	NamPower/NUA			
Status:			Met	

NamPower only monitors emissions that may compromise human health from the Van Eck power station in Windhoek, which is outside the area covered by the SEMP report. There is no monitoring around the Anixas power station in Walvis Bay. This station only operates when stand-by emergency supply is needed and is thus not expected to affect the health of Walvis Bay residents. The SEMP monitoring station at the municipal offices did not detect any air quality concerns at Walvis Bay (refer to EQO 5). In addition to human health electricity supply can impact birds and animals as described in the text box below.

Motivation of status: The indicator was **Met** in 2018/2019 because NamPower's power station at Walvis Bay only runs intermittently and the $PM_{2.5}$ particulate concentrations were below the WHO limits.

Good to know – Birds and Power Lines

The NamPower/Namibia Nature Foundation Strategic Partnership monitors interactions between wildlife and power supply infrastructure in Namibia to identify the extent of the impact, possible mitigation measures to avoid powerline incidents. Monitoring and feedback on results to date have shown that birds such as Ludwig's bustards, korhaans, raptors and flamingos often collide with power lines as shown in the photo below.

The NamPower/Namibia Nature Foundation Strategic Partnership collects power-line survey and incident reports in a countrywide database. The incidents are also mapped and made available on the Environmental Information Service (EIS; www.the-eis.com, Birds and powerlines tool). Observers, including environmental staff at participating mines, use standard forms to record dedicated power-line surveys and incidents that are spotted during routine work.

The database forms the basis for informed recommendations on the application of targeted mitigation measures. Mitigation measures to reduce bird collisions have to date been installed where the power line to Husab mine crosses the Khan River and close to the Swakop smallholdings. Two camera traps mounted on power line poles in the river monitor the presence of larger birds. These cameras are monitored and maintained by Swakop Uranium.

Indicator 3.5.1.6.	Mines pursue renewable power supply options as far as possible.			
Data Source	NUA/NamPower/Erongo RED			
Status:			Met	

Renewable energy alternatives have become more economic, especially if they are constructed to feed into the national supply network. During the years under review, NamPower supported the establishment of several solar power stations across the country and concluded power purchase agreements with the developers.[21] They are also planning to develop wind and biomass power stations.

Figure 12: Inauguration of the Trekkopje PV Plant
(Photo © Sertum Energy)

Renewable energy alternatives at mining companies included a privately-owned 5 MW photovoltaic power station at Trekkopje Mine that was completed in mid-2018 and inaugurated on 3 October 2019 (Figure 12). Husab Mine operates a power station to capture waste heat from the acid plant, which is used to heat boilers and generate steam to turn turbines for electricity generation. The company also conducted a feasibility study and EIA for a 12 MW solar power plant which was approved in September 2019.

Motivation of status: This indicator was **Met** because renewable power supply options were pursued or implemented in 2018 and 2019.

[21] NamPower 2018 Annual Report

Desired Outcome 3.6.	**Waste sites have adequate capacity.**
Target 3.6.1.	**All sewage, domestic and hazardous waste sites are properly designed and have sufficient capacity for the next 20 years, taking into account the expected volumes from mines and all associated industries.**
Indicator 3.6.1.1.	**Municipalities have sufficient capacity of sewage works and waste sites based on actual and predicted volumes of waste.**
Data Source	**Municipality of Walvis Bay and Swakopmund**
Status:	**Met**

The municipalities of Swakopmund and Walvis Bay reported have confirmed in previous SEMP reports that their landfill sites have enough space for at least 20 years.[22] Swakopmund has a relatively new sewage treatment plant with enough capacity for the future, while the Walvis Bay sewage treatment plant is being upgraded to cater for the next five years. A new plant for the airport, army base and industrial area may be added in future.

Motivation of status: The indicator was **Met** because both municipalities confirmed that their landfills and sewage-works have enough capacity based on actual and predicted waste volumes.

Indicator 3.6.1.2.	**Independent audits are undertaken for waste sites and findings are closed out.**
Data Source	**Municipality of Walvis Bay and Swakopmund**
Status:	**MEFT**

Independent audits were undertaken by representatives of the Auditor General and the Environmental Commissioner, while the Department of Water Affairs & Forestry of MAWLR carried out annual inspections of the sewage treatment plants. The required wastewater and effluent disposal permits were in place. The Auditor General's performance audit report on sewerage management by local authorities in Namibia that was tabled in the National Assembly in July 2018 highlighted a lack of environmental management plans for existing sewerage infrastructure in the years up to 2015/16.[23] The municipalities have however been working on EMPs during the last two years and have applied for environmental clearances. Most uranium mining companies subscribe to product stewardship and environmental management systems like ISO 14001 that call for audits of the waste sites they use and independent audits of the waste practices at the mines themselves.

[22] Information related to waste management at Swakopmund and Walvis Bay was provided by the Swakopmund Municipality and Walvis Bay Municipality, unless otherwise stated

[23] Article "Environment ministry fails in sewer management – Kandjeke" in The Namibian of 12 July 2018

Motivation of status: The indicator was **Met** because independent audits and inspections were conducted at the Walvis Bay and Swakopmund landfills and sewage plants.

Indicator 3.6.1.3.	**All new waste sites undergo an EIA prior to construction and receive an environmental clearance certificate.**
Data Source	**Municipality of Walvis Bay and Swakopmund/MEFT**
Status:	

There were no new waste sites at the municipalities or the mines in 2018/2019.

Motivation of status: The indicator was **Not Applicable.**

Desired Outcome 3.7.	**Waste sites are properly managed.**
Target 3.7.1.	**The management of waste sites meets national standards.**
Indicator 3.7.1.1.	**Waste site managers are adequately trained (where managers have attended at least a one-week course in waste management at a reputable training institution).**
Data Source	**Municipality of Walvis Bay and Swakopmund**
Status:	

Both municipalities confirmed in the 2017 SEMP report that they were employing waste management contractors and were not aware of these companies' training requirements. The indicator was not evaluated in 2018/2019 because the government agencies responsible for independent audits as per Indicator 3.6.1.2 would be better placed to identify and address any short-comings in this regard.

Motivation of status: The indicator was **Not Applicable**.

Indicator 3.7.1.2.	**Site manifests which record non-hazardous wastes, volumes and origins are kept.**
Data Source	**Municipality of Walvis Bay and Swakopmund**
Status:	

The indicator was not evaluated in 2018/2019 for the same reason as Indicator 3.7.1.1.

Motivation of status: The indicator was **Not Applicable**.

Indicator 3.7.1.3.	Only hazardous waste classes for which the sites are licensed are accepted.			
Data Source	Municipality of Walvis Bay and Swakopmund			
Status:		In Progress		

Licensing of the Walvis Bay hazardous waste facility, which is the only one in the coastal area, is still in progress. The Municipality stated that the facility has from the start only accepted those hazardous waste classes for which it expects to be licensed. Arrangements must be made with the hazardous waste inspector before any incoming load is accepted. Independent confirmation of these statements has not been obtained and anecdotal evidence from various sources revealed some short-comings in the management of the hazardous waste site.

Motivation of status: The indicator was rated **In Progress** pending the successful licensing of the Walvis Bay hazardous waste facility.

Indicator 3.7.1.4.	Water and air quality monitoring data at waste disposal sites show no non-compliance readings.			
Data Source	Municipality of Walvis Bay and Swakopmund			
Status:		In Progress		

Information about the air quality at Walvis Bay and Swakopmund can be found under EQO 5. The data show that the readings for Swakopmund and Walvis Bay remained below the WHO limit for $PM_{2.5}$, while the PM_{10} dust levels occasionally exceeded the WHO limit. The study consultants found that the natural environment was the main source of the $PM_{2.5}$ and PM_{10} dust.[24] What is important for the assessment of this indicator is that the $PM_{2.5}$ data did not show excessive fine particle pollution from the burning of waste or other sources.

Motivation of status: This indicator was rated **In Progress** because air quality monitoring is in place and water quality monitoring is expected to start once ECCs have been issued and EMPs are implemented.

Indicator 3.7.1.5.	Municipalities comply with the site licence requirements relating to pollution control.			
Data Source	Municipality of Walvis Bay and Swakopmund			
Status:				

The indicator was not evaluated in 2018/2019 for the same reason as Indicator 3.7.1.1.

[24] Liebenberg-Enslin, H et al (2019): Advanced Air Quality Management for the Strategic Environmental Management Plan for the Uranium and Other Industries in the Erongo Region: Air Quality Management Plan Report. Report No.: 15MME01-4

Motivation of status: The indicator was **Not Applicable**.

Target 3.7.2.	**The management of mines' mineral waste sites (tailings and waste rock facilities) meets national standards.**			
Indicator 3.7.2.1.	**Effluents from mineral waste sites are managed in compliance with DWA industrial effluent exemption permit conditions.**			
Data Source	**DWA**			
Status:			**Met**	

Mineral waste produced during mining consists of waste rock, which includes overburden and low-grade ore with a uranium content that is below the cut-off grade. The metallurgical process generates tailings, i.e. the leached ore that remains behind after the uranium has been removed. Mineral waste stays on the mine sites, either in form of waste rock dumps or as backfill material in pits or in a tailings storage facility.

The environmental impact of mine waste depends on its type and composition, which vary considerably with the commodity being mined, type of ore, and technologies used to process the ore. Every mine requires its own waste characterization, prediction, monitoring, control and treatment. The major environmental impacts from waste disposal at mine sites can be divided into two categories: the loss of land (and biodiversity) following its conversion to a waste storage area, and the introduction of sediment, acid and other process chemicals, as well as radioactive contaminants into surrounding surface and groundwater from water running over and/or seeping through chemically reactive wastes. These processes continue long after a mine has closed and must be controlled. At most mines waste dumps and tailings storage facilities will remain as permanent features that need to be stabilised and integrated in the landscape.

Environmental management plans are designed to avoid or mitigate the environmental impacts resulting from the construction and operation of waste disposal facilities, as well as long-term liabilities after mine closure. They include measures to manage the impact of effluents on the ambient water quality and the control of radioactive emissions. Mines use standard operating procedures and plans to ensure that the waste disposal methodology complies with environmental regulations and good engineering practice, e.g. in terms of stability.

The application of these procedures is verified through inspections and audits (first, second and third party). Records of mineral waste volumes are kept and documented for reporting to the relevant authorities. Target 3.2.7 requires that the management of mines' mineral waste sites (tailings and waste rock facilities) meets the national standards. Four indicators cover the areas of concern and are assigned to the relevant authorities. Indicator 3.7.2.1 is intended to ensure that mines manage effluents from mineral waste sites in compliance with DWA effluent disposal exemption permit conditions. The purpose of the DWA industrial effluent disposal exemption permit is to manage the impact of effluents from waste facilities on the ambient surface and groundwater quality. DWA inspectors do not issue

non-compliance reports but write "letters of irregularities" if shortcomings are observed during mine inspections. No such letters were issued in 2018/2019. [25]

Langer Heinrich Uranium reported that conditions stipulated in the wastewater and effluent disposal exemption permit were adhered to during the reporting period. Rössing Uranium's permit requires that industrial effluents, including tailings solution, are recycled and that the groundwater quality at certain boreholes is monitored. The company complied with these permit conditions. Swakop Uranium received an industrial effluent exemption permit for operations from DWA, which includes mineral waste sites. Management of these facilities, including the sewerage treatment plant and related infrastructure, was in line with EMP commitments and requirements in 2018/2019.

Motivation of status: The indicator was **Met** because operating mines complied with their permit conditions.

Indicator 3.7.2.2.	**Management of waste sites complies with NRPA regulations.**			
Data Source	**NRPA**			
Status:			**Met**	

The National Radiation Protection Authority (NRPA) requires mines to implement a radiation management plan (RMP) to *inter alia* control radioactive emissions from mineral waste sites and to prepare annual reports on the implementation of the RMP. The Authority's inspectors review the companies' reports and visit the mines to ensure compliance. The operating mines and projects submitted their 2018/2019 annual reports and the NRPA did not encounter any issues related to mineral waste management during inspections. [26] Swakop Uranium reported no non-conformities regarding waste management practices; though there were noted areas for improvement with respect to the radioactive disposal site on the waste rock dump that are being attended to.

Motivation of status: The indicator was **Met** because the NRPA did not issue any non-compliance reports related to the management of mineral waste sites in 2018/2019.

Indicator 3.7.2.3.	**Management of waste sites complies with approved EMP.**			
Data Source	**MEFT**			
Status:			**Met**	

The Ministry of Environment, Forestry and Tourism evaluates and approves EMPs including provisions for the mitigation of environmental impacts resulting from the construction and operation of waste disposal facilities, as well as long-term liabilities after mine closure. Currently, there are no regulations under the Environmental Management Act that would enable MEFT to issue fines. MEFT uses a system of 1) compliance notifications as warnings to allow operations time to acquire an ECC or to remedy

[25] Pers. comm. DWA, 2019
[26] Pers. comm. NRPA, 2019

impacts following the EIA process; and 2) compliance orders to stop operations for failure to comply with either a compliance notification or an EMP. No compliance orders were issued in 2018/2019.[27]

All operating mines and active exploration projects were covered by valid environmental clearance certificates and submitted the required biannual reports on the status of the environment. Langer Heinrich Uranium reported that a detailed and approved EMP was in place and internal audits on the implementation of EMP commitments carried out. An ISO 14001 audit was carried out to measure compliance with the commitments, standards and legal requirements that formed part of the audit programme, i.e. the whole of the EMP was audited. Rössing Uranium also confirmed compliance with the MEFT-approved EMP. EMP and permit compliance checks form part of the ISO 14001 environmental management system auditing process at the operating mines. Swakop Uranium maintains a detailed approved EMP with applicable procedures for Husab Mine's activities. Internal compliance inspections and audits were carried out to measure compliance with the commitments, standards and legal requirements. The mine has been IMS certified according to the new ISO 14001:2015 standards as of the fourth quarter of 2018.

Motivation of status: The indicator was **Met** because the Ministry of Environment, Forestry and Tourism did not issue any compliance orders to uranium mines in 2018/2019.

Indicator 3.7.2.4.	**Management of waste sites complies with approved closure plan.**			
Data Source	**MME/MEFT**			
Status:			**Met**	

High-level closure plans are usually included in mining companies' EMPs, which are reviewed and approved by the Ministry of Environment and Tourism; this means that the environmental clearance certificate includes approval of the EMP closure commitments. In addition, most mines develop a separate, more detailed closure management plan, which is reviewed and updated periodically. This is the case at Langer Heinrich Uranium, Rössing Uranium and Swakop Uranium.

Rössing Uranium's closure management plan makes the following provisions for mineral waste facilities: The tailings storage facility will be capped with rock to prevent wind and water erosion; the waste rock dumps will be shaped to blend into the natural landscape and a fine-grained layer to prevent rainwater infiltration and promote vegetation growth will be applied at the end of waste rock deposition. This plan has been approved as part of the EMP for the mine but will only be implemented at closure. The Husab Mine Rehabilitation, Restoration and Closure Plan was finalised in 2018 and all applicable requirements are detailed in line with the EMP conditions.

Motivation of status: The indicator was **Met** because all mines have approved closure plans and are managing their waste sites in compliance with these plans, as far as this is possible during operation. Provision is made for the plans to be fully implemented at closure.

[27] Pers. comm. MEFT:DEA, 2019

Desired Outcome 3.8.	**Recycling is common practice in the Central Namib.**			
Target 3.8.1.	**A sustainable waste recycling system is operational in the Central Namib, servicing the uranium mines and the public.**			
Indicator 3.8.1.1.	**A waste recycling depot is established.**			
Data Source	**Municipality of Walvis Bay and Swakopmund**			
Status:			**Met**	

Indicator 3.8.1.2.	**Waste recycling operators have sufficient capacity to collect, transport and recycle waste in a safe and responsible manner.**			
Data Source	**Municipality of Walvis Bay and Swakopmund**			
Status:			**Met**	

As previously reported, waste recycling has become common practice at the central coast. The municipalities of Walvis Bay and Swakopmund, as well as the uranium mines employ functioning waste management systems to reduce the volume of waste that would otherwise end up on municipal landfills. Recyclable materials are taken to the recycling depots at Swakopmund and Walvis Bay where they are sorted and sent for further processing.

Figure 13: Upgraded Rent-A-Drum Recycling Facility at Swakopmund

The recycling company has recently upgraded its material recovery facility at Swakopmund to double the recycling output (Figure 13). [28] The recycling contractor stated in the article that before the upgrade, nearly 100 tonnes were recycled each month, which has now been increased to 200 tonnes.

Motivation of status: Both indicators were **Met** because sustainable waste recycling systems were in place at Swakopmund, Walvis Bay and the operating mines.

Indicator 3.8.1.3.	**Volume of waste disposed to landfill per capita decreases.**			
Data Source	**Municipality of Walvis Bay and Swakopmund**			
Status:			**Met**	

Data on recent waste volumes were not available from the municipalities, but the recycling contractor, Rent-A-Drum said that Swakopmund saves more recyclable material per capita than Windhoek, thanks to the municipality's environment-friendly refuse removal system. This refers to the orange waste bins that were introduced a few years ago. The municipality's General Manager Health Services stated that fewer than 2% of recyclable materials were taken to the landfill site now. [29] Rent-A-Drum also operates a material recovery facility at Walvis Bay, where substantial volumes of waste are recycled (refer to data in the 2017 SEMP report).

Motivation of status: Recycling has reduced the waste-to-landfill volumes per capita at Swakopmund and Walvis Bay based on observation of the contractor's operations. The indicator was **Met**.

[28] "Swakop trash recycling plant upgraded" by Adam Hartman, The Namibian, 19 November 2019
[29] "Swakop trash recycling plant upgraded" by Adam Hartman, The Namibian, 19 November 2019

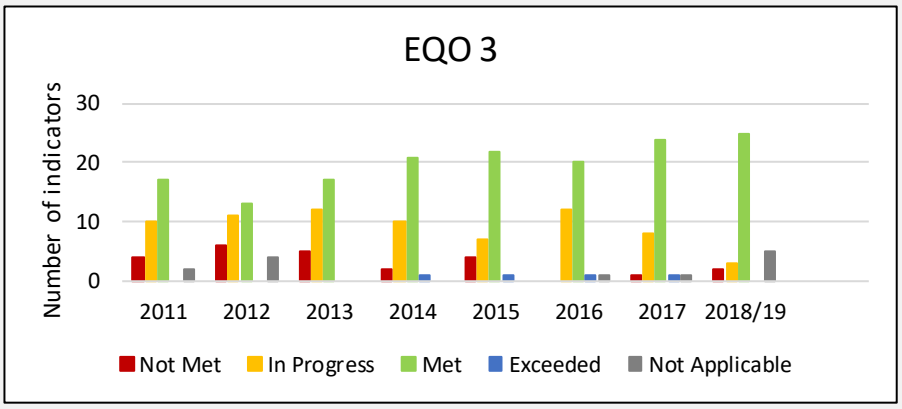
********** ********** ********** ********** ********** **********

Summary of performance over time: EQO 3

Total no. indicators assessed: 35 (5 were **Not Applicable**)

2018/2019	Not Met	In Progress	Met	Exceeded
Number of indicators in class	2	3	25	0
Percent of indicators in class	6%	9%	71%	0%

Overall performance: The infrastructure EQO covers housing, transportation including roads, railways and harbour, electricity supply and renewable energy, as well as waste management and recycling. One of the two housing indicators continued to be **Met** because mining companies do not intend to establish mine-only townships, while the other was **Not Met** due to Swakop Uranium's use of an on-site hostel after the end of the construction phase. Five indicators referring to road condition and maintenance were **Met**, and one was **In Progress**, while one (safe traffic on the B2 road) was **Not Met**. The indicator of rail use for bulk goods was **Met**, while Namport's three indicators were **Met**. The indicators concerning the quantity and quality of electricity supply to the region and the implementation of renewable energy projects at mines were **Met**. Thirteen waste management indicators were **Met** and two were **In Progress**. Among these, all four indicators that check the mines' compliance with regulatory requirements for the management of mineral waste were **Met**. The indicators that were **Not Applicable** in 2018/2019 refer to the reduction of heavy traffic on the road between Swakopmund and Walvis Bay, EIAs for new waste sites and compliance with waste management standards that are not yet in place.



********** ********** ********** ********** ********** **********

EQO 4. Water

Aims of this EQO: To ensure that the public have the same or better access to water in future as they have currently, and that the integrity of all aquifers remains consistent with the existing natural and operational conditions (baseline). This requires that both the quantity and quality of groundwater are not adversely affected by prospecting and mining activities.

Underground water plays an important role in the sustainable development of the country. This resource is utilized in towns and communal areas, in industries, mining and agriculture, and is an integral part of a functioning ecosystem. Namibia relies much on runoff from rainfall that is either caught in dams or flows along ephemeral rivers and infiltrates into the ground to form aquifers. The Water EQO aims to assure the quality and quantity of water in the Erongo Region. Key stakeholders in this EQO are the Department of Water Affairs (DWA) of the Ministry of Agriculture, Water and Land Reform (MAWLR) as the regulator, NamWater as the bulk-supplier, and towns and industries as major consumers.

In 2013, NamWater started supplementing the dwindling groundwater resources of the Central Namib Water Supply Scheme with desalinated seawater from the Erongo Desalination Plant (EDP). The plant is located near Wlotzkasbaken, 35 km north of Swakopmund and owned by Orano Mining Namibia. Commissioned in 2010, it was originally built to supply water to Trekkopje Mine but had surplus capacity when the mine was put under care and maintenance. Desalination now provides a large portion of the water used in the central Namib area, securing a steady water supply and supporting the economic development of the Erongo region.

Desired Outcome 4.1.	**Water for urban and rural communities is of acceptable quality.**			
Target 4.1.1.	**Uranium mining does not compromise community access to water of appropriate quality.**			
Indicator 4.1.1.1.	**Potable water conforms to minimum required quality as prescribed in the national water quality standards.**			
Data Source	**DWA**			
Status			**Met**	

NamWater monitors the quality of potable water supplied to urban and rural consumers and carries out drinking water analyses at their laboratory in Windhoek. Results shown in previous SEMP reports have included physical parameters, major anions and cations, trace elements and radionuclides, as well as microbiological indicators at Arandis, Henties Bay, Swakopmund and Walvis Bay. The results of 2011-2017 classified the water quality as good (Group B) to excellent (Group A) according to the national water quality standards and suitable for human consumption.

This is not surprising because the uranium mines are not situated in the catchment areas of the rivers used for public water supply. Drinking water pumped to Swakopmund, Arandis and the mines consists of a mix of desalinated water from the Erongo Desalination Plant and groundwater from the Omdel and

Kuiseb River wellfields. Henties Bay relies exclusively on the Omdel wellfield, while Walvis Bay is mostly supplied from the Kuiseb River. The pipeline from the Kuiseb wellfields to Swakopmund that could previously only pump in one direction has been upgraded so that mixed water from Swakopmund can now be delivered to Walvis Bay too.

Motivation of status: The findings reported above have confirmed that uranium mining does not compromise community access to water of appropriate quality. It would therefore not make sense to evaluate this indicator in each SEMP report, though the status should be re-evaluated when a mine opens up in an aquifer catchment area. Until then the indicator can be regarded as **Met**.

Target 4.1.2.	**Uranium mining does not compromise the water quality in the lower Khan and Swakop rivers.**			
Indicator 4.1.2.1.	**The water quality does not deteriorate compared to the historical baseline.**			
Data Source	**DWA**			
Status:			**Met**	

Commercial farmers along the Khan and Swakop rivers and on the lower Swakop smallholdings who use groundwater for livestock watering and crop irrigation were concerned about the effect of mining on the water availability and quality. The SEMP project has therefore identified 15 boreholes along the rivers where the groundwater levels and quality are monitored every year (Figure 14).

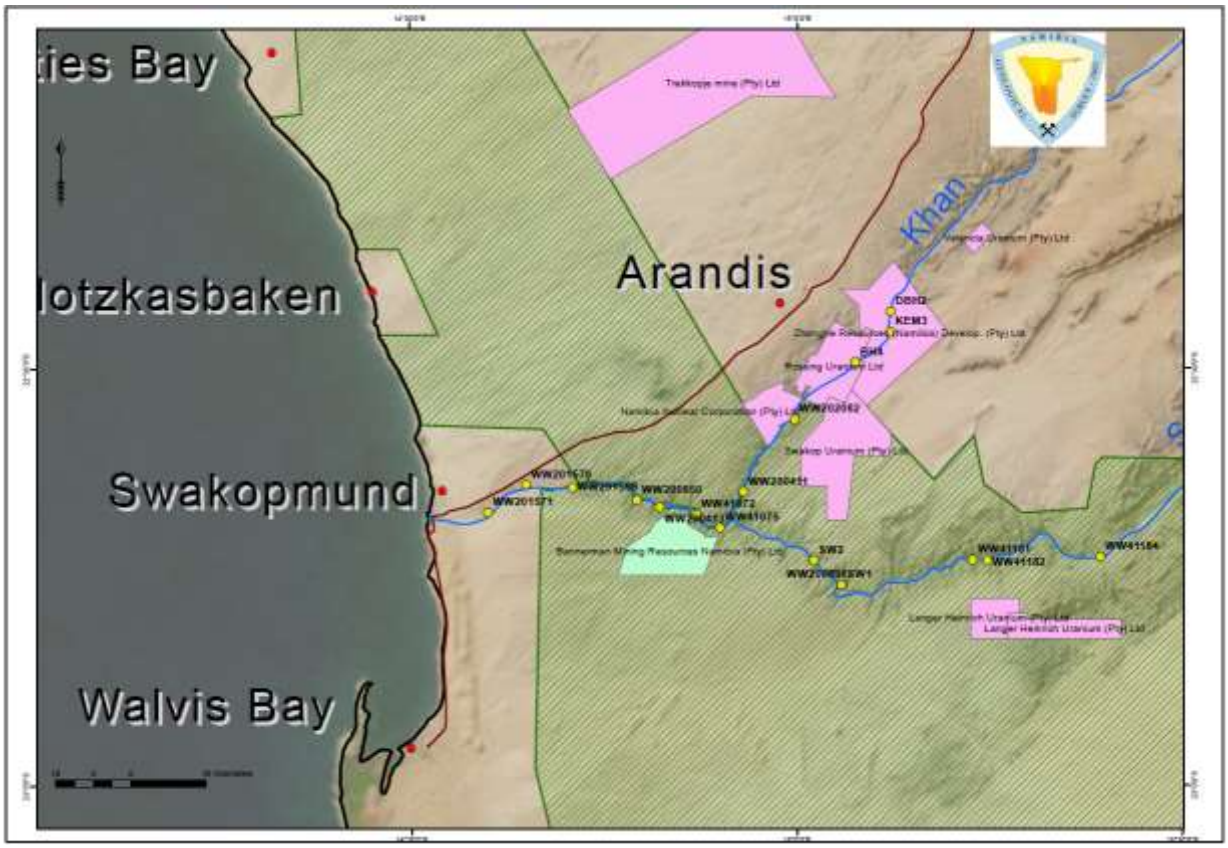


Figure 14: SEMP Monitoring Boreholes

Some of the original SEMP boreholes have collapsed and had to be replaced with alternative sites, i.e. KEM3 with DBH2 upstream of Rössing mine and SW1 south of Husab Mine with SW2. DWA is normally responsible for the borehole sampling campaign, but they were unable to conduct it in 2018/2019. The water level and analysis data were contributed by NUA to fill the gap. Table 7 shows the relevant parameters of the analyses carried out in 2018 and 2019 compared to the Namibian water quality standard for livestock watering. The figures are in milligrams per litre (mg/L); highlighted in red are concentrations exceeding the limits for stock watering.

Table 7: Khan and Swakop River Water Quality 2018/2019

Determinant (mg/L)	Livestock limits	Khan DBH2	Khan BH4	Khan BH1.11	Khan 202082	Swakop 41184	Swakop 41182	Swakop SW2
Date sampled		Aug 19	Aug 19	Aug 19	Aug 19	Aug 19	Aug 19	Aug 19
Total dissolved solids (calculated)	6000	2260	4560	4560	6366	2681	7419	4604
Chloride as Cl^-	3000	850	2800	2359	3536	1042	3846	1936
Fluoride as F^-	2.0-6.0	4.1	4.0	4.4	1.2	nd	nd	0.5
Sulphate as SO_4^{2-}	1000	211	167	420	1040	487	906	543
Nitrate as N	100	1.2	0.8	3.1	18	7.1	0.5	0.1
Sodium as Na	2000	289	1191	1684	1458	499	1725	921
Magnesium as Mg	500	44	154	76	235	73	175	84
Calcium as Ca	1000	216	111	125	602	270	660	442
Iron as Fe	NA	bdl	bdl	bdl	bdl	0.04	0.03	0.12
Manganese as Mn	NA	2.6	1.1	7.6	bdl	0.225	1.23	1.07
Uranium as U	NA	nd	bdl	nd	1.18	0.015	0.08	0.09

Determinant (mg/L)	Livestock limits	Swakop 41075	Swakop 41072	Swakop 200413	Swakop 200850	Swakop 201569	Swakop 201570	Swakop 201571
Date sampled		Oct 18	Oct 18	Oct 18	Oct 18	Aug 18	Aug 18	Aug 18
Total dissolve solids (calculated)	6000	4432	7143	8616	10648	1789	9494	18961
Chloride as Cl^-	3000	1820	2996	4032	5069	622	4839	9793
Fluoride as F^-	2.0-6.0	0.6	0.4	0.4	0.4	0.4	0.2	0.1
Sulphate as SO_4^{2-}	1000	552	1489	1329	1668	241	1019	1590
Nitrate as N	100	3.7	1.2	3.9	4.0	4.2	13	bdl
Sodium as Na	2000	926	1561	1895	2293	357	2118	4511
Magnesium as Mg	500	100	191	233	313	43	228	442
Calcium as Ca	1000	364	580	659	943	66	662	1344
Iron as Fe	NA	1.3	0.64	13.9	0.06	0.09	0.42	13
Manganese as Mn	NA	0.04	0.60	0.64	1.03	bdl	0.01	0.05
Uranium as U	NA	0.05	0.11	0.08	0.11	nd	nd	nd

Key: bdl = below detection limit, nd = not determined

The standard does not set limits for metals such as iron, manganese and uranium. The results for the Swakop and Khan rivers should not be evaluated against the drinking water standard, because the groundwater is naturally brackish to saline. Just for comparison, the currently valid upper limits for drinking water according to the Water Act (Act 54 of 1956) and its regulations are iron 1 mg/L, manganese 1 mg/L and uranium 4 mg/L.

The analyses show that the salinity generally increases towards the coast, but pockets of fresher water from recent flood events can be found all along the lower Swakop, especially at borehole WW201569 which is just downstream of the sand pits in the area of the smallholdings. Water quality studies from the time before the start of uranium mining, especially a detailed survey of the entire Swakop River in the 1960s, show that the excess salinity has natural causes such as evaporation and transpiration from wetlands, upwelling at compartment boundaries, as well as the inflow of saline groundwater from tributaries and bedrock. [30][31]

Khan River groundwater slightly exceeded the limits for stock watering at borehole DBH2 upstream of the mine and at 202080 far downstream, but was suitable at the boreholes along the mine frontage. Swakop River water was of acceptable quality at three sites in the Langer Heinrich, Swakop Uranium and Bannerman compartments, and upstream of the farming area. Groundwater from the other Swakop River sites was too saline for stock watering. Uranium concentrations varied from 0.01 to 0.11 mg/L in the Swakop River. Specialist studies carried out as part of the 2010 SEA concluded that uranium in Khan and Swakop groundwater originated from weathering of uranium-bearing rock types that occur in the catchment areas.[32]

There is no Namibian water quality standard for crop irrigation water, though the salinity index and sodium adsorption ratio can be used to assess the suitability of a water source for this purpose. Farmers along the Swakop and Khan rivers know that only certain plants, such as olive trees, can tolerate brackish groundwater, and use fresh water from the NamWater pipeline for other crops.

Motivation of status: The indicator was **Met** because monitoring results confirmed that the water quality in the Swakop and Khan rivers was within the range of historical variations.

[30] NIWR (1966): Verslag oor Opname van die Swakoprivier, Suidwes Afrika, met Spesiale Verwysing na die Chemiese Kwaliteit en die Faktore wat die beinvloed. Contract Report C WAT 10

[31] National Institute for Water Research, CSIR, Pretoria, and DWA (1977): Gehalte- en Potensiaalopname van Grondwater in die Swakoprivier vanaf Horebis-Noord tot by Nabas. Internal Report No. WW 30/95/3, Hydrology Division, Department of Water Affairs, Windhoek

[32] MME (2010): Strategic Environmental Assessment for the Central Namib Uranium Rush. Ministry of Mines and Energy, Republic of Namibia, Windhoek

Desired Outcome 4.2.	**The natural environment, urban and rural communities have access to adequate water.**			
Target 4.2.1.	**Uranium mining does not compromise surface and groundwater availability.**			
Indicator 4.2.1.1.	**Groundwater abstraction from NamWater's Central Namib water scheme does not exceed the aquifers' sustainable yield.**			
Data Source	**DWA, NamWater**			
Status:			**Met**	

The Kuiseb River aquifers were fully recharged in 2011, so that they should be able to support the permitted quota of 7 Mm^3/a until the next major recharge event. NamWater did not provide abstraction and water level graph for this report, but DWA supplied some water level data. Four boreholes in the Swartbank and Rooibank aquifers showed gently dipping trends (Figure 15Figure 15), an indication that the sustainable yield was probably not exceeded. [33]

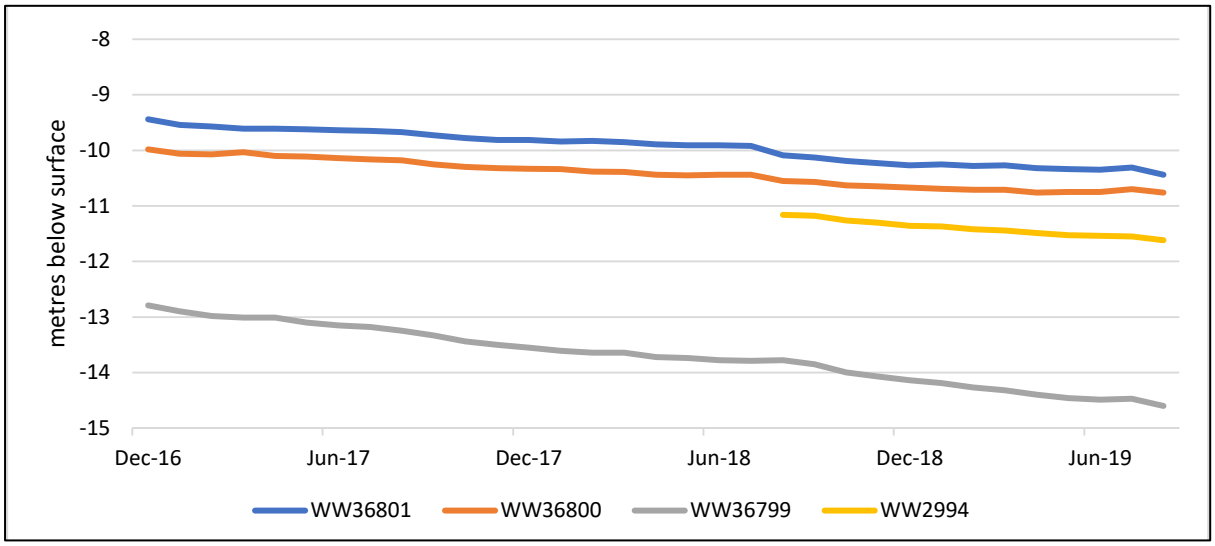


Figure 15: Water Levels of Kuiseb River Monitoring Boreholes

NamWater updated the Omdel groundwater flow model in 2017 to support its abstraction permit application for 4.5 Mm^3/a. The model confirmed this volume as the current sustainable yield, provided that the Omdel dam receives regular inflow that can feed the aquifer recharge scheme. [34] The average water level of the aquifer recovered in 2015-2016 after the abstraction was reduced (Figure 16). Occasional water level peaks in this graph show are due to recharge from the Omdel dam. DWA water level monitoring data confirmed that the relatively stable trend shown in the Omdel graph in 2017 continued in 2018 and 2019.

[33] Pers. comm. DWA, 2020
[34] Pers. comm. NamWater, 2020

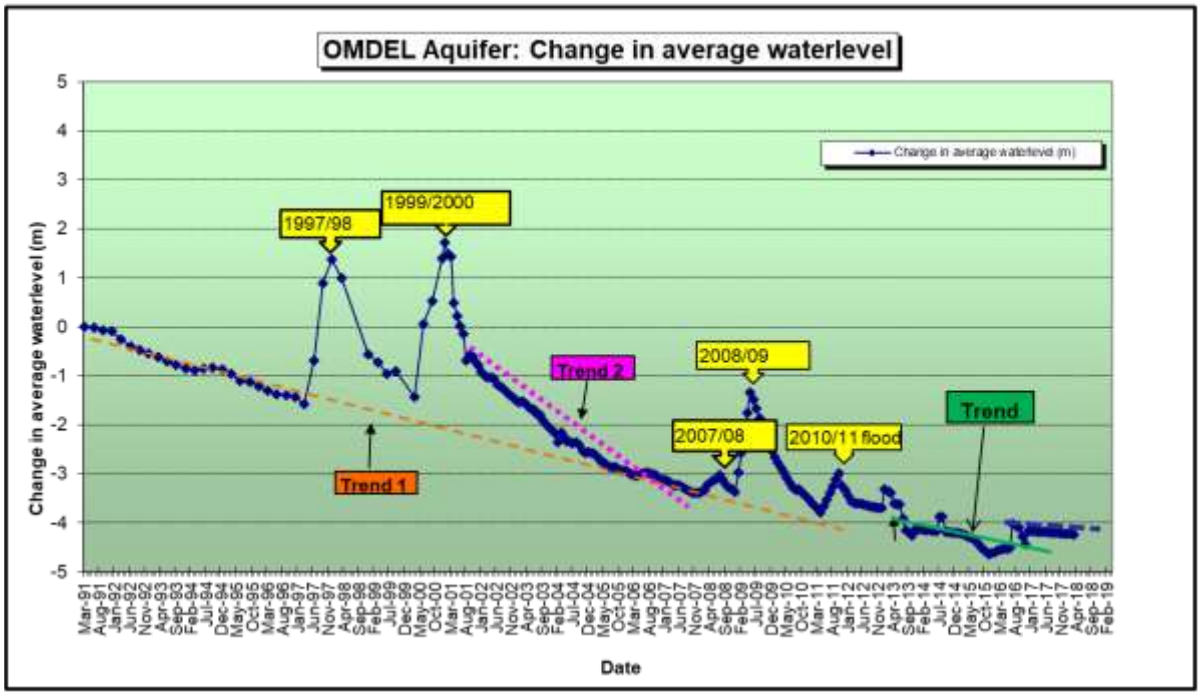


Figure 16: Abstraction and Average Water Level of the Omdel Aquifer

Motivation of status: The indicator was **Met** based on the available water level information. It appears that the groundwater abstraction from the Kuiseb and Omdel water schemes did not exceed the aquifers' sustainable yield as determined by DWA.

Indicator 4.2.1.2.	**Borehole levels fluctuate within existing norms.**			
Data Source	**NUA/DWA**			
Status:			**Met**	

The effect of groundwater abstraction on the stored water resources of the Khan and Swakop rivers is assessed by monitoring the water level fluctuations in boreholes that MAWLR and various mines have drilled in these rivers. Groundwater levels along the Swakop and Khan rivers were monitored in 2018 and 2019 with the results shown in Table 8 compared to previous measurements. The water levels are shown in metres below top of borehole collar, which in most cases is close to the ground surface.

Figure 17 shows the water level trends at the SEMP boreholes, which are arranged from upstream on the right to downstream on the left. The four boreholes on the right are in the Khan River, while all others are in the Swakop River. The water levels dropped by 0-2 metres since 2014, which corresponds to the normal trend in the absence of recharge. The Khan River flowed in the Rössing area after rains in February/March 2017 and October 2018 without much effect on the water levels.

Motivation of status: The monitoring data indicate that the range of water level fluctuations observed in the Swakop and Khan rivers were in line with the normal trend that is caused by evaporation of water from wet sand and uptake by trees and shrubs growing in the river beds. This indicates that groundwater abstraction by mines and other consumers did not negatively affect the water resources. The indicator was **Met**.

Table 8: SEMP Borehole Locations and Water Levels 2013-2019

WW no/ID	Location	2013	2014	2016	2017	2018	2019
KEM3/*DBH2	Rössing	8.92	9.32	KEM3 collapsed		-	*12.90
BH4	Rössing	9.51	8.42	9.98	8.01	9.45	11.05
200411	Rössing	17.80	18.07	19.18	19.38	19.64	19.84
202082	Husab	11.79	11.86	12.14	12.05	12.21	12.13
41184	Langer Heinrich	5.20	5.77	7.16	7.06	7.66	7.98
41182	Langer Heinrich	2.94	2.70	3.67	3.86	4.30	4.57
41181	Langer Heinrich	3.66	3.38	4.16	4.33	4.60	4.91
SW1	Husab	2.42	3.01	collapsed		-	-
200898	Husab	replaces SW1		4.20	5.02	5.81	6.70
SW2	Husab	2.30	2.54	2.99	3.27	3.53	3.90
41075	Bannerman	4.67	3.94	4.43	4.70	4.97	5.31
41072	Bannerman	4.86	4.18	4.83	5.10	5.35	5.60
200413	Bannerman	3.65	2.79	3.43	3.70	3.97	4.23
200850	Bannerman	3.99	3.01	3.49	3.73	3.98	4.25
201569	Lower Skp Farms	-	3.10	6.13	5.34	6.78	7.20
201570	Lower Skp Farms	-	-	3.76	2.73	3.90	3.98
201571	Lower Skp Farms	-	1.82	2.83	1.87	2.83	2.89

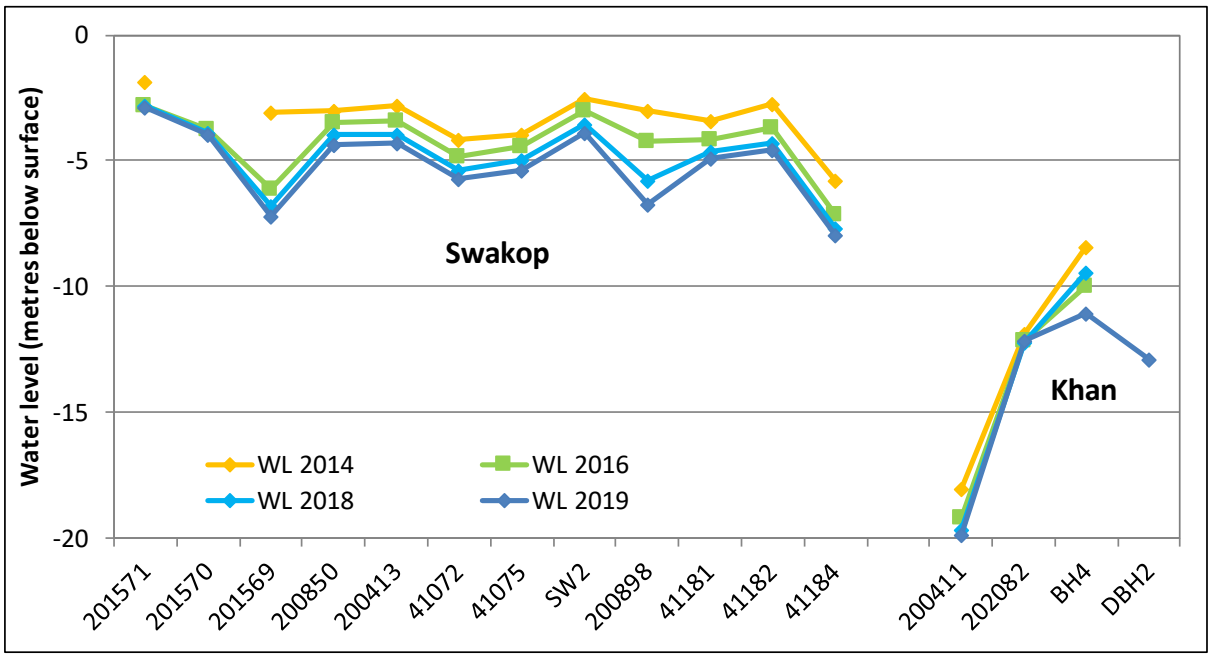
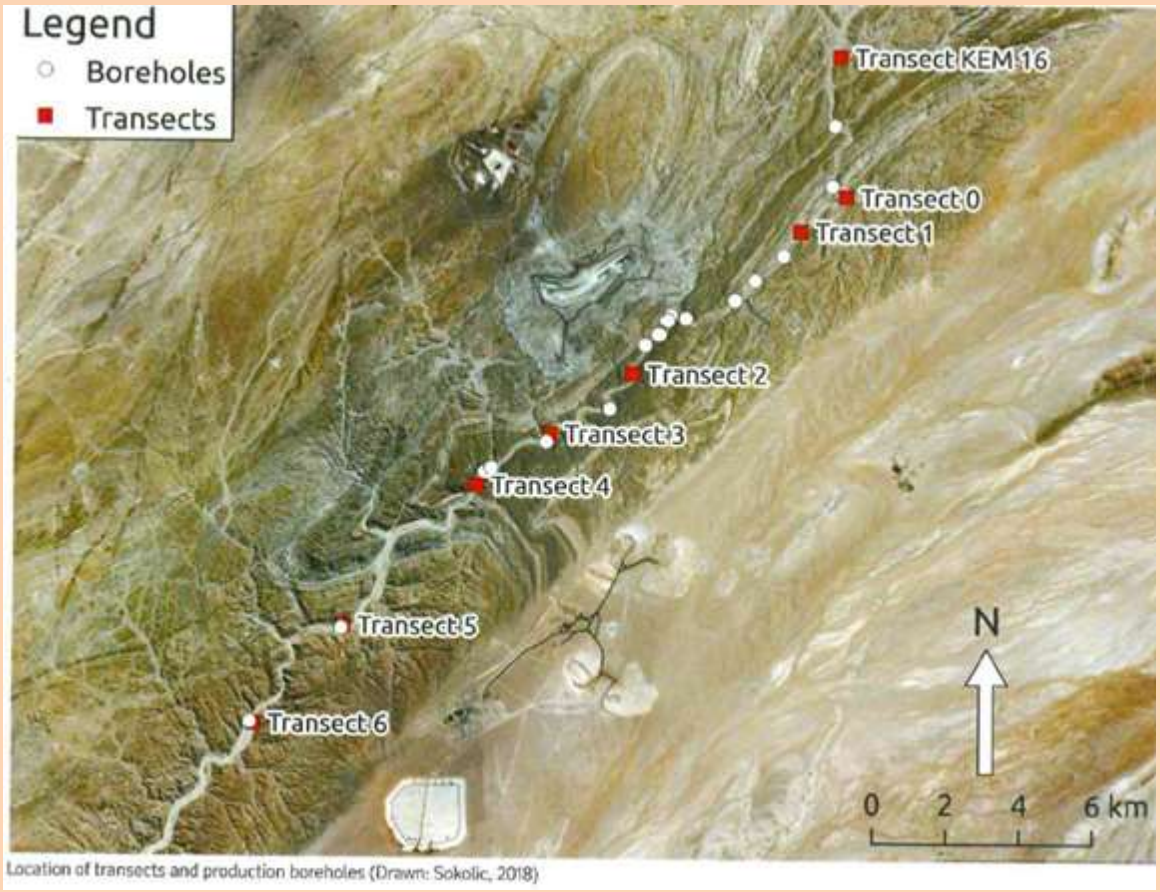


Figure 17: Water Levels Trends of SEMP Boreholes 2014-2019

Good to know – 30 Years of Khan River Vegetation Monitoring

During the last 30 years, Rössing Uranium has monitored the condition of the trees in the Khan River to see if they are affected by the extraction of brackish groundwater. Production boreholes are located between Transect 1 and Transect 4, while the riparian vegetation is monitored at eight transects (see map below).



Location of transects and production boreholes (Drawn: Sokolic, 2018)

The vegetation monitoring programme was developed by the South African Council for Scientific and Industrial Research and implemented in 1988. The MAWLR made biannual vegetation surveys a condition of the groundwater abstraction permit and has since used the reports on monitoring results to decide on permit renewals.

The first objective of the programme is to ensure that changes in the vitality of the trees are noticed early enough to prevent irreversible damage by adjusting the pumping rate. Each transect has about eight trees that are identified with tags. Surveys are carried out in March and September to record seasonal changes. This is important because ana trees look lush in winter and shed their leaves in dry summers, the latter should not be mistaken for mine-induced water stress. Indicators of tree health such as leaf coverage, presence of flowers and pods, new shoots, dead branches and parasites are recorded. The tree height and circumference at the tag are measured and fixed-point photographs are taken.

In 2018, a researcher assessed the effectiveness of the Khan River survey as part of a master's thesis. The findings revealed that the programme was effective due to continuous funding, committed leadership, data-sharing with research institutions and regular review to ensure legal compliance. Long-term monitoring is a valuable part of environmental management that provides most useful insight into ecosystem changes. The Rössing survey will continue for years to come.

Indicator 4.2.1.3.	Aquifer water will be made available to domestic users at approved NamWater rates.			
Data Source	NamWater			
Status:			Met	

Bulk water users supplied from NamWater's Central Namib Water Supply scheme were charged according to government-approved tariffs for groundwater and blended water, a mix of groundwater and desalinated seawater. The tariff for groundwater was N$11.75 per cubic metre from 1 July 2018 to 30 June 2019; it increased by 5% to N$12.35 as of 1 July 2019. The cost of blended water inched up from N$14.75 to N$14.87 at the same time.[35]

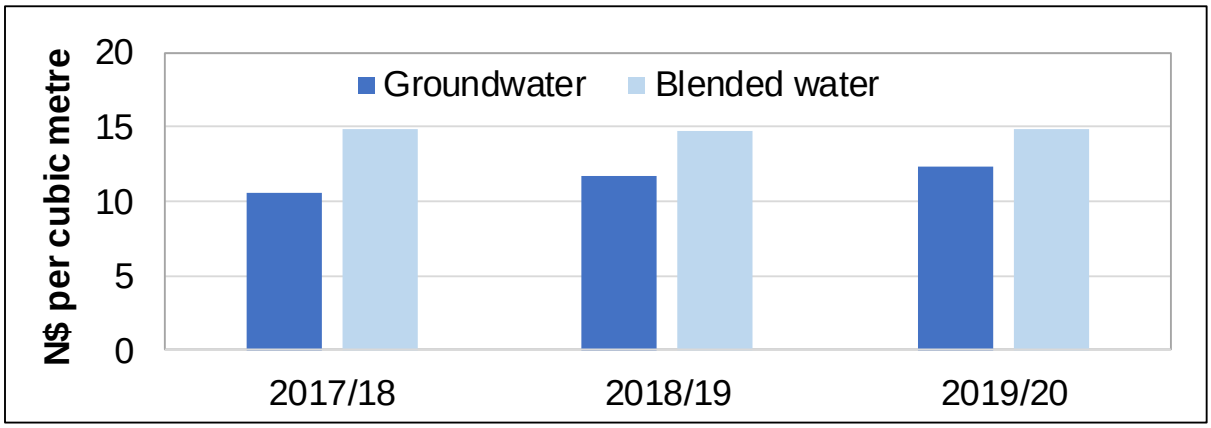


Figure 18: NamWater Tariffs for Groundwater and Blended Water

NamWater has raised the groundwater tariffs by 11% and 5% in the last two years, while the blended water tariff has remained just below N$14.90 (Figure 18). NamWater and the affected town councils did not come to an agreement about the introduction of the blended water tariff in 2018/2019. The parties only decided at the end of 2018 that the blended water tariff will be implemented in the 2019/2020 financial year. The higher-than-usual 11% increase in 2018/2019 was probably applied to bring the groundwater tariff closer to the cost of blended water, which was already supplied to some municipalities, even though they did not pay for it.

The municipalities determine their own tariffs for domestic and industrial users, which are generally higher than the NamWater rates. The gazetted municipal tariffs at Swakopmund and Walvis Bay are listed in Table 9.[36] Both municipalities apply staggered tariffs for higher consumption rates to finance their operation, cross-subsidise low-income consumers and to encourage water saving.

The desalinated water tariffs for mines are not gazetted because they are subject to confidential contracts based on full cost recovery between NamWater and the individual companies. Mining companies reported to NUA that the price they paid in 2018 and 2019 included the cost of seawater desalination, electricity, the new pipeline from the desalination plant to Swakopmund and the NamWater reservoir.

[35] Government Gazette No. 6747 for 2018/19 and No. 6936 for 2019/20

[36] Government Gazette No. 6638 and No. 6669 for Swakopmund and Walvis Bay (2018/19), No. 6905 for 2019/20 (both towns)

Table 9: Municipal Tariffs for 2018/2019 and 2019/2020

Swakopmund	**Basic (0-8 m^3)**	**9-30 m^3**	**31-60 m^3**	**Over 60m^3**
2018/19 N$/$m^3$	91.95 flat rate	14.80	20.90	32.20
2019/20 N$/$m^3$	125.70 flat rate	16.00	22.50	34.80
Walvis Bay	**0-15 m^3**	**16-30 m^3**	**31-85 m^3**	**Over 85m^3**
2018/19 N$/$m^3$	15.60	25.65	43.35	65.10
2019/20 N$/$m^3$	16.63	27.32	46.22	69.12

Motivation of status: NamWater tariffs presumably exceeding the cost of aquifer water were passed on to domestic consumers in 2019/2020 to recover the higher cost of desalinated water that was needed to augment the dwindling groundwater supply. The municipalities are now charging the tariff for blended water, except for the basic consumption category (up to 8 or 15 m^3) that remains at a subsidised level comparable to the former groundwater tariff. The intention of the indicator was to protect domestic consumers who cannot afford to pay for desalinated water. On this basis, it was **Met** for the majority of the towns' residents, while the more affluent domestic consumers can either pay the relatively affordable tariffs for blended water or reduce their water consumption.

Indicator 4.2.1.4.	**NamWater disaster management plans are in place and implemented in case of flood damage to supply schemes.**			
Data Source	**NamWater**			
Status:			**Met**	

The uninterrupted water supply to urban and industrial users, even in case of flood damage to one of the wellfields, is NamWater's responsibility. NamWater reported the following status of the disaster management plan in 2018:[37]

- An early flood warning system at Gobabeb weir and some monitoring upstream by DWA.
- Kuiseb power lines and pipelines have been reinforced to withstand flood damage.
- Resources such as manpower and spare parts are provided to repair flood damage to infrastructure as soon as possible.
- Pipeline between Swakopmund and Walvis Bay has been upgraded so that blended water can be pumped to Walvis Bay in case of flood damage to the Kuiseb system.

No flood damage occurred during the last two years, but some power lines in the Kuiseb scheme were damaged by east wind in 2019. Walvis Bay's supply was augmented from the Swakopmund reservoir via the upgraded pipeline and link to the Mile 7 reservoir until the power was restored. [38]

[37] Pers. comm. NamWater, 2018
[38] Pers. comm. NamWater, 2018

Motivation of status: The indicator was **Met** because a flood emergency plan was in place**.**

Desired Outcome 4.3.	**Water for industrial purposes is available and reliable.**			
Target 4.3.1.	**Additional water resources (notably desalinated water) are developed to meet industrial demand.**			
Indicator 4.3.1.1.	**Industrial investors are not lost because of water unavailability.**			
Data Source	**DWA**			
Status:			**Met**	

NamWater is securing the water supply for industrial development by augmenting the groundwater resources with desalinated seawater as required by Target 4.3.1. Industrial development went ahead without being affected by water problems, e.g. North River's Namib Lead Mine and a Peugeot vehicle assembly plant at Walvis Bay. Other activities, e.g. building and manufacturing were subdued owing to the current economic recession.

Will the availability of desalinated water accelerate industrial development? One often reads about desalination as the answer to the country's water supply problems and even as a source of water for agricultural irrigation schemes. A recent scoping study for a water carriage system to the central area of Namibia[39] has provided initial cost estimates for construction that could result in water production costs of at least N$50/$m^3$. The consultants estimated that for an agricultural scheme to be economical the water cost should be below US$0.30/$m^3$. [40] The composition of seawater along the central Namibian coast doubles the cost of desalination compared to other regions of the world.

The economics of desalination were not well understood when the SEA report was compiled. It can be expected that industrial investors will consider all input costs and rather establish water-intensive industries in countries with cheap and plentiful water. Industries that are better adapted to Namibian conditions could however be attracted by the sustainable and relatively reliable desalinated water supply.

Motivation of status: The desalination plant ensured that enough water was available for appropriate industrial development. The indicator was **Met**.

[39] ILF (2019): Feasibility Study for Desalination Plant and Water Carriage System to secure Water Supply to Central Coast, Windhoek and en-route Users. Draft Concept Report no O992-ILF-OD-0018/Rev. 0.
[40] Pers. comm. ILF, 2020

Indicator 4.3.1.2.	Desalinated water meets mine demand			
Data Source	DWA/NUA			
Status:		In Progress		

NamWater bought and distributed 9.45 Mm^3 of desalinated water in 2018 and 11.16 Mm^3 in 2019 (Figure 19). [41] The bulk of this water was supplied to Rössing Uranium and Swakop Uranium, while lower volumes went to Langer Heinrich Uranium and the coastal towns.

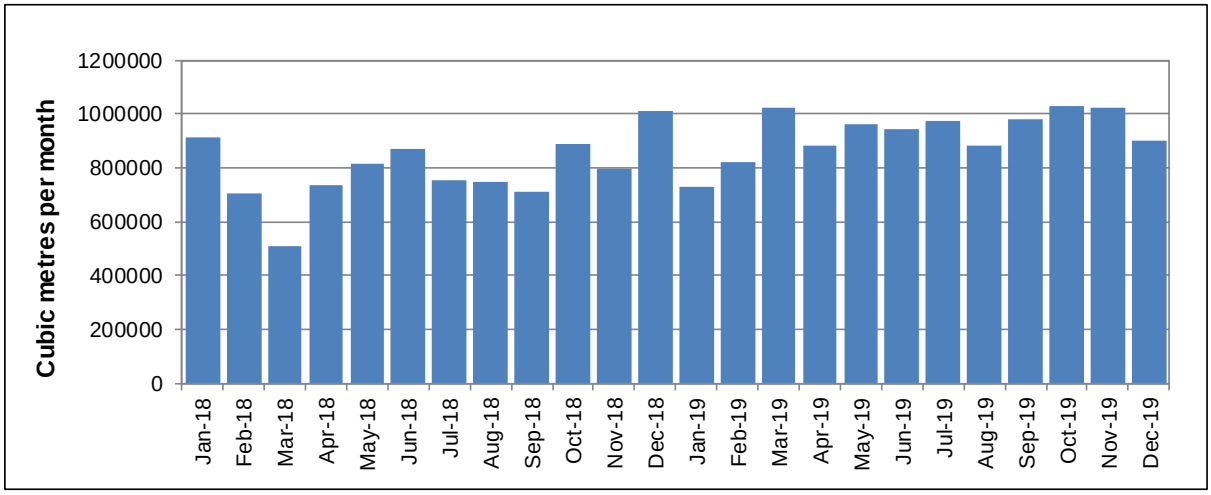


Figure 19: Volumes of Desalinated Water Supplied in 2018-2019

Some scheduled and unscheduled plant shutdowns disrupted the desalinated water supply. Algae blooms and sulphur outbreaks with hydrogen sulphide concentrations up to 50 mg/litre occurred in February-March 2018 and January-February 2019. The desalination plant was stopped whenever hydrogen sulphide levels above 15 mg/litre were detected in the feed water and started when the readings were lower than 7.5 mg/litre for two hours. It was reported that the prolonged outages caused production losses at the mines. Swakop Uranium, for instance, attributed 10% of its production downtime in 2018 to lack of water and reported 24 days of water-related production loss in 2019, stating that some of these outages were caused by NamWater maintenance. [42]

The water supply contract between NamWater and Orano Mining Namibia makes provision for the plant to be stopped during sulphur outbreaks because the high sea water turbidity and hydrogen sulphide concentration during these outbreaks would otherwise lead to fouling of the reverse osmosis membranes. As a contingency measure during these unavoidable natural events NamWater could adjust their groundwater abstraction strategy to make up the supply shortfall by temporarily increasing the pumping rates of the Omdel and Kuiseb wellfields.

Motivation of status: The desalination plant was able to meet its contractual obligations towards the mines' demand in 2018/2019, but NamWater did not have enough additional production capacity to supply the required volumes of water during sulphur outbreaks. The utility is planning to extend the

[41] Data and graph provided by Orano Mining Namibia
[42] Pers. comm. Swakop Uranium, 2019

Rooibank B wellfield in the Kuiseb River to augment its supply capacity and has commissioned an EIA for this project in 2019. Seeing that plans are in place towards meeting the indicator it was rated **In Progress**.

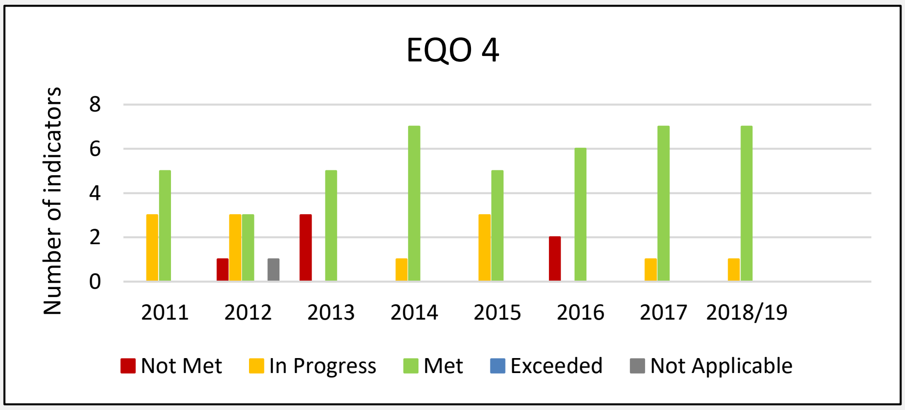
*************************** * * * * * * * * * * * **************************

Summary of performance over time: EQO 4

Total no. indicators assessed: 8

2018/2019	**Not Met**	**In Progress**	**Met**	**Exceeded**
Number of indicators in class	0	1	7	0
Percent of indicators in class	0%	12.5%	87.5%	0%

Overall performance: Seven of the eight indicators in the Water EQO were **Met** (87.5%) in 2018-2019, while one indicator related to the continuous availability of desalinated water during sulphur outbreaks was **In Progress** (12.5%). Contrary to fears expressed during the SEA process, uranium mining did not compromise the water quality or lower the water table in the rivers since monitoring started in 2011. The water-tariff increase for domestic users to cover the cost of desalinated water was limited to an acceptable level.



*************************** * * * * * * * * * * * **************************

EQO 5. Air Quality

Aims of this EQO: Workers and the public do not suffer significant increased health risks as a result of exposure to dust emission from the uranium mines.

The objective of the Air Quality EQO is the assessment of the additional contribution of the mines to the background dust concentration in the region, especially at the major towns. Dust emissions may occur during each stage of the mining cycle, i.e. exploration drilling, mine construction and operational activities. The principal dust generating activities at mines include blasting, loading, hauling and crushing, wind erosion of exposed surfaces such as tailings, stockpiles, waste dumps and haul roads, and to a lesser extent combustion of diesel fuel generating fine particulates.

The SEMP Office of the GSN is developing an Air Quality Management Plan for the uranium and other industries in the Erongo Region. The aim is to find out which mitigation measures are needed and how they can be implemented by the various role players in a coordinated manner. At the core of the plan is an advanced air quality study commissioned in October 2016 and completed in February 2019.

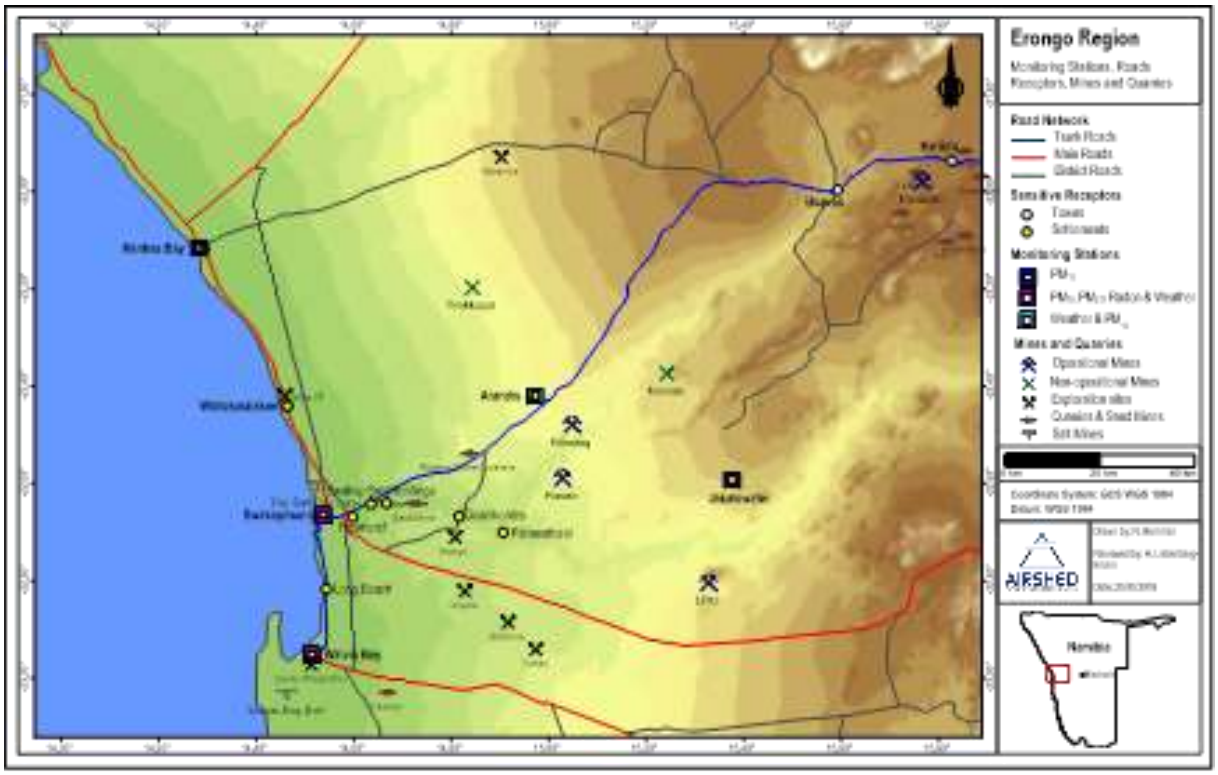
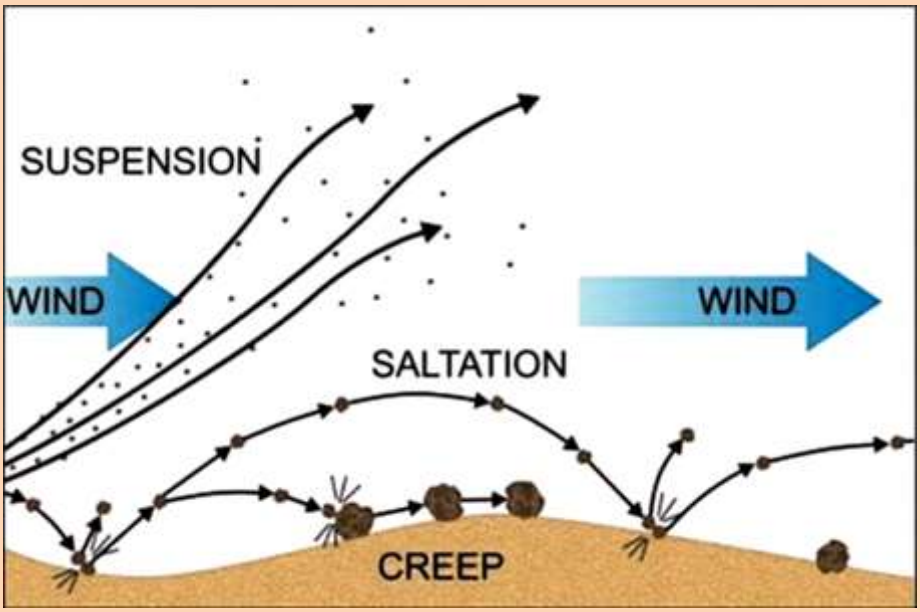


Figure 20: Location of Monitoring Stations Used in the Advanced Air Quality Study

Monitoring stations were established at Arandis, Swakopmund, Walvis Bay, Henties Bay and Jakalswater to measure fine dust and radon together with meteorological parameters (Figure 20). The objective was to determine the current air quality and report on public exposure to dust. The study identified various dust sources additional to uranium mining, including public roads (paved, treated and unpaved, vehicle exhaust), soil erosion, other mining operations (stone quarries, sand mining), harbour emissions (ships, loading activities, mobile equipment), small boilers and incinerators.

Good to know – What is dust?

What we call dust is known to scientists as particulate matter. This is a mixture of organic and inorganic substances of various shapes and sizes. It is divided into coarse and fine particulate matter because the wind can transport fine dust much farther than coarse sand grains. Strong winds may be able to carry particles as large as 0.15 mm (150 micrometres). As shown in the diagram below, these grains may creep or jump (saltation) for short distances. Generally, dust particles larger than 75 to 100 micrometres do not travel far and are trapped behind plants or rocks close to the source of emission. Fine dust, on the other hand, is picked up and suspended in the air so that it can be transported over great distances.



Suspended, visible dust is also known as 'nuisance dust', which is harmless. Only the tiny particles of inhalable dust influence human health. The potential of particles to be inhaled and deposited in the lung is a function of the particle size, shape and density. The deposition of particles in different regions of the respiratory system mainly depends on their size. Large dust particles can enter the nose, but they are deposited on hairs or at the bends of the nasal passages.

Smaller particles pass through the nose and are deposited in the tracheobronchial and pulmonary regions. Particles are removed by impacting with the wall of the bronchi when they are unable to follow the airflow through subsequent bifurcations of the bronchial tree. As the airflow decreases near the terminal bronchi, the smallest particles settle on the alveolar membrane (Dockery and Pope, 1994; and CEPA/FPAC Working Group, 1998). $PM_{2.5}$ dust that gets into the alveoli (tiny air sacs in the lungs) has emerged as the major cause of health problems, whereas the bronchi have a self-cleaning function that ejects dust particles together with mucus.

Recognising the importance of dust particle sizes, international air quality guidelines are given for each of the following size fractions: total suspended particulates, thoracic (PM_{10}) and respirable ($PM_{2.5}$) particulates. PM_{10} means particles smaller than 10 micrometres (0.01 mm), while $PM_{2.5}$ refers to tiny particles smaller than 2.5 micrometres.

The air quality monitoring stations mentioned above measure the PM_{10} dust concentration, ambient temperature, barometric pressure, wind speed, wind direction and relative humidity. The stations at Swakopmund and Walvis Bay are also equipped with $PM_{2.5}$ monitors to establish whether there is air pollution from the combustion of fuel or waste. Radon monitors have been placed at Arandis, Swakopmund and Walvis Bay (Figure 20).[43]

The purpose of monitoring is to ensure that ambient PM_{10} concentrations at public locations do not exceed the targets or limits set for the area. The preliminary limits set in the SEA report for the Erongo Region were based on the World Health Organisation (WHO) Interim Target 3 (IT-3) guidelines for PM_{10} dust: 75 µg/m³ for the average over 24 hours and 30 µg/m³ for the annual average. The WHO IT-3 correlates with the South African limit that was based on environmental, social and economic conditions close to those in Namibia. The WHO allows the 24-hour guideline to be exceeded on three days, while South Africa allows four days per calendar year (10% of 365 days). The GSN's advanced air quality study has reviewed this recommendation and proposed a more realistic standard for the Erongo Region, considering the frequent occurrence of strong winds in the area. The recommendation is currently under review.

Desired Outcome 5.1.	**Annual human exposures to particulate concentrations are acceptable (IFC Standard).**			
Target 5.1.1.	**Ambient PM_{10} concentrations at public locations and mines should not exceed the required target/limit to be set for the Erongo Region for both annual and 24-hour averages. The target/limit should be based on international guidelines but should consider local environmental, social and economic conditions.**			
Indicator 5.1.1.1.	**Ambient PM_{10} monitoring (µg/m³) is carried out at Swakopmund, Arandis and operating mines.**			
Data Source	**SEMP Office/NUA**			
Status:			**Met**	

Monitoring of ambient PM_{10} dust continued in 2018-2019 as part of the advanced air quality study.[44] As before, PM_{10} daily concentrations were on average higher at Swakopmund and Walvis Bay (Figure 21) than at Henties Bay and at the inland stations of Arandis and Jakalswater (Figure 22). The daily PM_{10} limit of 75 µg/m³ should not be exceeded on more than four days per year as per WHO guideline, yet it was exceeded on 27 days at Swakopmund and 32 days at Walvis Bay. At Arandis, the limit was exceeded on 19 days, with five exceedance days at Jakalswater and none at Henties Bay. The annual average PM_{10} concentrations of 37 µg/m³ at Swakopmund and 44 µg/m³ at Walvis Bay exceeded the annual limit of 30 µg/m³, while the other stations were below the limit.

[43] Figures 20-22 from Liebenberg-Enslin, H et al (2019): Advanced Air Quality Management for the Strategic Environmental Management Plan for the Uranium and Other Industries in the Erongo Region: Air Quality Management Plan Report. Report No.: 15MME01-4

[44] Liebenberg-Enslin, H et al (2019): Advanced Air Quality Management for the Strategic Environmental Management Plan for the Uranium and Other Industries in the Erongo Region: Air Quality Management Plan Report. Report No.: 15MME01-4

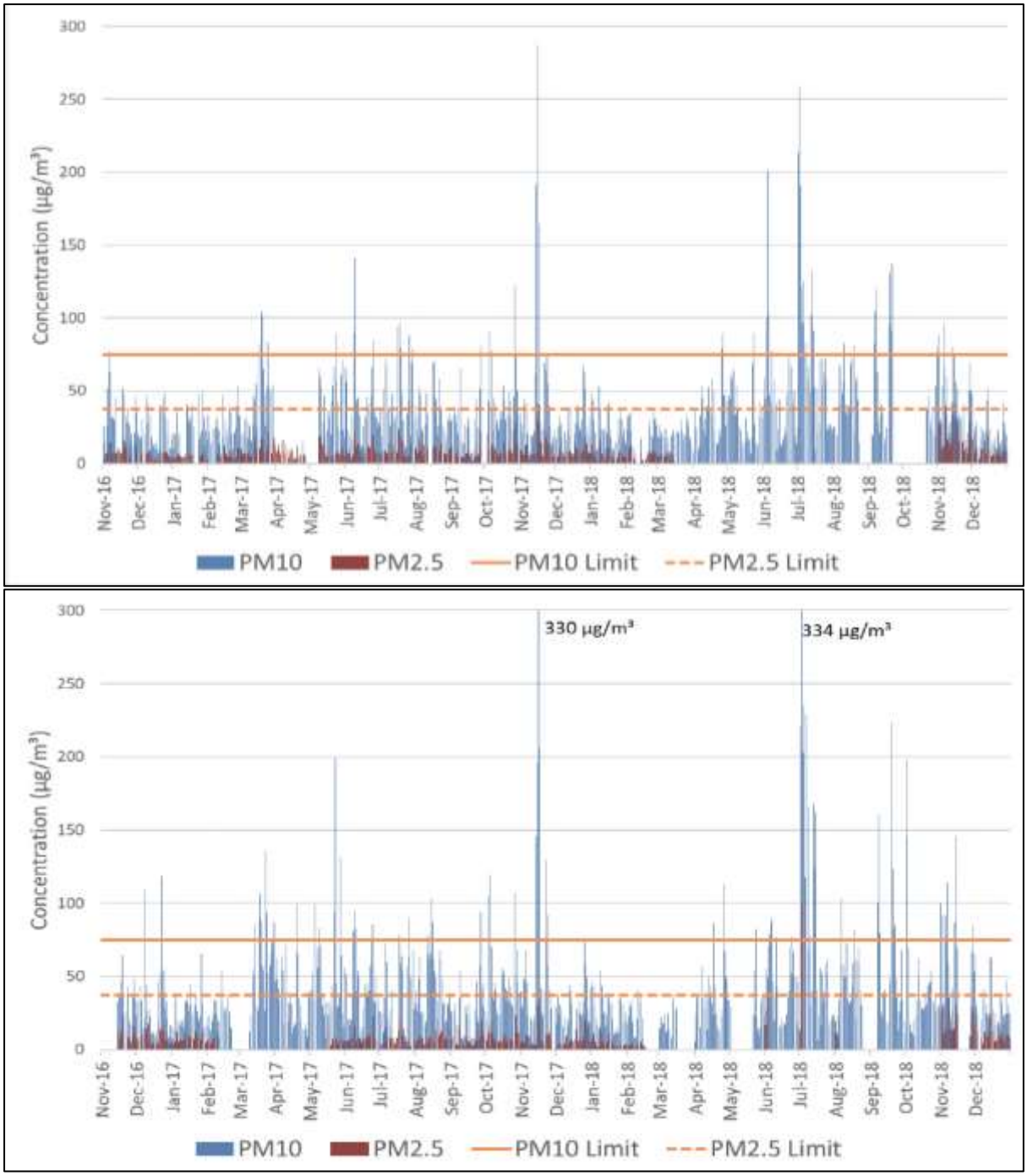
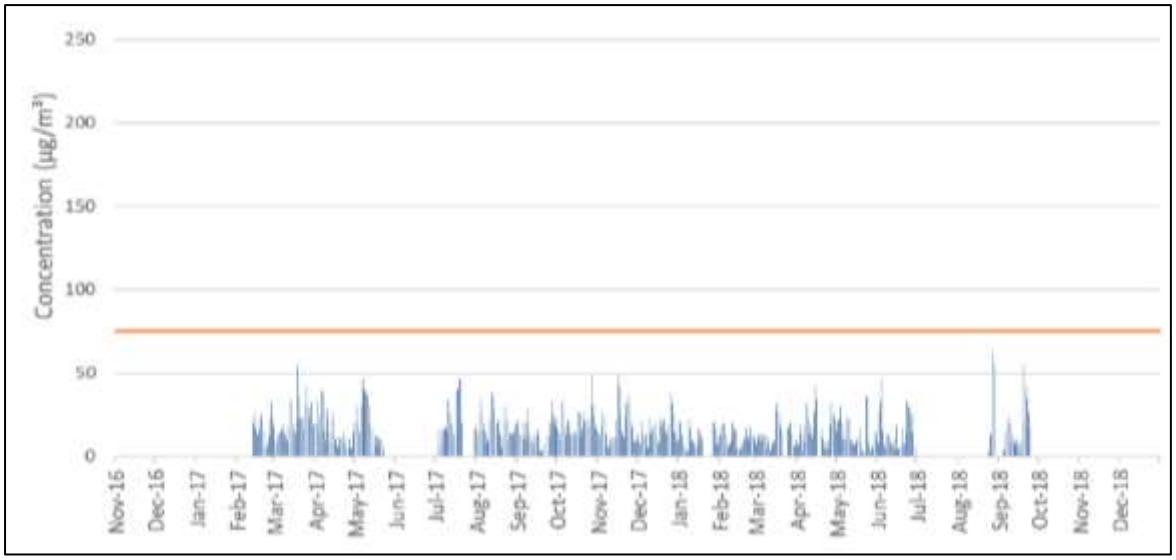
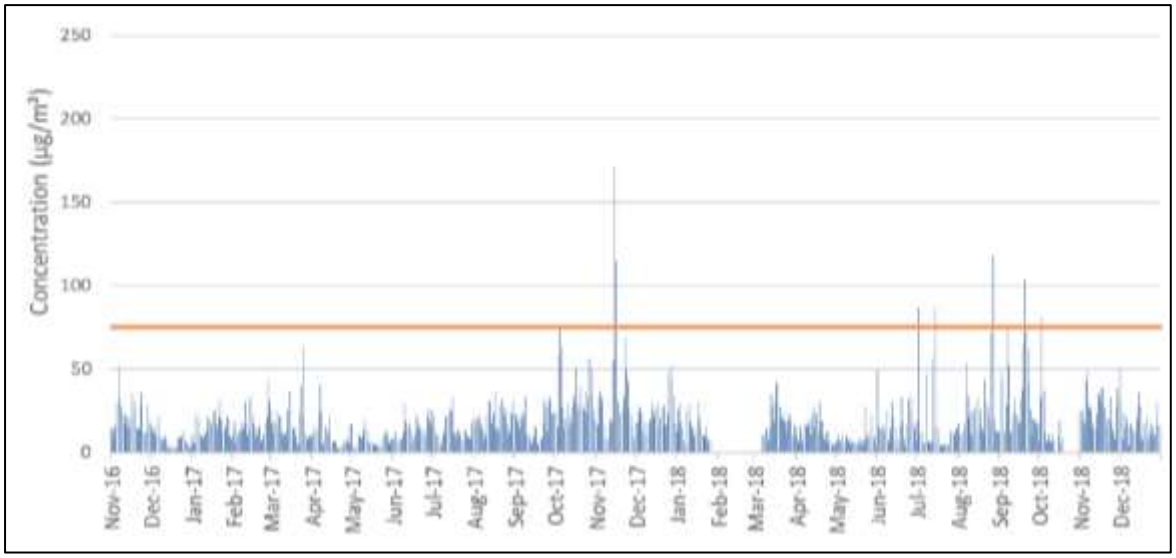


Figure 21: Dust Concentrations at Swakopmund (top) and Walvis Bay in 2016-2018

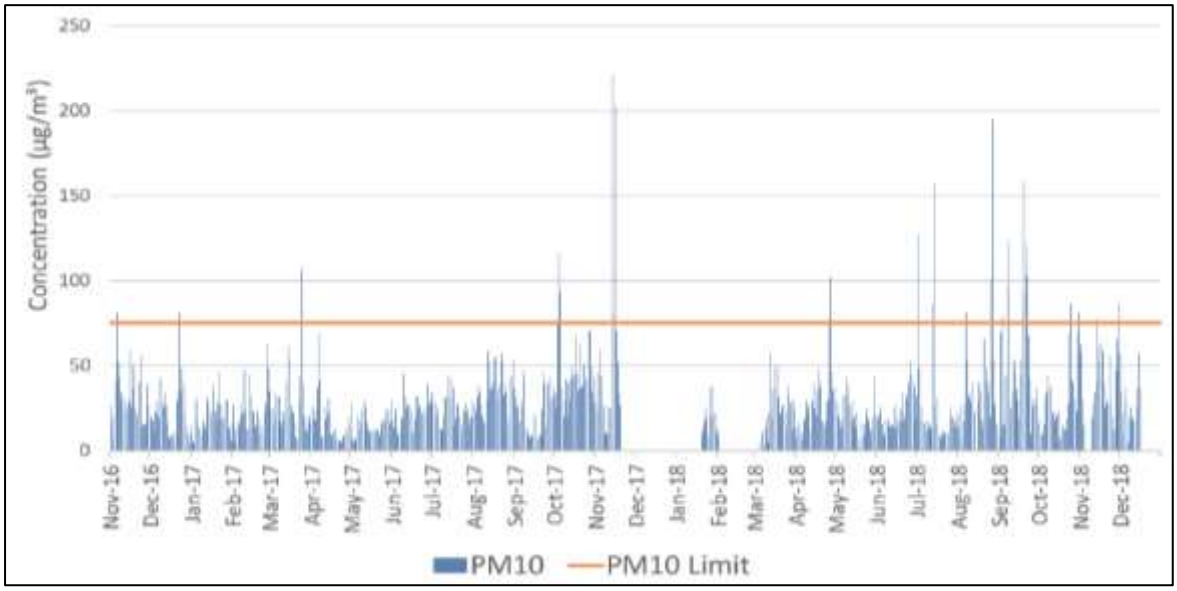
An evaluation of the wind directions and analysis the dust samples obtained during dusty conditions in towns indicated salt from sea spray and dust generated locally as the predominant sources. The peaks on 3 July 2018 were caused by moderate winds blowing from due south. The $PM_{2.5}$ average daily concentrations at Walvis Bay exceeded the daily limit of 37.5 µg/m³ once at the 3rd July but not in Swakopmund. The annual average $PM_{2.5}$ concentrations remained well below the annual limit of 15 µg/m³ at both towns.



Henties Bay



Arandis Rössing



Arandis Orano

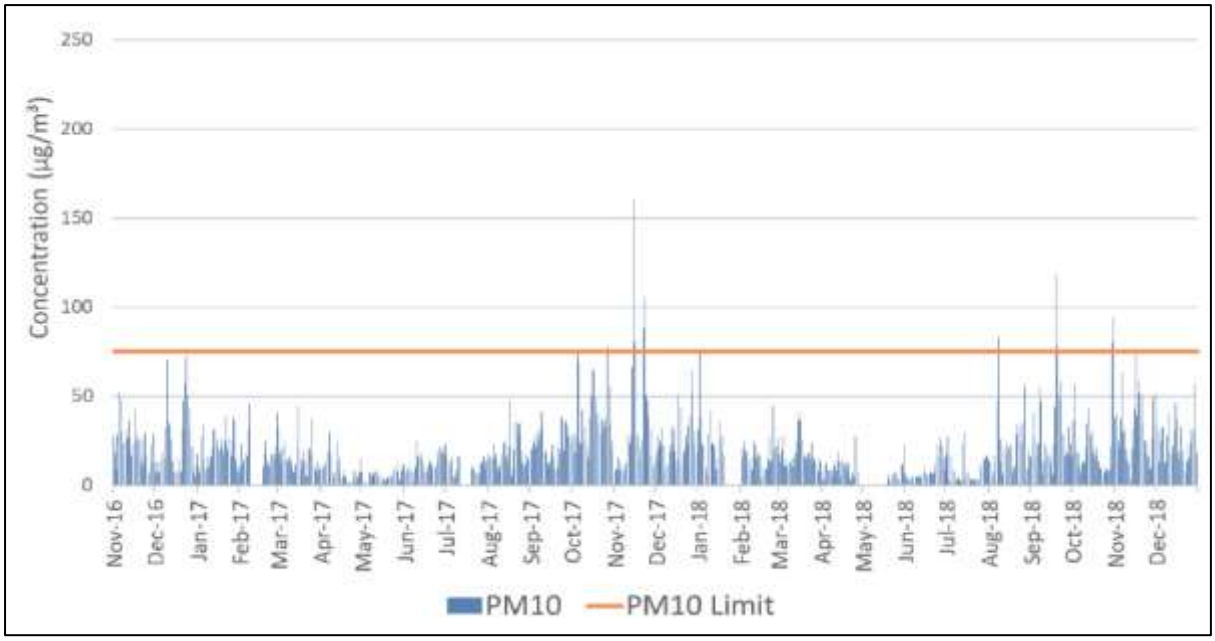


Figure 22: Dust Concentrations at Henties Bay, Arandis (Rössing and Orano) and Jakalswater

As required by indicator 5.1.1.1, operating uranium mines are monitoring PM_{10} dust at the mine sites and at Arandis where both Orano Mining Namibia and Rössing Uranium have monitoring stations. The annual average PM_{10} dust concentrations for 2014 to 2019 at the relevant receptor locations around the mines are summarised in Table 10.

Table 10: PM_{10} Dust Concentrations at Arandis Town and Uranium Mines

Locality	**Average Annual PM_{10} Dust Concentration (µg/m³)**					
Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Arandis, Orano	26.1	27.4	26.4	29.3	29.9	no data
Arandis, Rössing	11.4	8.6	15.9	18.8	18.0	15.8
Rössing CMC	no data	21.7	23.3	23.9	25.7	23.4
LHU access gate	42.1	45.4	34.3	40.7	29.4	32.5
Husab Mine	28.2	41.0	40.5	77.5	71.0	47.6

Orano Mining Namibia recorded an average PM_{10} dust concentration of 29.9 µg/m³ in the centre of Arandis in 2018, while the 2019 readings were unfortunately lost. Rössing Uranium measured 18.8 µg/m³ in 2018 and 15.8 µg/m³ in 2019 on the eastern edge of the town. The values were below the WHO IT-3 limit of 30 µg/m³ for the **annual** mean. The average **daily** dust concentrations exceeded the WHO IT-3 limit of 75 µg/m³ nineteen times at the Orano Arandis monitoring station in 2018; the Rössing station recorded six exceedances in 2018 and two in 2019. The Orano station's highest reading was on 27 August 2018 at 195 µg/m³. On the same day the highest peak of 140 µg/m³ was measured at the Rössing station. Peak dust levels in the Erongo Region are normally associated with east winds in winter but weather data for 27 August 2018 indicated low wind speeds from the south-east.

Langer Heinrich Uranium uses high-volume dust samplers fitted with PM_{10} heads to monitor dust levels in the environment. Samples are generally collected over a seven-day period. There are three samplers placed around the site with the one used for critical group assessments situated at the entrance gate to the mine. An average PM_{10} concentration of 29.4 µg/m³ was measured at this station in 2018, while the average for 2019 was 32.5 µg/m³ (Table 10). Both values were close to the WHO-IT-3 interim guideline of 30 µg/m³ for annual mean concentrations. Dusting was caused by traffic on the gravel road to the mine. Anemometer data for the entrance gate indicated that the wind was blowing from the mineralised section of the mine for less than 18.7% of the year 2018.

Rössing Uranium measures PM_{10} dust concentrations at four stations: Arandis, Tailings Storage Facility, Communications Management Centre (CMC) and at the south-western mine boundary. All PM_{10} samplers measure dust concentration in the <10 µm fraction and wind speed and wind direction at an interval of 15 minutes. The simultaneous monitoring of wind direction allows the allocation of a dust concentration as mining-related (if the wind blows from the mine) or background (when the wind is blowing from any other direction). At the CMC north-east of the mine, annual average PM_{10} dust concentrations of 25.7 µg/m³ were recorded in 2018 and 23.4 µg/m³ in 2019. Both values were below the WHO IT-3 annual mean limit of 30 µg/m³. At the south-western mine boundary, the annual average PM_{10} dust concentrations of 22.8 µg/m³ in 2018 and 12.3 µg/m³ in 2019 measured were also below the annual limit of 30 µg/m³. The daily limit of 75 µg/m³ was not exceeded in 2018 and most of 2019, except for six days in December. The highest dust concentration of 94.6 µg/m³ was measured on 16 December 2019 when the average wind speed was 3.8 m/s. The wind direction during these days was predominantly south-west, which means that dust from the environment was blown towards the station on the mine boundary.

Swakop Uranium's MiniVol dust sampler is located at the weather station close to the Husab mine waste rock dumps and north of the open pit Zone 1. The Grimm dust monitor is located 1.5 km away from the open pit Zone 2. Both dust monitors are located close to operational mining zones where activities such as 24-hour loading, hauling, blasting, drilling, stockpiling take place. This is why they recorded relatively high average PM_{10} concentrations in 2018 and 2019 (). The annual averages exceeded the WHO IT-3 annual limit of 30 µg/m³. Table 11 also shows the number of days on which the average daily dust limit of 75 µg/m³ was exceeded.

Table 11: Swakop Uranium PM10 Dust Monitoring Results

Instrument		Average PM_{10} dust (mg/m³)		No. of days limit was exceeded	
		2018	**2019**	**2018**	**2019**
MiniVol PM_{10}	Minimum	15.8	12.1		
	Maximum	415.0	127.1		
	Average	**71.0**	**49.4**	**13**	**4**
Grimm PM_{10}	Minimum	9.9	2.4		
	Maximum	280.7	477.5		
	Average	**60.6**	**80.1**	**14**	**81**

Several east wind events were experienced between the months of April and September 2019, along with several days without water supply that affected dust suppression spraying. Exceedance of the WHO guideline highlights the need for mine workers to use respiratory protection in the designated areas; it does not mean that these localised emissions contribute to higher dust exposure of residents in neighbouring towns. During November 2019, four E-samplers were installed North, East, South and West of the mine. The eastern sampler will be used as the control sampler, as it is far away from the mining operations. Data will be reported in the 2020/2021 SEMP report when the E-samplers' k-factor value has been determined.

Motivation of status: The indicator was **Met** because PM_{10} dust was monitored at Swakopmund, Arandis and the operating mines, as well as additional sites. PM_{10} concentrations in residential areas were generally below the WHO IT-3 daily limit of 75 µg/m^3 with 27 and 32 exceedances at Swakopmund and Walvis Bay respectively. These exceedances can be attributed to abnormal wind events eroding dust close to sources. Note that the WHO daily limit is just a preliminary guideline. More applicable standards for the region have been proposed in the advanced air quality study.

Desired Outcome 5.2.	**Nuisance dust resulting from uranium mining is within acceptable thresholds.**			
Target 5.2.1.	**Dust fallout levels at residences in towns should not exceed the recommended limit of 600 mg/m^2/day.**			
Indicator 5.2.1.1.	**Dust fallout levels in relevant towns are monitored continuously.**			
Data Source	**SEMP Office/NUA**			
Status:			**Met**	

Dust fallout or nuisance dust consists of particles larger than 10 µm. It is usually monitored by means of sampling containers of defined dimensions (dust buckets) in which the dust that settles from the air is collected over defined time periods. The SEA study established a baseline of regional dust fallout levels and found that the highest dust concentrations outside of mining areas occurred near gravel roads. It was confirmed that none of the towns in the region were affected by dust fallout from uranium mining exceeding the 600 milligrams per square metre per day (mg/m^2/day) residential limit. The regional network was therefore dismantled in 2012, only Arandis continued to be monitored. The results presented in Figure 23 show dust levels at Arandis below 150 mg/m^2/day.

Motivation of status: The target and indicator were **Met** because nuisance dust levels at residences in Arandis did not exceed the recommended limit of 600 mg/m^2/day.

Target 5.2.2.	**Mitigation measures to be implemented by mines at all major dust generating sources such as haul roads, materials transfer points and crushing operations. The best practical dust suppression methods should be implemented and monitored through dust fallout buckets at strategic locations.**			
Indicator 5.2.2.1.	**Mines must implement a dust fallout network, measuring dust fallout at main dust generating sources and mine license boundaries.**			
Data Source	**SEMP Office/NUA/NRPA**			
Status:			**Met**	

All operating mines, mines in care and maintenance and development projects supplied data from their dust fallout monitoring networks in 2018/2019. The results were evaluated against the South African National Dust Control Regulations (SA NDCR) limit for residential areas of 600 mg/m^2/day and the limit

for non-residential areas of 1200 mg/m^2/day. Both limits may be exceeded up to four times within any year. This provision may however not be realistic for the Erongo Region where the east wind sometimes blows for several weeks during the winter season. Figure 23 shows the average annual dust fallout measured at the mines' external monitoring sites in 2019 in mg/m²/day. [45]

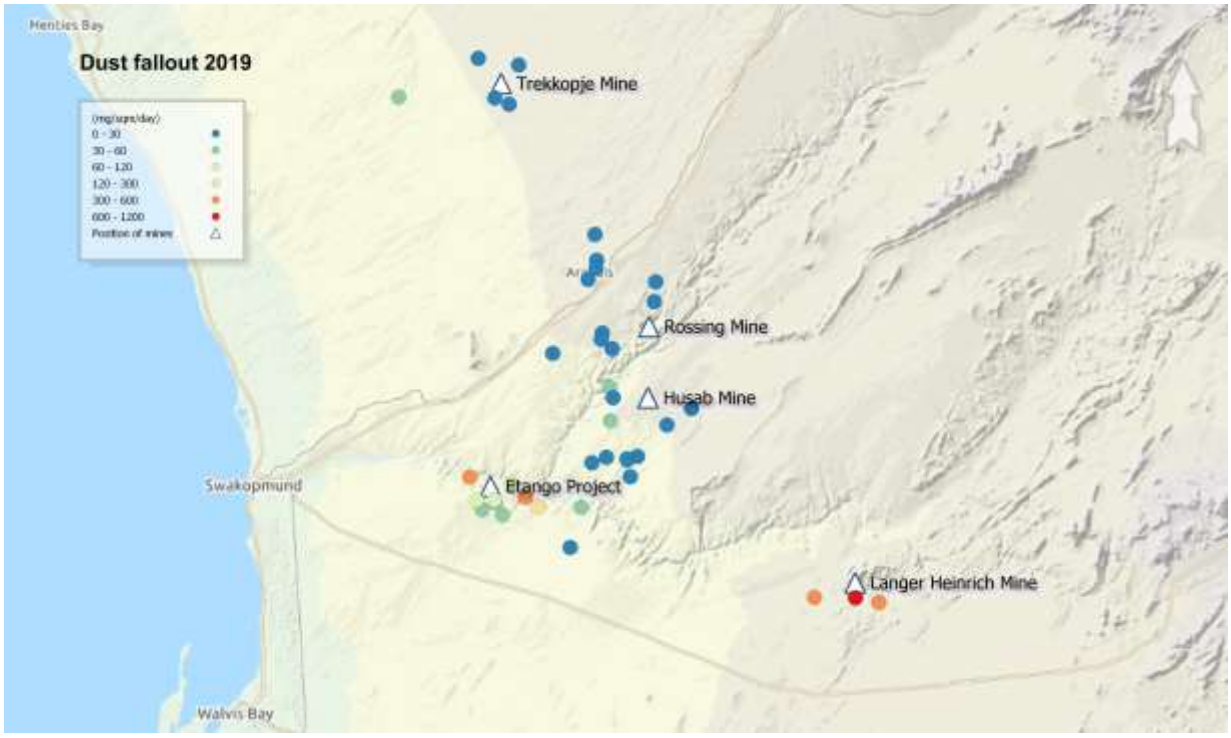


Figure 23: Average Annual Dust Fallout Concentrations in 2019

At Bannerman Mining Resources' Etango Project dust levels were generally low (54-128 mg/m²/day) at most sites. Higher averages were measured at Palmenhorst (577 mg/m²/day) and Goanikontes (407 mg/m²/day) due to livestock movement and vehicle traffic at these smallholdings in the Swakop River. The SA NDCR for residential areas of 600 mg/m²/day was exceeded in some of the dry and windy winter months.

Langer Heinrich Mine monitored dust fallout at nine sites on and around the ML 140 area during the care and maintenance phase in 2019. Dust fallout rates below the non-residential limit of 1200 mg/m^2/day were recorded at all locations on the mine, while the Namib-Naukluft Park's Bloedkoppie camp site and the Gecko campsite remained below the residential limit of 600 mg/m^2/day.

Orano Mining Namibia monitored dust fallout at 13 sites on Trekkopje mine and at Arandis. The average dust fallout rates in 2018/2019 were 9.0-50.6 mg/m^2/day. Dust levels at the two sites in Arandis were low ranging from 19.3 to 26.0 mg/m^2/day. None of the peak values exceeded 250 mg/m^2/day. During the current care and maintenance phase dust is mainly mobilised by traffic on gravel roads.

Rössing Uranium reported dust fallout results for Arandis and a site on the mine boundary south-west of the open pit where all the fallout dust readings in 2018/2019 were below the SA NDCR limit for residential areas of 600 mg/m^2/day.

[45] Map by R Schneeweiss for NUA, 2020

Swakop Uranium monitored 33 dust fallout buckets on and around the Husab mine site in 2018/2019, though only stations outside the operational area were included in this report. All dust concentrations were below the SA NDCR residential limit, varying from <50 mg/m^2/day to maximum values of 128 mg/m^2/day in 2018 and 110 mg/m^2/day in 2019.

Motivation of status: The indicator requires that mines implement dust fallout networks, measuring dust fallout at main dust generating sources and mine licence boundaries. It does not call for compliance with an air quality standard. Companies nevertheless evaluated their monitoring results against the South African non-residential limit of 1200 mg/m^2/day and the residential limit of 600 mg/m^2/day. The indicator and standards were **Met** as demonstrated by the results presented above.

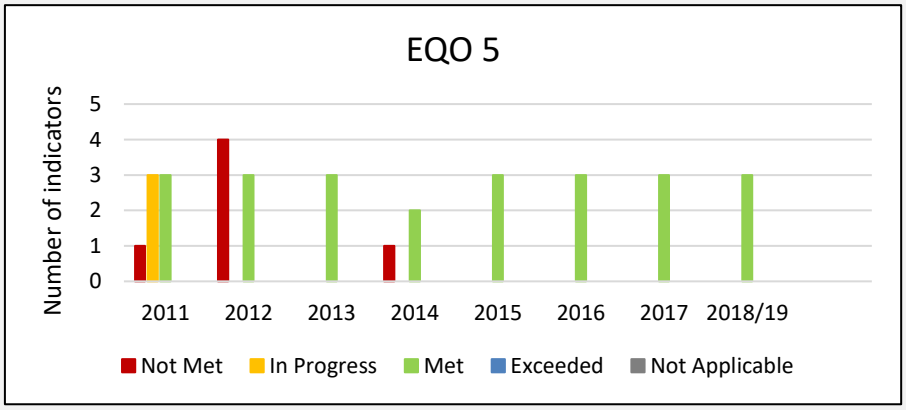
****

Summary of performance over time: EQO 5

Total no. indicators assessed: 3

2018/2019	Not Met	In Progress	Met	Exceeded
Number of indicators in class	0	0	3	0
Percent of indicators in class	0%	0%	100%	0%

Overall performance: The three air quality indicators were **Met** in 2018/2019. Dust fallout monitoring took place and dust levels at Arandis and at the mine boundaries were within the adopted SA NDCR limits for residential and non-residential areas. The advanced air quality study provided additional PM_{10} dust data and proposed a regional air quality standard. The regional monitoring system set up by the consultants was handed over to government (Geological Survey in MME) in early 2019.



****

EQO 6. Health

Aims of this EQO: Adequate health services are available to all. Workers and the public do not suffer significant increased health risks from uranium mining.

The SEA identified the risk that an influx of job seekers due to uranium mining could overburden the public health services in the Erongo region. An increase in mine workers would not place a burden on the public health sector because mining companies usually enrol their employees in medical aid schemes. The EQO makes provision for certain numbers of health workers and facilities to be made available per 100 000 residents by 2020. Shortfalls in public health services are not unique to the Erongo Region, but rather a national problem. The Ministry of Health and Social Services (MHSS) has therefore formulated a strategy including planned targets for the number of patients per health worker to be achieved by 2022. Its implementation depends on the availability of resources.

The second aim of the EQO is monitored by the National Radiation Protection Authority (NRPA), a division within the MHSS. Its objective is to protect human beings (workers, patients and the public), as well as the environment from undue risks, resulting from the harmful effects of ionising radiation, while allowing for its beneficial application in medical, industrial, scientific and other purposes.

Namibian legislation requires that radiation originating from mines is constrained so that the cumulative radiation dose to members of the public is minimized as far as reasonably practicable and does not exceed the legal limit of 1 millisievert per annum (mSv/a) in addition to the natural background radiation. The public dose cannot be measured directly; it is estimated in public dose assessments by modelling the predicted dose to the group of residents that lives close to the mine, the so-called “critical group”. If more than one town is situated close to a mine there can be several critical groups.

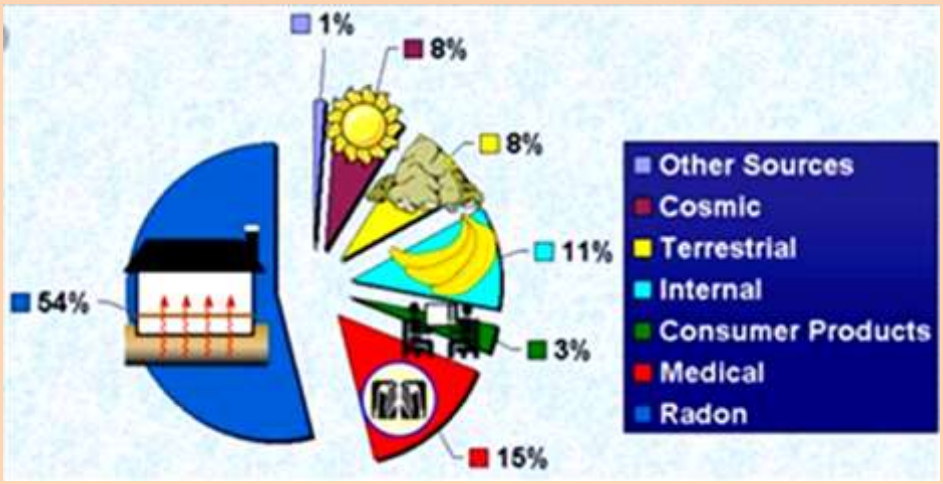
Figure 24: NRPA Officials receive an RMP

Uranium mines are required to have Radiation Management Plans (RMP) and report annually on the implementation of radiation safety standards, pursuant to Section 29(2) of the Act of the Atomic Energy & Radiation Protection Act, Act No 5 of 2005 (Figure 24). This provision is intended to give assurance to the NRPA that the operations are indeed maintained within regulatory requirements and the RMP safety assessments. The NRPA also carries out site inspections to confirm the mines’ monitoring results and evaluates the public dose assessments in relation to the potential exposure pathways that reach the critical groups.

Good to know

Radiation has existed in the universe since the beginning of time. Radiation is travelling energy and manifests itself in the form of electromagnetic waves and sub-atomic particles. Humans are perpetually exposed to various forms of radiation of natural and man-made origin. Natural sources include cosmic radiation, terrestrial radiation emitted by soils, rocks and groundwater, as well as radioactive dust and gases such as radon. In contrast, man-made sources of ionising radiation include X-rays and radioactive isotopes used in medical treatments, among others.

Radiation can have low or high energy. High-energy radiation is known as 'ionising radiation' because it removes electrons from the shells of atoms, whereas low-energy radiation, such as sunlight or radio waves, is non-ionising. Types of ionising radiation are X-rays and gamma rays, as well as alpha and beta radiation emitted by radioactive materials. Exposure to ionising radiation can damage human cells and tissue and may cause negative health effects.



Dust particles from natural and man-made emissions described in EQO 5 contain radioactive elements that they emit ionising radiation in the form of highly energetic particles and electromagnetic gamma radiation. The radiation exposure dose resulting from the inhalation of airborne pollutants in the Erongo Region was assessed in the GSN advanced air quality study and serves as an indication of the biological risk to members of the public. A 'dose' is the amount of medically significant radiation a person receives. Because radiation occurs naturally on earth, both people and the environment have adapted to certain levels of ionising radiation. The naturally occurring background radiation in the Erongo Region is approximately 1.8 millisieverts per year.*

Uranium miners are exposed to naturally-occurring radioactive materials and more concentrated uranium product. Although uranium itself is not very radioactive, the ore contains uranium decay products such as radium and radon. This makes it potentially hazardous, especially if a mine has high-grade ore. Radon gas escapes from the ore and mineral waste and quickly decays further into solid elements that are energetic alpha-radiation emitters. This explains why precautions are required at uranium mines to protect the health of workers. The occupational health hazard needs to be monitored and controlled.

** The sievert (symbol: Sv) is a derived unit of ionising radiation dose in the International System of Units and is a measure of the health effect of low levels of ionising radiation on the human body. One millisievert equals 0.001 sievert.*

Desired Outcome 6.1.	**Disease rates amongst the public and employees of the mines are not increased as a result of uranium mining.**
Target 6.1.1.	**Increments in the concentrations of uranium, thorium and health-relevant nuclides of the uranium, thorium and actinium decay chains such as Ra-226 and Ra-228 (above respective background concentrations) in air and water (ground and surface) that originate from uranium mines, must be constrained so that the cumulative radiation dose to members of the public is reasonably minimized and does not exceed 1 mSv per annum above background.**
Indicator 6.1.1.1.	**Public dose assessments produced by each new mine project include the cumulative impact of other operating mines.**
Data Source	**NUA/NRPA**
Status:	

There were no new uranium mining projects in the region in 2018/2019. A public dose assessment of the cumulative impact of existing mines was however carried out as part of the advanced air quality study reported under the next indicator.

Motivation of status: The indicator was **Not Applicable**.

Indicator 6.1.1.2.	**Modelled cumulative radiation dose to critical groups of the public does not exceed 1 mSv/a above background**
Data Source	**NUA/NRPA**
Status:	**Met**

The advanced air quality and radiation study that was completed in early 2019 included a comprehensive re-assessment of the cumulative impact of all operating mines on the public dose in the Erongo uranium province.[46] Its results supersede the previous assessment in the 2010 SEA.[47] The information presented in this indicator is based on the air quality and radiation study report.

Radon gas and its solid radioactive decay products, as well as airborne radioactive dust, are the principal contributors to the public exposure dose in the Erongo Region. The inhalation dose resulting from radon decay products is directly related to the radon concentration in air, which was monitored at Swakopmund, Walvis Bay and near Arandis as part of the present study. The exposure dose resulting from inhalable radioactive dust is related to the concentration of radionuclides in air, which was also

[46] Liebenberg-Enslin, H et al (2019): Advanced Air Quality Management for the Strategic Environmental Management Plan for the Uranium and Other Industries in the Erongo Region: Air Quality Management Plan Report. Report No.: 15MME01-4

[47] MME (2010): Strategic Environmental Assessment for the Central Namib Uranium Rush. Ministry of Mines and Energy, Republic of Namibia, Windhoek

determined in the study. Methods to estimate the dose from these concentrations are prescribed by the International Commission on Radiological Protection (ICRP).

According to the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the average world-wide population-weighted (i.e. taking actual regional population concentrations into account) and age-weighted (i.e. taking the age distribution of the population into account) exposure dose attributable to radon in air amounts to 1.095 mSv/a, while the exposure dose resulting from the inhalation of airborne radioactive dust is around 0.006 mSv/a.[48]

Atmospheric Radon

This section presents the results of the real-time measurements of the ambient atmospheric radon concentrations for the period between 1 November 2016 and 31 December 2018 (where applicable) from the three radon monitoring stations in the Erongo Region, i.e. at Swakopmund, Walvis Bay and in-between Arandis and Rössing Uranium.

The average atmospheric radon concentration measured at the Swakopmund monitoring station (old sewage works) amounted to 8.4 becquerel per cubic metre (Bq/m^3), with a maximum concentration of 99.5 Bq/m^3. The average monthly concentrations at Swakopmund and the average concentration across the entire monitoring period (indicated by the blue line) are shown in Figure 25. Due to data transmission challenges, data for January and April 2017 were lost. The graph illustrates the seasonal variability of the radon concentrations, with peaks occurring in winter. The lower levels in summer result from increased atmospheric mixing and dispersion of radon when it is hot.

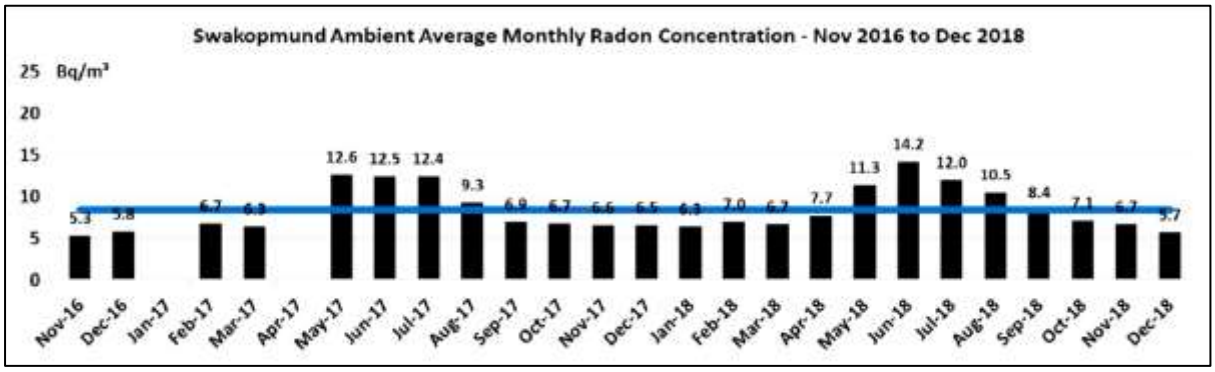


Figure 25: Monthly Average Radon Concentrations at Swakopmund

During this study, the radon monitoring station located at the Civic Centre in Walvis Bay only operated from October 2016 to May 2017. It should however be noted that the same instrument recorded radon concentrations at Walvis Bay in 2014 and 2015 (refer to Table 11). Given the quality and quantity of ambient radon concentration data collected during that time and the very low radon concentrations at Walvis Bay, MME decided not to repair or replace the station.

The measured average atmospheric radon concentrations amounted to 4.5 Bq/m^3, while the maximum concentration was 110.5 Bq/m^3. The average monthly atmospheric radon concentrations for Walvis Bay and associated average concentration across all measurements during the monitoring period (indicated by the blue line) are shown in Figure 26.

[48] UNSCEAR (2000): Report of the United Nations Scientific Committee on the Effects of Atomic Radiation to the General Assembly

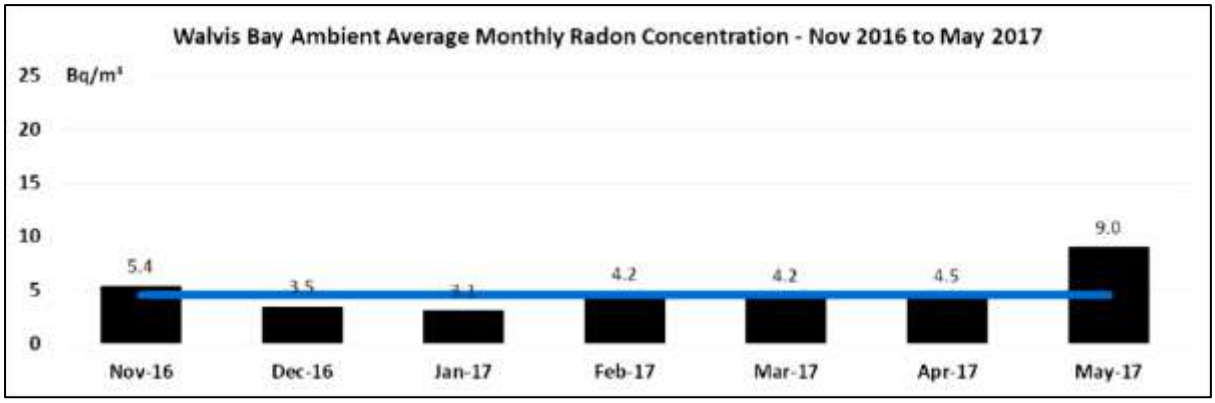


Figure 26: Monthly Average Radon Concentrations at Walvis Bay

Atmospheric radon concentrations at the NamWater reservoir between Arandis and Rössing Mine amounted to 16.7 Bq/m^3, with a maximum concentration of 266.0 Bq/m^3 (Figure 27).

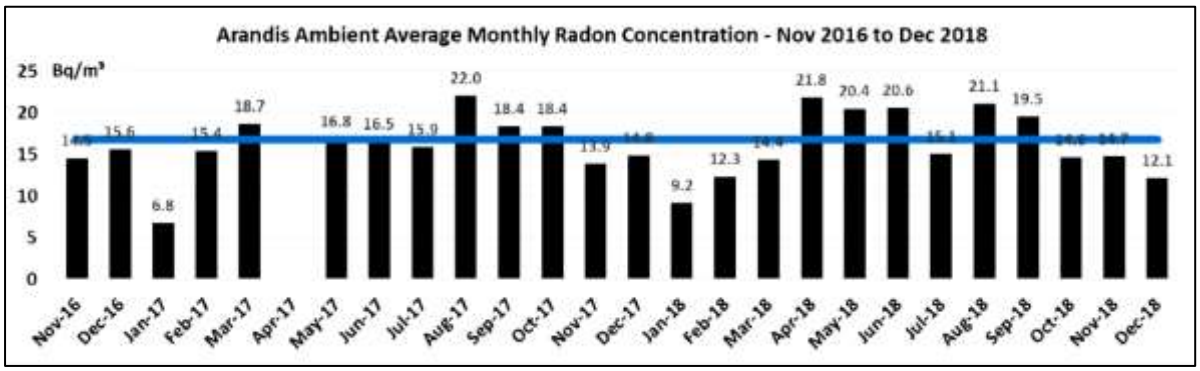


Figure 27: Monthly Average Radon Concentrations at Arandis

The monitoring results presented above show that the location that is most exposed to regular south-westerly winds, i.e. Walvis Bay, experienced the lowest radon concentrations. This result was to be expected, because air masses moving in from the ocean contain very little radon gas owing to the low uranium concentration in seawater. It is also important to note that the location of the monitoring station, i.e. on the roof of the Walvis Bay Civic Centre building, exposes this location to stronger winds than those typically recorded at the other stations.

The radon concentrations at Swakopmund are somewhat higher than at Walvis Bay, but still diluted by winds from the ocean. Away from the coast, more radon emanates from the soil, and especially from the uranium-bearing granites occurring in the region. The radon concentrations at Arandis/Rössing are further elevated by the presence of the mine's uranium ore stockpiles and tailings storage facility that is within line of sight of the monitoring station.

The measured radon values can be evaluated by comparing them to global standards. An internationally accepted reference level for outdoor radon concentrations has not yet been promulgated,[49] but the Namibian results are low compared to the WHO's suggested indoor radon reference level (upper limit) of 100 Bq/m^3. Radon concentrations inside buildings are higher than outside because radon gas from the ground migrates into buildings and tends to accumulate if there is poor ventilation.

[49] ICRP (2018): Summary of ICRP Recommendations on Radon, ICRP Ref 4836-9756-8598, www.icrp/org

The most important result of the study is the annual average public exposure dose resulting from the inhalation of radon and its progeny at the three monitoring locations. The dose calculation[50] is based on the long-term average radon concentrations that members of the public residing close to the monitoring stations are be exposed to in one year. The location-specific annual public exposure doses summarized in Table 11 are far smaller than the world-wide average population- and age-weighted public radon exposure dose of 1.095 mSv/a as put forward by UNSCEAR. This finding confirms a well-known phenomenon that characterises the outdoor radon concentrations in the southern hemisphere and is (amongst others) the result of higher average ambient temperatures and a more effective mixing of radon in ambient air due to thermal forces in the atmosphere.[51]

Table 11: Radon Concentrations 2014-2018 and Public Dose for Oct 2016-Dec 2018

	Average Radon Concentration (Bq/m^3)			**Dose (mSv/a)**
	2014	**2015**	**2016/18**	**2016/18**
Arandis	20.3	19.5	16.4	0.4
Swakopmund	11.7	12.7	8.4	0.2
Walvis Bay	7.9	7.9	4.5	0.1

The study found that the atmospheric radon concentrations determined in the 2010 SEA, which were measured using track-etch radon gas monitors, were on average much higher than those determined by the real-time radon monitoring network. The population-weighted average in 2010 was 0.46 mSv/a. The difference is partly due to the track-etch monitors being placed only one metre above the ground, while the real-time monitors were three to five metres above the ground. Considering the technical sophistication of the real-time radon monitors and long-term consistency of the data, the 2016/2018 data are considered more reliable and representative than the 2010 results.

The second step of the public dose assessment was to determine the dose resulting from the inhalation of radioactive dust. To do this, samples of PM10 dust were sent to an accredited German laboratory (IAF Radioökologie GmbH, Radeberg) for the determination of radionuclides. The samples were collected between April/May and June 2018, between June and August 2018, and between August/September and October 2018 at the PM10 monitoring stations located at Swakopmund, Walvis Bay, Henties Bay and Jakalswater. The German laboratory conducted an alpha spectrometric analysis according to the International Organization for Standardization (ISO) 11929.

The analysis of the first batch of PM_{10} dust samples delivered inconclusive results that were not considered further in the evaluation. The results of the second and third batch of samples were found to be below the limit of detection of the alpha spectrometric analysis. This was an unexpected and somewhat disappointing result. It did however provide a valuable indication of the upper limit for the radioactive atmospheric concentration in the region. It basically means that the actual radionuclide activities in dust were too low to be measured with the chosen sampling and analysis methods.

[50] The exposure dose calculation is based on an exposure period of 8 760 hours per annum, equilibrium factor of 0.4, conversion factor of $5.56E^{-6}$ (mJ/m^3)/(Bq/m^3) and public dose conversion factor of 1.1 mSv/(mJ.h/m^3) as per ICRP (1993)

[51] Von Oertzen, GU & Von Oertzen, DW (2018): Radiation Safety Officer's Handbook, Namibian Uranium Association, http://www.namibianuranium.org

NUA is planning to collect PM_{10} dust with high-volume samplers in the next reporting period to identify radionuclides present in dust and measure their alpha activities. In the present study the exposure dose resulting from the inhalation of radioactive dust was determined under the assumption that the actual alpha activity in the samples amounted to some 2 millibecquerel of alpha activity per radionuclide. Taking the actual monitoring periods into account, the assumed activity concentrations imply an upper limit for the adult inhalation exposure dose of approximately 0.003 mSv/a, and an upper limit for the infant (one-year-old) inhalation exposure dose of approximately 0.002 mSv/a.[52]

These doses are well below the UNSCEAR dust inhalation doses of 0.006 mSv/a for adults and 0.005 mSv/a for infants.[53] They are also 10 times lower than the estimate provided in the 2010 SEA, and 100 times smaller than the public radon exposure dose. This is an important result as it provides further evidence that the exposure dose due to the inhalation of radioactive dust in the main population centres of the Erongo Region cannot reasonably be considered as a public health risk. Adding the dust doses to the radon doses in Table 11 results in total public doses of 0.103 at Walvis Bay, 0.203 at Swakopmund and 0.403 at Arandis (for adults).

Motivation of status: The indicator was **Met** because a public dose assessment was completed and the modelled radiation dose to critical groups was lower than 1 mSv/a above background. Neither radon and its decay products, nor radioactive dust can reasonably be considered as public health risks in the Erongo Region.

Target 6.1.2.	**The cumulative radiation dose to members of the public and radiation workers does not exceed the legal limit.**			
Indicator 6.1.2.1.	**Measured change in absorbed radiation dose of uranium mine workers.**			
Data Source	**NUA**			
Status:			**Met**	

The term “radiation workers” used in this target is not defined in the Atomic Energy and Radiation Protection Act (Act No 5 of 2005). Its meaning in this report is the same as the Act’s term “occupationally exposed persons” i.e. all mine workers who may be exposed to ionising radiation at the workplace. Workers are classified as either occupationally exposed persons (OEPs) or non-exposed persons (NOEPs). OEPs are basically “radiation workers” because they work in areas where they can potentially be exposed to 5 mSv or more in a year. NOEPs work in areas without radiation risk such as offices. Some companies, e.g. Rössing Uranium, treat all site-based employees as OEPs because their presence on the mine exposes them to higher-than-normal background radiation. Uranium mines must ensure that occupational radiation exposures are within the regulatory limit of 20 mSv/a in addition to the natural background and that reasonable attempts are made to minimise all exposures. Protection and safety measures must be optimised so that the likelihood of exposure to radiation, the number of people exposed, and the actual doses are kept as low as reasonably achievable, economic and social factors

[52] Based on an exposure period of 8 760 hours per annum, adult (infant) breathing rate of 0.9 (0.2) m^3/hour and radionuclide-specific dose conversion coefficients for adults (infants) as provided in the 2014 version of the IAEA’s Basic Safety Standards

[53] UNSCEAR (2000): Report of the United Nations Scientific Committee on the Effects of Atomic Radiation to the General Assembly

being taken into account. The individual doses shown in Table 12 were calculated by summing all the exposure pathways and all types of radiation exposure. The figures show the mine-wide weighted average doses to all occupationally exposed persons including background and extrapolated to an average working time of 2000 hours per annum.

Table 12: Radiation Dose to Uranium Mine Workers

Company	Average dose to all occupationally exposed persons (mSv/a)	Number of occupationally exposed workers	Number of workers exposed to >5 mSv/a	Number of workers exposed to >20 mSv/a	Individual maximum dose (mSv/a)
Langer Heinrich	0.7 (2018)	327	1	0	7.6
Rössing Uranium	1.2 (2018)	1961	1	0	5.5
	1.4 (2019)	1980	6	0	6.2
Swakop Uranium	1.8 (2018)	2365	0	0	3.7
	0.6 (2019)	2365	0	0	3.6

The average weighted doses varied between 0.6 mSv/a and 1.83 mSv/a, while the maximum individual doses at operating mines were 3.6-7.6 mSv/a. The comparatively low doses at Swakop Uranium indicate that the figures supplied to NUA probably exclude the natural background radiation.

Motivation of status: None of the measured doses to workers exceeded the limit of 20 mSv/a in 2018/2019. The indicator was therefore **Met**.

Target 6.1.3.	**No measurable increase, directly or indirectly attributable to uranium mining and its support industries in the incidence rates of the following:** • **Industrial lung disease (including pneumoconiosis)** • **Lung cancer and other industrial-related cancers** • **Industrial induced renal damage** • **HIV/ AIDS, tuberculosis** • **Industrial dermatitis**
Indicator 6.1.3.1.	**Measured change in the incidence rate of industrial diseases amongst uranium mine workers.**
Data Source	**NUA**
Status:	**Met**

The information about industrial diseases presented in this report has been obtained from Medixx Occupational Health Services in Swakopmund who carry out occupational medical examinations for the operating uranium mines and most of their contractors. When comparing recent and older data it

should be noted that Medixx examined many short-term contractors working on the Husab project during 2014-2016. The health profile of this group of employees may be different from that of permanent mine employees. Table 13 therefore shows the industrial disease rates of permanent mine employees only, while Table 14 provides a summary of all mine and contractor employees that were examined.

Table 13: New Industrial Disease Cases among Permanent Mine Employees

Disease	2012	2013	2014	2015	2016	2017	2018	2019
Noise-induced hearing loss	1	1	3	0	1	4	3	2
Contact dermatitis	4	4	2	2	1	1	2	0
Pneumoconiosis	0	0	0	0	0	0	0	0
Occupational asthma	0	0	1	0	0	0	0	1
Lung cancer	0	1	1	0	0	0	0	0
Asbestosis	0	0	0	0	0	0	0	0
Industrial-induced renal damage	0	0	0	0	0	0	0	0
Number of medical examinations	2801	2563	2358	2727	3171	3702	5221	3868
New cases as % of examinations	0.18	0.23	0.30	0.07	0.06	0.14	0.10	0.08

Five new cases of industrial disease were detected in 2018 and three in 2019. Five patients had noise-induced hearing loss, two developed contact dermatitis (a skin complaint caused by prolonged exposure to chemicals or other irritants) and one had occupational asthma. Contractor employees suffered another four cases of hearing loss and one lung cancer (Table 14).

Table 14: New Industrial Disease Cases among Mine and Contractor Employees

Disease	2012	2013	2014	2015	2016	2017	2018	2019
Noise-induced hearing loss	1	8	9	6	5	4	7	2
Contact dermatitis	4	7	5	6	3	1	2	0
Pneumoconiosis	1	2	0	0	0	0	0	0
Occupational asthma	0	0	1	0	1	0	0	1
Lung cancer	1	1	1	1	2	0	1	0
Asbestosis	0	0	1	0	0	0	0	0
Industrial-induced renal damage	0	0	0	0	0	0	0	0
Number of medical examinations	9920	9820	12049	15197	11784	8589	9960	9159
New cases as % of examinations	0.07	0.18	0.13	0.09	0.09	0.06	0.09	0.03

While the number of persons examined has varied, the incidence rate has remained well below 0.1% since 2015. The incidence rate indicates that fewer than one person in a thousand develops an industrial disease.

HIV/AIDS and tuberculosis (TB) occur among all sectors of the population and are only defined as industrial diseases if workers are infected under specific circumstances. For instance, in South Africa TB is

recognised as an industrial disease if contracted by underground mine workers who have been exposed to high levels of silica in dust.[54] HIV/AIDS has been identified as a problem among mine workers who live in hostels far from their families and may therefore engage in unsafe sexual practices.

Table 15: New HIV and TB Cases among Permanent Mine Employees

	2012	2013	2014	2015	2016	2017	2018	2019
Newly diagnosed HIV cases (self-reported)	1	2	0	2	1	2	11	1
Rate of newly reported HIV cases per 100 000	36	78	0	73	32	54	211	26
Known HIV cases (diagnosed during lifetime)	7	56	50	49	59	70	230	54
Percentage of known HIV+ cases	0.2	2.2	2.1	1.8	1.9	1.9	4.4	1.4
Newly diagnosed TB cases	3	0	1	5	2	7	6	1
Rate of new TB cases per 100 000	**107**	**0**	**42**	**183**	**63**	**189**	**115**	**26**
Known TB cases (diagnosed since birth)	8	6	15	54	94	120	165	83
Rate of known TB cases per 100 000	286	234	636	1980	2964	3241	3160	2146

Table 16: New HIV and TB Cases among Mine and Contractor Employees

	2012	2013	2014	2015	2016	2017	2018	2019
Newly diagnosed HIV cases (self-reported)	20	3	8	10	16	10	12	5
Rate of newly reported HIV cases per 100 000	202	31	66	66	136	116	121	55
Known HIV cases (diagnosed during lifetime)	276	216	327	378	323	229	283	210
Percentage of known HIV+ cases	2.8	2.2	2.7	2.5	2.7	2.7	2.8	2.3
Newly diagnosed TB cases	15	2	4	19	10	14	12	5
Rate of new TB cases per 100 000	**151**	**20**	**33**	**125**	**85**	**163**	**121**	**55**
Known TB cases (diagnosed since birth)	27	32	136	550	451	355	411	260
Rate of known TB cases per 100 000	272	326	1129	3619	3827	4133	4127	2839

This situation does not apply to the Namibian uranium industry where employees live with their families in established towns. The only exception is during the construction phase when large numbers of contractor employees are accommodated in temporary camps. The reported HIV infection rate of 4.4% and 1.4% for mine employees in 2018 and 2019 (Table 15); or 2.8 and 2.3% including contractors (Table

[54] Ministry of Health and Social Services, National Tuberculosis and Leprosy Programme, Annual Report 2015-2016

16) is much lower than the national average of 13-19% during the reporting period[55]. The figures may however be too low because they are based on voluntary self-reporting by workers. HIV testing is not included in the scope of occupational medical examinations but can be conducted if a person wants to be tested.[56]

The most recent Namibian national rate of new TB cases was 524 per 100 000 (Challenge Report, 2019).[57] MHSS found more than 1000 cases per 100 000 in the Erongo region in 2015. The rate of new cases diagnosed at the uranium mines was 26 per 100 000 permanent employees (Table 15) and 55 per 100 000 if contractor employees are included (Table 16). This indicates that mine workers are less exposed to TB than the average population. The known TB cases since birth per 100 000 shown in the tables will generally increase as new reports are added to the existing known cases.

Motivation of status: The indicator to be measured is the change in the incidence rate of industrial diseases amongst uranium mine workers. Looking at the number of recognised industrial disease cases in Table 13 and Table 14 it is evident that the rate has remained below 0.1% since 2015. The absence of an increasing trend shows that the indicator has been **Met**.

Indicator 6.1.3.2.	**Measured change in the incidence rate of diseases scientifically attributed to radiation amongst members of the public and uranium mine workers.**			
Data Source	**NUA**			
Status:		**In Progress**		

Rössing Uranium has commissioned a comprehensive epidemiological study of former and current employees of the mine, from which conclusions about the incidence rate of radiation-related diseases may be drawn. Preparations for the epidemiological study on the potential effects of occupational radiation exposures on mine workers, designed to stand up to scientific scrutiny, began in 2011. The scoping for the study was concluded in 2015 and the project was awarded to the Centre for Occupational and Environmental Health at the University of Manchester in the UK. The study design, chosen for best statistical power, was that of a "case-cohort" study, where a sub-group of the workers who have been diagnosed with specific cancers of interest (the cases) are compared with a larger subgroup of workers (the cohort).

The study team worked with the Namibian and South African cancer registries to identify as many cancer cases within the workforce as possible to achieve statistically valid results. All information about cancer cases was anonymised before it was communicated to the research team and former workers had the opportunity to withdraw their consent for the use of their anonymised data. The study obtained ethics approval from the Ministry of Health and Social Services. An external advisory committee consisting of community leaders and government representatives was appointed to provide input and supervision. The collection of cancer cases and occupational hygiene data for the past 40 years was completed in 2017.[58]

[55] Namibia Population-based HIV Impact Assessment NAMPHIA on www.mhoss.gov.na
[56] Pers. comm. Medixx Occupational Health Services, 2020
[57] Challenge Report, 2019
[58] Rössing Uranium Limited (2018): Consolidating for success - Report to stakeholders 2017

The evaluation and statistical analysis of the cases was completed in 2018/2019 and a draft report was released at the end of 2019. This report must still be reviewed and approved by MHSS before the results can be shared with the public. [59]

Motivation of status: The Rössing Uranium epidemiological study aims to determine whether there is an excess, work-related cancer risk for uranium miners, which will indicate whether there is a higher incidence rate of diseases scientifically attributed to radiation amongst uranium mine workers. Seeing that the study has been completed in 2019 and results are expected to be published in 2020 the indicator was rated **In Progress**.

Desired Outcome 6.2.	**Improved healthcare facilities and services are able to meet the increased demand for healthcare resulting from uranium mining.**
Target 6.2.1.	**An increase in qualified health workers available to all in the Erongo Region, reaching 2.5 per 1000 of the population by 2020.**
Indicator 6.2.1.1.	**Number of available qualified healthcare personnel: 2.5 per 1000 of population;** **Number of Medical Practitioners: 1 per 1000 of population;** **Number of Dental Practitioners: 1 per 2000 of population;** **Number of nurses: 2.5 per 1000 of population;** **Pharmacists: 1 per 2000 of population.**
Data Source	**SEMP Office/MHSS**
Status:	**Not Met**

Target 6.2.2.	**An increase in registered healthcare facilities in Erongo, available to all, reaching 2.5 acute care beds per 1000 population and 0.5 chronic care beds per 1000 population by 2020.**
Indicator 6.2.2.1.	**Number of available registered healthcare facilities: 1 per 1000.**
Data Source	**SEMP Office/MHSS**
Status:	**Not Met**

[59] Pers. comm, RUL, 2020

Target 6.2.3.	**An increase in ambulances in Erongo, reaching 1 per 20,000 by 2020.**
Indicator 6.2.3.1.	**Number of available ambulances: 1 per 20,000.**
Data Source	**SEMP Office/MHSS**
Status:	**Not Met**

Namibians have access to three types of health services: public, private and not-for-profit healthcare systems. Only 15% of the country's population, mostly middle- and high-income earners can afford private healthcare services, while 85% of the population is served by public and non-profit health care facilities. Certain services like organ transplantations are only available from private medical centres, putting them out of reach of most Namibians. The Ministry of Health and Social Services (MHSS) in its Strategic Plan for 2017/2018 to 2021/2022 stated that ensuring the provision of quality health care is one of its most important goals. The Ministry reconfirmed its commitment to capacity building and skills development of health workers to provide quality essential services.[60] Table 17 sets out the planned targets for the number of patients per health worker. The plan does not specify the desired number of dentists, health care facilities or ambulances.

Table 17: MHSS Planned Ratio per Population

	Baseline	2017/18	2018/19	2019/20	2020/21	2021/22	SEMP
Nurses	328	317	307	297	285	270	400
Pharmacists	4095	3563	3286	2922	2567	2289	2000
Doctors	2485	2224	2012	1837	1625	1457	1000

According to these figures, the SEMP indicator of 2.5 nurses per 1000 has already been reached –though one should note that these figures apply to the entire country, not only the Erongo Region. The indicators for doctors (1:1000) and pharmacists (1:2000) will not be met, though the projected 2021/22 figures may come close enough to the target.

A regional picture emerged from the Workload Indicators of Staffing Need (WISN) exercise that MHSS conducted in 2015 to generate evidence to inform the Ministry's staffing decisions.[61] The report stated that the Namibia staffing norms and number of health workers had to be revised to address a general shortage of certain professionals. The WISN method was applied to all regions and focused on four categories of health workers that the MHSS perceived to be the most critical, i.e. doctors, dentists, nurses, pharmacists and pharmacist assistants. Table 18 summarises the WISN results for the Erongo Region compared to the SEMP targets. It also shows the target ratios of health care professionals against the actual numbers in 2015, assuming a population of 175,750 in Erongo[62].

[60] Ministry of Health & Social Services: Strategic Plan 2017/2018 – 2021/2022, www.mhss.gov.na
[61] MHSS (2016): Namibia National WISN Report 2015: A Study of Workforce Estimates for Public Health Facilities in Namibia. Report by IntraHealth International-Namibia on behalf of MHSS, Windhoek
[62] NSA (2016): Presentation-NIEHS 2015-2016 Preliminary Indicators, www.nsa.org.na.

Table 18: Public Health Professionals in the Erongo Region

	Doctor		Dentist		Pharmacist		Pharmacist assistant		Registered nurse		Enrolled nurse	
Health District	Actual	Required	Actual	Required	Actual	Required	Actual	Required	Actual	Required	Actual	Required
Omaruru district	3	4.6	0	0.8	0	2.8	1	2.5	0	33	0	30
Swakopmund district	5	14	2	1	0	4.3	4	6.7	49	64	27	43
Usakos district	2	4.7	0	2	0	2.8	1	4.2	24	36	16	30
Walvis Bay district	4	14	3	1	0	4.5	2	9.3	12	89	9	69
Total	**14**	**37**	**5**	**5**	**0**	**14**	**8**	**23**	**85**	**223**	**52**	**172**
Target ratio per 1000	1:1000		1:2000		1:2000		1:2000		2.5:1000		2.5:1000	
Actual ratio per 1000	1:12550		1:35150		None		1:22000		1:2070		1:3380	

The WISN determined the number of health professionals required according to national practice standards in Namibia. The report made policy recommendations to the ministry, e. g. increasing the number of positions where there are critical shortages, redistributing existing staff, reviewing health facility classifications, promoting appropriate task-sharing, focusing on competency training, reviewing health information system indicators, and service priorities. MHSS announced in August 2019 that they want to fill 4612 positions in response to acute staff shortages.[63] Government has provided some funds for the recruitment of health personnel in the mid-year budget review (October 2019).

Ten times more doctors and pharmacists or pharmacist assistants would be needed to meet the required ratios. The WISN report regarded the number of five dentists in Erongo as adequate, even though the ratio is only 1:35,150. If the number of registered and enrolled nurses is combined the actual ratio is 1:1280, which is still far from the desired coverage of 1 per 400 persons (2.5:1000).

The number of healthcare facilities was 27 for 175,750 inhabitants, which translates to an actual ratio of 1:6500 compared to the desired target of 1:1000. The indicator proposes one ambulance per 20,000 inhabitants, i.e. nine for the region. The actual number was not given in the MHSS reports. The private healthcare figures are closer to the desired targets, but they were not reviewed because the facilities are not accessible to all.

Motivation of status: The MHSS strategic plan did not make provision for the required number of doctors and pharmacists to be recruited and the government's budget constraints did not allow significant progress to be made in filling the gaps. The indicators were therefore regarded as **Not Met** for 2018/2019.

[63] "Ministry of health wants 4000 posts filled" by Clemans Miyancwe in The Namibian of 20 August 2019

********** ********** ********** ********** ********** **********

Summary of performance over time: EQO 6

Total no. indicators assessed	7 (1 was **Not Applicable**)

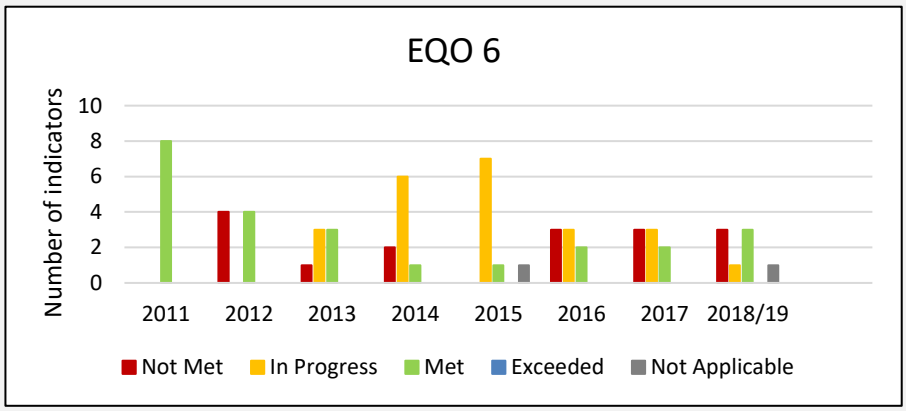
2018/2019	**Not Met**	**In Progress**	**Met**	**Exceeded**
Number of indicators in class	3	1	3	0
Percent of indicators in class	43%	0%	57%	0%

Overall performance: Four indicators were **Met** (57%):

- A public radiation dose assessment was completed and confirmed that the public dose was below the legal limit.
- The radiation dose to mine workers did not exceed the legal limit of 20 mSv/a.
- The incidence rate of occupational diseases did not increase.

The epidemiological study to find out if there is a link between work-related radiation exposure and cancer risk for uranium miners is nearing completion but still **In Progress**.

The three indicators measuring the ratio of healthcare professionals and facilities per number of patients were **Not Met** (43%) because the MHSS strategic plan for the next five years did not make provision for the required number of health service providers to be employed by 2020. The indicator requiring public dose assessments for each new mine was **Not Applicable** because no new mines opened in 2018/2019.



********** ********** ********** ********** ********** **********

EQO 7. Effect on Tourism

Aims of this EQO:

- **The natural beauty of the desert and its sense of place are not compromised unduly by uranium mining; and to identify ways of avoiding conflicts between the tourism industry and prospecting/mining, so that both industries can coexist in the Central Namib.**
- **Uranium mining does not prevent the public from visiting the usually accessible areas in the Central Namib for personal recreation and enjoyment; and to identify ways of avoiding conflicts between the need for public access and mining.**

The Namibian government regards tourism as one of the pillars of the national economy and a key strategic area to stimulate the economy during the recession the country currently faces. The total contribution of tourism to GDP was N$23,775 million or 13.8% of GDP. The tourism directly supported 23,000 jobs (3.2% of total employment) and the total contribution of the industry to job creation was 14.0% of total employment (98,000 jobs). Visitor exports generated N$4,370 million, while investment in tourism was N$4,426 million, 12.0% of total investment.[64]

Figure 28: Lagoon Cruises at Walvis Bay

The number of foreigners, including business travellers, arriving in Namibia increased from 1.6 million in 2018 to 1.6 million in 2019 (including business travel).[65] Most international holiday makers spend a few nights at the coast and take part in leisure activities, such as dolphin and seal cruises on the Walvis Bay lagoon (Figure 28)[66]. More and more cruise ships docking at Walvis Bay also made a welcome contribution to the economy of the Erongo Region.

[64] World Travel & Tourism Council (2018): Travel & Tourism Economic Impact 2018 - Namibia
[65] MEFT (2020): Namibia Tourism Statistic Report for 2019
[66] Photo by Catamaran Charters via Google

To ensure that visitors will be able to enjoy the natural beauty of the desert and its sense of place EQO 7 advises the uranium mining industry to reduce its visual impact and to identify ways of avoiding conflict between tourism and prospecting/mining, so that both industries can coexist in the Central Namib. Uranium mining should not prevent the public from visiting the usually accessible areas in the Central Namib for personal recreation and enjoyment. A compromise can be found between the public's need for access and the mines' requirement to safeguard their properties against unauthorised incursions.

Desired Outcome 7.1.	**Central Namib is accessible to the public (within the regulations of the National Parks).**			
Target 7.1.1.	**Uranium mining does not result in net loss of publicly accessible areas.**			
Indicator 7.1.1.1.	**Areas of importance for recreation that are not yet alienated by mining or prospecting are declared 'red flag' for prospecting or mining. These include: The Walvis-Swakop dunes, Messum Crater, Spitzkoppe (Gross and Klein), Brandberg, the Ugab, Swakop, Khan, and Kuiseb rivers, the coastal area between the Ugab River mouth and the tidal mud banks south of Sandwich Harbour (between lower mark and the main coastal road), the Welwitschia Drive and Park campsites.**			
Data Source	**NERMU/NUA**			
Status:	**Not Met**			

The SEA envisaged that areas of importance for recreation would be 'red flag', meaning no-go areas for mining and prospecting, while special conditions would be imposed in 'yellow flag' areas (Figure 29).[67] Some of the areas identified in this indicator are situated in national parks and thus fall under the ambit of the National Policy on Prospecting and Mining in Protected Areas (refer to EQO 8 for background on the policy). [68]

Table 19 indicates in which areas listed under this indicator mining and prospecting activities will be prohibited once the policy has been approved. Mining will not be allowed along the Kuiseb and Ugab rivers and along the entire coast. The policy will protect three yellow-flagged areas but does not give specially protected status to the Swakop and Khan rivers, Welwitschia drive, Moon landscape and park campsites (Figure 30 and Figure 31 in EQO 8**Error! Reference source not found.**).

None of the four red-flagged areas will be protected by the policy. The Messum Crater, Brandberg, Gross and Klein Spitzkoppe are located outside of national parks, but within the communal Tsiseb and #Gaingu conservancies. The Brandberg and the rock paintings at Spitzkoppe have however been declared national monuments (* in Table 19). MEFT DEA reported that the new Protected Areas and Wildlife Management Act will empower the minister to refuse environmental clearance for mining projects in sensitive tourism or biodiversity areas, even if they are not specified in the policy, such as the SEMP red and yellow-flagged areas.[69]

[67] MME (2010): Strategic Environmental Assessment for the Central Namib Uranium Rush. Ministry of Mines and Energy, Republic of Namibia, Windhoek
[68] Republic of Namibia (2017): National Policy on Prospecting and Mining in Protected Areas
[69] Pers. comm. MEFT, SEMP SC meeting April 2018

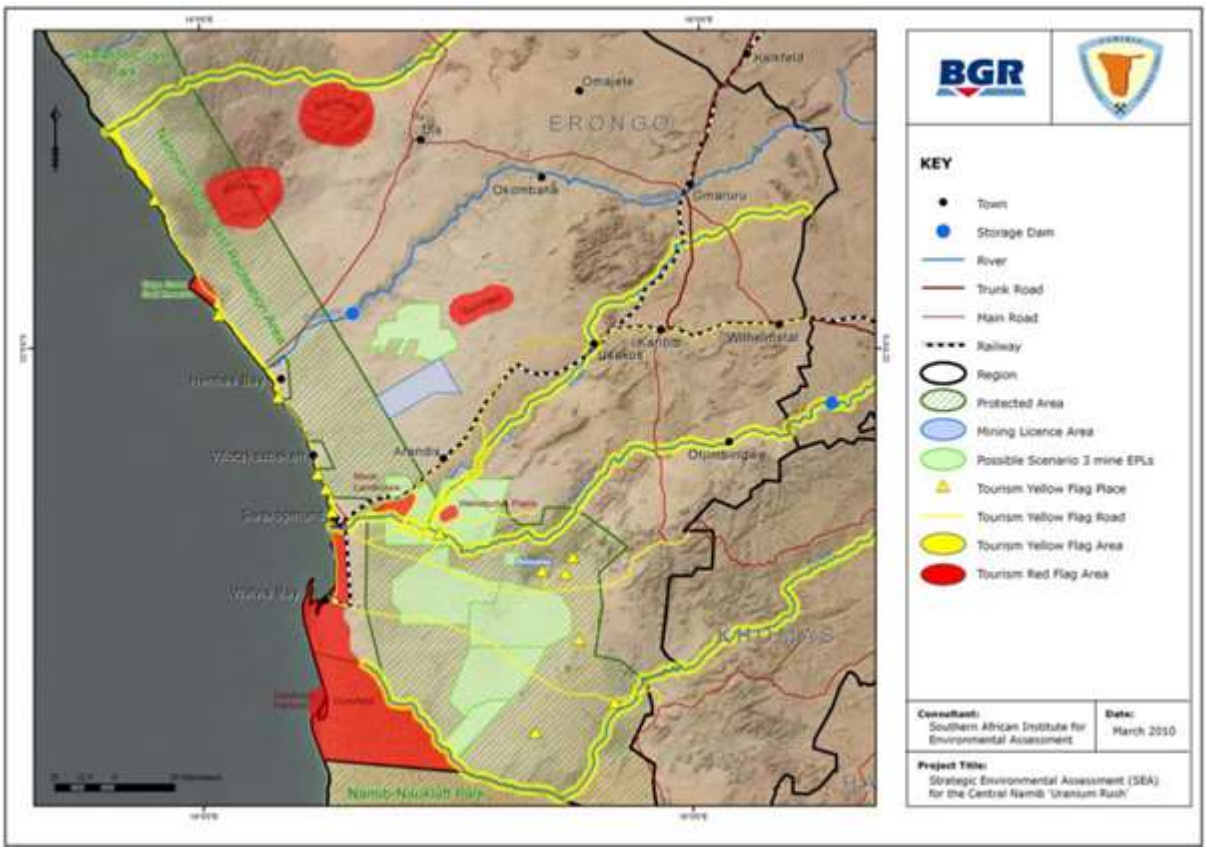


Figure 29: Red and Yellow Flag Tourism Areas

Table 19: Protection Status of Central Namib Tourism Hotspots

EQO 7 Tourism Area	Protected Area Name	Flag	Policy prohib-its mining?[70]
Walvis-Swakop dunes	Dorob National Park	Red	No
Messum Crater	Dorob, Tsiseb Conservancy	Red	No
Spitzkoppe (Gross and Klein)	#Gaingu Conservancy	Red	Partly*
Brandberg	Tsiseb Conservancy	Red	**Yes***
Ugab River	Dorob and Tsiseb	Yellow	**Yes**
Swakop/Khan River	Namib Naukluft NP	Yellow	No
Kuiseb River	Namib Naukluft, Dorob	Yellow	**Yes**
Coast from Ugab River to mud banks S of Sandwich Harbour	Namib Naukluft and Dorob National Parks	Yellow	**Yes**
Welwitschia drive	Namib Naukluft NP	Yellow	No
Moon landscape	Namib Naukluft NP	Yellow	No
NNNP campsites	Namib Naukluft NP	Yellow	No

[70] National Policy on Prospecting and Mining in Protected Areas

Motivation of status: The red-flagged recreation areas listed in the indicator and most of the yellow-flagged areas have been excluded from the final draft of the prospecting and mining in protected areas policy. It is not clear if areas outside of national parks can and will be protected by means of refusing environmental clearance. Seeing that some of the most important tourism areas have been omitted and the policy has not yet been gazetted the indicator was regarded as **Not Met**.

Indicator 7.1.1.2.	**EIAs for all new listed mineral developments address the issue of public access.**			
Data Source	**NERMU/NUA**			
Status:				

NUA reported that none of its member companies carried out EIAs for new mineral developments in 2018/2019.

Motivation of status: The indicator was **Not Applicable.**

Indicator 7.1.1.3.	**Mine closure plans and environmental contracts of exploration companies address public access after project closure.**			
Data Source	**NERMU/NUA**			
Status:			**Met**	

This indicator is different for operating mines and exploration companies. The latter can rehabilitate exploration drilling and trenching sites to restore public access without any restrictions and this has in fact happened as reported by Bannerman Mining Resources, Reptile Mineral Resources and Exploration, Rössing Uranium (Z20 area), Valencia Uranium and Zhonghe Resources (Namibia) Development. Swakop Uranium has addressed this requirement as per current approved EMP for exploration activities. Once work at exploration sites is completed, the roads are closed off and rehabilitated where required. Decommissioning of the Ida exploration camp was completed in 2019, while drilling activities took place during this period in SU EPL3138. Public access was never restricted during exploration activities apart from the road to the drill site and physical drill site.

Even though the full restoration of public access after closure of an operating mine would be ideal, the radioactive nature of the remaining mineral waste will generally require the public to be excluded from waste storage facilities and in the case of Rössing also from the open pit, which will remain unfilled. In terms of the IAEA standards for uranium mining waste management and international good practice, public access to an open pit backfilled with tailings would only be permitted if a tailings cover was in place and designed to reduce the radon emanation to such an extent that the radiation dose to a person living on the site would be below the public dose limit of 1 mSv/a above the natural background.

EQO 7 specifies that uranium mining should not prevent the public from visiting the usually accessible areas in the Central Namib for personal recreation and enjoyment. It should be noted that Rössing Uranium has not been accessible for more than 40 years and the Langer Heinrich Uranium area has been out of bounds since the Namib Naukluft Park was proclaimed in 1979. Even if sections of these

mine sites were to remain cordoned off after mine closure it would not result in a net loss in usually accessible areas (as per Target 7.1.1).

Motivation of status: Exploration companies have rehabilitated their sites and mining companies have made provision for public access to the extent that is feasible in their closure plans. The indicator was **Met**.

Desired Outcome 7.2.	**Uranium mining does not significantly reduce the visual attractiveness of the Central Namib.**			
Target 7.2.1.	**Direct and indirect visual scarring from uranium mining is avoided or kept within acceptable limits.**			
Indicator 7.2.1.1.	**Tour operators continue to regard areas such as the dunes, the coastline, Moon Landscape, Welwitschia Flats, Swakop and Khan River areas, and Spitzkoppe as a 'significant' component of their tour package.**			
Data Source	**CTAN, NERMU, Ministry of Environment and Tourism**			
Status:			**Met**	

Evidence presented in this section is based on a survey of the relevant operators' tour packages that were advertised on the internet. Trips along the coast, to the dunes, Moon Landscape, Bloedkoppie and Giant Welwitschia were offered by Living Desert Adventures, Charly's Desert Tours and Tommy's Tours, among others. Turnstone Tours and Swakop Tour Company conducted day trips to the Khan and Swakop River valleys. Sightseeing flights over the desert remained very popular too.

Motivation of status: Because the relevant tour operators were still offering trips to the listed attractions as a significant component of their tour packages in 2018/2019, the indicator was **Met.**

Indicator 7.2.1.2.	**Tourists' expectations are 'Met or Exceeded' more than 80% of the time in terms of their visual experience in the Central Namib.**			
Data Source	**NERMU/NUA**			
Status:				**Exceeded**

The SEMP steering committee decided in 2017 that the use of internet sites that allow tourists to give feedback on their travel experience was an appropriate data collection method for this indicator. The most widely used platform with thousands of reviews related to Namibia is TripAdvisor (www.tripadvisor.com). The site contained many reviews of the Erongo Region, which included self-drive and guided desert tours. To access the detailed reviews, one has to search each of the listed attractions or tour companies. The relevant options are listed in Table 20**Error! Not a valid bookmark self-reference.** together with the number of ratings in the various categories. There are more tour operators in the region, but not all of them were reviewed on TripAdvisor. Namibia Tours & Safaris operates in the region and country-wide, it was not possible to separate the large number of reviews. Another limitation is that only reviews in English could be evaluated, resulting in a total of 1205 reviews.

Overall there are very few negative comments regarding the tours offered into the landscapes around the uranium mines and exploration companies. The poor and terrible reviews only accounted for 1.9% of all the reviews, while the excellent and very good reviews accounted for 94% of the reviews. One reviewer wrote about the Moon Landscape: *"After 20 years I returned to the Moon landscape and was even more stunned than the 1st time. This is such a unique and amazing landscape. It kind of takes one's breath away."* People who gave "poor" or "terrible" ratings were mostly disappointed by their tour guides, the road conditions and the tour operator. Nobody mentioned negative impressions of the desert landscape.

Table 20: Tourist Ratings of Uranium Province Trips on TripAdvisor

Name	Excellent	Very good	Average	Poor	Terrible	Total
Welwitschia Plains	103	58	28	1	1	191
Moon Landscape	5	5	2	0	0	12
Living Desert Adventures	162	18	6	1	1	188
Charly's Desert Tours	85	17	2	1	1	106
Namibia Tours & Safaris	483	48	7	3	2	543
Desert Tracks Tours	25	2	0	1	0	28
Batis Birding Trips	89	5	0	2	2	98
Eagle Eye Aviation	25	5	2	3	4	39
Total	**977**	**158**	**47**	**12**	**11**	**1205**

TripAdvisor has a function that allows the reviews to be searched for key words. To find out about the impact of mining activities, the reviews were checked for the key-words "uranium", "mining", "mine" and "tracks". None of the recent reviews mentioned any of these key words, probably because there was not much drilling in the parts of the Namib-Naukluft Park that tourist visit. Some tours visited salt and mica mines and reviewers rated them as "amazing". Even looking at the possibility that tourists taking scenic flights, e.g. from Swakopmund to Sossusvlei, could easily see tracks across the desert from exploration activities did not turn up any negative reviews.

Motivation of status: Tourists did not publish critical reviews about uranium mining in 2018/2019. The excellent and very good ratings add up to 94% while the indicator only requires more than 80%. The indicator was again **Exceeded**.

Indicator 7.2.1.3.	**All EIAs for mine development address visual impacts and sense of place.**			
Data Source	**NERMU/NUA/MEFT**			
Status:			**Met**	

Swakop Uranium was the only company that prepared EIAs in 2018/2019. Two EIA amendment processes commenced in August 2017 and were completed in August 2018 when an application and scoping report (including EIA) were submitted to MEFT DEA. The EIA scoping report considered visual impacts and sense of place. MEFT approved the amendment for additional telecommunication antenna poles in April 2019 and issued another amendment to the current ECC in September 2019 for a waste incinerator, expansion of the waste rock dumps and the construction of a PV power plant.

Motivation of status: The indicator was **Met**.

Desired Outcome 7.3.	**Areas of significant natural beauty or sense of place are afforded proper protection (without undermining existing legal rights).**			
Target 7.3.1.	**Improved protection of listed areas.**			
Indicator 7.3.1.1.	**MME recognizes and respects 'red flag' status for areas regarded as being significantly beautiful.**			
Status:				

Indicator 7.3.1.2.	**MME recognizes and respects 'yellow flag' status for areas regarded as being scenically attractive.**			
Data Source	**NERMU/MME**			
Status:	**Not Met**			

Indicator 7.3.1.3.	**No new mining and prospecting licences are awarded in the red and yellow flag areas as identified by the SEA.**			
Data Source	**NERMU/NUA**			
Status:	**Not Met**			

These indicators refer to the red and yellow-flagged areas identified in the SEA report (Figure 29). It is expected that MME will be guided by the National Policy on Prospecting and Mining in Protected Areas that is still awaiting submission to Cabinet. However, as described under Indicator 7.1.1.1, the policy does not cover all the red and yellow-flagged areas in the SEA. In 2018, MME issued one new exclusive prospecting licence in a yellow-flagged area along the coast (refer to Indicator 10.1.1.3 for details).

Motivation of status: The new EPL covering yellow-flagged areas showed that MME did not recognise the need to protect scenic areas, which means that two of the three indicators were **Not Met.** The first indicator was **Not Applicable** because there were no applications for licences in red-flagged areas in 2018/2019.

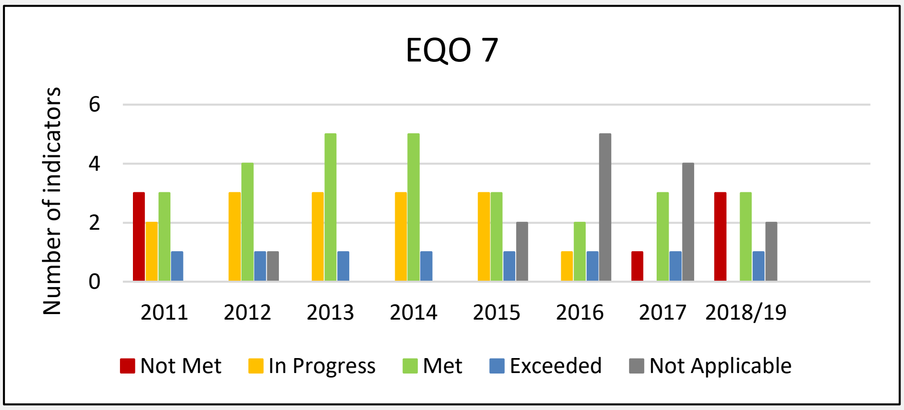
*************************** * * * * * * * * * * * * ***************************

Summary of performance over time: EQO 7

Total no. indicators assessed: 7 (2 were **Not Applicable**)

2018/2019	**Not Met**	**In Progress**	**Met**	**Exceeded**
Number of indicators in class	3	0	3	1
Percentage of indicators in class	43%	0%	43%	14%

Overall performance: The indicator gauging tourists' experience of the Namib was again **Exceeded** (14%) and two indicators were **Met** (43%), showing that tourism operators and mining industry can coexist in the Central Namib. To date, conflict between the need for public access and mining has been avoided and uranium mining did not prevent the public from visiting the usually accessible areas in the Central Namib for personal recreation. The indicators concerning the protection of tourism hotspots and MME not issuing licences in these areas were however **Not Met** (43%), highlighting the urgency for the National Policy on Prospecting and Mining in Protected Areas to be promulgated. Two indicators related to EIAs for new developments were **Not Applicable**.



*************************** * * * * * * * * * * * * ***************************

EQO 8. Ecological Integrity

Aims of this EQO: The ecological integrity and diversity of fauna and flora of the Central Namib is not compromised by uranium mining. Integrity in this case means that ecological processes are maintained, key habitats are protected, rare and endangered and endemic species are not threatened. All efforts are taken to avoid impacts to the Namib and where this is not possible, disturbed areas are rehabilitated and restored to function after mining/development.

Uranium mineralisation in Namibia tends to coincide with areas of high biodiversity, specifically the highly mineralised Damara orogenic belt that underlies sections of the Namib Naukluft National Park. Impacts of exploration and mining activities such as landscape alteration, soil and water contamination can be devastating to ecosystems and rare endemic species. The loss of critical habitats can affect endemic plant and animal species, which can in turn compromise the Namib's tourism potential. To counter this threat, MME and MEFT have drafted a National Policy on Prospecting and Mining in Protected Areas (see box on the next page).

The policy supports the aims of the SEMP with a strong policy framework to protect biodiversity, ecosystem services and cultural heritage from development impacts. The vision of the policy is to allow sustainable prospecting and mining in Namibia to support economic growth, whilst maintaining the integrity of ecosystems and natural resources, and avoiding degradation of highly sensitive areas of ecological, social or cultural heritage value. This is achieved through the identification of ecologically and culturally sensitive areas within Namibia's parks, including many of the red and yellow-flagged areas identified in the uranium province SEA.[71] Supportive measures to enhance the areas' protection include improved decision-making in the awarding of exploration and mining licences. The final draft of the policy was signed in early 2018. Approval of the policy by parliament will be a major step forward in meeting several targets and indicators of EQO 7, EQO 8 and EQO 10.

The assessment of EQO 8 indicators in annual SEMP reports offers the residents of the uranium province an opportunity to review and understand the cumulative impacts of uranium mining on the environment. Stakeholders can track the progress of actions taken to collectively address concerns about likely impacts on biodiversity including rare, endangered and endemic species, and other aspects of ecological integrity such as the protection of ecological processes and key habitats. Feedback from previous SEMP reports confirmed that the central Namib's conservation objective of species diversity and integration remained a priority, and that efforts by both the regulating authorities and mining companies were made to avoid, mitigate or rehabilitate mining impacts. Continued monitoring of the extent of direct impacts and the measures put in place to ensure persistence of all species remains relevant, even though the pace of new mine development has slowed down considerably since 2012.

It should be noted that biodiversity conservation in parts of the central Namib without uranium mining remains a challenge. Uncontrolled urban development along the coast continues to exert pressure on the natural environment, despite NACOMA's efforts to put in place a National Policy on Coastal Management.

[71] MME (2010): Strategic Environmental Assessment for the Central Namib Uranium Rush. Ministry of Mines and Energy, Republic of Namibia, Windhoek

Good to know – The Zonation of Namibia's Protected Areas

The National Policy on Prospecting and Mining in Protected Areas suggests the following zonation with different management interventions and permissible use of protected areas:

1. **Strict nature reserve**
   - Highly sensitive and high value conservation or biodiversity areas
   - Set aside for sensitive and low non-intrusive scientific study
   - No or minimal mechanized access, no permanent structures
2. **Wilderness area**
   - Sensitive ecosystems
   - High value 'sense of place'
   - Low impact usage
   - No or minimal mechanized access, no permanent structures
3. **National park**
   - Managed for conservation and controlled tourism
   - Mechanised access permitted
4. **Natural monument**
   - Conservation of specific outstanding features, including landscapes, geological and archaeological components, fossil deposits, areas of spiritual significance and areas of heritage value
5. **Habitat/species management area**
   - Protected areas mainly for conservation through active management intervention
   - To deliver benefits to people though within the scope of sustainable practices
6. **Protected landscape**
   - Relatively open access for public enjoyment
   - Generally higher intensity and lower regulatory areas
   - Add to welfare of local communities
7. **Managed resource protected areas**
   - Managed mainly for the sustainable use of natural resources, e.g. fishing
   - To ensure long-term protection and maintenance of biological diversity while providing at same time a sustained flow of natural products and services to meet local and national development needs, e.g. mining

The maps in the policy have not been updated to show which areas are classified as managed resource protected areas where mining is allowed. They do however indicate where prospecting and mining will not be allowed (see Figure 30 and Figure 31 on the next two pages).

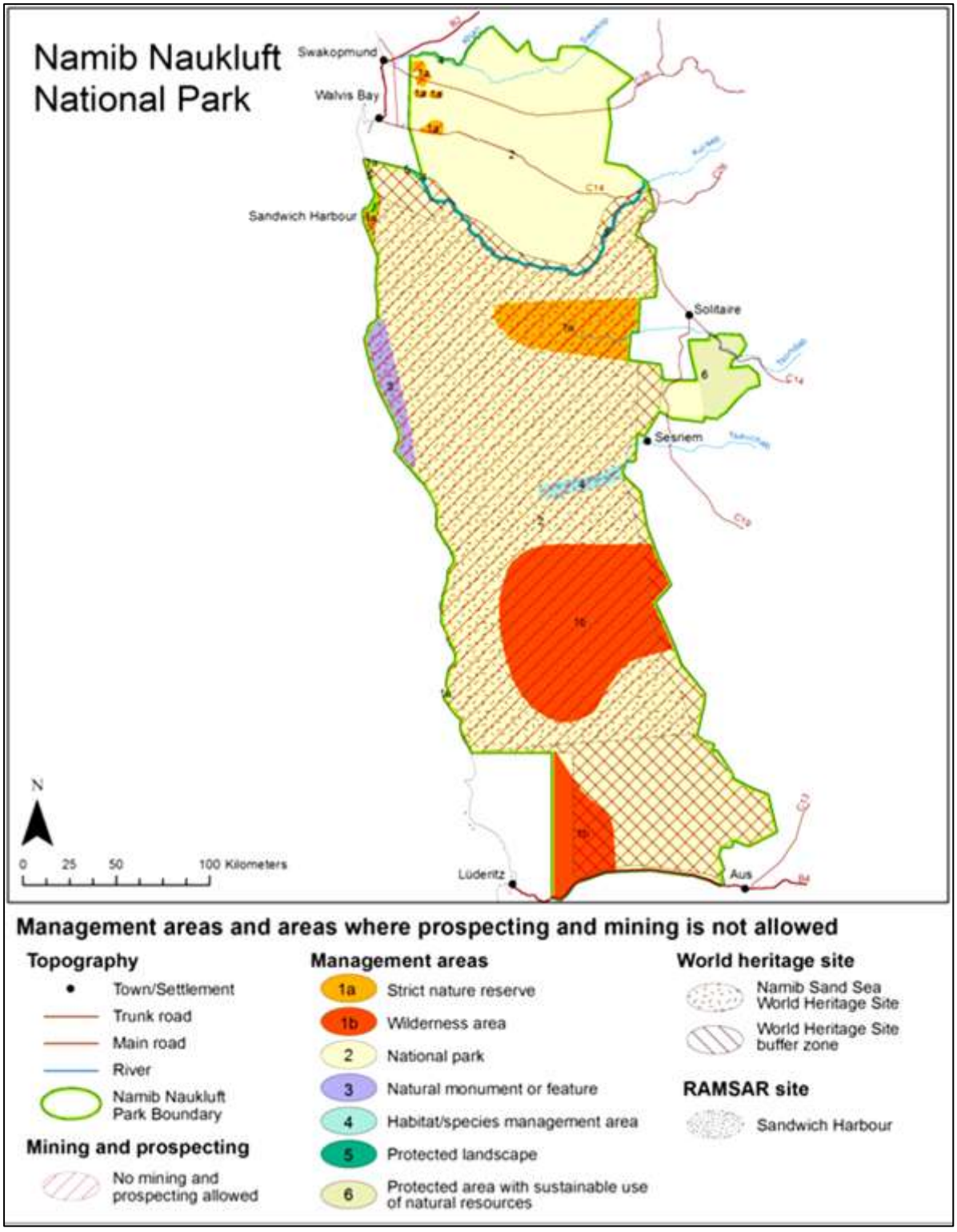


Figure 30: Zonation Map of the Namib Naukluft National Park

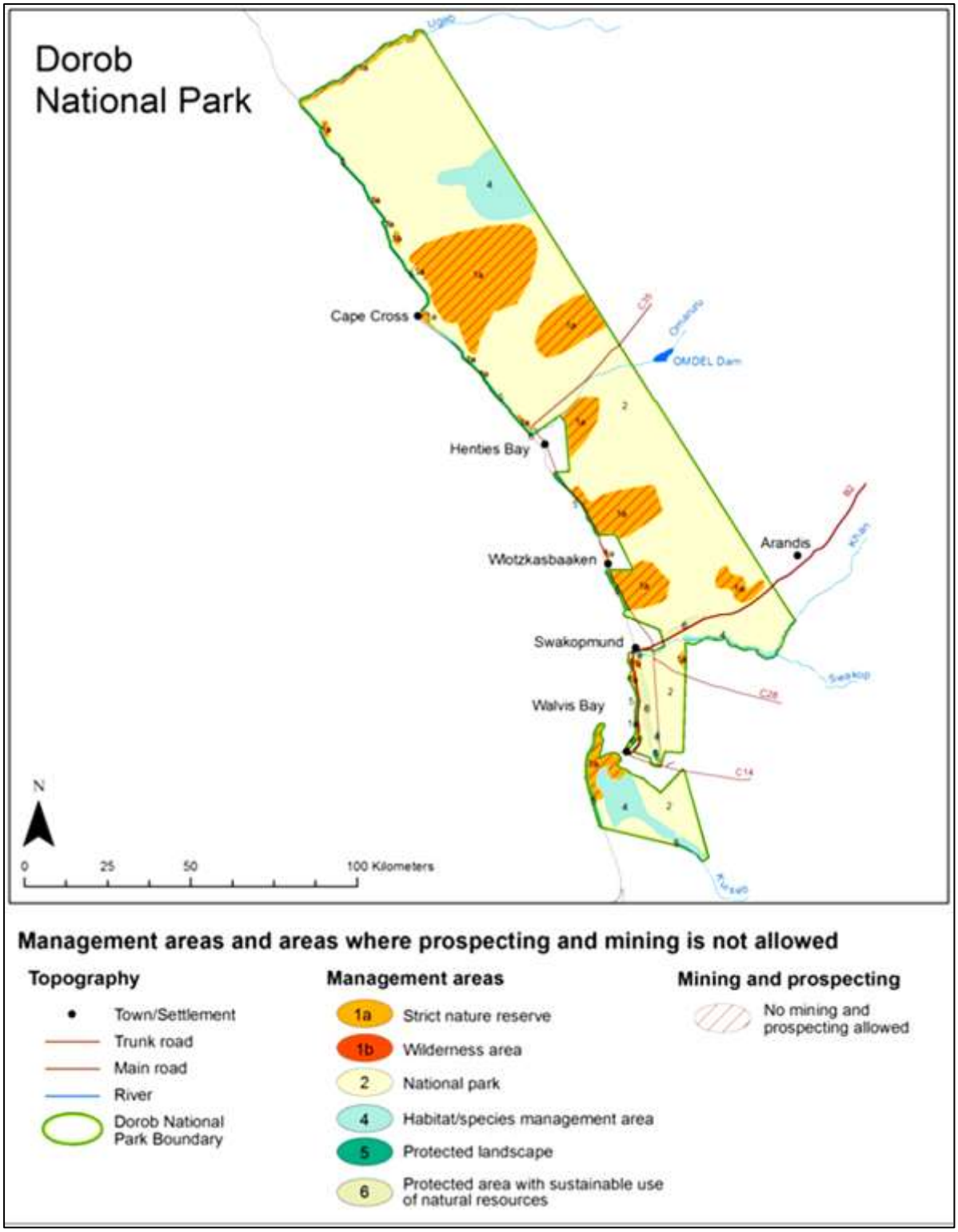


Figure 31: Zonation Map of the Dorob National Park

Desired Outcome 8.1.	**The ecological integrity of the Central Namib is maintained.**			
Target 8.1.1.	**The mining industry and associated service providers avoid impacts to biodiversity and ecosystems, and where impacts are unavoidable, minimisation, mitigation and/or restoration and offsetting of impacts is achieved.**			
Indicator 8.1.1.1.	**Important biodiversity areas [red or yellow flag areas] are taken into consideration when adjudicating prospecting and mining applications.**			
Data Source	**NERMU/NUA/MEFT**			
Status:	**Not Met**			

The SEA envisaged that red-flagged and yellow-flagged important biodiversity areas (Figure 32) would be indicated as 'no mining and prospecting allowed' in the National Policy on Prospecting and Mining in Protected Areas. The policy has however omitted the Welwitschia plains, the Omaruru, Swakop and Khan rivers, and numerous larger and smaller biodiversity hotspots within the northern Namib Naukluft National Park. Table 21 indicates in which areas mining and prospecting will be prohibited once the policy has been approved. No-mining areas include the Ugab River, the entire coastline between Ugab and Sandwich Harbour with some hotspots further inland (Figure 31), the Kuiseb River and delta, the lichen fields east of Wlotzkasbaken and three small sites along the C28 and C14 roads (Figure 30).

Table 21: Protection Status of Red-flagged Central Namib Biodiversity Hotspots

EQO 8 Biodiversity Area	Protected Area Name	Policy prohibits mining?
Brandberg	Tsiseb Conservancy	**Yes***
Messum Crater	Dorob, Tsiseb Conservancy	No
Ugab River	Dorob NP and Tsiseb	**Yes**
Coastal area between Ugab River and Sandwich Harbour	Namib Naukluft and Dorob National Parks	**Yes**
Omaruru River	Dorob National Park	No
Spitzkoppe (Gross and Klein)	#Gaingu Conservancy	Partly*
Wlotzkasbaken lichen fields	Dorob National Park	**Yes**
Swakop/Khan River	Namib Naukluft NP	No
Welwitschia Plains	Namib Naukluft NP	No
Langer Heinrich Mountain	Namib Naukluft NP	No
Several spots in Northern NNNP	Namib Naukluft NP	No
Kuiseb River and Delta	Namib Naukluft, Dorob	**Yes**

*Protected as national monuments

Even though some areas are not listed in the policy, MEFT:DEA reported that the Minister may have the power to refuse environmental clearance for mining projects in red- and yellow-flagged areas. Whether this protection will be effective will only become apparent once new EPLs and MLs are issued.

Motivation of status: Many of the red and yellow-flagged biodiversity areas listed in the indicator have been excluded from the Prospecting and Mining in Protected Areas Policy. It is not clear if areas outside of national parks can and will be protected by means of refusing environmental clearance. The indicator was therefore regarded as **Not Met**.

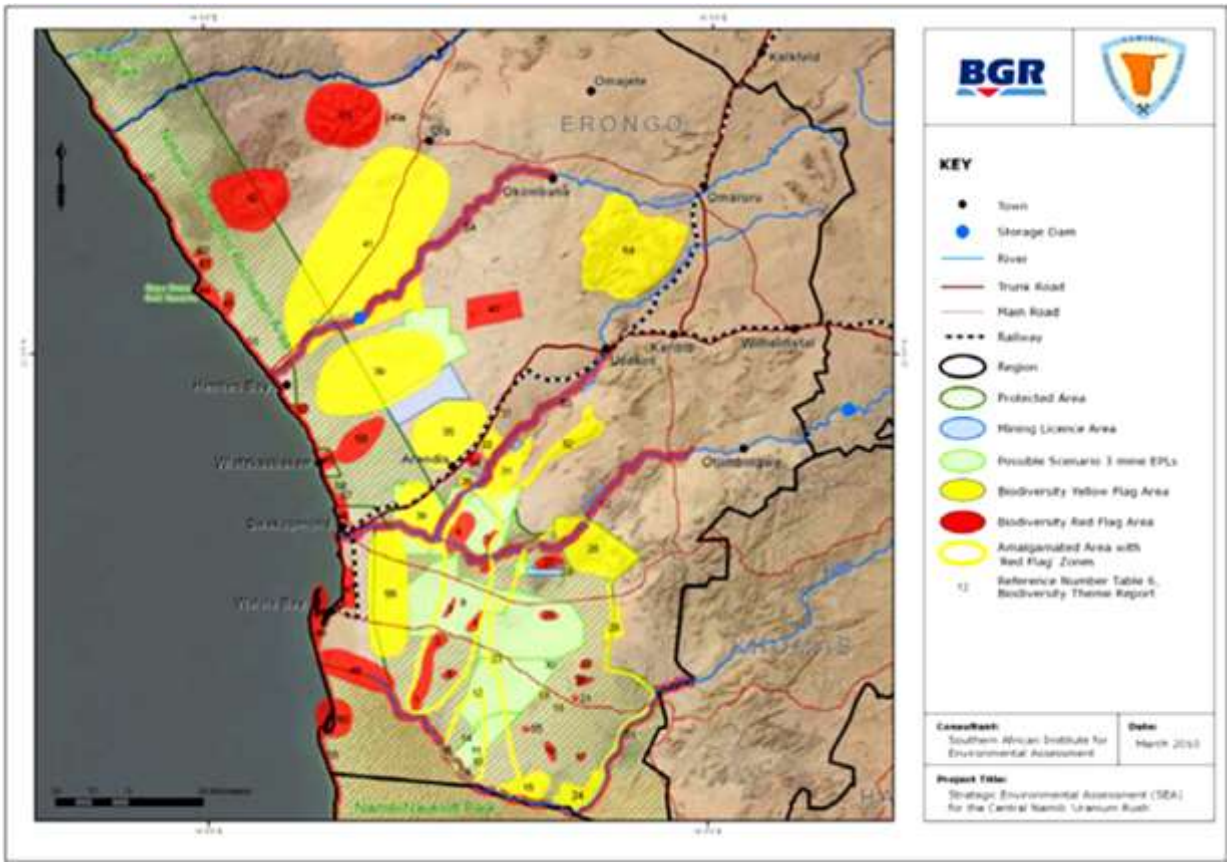


Figure 32: Red and Yellow Flag Biodiversity Areas

Indicator 8.1.1.2.	**The EIAs need to follow the mitigation hierarchy and incorporate off-sets as an option.**			
Data Source	**NERMU/NUA/MEFT**			
Status:			**Met**	

The EIA amendment process for Swakop Uranium's infrastructure mentioned under Indicator 7.2.1.3 followed the mandatory approach. The requirement to include offsets was not highlighted as necessary in the biodiversity specialist's study.

Motivation of status: Swakop Uranium's EIA amendments were the only studies carried out in 2018/2019. The indicator was **Met**.

Indicator 8.1.1.3.	**GRN keeps a record of all decisions made regarding prospecting and mining applications so that applications denied on biodiversity grounds are not awarded in the future, unless alternative approaches are adopted to avoid impact, mitigate or offset the impact.**
Data Source	**NERMU/NUA/MEFT**
Status:	

The Mining Directorate of the Ministry of Mines and Energy confirmed that records of decision are kept when licences are considered. The grounds for rejection are recorded in the minutes of Mining Advisory Council meetings.

Motivation of status: The indicator was **Not Applicable** because MME did not issue new mining licences for nuclear fuel minerals in 2018/2019.

Indicator 8.1.1.4.	**Mines have specific programmes and projects to actively avoid, mitigate, restore or offset their impacts, with impact avoidance predominating.**
Data Source	**NERMU/NUA**
Status:	**Met**

Operational mines indicated that avoidance is the preferred solution, but it is not always possible because the land surface must be disturbed to access and process the ore. As detailed below, mining companies have specific programmes to actively avoid, mitigate, restore their impacts and these are documented in their EIAs, EMPs and company-internal policies. Internal environmental monitoring and rehabilitation initiatives continued in 2018/2019 as part of the operating mines' EMP and ISO 14001 compliance requirements.

Langer Heinrich Uranium has a comprehensive biodiversity action plan that encompasses a detailed set of objectives, schedules, responsibilities, and deliverables for all different phases of the mine (from exploration through to closure). To manage water as an ecological driver the company monitors surface and ground water levels and quality. Langer Heinrich has established a plant nursery to determine the viability of transplanting indigenous species.

Rössing Uranium is guided by an environmental standard on biodiversity, rehabilitation and land use management that requires an internal environmental impact assessment to be conducted before a permit to disturb land is issued. It was through this permit system that plant species of conservation value such as *Adenia pechuelii*, *Commiphora* species and *Aloe namibensis* were rescued in 2019 and replanted at the Namib Botanical Garden in Swakopmund in collaboration with the Ministry of Agriculture, Water and Land Reform.

Swakop Uranium has a biodiversity and land use procedure and a comprehensive biodiversity action plan. The Biodiversity and Land Use Procedure addresses the identification and communication of No-go areas (i.e. biodiversity or archaeological sites) and empowers the Environmental Section to request a Land Clearance & Disturbance Application Form to be completed before any previously undisturbed

areas are disturbed. Pre-disturbance inspections to identify important fauna, flora and archaeological artefacts determine whether an activity may proceed or not. The company monitors natural storm-water catchments and drainage systems and stockpiles topsoil for restoration activities in future. The biodiversity action plan has identified a set of objectives, schedules, responsibilities, and deliverables for the life of the mine. The health and vigour of riparian vegetation in the Swakop and Khan rivers and around the mine is monitored in relation to surface and groundwater quality and water levels. The main sensitive area is the *Welwitschia mirabilis* field, which has been mapped and studied in cooperation with conservation partners. Disturbance of this area is avoided if possible.

Motivation of status: The indicator was **Met** because EIAs and EMPs of operational mines comply with the mitigation hierarchy as stipulated in Namibian legislation.

Indicator 8.1.1.5.	**Sensitive areas are identified by mines and disturbance of these areas is minimized.**			
Data Source	**NERMU/NUA**			
Status:			**Met**	

Sensitive areas are usually identified during the EIA process. All active uranium mines reported that they have mapped sensitive areas within their mining grants and have programmes in place to minimize the size of their footprint on sensitive biodiversity. Because mining companies cannot always avoid causing disturbances they make provision for the rehabilitation of disturbed areas (see EQO 12).

Companies use fencing or access control measures to minimize the disturbance of sensitive areas. Langer Heinrich Mine has stationed security personnel at the main entrance points to control access to the mine. Swakop Uranium has fenced off the mine site to keep mining activities and employees within the allowed area of disturbance. Security personnel are stationed at the main entrance points to manage access to the mine and the NNNP. Only the departments that work in exploration camps, linear infrastructure and monitoring sites are allowed into the park. The Environmental Section inspects the various off-site areas, investigates any unusual findings and reports them to the NNNP Warden and his team.

Motivation of status: The indicator was **Met** as all mines had mapped out sensitive habitats within their mining grants and were managing possible impacts according to the mitigation hierarchy.

Indicator 8.1.1.6.	**Infrastructure corridors are carefully planned to avoid ecologically sensitive areas, and demonstrate:** - **consideration of alternatives,** - **optimization of service provision; and** - **commitment to the 'green route'**			
Data Source	**NERMU/NUA**			
Status:				

Indicator 8.1.1.7.	**Mines share infrastructure as much as possible, thus minimizing infrastructure proliferation.**
Data Source	**NERMU/NUA**
Status:	

Indicator 8.1.1.8.	**Infrastructure planning and investment takes into account future demand, thus reducing the need for additional impacts.**
Data Source	**NERMU/NUA**
Status:	

There were no new large infrastructure projects in 2018/2019 that could have resulted in the establishment of infrastructure corridors. The proposed Swakop Uranium PV power plant will be placed in the Construction Camp close to the main on-site substation.

Motivation of status: The three infrastructure corridor indicators were **Not Applicable**.

Desired Outcome 8.2.	**Mining industry becomes a conservation partner.**
Target 8.2.1.	**Mines and associated industries support conservation efforts in Namibia.**
Indicator 8.2.1.1.	**Mining companies (particularly those operating in the NNP) partner with conservation organisations to effectively manage their biodiversity impacts (both direct and indirect).**
Data Source	**NERMU/NUA/MEFT**
Status:	**Met**

The mines' partnerships with Gobabeb, NERMU and the NamPower/NNF Strategic project have been running for many years and have started delivering valuable results. Langer Heinrich Uranium, for instance, has supported the Gobabeb GTRIP programme on restoration ecology, while Swakop Uranium appointed Gobabeb/NERMU to implement a five-year ecological monitoring and research programme that addresses EMP commitments regarding species of concern (i.e. Hartmann's zebra, *Welwitschia mirabilis*, gerbils, riverine vegetation, Husab sand lizard). Data collection for the project on riparian vegetation in the Ida Dome compartment of the Swakop and Khan rivers is still underway (see 'Good to know' box under Indicator 8.5.1.1).

Rössing Uranium and Swakop Uranium are working with NamPower to study of the interaction between power lines and birds (see "Birds and Power Lines" box in EQO 3). In 2018/2019, Swakop Uranium conducted monthly inspections on both internal and NamPower overhead power lines.

Langer Heinrich and Rössing Uranium are members of the Namibian Environment and Wildlife Society (NEWS). The society aims to 'conserve the natural environment of Namibia and promote protection, wise and sustainable use of natural resources and sustainable development'. It relies on membership fees to promote research, collect and disseminate information on the environment and advance community awareness and participation in sustainable development in Namibia.

Motivation of status: The indicator was **Met** because active mines maintained their partnership with conservation organisations within the limits imposed by the low uranium price.

Indicator 8.2.1.2.	**Mining companies commit to sustainable offset initiatives to ensure 'no net loss' to biodiversity as a result of their operations. This will involve partnering with long-term conservation partners (GRN, NGOs and communities).**			
Data Source	**NERMU/NUA/MEFT**			
Status:	**Not Met**			

Multinational mining companies have in recent years reconsidered their commitment to "no net loss", mostly due to difficulties experienced in the implementation of offsets. Conditions for offsets as specified by international organisations such as the Business & Biodiversity Offsets Programme turned out to be very onerous. Companies indicated they will consider biodiversity offsets in cases where rare biodiversity is lost, and restoration is not possible,[72] but in general they were guided by the Namibian Chamber of Environment (NCE) that has identified sustainable development offsets as more appropriate for Namibia, because the unsustainable use of natural resources is mainly driven by poverty. The Chamber of Mines has implemented two NCE-proposed offset projects in 2018/2019.

One of the objectives of the second National Biodiversity Strategy and Action Plan (NBSAP2) is the introduction of biodiversity offsets, especially in the mining industry. This has been unattainable to date because Namibia does not have a legal framework for the protection of like-for-like biodiversity offsets. Mines on private land could establish offsets by purchasing adjacent farms with similar biodiversity, but most uranium mines and projects are on state land. Given the fact that mining is permitted in protected areas, it would not make sense for the current ML holders to spend money on biodiversity offsets in areas that may be disturbed by other companies in future. The most important prerequisite for offsets is legislation that will enforce the protection of identified conservation or offset areas, even if there are mineral resources underground. Draft legislation for offsets is included in the Protected Areas and Wildlife Management Bill of 2017, though it does not address the ongoing protection of offset areas. Participants of stakeholder workshops conducted by MEFT's consultants in 2018 suggested that biodiversity offsets should be added to the current revision of the Environmental Management Act. The proponents were probably not aware of the provisions in the Protected Areas and Wildlife Management Bill.

Motivation of status: Some progress was made in 2017 and 2018 when options for the regulation of offsets were proposed. The indicator was however classified as **Not Met** because these initiatives came to a halt in 2019 and the draft legislation did not address the ongoing protection of offset areas. The loss of momentum alone would be enough to rule out an 'In Progress' rating.

[72] NUA input to 2018/2019 SEMP report

Indicator 8.2.1.3.	**Additional conservation projects are supported (e.g. wetland bird counts, wildlife surveys, Namib Bird Route, coastal management, research, public awareness) as part of the companies' social responsibility programmes.**			
Data Source	**NERMU/NUA/MEFT**			
Status:			**Met**	

Langer Heinrich Uranium continued its cooperation with the Desert Research Foundation of Namibia's in-service training programme for graduates. The company contributed to the Gobabeb Research and Training Internship Programme (GTRIP), which supports the development of scientific research skills of young environmental professionals through a five-month field-based internship programme facilitated at the Gobabeb Research and Training Centre with practical work being carried out at the mine. It aims to build capacity in the sustainable management of Namibia's natural resources.

Rössing Uranium hosted the annual birdwatching day for the 18th time in 2019. The bird-watching event is celebrated as part of the United Nations International Day for Biological Diversity and World Environment Day. In 2019, a total of 95 learners and teachers from local schools experienced the unique birdlife and learned about its role as an indicator of ecosystem health. Rössing worked closely with the Coastal Environmental Trust of Namibia to promote coastal biodiversity conservation at the event.

Swakop Uranium organised cleaning campaigns on National Clean-Up Days and raised awareness on waste management and recycling; in 2018 Arandis and surrounding areas were cleaned in cooperation with the Arandis Town Council and in 2019 Swakop Uranium worked together with the Swakopmund Secondary School (SSS).

Bannerman Mining Resources continued its partnership with TOSCO (Tourism Supporting Conservation), the Hospitality Association of Namibia and supported the joint venture between the GIZ and the Namibia Nature Foundation to assist the small miners near the Brandberg in terms of environmental awareness and closer contact with the tourism industry.

Motivation of status: The indicator was **Met** by supporting various additional conservation projects**.**

Indicator 8.2.1.4.	**Protection and management of key biodiversity offset areas is supported (e.g. NW Kunene, Messum, Spitzkoppe, Brandberg and other special areas in Namibia).**			
Data Source	**NERMU/NUA/MEFT**			
Status:				

This indicator cannot be evaluated until Government has provided a legal framework for the protection and management of biodiversity offset areas. It also still needs to be decided whether the areas listed above will emerge as suitable key biodiversity offset areas.

Motivation of status: The indicator was **Not Applicable**.

Desired Outcome 8.3.	**No species become extinct because of uranium mining.**			
Target 8.3.1.	**Authorisation to mine is denied if the extinction of a species is likely.**			
Indicator 8.3.1.1.	**All EIAs and EMPs must consider national extinction possibility.**			
Data Source	**NERMU/NUA/MEFT**			
Status:				

Indicator 8.3.1.2.	**Resources for a reasonable investigation are made available to manage species at risk of extinction**			
Data Source	**NERMU/NUA/MEFT**			
Status:				

There were no new EIAs for projects that could affect species extinction conducted during the review period and thus no assessment of these two indicators could be made.

Motivation of status: The indicators were **Not Applicable**.

Desired Outcome 8.4.	**No secondary impacts occur**			
Target 8.4.1.	**No secondary impacts occur**			
Indicator 8.4.1.1.	**Off-road driving, poaching, illegal camping, littering by mine personnel, are explicitly prevented by mining and exploration personnel and their contractors.**			
Data Source	**NERMU/NUA/MEFT**			
Status:			**Met**	

At a meeting between MEFT officials and the uranium industry the Chief Control Warden for the Central Parks pointed out that a mining company assisted MEFT with the installation of a radio system to help combat poaching in the Namib Naukluft Park, which had increased severely since the opening of Langer Heinrich Mine. [73] The Chief Control Warden reported that approximately one animal per week was poached, mostly oryx or zebra, and thus asked for closer support from the mines, e.g. by installing and maintaining more radio stations in the park. The highest death rate for animals was however due to collisions with speeding vehicles and mines were requested to enforce speed limits more rigorously.

[73] Minutes of meeting held on 4 July 2019 at the Namibian Uranium Institute

Mining and exploration operating in the park reported that they continued their efforts to prevent secondary impacts in 2018/2019 by educating and controlling their staff and contractors. Bannerman Mining Resources have demarcated the roads leading to their Demonstration Plant and provided turnaround points every 400 metres to restrict the environmental footprint and prevent illegal off-road driving. Contractors and employees are inducted in the rules of the National Park and no night work is allowed. The company has continued to grade a section of the park road along the Moon Landscape towards the Big Welwitschia.

Langer Heinrich Uranium and Swakop Uranium inform all employees, visitors, contractors, suppliers and service providers about the park rules and distribute copies to everybody. Environmental awareness training conducted during the period under review covered topics such as the NNNP permit, park rules and conditions, and the avoidance of secondary impacts on sensitive biodiversity areas. The induction also includes topics such as correct waste management practices, driving behaviour (including speed limits) and protection of local fauna and flora. Stringent access control measures are in place with daily security checks being carried out. Off-road driving is prohibited at all mines and exploration sites.

Reptile Mineral Resources and Exploration enforces stringent rules and controls of their exploration activities in the NNNP. All employees and visitors receive inductions in the NNNP rules before they may start any kind of exploration activities. Drill sites and tracks are marked beforehand to prevent – as much as possible - disturbance to plants, nesting birds, known archaeological sites, and areas with gypsum crusts that are difficult to rehabilitate. Company staff report vehicle, motorcycle and fat bike tracks found (and not made by the company) and any other extraordinary disturbance, e.g. poaching incidents to the NNNP warden.

Motivation of status: The indicator requires that secondary impacts by mine personnel and contractors are prevented. Companies operating within the national park confirmed that they were doing everything possible to avoid secondary impacts. The Ministry of Environment, Forestry and Tourism did not identify any incidents directly caused to mines in 2018/2019. The indicator was **Met.**

Indicator 8.4.1.2.	**Improved vigilance and visibility of law enforcement personnel, with structured support from civil society (e.g. Honorary Wardens) reduces park/conservation transgressions.**			
Data Source	**NERMU/NUA/MEFT**			
Status:		**In progress**		

The Ministry of Environment and Tourism reported at the meeting mentioned above that they were doing what they could but were hampered by a shortage of resources. The appointment of honorary wardens was not expected to help; when this concept was used in the past it was found that honorary wardens misused their position. The Protected Areas and Wildlife Management Bill makes provision for the appointment of honorary conservation officers: [74]

144 (1) The Minister may in writing delegate any power conferred upon him or her by or under this Act, except the powers to make regulations and to hear reviews, to any officer in the Ministry or to any officer of the Ministry or any honorary conservation officer or a conservancy member.

[74] MEFT: Protected Areas and Wildlife Management Bill, 31 August 2017

Motivation of status: The indicator was **In Progress** because the Ministry of Environment, Forestry and Tourism asked the mines in the NNNP for more support, while the Protected Areas and Wildlife Management Bill that makes provision for the appointment of honorary conservation officers is still to be enacted.

Desired Outcome 8.5.	**Water quality and quantity does not decrease to the extent that it negatively affects biodiversity.**			
Target 8.5.1.	**Water table levels, and water quality standards are described, and ephemeral river ecosystems are monitored to ensure that these standards are not compromised.**			
Indicator 8.5.1.1.	**Regular monitoring of indicator species in relevant ephemeral rivers is in place to detect any impacts on wetlands, phreatophytes and riparian vegetation.**			
Data Source	**NERMU/NUA/MEFT**			
Status:			**Met**	

Rössing Uranium has been monitoring trees at selected transects along the Khan River for over 30 years and developed guidelines for groundwater extraction that will protect the vegetation (see box under EQO 4). The surveys in 2018/2019 did not detect any unusual deterioration in the condition of the riparian flora. The water table was relatively stable because the pumping rates were much lower than the permitted quota.

Swakop Uranium has appointed researchers linked to the Gobabeb Desert Research Station to develop a long-term ecological monitoring and research programme for Husab mine, which includes a study of riverine tree health, although the company does not pump groundwater from its production boreholes in the Swakop River (see box below). Regular field campaigns were carried out to measure photosynthetic efficiency, water potential and growth rates.[75] The study aims to understand if and how groundwater abstraction affects tree mortality, and how the impact may be monitored to timeously detect and prevent damage to the riparian forests. In terms of this indicator the study can be regarded as "regular monitoring".

Motivation of status: The indicator was **Met** because surveys were conducted in 2018/2019 to define the impact of water abstraction on the riverine vegetation in the Khan and Swakop rivers.

[75] NUA input to 2018/2018 SEMP report

Good to know – How to Evaluate Water Stress in Trees

Woodlands in the central Namib's rivers are the most diverse and productive habitats in the desert. These woodlands depend on flood-replenished groundwater in the alluvial aquifers that underlie the dry riverbeds. The abstraction of groundwater for farming or industrial use threatens the survival of the ecosystem as both people and trees draw water from limited resources. There have been many anecdotal observations, but few properly designed scientific studies to find out if trees die at specific pumping rates. Gobabeb's Namib Ecological Restoration and Monitoring (NERMU) team is working on a project to improve the theoretical understanding of tree health factors and develop a long-term monitoring programme.

NERMU conducted an initial monitoring programme over three years to estimate the water status of three tree species, namely ana trees, camel thorn and prosopis, in the Khan, Swakop and Kuiseb rivers. This is supplemented by a PhD study to determine at which water stress levels trees are irreversibly damaged. The study has four components:

1. Determine the relationship between tree mortalities and groundwater abstraction.
2. Determine the standard values that represent a healthy tree against which monitored trees can be evaluated.
3. Determine the threshold values that represent a dying tree.
4. Monitor the health of trees around boreholes for potential groundwater abstraction.

Chlorophyll alpha fluorescence and stem water potential are measured at night (photos by Elbé Becker)

The selected tree health parameters are chlorophyll alpha fluorescence (an indicator of photosynthetic efficiency), stem water potential, stomatal conductance, leaf and flower phenology and qualitative condition scores. These are determined under different environmental conditions, in summer and winter seasons and at various times of the day. A large group of 315 trees is monitored twice a year, while a smaller group of 15 trees is measured every two months for three days at four-hourly intervals.

Indicator 8.5.1.2.	**Results from monitoring are fed back to regulators and impacting companies so that negative impacts on riverine vegetation, springs and pans can be dealt with appropriately.**			
Data Source	**NERMU/NUA/MEFT**			
Status:			**Met**	

As mentioned under Indicator 8.5.1.1, Rössing Uranium and Swakop Uranium have monitoring programmes in place to determine the effects of groundwater abstraction on the riverine vegetation and report the results to MAWLR. Feedback to regulators (MAWLR) also takes place in form of groundwater level monitoring by mines that have an abstraction permit as reported in EQO 4, Indicator 4.2.1.2. Groundwater abstraction permits require that permit holders send monthly returns stating abstraction volumes and water levels to DWA. The mining companies submitted these returns in 2018/2019. [76]

Motivation of status: This indicator was **Met** because regulators received feedback in 2018/2019 and water level monitoring for Indicator 4.2.1.2 did not reveal any abnormal changes; remedial action was therefore not required.

Target 8.5.2.	**Uranium mining does not compromise surface and groundwater availability.**			
Indicator 8.5.2.1.	**No unusual loss of wetland and riparian vegetation.**			
Data Source	**NERMU/NUA/MEFT**			
Status:		**In Progress**		

Indicator 8.5.2.2.	**No unusual loss of phreatophytes (deep-rooted plants dependent on water from the saturated zone of groundwater).**			
Data Source	**NERMU/NUA/MEFT**			
Status:		**In Progress**		

These two indicators are addressed by the study on the vitality of large trees in the Swakop and Khan rivers mentioned under 8.5.1.1. that made good progress in 2018/2019. The camelthorn (*Acacia erioloba*) is the most important phreatophyte (deep-rooted plant) in the ephemeral rivers and is therefore a good indicator of whether deep-rooted plants are affected by groundwater pumping. The groundwater levels in 2018/2019 as shown in EQO 4 were well within the documented rooting depths of the camelthorn, which can reach more than 50 metres.[77] The results of the ongoing study will hopefully

[76] Pers. comm. DWA, 2019

[77] Schachtschneider, K. (2010) Water sourcing by riparian trees along ephemeral riverbeds. Unpublished PhD thesis, University of Cape Town

show if there has been any unusual loss of wetland and riparian vegetation and identify the contributing factors.

Motivation of status: Seeing that results are expected in the next few years the indicators were rated **In Progress**.

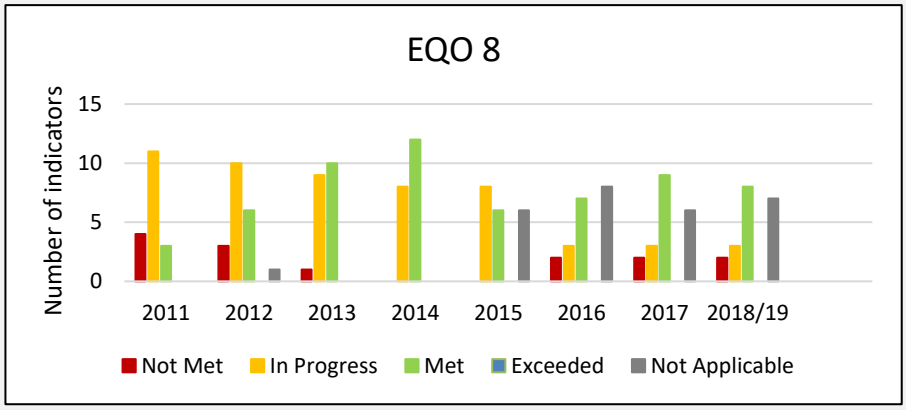
********** ********** ********** **********

Summary of performance over time: EQO 8

Total no. indicators assessed: 13 (7 were **Not Applicable**)

2018/2019	Not Met	In Progress	Met	Exceeded
Number of indicators in class	2	3	8	0
Percent of indicators in class	15%	23%	62%	0%

Overall performance: Eight of the thirteen Ecological Integrity (EQO 8) indicators were **Met** in 2018/2019 (62%). It was confirmed that mines use the mitigation hierarchy to actively avoid, mitigate or restore the affected environment, specifically sensitive areas within the mining licence areas. Mining companies have also partnered with conservation organisations and supported additional conservation projects, as far as currently possible. The impact of groundwater abstraction on the ephemeral rivers was monitored. A study to understand the impact of water abstraction and to develop a regular monitoring programme for riverine vegetation and wetlands is underway and MEFT's efforts to reduce secondary impacts and improve law enforcement in the parks with the support of concerned stakeholders also remained **In Progress** (23%). Two indicators concerning the protection of important biodiversity areas and the implementation of biodiversity offsets were **Not Met** (15%) due to the absence of enabling legislation. Seven indicators were **Not Applicable** because the relevant activities did not take place in 2018/2019.



********** ********** ********** **********

EQO 9. Education

Aims of this EQO: In the Erongo Learning Region, people continue to have affordable and improved access to basic, secondary and tertiary education, which enables them to develop and improve skills and take advantage of economic opportunities.

The education EQO keeps track of developments in the Erongo region's education sector to ensure that schools are not over-crowded and that school leavers are well educated so that they can find employment, either immediately after finishing school or when they have obtained a tertiary qualification. The Ministry of Education, Arts and Culture (MEAC) has introduced free primary education in 2013 and free secondary education in 2016 to provide "affordable access" to education. Since then, insufficient financing has hampered the performance of the sector and the quality of education seems to have suffered. The aims of the EQO will not be achieved unless the government is able to provide enough resources to sustain the quality of free education. While much of the information for EQO 9 was sourced from the Ministry of Education, the mining industry contributed the indicators related to bursaries and skills development programmes for employees.

Desired Outcome 9.1.	**Improved quality of school education.**			
Target 9.1.1.	**Improved results.**			
Indicator 9.1.1.1.	**Erongo Region Grade 10 and 12 results improve over time compared to other regions.**			
Data Source	**MEAC**			
Status:	**Not Met**			

The Erongo region used to be among the top performers in Grade 10 and 12 exams but has continuously deteriorated since 2010. Results for 2019 from the Ministry of Education, Art and Culture (MEAC) database showed that the Grade 12 (NSSC-O) results for the Erongo region were similar to the other 13 regions (Figure 33). The Grade 10 (JSE) results were not available per region.

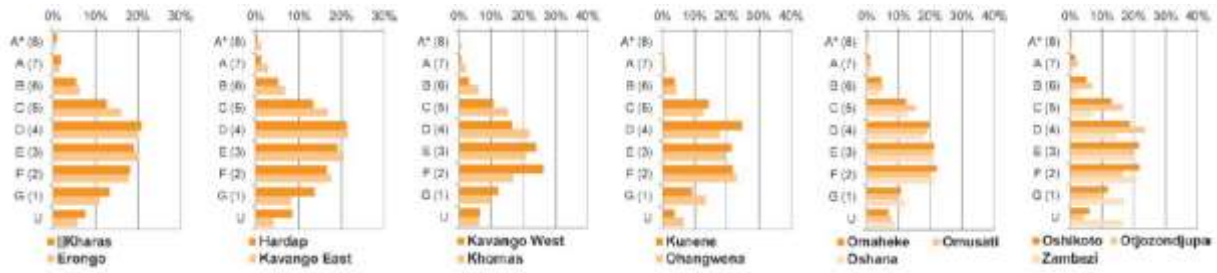


Figure 33: Grade 12 Examinations Results per Region in 2019

Motivation of status: This indicator was **Not Met** because the Erongo region's results did not achieve better results than the other regions.

Good to know – Mines support education

Uranium mining companies support education as part of their social responsibility programmes and by paying VET levies. Langer Heinrich Uranium has a formal social performance management plan that is consistent with ISO standards 14001/26000 and with Paladin Energy's policy. The core community investment areas focus specifically on the Erongo region and include education and skills development, environmental management and health promotion, sports and nutrition. In 2018, the company supported the Mondesa Youth Opportunities Trust, the annual mathematics congress, regional teachers' awards and the Etoto West primary school in the Kunene region. Langer Heinrich also supported the Promiseland Trust Feeding Scheme that supplies daily meals to approximately 250 disadvantaged children.

Rössing Uranium implements numerous education initiatives through the Rössing Foundation. The foundation operates three English, Mathematics and Science centres at Arandis, Swakopmund and Ondangwa, as well as a mobile laboratory that travels around the country. Other initiatives include teachers' and learners' educational support programmes, vacation classes and library services to the community.

The Rössing Foundation Centre in Tamariskia, Swakopmund (photo by RUL)

Swakop Uranium supported education development programmes at the Etunda Primary School in Northern Namibia and provided exam readiness kits to grade 12 learners of SSS. The Erongo Directorate of Education received funds towards the Annual Spring School that prepares grade 10 learners for external exams. A total of 1200 used beds, matrasses and blankets were donated to various schools in the country including the Zambezi, //Kharas and Tsumkwe regions.

Among the exploration companies, Bannerman Mining Resources continued its programme of donating school uniforms to primary schools. In 2018 this programme was extended to the San community in the Omaheke Region. This programme has benefited over 2300 needy primary school children to date. BMR also assists the Erongo Development Foundation to provide opportunities for under-privileged school leavers who want to obtain a trade certificate. In 2018 two students were supported at the Namibian Institute of Mining and Technology (NIMT).

Reptile Mineral Resources and Exploration focussed on early childhood development, as well as empowering people and communities through sports – and as such supporting aspirations and goals set out in the country's NDP5. The company repaired and upgraded the ablution facilities at the Hanganeni primary school located in Mondesa, Swakopmund in 2018 and supported Mondesa Youth Opportunities in 2019. They also donated boxing equipment and upgraded the gym of the local Albertus Tsamaseb Boxing Academy, which significantly improved the training conditions of its boxers. The Nova JV donated equipment to the Gobabeb Desert Research Foundation that will be used by a Namibian student to research human-wildlife conflict in the Namib Desert.

Indicator 9.1.1.2.	Teacher to learner ratio at GRN schools in Arandis, Swakopmund and Walvis Bay is better than the national average.
Data Source	MEAC
Status:	Not Met

Table 22 shows the learner to teacher ratios in each region of Namibia that were determined at the beginning of the 2020 school year.[78] A similar picture emerged for 2019 when the ratio was 26 learners per teacher in the Erongo Region. The latest ratio of 27 learners per teacher was slightly higher than the national average of 26 learners per teacher. A comparison of the ratios from previous reports shows no improvement in the Erongo Region. Separate figures for Erongo schools were not available.

Table 22: Teacher to Learner Ratios per Region in 2019

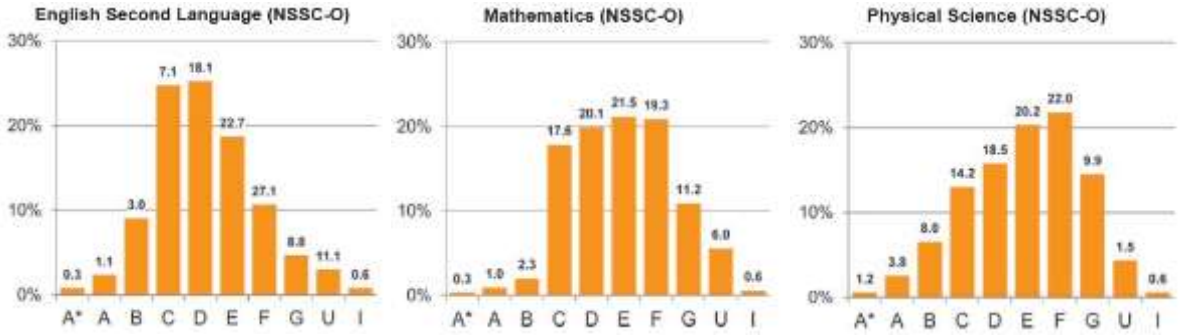
Region	Learners	Teachers	Ratio	Region	Learners	Teachers	Ratio
//Kharas	23573	983	24	Ohangwena	112358	4149	27
Erongo	**48341**	**1799**	27	Omaheke	25101	887	28
Hardap	27118	1014	27	Omusati	102823	4160	25
Kavango East	68284	2164	32	Oshana	56503	2387	24
Kavango West	45804	1631	28	Oshikoto	74597	3050	24
Khomas	94994	3921	24	Otjozondjupa	50560	1743	29
Kunene	32194	1149	28	Zambezi	41829	1729	24
Total					**804079**	**30766**	**26**

Motivation of status: The indicator was **Not Met** because the 2019 and 2020 learner to teacher ratios in the Erongo region remained worse than the national average.

Indicator 9.1.1.3.	National examination results in Grade 10 and 12 in maths, English and science are a D or better for more than 50% of learners from GRN schools.
Data Source	MEAC
Status:	Not Met

The results for English, maths and science in the end of 2019 examinations are displayed graphically in Figure 33 for 2019. [79] These statistics are for the entire country and all types of schools combined.

[78] Ministry of Education, Arts and Culture (2020): Fifteenth School Day Report for 2020 produced by the Education Management Information System (EMIS) division. Published on the UNICEF website www.unicef.org
[79] MEAC: EMIS Education Statistics 2019



Motivation of status: The indicator requires more than 50% of the learners to achieve at least a D symbol in English, physical science and mathematics in their NSSC examinations. None of the three results came close to meeting the indicator, therefore is was **Not Met**.

Indicator 9.1.1.4.	**Region improves performance in reading and mathematics.**			
Data Source	**MEAC**			
Status:	**Not Met**			

NNSAT results that were used to rate this indicator were suspended in 2016 due to the curriculum reform and not yet re-instated. Based on the Grade 10 and Grade 12 results reported in Indicator 9.1.1.3, it is unlikely that the Erongo Region has improved its performance in reading and mathematics.

Motivation of status: Grade 10 and Grade 12 results in mathematics and English (as an indication for reading skills) were below the target of 50% D and higher in 2019. The indicator was **Not Met**.

Desired Outcome 9.2.	**Increased availability of technical skills in Erongo.**			
Target 9.2.1.	**More qualified artisans, technicians, geologists, accountants and engineers.**			
Indicator 9.2.1.1.	**Increasing number of graduates from NIMT, NUST and UNAM.**			
Data Source	**SEMP Office/UNAM/NUST/VTC/NIMT**			
Status:			**Met**	

Qualified artisans, technicians, geologists and engineers are needed in the uranium mining industry. Indicator 9.2.1.1 envisages that an increasing number of graduates from the institutions listed above will ensure that the necessary skills are available to the mining industry. Since 2011, UNAM and NUST have each produced around 2500-3000 graduates per annum. At NIMT around 300-500 artisans complete their training every year. The mining industry supports almost 100 NIMT trainees every year through bursaries and job attachments. The number of graduates and qualified artisans was more than sufficient to meet the industry's needs. It is probably time to move away from measuring quantity to assessing whether the education at these institutions fulfils the requirements in terms of quality.

Motivation of status: The indicator was **Met** because there was a long-term increase in the number of graduates from the relevant institutions over the last ten years.

Indicator 9.2.1.2.	**Every mine has or funds a skills development programme for employees (3% of wage cost).**
Data Source	**NUA**
Status:	**Not Met**

This indicator only applies to operating mines (Langer Heinrich Uranium, Rössing Uranium and Swakop Uranium). Langer Heinrich's percentage of wage cost allocated to skills development decreased from 2.3% in 2017 to 1.6% in 2018 (Table 23). Rössing Uranium's training contribution of <1% of wage cost was below the target too. In 2018/2019, the company offered 30 trade job attachments and had eight graduates on a 24-month training programme to develop their technical competencies and leadership skills. The company awarded eight study bursaries in 2018 and four in 2019, while employees benefited from correspondence courses at undergraduate and post-graduate level. Swakop Uranium funds a skills development programme to address legal and job-relevant training. The self-study programme enables identified employees to further their studies and gain the required skills. Graduate and job attachment programmes are in place for students in required fields to gain experience for a set period of time (e.g. two years). The percentage of wage cost was not provided.

Table 23: The Mining Industry's Contribution to Skills Development in 2018/2019

Company	**Skills development (internal and external)**			
Number of:	**NIMT & NTA apprentices**	**Work permits**	**Bursary holders**	**% of wage cost**
Langer Heinrich	28 (2018)	12	0	1.6%
Rössing Uranium	30 (2019)	1	4	<1%
Swakop Uranium	37 (2018)	69	3	<1%

Motivation of status: The target of 3% of wage cost was **Not Met**.

Indicator 9.2.1.3.	**Each mine has 10% more bursary holders than work-permit holders.**
Data Source	**NUA**
Status:	**Not Met**

Langer Heinrich Uranium had 12 work-permit holders in 2018, while no external bursaries were awarded. Due to financial constraints it was impossible to increase the number of bursaries in line with the indicator. Langer Heinrich Uranium complied with the requirements of the Employment Equity Act. The Employment Equity Commission approved the change of relevant employer status while the mine is on care and maintenance and employing fewer than 25 employees. Rössing Uranium met the target by having five work permit holders and eight bursaries (Table 23). Swakop Uranium only awarded three bursaries in 2018 and eight in 2019. This was far below the required 76 bursaries for 69 work permits.

Motivation of status: Each mine should have 10% more bursary holders than work-permit holders. Because only Rössing Uranium met the target, the indicator was **Not Met** for 2018-2019.

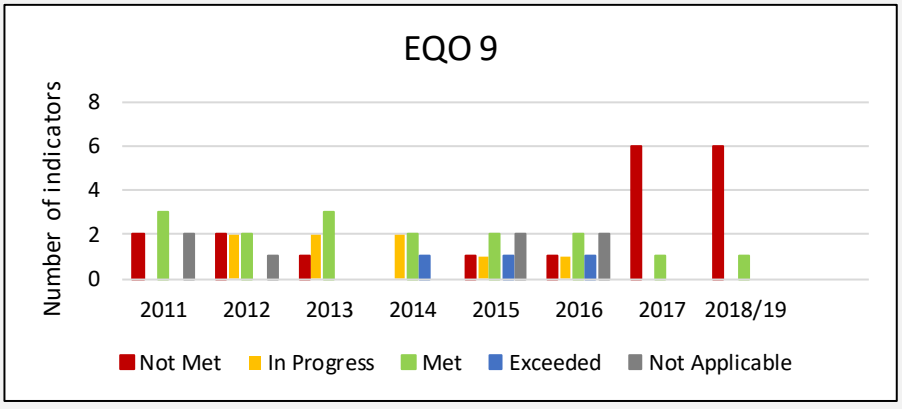
********** ********** ********** **********

Summary of performance over time: EQO 9

Total no. indicators assessed 7				
2018/2019	**Not Met**	**In Progress**	**Met**	**Exceeded**
Number of indicators in class	6	0	1	0
Percent of indicators in class	86%	0%	14%	0%

Overall performance: Six of seven education indicators were **Not Met** (86%), only the indicator requiring an increase in the number of graduates from tertiary and vocational training institutions was **Met** (14%). Four indicators that were **Not Met** concerned the performance of schools in the Erongo Region in terms of improved Grade 10 and 12 examination results and teacher to learner ratios. The other two indicators revealed that operating mines failed to spend 3% of their total wage cost on training and did not give 10% more bursaries than the number of work-permit holders.

Reasons for the poor performance of this indicator are twofold: 1) MEAC is under-resourced and over-stretched by increasing learner numbers, not only in the Erongo region but the entire country; 2) uranium mines were in survival mode and could not allocate more funds to training and bursaries.



********** ********** ********** **********

EQO 10. Governance

Aims of this EQO: Regulators and industry protect Namibia's reputation as a responsible uranium producer by means of ethical conduct and environmentally, socially and financially responsible practices.

The future of Namibia's uranium industry can only be safeguarded if all government and industry stakeholders subscribe to ethical conduct and internationally accepted social, environmental and economic standards. International power utilities are free to choose where they purchase nuclear fuel and will go for countries that subscribe to best practice standards. Customers require that 1) their business partners are responsible mining companies, and 2) that countries supplying uranium do their best to eliminate corruption.

EQO 10 was revised in 2018 to incorporate two indicators related to Namibia's reputation as a responsible uranium producer that were previously included under EQO 11. These indicators assess the uranium industry's international reputation by reviewing national and international online media to find any negative or critical reports that may influence key international stakeholders. The Governance EQO also evaluates the way in which mining and prospecting licences are awarded and check whether government agencies enforce the applicable legislation for the protection of the environment and exercise appropriate supervision over mining operations. Mining is regulated under the Minerals Act of 1992, the Atomic Energy Act of 2005 and the Environmental Management Act of 2007.

Desired Outcome 10.1.	**Prospecting and mining avoid environmentally high value, sensitive areas.**			
Target 10.1.1.	**Sensitive areas in need of protection are not generally available for prospecting or mining.**			
Indicator 10.1.1.1.	**Declared 'red flag' areas undergo the required high level of scrutiny before mineral licences are considered.**			
Data Source	**SEMP Office/MME/MEFT**			
Status:	**Not Met**			

Indicator 10.1.1.2.	**Where possible, red flag areas remain undisturbed by mining or other developments that have high impacts on biodiversity, heritage and/or sense of place.**			
Status:	**Not Met**			

Indicator 10.1.1.3.	If development (especially mining) is to take place in a yellow flag area, strict conditions are attached with the approval certificate.			
Data Source	SEMP Office/MME/MEFT			
Status:	Not Met			

Namibia is probably the only country in the world that allows exploration and mining in national parks, though a Policy on Prospecting and Mining in Protected Areas prohibits mining in sensitive areas of high biodiversity, heritage or tourism value. The 'no-mining areas' in the policy can be equated to the 'red flag' areas of the SEA; the policy does not recognise 'yellow flag' areas that would require less stringent protection. As mentioned under EQO 7 and EQO 8 the policy does not cover all the areas recommended in the SEA.

Existing uranium exploration and mining activities continue in ecologically-sensitive parts of the Namib Naukluft National Park and new EPLs and environmental clearance certificates were issued in 2019 without consideration for protected areas. One was for Marenica Energy's nuclear fuel EPL at Mile 72 in the Dorob National Park, 30 km north of Henties Bay (Figure 34). The EPL as defined by MME stretches down to the coast and along the Omaruru River in red and yellow-flagged tourism and biodiversity areas. Marenica stated that they have identified these areas in the EIA and taken them out of the EPL so that they will not be disturbed. [80] Another licence was allocated over the Blutkoppe (or Bloedkoppie) area, a tourism hot-spot in the Namib-Naukluft Park.

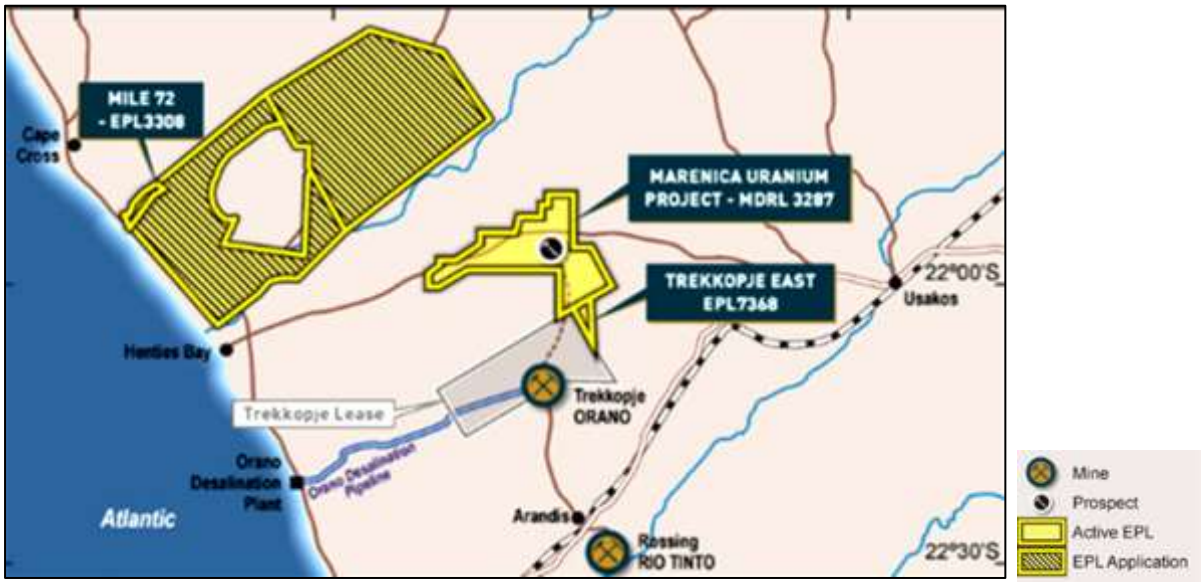


Figure 34: Marenica's EPL3308 at Mile 72

Motivation of status: The three indicators were **Not Met** because MEFT and MME's Mineral Rights Committee did not consider the areas defined in the Policy on Prospecting and Mining in Protected Areas or the SEMP red and yellow-flagged areas when granting EPLs or ECCs.

[80] Pers. comm. NUA, 2019

Indicator 10.1.1.4.	**No new power lines, pipelines or roads linked to uranium mining are routed through red flag areas, and preferably also not through yellow flag areas, nor interfere with ecological processes (such as migration routes for example)**
Data Source	**SEMP Office/MEFT/NUA**
Status:	

There were no new infrastructure developments in red- or yellow-flagged areas in 2018/2019.

Motivation of status: The indicator was **Not Applicable.**

Desired Outcome 10.2.	**Good governance is maintained in the issuing of mineral licenses.**
Target 10.2.1.	**The defined process is always followed in the allocation of all kinds of mineral licenses and the establishment of supporting infrastructure.**
Indicator 10.2.1.1.	**Mineral licenses are given only after full consultation of, and consensus within, the Mineral Rights Committee and considering the relevant status of areas in question (red and yellow flag areas).**
Data Source	**SEMP Office/MME/MEFT**
Status:	**Not Met**

MME confirmed that mineral licences are issued to applicants after consulting the Mineral Prospecting and Mining Rights Committee (MPMRAC) and obtaining an Environmental Clearance Certificate.[81] It is therefore important to strengthen MEFT representation on the MPMRAC and ensure that the Environmental Commissioner refuses environmental clearance for projects in red and yellow-flagged areas.

Motivation of status: This indicator was **Not Met** because exclusive prospecting licences in red and yellow-flagged areas were issued in 2018/2019.

Indicator 10.2.1.2.	**No evidence of corruption in the allocation of mineral licences.**
Data Source	**SEMP Office/MME**
Status:	**Met**

Motivation of status: The indicator was **Met** because there was no evidence for corruption related to nuclear fuel mining licences issued in 2018/2019.

[81] MME (2018): Licences, Rights and Permits Application Guidelines and Assessment Process

Indicator 10.2.1.3.	**No prospecting, mining or major infrastructure projects are permitted before full EIAs are completed and approved. Minimum EIA standards as in the EMA and regulations, are adhered to, including:** **- Clear TORs** **- Use of independent consultants** **- Public consultation** **- Specialist studies** **- Consideration of alternatives** **- Avoid and/or minimise adverse impacts** **- Include an EMP and closure and restoration plan** **- Professional review of EIAs and EMPs**			
Data Source	**SEMP Office/MME/MEFT**			
Status:			**Met**	

Swakop Uranium was the only uranium mining company that submitted EIAs in 2018/2019. They reported that the process was handled professionally by an external independent consultant and all the required items were included and investigated. The application with scoping report and EIA was submitted in August 2018 and approved by MEFT: DEA in 2019. EIAs for the newly issued EPLs at Mile 72 and Bloedkoppie could not be traced.

Motivation of status: The indicator was **Met**.

Desired Outcome 10.3.	**Prospecting and mining activities are properly monitored.**			
Target 10.3.1.	**Post-implementation monitoring is regular, efficient and outcomes-based.**			
Indicator 10.3.1.1.	**GRN agencies (notably MME, MEFT, MAWLR, MHSS) inspect active mines at least once per annum, and closed mines at least once every 3 years.**			
Data Source	**SEMP Office/MME/MEFT/MAWLR/MHSS**			
Status:		**In Progress**		

Various government institutions are responsible for the implementation of this EQO. In the Ministry of Mines and Energy (MME), the Division of Engineering and Environmental Geology (DEEG) in the Geological Survey of Namibia (GSN) and the Mines Inspectorate in the Directorate of Mines are mandated to monitor operating and abandoned mine sites. Abandoned mines are monitored according to the risk they pose. Those classified as "mining environmental liability" are regularly monitored and precautionary measures are taken where necessary. Table 24 lists the government inspections conducted at mines and exploration sites in 2018/2019.

Table 24: Government Inspections of Uranium Mines and Projects in 2018/2019

Company	Government Agencies (date, type of inspection)
Rössing Uranium	NRPA inspection on 24-25 October 2018. NRPA also observed a uranium spill emergency drill performed by Rössing, Bannerman, Orano and Swakop Uranium on 26 October 2018 NRPA inspected/visited 5-6 August, 22 August and 23 September 2019 Office of the Auditor General performance audit on hazardous waste management on 24 May 2019
Langer Heinrich Uranium	Department of Water Affairs in February 2018 Auditor General in June 2018 NRPA in June and September 2018
Swakop Uranium	14 March 2018 - MEFT Directorate of Environmental Affairs audit of Husab Mine. Report not yet received, no major findings noted during the audit. 28 March 2018 – Ombudsman visited in response to NGO Earthlife's queries to observe corrective action after the TSF seepage system overflow incidents. They were satisfied with the clean-up efforts. 14 June 2018 – NNNP officials on site to discuss drone concerns and partake in bi-weekly SSHER meeting. Rules to carry NNNP permits and not to bring plastic bags into the park were discussed with all SU and contractor/business partner supervisors. 17 August 2018 – DWA visit regarding Zone 2 pit dewatering permit. No concerns noted, assistance with the permit acquired. 20 August 2018 – NNNP Officials visited Ida Camp with MRM & ENV to discuss plans for the area. A proposal was issued to MEFT, awaiting official response. January 2018 and October 2018 – NRPA conducted annual visits and requested an update of the TSF spillage progress. They noted the dust suppression at the crushers as an area of concern. June 2019 – IAEA, MME and NRPA general inspection including the May 2019 TSF trench overflow. 18 July 2019 – MEFT DEA conducted a general compliance visit, additionally reviewed the recent TSF incident and the location of the solar power plant. August 2019 – NRPA and DWAF compliance visits and review of progress on rehabilitation and engineering controls of TSF spillages. 18 October 2019 – New Chief Warden of the NNNP was invited to view the final rehabilitation of Ida Camp, the fence installed around the TSF trench to keep out wildlife, two Welwitschia information boards and new NNNP signs on the access road.

MEFT's Directorate of Environmental Assessment (DEA) requires regular reports on the status of the environment to assess the mines' compliance with their environmental management plans and does site inspections from time to time. MAWLR's Directorate of Resource Management (DRM) inspects mines for compliance with groundwater abstraction permits and industrial and domestic wastewater discharge permits. They occasionally collect water samples for independent analysis. The Ministry of Health and Social Services (MHSS) inspects and licences health-care personnel and facilities at mines, e.g. first-aid stations or clinics. The National Radiation Protection Authority (NRPA), which also resorts under MHSS, conducts inspections for compliance with the relevant legislation and the mines' radiation

management plans. The Ministry of Labour, Industrial Relations and Employment Creation (MLIREC) is also involved, particularly in inspecting working conditions.

Motivation of status: The relevant government agencies, DWA, MEFT and MHSS/NRPA, carried out several inspections at Husab mine, while other mines only received one or two visits in 2018. Since the indicator defines "proper monitoring" as an inspection at least once per annum, it would be preferable if all relevant ministries conducted regular site inspections at active mines. Closed mines, at least those posing an environmental risk, should be inspected at least once every three years. Because there was still room for improvement the indicator was rated **In Progress**.

Indicator 10.3.1.2.	**Honorary conservators are appointed by MEFT to assist with monitoring, including of unauthorized secondary (off-mine) activities such as off-road driving, poaching and littering.**			
Data Source	**SEMP Office/MME/MEFT**			
Status:		**In Progress**		

As reported under Indicator 8.4.1.2, the Protected Areas and Wildlife Management Bill makes provision for the appointment of honorary conservation officers: [82]

144 (1) The Minister may in writing delegate any power conferred upon him or her by or under this Act, except the powers to make regulations and to hear reviews, to any officer in the Ministry or to any officer of the Ministry or any honorary conservation officer or a conservancy member.

It is hoped that MEFT will make use of this option once the bill has been promulgated. In the meantime, Swakop Uranium has taken the initiative of reporting to MEFT: Parks & Wildlife when they come across indications of poaching activities in the parks or associated river systems. It is suggested that the intent of the indicator could be met if all interested members of the public or mine employees play a role in monitoring and reporting secondary impacts by contacting the NNNP Wardens directly.

Motivation of status: The new bill provides the opportunity of appointing honorary conservator officers. This indicator can be rated **In Progress** until the legislation is in place.

Indicator 10.3.1.3.	**International agencies regularly inspect mines and provide independent opinion on their performance.**			
Data Source	**SEMP Office/MME**			
Status:			**Met**	

The International Atomic Energy Association (IAEA) is the designated international agency mandated to inspect uranium mines under the Nuclear Safeguards Agreement concluded with the Namibian government. The IAEA Safeguards are a system of inspection and verification of the peaceful uses of nuclear materials as part of the nuclear non-proliferation treaty (NPT). The IAEA safeguards nuclear material

[82] MEFT: Protected Areas and Wildlife Management Bill, 31 August 2017

and activities under agreements with more than 140 states.[83] The IAEA conducted mine inspections/visits in 2019 together NRPA officials.

These aspects are covered by the Equator Principles established by the International Finance Corporation (IFC). The Equator Principles are a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in project finance.[84] Financial institutions in 35 countries have officially adopted the Equator Principles, meaning that mining companies wanting to access international project finance in emerging markets are required to abide by the principles. Mining companies will state in their EIAs and EMPs that these documents were developed in compliance with the Equator Principles. Compliance is independently audited, for instance as part of the annual ISO 14001 environmental management system audits at operating mines.

Another relevant international agency is the World Nuclear Association (WNA). Though the WNA does not physically inspect Namibian uranium mines it has issued a very comprehensive self-assessment reporting tool that companies should complete to demonstrate compliance with the International Council on Mining and Metals (ICMM) sustainable development principles, the Global Reporting Initiative (GRI) and other international best practice standards.[85] The checklist is a useful tool to collate the required data and documentation for audits. Such audits or compliance checks are often carried out by the mines' international customers.

Motivation of status: The current level of international oversight by the IAEA and the mining industry's voluntary compliance with the Equator Principles, ICMM sustainable development principles, GRI and WNA requirements is regarded as adequate to rate the indicator as **Met**.

Indicator 10.3.1.4.	**Results of monitoring improve practice and are disclosed to the public through existing channels and in an annual SEMP report, or more regularly.**			
Data Source	**SEMP Office**			
Status:			**Met**	

Annual SEMP reports that are freely available to the public on the MME or NUA websites present the results of monitoring related to uranium mining. The reports contain action plans that identify shortcomings and aim to improve practices. More regular reports were published in 2018 about certain topics of interest, such as the advanced air quality study. GSN and NUA also cooperate on scientific articles and public lectures, e.g. about groundwater monitoring results in the Khan and Swakop rivers and the health effects of radon gas.

Motivation of status: The indicator was **Met** because monitoring results are published in annual SEMP reports that are freely available to the public and can be used to improve practices.

[83] https://www.iaea.org/publications/factsheets/iaea-safeguards-overview
[84] International Finance Corporation "Equator Principles"
[85] World Nuclear Association (2015): Internationally Standardized Reporting (Checklist) on the Sustainable Development Performance of Uranium Mining and Processing Sites

Desired Outcome 10.4.	**Non-compliance is rectified.**			
Target 10.4.1.	**Transgressions are noted and acted upon timeously.**			
Indicator 10.4.1.1.	**The activities of proponents / developers / service providers, who have caused unauthorised negative impacts, are suspended, and they are forced to remedy impacts.**			
Status:		**In Progress**		
Indicator 10.4.1.2.	**If impacts are not remedied, the operation is closed, and the project authorisation is cancelled.**			
Status:		**In Progress**		
Indicator 10.4.1.3.	**Fines are issued for non-compliance.**			
Data Source	**SEMP Office/MME/MEFT**			
Status:		**In Progress**		
Indicator 10.4.1.4.	**All incidences of non-compliance are publicised through the media and noted in the annual SEMP report.**			
Data Source	**SEMP Office**			
Status:		**In Progress**		

Indicators 10.4.1.1-10.4.1.4 are related because non-compliance can only be rectified once the required legislation is in place. Currently, the Environmental Management Act (Act No. 7 of 2007) does not empower the Ministry of Environment, Forestry and Tourism to issue fines. MEFT can only issue compliance orders to parties that commit environmental transgressions. They are given 21 days to achieve compliance before their clearance is revoked. When a compliance order is issued all activities must stop until the case has been cleared. The regulations to the Environmental Management Act, which are currently in draft form, will make provision for fines and other penalties for environmental offences.[86] The draft amendment does not mention that non-compliance cases should be reported in the media. MEFT will however report transgressions in its contribution to the SEMP reports. No cases of compliance orders issued to the industry or clearances being revoked were reported in 2018/2019. [87]

[86] "Environmental Management Act to be amended" by Absalom Shigwedha in The Namibian of 12 September 2019

[87] Pers. comm. Ministry of Environment and Tourism, 2019

Motivation of status: The revision of the Act and regulations remained **In Progress** and no compliance orders were issued in 2018/2019.

Desired Outcome 10.5.	**The good reputation of Namibian uranium is maintained.**			
Target 10.5.1.	**The 'Namib uranium province' is regarded internationally as an area where ethical, environmentally, socially and financially responsible companies prospect and mine uranium.**			
Indicator 10.5.1.1.	**No published evidence about unethical practices in the Namib uranium province.**			
Data Source	**SEMP Office**			
Status:	**Not Met**			

The following newspaper archives were searched for articles related to uranium mining published in 2018/2019: Namibia Economist, Namibian Sun, The Namibian, Namib Times and Windhoek Observer. International media usually only pick up issues that were first reported in the local papers or online. An internet search did not encounter any critical international reports. The critical local reports relevant to this indicator are described in more detail below.

Procurement fraud at Rössing Uranium – February 2018[88]

"Rio Tinto's Rössing Uranium Mine is expected to conclude an internal disciplinary enquiry this week into alleged fraud involving a million-dollar contract for the installation of a fire suppression system. The matter came to light late last year, prompting internal investigations and the temporary suspension of two workers until the enquiry has been concluded. The source said the suspects allegedly paid for the fire system before the tanks were constructed, without administrative approval to make such payment. It was suggested that there was collusion between the managers and the supplier. Speaking to The Namibian, Rössing Uranium's managing director, Werner Duvenhage, confirmed the issue, stating that irregularities were already suspected in 2017. He said it is, however, officially an internal disciplinary issue. He did not elaborate as to what the alleged fraud entailed, except mentioning "price escalation". Duvenhage said any criminal activity, fraud or corruption was not acceptable to the company, and swift action would be taken where appropriate."

Evaluation of report: The two suspects were later cleared. [89] In an unrelated case another Rössing employee was arrested and appeared in court on charges of tender corruption dating back to 2012-2016. [90] Fraudulent behaviour of individuals can occur in any company and as such should not affect the reputation of the uranium industry.

UraMin/AREVA corruption case

August 2018: *"President Hage Geingob said he will not testify in France if asked to provide evidence in a court case involving allegations of corruption and bribery. The court case centres around a corruption*

[88] "Rössing investigates fraud" by Adam Hartman, The Namibian, 28 February 2018
[89] "Two Rössing employees cleared of fraud" by Adam Hartman, The Namibian, 6 July 2018
[90] "Former Rössing pit boss nabbed for tender corruption", The Namibian, 3 September 2018

probe about how French state-owned nuclear giant Areva bought a Canadian uranium company, UraMin, in 2007. Areva paid US$2,5 billion for UraMin, which owned the Trekkopje uranium mine in Namibia and other mineral rights in South Africa and the Central African Republic. Areva later admitted that it overpaid for UraMin, which was worth only half the price. Geingob has declared to the Namibian parliament that he was paid N$3 million as a consultant to help UraMin renew their licence in Namibia before it was sold to Areva."[91]

Evaluation of report: Will only be possible once the court case in France has been completed.

Langer Heinrich tax avoidance

December 2018: *"The Namibian government lost N$219 million in taxes from the sale of shares in one of the world's largest uranium mines, Langer Heinrich, because the country's tax avoidance law is not up to scratch. An investigation by The Namibian and UK-based journalism organisation Finance Uncovered revealed that the Australian multi-national mining corporation, Paladin Energy, pocketed N$665 million after selling shares in the Langer Heinrich mine through a Mauritius-based offshore company. Paladin argues that using an offshore holding company means they are not liable to pay tax in Namibia. Tax on the proceeds of the sale would have amounted to N$219 million. When presented with details of the joint investigation, the Namibian tax office said they were unaware of the Langer Heinrich deal, but in their view, taxes should have been paid on the proceeds. Tax bosses admitted that problems with legislation mean they are unable to enforce the law on offshore transactions."* [92]

Evaluation of report: Following the newspaper report, Langer Heinrich Uranium management referred the matter to Paladin Energy Limited. Feedback from Paladin was that at the time of the transaction professional taxation advice was sought by Paladin and the transaction was concluded in line with Namibian taxation legislation.[93]

Blasting safety at Swakop Uranium

26 February 2019: *"Mining operations at Swakop Uranium's Husab mine in Erongo were stopped on Tuesday after workers aired concerns over their safety in light of claims that unchecked explosives and detonators were discovered on the site. Sources on the mine told The Namibian that about 500 workers in the mining department stopped working yesterday already and will not return to work until their concerns are investigated and the mine declared as safe by their employer. The workers warned that if this is not done soon, the processing department of about 1 200 workers would also shut down as it would not be supplied by the miners. A petition was handed over to the mine's management this morning and vice president of human resources Percy McCallum said operations were stopped to ensure that the potentially dangerous situations are fully investigated. The issue is linked to the alleged non-compliance and recklessness of a Chinese explosives contractor."*[94]

23 March 2019: *"The management of Swakop Uranium has agreed to take stricter measures to ensure the safety of its employees at Husab Mine. Employees of the mine in a petition recently expressed concern about alleged negligence by the contracted Beifang Mining blasting company and safety measures, leading them to halt work in the mine's zones 1 and 2. A media release issued by the Mineworkers Union of Namibia's (MUN) western regional coordinator on Friday indicated that some of the agreements*

[91] "Geingob won't testify in France" by Shinovene Immanuel, The Namibian, 20 August 2018
[92] "Langer Heinrich dodged N$219 million tax" by George Turner, Lazarus Amukeshe & Shinovene Immanuel, The Namibian, 12 December 2018
[93] Pers. comm. Johan Roux, MD of Langer Heinrich Uranium, 2020
[94] "Husab operations halted due to safety concerns" by Adam Hartman, The Namibian, 26 February 2019

between the union and Swakop Uranium include the appointment of an independent expert to head an investigation task team into the danger zones. Upon conclusion of the investigation, the task team submitted preliminary reports that declared the areas safe and employees were instructed by the company to commence work in those areas. The union and company management also set out strategies to reform the status quo as far as safety is concerned. Among the demands from the employees was also the total removal of Beifang Mining, which the mine's management disputed and said it would not terminate the service contract at this point. 'Although Swakop Uranium acknowledged Beifang's shortcomings with respect to safety, the union still demands that the company be removed indefinitely, and that a competent and qualified management be awarded the tender,' the MUN statement said. [95]

Evaluation of reports: Unsafe blasting practices at Husab Mine came to light through incidents that could have been fatal. Exposing employees to the danger of unexploded charges can certainly by seen as unethical behaviour that tarnishes the industry's reputation.

Industrial relations at Swakop Uranium

March 2019: *"Erongo governor Cleophas Mutjavikua told the media that he would apologise to the workers of Swakop Uranium's Husab mine if they were offended by the word "reorganisation' he mentioned in a leaked audio of a meeting between him and the company over a looming wage deadlock. Mutjavikua said this during a press conference on Wednesday at Swakopmund after the leaking of an audio in which he seemed to suggest to the Swakop Uranium management to follow the reorganisation clause in the Labour Act to undermine the Mineworkers Union of Namibia's demands in the annual wage negotiations. The union called for Mutjavikua to be fired as they interpreted what he did as a betrayal of Namibian workers' trust to the Chinese company. Mutjavikua said the audio was 'edited', and therefore quoting him out of context, and that he never mentioned retrenchment of workers, nor did he advise the company to retrench."* [96]

Evaluation of report: The regional governor's attempt to mediate in wage negotiations between Swakop Uranium's management and Mineworker's Union backfired when a clandestine recording apparently showed him to be on the company's side. This incident may have confirmed the public's perception that powerful international companies can influence Government to act in their interest.

September 2019: *"As from today workers at the Husab Uranium mine will no longer work on weekends. A reliable source confirmed this, saying that the situation came about after shift rosters lapsed. This meant that workers had to sign a new exemption and decide whether they would continue with the former shift roster. The same applies for the payment of overtime on weekends. The company ostensibly indicated to the Mineworkers Union of Namibia (MUN) that it did not want to continue with the old shift pattern. The workers thus decided that they would only be prepared to continue working five working days per week of eight hours a day. The source said that the company agreed to this while the negotiation process continues and thus workers are now working only five days a week until further notice.* [97]

Evaluation of report: Swakop Uranium stated that the MUN BEC and company representatives during the application for continuous operations and exemptions thereto in September 2019 could not reach an agreement on certain terms and conditions of the Labour Act, and therefore sought guidance from the Ministry of Labour, Industrial Relations and Job Creation. Meetings with the Chief Executive Officer (former PS) were held in Windhoek and consensus on the application was reached with the Minister

[95] "Swakop Uranium agrees to some of Husab workers' demands" by NAMPA, The Namibian, 23 March 2019
[96] "I will humble myself and apologise – Mutjavikua" by Adam Hartman, The Namibian, 1 March 2019
[97] "Husab grinds to a halt over weekends" by Otis Finck, Namibian Sun, 20 September 2019

and the agreement signed. Continuous operations resumed following the conclusion of the agreement. It was confirmed that the company was within the Labour Act.

Rössing pension fund surplus distribution[98]

Arrangements for the distribution of the pension fund surplus were announced in January 2019 [99] and resulted in queries from former employees.[100]

October 2019: *"Disgruntled former Rössing Uranium Limited employees have given the company 30 days to conclude their pension surplus pay-out, citing unspecified action if their demands are not met. The group held a press conference at Ongwediva last week to air their concerns, saying the beneficiaries of the fund have been subjected to unfair treatment and unequal distribution of the pension surplus to former members, and that the process is very slow. 'We are sick and tired of being patient and told many stories. Not a single one of us has been paid a cent by Rössing Uranium to date. We have been patient enough. For how long will they keep on telling us lies?' Efforts to get comment from the Rössing Pension Fund's principal officer proved futile. Earlier this year, more than 1200 former Rössing Uranium Limited employees had been traced so that they can benefit from the N$87.5 million pension fund surplus. Rössing Uranium's board of directors decided in February 2012 to allocate through the Rössing Pension Fund about 15% of the surplus among former members of the fund, 52% to current members, and 33% to the company. Dissatisfied with that decision, former members of the fund sued the pension fund and Rössing Uranium in the High Court to have the planned allocation of the surplus set aside. The former members of the fund won the case in the High Court in June 2016 but lost it on appeal in the Supreme Court a year later – with the result that the board of directors' initial decision to allocate 15% of the surplus to former members of the pension fund remained valid."*

Evaluation of report: The complaint in this article about delaying the pay-out appears to be a true reflection of the situation as verified with ex-Rössing employees who now work at other uranium mines. While many ex-workers have been paid the amount that was due, others have been kept waiting since they registered in 2017. [101]

Motivation of status: The Namibian media reported five issues that members of the public could potentially interpret as instances of unethical or environmentally, socially or financially irresponsible behaviour. Three events were evaluated as Met or In Progress, i.e. the Rössing Uranium fraud case was not specific to the uranium industry, while Langer Heinrich complied with the Namibian tax legislation and the AREVA fraud case has not yet been decided. The indicator however calls for "**no** published evidence about unethical practices in the Namib uranium province." The concerns about blasting safety at Husab Mine and the pension surplus pay-out at Rössing Uranium appeared to be valid, so that the indicator had to be rated as **Not Met**.

[98] "Ex-Rössing employees press on for pension surplus" by Hileni Nembwaya, The Namibian, 3 October 2019
[99] "N$87.5m for former Rössing employees", The Namibian, 17 January 2019
[100] "Pensioners query Rössing payout formula", The Namibian, 22 January 2019
[101] Pers. comm. NUA, 2019

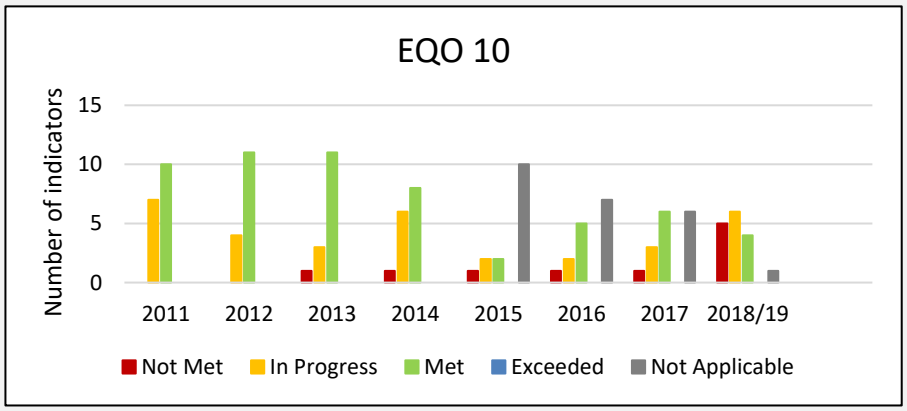
********** ********** ********** ********** ********** **********

Summary of performance over time: EQO 10

Total no. indicators assessed	15 (1 was **Not Applicable**)

2018/2019	**Not Met**	**In Progress**	**Met**	**Exceeded**
Number of indicators in class	5	6	4	0
Percent of indicators in class	33%	40%	27%	0%

Overall performance: Four of the EQO 10 indicators were **Met** (27%) since the correct EIA process was being followed, international checks on the uranium industry's performance were in place and monitoring results were available in annual SEMP reports. The indicators **In Progress** (40%) were related to GRN agencies conducting regular inspections at active mines and enacting legislation that will enable MEFT to appoint honorary conservation officers and issue fines for environmental non-compliance. Four indicators were **Not Met** because MEFT and MME's Mineral Rights Committee did not consider the protection of areas defined in the Policy on Prospecting and Mining in Protected Areas when granting EPLs or ECCs; while the fourth indicator that was **Not Met** concerned published evidence of unethical conduct, bringing the total to 33%. One indicator related to new linear infrastructure was **Not Applicable**.



********** ********** ********** ********** ********** **********

EQO 11. Heritage

Aims of this EQO: Uranium exploration and mining and related infrastructure developments will have the least possible negative impact on archaeological and paleontological heritage resources. Survey, assessment and mitigation will result in significant advances in knowledge of archaeological and paleontological heritage resources, so that their conservation status is improved and their use in research, education and tourism is placed on secure and sustainable footing.

EQO 11 defines measures to protect the archaeological sites in the uranium province and to ensure significant advances in scientific knowledge. The Central Namib is home to some of Namibia's key heritage resources with an archaeological history dating back more than a million years. Significant human evolutionary development and specific adaptations to extreme aridity and environmental uncertainty are evident. Some of the archaeological sites are obvious to any observer, such as rock art or historical mines. Others, such as pre-colonial stone features or surface scatters of stone artefacts are virtually invisible to the untrained eye. This means that archaeological sites must be located and identified before the start of mining projects to avoid damage. Consequently, it has become regular practice to carry out archaeological surveys and assessments at the earliest possible stage of exploration, mine development or expansion.

Desired Outcome 11.1.	**The integrity of archaeological and paleontological heritage resources is not unduly compromised by uranium mining.**
Target 11.1.1.	**Mining industry and associated service providers avoid impacts to archaeological resources, and where impacts are unavoidable, mitigation, restoration and /or offsetting are achieved.**
Indicator 11.1.1.1.	**All mining and related developments are subject to archaeological and paleontological assessment** **No unauthorised impact occurs**
Data Source	**NERMU/MEFT/NUA**
Status:	

During the 'uranium rush' all new projects at mines and exploration sites were subject to the EIA or scoping process during which the need for archaeological assessments was identified. Many archaeological surveys carried out during this time resulted in a significant increase in scientific knowledge. There were very few new projects in the last few years that required archaeological research, though operating mines continued implementing their procedures to safeguard any unexpected finds and consult specialists on the way forward. However, no such finds and no authorised impacts were reported in 2018/2019.

Motivation of status: The indicator was **Not Applicable**.

Indicator 11.1.1.2.	Mining companies adhere to local and international standards of archaeological assessment**.**
Data Source	**NERMU/MEFT/NUA**
Status:	

No archaeological assessments for new projects or existing mines were carried out in 2018/2019.

Motivation of status: The indicator was **Not Applicable**.

Desired Outcome 11.2.	**Integration of archaeological and environmental knowledge in a balanced working model of Namib Desert environmental processes.**
Target 11.2.1.	**Development of a general research framework to identify gaps in scientific knowledge.**
Indicator 11.2.1.1.	**Research in progress.**
Data Source	**NERMU/MEFT**
Status:	**Met**

Indicator 11.2.1.2.	**Working model of Namib Desert developed.**
Status:	**Met**

Indicator 11.2.1.3.	**Model providing information to guide decision-making about development in the Namib desert.**
Status:	**Met**

At the time of the SEA it was expected that the development of new mines would be accompanied by continuous archaeological research. Even though the current mining scenario does not support ongoing research, the results of studies carried out during the boom-years were incorporated in books or papers such as 'A history of Namibia: from the beginning to 1990'[102] and 'Post-Pleistocene archaeology and geomorphological processes on the Namib Desert coast'.[103]

[102] John Kinahan: A history of Namibia: from the beginning to 1990, unpublished, available on request

[103] John Kinahan and Jill Kinahan (2016): Post-Pleistocene Archaeology and Geomorphological Processes on the Namib Desert Coast of South Western Africa. Journal of Island and Coastal Archaeology

The article states that the Namib Desert has by far the longest archaeological record of all southern hemisphere deserts (approximately 800 000 years), although human occupation was patchy and episodic, mainly due to a severe lack of water resources. While the coastline has yielded little evidence of sustained settlement, the mid-Holocene to recent precolonial period was well represented by dense local concentrations of surface remains. These sites allowed reconstruction of key periods, including the richest and most detailed record of indigenous contact with early European maritime traders on the southern African coastline.

The potential for advanced research on the Namib Desert coast remains high and the Namib Desert Archaeological Survey initiative has made proposals for new archaeological conservation areas in partnership with traditional desert communities. The main researcher, Dr John Kinahan, has in the meantime used the data collected in the Namib to develop a model based on the concept of CS Holling's adaptive cycle for Holocene human adaptation in the desert.[104] He found that the climatic amelioration during the mid-Holocene was associated with hunter-gatherer occupation of remote sites in the Namib Desert. Subsequent changes in the late Holocene site distribution suggested alternative responses to increasing aridity: Abandonment or episodic occupation was evident in some areas, while others showed an emphasis on mountain refuges and resource anomalies. People developed specialized coping strategies during this time allowing a broad re-occupation of the desert when conditions improved briefly during the Medieval Warm Epoch.

A related article about human responses to climatic variation was based on the results of radiocarbon dating of camelthorn trees in the Namib Desert. [105] The data reflected marked variations in rainfall during the last 1,000 years. These records and other climate data indicated a loose connection with the southern African climatic record, especially for dry conditions resulting from extreme El Niño events. However, in contrast to the climate record, archaeological evidence of hunter-gatherer and nomadic pastoralist occupation revealed that the desert was not only inhabited during periods of good rainfall. It pointed instead to a specialized strategy that allowed continuous occupation of the Namib Desert despite extreme fluctuations in rainfall, by combining the use of primary resource areas with opportunistic use of secondary, ephemeral resources.

The preliminary working model has established settlement and migration patterns and can thus be used to guide decision-making about where to allow development in the Namib desert.

Motivation of status: The three indicators were **Met** because the information gathered during previous years contributed to the development of an archaeological history of the Namib and an initial approach to the proposed working model.

[104] Kinahan, J. (2017): Holocene human adaptation in the Namib Desert: A model based on the concept of Holling's loop. Published on www.wits.academia.edu/JohnKinahan

[105] Kinahan, J. (2016): Human Responses to Climatic Variation in the Namib Desert during the Last 1,000 Years. African Archaeological Review

Indicator 11.2.1.4.	**Development of diachronic models to determine the effects of climatic and other environmental changes.**			
Data Source	**NERMU/MEFT/NUA**			
Status:				

Determining the effects of climatic and other environmental changes in diachronic models may be a lengthy process and probably subject to other research priorities.

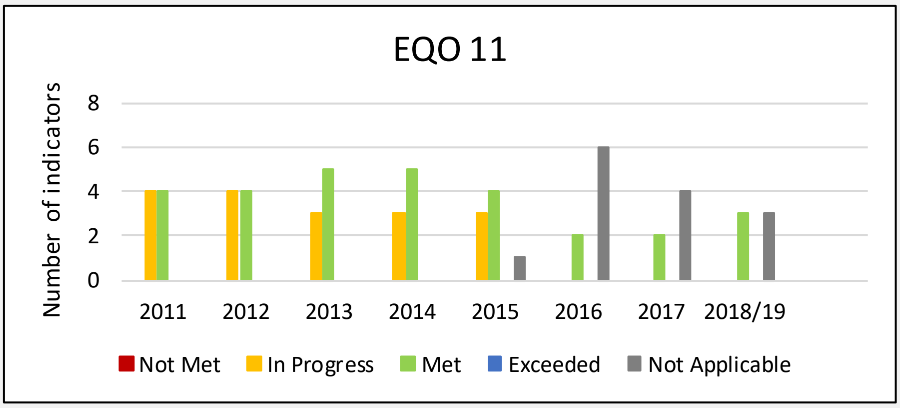
Motivation of status: In line with a decision by the SEMP steering committee in 2018 the indicator was rated **Not Applicable**.

*************************** * * * * * * * * * * * **************************

Summary of performance over time: EQO 11

Total no. indicators assessed	3 (3 indicators were **Not Applicable**)			
2018/2019	**Not Met**	**In Progress**	**Met**	**Exceeded**
Number of indicators in class	0	0	3	0
Percentage of indicators in class	0%	0%	100%	0%

Overall performance: There was significant progress in archaeological research during the last two years, leading to three indicators being **Met** (100%). Three indicators were **Not Applicable** since no archaeological assessments were carried out in 2018/2019 and the development of diachronic models was classified as a long-term research project.

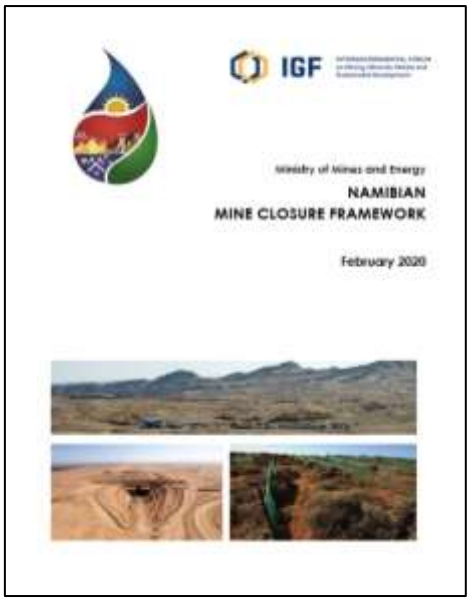


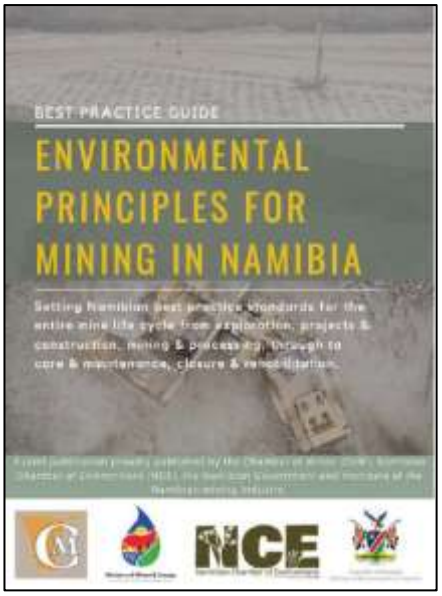
*************************** * * * * * * * * * * * **************************

EQO 12. Mine Closure and Future Land Use

Aims of this EQO: To maximize the sustainable contribution mines can make post closure to society and the region, and to minimize the social, economic and biophysical impacts of mine closure.

The EQO aims to maximize the sustainable contribution that mines can make to society and the region post-mining. Mine closure is one of the industry's hardest sustainable development challenges because it is necessary to incorporate socio-economic aspects, along with infrastructure and biophysical aspects into the closure planning process. International best practice dictates that closure plans should be drawn up as early as possible and be an integral part of the mining plan. If the shape of the ore body and open pit allow this option, rehabilitation should be undertaken progressively during the life of the mine. Financial resources must be allocated during and after mining to enable (progressive) rehabilitation and decommissioning of mine structures at final closure. Mining companies are key players with significant influence and resources to address the socio-economic impacts of mine closure.





Namibia currently does not have legislation governing mine closure, although MME has prepared a draft Mine Closure and Rehabilitation Framework (MCRF) and both MME and MEFT have started drafting amendments to the relevant acts. The MCRF is based on international practice and the Namibian Mine Closure Framework issued by the Chamber of Mines in 2010. In 2019, the Namibian Chamber of Environment published the best practice guide 'Environmental Principles for Mining' that contains a chapter on mine closure, describing how to develop relevant, practical and cost-effective closure plans. [106] Well-structured and researched closure plans inform government agencies what to expect at the end of mine-life, while companies will be prepared and have the necessary resources to implement the closure plan, ensuring that negative social, economic and biophysical impacts are minimized.

[106] Namibian Chamber of Environment et al. (2019): Best Practice Guide – Environmental Principles for Mining in Namibia, www.archive.the-eis.com

Desired Outcome 12.1.	**Companies have approved closure plans in place which ensure that there are no significant post-closure long term negative socio-economic, health and biodiversity effects from the mine. These plans should address planned as well as premature closure.**
Target 12.1.1.	• **The planning process is initiated early (in the feasibility study stage) to ensure that reasonable opportunities for post closure development are not prevented by inappropriate mine design and operations.** • **Mine closure plans need to be based both on expert and stakeholders' input, and consider site-specific risks, opportunities and threats as well as cumulative issues. These must include socioeconomic opportunities for nearby communities and the workforce, demolition and rehabilitation and post closure monitoring and maintenance.** • **The plan needs to contain accepted and agreed objectives, indicators and implementation targets.** • **The plan needs to be subjected to periodic critical internal and external reviewed, must have written GRN approval.**
Indicator 12.1.1.1.	**The contents of the plan are consistent with the IAEA guidelines, Namibian regulations and policies and the Namibian Mine Closure Framework.**
Data Source	**SEMP Office/CoM/MME**
Status:	**Met**

According to current practice operational mines have formal closure plans, while exploration companies only need a plan and financial provisions for site rehabilitation and retrenchments. All operational mines reported that the contents of their plans were consistent with the Namibian Mine Closure Framework that was developed based on International Atomic Energy Agency (IAEA) guidelines and international good practice, e.g. the West Australian Closure Standard that is regarded as leading practice (items 9 and 11 in Table 25).

It is expected that mine closure legislation will be incorporated in the regulations under the revised Minerals Act.[107] Closure of non-mining developments may be included in the revised Environmental Management Act.[108] Once these regulations have been promulgated, certain EIAs will have to be accompanied by a rehabilitation, closure and aftercare plan. The regulations will also specify the details to be contained in the plan and the financial guarantee for rehabilitation. Because these regulations are still under discussion item 10 was mostly marked not applicable (N/A). Companies that answered "yes" have received an ECC for a closure plan that was included in their EMP.

[107] Consultation with team from Intergovernmental Forum on Mining, Minerals Metals and Sustainable Development, MME, NUST and Environmental Compliance Consultants on the Mining Policy Framework, February 2018
[108] MEFT workshop on revised EMA, EIA and SEA regulations, Windhoek, February 2018

Table 25: Feedback on Compliance with Closure Planning Requirements

Closure plan requirements	Langer Heinrich Uranium	Rössing Uranium	Swakop Uranium
1) Planning process started at feasibility study stage	Yes	No	Yes
2) Was based on expert and stakeholder input	Yes	Y/N	Yes
3) Considers site risks, opportunities, threats, and cumulative issues	Yes	Yes	Yes
4) Socio-economic opportunities for communities and workforce	Yes	Yes	Yes
5) Demolition, rehabilitation and post closure monitoring, maintenance	Yes	Yes	Yes
6) Contains accepted and agreed objectives, indicators and targets	Yes	Partly	Yes
7) Subjected to internal and external review	Yes	Yes	Yes
8) Written GRN approval	Yes	No	Yes
9) Consistent with IAEA guidelines	Yes	Yes	No
10) Namibian regulations and policies	Yes	Yes	Yes
11) Namibian Mine Closure Framework	Yes	Yes	Yes

Table 25 also contains feedback on the items listed under the bullet points of Target 12.1.1. Regarding item 1, Rössing Uranium's feasibility study was completed in the early 1970s when closure planning was not considered in mine development. Other companies started the closure planning process at the feasibility study stage. Item 2: The plans were generally based on expert input and, if included in EMPs, also on public consultation or input from other stakeholders. A Yes/No answer means only expert input. Item 3: Most plans considered site risks, opportunities and threats, whereas cumulative issues (several mines closing at the same time) were not always considered. Socio-economic opportunities for communities and the workforce (item 4) were included in all the plans.

Most companies have looked at demolition, rehabilitation and post closure monitoring and maintenance (item 5). The next three points should be considered together, starting with item 8 that requires written GRN approval. A formal process to obtain approval is not yet in place because Namibian policies and regulations specific to mine closure are still being drafted. The companies that responded "yes" to item 8 are referring to closure plans included in their EMPs and as such approved by MEFT as part of the environmental clearance process. Swakop Uranium mentioned that their closure plan will be submitted to GRN in 2020 with an updated social component. Accepted and agreed objectives, indicators and targets (item 6) can only be developed once specific regulations are provided by GRN. Item 7: At this stage companies rely on corporate head offices, EIA consultants and/or ISO 14001 auditors to review the closure plans as there are no external reviews by government agencies. Regarding item 9,

Swakop Uranium only referred to local legislation and the ICMM Closure Toolkit and stated that a focused closure RMP document was not yet available for incorporation into the risk assessment

Motivation of status: The indicator was **Met** because the operating mines have closure plans mostly consistent with the Namibian Mine Closure Framework and IAEA guidelines.

Desired Outcome 12.2.	**Mines have adequate financial resources to close operations responsibly and to maintain adequate aftercare.**			
Target 12.2.1.	**The financial provision for mine closure needs to be based on cost calculations. Companies, in conjunction with regulators, need to establish an independent fund to provide adequate financial resources to fully implement closure.**			
Indicator 12.2.1.1.	**Closure cost estimations are contained in the closure plan.**			
Status:			**Met**	

The target specifies that cost estimates for the following items must be considered in mine closure plans and the necessary financial resources must be placed in an independent fund:

- employee costs (retrenchment provision, new employment opportunities, re-training costs);
- social aspects (sustainability of associated communities), exit strategy (that is, the process by which mines cease to support initiatives), social transition (that is, communities receiving support for transition to new economic activities);
- demolition and rehabilitation costs (infrastructure break-down, salvage and/or disposal at the site or transition to end uses), ecosystem rehabilitation costs of the site;
- post-closure monitoring and maintenance; and
- project management (administration and management costs during the decommissioning period).

Motivation of status: Closure cost estimates are contained in the closure plans of operating mines and include the aspects listed above as shown in Table 26. The indicator was **Met**.

Indicator 12.2.1.2.	**Financial sureties are available.**			
Data Source	**SEMP Office/CoM/MME**			
Status:	**Not Met**			

Both MME and MEFT are planning to regulate closure funding, but no laws were enacted in the years under review. MME envisages that a requirement for financial sureties to be placed in an independent fund will be included in the revised Minerals Act or associated regulations. Langer Heinrich and Rössing Uranium provided financial sureties in funds under their own control. Swakop Uranium reported that they were aware of the legal requirement for financial sureties in an independent fund in South Africa, but this was not yet required in Namibian legislation. The company has made a decommissioning and restoration liability provision as at 31 December 2018 but has not yet established an independent fund or obtained financial sureties to cover this value.

Motivation of status: Langer Heinrich and Rössing Uranium provided financial sureties in their own funds, while Swakop Uranium was waiting for this practice to become a legal requirement. Seeing that the indicator does not link financial sureties to legislation, it can be regarded as **Not Met**.

Table 26: Feedback Regarding Compliance with Closure Cost Provisions

Closure financing requirements	Langer Heinrich Uranium	Rössing Uranium	Swakop Uranium
Includes employee costs	Yes	Yes	No
Social aspects and exit strategy	Yes	Yes	No
Demolition and rehabilitation costs	Yes	Yes	Yes
Post-closure monitoring and maintenance	Yes	Yes	Yes
Project management	Yes	Yes	Yes
Closure cost estimations contained in the plan	Yes	Yes	Yes
Financial sureties are available	Yes	Yes	N/A

Exploration companies are not required to comply with indicators 12.2.1.1 and 12.2.1.2.

Desired Outcome 12.3.	**The Government has appropriate mechanisms in place to approve mine closure plans, financial instruments chosen for implementation and to effect relinquishment back to the state.**			
Target 12.3.1.	**Adequate regulations applicable to mine closure are contained in the relevant legislation.**			
Indicator 12.3.1.1.	**Mine closure regulations are adequate to govern:** • **review and approval of mine closure plans;** • **financial guarantees and sureties;** • **implementation review,** • **Relinquishment and transfer of liabilities to the subsequent land owner.**			
Data Source	**SEMP Office/CoM/MME/Ministry of Environment and Tourism**			
Status:		**In Progress**		

In 2018, MME started the process of reviewing and amending the Minerals Act and the Minerals Policy. A working committee was set up at MME as requested by the Minister of Mines to prepare a draft mine closure framework that will address all aspects of closure including financial provisions. The framework will determine how the state will manage closure provisions, i.e. what is expected from companies in terms of closure plan content and how closure planning links to the licencing and permit process. The concept framework is still being compiled by the working committee and to be presented to the

Minister. The committee will then draft the details of the framework by mid-2019. By this time, it should become clear which laws must be amended to accommodate the framework.[109]

At the same time, MEFT were also working on a revision of the Environmental Management Act to make provision for mine closure. How and where mine closure funding and all associated provisions will be regulated is yet to be determined.

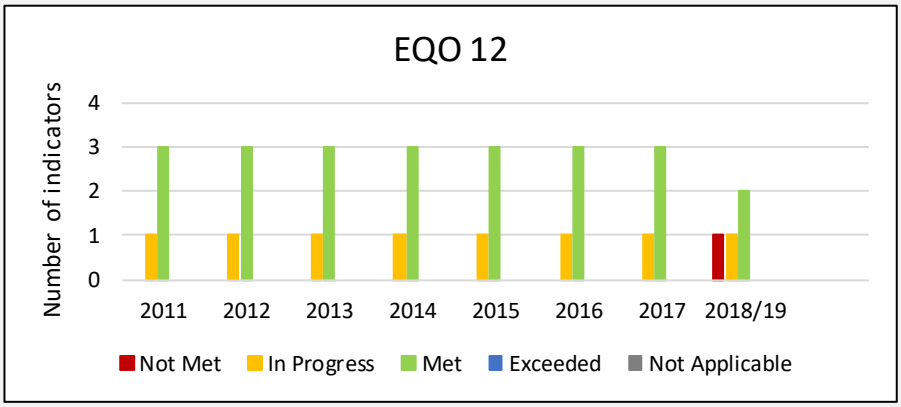
Motivation of status: The indicator was rated **In Progress** because Government is working on mine closure legislation.

********** ********** ********** **********

Summary of performance over time: EQO 12

Total no. indicators assessed 4				
2018/2019	**Not Met**	**In Progress**	**Met**	**Exceeded**
Number of indicators in class	1	1	2	0
Percent of indicators in class	25%	25%	50%	0%

Overall performance: Two indicators were **Met** (50%) because the operating mines had closure plans in line with the Namibian Mine Closure Framework and IAEA guidelines, as well as closure cost estimations. One company did not provide financial sureties so that the related indicator was **Not Met** (25%). The last indicator requiring adequate mine closure regulations to govern the review and approval of mine closure plans at all stages of the closure and relinquishment process was rated **In Progress** (25%) because Government worked on closure guidelines in 2018/2019 and presented a draft framework towards the end of 2019.



********** ********** ********** **********

[109] Pers. comm. Environmental Compliance Consultancy (a member of the MME working committee), 2019

SUMMARY OF RESULTS

The SEMP is a living document that has to be amended to keep up with development. Over the years, some goals, targets and indicators have been added, changed or deleted to better represent the intention of the SEA. It has become clear that many indicators were formulated under the assumption that the "uranium rush" that triggered the SEA would lead to the development of quite a few new mines. The current mining scenario, which closely resembles the base case, was not foreseen in the SEA. There are only two operating mines, Rössing and Husab, while Langer Heinrich was mothballed in 2018. All the other projects are still awaiting improved market conditions.

Seeing that the uranium rush was revealed as a short-lived phenomenon, the impact on the environment and the demand for social services in the Erongo Region will evidently not continue rising as a result of uranium mining. The SEMP Steering Committee has therefore raised the question whether it was worthwhile evaluating all indicators on an annual basis. It was suggested that "slow-moving" EQOs like infrastructure, health and education could be assessed every second year. Issues of public concern such as economic development, employment, tourism and ecological impact, as well as air and water quality would still be monitored and updated annually, possibly on the MME website. These considerations resulted in a decision to extend the reporting period, so that the current report for 2018/2019 is the first one covering two years. Short summaries of each EQO are presented below, followed by an evaluation of the SEMP's performance since its inception in 2011.

EQO 1

Indicators of Socioeconomic Development are related to the payment of royalties and taxes, local procurement and EPZ status for processing companies. The four indicators have all been **Met** in 2018-2019 (100%).

EQO 2

The only indicator of Employment has always been **Met** (100%) because the majority of the permanent workers and contractors at uranium mines are Namibian citizens and companies receive AA compliance certificates.

The infrastructure EQO covers housing, transportation including roads, railways and harbour, electricity supply and renewable energy, as well as waste management and recycling. One of the two housing indicators continued to be **Met** because mining companies do not intend to establish mine-only townships, while the other was **Not Met** due to Swakop Uranium's use of an on-site hostel after the end of the construction phase.

EQO 3

Five indicators referring to road condition and maintenance were **Met**, and one was **In Progress**, while one (safe traffic on the B2 road) was **Not Met**. The indicator of rail use for bulk goods was **Met**, while Namport's three indicators were **Met**. The indicators concerning the quantity and quality of electricity supply to the region and the implementation of renewable energy projects at mines were **Met**.

Thirteen waste management indicators were **Met** and two were **In Progress**. Among these, all four indicators that check the mines' compliance with regulatory requirements for the management of mineral waste were **Met**. The indicators that were **Not Applicable** in 2018/2019 refer to the reduction of heavy traffic on the road between Swakopmund and Walvis Bay, EIAs for new waste sites and compliance with waste management standards that are not yet in place.

EQO 4

Seven of the eight indicators in the Water EQO were **Met** (87.5%) in 2018-2019, while one indicator related to the continuous availability of desalinated water during sulphur outbreaks was **In Progress** (12.5%). Contrary to fears expressed during the SEA process, uranium mining did not compromise the water quality or lower the water table in the rivers since monitoring started in 2011. The water-tariff increase for domestic users to cover the cost of desalinated water was limited to an acceptable level.

EQO 5

The three air quality indicators were **Met** (100%). Dust fallout monitoring took place and dust levels at Arandis and at the mine boundaries were within the adopted SA NDCR limits for residential and non-residential areas. The advanced air quality study provided additional PM_{10} dust data and proposed a regional air quality standard. The regional monitoring system set up by the consultants was handed over to government in early 2019.

EQO 6

Four Health indicators were **Met** (57%): A public radiation dose assessment was completed and confirmed that the public dose was below the legal limit; the radiation dose to mine workers did not exceed the legal limit of 20 mSv/a and the incidence rate of occupational diseases did not increase. The epidemiological study to find out if there is a link between work-related radiation exposure and cancer risk for uranium miners is nearing completion but still **In Progress**. The three indicators measuring the ratio of healthcare professionals and facilities per number of patients were **Not Met** (43%) because the MHSS strategic plan for the next five years did not make provision for the required number of health service providers to be employed by 2020. The indicator requiring public dose assessments for each new mine was **Not Applicable** because no new mines opened in 2018/2019.

EQO 7

The indicator gauging tourists' experience of the Namib was again **Exceeded** (14%) and two indicators were **Met** (43%), showing that tourism operators and mining industry can coexist in the Central Namib. To date, conflict between the need for public access and mining has been avoided and uranium mining did not prevent the public from visiting the usually accessible areas in the Central Namib for personal recreation. The indicators concerning the protection of tourism hotspots and MME not issuing licences in these areas were however **Not Met** (43%), highlighting the urgency for the National Policy on Prospecting and Mining in Protected Areas to be promulgated. Two indicators related to EIAs for new developments were **Not Applicable**.

Eight of the thirteen Ecological Integrity (EQO 8) indicators were **Met** in 2018/2019 (62%). It was confirmed that mines use the mitigation hierarchy to actively avoid, mitigate or restore the affected environment, specifically sensitive areas within the mining licence areas. Mining companies have also partnered with conservation organisations and supported additional conservation projects, as far as currently possible.

EQO 8

The impact of groundwater abstraction on the ephemeral rivers was monitored. A study to understand the impact of water abstraction and to develop a regular monitoring programme for riverine vegetation and wetlands is underway and MEFT's efforts to reduce secondary impacts and improve law enforcement in the parks with the support of concerned stakeholders also remained **In Progress** (23%).

Two indicators concerning the protection of important biodiversity areas and the implementation of biodiversity offsets were **Not Met** (15%) due to the absence of enabling legislation. Seven indicators were **Not Applicable** because the relevant activities did not take place in 2018/2019.

EQO 9

Six of seven education indicators were **Not Met** (86%), only the indicator requiring an increase in the number of graduates from tertiary and vocational training institutions was **Met** (14%). Four indicators that were **Not Met** concerned the performance of schools in the Erongo Region in terms of improved Grade 10 and 12 examination results and teacher-to-learner ratios. The other two indicators revealed that operating mines failed to spend 3% of their total wage cost on training and did not give 10% more bursaries than the number of work-permit holders. Reasons for the poor performance of this indicator are twofold: 1) MEAC is under-resourced and over-stretched by increasing learner numbers, not only in the Erongo region but the entire country; 2) uranium mines were in survival mode and could not allocate more funds to training and bursaries.

EQO 10

Four of the EQO 10 indicators were **Met** (27%) since the correct EIA process was being followed, international checks on the uranium industry's performance were in place and monitoring results were available in annual SEMP reports. The indicators **In Progress** (40%) were related to GRN agencies conducting regular inspections at active mines and enacting legislation that will enable MEFT to appoint honorary conservation officers and issue fines for environmental non-compliance. Four indicators were **Not Met** because MEFT and MME's Mineral Rights Committee did not consider the protection of areas defined in the Policy on Prospecting and Mining in Protected Areas when granting EPLs or ECCs; while the fourth indicator that was **Not Met** concerned published evidence of unethical conduct, bringing the total to 33%. One indicator related to new linear infrastructure was **Not Applicable**.

EQO 11

There was significant progress in archaeological research during the last two years, leading to three indicators being **Met** (100%). Three indicators were **Not Applicable** since no archaeological assessments were carried out in 2018/2019 and the development of diachronic models was classified as a long-term research project.

EQO 12

Two indicators **Met** (50%) refer to closure plans in line with the Namibian Mine Closure Framework and IAEA guidelines, as well as closure cost estimations. One indicator was **Not Met** (25%) because a company did not provide financial sureties. The indicator requiring adequate mine closure regulations to govern the review and approval of mine closure plans at all stages of the closure and relinquishment process was rated **In Progress** (25%) because Government worked on closure guidelines in 2018/2019 and presented a draft framework towards the end of 2019.

Table 27: EQO Performance in 2011-2018/2019

Years	Indicators	Not Met	In Progress	Met	Exceeded	Not Appl.
2011	127	14	44	64	1	4
2012	124	21	37	57	1	8
2013	119	12	36	70	1	0
2014	122	8	40	71	3	0
2015	123	3	34	61	3	22
2016	121	9	23	57	3	29
2017	121	14	19	65	2	21
2018/19	**121**	**22**	**15**	**64**	**1**	**19**

The total number of SEMP indicators **Met** was 64 in 2018/2019 compared 65 in the previous year, while only one indicator was **Exceeded**. The number of indicators that were **Not Met** increased from 14 to 22, while the indicators **In Progress** dropped from 19 to 15 (Table 27 and Figure 35). In 2018/2019, 19 indicators were **Not Applicable** because the relevant activities did not take place.

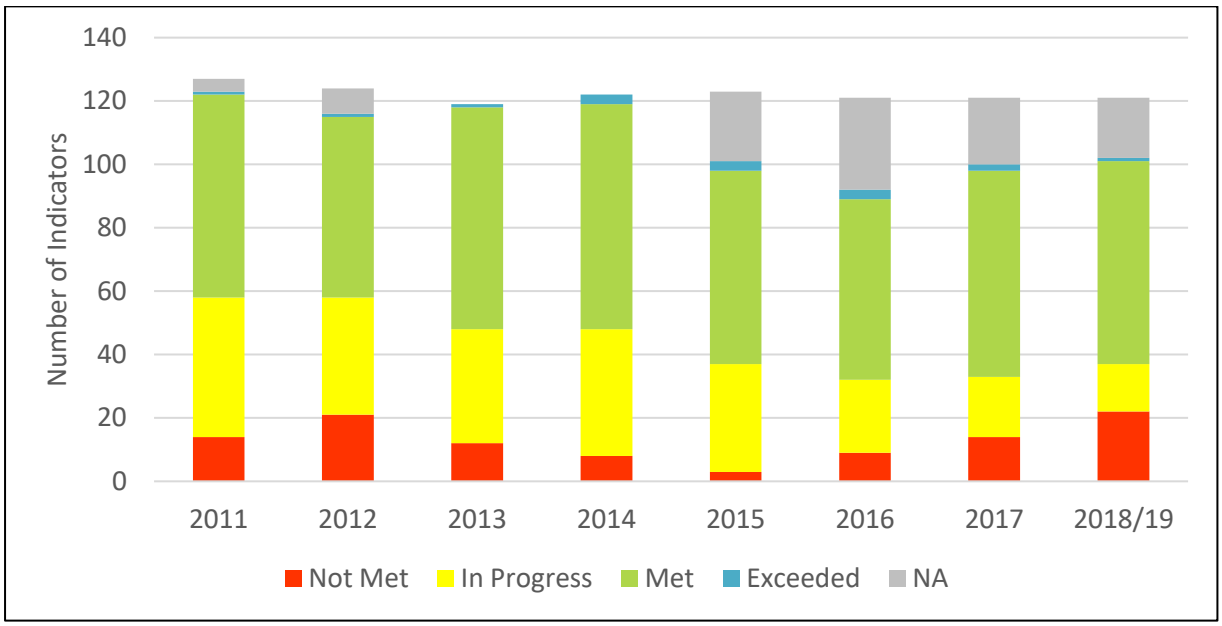


Figure 35: EQO Performance Trends over Time

The number of indicators **Met** in 2018/2019 was the same as the initial figure in 2011. The best result of 71 indicators **Met** was achieved in 2014, while the lowest number was 57 in 2012 and 2016. The lack of improvement was at least partly due to the significant number of indicators that could not be assessed (**Not Applicable**).

On the other hand, there was a definite increase in the number of indicators that were **Not Met.** The persistently high number of outstanding issues suggests that more resources will be required if the desired outcome of the SEMP is to be achieved. Recommended actions to rectify the deficiencies have been included in the SEMP action plan in the next chapter.

There were fewer indicators **In Progress** in 2018/2019; this came about because 1) projects were completed or 2) it became clear that the indicator should be moved into the **Not Met** category or 3) it was found to be **Met**. A more stringent approach was taken to avoid assessing an indicator as **In Progress** when no real advancement could be shown.

The latest performance ratings of each EQO are displayed in Figure 36 and summarised as follows:

- Four EQOs were 100% **Met**: Socioeconomic Development (EQO 1), Employment (EQO 2), Air Quality (EQO 5) and Heritage (EQO 11), except for some indicators that were not applicable.
- The Water (EQO 4) indicators were mostly **Met** with a small percentage **In Progress**.
- Mixed results ranging from **Met** to **Not Met** were obtained for the following EQOs: Infrastructure (EQO 3), Effect on Tourism (EQO 7), Ecological Integrity (EQO 8), Governance (EQO 10) and Mine Closure (EQO 12).
- The worst performing EQOs were Health (EQO 6) and Education (EQO 9) with a high number of indicators **Not Met**.
- One indicator was **Exceeded** in EQO 7 regarding tourists' expectations of their visual experience in the Central Namib.

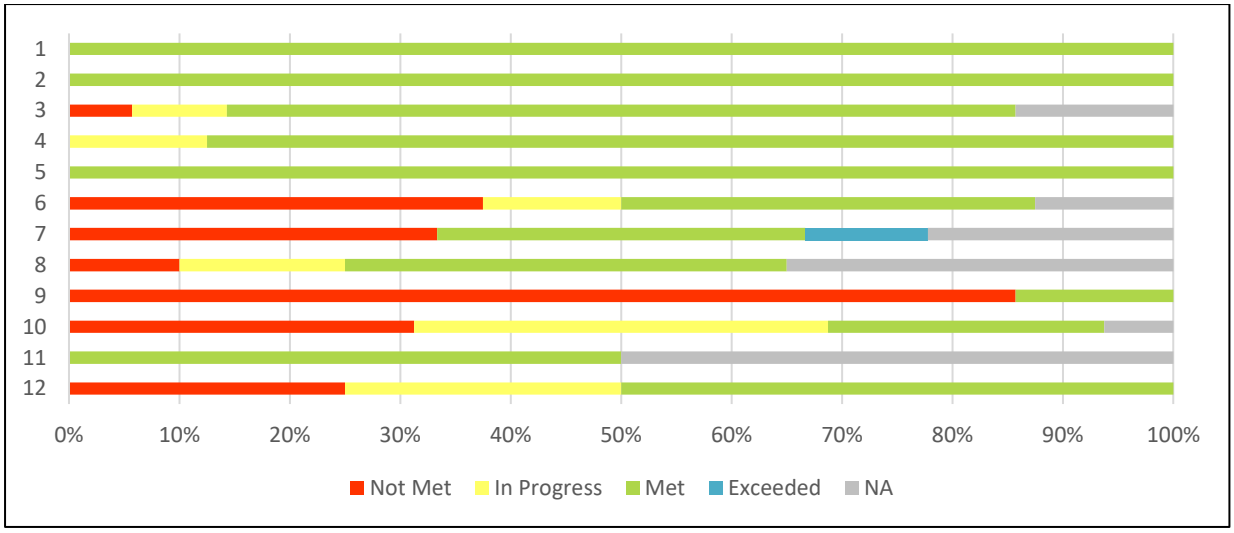


Figure 36: Performance per EQO in 2018/2019 in %

ACTIONS ARISING FROM THIS REVIEW

The implementation of EQO targets is essential to ensure that the region is well positioned for future uranium mining projects. Table 28 summarises the most important actions to address the shortcomings (indicators Not Met or In Progress) identified in this report. Responsible agencies should take note that the review covers the years 2018 and 2019 and the report was completed in 2020.

Table 28: SEMP Action Plan

Target / Indicator	Deficiency	Actions	Agency
3.1.1.2: There are no on-site hostels during the operational phase of a mine	Swakop Uranium is using an on-site construction camp during operation	• Decide on the applicability of the indicator to this specific case	SEMP Steering Committee
3.2.1.1: Surfaced roads are adequate and safe for traffic frequency	Traffic on the B2 has increased to the extent that the road has become unsafe	• Upgrade the road to double lanes or create passing lanes at least up to Arandis	Roads Authority
3.2.1.4: Road markings and signs are present and in good condition	Visibility on the B2 at night should be improved	• Install cat's eyes for better visibility in the fog zone	Roads Authority
3.3.1: Most bulk goods are transported by rail	Bulk goods such as fuel are transported by road	• Upgrade the railway line to keep bulk freight off the roads	Transnamib
3.5.1.5: Electricity provision does not compromise human health	Planned extension of Anixas power station may affect Walvis Bay residents	• Power station emissions should comply with air quality guidelines	NamPower
3.6.1.3: All new waste sites undergo an EIA prior to construction and receive a licence to operate	Municipalities completed EIAs for new sites, licencing in progress	• Comply with conditions to obtain environmental clearance certificates	Swakop and Walvis Bay Municip.
3.7.1.1: Waste site managers are adequately trained	Contractors at Walvis Bay were not fully trained	• Train newly appointed contractors	WB Municipality
3.7.1.2: Site manifests which record non-hazardous waste volumes and origins are kept	Not all the required records are kept	• Swakopmund waste site needs a weighbridge • Improve record-keeping	Swakop, WB Municipalities
3.7.1.4: Water and air quality monitoring data at waste sites show no non-compliance readings	Air quality is monitored at Swakopmund and Walvis Bay, but not water quality	• Monitor water quality to see if there is hydrocarbon or other hazardous pollution	Swakop, WB Municipalities
4.3.1.2: Desalinated water meets mine demand	Water supply disruptions due to sulphur outbreaks in the sea	• Upgrade capacity of wellfields • Add storage capacity at mines	NamWater, NUA

Target / Indicator	Deficiency	Actions	Agency
6.1.3.2: Incidence rate of diseases scientifically attributed to radiation amongst members of the public and mine workers	Incidence rate of diseases scientifically attributed to radiation in the Erongo Region is unknown	• Rio Tinto Rössing Uranium to publish results of study to determine work-related cancer risk for uranium miners	NUA (RUL)
6.2.1: An increase in qualified health workers available to all in the Erongo Region to 2.5 per 1000 of the population by 2020	Number of healthcare professionals in the region is below the envisaged target ratios	• Employ the number of healthcare professionals identified in the SEA	MHSS
6.2.2: An increase in registered healthcare facilities in Erongo, reaching 2.5 acute care beds per 1000 population and 0.5 chronic care beds per 1000 population by 2020	Number of healthcare facilities in the region is below the envisaged targets	• Construct additional healthcare facilities as identified in the SEA	MHSS
6.2.3: An increase in ambulances in Erongo, reaching 1 per 20,000 by 2020	Number of ambulances in the region is below target	• Get additional ambulances (and well-trained drivers)	MHSS
7.1.1.1: Areas of importance for recreation that are not yet alienated by mining or prospecting are declared 'red flag' for prospecting or mining	The Walvis-Swakop dunes, Messum Crater, Klein Spitzkoppe, Swakop and Khan rivers, Welwitschia Drive and Park campsites are not declared 'red flag', MME issued EPLs in some of these areas	• No EPLs, MLs or claims to be allocated in red flag areas • Ensure that these areas remain accessible for tourism and recreation	MME and MEFT
7.3.1.2: MME recognizes and respects 'yellow flag' status for areas regarded as being scenically attractive	MME issued two EPLs in yellow-flagged areas	• No EPLs, MLs or claims to be allocated in yellow-flag areas	MME
8.1.1.1: Important biodiversity areas [red or yellow flag areas] are taken into consideration when adjudicating prospecting and mining applications	Some red and yellow flag areas are not included in the Policy on Prospecting and Mining in Protected Areas	• Consider the status of these areas before granting mining or exploration licences	MME
8.2.1.2: Mining companies commit to sustainable offset initiatives to ensure 'no net loss' to biodiversity as a result of their operations	Implementation of offsets hampered by lack of procedure and regulations	• Include offsets in revised Environmental Management Act and regulations	NUA
8.4.1.1: Off-road driving, poaching, illegal camping, and littering are explicitly	MEFT reported transgressions but could not say if they were committed by	• Report offenders to NUA so that mines can act	MEFT

Target / Indicator	Deficiency	Actions	Agency
prevented by mining and exploration personnel and their contractors	mining personnel or members of the public	• Continue to prevent and monitor secondary impacts	NUA
8.5.1.1: Regular monitoring of indicator species in relevant ephemeral rivers is in place to detect any impacts on wetlands, phreatophytes and riparian vegetation	Monitoring system not yet in place, but studies ongoing	• Identify indicators, design and implement a monitoring system	NERMU
8.5.2.1: No unusual loss of wetland and riparian vegetation	This will form part of the monitoring system mentioned above	• Identify indicators, design and implement a monitoring system	NERMU
9.1.1.1: Erongo Region Grade 10 and 12 results improve over time compared to other regions	Erongo was among the underperforming regions	• Improve performance of teachers and learners in the region	MEAC
9.1.1.2: Teacher to learner ratio at schools in Arandis, Swakopmund and Walvis Bay is better than the national average	Erongo Region's ratio of 27 was above the national average of 26	• Employ more teachers to achieve a ratio of <26 in the Erongo Region	MEAC
9.2.1.2: Each mine has or funds a skills development programme for employees (3% of wage cost)	Companies did not meet the target	• Allocate more funding to skills development	NUA
9.2.1.3: Each mine has 10% more bursary holders than work-permit holders	Companies did not meet the target	• Allocate more bursaries or reduce number of work-permit holders	NUA
10.1.1.1: Declared 'red flag' areas undergo the required high level of scrutiny before mineral licences area considered	MME issued two EPLs in biodiversity red flag areas	• No EPLs, MLs or claims to be allocated in red flag areas	MME
10.1.1.3: If development is to take place in a yellow flag are, strict conditions are attached with the approval certificate	MME issued two EPLs in tourism yellow flag areas without considering ECCs and conditions	• Strict conditions to be attached with the environmental approval certificate	MEFT, MME
10.2.1.1: Mineral licences are given only after full consultation of the Mineral Rights Committee and considering the status of areas in question (red and yellow flag)	MME issued two EPLs in tourism yellow flag and biodiversity red flag areas	• MPMRAC to consider the status of areas in question before issuing licences	MME MPMRAC

Target / Indicator	Deficiency	Actions	Agency
10.3.1.1: GRN agencies inspect active mines at least once per annum, and closed mines at least once every 3 years	Not all agencies inspected each of the mines as required in 2018-2019	• Inspect operating mines every year • Inspect closed mines every 3 years	MME MEFT MAWLR MHSS
10.3.1.2: Honorary conservators are appointed by MEFT to assist with monitoring, including of unauthorized secondary activities such as off-road driving, poaching and littering	No honorary conservator officers appointed to date, though provision is made in Parks and Wildlife Bill	• Promulgate Parks and Wildlife Bill • Create the necessary regulations	MEFT
10.4.1.3: Fines are issued for non-compliance	Currently no legal basis for the issuing of fines	• Amend EMA and create regulations for fines	MEFT
10.5.1.1: No published evidence about unethical practices in the Namib uranium province	Unethical practices were revealed in the press	• Conduct peer review to hold members accountable	NUA
12.2.1.2: Financial sureties are available	One mine did not put aside funds for closure	• Create a closure fund	NUA
12.3.1.1: Mine closure regulations are adequate to govern: Review and approval of mine closure plans; financial guarantees; implementation review; relinquishment and transfer of liabilities to the subsequent land owner	Namibia does not have mine closure regulations, only a Mine Rehabilitation and Closure Framework (currently in draft)	• Update the Minerals Policy and Act • Create the necessary regulations	MME

CONCLUSION

The SEMP is a living document that has to be amended to keep up with development. Over the years, some goals, targets and indicators have been added, changed or deleted to better represent the intention of the SEA. It has become clear that many indicators were formulated under the assumption that the "uranium rush" that triggered the SEA would lead to the development of quite a few new mines. The current mining scenario, which closely resembles the base case, was not foreseen in the SEA. There are only two operating mines, Rössing and Husab, while Langer Heinrich was mothballed in 2018. All the other projects are still awaiting improved market conditions.

Seeing that the uranium rush was revealed as a short-lived phenomenon, the impact on the environment and the demand for social services in the Erongo Region will evidently not continue rising as a result of uranium mining. The SEMP Steering Committee has therefore decided to extend the reporting period so that the current report covers the two years 2018 and 2019.

Biennial reporting will maintain the function of the SEMP as a long-term monitoring and decision-making tool that highlights potential risks so that measures can be introduced in time to avoid unnecessary consequences or mitigate unavoidable impacts. A continuing aim of the SEMP process is to increase the commitment of key government institutions, the uranium industry and NGOs to undertake whatever actions will take the Erongo Region towards the desired future state where communities and industry are able to co-exist in harmony.

The SEMP Office issued a brochure in 2018 to inform the public and stakeholders such as government and parastatal institutions about the objectives of the SEMP and the importance of their contributions. Some stakeholders involved in data collection or monitoring and the implementation of particular targets were visited during the data collection process. Personal interaction was found to be most effective in building productive relationships. The SEMP Office hopes to expand on this stakeholder engagement process in future.

In view of the cyclical nature of commodity markets it is expected that the demand for uranium will increase in future. The implementation of EQO targets according to the action plan in this report, as well as the ongoing monitoring and reporting on achievements and shortcomings is essential to ensure that the Erongo Region is well positioned for future uranium mining projects.

Geological Survey of Namibia
Ministry of Mines and Energy
Private Bag 13297
Windhoek
Namibia