Ministry of Mines and Energy

Strategic Environmental Management Plan (SEMP) for the Central Namib Uranium Province 2015 Annual Report

April 2017

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:	April 2017
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Citation

Geological Survey of Namibia (2017): Strategic Environmental Management Plan (SEMP) for the Central Namib Uranium Mining Province, 2015 Annual Report. Ministry of Mines and Energy, Windhoek, Republic of Namibia

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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 and it is supported by the Namib Ecological Restoration and Monitoring Unit (NERMU) at the Gobabeb Research and Training Centre.

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) and the extent to which uranium mining is impacting the central Namib. Each EQO articulates a specific goal, provides a context, sets standards and elaborates on a number of key indicators that are monitored.

The Namibian economy was affected by low commodity prices, especially on the uranium market. The uranium spot price fluctuated around US$36-39 per pound during 2015 and fell to US$25 per pound in 2016. A recovery to at least US$60-70 per pound is required to ensure the profitability of many projects that are currently at the exploration or care and maintenance stage. This explains why the Namibian uranium industry has remained in SEA Scenario 1 with only two producing mines, Rio Tinto's Rössing Uranium and Paladin's Langer Heinrich Uranium. Swakop Uranium proceeded with the construction of its Husab mine which was scheduled for commissioning before the end of 2016.

The overall performance of the 2015 SEMP showed an improvement compared to the preceding years. This is partly due to 23 indicators being rated **NOT APPLICABLE** (19%), either because the relevant activity did not take place in 2015 or because the required information was not collected and will not become available in future. Some of the latter indicators have in the past been rated **NOT MET** or **NO DATA**. In summary, 46% of the indicators were **MET**, 28% were **IN PROGRESS**, 2% **EXCEEDED** and 5% **NOT MET**.

The graph on the next page displays the performance per EQO that can be summarised as follows:

- The Socioeconomic Development (EQO 1), Employment (EQO 2) and Air Quality (EQO 5) objectives were 100% **MET**.
- The objectives for Water (EQO 4), Governance (EQO 10), Heritage and the Future (EQO 11), as well as Mine Closure and Future Land Use (EQO 12) were mostly **MET** while some indicators remained **IN PROGRESS**.
- Mixed results ranging from **EXCEEDED** to **NOT MET** were obtained for the Infrastructure (EQO 3) and Education (EQO 9) objectives.
- Effect on Tourism (EQO 7) shows the same percentages of indicators **MET** and **IN PROGRESS**, while one indicator was **EXCEEDED**.
- Areas where the number of indicators **IN PROGRESS** is higher than the ones **MET** are Health (EQO 6) and Ecological Integrity (EQO 8).
- Six indicators (3%) were **NOT MET**; these can be found under Infrastructure (EQO 3), Education (EQO 9) and Governance (EQO 10). The first two short-comings were due to the lack of legislation for pollution control and monitoring of waste sites. In Education there was a failure to achieve more than 50% D or higher symbols in the 2015 Grade 10 and 12 examinations. The problem in Governance was the the lack of legislation that would allow MET to appoint honorary wardens.
- The indicators that were rated as **EXCEEDED** were in the Infrastructure EQO (average waiting time for ships to obtain a berth at Namport was much lower than 12 hours), in Effect on Tourism (tourists' expectations of their visual experience in the Central Namib were mostly exceeded) and in the Education EQO (percentage of wage cost allocated to skills development exceeded the 3% target at operating mines).

A gradual improvement in performance has been observed since the first SEMP report in 2011 (Figure 28). The number of indicators **NOT MET** has decreased and the percentage **IN PROGRESS, MET** and **EXCEEDED** has increased.

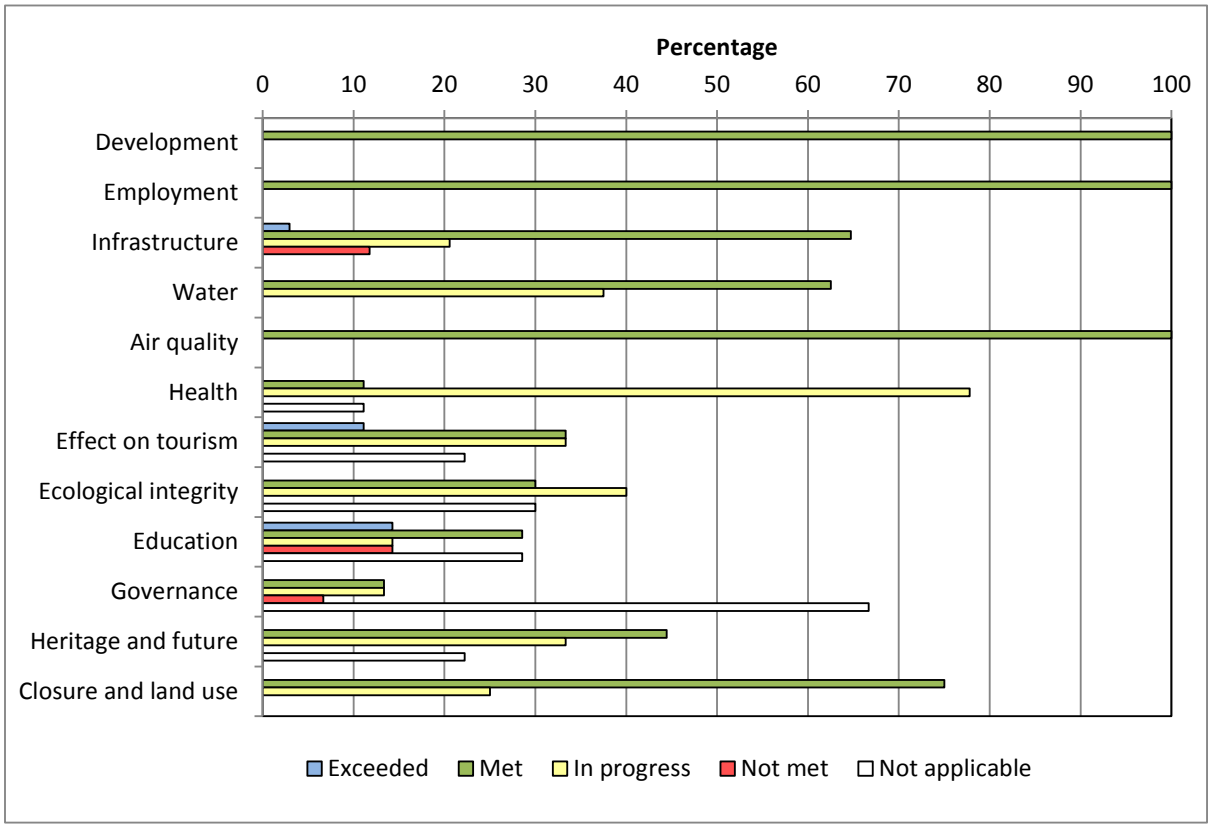

Figure I: Performance per EQO in 2015

In its fifth assessment period the SEMP's achievements to date include the establishment of a long-term monitoring and decision-making tool through which potential impacts are highlighted so that measures can be developed to avoid unnecessary impacts or mitigate unavoidable impacts. The 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 region towards the desired future state of the SEMP.

To address certain stakeholders' lack of commitment that was noticed while compiling the 2014 report, the SEMP Office embarked on a roadshow in 2015. All government and parastatal institutions that are involved in data collection, monitoring and/or responsible for the implementation of particular targets were visited and informed about the objectives of the SEMP and the importance of their contributions.

The anticipated "uranium rush" that triggered the SEA and SEMP did not materialise due to the lower demand for uranium following the Fukushima disaster. The slower pace of development with only one new mine coming into operation has created an opportunity for government agencies and parastatals to catch up with the Erongo Region's infrastructure needs. Implementation of the SEMP will ensure that the region is well positioned and prepared for any future increases in uranium demand.

CONTENTS

List of Figures

List of Tables

ABBREVIATIONS

AA	Affirmative Action
BH	Borehole
BMC	Basin Management Committee
CoM	Chamber of Mines
DWAF	Department of Water Affairs and Forestry
DWSSC	Directorate Water Supply Sanitation Co-ordination, DWAF
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
IWRM	Integrated Water Resources Management
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
MAWF	Ministry of Agriculture, Water Affairs and Forestry
MHSS	Ministry of Health and Social Services
MLIREC	Ministry of Labour, Industrial Relations and Employment Creation
MME	Ministry of Mines and Energy
MoE	Ministry of Education
MoF	Ministry of Finance
N$	Namibian Dollars
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
No.	Number
NRPA	National Radiation Protection Authority
NSA	National Statistics Agency
NUA	Namibian Uranium Association

Pers. comm.	Personal Communication (Interview)
PM_{10}	Inhalable dust with particles smaller than 10 micrometres
SA NDCR	South African National Dust Control Regulations
SANS	South African National Standard
SEA	Strategic Environmental Assessment
SEMP	Strategic Environmental Management Plan
VET Levy	Vocational Education and Training Levy
WHO	World Health Organisation

Abbreviations used in Radioactivity and Water Quality Analyses

Bq/m^3	Becquerel per Cubic Metre
Ca	Calcium
$CaCO_3$	Calcium Carbonate (limestone)
Cd	Cadmium
cfu/mL	Colony-forming units per millilitre
Cl	Chloride
Cu	Copper
F	Fluoride
Fe	Iron
K	Potassium
Mg	Magnesium
Mg/L	Milligrams per litre (also written as mg/l)
Mn	Manganese
mS/m	Millisiemens per metre
Na	Sodium
NO_2	Nitrite
NO_3	Nitrate
NTU	Nephelometric Turbidity Units
Pb	Lead
pH	Indicates if a solution is acid (0-7) or alkaline (7-14)
Ra-226	Radium Isotope, naturally occurring
Ra-228	Radium Isotope, naturally occurring
SiO_2	Silica
SO_4	Sulphate
TDS	Total Dissolved Solids (a measure of salinity)
U	Uranium
U_3O_8	Uranium trioxide, the form that is usually traded on the market
Zn	Zinc

SEMP BACKGROUND

A Strategic Environmental Assessment (SEA) was undertaken in response to a "uranium rush" that broke out when the spot market price started rising in 2005 and reached over US$120 per pound in 2007. The Ministry of Mines and Energy announced a moratorium on the issuing of exclusive prospecting licences for nuclear fuel in 2007, in the wake of an unprecedented wave of licence applications that covered the entire Erongo region and other parts of the country. Though the uranium price quickly dropped to US$40-60 per pound in the following years a number of companies continued with exploration, feasibility studies, process development and applications for mining licences.

Government and stakeholders became concerned about the effect that uranium prospecting and mining could have on the environment and affected communities. The mining industry was worried that unscrupulous miners could tarnish the Namibia's reputation as a responsible uranium supplier. All involved parties felt that the Erongo region did not have the infrastructure and social services to accommodate a massive influx of job seekers. The SEA was undertaken in 2009-2010 to address these concerns, provide vision and generate a culture of collaboration among the mining industry, government, and the public. As part of the SEA process a Strategic Environmental Management Plan (SEMP) was developed based on issues raised by stakeholders during consultation meetings.

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 deposit are partly located in a proclaimed national park and one of the most popular tourist hotspots 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, the mining companies and civil society (to a lesser extent) 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 (MME 2010).

The SEMP is an over-arching framework to address the cumulative impacts of existing and potential new developments, within which individual projects have to be planned and implemented. It consists of twelve Environmental Quality Objectives (EQOs), measuring the positive and negative impact of uranium mining on the Erongo Region (**Error! Reference source not found.**). Each EQO articulates specific aims, sets standards and elaborates on key indicators that need to be monitored.

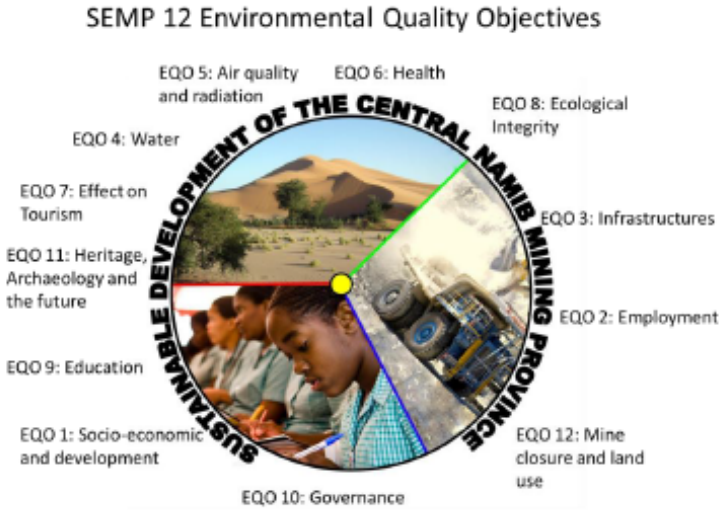

Figure 1: Environmental Quality Objectives of the SEMP Operational Plan

Implementation of the SEMP is guided by a steering committee that is chaired by the Geological Survey of Namibia (GSN) at the Ministry of Mines and Energy (MME). Members include the Department of Water Affairs (DWAF) in the Ministry of Agriculture, Water and Forestry (MAWF), the Ministry of Health and Social Services (MHSS), which includes the National Radiation Protection Authority (NPRA), the Ministry of Environment and Tourism (MET), the Gobabeb Research and Training Centre's Namibia Ecological Restoration and Monitoring Unit (NERMU), the Namibian Coast Conservation and Management project (NACOMA) and the Namibian Uranium Association (NUA).

The SEMP Office that is housed in the GSN ensures that monitoring is carried out and data on environmental performance indicators are collected. This involves consultation with government and non-government organisations as shown in Figure 2. 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.

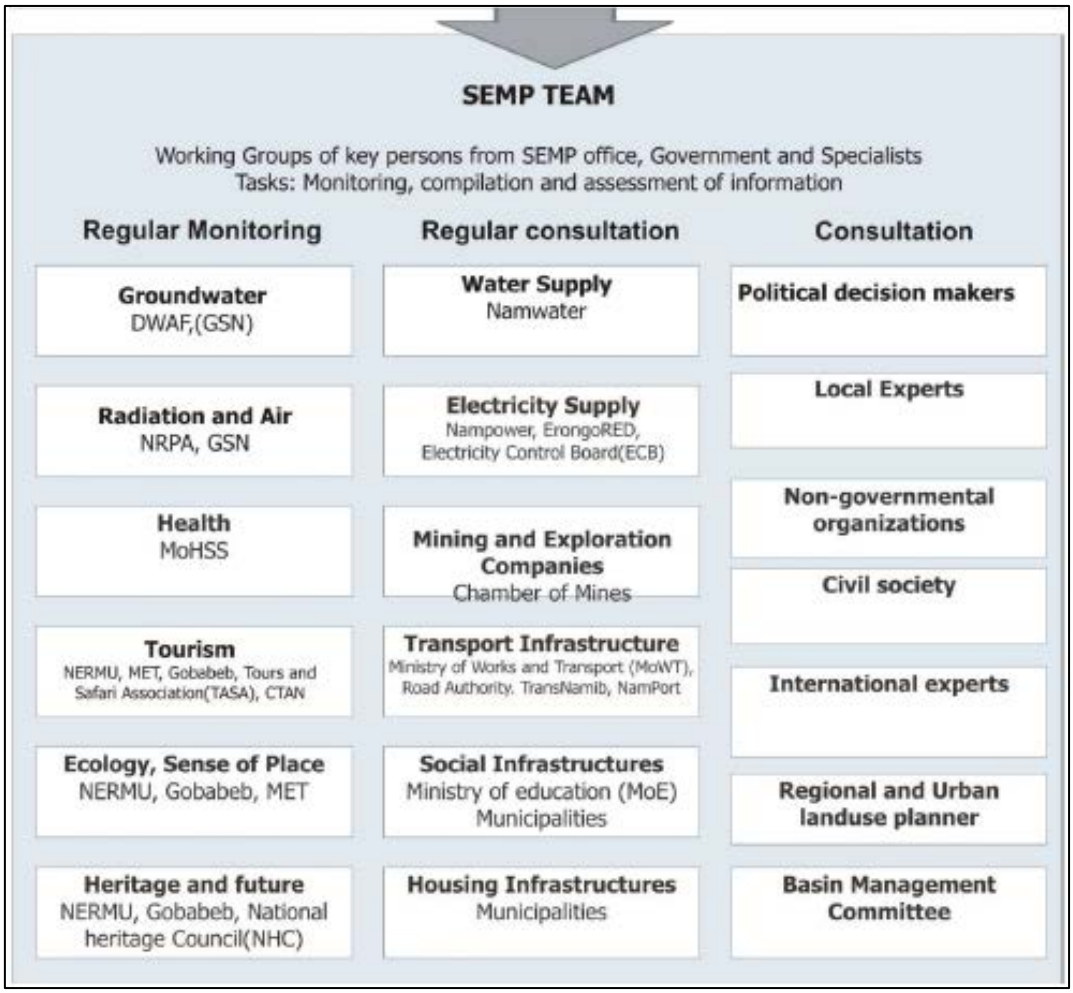

Figure 2: Diagram of SEMP Stakeholders

The annual reports consist of a set of matrices, in which the desired outcomes, targets and indicators spread across the 12 EQOs are assessed. Each indicator is evaluated in terms of whether it has been "exceeded", "met" or "not met". In many cases measures to meet a goal are still "in progress". A four-tiered colour-coding system is used for easy reference. In the current reporting period it became necessary to add a "not applicable" rating for indicators that could not be assessed because there was no such activity in 2015.

URANIUM MINING SCENARIO IN 2015

The Namibian economy continued to be affected by low commodity prices, especially on the uranium market. According to the UxC Nuclear Fuel Price Indicator (www.uxc.com) the uranium spot price fluctuated around US$36-39 per pound of uranium trioxide (U_3O_8) during 2015 and fell to US$35 per pound at the end of the year (Figure 3). At the time of writing this report in the second half of 2016 the price has dropped to US$25 per pound. A recovery to at least US$60-70 per pound is required for the profitability of many projects that are currently at the exploration or development stage.

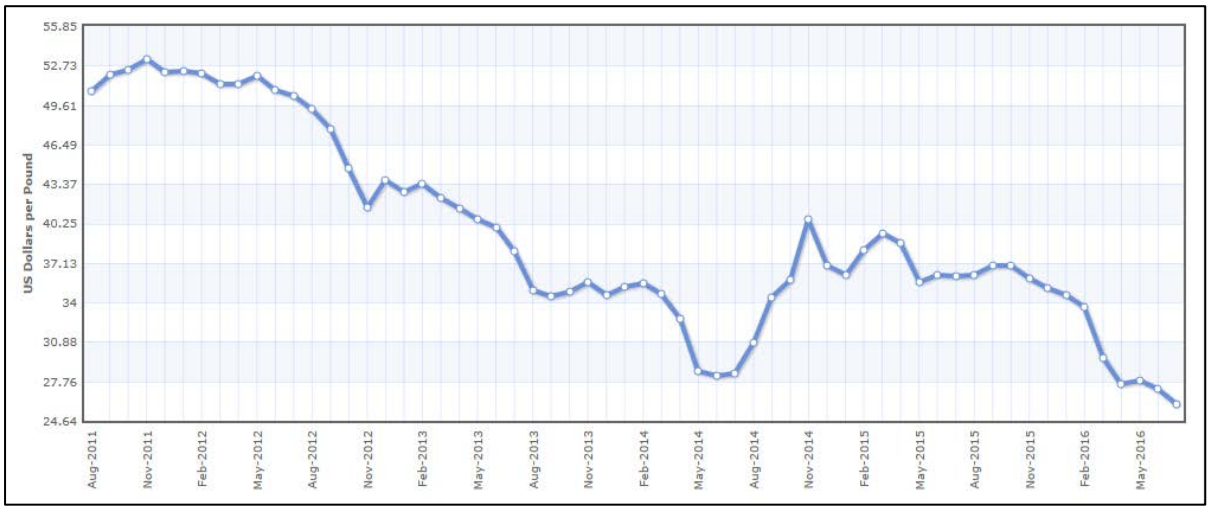

Figure 3: U_3O_8 Spot Price 2012-2016 (www.indexmundi.com/commodities)

This explains why the Namibian uranium industry has remained in SEA Scenario 1 with two producing mines (Rio Tinto's Rössing Uranium and Paladin's Langer Heinrich Uranium) and two new mines being developed (Husab and Trekkopje). Swakop Uranium proceeded with the construction of its Husab mine in spite of adverse market conditions, while Trekkopje mine remained in care and maintenance. The cyclical nature of commodity markets implies that an upturn can be expected sooner or later. In the meantime the industry is trying to weather the storm by optimising its resources and processes. The following paragraphs provide short summaries of each company's activities based on the Chamber of Mines Annual Review for 2015.

Though AREVA Resources Namibia's Trekkopje mine was placed under care and maintenance in mid-2013, the company continued to research the alkaline heap leach process that will be employed once the mine enters full-scale production. Having optimised the existing process in the last two years, the focus of metallurgical test work in 2015 was on various methods of pre-concentrating the uranium ore before heap leaching.

Bannerman Mining Resources (Namibia) completed the construction of a heap leach demonstration plant at its Etango uranium project in March and commissioned the plant in April 2015. Results yielded by the plant confirmed that the heap leach process is ideally suited for the Etango ore with uranium extraction of 93% being consistently achieved in a leach time of 20 days. Bannerman completed an optimisation study of the Etango project that showed a significant improvement in net present value and other financial parameters.

Langer Heinrich Uranium's main focus for the year was to increase throughput to nameplate production, improve efficiencies and reduce costs. The company has commissioned a reagent recovery plant that significantly reduced its sodium bicarbonate, caustic soda and freshwater consumption. Production was however constrained in the first half of the year due to scale formation that required secondary pipe installation.

Marenica Energy Namibia has applied for a mineral deposit retention licence for its EPL to await an increased uranium price. In the meantime metallurgical test work continued to refine the company's proprietary processing technology. Having tested calcrete-hosted ore from other sources to confirm a broader application the company is now planning to build and operate a pilot plant.

Reptile Uranium's exploration activities included geological mapping at the Omahola, Tumas and Tubas Sand projects, ground geophysical surveys, as well as a depth-to-basement study of the Tumas/Tubas channel using remote sensing data and new modelling techniques. A bulk sample for metallurgical testing was taken from the Tumas area.

Rössing Uranium implemented an integrated productivity model to sustain increased production, which started to show results in November and December 2015. The maintenance strategy helped to improve the residual life of plant infrastructure. Two important projects were completed on the tailings dam and in the fine crushing plant. An EIA was carried out for a proposed desalination plant close to Swakopmund, but environmental clearance was denied.

Swakop Uranium made good progress with the construction of Husab mine, which is expected to come into production in early 2017. Overburden stripping started in 2015 and employees for all departments were recruited and trained throughout the year. Education and skills development programmes included mining operator, processing operator and artisan training, as well as health and safety training for all employees.

Valencia Uranium completed a definitive feasibility study for the Norasa uranium project, which is a consolidation of the Valencia and Namibplaas projects. Optimisation studies identified improvements to the original process design and a larger resource base resulted in improved project economics. The company is currently updating its EIA and EMP.

Zhonghe Resources Namibia conducted geochemical surveys and ground geophysical surveys as part of its supplementary exploration programme in 2015. Ore samples were taken for leach testing.

The moratorium on exclusive prospecting licences remained in place since 2007 and no new uranium mining licences were issued in 2015. The Ministry of Mines and Energy is expected to lay down guidelines for the issuing of uranium prospecting and mining licences in a new uranium and nuclear energy policy.

EVALUATION OF THE ENVIRONMENTAL QUALITY OBJECTIVES

EQO 1. Socio-Economic Development

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

Countries that are rich in natural resources such as minerals and oil are often overly reliant on mining and fail to develop secondary and tertiary industries that will sustain the economy when the primary resources run out. The term "natural resource curse" is often used to describe a situation where a government does not reinvest the income it reaps from mining in socioeconomic development that benefits the entire population (McMahon and Moreira, 2014). This can lead to disappointing economic growth performance compared to countries with more diversified industries and a strong agricultural sector. Namibia could be susceptible to the "natural resource curse" if the income from its mining industry is not well managed. It is therefore the objective of EQO1 to ensure that the uranium industry contributes its fair share to the socio-economic development of the Erongo region and Namibia as a whole.

Four indicators are used to measure the contribution of the mining sector to the socioeconomic development of the country, the first two being the amount of fiscal revenue generated through royalties and corporate taxes paid by the mines. The third indicator assesses whether companies procure goods and services within Namibia, thus contributing to overall industrialization of the country, while the fourth one states that uranium processing companies should not be granted EPZ status because this would reduce the state's tax income.

Another indicator that could have been considered relates to the income earned by local beneficiation of raw materials, an opportunity that the Namibian government wants to promote. The Chamber of Mines has carried out a study that identified beneficiation options for several metals and minerals. Uranium can however only be processed at a few facilities around the world due to the complexity and cost of the uranium enrichment and nuclear fuel production technology.

Mining plays a vital role in the Namibian economy. In 2015 the mining sector made a direct contribution of 12.5% to the GDP of the country which was 0.3% less than the previous year (National Statistics Agency, Annual National Accounts 2015). The contribution from uranium mining was only 1% of GDP. This was mostly due to the low demand for uranium on the world market, with the spot price hitting a low of U$35 per pound at the end of 2015. The price affected the production of the operating mines, with the result that the government's income from royalties and taxes in 2015 declined too.

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, in this case uranium. Royalties are due when the product is sold, which means that revenue to the state is still generated even if a mining company does not make taxable profits. The two operating mines, Rössing and Langer Heinrich, paid royalties in 2015 as shown Table 1 in comparison to the previous three years. Langer Heinrich mine has ramped up its production, resulting in higher royalty payments in 2014 and 2015. In contrast to this, Rössing Uranium's royalties have declined by 50% compared to 2012 due to a significant fall in uranium production.

Table 1 Royalties paid by Uranium Mining Companies

Company	2015 (N$)	2014 (N$)	2013 (N$)	2012 (N$)
Langer Heinrich	60,696,272	65,175,939	56,277,197	53,990,032
Rössing	54,312,447	56,828,000	85,240,000	110,183,000

Motivation of status: The operating mines Rössing and Langer Heinrich paid royalties, this indicator is therefore **MET.** The indicator is not applicable to exploration companies or mines that are not yet in operation.

Indicator 1.1.1.2.	**Corporate taxes are paid in full by mines.**			
Data Source	**SEMP Office/MoF/NUA**			
Status:			**MET**	

Companies are not required to pay corporate taxes if they do not make a profit. Both Langer Heinrich and Rössing Uranium were in a tax loss position in 2015 (Table 2). The indicator is not applicable to exploration companies.

Table 2: Corporate Tax paid by Uranium Mining Companies

Company	2015 (N$)	2014 (N$)	2013 (N$)	2012 (N$)
Langer Heinrich	Nil	Nil	Nil	Nil
Rössing	Nil	74,170,000	Nil	Nil

Motivation of status: Companies are only required to pay corporate taxes when they make a profit; therefore no taxes were due in 2015. The indicator is **MET.**

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

The indicator to be measured here is the percentage of total procurement spent locally within Namibia. Table 3 provides figures for the last three years to see whether local procurement of Langer Heinrich and Rössing Uranium has been increasing over time.

Figures for exploration companies and mines under development are not included in Table 3 because the indicator only applies to operating mines. It should however be mentioned that the local procurement percentages for AREVA, Bannerman, Reptile and Valencia ranged from 64% to 95% in

2015. The total value of procurement that Swakop Uranium awarded to Namibian owned and registered companies was 48.9% of the total awarded value (CEO Zheng KePing, article in The Namibian of 3 August 2016). This presumably refers to procurement during the construction period of Husab mine, not to a specific year.

Table 3: Percentage of Local Procurement of Goods and Services by Operating Uranium Mines

	Local procurement of goods and services as % of total procurement		
Company	**2015**	**2014**	**2013**
Langer Heinrich	85%	71%	78%
Rio Tinto Rössing	73%	68%	64%

Motivation of status: A growing trend towards local procurement was evident for Langer Heinrich and Rössing Uranium with increases of 14% and 5%, respectively. This indicator is therefore **MET**.

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

No new mining-related companies were granted EPZ status in 2015 and neither did any existing uranium-processing companies have EPZ status.

Motivation of status: The indicator is **MET**, because there was no new EPZ status granted to processing companies associated with uranium mining.

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Summary of performance: EQO 1

Total no. indicators assessed	**4**			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	0	0	4	0
Percentage of indicators in class	0%	0%	100%	0%

Overall performance: Indicators of socioeconomic development are related to the payment of royalties and taxes, local procurement and EPZ status for processing companies. They have all been **MET** in 2015 and previous years.

EQO 2. Employment

Aims of this EQO: Promote local employment and integration of society.

Namibia's high unemployment rate remains a concern. The National Development Plans which are the implementing medium-term plans for the national long-term goal Vision 2030 are clear on the issue of unemployment. Namibia has put in place a number of policy measures and programmes to encourage local and foreign investment. The government of Namibia's policy is aimed at promotion of growth, increasing employment and alleviating poverty, as well as reducing the unequal distribution of income. Measures have also been taken by the government to create employment and address labour market inequalities. Among the policy measures in place is the Affirmative Action (Employment) Act No. 29 of 1998 that aims to enhance participation and integration of previous disadvantaged groups of the society in the labour market and to promote equal opportunities in employment.

Despite the aforementioned, the high unemployment rate remains a concern in Namibia. The latest available Labour Force Survey of 2014 (NSA 2014) showed that 990,998 of the estimated population aged 15 years and above in Namibia is in the economically active group, which forms the labour force, while 441,500 of the estimated population is outside the labour force. The survey recorded that 71.9% of the economically active group were employed in 2014, while the unemployment rate was 28.1% (Figure 4).

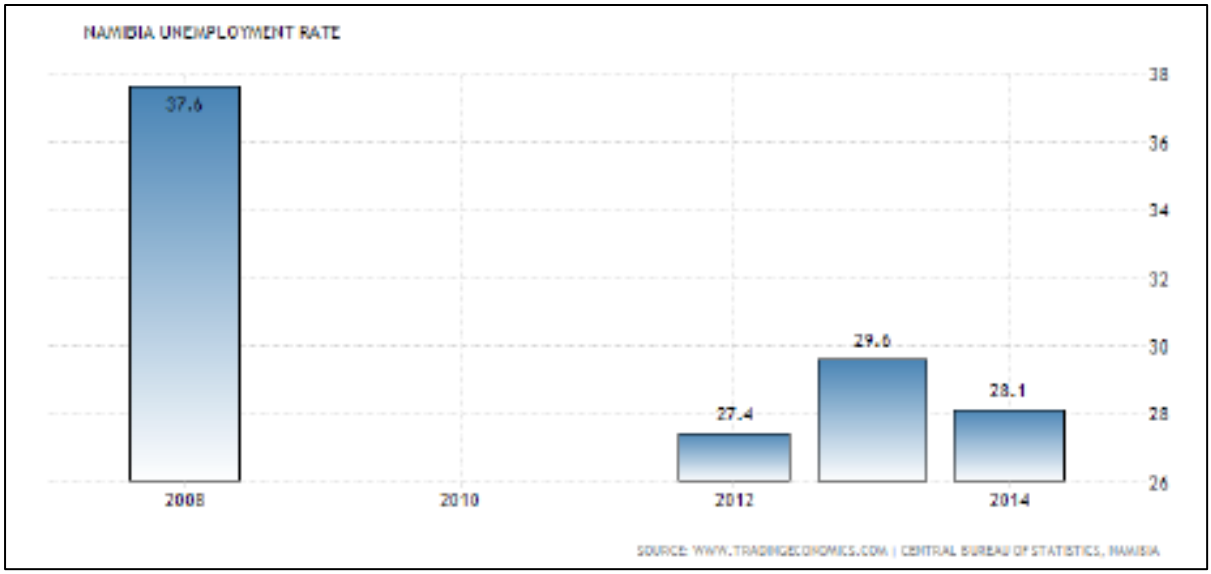

Figure 4: Unemployment Rate in Namibia from 2008-2014

In 2015, the mining industry made a direct contribution of 12.5% to the country's gross domestic product (NSA 2016) and provided jobs to 8853 permanent and temporary employees, as well as 9423 employees of contracting firms (CoM 2016). EQO2 expects the uranium mining companies to employ Namibian citizens, preferably people residing in the vicinity of the mine (locals), and to adhere to the requirements of the Affirmative Action (Employment) Act that gives preference to previously disadvantaged groups.

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**	

The two operational mines, Langer Heinrich and Rössing, complied with the provisions of the Affirmative Action (Employment) Act and met their employment equity targets. The same applies to AREVA Namibia where just over 40 people were employed in 2015. Swakop Uranium has an approved affirmative action plan (CoM 2016). The company's CEO Zheng KePing stated that the percentage of Namibians working on the Husab project was currently 92% and this figure was expected to increase to 95% (article in The Namibian of 3 August 2016). Companies with fewer than 25 employees, such as Bannerman, Marenica, Reptile, Valencia and Zhonghe, do not need AA certificates.

Another important aspect that was mentioned in the SEA report is the question whether contractor companies employed at uranium mines meet the affirmative action target. In 2015, 73% of Rössing's contractor companies were EE-compliant, while AREVA and Langer Heinrich employed 100% compliant contractors. Other companies either did not employ contractors or the contractors had <25 employees.

Motivation of status: Seeing that the two operating mines, Langer Heinrich and Rössing, complied with the provisions of the Affirmative Action (Employment) Act and met their employment equity targets, the indicator is rated as **MET**.

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Summary of performance: EQO 2

Total no. indicators assessed	1			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	0	0	1	0
Percentage of indicators in class	0%	0%	100%	0%

Overall performance: EQO 2 only has one indicator, which has always been **MET** because the majority of the permanent workers at uranium mines are Namibian citizens. Mining companies, except for Swakop Uranium, have been reporting data on the AA compliance of their contractors since 2014. The operating mines reported that 87% of the contractors were compliant in 2015.

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 we are able to move goods and services, but also people 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 has to 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.

Desired Outcome 3.1.	**Existing, proclaimed towns are supported.**			
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**	
Indicator 3.1.1.2.	**There are no on-site hostels during the operational phase of a mine.**			
Data Source	**SEMP Office/NUA**			
Status:			**MET**	

All operating mines and exploration projects are housing or planning to house employees in proclaimed towns. They will not establish mine-only townships or suburbs or on-site hostels. Only Valencia plans to provide operational staff with accommodation near site while they are on-shift and then assist with transport to and from their homes during their off periods. No relocation of families will be required.

Motivation of status: Both these indicators are rated as **MET** because no operating mine has on-site accommodation or plans to establish mine-only townships.

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.	**All key gravel roads are graded timeously to avoid deterioration.**			
Data Source	**RA/NUA**			
Status:			**MET**	

The Roads Authority (RA) confirmed that their maintenance division follows a programme to blade the key roads timeously. The M52 and M44 roads were thus well maintained in 2015. The M36 road from Walvis Bay into the Namib-Naukluft Park was refurbished in 2014 and a short section bearing heavy truck traffic to the salt factory (near the Walvis Bay airport) was maintained in 2015.

The volume of mine-related traffic to exploration areas or mine sites in the park has decreased significantly since Swakop Uranium's new road from the B2 was commissioned and drilling projects were completed or scaled down. The reduced traffic volume resulted in better road conditions to the benefit of all users. A random sample of tourists confirmed that the roads in the Namib section of the park were well maintained, but the road further south towards Naukluft and Sossusvlei was in a poor state (pers. comm. various tourists).

Motivation of status: This indicator is rated as **MET** as all key gravel roads used by mining companies and tourists were graded timeously to avoid deterioration.

Indicator 3.2.1.2.	**Un-surfaced roads carrying >250 vehicles per day need to be tarred.**			
Data Source	**RA**			
Status:		**IN PROGRESS**		

In principle, it is correct that all gravel roads with traffic of more than 250 vehicles per day (v/d) should be upgraded, but because of insufficient funds not all such roads can be tarred immediately. However, long sections of the C28 road from Swakopmund to the Langer Heinrich mine turn-off have already been tarred and the MR44 road from Swakopmund to Walvis Bay east of the dunes will be tarred in 2016/17. There are also plans to tar the MR36 (C14) gravel road in future.

Motivation of status: Due to insufficient funds for road upgrading the Road Authority has not yet been able to tar all roads carrying >250 v/d. Because plans are in place and progress has been made the indicator is rated **IN PROGRESS**.

Indicator 3.2.1.3.	**The B2 tar road is free of pot-holes and crumbling verges.**			
Data Source	**RA**			
Status:			**MET**	

The Roads Authority reported that the B2 tar road is free of potholes and crumbling verges, but in a fair condition as observed on the stretch between Swakopmund and the Trekkopje turn-off. Towards Usakos, a short segment of the road T0202 (part of the B2) was deteriorating until the surface was re-sealed in 2015. Maintenance work on crumbling verges was carried out where required. Road users have however observed that the road is deteriorating due to the traffic load, especially the high number of heavy vehicles. The road will need a major upgrade and widening to accommodate the increased traffic in the next few years (NUA 2016). The Roads Authority confirmed that the project to upgrade the Karibib-Swakopmund road to two-plus-one lane was currently at the design stage (article in The Namibian, 29 September 2016).

Motivation of status: The Road Authority reported no potholes and crumbling verges on the B2 in the uranium province in 2015, meaning that this indicator has been **MET**.

Indicator 3.2.1.4.	**Road markings and signage are in place and in good condition.**			
Data Source	**SEMP Office/RA**			
Status:			**MET**	

Some of the old, corroded road signs were replaced with new ones in 2015 and the white centre lines on the B2 road were repainted. Other road markings will follow.

Motivation of status: Signage on the roads was generally in good condition in 2015; this indicator is therefore rated as **MET**.

Indicator 3.2.1.5.	**MR44 previously known as D1984 (Swakopmund to Walvis Bay east of dunes) is tarred.**			
Data Source	**SEMP Office/RA**			
Status:		**IN PROGRESS**		

As mentioned under Indicator 3.2.1.2 upgrading of the MR44 road to a dual carriageway and bitumen standard started in 2016.

Motivation of status: The indicator is rated **IN PROGRESS** because planning was completed in 2015 so that the tender process and actual tarring project of the MR44 could start in 2016.

Indicator 3.2.1.6.	**90% of traffic on the B2 coastal road (Swakop-WB) is light vehicles.**			
Data Source	**SEMP Office/RA**			
Status:	**NOT MET**			

This indicator can only be assessed once the MR44 road has been tarred so that heavy vehicle traffic can be banned from using the coastal road. Signs are already in place to direct trucks over 10 tonnes towards the MR44. Statistics in the 2014 SEMP report showed that the road was serving on average 5170 light and 715 heavy vehicles daily, which translates to 88% light and 12% heavy vehicles. In the absence of new information from the RA it was assumed that the proportion was probably similar in 2015.

Motivation of status: On the evidence of the 2014 traffic survey the indicator is rated **NOT MET**.

Indicator 3.2.1.7.	**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. The last few years have seen a significant reduction in mining traffic on tourist roads, mostly due to the completion of Swakop Uranium's private road to Husab mine and the slowdown in uranium exploration activities. Access to Langer Heinrich mine is along a mostly tarred section of the C28 road in the Namib-Naukluft Park, while Reptile Uranium occasionally used tourist roads for exploration work in 2015. Some mines have constructed their own roads to avoid tourist traffic. AREVA Resources Namibia has built a gravel road from Arandis to Trekkopje mine which has slightly reduced the traffic volume on the B2 between Arandis and Usakos. Valencia mine has also constructed a private gravel road (28 km) from the B2 to site. Part of the road is available to tourists into the Khan River valley at their own risk.

Motivation of status: Seeing that the 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 rail.**			
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:	**NOT MET**			

Rössing mine transported 86% of its bulk goods (sulphuric acid) by rail from Tsumeb and Walvis Bay (Table 4). Some reagents that are used in smaller quantities were transported by road. Langer Heinrich mine has no rail connection and new construction is not economical if one considers that the rail line would become obsolete at the end of the relatively short mine-life. A positive development was Transnamib's decision to upgrade the line between Kranzberg and Tsumeb over the coming years.

Table 4: Transportation Mode of Bulk Goods to Mining Companies

Company	Tonnes by rail	Tonnes by road	% by rail
Langer Heinrich	0	68,922	0%
Rio Tinto Rössing	188,209	30,517	86%
Total	**188,209**	**99,439**	**65%**

Motivation of status: This indicator was **NOT MET** because only sixty-five percent of all bulk goods supplied to operating mines were transported by rail in 2015.

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:		**IN PROGRESS**		
Indicator 3.4.1.2.	**Average waiting time for ships to obtain a berth is <12 hours.**			
				EXCEEDED
Indicator 3.4.1.3.	**No oil/chemicals/contaminants/sewerage spills enter the Ramsar site.**			
Data Source	**Namport**			
Status:			**MET**	

Walvis Bay is Namibia's largest port, receiving over 3,000 vessel calls each year and handling about 5 million tonnes of cargo. In order to deal with even higher levels of throughput, Namport has steadily improved its cargo-handling facilities such as cranes and reach stackers. The container terminal can accommodate ground slots for 3,875 containers and handle about 250,000 containers per annum (Namport website). In 2015, the average loading rate for containers was 22 berth moves per hour compared to 20 moves in 2014. The average waiting time for ships to obtain a berth of 3 hours 50 minutes was much faster than the target. Namport reported that no oil, chemicals, contaminants or sewerage spills entered the Ramsar site (lagoon) in 2015, adding that the port expansion (Figure 5) now forms a catchment area for any oil spills originating from the port. This will greatly assist in preventing pollution of the lagoon (pers. comm. Tim Eimann, Namport).

Figure 5: Namport Expansion for Container Terminal (Google Earth)

Motivation of status: Indicator 3.4.1.1 was rated **IN PROGRESS** because only 22 berth moves per hour were achieved, but new container infrastructure is being built. Indicator 3.4.1.2 was **EXCEEDED** as the average waiting time to obtain a berth was much less than 12 hours. In the absence of any spills indicator 3.4.1.3 was **MET**.

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.**			
Status:			**MET**	
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 unavailability.**			
Status:			**MET**	
Indicator 3.5.1.4.	**Electricity quality of supply meets ECB standard.**			
Status:			**MET**	
Indicator 3.5.1.5.	**Electricity provision does not compromise human health.**			
Data Source	**SEMP Office/NamPower/NUA**			
Status:			**MET**	

The five electricity supply indicators are discussed and assessed together. Namibian electricity consumption is strongly correlated to GDP growth. Any future increase in the global demand for raw materials will promote new mining activities. Because mines are significant electricity consumers, NamPower is expecting the local energy demand to increase in tandem with international economic growth. Moreover, as Namibia continues to push toward diversification into beneficiation and manufacturing, NamPower expects long-term growth in these sectors.

NamPower's high-level goal is to ensure that 100% of peak demand and at least 75% of total demand will be supplied from internal sources by 2018 (NamPower 2015 annual report). In 2015, NamPower was able to consistently meet the electricity needs of all sectors of the economy without load-shedding or blackouts, at a cost that has continued to foster overall economic growth in Namibia. The availability of generation systems was 94% and that of transmission systems 99% (NamPower 2015 annual report). The organization is augmenting its capacity and concluding new power purchase agreements to overcome the supply deficit to 2018 when the planned 880 MW Kudu gas-to-power plant was expected to be in place.

A new 250 MW facility was planned to ease the country's power shortage in the interim period. NamPower considered various options such as a coal or gas-fired power station at Walvis Bay or near Arandis or an oil-fired station on a power ship off-shore (Nampower and supplier EIAs 2009-2016).

The minister of mines and energy, Obeth Kandjoze said that the challenges of energy infrastructure constraints and stunted economic growth remain stubbornly in place for developing economies (article in The Namibian of 30 October 2015). He added that Namibia and the SADC need to prioritize investment in the energy sector and Namibia has to review the current policies that inhibit private sector investment in the energy sector. In spite of these statements, no decision for one of the investigated options was taken at the time of writing. This fact fuelled concern about future supply shortages among the industry and Erongo regional government (NUA 2016).

A positive development was the upgrade of the power supply infrastructure in the Erongo region in 2015. The west coast strengthening project entails a doubling of the existing 220 kilovolt (kV) ring from the Omburu substation to the Kuiseb substation to ensure a continuous power supply to the coast if the power flow along one line is interrupted. A new substation called Lithops forms part of the ring and serves as integration point for the 132 kV power line to Husab mine. In addition, the strengthening project increases the supply capacity to Walvis Bay to 80 MVA (article in The Namibian of 29 August 2016).

The Erongo regional electricity distributor (RED) is an institution tasked with the distribution and supply of electricity within the Erongo Region. The Erongo RED supply fully complies with ECB standards and safety standards regarding the supply and distribution of electricity in the Erongo Region (pers. comm. Mr Thiel, Erongo RED 2015). In 2015, Erongo RED launched a bulk power supply upgrade at Walvis Bay that is expected to be completed by January 2017 (article in The Namibian of 30 April 2015). Until then the RED expects several planned and unplanned outages caused by the ongoing upgrade. The bulk upgrade was necessary to prevent load shedding and therefore NamPower partnered with Erongo RED to strengthen the supply infrastructure for at least the next ten to 15 years. The project is divided into three phases, namely the replacement of two 66 kV lines between the Kuiseb substation and Walvis Bay with two 132 kV lines; the upgrade of the Kuiseb substation and the construction of the new Walvis Bay intake substation.

NamPower has started to address the question whether or not electricity provision compromises human health. Baseline emission monitoring was launched during the year under review at Van Eck power station, with the aim of better understanding the plant’s impacts on air quality and whether interventions to reduce emissions may be necessary or appropriate. Monitoring of the water quality at Van Eck, Ruacana and the Brakwater depot was undertaken to determine the effects of these facilities in terms of water pollution. The project is expected to start yielding results during the 2015/16 financial year. In terms of the Environmental Management Act, new electricity generation infrastructure requires an EIA, which should also assess impacts on human health and propose mitigation measures in an EMP. Relevant studies in the Erongo Region were: 1) Scoping report and EMP for the construction and operation of a water pipeline from Walmund substation to Kuiseb substation and 2) Scoping report and EMP for Valencia substation and Khan switching station.

Motivation of status: Electricity supply was reliable and complied with ECB standards that are in place to protect human health. Though there were no reports of investment decisions being deferred due to a power shortage, the mining industry is concerned about the delay in construction of an interim supply source. The five indicators were rated as **MET** for 2015, but 3.5.1.2 may have to be downgraded in 2016 if the interim supply cannot be assured.

Indicator 3.5.1.6.	**Mines pursue renewable power supply options as far as possible.**			
Data Source	**NUA/NamPower**			
Status:			**MET**	

Renewable energy alternatives are gradually becoming more economic, especially if they are constructed by the national supplier. During the year under review, NamPower embarked on a study into the affordability and feasibility of concentrated solar power station near Arandis and another study into the feasibility of harvesting bush as a fuel source for utility-scale or smaller power station applications (NamPower 2015 annual report).

Some mining companies also investigated or applied renewable energy alternatives in 2015. A company has decided to establish a 5 MW photovoltaic power station at Trekkopje mine in cooperation with AREVA Resources Namibia. All necessary permissions have been obtained and construction will start in 2016. Bannerman's Demonstration Plant operates partially on solar energy. When heap leach columns are in operation only solar energy is used, while cribs are operated with a silent diesel generator.

Rössing Uranium has explored two different options for utilising renewal energy. These included concentrated solar thermal power for thermal applications to generate steam for the processing plant and solar photovoltaic technologies as a means for generating electrical energy as an alternative to utilities supply. Swakop Uranium has installed an on-site power station to capture waste heat from the acid plant, which in turn will heat boilers and generate steam to turn turbines and generate electricity.

Motivation of status: Swakop Uranium has installed an on-site power station that will generate power from the waste heat of the acid plant. A solar power station will be constructed at Trekkopje mine. Other mines are exploring options or use renewable energy on a small scale. This indicator is rated as **MET** because renewable power supply options are being pursued as far as currently possible.

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 Walvis Bay Municipality reports that they have sufficient space for solid waste for more than 20 years (pers. comm. David Uushona, Walvis Bay Municipality). The existing sewage treatment plant will be upgraded over the next two years to handle 11,000 m^3/day. An additional plant for the airport, army base and industrial area with a capacity of 6,000-8,000 m^3/day is planned for 2018/19.

The design of this plant will make provision for the option of treating effluent water to potable standard to be added at a later stage (pers. comm. André Burger, Walvis Bay Municipality).

The Swakopmund Municipality has constructed a new sewage treatment plant a few years ago, which has sufficient capacity for the future. The landfill site has been moved to make way for residential areas; the new site has enough space for the predicted volumes of waste. A recycling facility that has been built next to the landfill has already resulted in reduced final disposal volumes (pers. comm. Robeam Ujaha, Swakopmund Municipality).

Motivation of status: Indicator is rated as **MET** because both municipalities confirmed that their waste sites and sewage works have sufficient capacity based on actual and predicted waste volumes.

Indicator 3.6.1.2.	**Independent audits are undertaken for waste sites.**			
Data Source	**Municipality of Walvis Bay and Swakopmund**			
Status:		**IN PROGRESS**		

Walvis Bay Municipality carries out internal audits to ensure that their solid water disposal contractor complies with the municipal regulations, but does not arrange for independent audits because there are no national standards for solid waste management (pers. comm. David Uushona).

The Swakopmund Municipality also employs a contractor to manage the landfill; they will only start with independent audits when an environmental clearance certificate (ECC) has been issued (pers. comm. Robeam Ujaha). The Public and Environmental Health Act No. 1 of 2015 includes some provisions for waste management and the Ministry of Environment and Tourism is planning to include integrated waste management in the next revision of the Environmental Management Act.

Regular inspections of the waste water treatment plants at Swakopmund and Walvis Bay are conducted by the Department of Water Affairs & Forestry (DWAF). The effluent disposal permit was recently renewed for five years (pers. comm. André Burger).

Motivation of status: Independent audits/inspections are conducted at the Walvis Bay and Swakopmund sewage plants, but not at the solid waste sites. This part of the indicator can only be assessed when standards for solid waste sites are set against which compliance can be audited. The indicator is therefore rated **IN PROGRESS**.

Indicator 3.6.1.3.	**All new waste sites undergo an EIA prior to construction and receive a licence to operate.**			
Data Source	**Municipality of Walvis Bay and Swakopmund**			
Status:		**IN PROGRESS**		

Both Swakopmund and Walvis Bay municipalities confirmed that any new solid waste sites will undergo an EIA and obtain a licence. An EIA for the new waste water treatment plant at Walvis Bay is planned for 2016/17 (pers. comm. André Burger). Section 5 (3) of the Environmental Management Act refers to existing waste sites: "Where a waste disposal site already exists in terms of any law, the Minister may approve that site as a waste disposal site for the purpose of this section." The approval process involves preparing an EMP and obtaining an ECC from MET. The ECC is regarded as a "licence to operate" in terms of this indicator. The Walvis Bay Municipality is currently busy with an EMP (pers. comm. David Uushona).

The recycling operator at Swakopmund carried out an EIA for the recycling facility and landfill, and obtained an environmental clearance certificate. The Municipality is planning to prepare an EMP for the landfill as well (pers. comm. Robeam Ujaha).

Motivation of status: Both municipalities stated that they will do EIAs and apply for licences before constructing any new waste sites. Walvis Bay and Swakopmund are also both planning to obtain ECCs for the existing landfills. The indicator can be regarded as **IN PROGRESS.**

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:			**MET**	

At Walvis Bay Municipality, the solid waste foreman and inspector of hazardous waste have both been trained (pers. comm. David Uushona). Other employees involved with waste water treatment are competent and trained as needed, while all employees are overseen by a professional engineer. The waste site managers at Swakopmund Municipality are qualified Environmental Health Practitioners (pers. comm. Robeam Ujaha), while the waste management contractor employs adequately trained personnel.

Motivation of status: Municipal employees in charge of waste management are adequately trained, this indicator was **MET**.

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:			**MET**	

In Walvis Bay the weighbridge records the weight, origin and type of all refuse entering the landfill site (pers. comm. David Uushona). The information used to be compiled in annual reports. The Swakopmund Municipality does not yet have a weighbridge, but is planning to build one as this is one of MET's requirements before an ECC can be issued. Currently only records of the number of waste trucks dumping at the landfill are kept and the recycling operator reports the tonnage of recycled materials (pers. comm. Robeam Ujaha). Origins are not recorded, but this requirement is not essential for non-hazardous waste.

Motivation of status: This indicator is rated as **MET** because records of non-hazardous waste are being kept.

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:			MET	

The only hazardous waste site for the coastal area is operated by the Walvis Bay Municipality and they confirmed that only those hazardous waste classes for which the site is licensed are accepted. All operating mines take their hazardous waste to Walvis Bay (NUA, 2016). The Walvis Bay Municipality treats all waste coming from mines as hazardous and keeps manual manifests of the waste type, weight and origin (pers. comm. David Uushona). The Swakopmund landfill site is not authorised for and does not accept hazardous waste. The only problem they sometimes have is with household medical waste, e.g. needles used by diabetics that should be treated as hazardous waste (pers. comm. Robeam Ujaha).

Motivation of status: No hazardous waste is accepted at the Walvis Bay hazardous waste site unless pre-approved, the indicator is therefore **MET**.

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:	NOT MET			

The municipalities of Walvis Bay and Swakopmund reported that no water and air quality monitoring is taking place at their waste disposal sites. The reasons are that there is no legal requirement to do so and it is not possible to identify non-compliance because air quality standards have not been set. Both municipalities try to reduce the air quality impact by banning waste burning on the landfills (pers. comm. David Uushona and Robeam Ujaha).

Water quality standards are not applicable because the receiving groundwater (if present) is saline (Hydrogeological Map of Namibia 2001). Regulations for monitoring may in future be made under the Environmental Management Act, the National Waste Management and Pollution Control Strategy and/or the Environmental Quality Management Standards that MET is planning to develop (The Namibian of 26 September 2016).

Motivation of status: This indicator is rated as **NOT MET** as there are no regulations regarding water and air quality monitoring at waste disposal sites.

Indicator 3.7.1.5.	Municipal budgets are sufficient to comply with the site licence requirements relating to pollution control.			
Data Source	Municipality of Walvis Bay and Swakopmund			
Status:	NOT MET			

Both municipalities confirmed that their budgets are sufficient to manage waste in accordance with current practice (pers. comm. Swakopmund and Walvis Bay municipalities). Because there are cur-

rently no regulations relating to pollution control (refer to Indicator 3.7.1.4), the towns cannot make financial provision for unspecified control measures.

Motivation of status: This indicator was **NOT MET** because pollution control legislation is not yet in place. This shortcoming will be addressed by the Ministry of Environment and Tourism in the next revision of the Environmental Management Act.

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 DWAF industrial effluent exemption permit conditions.**			
Data Source	**DWAF**			
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 can continue long after a mine has closed. At most mines waste dumps and tailings dams 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. The purpose of the DWAF industrial effluent disposal exemption permit is to manage the impact of effluents from waste facilities on the ambient surface and groundwater quality.

Indicator 3.7.2.1 is intended to ensure that mines manage effluents from mineral waste sites in compliance with DWAF effluent disposal exemption permit conditions. Langer Heinrich Mine's compliance in terms of the permit conditions was audited by a DWAF delegation during 2015; no non-compliances were reported. Rössing Uranium's permit requires that industrial effluents, including

tailings solution, have to be recycled and that the groundwater quality at certain boreholes has to be monitored. The mine complied with these permit conditions.

Motivation of status: The indicator was **MET** because DWAF did not report any non-compliance in 2015.

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

The NRPA requires mines to implement a radiation management plan (RMP) to *inter alia* control the emission of radiation from mineral waste sites and to compile annual reports on the implementation of the plan. The Authority's inspectors review the annual reports and visit the mines to ensure that the RMPs are implemented in practice. All operating mines and projects were inspected in 2015 (see EQO 10). The NRPA did not encounter any issues related to mineral waste management.

Motivation of status: The indicator was **MET** because no non-compliances were reported by the NRPA.

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

Ministry of Environment and Tourism evaluates and approves environmental management plans 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. 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 and Rössing reported that a detailed approved EMP was in place and audits were carried out to measure compliance with the commitments, standards and legal requirements. The environmental management systems of both companies are ISO 14001 certified. The ministry did not issue any compliance orders in 2015.

Motivation of status: The indicator was **MET** because no non-compliances were reported by the Ministry of Environment and Tourism.

Indicator 3.7.2.4.	**Management of waste sites complies with approved closure plan**			
Data Source	**MME/MET**			
Status:		**IN PROGRESS**		

MME is currently not involved in the approval of mine closure plans though this may change when new legislation is enacted. High-level closure plans are usually included in mining companies' EMPs, which are reviewed and approved by the Ministry of Environment and Tourism. Langer Heinrich mine's closure management plan that was updated in 2015 was not reviewed by MET.

Rössing Uranium has an approved Closure Management Plan with the following provisions for mineral waste facilities: The tailings storage facility will be entirely covered with rock, tailings seepage recovery will continue until a balance with evaporation has been reached and the waste rock dumps will be shaped to fit into the natural landscape. This plan has been approved as part of the EMP for the mine.

Modelling of the long-term behaviour of mineral waste facilities and evaluation of the risk that these facilities might pose to the environment requires experts who specialise in this field. The industry is therefore concerned about the Ministry of Environment and Tourism's capacity to assess the proposed closure plans. It would be more appropriate for specially trained NRPA and MME staff to take on this function once the required legislation is in place.

Motivation of status: The indicator was rated **IN PROGRESS** because the current practice of closure plan approval by the Ministry of Environment and Tourism does not ensure a critical review of the risks related to the long-term management of mineral waste facilities.

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**	

The Municipality of Swakopmund is working with a contractor who established a recycling facility in 2015. Orange waste bins for recyclable materials were distributed to all households and are emptied regularly. The Walvis Bay Municipality does not own a recycling depot, but rather creates an environment that is conducive for private recyclers to operate, e.g. by providing land next to the waste site. Recyclers report volumes of the various materials that they recover to the municipality. In 2016, a new PPP will be established for the thermochemical pyrolysis of unsorted household waste to generate 6 MW of electricity (pers. comm. David Uushona). This facility will process all existing and new waste.

Mining companies also employ functioning waste management systems to reduce the volume of waste that would otherwise be taken to municipal landfills. For instance, Rössing Uranium uses a contractor to provide integrated waste management services. Minimising the volume of waste to landfill is not only eco-friendly but also reduces cost. It is essential that all recyclable material, e.g. waste oil, scrap metal, wood and paper is removed from the general waste stream at source. Langer Heinrich and Husab mines use a similar system.

Motivation of status: This indicator was **MET**, because sustainable waste recycling systems were in place at Swakopmund, Walvis Bay and the operating mines in 2015.

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 reported by both municipalities and NUA waste recycling companies operating at Swakopmund, Walvis Bay and the mines had sufficient capacity to collect, transport and recycle waste in a safe and responsible manner (pers. comm. David Uushona and Robeam Ujaha, NUA 2016). The Swakopmund recycler at first had too few vehicles to cover the entire area each week, but that has been addressed. A problem still experienced at Swakopmund is that people scavenging in waste bins often move the contents of the black waste bin into the orange recycle bin and *vice versa*. This slows down the collection process (pers. comm. Sandra Müller, Swakopmund resident).

Motivation of status: This indicator is rated as **MET** because waste recycling operators had sufficient capacity in 2015.

Indicator 3.8.1.3.	Volumes of waste disposed to landfill per capita decreases.			
Data Source	Municipality of Walvis Bay and Swakopmund			
Status:		IN PROGRESS		

The Walvis Bay Municipality reported that the fluctuating waste volumes in response to building and industrial activities and the continuous influx of people make it difficult to maintain a record of waste volume per capita. It is therefore not clear if a decrease has been achieved by recycling (pers. comm. David Uushona).

The Swakopmund Municipality indicated that the volumes of waste disposed on their landfill have decreased, but they did not have records of the volume per capita (pers. comm. Robeam Ujaha). It will be difficult to meet this indicator because municipalities do not have annual census data. Both towns however keep records of recycled materials, so a better indicator would be: “The volume of materials recycled per year shows an increasing trend”.

Motivation of status: Waste-to-landfill volumes are not available per capita for Walvis Bay or Swakopmund. The indicator should be revised to measure the volume of recycled materials, which is available, and is therefore rated **IN PROGRESS**.

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Summary of performance: EQO 3

Total no. indicators assessed:	34			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	4	7	22	1
Percentage of indicators in class	12%	21%	65%	3%

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. The two housing indicators continued to be **MET** because mining companies do not intend to establish on-site hostels or mine-only townships. Three indicators referring to road condition and maintenance were **MET**, while two about tarring a busy gravel road were still **IN PROGRESS** and one was **NOT MET**. The indicator of rail use for bulk goods was **NOT MET**. As in 2014, Namport's three efficiency indicators were **EXCEEDED, MET** and **IN PROGRESS**, respectively. The five indicators concerning the quantity and quality of electricity supply to the region were all **MET**, while the implementation of renewable energy projects at mines advanced from IN PROGRESS in 2014 to **MET** in 2015. Nine waste management indicators were **MET** and four were **IN PROGRESS**. Two were **NOT MET** because there is no legislation for pollution control and monitoring. There was not much change in waste management compared to the previous report.

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 that is available to the public in the Erongo region. Key stakeholders in this EQO are the Department of Water Affair and Forestry (DWAF) of the Ministry of Agriculture, Water and Forestry (MAWF) as the regulator, NamWater as the bulk-supplier and distributor, and the towns and mining industry as major consumers.

Monitoring of groundwater in the uranium province is undertaken with the aid of 15 boreholes along the Swakop and Khan rivers. In fulfilling the monitoring responsibility, DWAF carries out an annual borehole sampling campaign, while NamWater monitors the quality of potable water supplied to the coastal towns, mines and small consumers. Data for this EQO were supplied by DWAF and NamWater, while the mining industry contributed water levels in the Swakop and Khan rivers.

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:** • **Urban users** • **Rural communities supplied by DWSSC** • **Commercial farmers (own supplier)** • **Lower Swakop River smallholdings**
Indicator 4.1.1.1.	**Aesthetic/physical, inorganic, radionuclide and bacteriological determinants conform to minimum required quality as prescribed in the national water quality standards.**
Data Source	**DWAF**
	MET

The monitoring scope as defined in this target includes water supplied to urban users in Arandis, Henties Bay, Swakopmund and Walvis Bay, as well as commercial and communal farmers along the lower Khan and Swakop rivers, including the lower Swakop smallholdings. The Directorate of Water Supply and Sanitation Coordination (DWSSC) does not supply rural communities from these rivers.

Water quality monitoring involves the analysis of physical parameters, major anions and cations, trace elements and radionuclides, depending on expertise and finances available in the monitoring institution. The first two indicators of this EQO focus on the quality of water that is supplied to urban users, communal and commercial farmers. To find out if the desired outcome of acceptable water quality was achieved NamWater collected water samples and analysed them at the laboratory in Windhoek. DWAF's sampling exercise of the Khan and Swakop rivers had to be postponed from

2015 to 2016 (refer to Indicator 4.1.2.1). The analyses of drinking water are compared to the Namibian Guideline Values, whereas groundwater quality results for the Swakop/Khan system are evaluated against the background water quality because the groundwater is naturally brackish to saline.

Chemical Analyses of Drinking Water

NamWater provided some chemical analyses and bacteriological tests of tap water samples taken at Henties Bay, Swakopmund and Walvis Bay in 2015, which are presented in Tables 5 and 6. The samples were analysed at the NamWater laboratory and results confirmed that the water was of good (Group B) to excellent (Group A) quality and suitable for human consumption (the Namibian Water Quality Standards are shown in Table 22 in the Appendix).

Table 5: Chemical Analyses of the NamWater Supply to Henties Bay and Walvis Bay

Sampling Point Name	Henties Bay	Henties Bay	Walvis Bay	Walvis Bay
Date sample taken	26-Jan-15	10-Feb-15	26-Jan-15	9-Feb-15
pH	8.0	8.1	8.0	8.2
Turbidity in NTU	0.64	0.33	0.18	0.38
Conductivity mS/m	147	149	116	118
TDS Calculated	982	999	778	793
Na in mg/l	200	185	117	114
K in mg/l	10	10	15	15
Ca as CaCO3	178	173	220	215
Mg as CaCO3	95.8	91.7	133	125
SO4 in mg/l	56	54	150	161
NO3 as N in mg/l	1.2	3.3	2.9	4.7
NO2 as N in mg/l	<0.1	0.1	<0.1	<0.1
SiO2 in mg/l	27	28	35	36
F in mg/l	0.6	0.6	0.1	0.1
Cl in mg/l	320	320	130	130
Alkalinity as CaCO3	170	182	244	258
Fe in mg/l	0.04	<0.01	0.04	<0.01
Mn in mg/l	<0.01	<0.01	<0.01	<0.01
Cu in mg/l	0.01	<0.01	0.01	<0.01
Zn in mg/l	0.02	0.01	0.01	0.01
Cd in mg/l	0.01	0.01	<0.01	<0.01
Pb in mg/l	<0.02	<0.02	<0.02	<0.02

The water supplied from Omdel to Henties Bay, Swakopmund and Arandis is of good to excellent quality for most of the physical and chemical parameters. The salinity of Kuiseb River groundwater that is supplied to Walvis Bay is lower than the salinity of Omdel water. In terms of heavy metals, the NamWater laboratory analyses iron (Fe), manganese (Mn), copper (Cu), zinc (Zn), cadmium (Cd) and lead (Pb), but does not have a method to determine uranium in water.

The towns' drinking water is pumped from the Kuiseb and Omaruru rivers where there is no uranium mining, it is therefore not possible for uranium from the mines to enter the potable water supply. The metal concentrations were at or below the detection limit of 0.01-0.02 mg/L.

Table 6: Chemical Analyses of the NamWater Supply to Swakopmund

Location Description	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir
Date sample taken	13-Jan-15	26-Jan-15	10-Feb-15	24-Mar-15	7-Apr-15	21-Apr-15	5-May-15	19-May-15	2-Jun-15	25-Jun-15
pH	8.0	8.2	8.1	8.0	8.0	8.1	8.1	8.0	7.8	8
Turbidity in NTU	0.7	0.4	0.4	0.4	3.5	0.2	1.1	0.2	0.4	1.4
Conductivity mS/m	117.3	144.4	131.8	165.3	132.4	143.3	122.5	139.6	164.1	152.6
TDS Calculated	786	967	883	1108	887	960	821	935	1099	1022
Na in mg/l	155	205	165	222	165	170	190	188	240	200
K in mg/l	8	10	10	10	9	9	8	10	10	10
Ca as CaCO3	122.5	107.5	180	197.5	155	175	77.5	180	165	187.5
Mg as CaCO3	50	62.5	70.8	79.2	62.5	62.5	33.3	70.8	62.5	70.8
SO4 in mg/l	53	51	78	89	73	79	31	96	67	80
NO3 as N in mg/l	1.2	<0.5	3.2	3	2.5	2.9	1.4	2.9	1.7	1.7
NO2 as N in mg/l	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SiO2 in mg/l	14	8	23	24	19	22	5	19	17	22
F in mg/l	0.2	0.2	0.3	0.3	0.3	0.3	0.1	0.4	0.3	0.4
Cl in mg/l	240	330	250	350	250	285	300	305	405	345
Alcalinity as CaCO3	122	92	174	162	144	162	84	168	136	156
Fe in mg/l	-	0.01	<0.01	-	-	-	-	0.02	-	-
Mn in mg/l	-	<0.01	<0.01	-	-	-	-	<0.01	-	-
Cu in mg/l	-	<0.01	<0.01	-	-	-	-	0.01	-	-
Zn in mg/l	-	0.01	<0.01	-	-	-	-	0.01	-	-
Cd in mg/l	-	0.01	<0.01	-	-	-	-	<0.01	-	-
Pb in mg/l	-	<0.02	<0.02	-	-	-	-	<0.02	-	-

Location Description	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir	Reservoir
Date sample taken	14-Jul-15	28-Jul-15	11-Aug-15	25-Aug-15	8-Sep-15	22-Sep-15	27-Oct-15	17-Nov-15	1-Dec-15	27-Jan-16
pH	8	8	8	8	8.11	7.9	8.1	8.1	8.6	8.7
Turbidity in NTU	0.5	1.6	0.2	10.0	0.5	0.3	8.0	0.8	1.4	0.4
Conductivity mS/m	125.1	162.7	153.7	147.2	165.2	134.3	137.6	149.9	124.1	148.3
TDS Calculated	838	1090	1030	986	1107	900	922	1004	831	994
Na in mg/l	165	202	225	189	196	171	164	165	171	200
K in mg/l	5	10	9	10	9	9	9	10	7	8
Ca as CaCO3	157.5	182.5	145	197.5	142.5	150	155	187.5	92.5	110
Mg as CaCO3	58.3	75.0	62.5	75.0	54.2	54.2	62.5	75.0	29.2	37.5
SO4 in mg/l	62	82	61	83	62	69	82	96	37	42
NO3 as N in mg/l	0.6	1.8	0.9	2.8	2.2	2.1	1.7	2.3	<0.5	<0.5
NO2 as N in mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
SiO2 in mg/l	16	24	18	23	14	13	17	18	8	7
F in mg/l	0.3	0.3	0.3	0.4	0.3	0.3	0.2	0.4	0.2	0.1
Cl in mg/l	275	350	355	320	340	285	265	255	280	350
Alkalinity as CaCO3	124	154	116	150	118	130	152	176	84	92

Microbiological Analyses of Drinking Water

Microbiological testing of drinking water determines three parameters: Heterotrophic plate count, coliform bacteria and Escherichia coli. The heterotrophic plate count is an analytical method used to measure the variety of bacteria that are common in water. The concentration of bacteria shows whether the water system is well maintained. Increases in heterotrophic plate count are due to the re-growth of bacteria in tanks and plumbing, and do not necessarily indicate the existence of a health risk, if the entry water meets the microbial water quality norms and contamination from outside is prevented. To consider water as very safe for human consumption (Group A) the total plate count may not exceed 100 colony-forming units per millilitre (cfu/mL) and coliform and *Escherichia coli* (*E. coli*) must be absent in 100 mL in 95% of the samples. A heterotrophic plate count exceeding 1000 cfu/mL results in a classification of Group C - water with a risk factor which requires rectification. In this case, the water supply system is disinfected with chlorine.

Coliform bacteria are commonly found in the environment (e.g. soil or vegetation) and are generally harmless. If only total coliform bacteria are detected, the source is probably environmental rather than faecal. Faecal coliforms (more specifically *E. coli*) indicate faecal pollution by warm-blooded animals or humans, which implies the potential presence of waterborne pathogens. The results of the examination of a single sample from a source are considered inadequate to evaluate the water quality. An evaluation should be based on the examination of a series of samples collected over a long period of time. If the guideline values are exceeded in one sample, a second sample should be taken from the same source as soon as possible.

Table 7: Microbiological Analyses of the NamWater Supply to the Coastal Towns

Date	Town	Sample taken at:	Heterotrophic plate count	Coliforms	Faecal coliforms	Quality
26/01/2015	Henties Bay	Reservoir	1323	Not detected	Not detected	C
10/02/2015	Henties Bay	Reservoir		Not detected	Not detected	A
15/02/2016	Henties Bay	Reservoir	6	Not detected	Not detected	A
13/04/2016	Henties Bay	Reservoir		Not detected	Not detected	A
23/05/2016	Henties Bay	Tower Reservoir	23	Not detected	Not detected	A
25/07/2016	Henties Bay	Tower Reservoir	Not detected	Not detected	Not detected	A
12/10/2015	Henties Bay	Ground Reservoir	7	Not detected	Not detected	A
12/10/2015	Henties Bay	Tower Reservoir	18	Not detected	Not detected	A
23/05/2016	Mile 7	Reservoir	619	Not detected	Not detected	B
26/01/2015	Rössing Mine	Reservoir	1	Not detected	Not detected	A
11/02/2015	Rössing Mine	Reservoir		Not detected	Not detected	A
26/01/2015	Swakopmund	Reservoir	201	Not detected	Not detected	B
10/02/2015	Swakopmund	Reservoir		Not detected	Not detected	A
16/02/2016	Swakopmund	Reservoir	13	Not detected	Not detected	A
14/04/2016	Swakopmund	Reservoir		Not detected	Not detected	A
07/06/2016	Swakopmund	Reservoir	3	Not detected	Not detected	A
13/07/2016	Swakopmund	Reservoir	4	Not detected	Not detected	A
18/07/2016	Swakopmund	Reservoir	5	Not detected	Not detected	A
25/07/2016	Swakopmund	Reservoir	1	Not detected	Not detected	A
01/08/2016	Swakopmund	Reservoir	20	Not detected	Not detected	A
08/08/2016	Swakopmund	Reservoir	Not detected	Not detected	Not detected	A
15/08/2016	Swakopmund	Reservoir	Not detected	Not detected	Not detected	A
26/01/2015	Walvis Bay	Rooikop Reservoir	89	Not detected	Not detected	A
26/01/2015	Walvis Bay	Mile 7 Reservoir	7	Not detected	Not detected	A
09/02/2015	Walvis Bay	Rooikop Reservoir		Not detected	Not detected	A
09/02/2015	Walvis Bay	Mile 7 Reservoir		Not detected	Not detected	A

The results in Table 7 show that the water supplied to the coastal towns was mostly very safe (Group A) or safe (Group B). A high plate count was found at Henties Bay in January, but later samples were fine. No coliforms or faecal coliforms were detected in any of the samples. The results for the Rössing reservoir apply to the mine and the town of Arandis. The Mile 7 reservoir supplies Walvis Bay, while the Rooikop reservoir is used for the airport and army base.

Chemical Analyses of Groundwater in the Swakop and Khan Rivers

The quality of water supplied to commercial farmers along the rivers and on the lower Swakop smallholdings is evaluated together. The farmers use groundwater for livestock watering and crop irrigation. The Namibian water quality standard for livestock watering sets limits of 6000 mg/L TDS, 1500-3000 mg/L chloride and 2000 mg/L sodium (Table 22 in the Appendix).

As described in the 2014 SEMP report (MME 2016), most of the Khan and Swakop boreholes were within the limits of the standard and therefore safe to use for animals. The only exception was the area of the Swakop smallholdings, but the high salinity there is a natural phenomenon that is not linked to uranium mining. In the absence of recharge from floods in 2015, this situation has almost certainly remained unchanged; though this will only be confirmed with new data in the 2016 SEMP report (refer to next indicator).

There is no Namibian water quality standard for crop irrigation water, though there are indicators like salinity index and sodium adsorption ratio that agricultural organisations use to assess the suitability of a water source for this application. Farmers along the Swakop and Khan rivers know that only certain plants, e.g. olive trees and tomatoes, can tolerate brackish to saline groundwater. They use freshwater from the NamWater pipeline for other crops.

Motivation of status: The indicator requires that aesthetic/physical, inorganic, radionuclide and bacteriological determinants conform to the minimum required quality as prescribed in the national water quality standards. The quality of the NamWater supply to Henties Bay, Swakopmund and Walvis Bay was good to excellent and suitable for human consumption. Monitoring results for the Swakop and Khan rivers showed that the water quality generally improved since the 2011 floods, except for the area of the Swakop smallholdings (MME 2016). These results lead to the conclusion that all parts of the indicator have been **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.	**Radionuclide and heavy metal concentrations conform to the national water quality standards.**			
Data Source	**DWAF**			
Status:		**IN PROGRESS**		

The whole suite of physical and inorganic components, including trace metals and uranium was only analysed in January 2013. GSN and MAWF planned to address this shortcoming in 2015 by engaging a consultant to assist with comprehensive sampling, including radionuclides, and at the same time train GRN staff in sampling and analysis evaluation techniques. Various administrative issues however delayed the project, so that it only took place in 2016. The analysis results will thus be presented in the next SEMP report.

Motivation of status: The indicator was rated **IN PROGRESS** because a project for comprehensive sampling and analysis was planned for 2015, an application for funding was submitted and the sampling and training actually took place in 2016 (pers. comm. Rosina Leonard).

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	**DWAF**
Status:	**MET**

NamWater stated in the 2014 SEMP report that abstraction from Omdel was reduced from 9 Mm^3/a to 4.5 Mm^3/a in 2013 (MME 2015), while the pumping rate of the Kuiseb River was raised from 4.8 Mm^3/a to 7 Mm^3/a. Figures 6 and 7 show the monthly abstraction rates and average water levels for both aquifers. Abstraction from the two major Kuiseb wellfields, Swartbank and Rooibank was close to the sustainable yield in 2015 (Figure 6). The water level dropped faster than in 2009-2010, but the rate was not excessive for a recently recharged aquifer (NUA 2016).

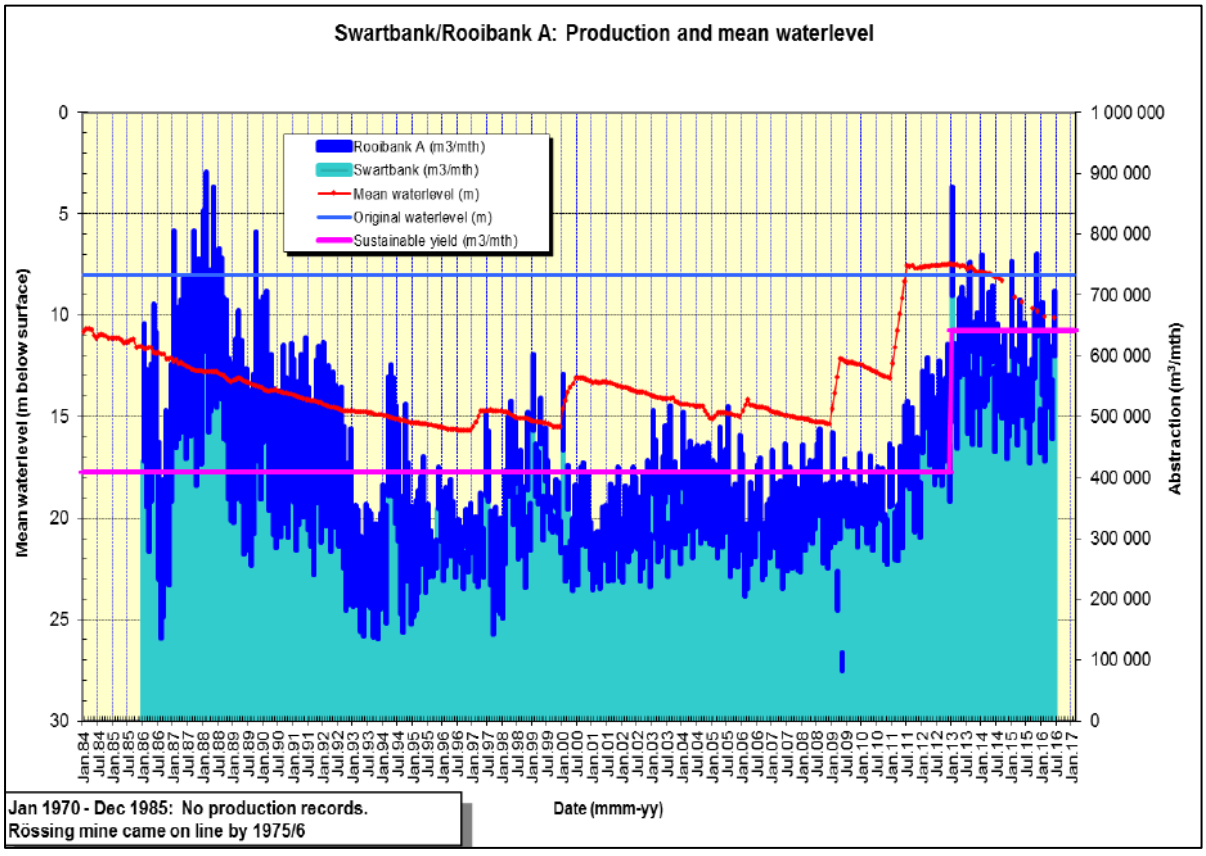

Figure 6: Abstraction and Average Water Level of the Kuiseb Aquifer (source: NamWater)

In the absence of the most recent Omdel water levels it can only be observed that the 2014 trend indicates a slower decline after the abstraction was reduced (Figure 7). In the latest permit DWAF has further reduced the quota from 4.5 Mm^3/a to 3 Mm^3/a (Dr. Vaino Shivute, NamWater, presentation at Swakopmund on 22 August 2016). Occasional water level peaks in Figure 7 were due to recharge from the Omdel dam.

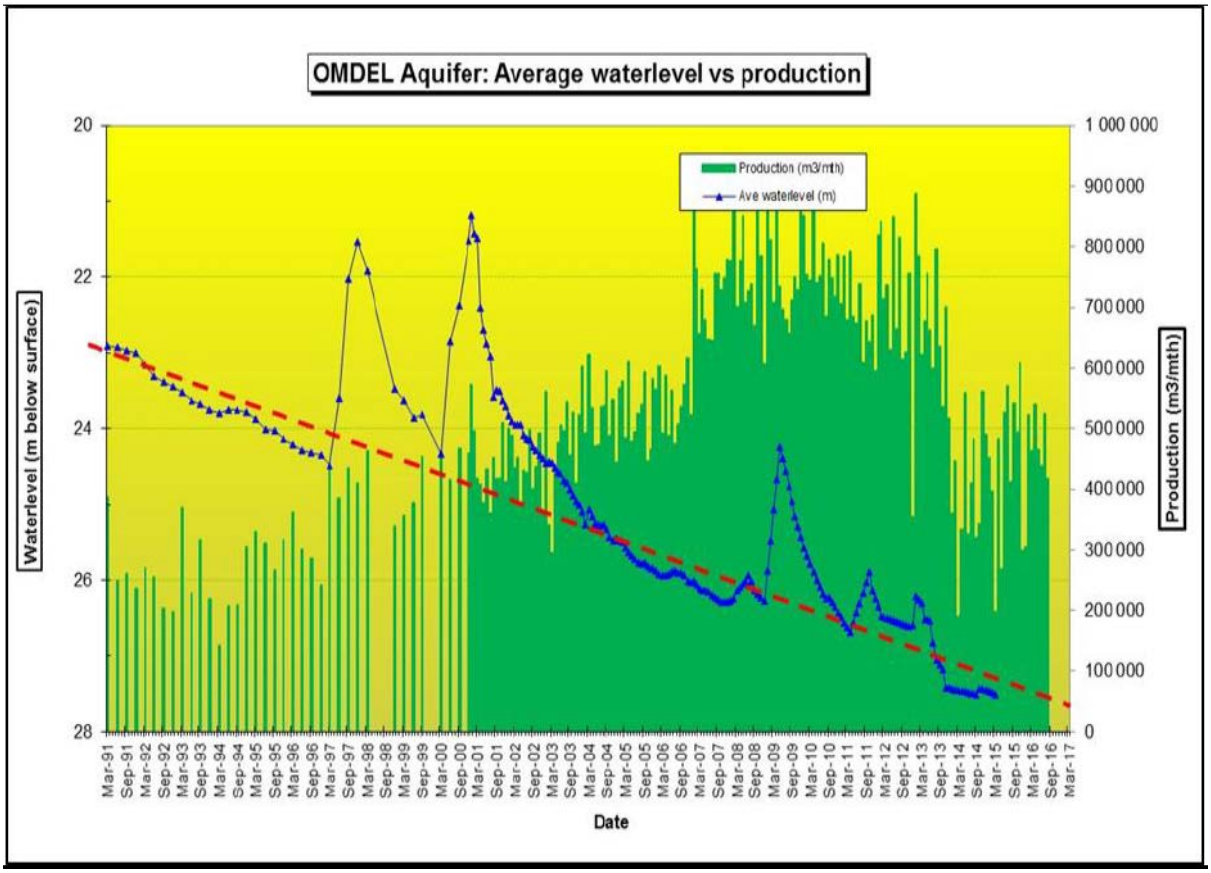

Figure 7: Abstraction and Average Water Level of the Omdel Aquifer (source: NamWater)

Motivation of status: In 2015, groundwater abstraction from the Central Namib water scheme did not exceed the aquifers' sustainable yield as determined by DWAF. The indicator is rated as **MET**.

Indicator 4.2.1.2.	**Borehole levels fluctuate within existing norms.**			
Data Source	**NUA/DWAF**			
Status:		**IN PROGRESS**		

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 drilled in/along these rivers by MAWF. Groundwater levels in the SEMP monitoring boreholes along the Swakop and Khan Rivers were not monitored for the year 2015 as planned. GSN and MAWF had planned a training workshop in order to equip employees with sampling and evaluation analysis techniques. This project was delayed due to various administrative issues, which then only took place in 2016. Thus, no groundwater levels were recorded as no field trip was conducted in 2015. The groundwater levels for 2016 will be displayed in the 2016 SEMP report. The consultant's report on the training that was given and the results of the 2016 water quality analyses can be downloaded from the MME website.

Bannerman, Langer Heinrich, Rössing and Swakop Uranium monitor water levels in the Khan and Swakop rivers. They have made their data available to complement the SEMP water levels and help to define the concept of fluctuation "within existing norms". Generally water levels in the boreholes rise when the aquifers are recharged during floods and fall as a result of evapotranspiration and drawdown due to pumping (where this takes place). It is important to note that water levels always

decrease except during and just after runoff. The natural decline results in a gently sloping line, while a steeper drop may indicate that abstraction exceeds the sustainable yield of the aquifer.

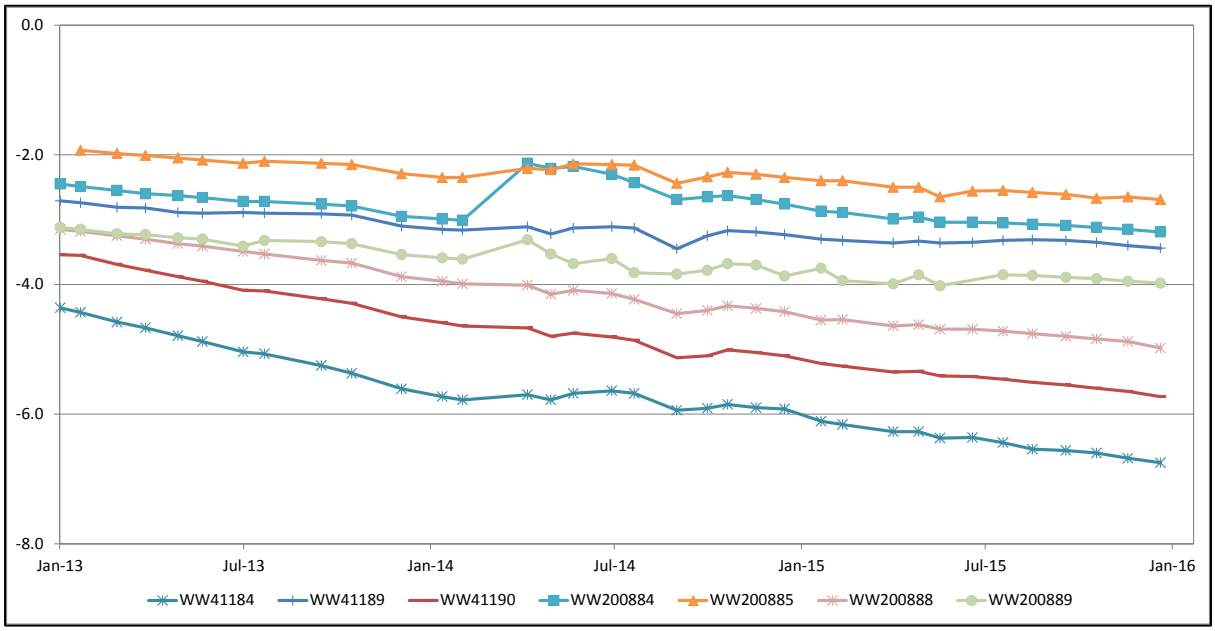

Figure 8: Water Level Trends in the Swakop River at Langer Heinrich Mine

Langer Heinrich mine takes monthly water level measurements at 15 boreholes in the Swakop River to monitor the effect of abstraction on the aquifer. The company operates a production borehole to abstract saline groundwater for industrial purposes. Figure 8 shows the water level trends over the last three years at seven representative sites. Recharge last occurred in early 2014 as indicated by rising water levels at some boreholes. Since then, water levels have remained stable or followed the normal declining trend. Swakop Uranium and Bannerman monitor the stretch of the Swakop River between Langer Heinrich and Goanikontes. This area received some recharge at the end of 2013. In 2014 and 2015, the water levels dropped slowly but continuously (Figure 9).

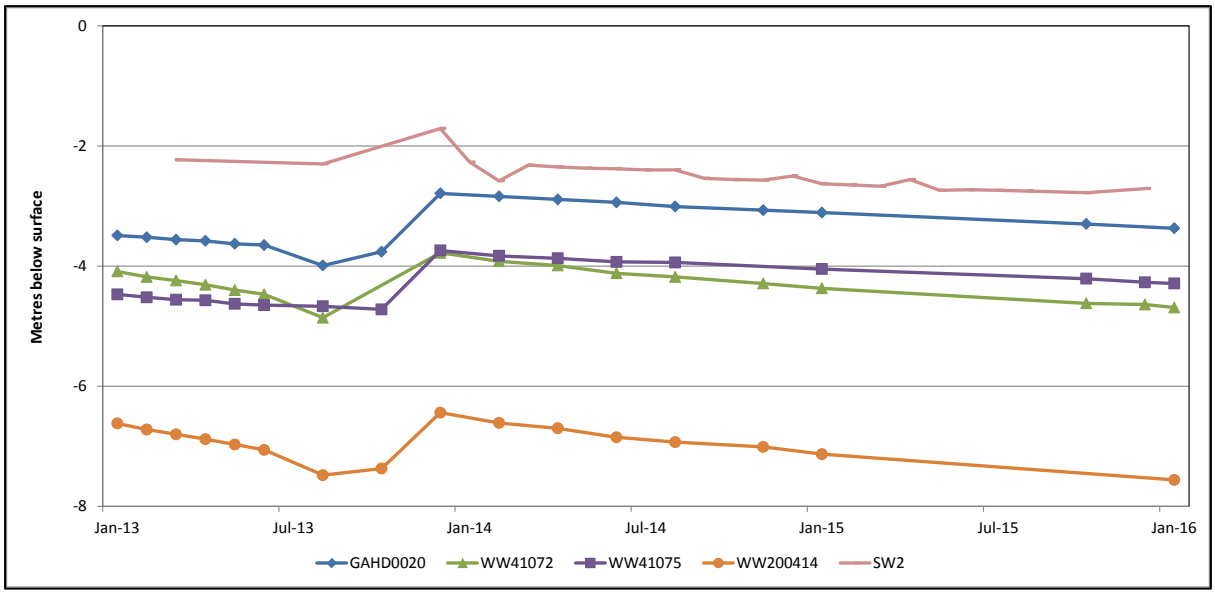

Figure 9: Water Level Trends in the Swakop River at the Swakop Uranium and Bannerman Boreholes

An even slower decline can be observed in the lower Khan River boreholes monitored by Rössing and Swakop Uranium (Figure 10). While the water table in the Swakop River is situated 2-7 m below

surface, it is generally deeper at 6-17 m below surface in the Khan. No major fluctuation occurred during the last three years, except for a slight rise at BH1.4A in 2014.

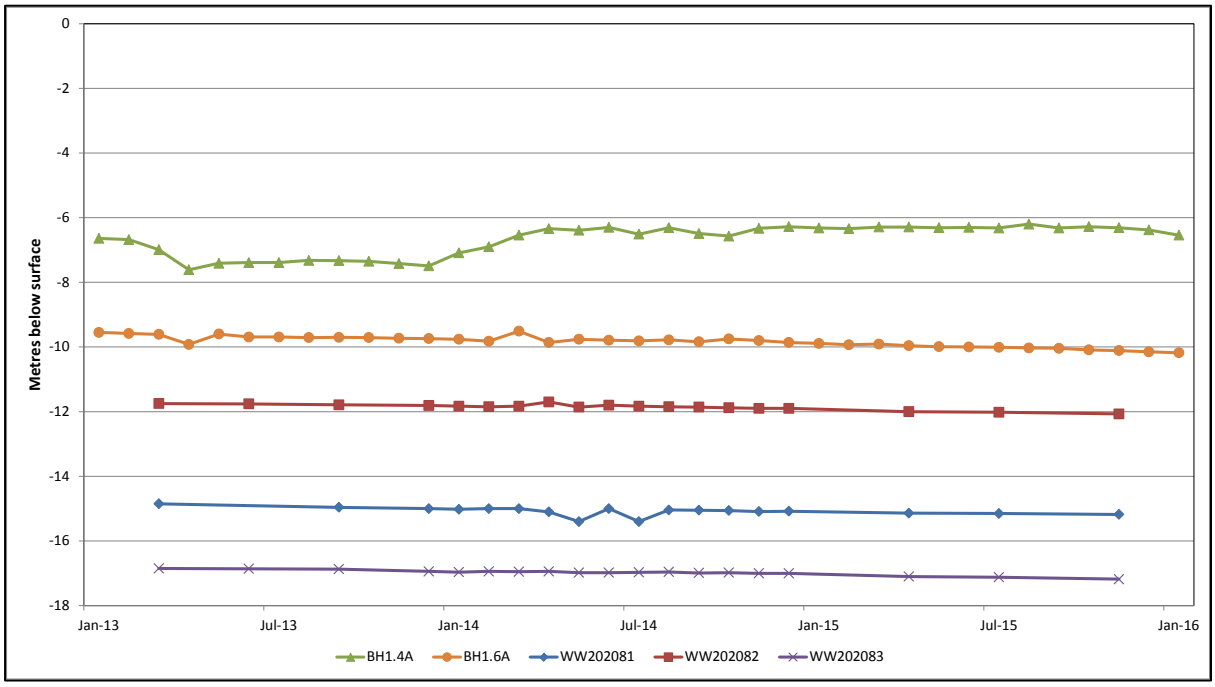

Figure 10: Water Level Trends in the Khan River

The monitoring data indicate that the fluctuations observed in the Swakop and Khan rivers were in line with the normal trend that is caused by evapotranspiration (water consumption by vegetation).

Nevertheless, a group of Swakop River farmers was concerned about Swakop Uranium's plan to use water from a production borehole upstream of the eastern-most farms for commissioning. They contacted the media and staged a demonstration in January 2016 (also refer to EQO11). Further developments will be discussed in the 2016 SEMP report.

Motivation of status: The range of water level fluctuation observed at mine boreholes in 2015 was found to be within existing norms, indicating that groundwater abstraction by mines and other consumers did not negatively affect the water resources. The indicator was regarded as **IN PROGRESS** because the water levels at the SEMP boreholes were only measured in 2016.

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

NamWater has been supplying water to consumer since its inception in 1997 (DWAF, 2015). Bulk water users supplied from NamWater's Central Namib scheme paid water rates that were approved by Government (Government Gazette No. 5796, July 2015). The gazetted tariffs for towns and other consumers supplied from the Central Namib scheme increased by 10% compared to 2014 (Table 8). Aquifer water was provided to the Walvis Bay Municipality at a tariff of N$8.25/$m^3$ and to the Swakopmund Municipality at N$8.75/$m^3$. The municipalities determine their own tariffs for domestic and industrial users, which are generally higher than the NamWater rates. Residents and vegetable farmers supplied from the Swakopmund-Rössing pipeline paid N$10.10/$m^3$.

Tariffs for mines are not gazetted; they are subject to confidential contracts between NamWater and the individual companies. Mines paid for desalinated water which is produced at a cost of approximately US$2/m^3 when the plant is running at full capacity. Since the plant only ran at 20-25% of capacity in 2015 the actual cost was much higher (NUA, 2016).

Table 8: Water Tariff Increases for 2015 (from Government Gazette No. 5796)

Scheme Description	Tariff 2014	% Increase	Tariff 2015
Henties Bay	7.70	10%	8.45
Rooibank Mile 7 Reservoir (Walvis Bay)	7.50	10%	8.25
Swakopmund reservoir	7.95	10%	8.75
Swakopmund-Rössing (pipeline)	9.20	10%	10.10
Omdel-Swakopmund	8.80	10%	9.70
Swartbank Schwarzekuppe	7.30	10%	8.05
Arandis Town	9.20	10%	10.10

Motivation of status: The tariffs gazetted in 2015 were based on the cost of aquifer water and did not include additional increases to recover the higher cost of desalinated water from domestic consumers. The indicator was **MET**.

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:		**IN PROGRESS**		

The uninterrupted water supply to urban and industrial users at an affordable price is NamWater's responsibility. Efforts are ongoing to ensure that NamWater infrastructure is protected from flood damage. This is done by constructing boreholes, pipelines and power lines to either withstand or avoid flood damage.

Motivation of status: Because of the ongoing activity this indicator is rated as **IN PROGRESS.**

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	**DWAF**			
Status:			**MET**	

Water for industrial development was secured in 2015 by augmenting the groundwater resources with desalinated seawater. Operating mines were however concerned that the high cost of desalinated water was affecting their financial viability. The Governor of the Erongo Region stated that industrial investment opportunities may have been lost due to a lack of water (Hon. C. Mutjavikua, speech at Swakopmund, 22 August 2016). NamWater indicated in the previous SEMP report that

they were planning to develop the southern palaeochannel at Omdel, but funds were not provided in the 2015/16 budget (Dr. V. Shivute, presentation at Swakopmund, 22 August 2016).

Motivation of status: Supply was secure in 2015, although it came at a higher cost because the groundwater supply shortfall had to be made up with desalinated water. This indicator is rated as **MET** for 2015, but may have to be downgraded in 2016.

Indicator 4.3.1.2.	**Desalinated water meets mine demand**			
Data Source	**DWAF/NUA**			
Status:			**MET**	

In 2015, NamWater met the mines' demand by supplying 4.4 Mm^3 of desalinated water to Husab, Langer Heinrich and Rössing Uranium. However, due to the high cost of desalinated water Rössing Uranium planned to construct its own desalination plant. The company completed an EIA and received environmental clearance in 2016, after MET had first turned down the application in 2015.

Motivation of status: The volume of desalinated water was sufficient to meet the mines' demand. The indicator was therefore **MET**.

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Summary of performance: EQO 4

Total no. indicators assessed:	8			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	0	3	5	0
Percentage of indicators in class	0%	37.5%	62.5%	0%

Overall performance: Five of the eight indicators in the Water EQO were **MET**, while three indicators related to water levels, comprehensive sampling and disaster management were **IN PROGRESS**. The results indicate that drinking water for urban and rural communities was of acceptable quality and uranium mining did not compromise the water quality in the lower Khan and Swakop rivers, and neither was the water table lowered beyond the normal rate. NamWater's groundwater abstraction from the Central Namib water scheme did not exceed the aquifers' sustainable yield as determined by DWAF. Aquifer water was made available to domestic users at approved NamWater rates, even though it had to be augmented with desalinated water. There were no reports of industrial investors being lost due to water unavailability because desalinated water was available to meet the demand. The results were similar to the previous two reporting years, except for the indicator for groundwater sampling changing from MET to IN PROGRESS.

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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 entails the assessment of the quantity of dust blown from the uranium mining sites into the environment. Dust emissions may occur during each stage of the mine cycle, in particular during exploration, development, construction and operational activities. The principal sources include dust generated by blasting, wind erosion of exposed surfaces such as tailings, stockpiles, waste dumps and haul roads, and to a lesser extent fine particulates from combustion of diesel that is used to fuel mining equipment.

The SEMP office monitors and reports public exposure from dust, which includes both nuisance dust and inhalable dust. The latter is also known as PM_{10} dust because its particles are smaller than 10 micrometres. The SEMP office has placed a PM_{10} E-Sampler at Swakopmund that is able to collect the following data: PM_{10} dust concentration, ambient temperature, barometric pressure, wind speed, relative humidity, and wind direction. Most mines use E-Samplers too, but not all of them are equipped with weather stations.

The purpose of monitoring this dust fraction is to ensure that ambient PM_{10} concentrations at public locations do not exceed the targets or limits set for the area. The SEA report (MME 2010) selected the World Health Organisation (WHO) IT-3 guidelines for PM_{10} dust as limits for the Erongo region. These are 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 developed based on environmental, social and economic conditions that are similar to Namibia. The WHO allows three days where the 24-hour guideline may be exceeded and South Africa allows four days per calendar year. One of the aims of the advanced air quality study that the GSN initiated in 2015 and that will start in 2016 is to review this recommendation and propose a realistic standard for the region.

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**	

The SEMP office monitors the PM_{10} dust concentration in the town of Swakopmund. Figure 11 shows the average monthly PM_{10} concentration for 2015. The concentrations were well below the WHO IT-3 limit of 75 µg/m³ with an average of 11.19 µg/m³ and the highest concentration of 34.7 µg/m³ recorded in November. The monitor will be moved from its current place at the NamWater reservoirs to a more suitable location in town as part of the advanced air quality study in 2016.

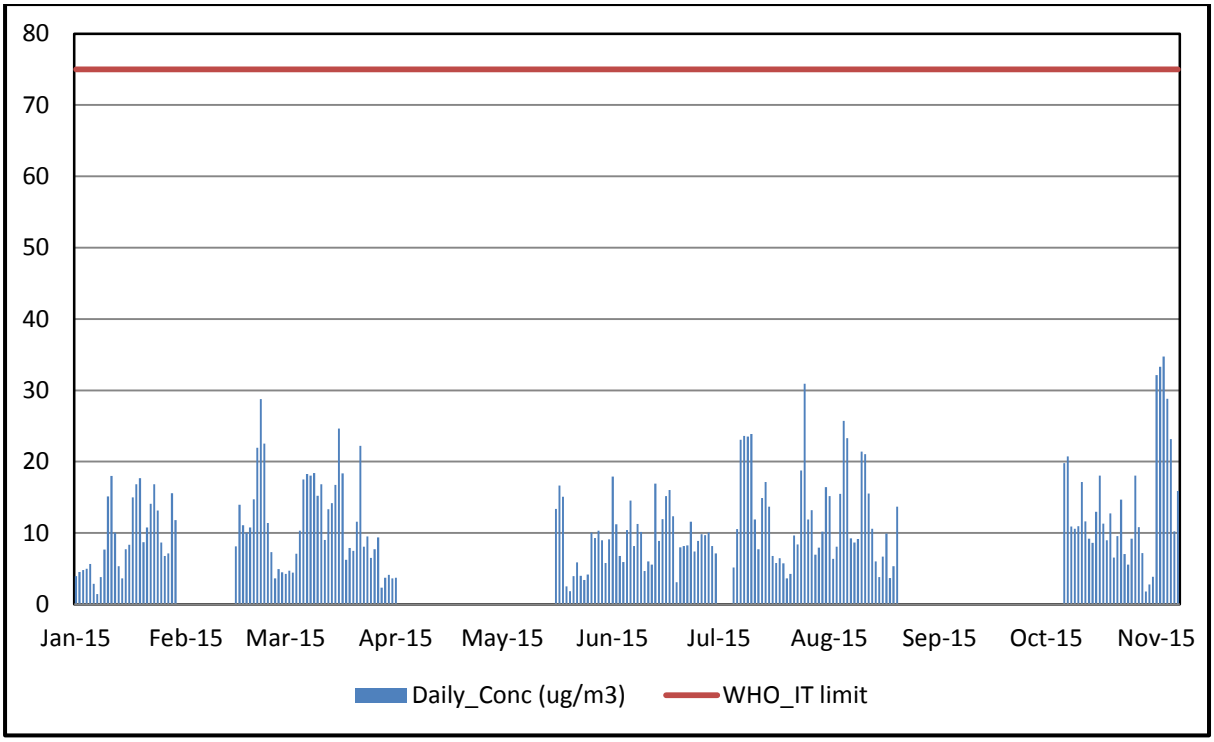


Figure 11: Average Daily PM_{10} Dust Concentrations at Swakopmund

The uranium industry supports the SEMP office by monitoring PM_{10} dust at Arandis (AREVA and Rössing), as well as providing monitoring data collected at the mine sites. Mines are monitoring PM_{10} dust concentrations on site and at receptor locations. The annual average figures for 2013-2015 are summarised in Table 9 to enable comparison of the dust levels at or close to the mines and at Arandis, which is the only public receptor location that is currently being monitored.

Table 9: PM_{10} Dust Concentrations at Arandis Town and Uranium Mines

Locality	**Average Annual PM_{10} Dust Concentration (µg/m³)**		
Year	**2015**	**2014**	**2013**
Arandis, AREVA station	9.8	9.1	10.4
Arandis, Rössing station	8.6	11.4	15.8
Rössing contractor management camp	21.7	No data	No data
LHU, entrance gate	45.4	42.1	44.3
Husab Mine	41.0	28.2	34.1

AREVA Resources Namibia recorded an average PM_{10} dust concentration of 9.8 µg/m³ in the centre of Arandis, while Rössing Uranium measured 8.6 µg/m³ on the eastern edge of the town. This was well below the WHO IT-3 limit of 30 µg/m³ for the annual mean. The average daily dust concentrations at both Arandis stations were below the WHO IT-3 limit of 75 µg/m³ (Figures 12 and 13).

The AREVA station's highest reading was 62 µg/m³ on 1 October 2015. Peak dust levels in the Erongo region are normally associated with east wind events in winter, but there were no sandstorms in the last three seasons. The peaks therefore occurred in October-November and were caused by south-westerly winds.

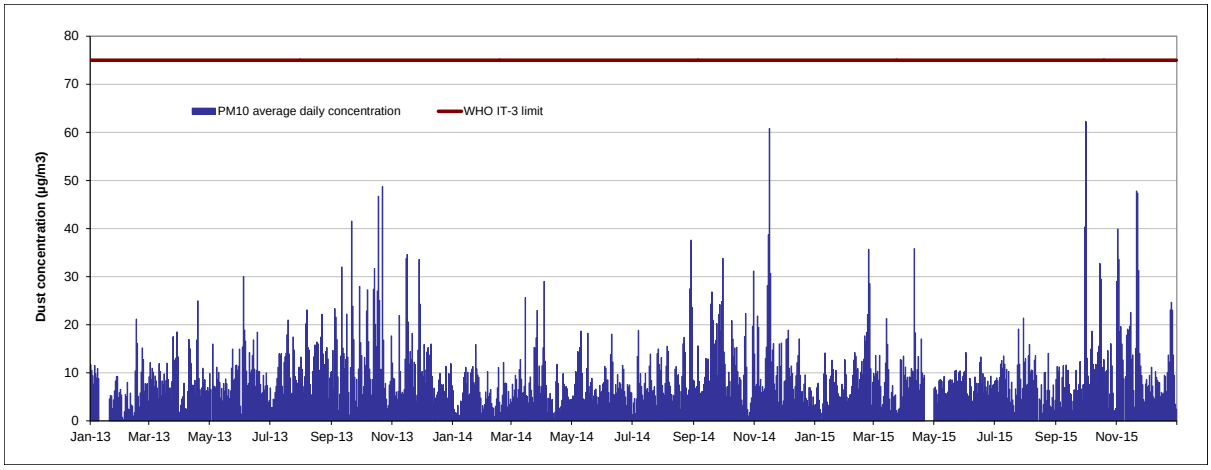


Figure 12: Average Daily PM10 Dust Concentrations at Arandis (AREVA) in 2013-2015

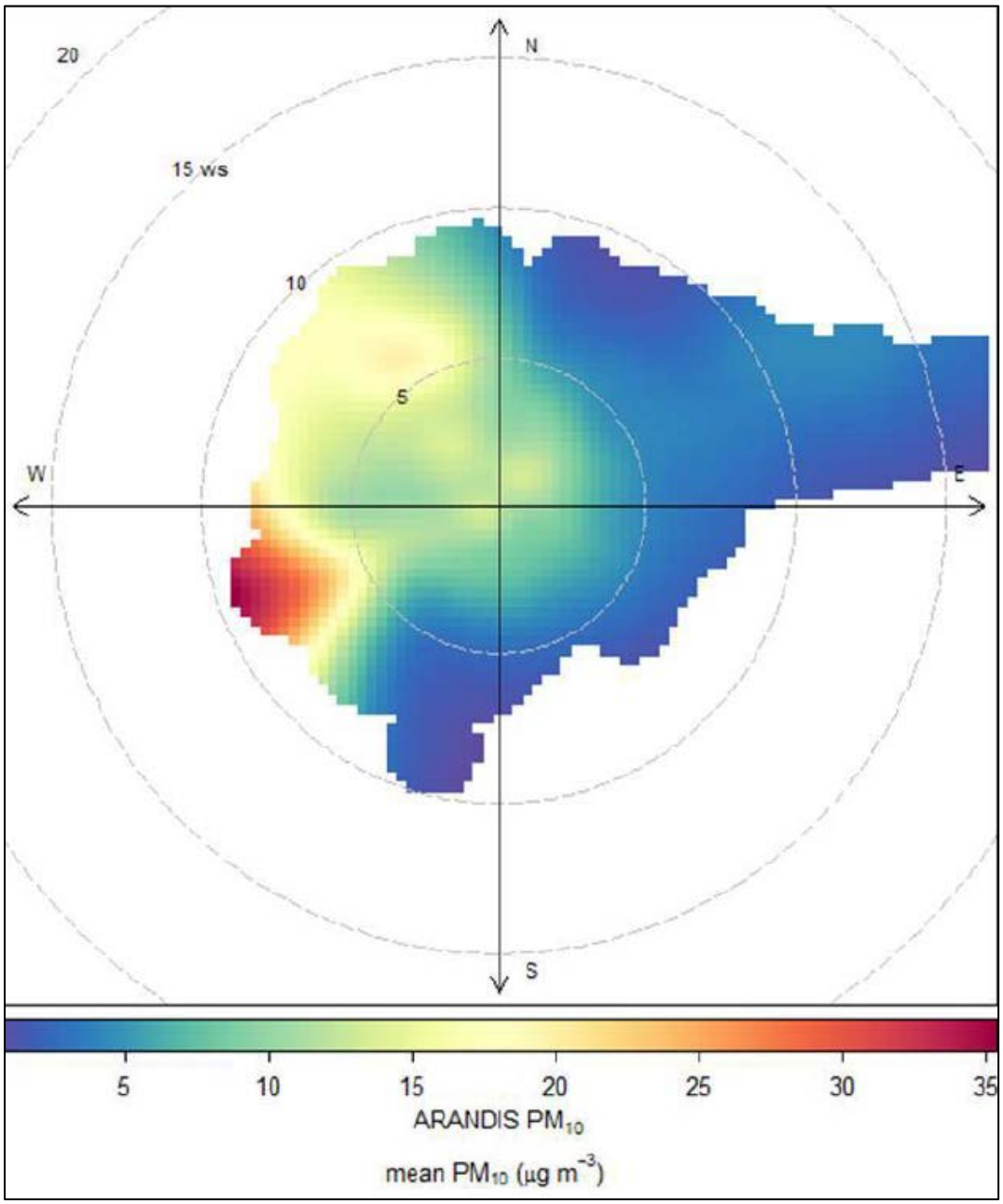


Figure 13: Polar Plot of Mean Daily PM10 Dust Concentrations at Arandis (Rössing)

The Rössing data are presented in Figure 14 in form of a polar plot. Polar plots represent the ambient PM_{10} concentration shown in various colours in relation to the wind speed ('ws' on concentric circles) and the direction from where the dust originated (compass points). The plot indicates that most dust was generated south-southwest of the monitoring site at wind speed below 10 metres per second (m/s). Site inspection showed a gravel road to be the main dust source. The dust concentration at this site has decreased since 2013 (Table 10). Rössing monitors PM_{10} dust at three sites on the mine, but only the instrument at the contractor management camp was in operation throughout the year. An annual mean of 21.7 µg/m³ was measured at the camp, which is located north of the mine entrance. Similar to Arandis, the highest daily dust concentration of 97.7 µg/m³ was recorded in October and caused by strong south-westerly winds.

Langer Heinrich mine reported an annual average PM_{10} concentration of 45.4 µg/m³ at the mine entrance; while Swakop Uranium measured 41.0 µg/m³ at Husab mine in July-December 2015. Both values exceeded the annual mean WHO IT-3 limit of 30 µg/m³, but were below the 75 µg/m³ 24-hour limit.

These results indicate that the 30 µg/m³ annual limit may be unrealistically low for operating mines in the Erongo region. The WHO daily limit has been used in previous SEMP reports and will still apply until new standards can be obtained from the advanced air quality study.

Motivation of status: The SEMP PM_{10} at Swakopmund and the PM_{10} concentrations recorded at the mines were below the WHO IT-3 daily limit of 75 µg/m^3. Therefore the indicator is rated as **MET**.

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.	**Continuous dust fallout measurements (mg/m^2/day) on a regional scale e.g. maintain existing SEA dust fallout network.**			
Data Source	**SEMP Office/NUA**			
Status:			**MET**	

Dust fallout or nuisance dust has particles larger than 10 micrometres and is collected in dust buckets. In the absence of Namibian guidelines the South African National Dust Control Regulations are used, which allow up to 600 mg/m²/day for residential and light commercial areas and 1,200 mg/m²/day for heavy commercial and industrial sites. Both limits may be exceeded up to three times within any year, but not in successive months. This provision may not be realistic for the Erongo region where the east wind might blow for several months during the winter season.

Monitoring of the SEA dust fallout network ended in 2012 after an adequate baseline of regional dust fallout levels had been established. It was found during this survey that the highest dust concentrations outside of mining areas occurred in the vicinity of gravel roads and that none of the towns in the region were affected by dust fallout exceeding the 600 mg/m^2/day residential imit.

To establish whether this was still the case in 2015 dust fallout was measured at three sites in Arandis. The results presented in the graphs for AREVA (Figure 16) and Rössing (Figure 19) under indicator 5.2.2.1 showed dust fallout levels below 50 mg/m^2/day.

Motivation of status: Target 5.2.1 specifies that dust fallout levels at residences in towns should not exceed the recommended limit of 600 mg/m^2/day. If this target is read together with the indicator that requires continuous dust fallout measurements to be carried out, it can be concluded that the intention has been **MET**. Rewording of the indicator should be considered in 2016.

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 fall-out at main dust generating sources and mine license boundaries**
Data Source	**SEMP Office/NUA/NRPA**
Status:	**MET**

All operating mines and mines under development applied mitigation measures and maintained dust fallout monitoring networks in 2015. The results are 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 industrial areas of 1200 mg/m^2/day. The SA NDCR have replaced the SANS standard.

AREVA Resources Namibia monitored dust fallout at 13 sites on Trekkopje mine, at Arandis and at the Erongo desalination plant. Dust levels were generally low with annual average values of 12-37 mg/m^2/day. The maximum of 208 mg/m^2/day was recorded in May 2015 northeast of the Midi pad (Figure 14). Many monitoring sites showed slightly higher dust concentrations during the second half of the year, which may be caused by generally drier conditions and higher wind speeds during this time. The dust fallout at all sites was below the SA NDCR limit for residential areas of 600 mg/m^2/day.

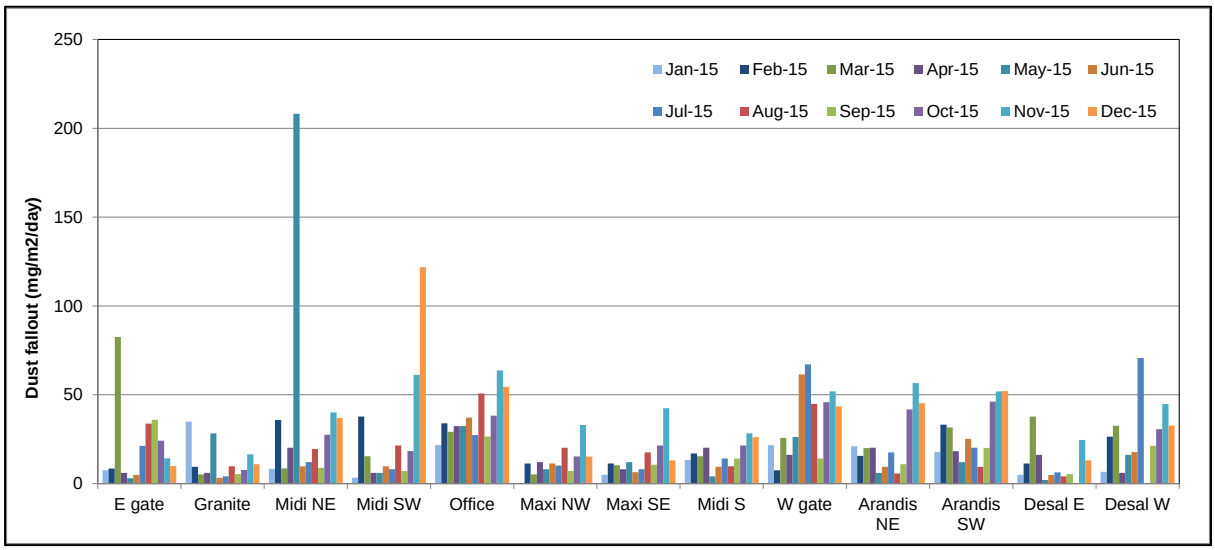


Figure 14: AREVA Resources Namibia Average Monthly Dust Fallout Concentrations

Dustfall rates at Bannerman's Etango project were generally low and well within the 600 mg/m²/day SA NDCR limit for residential areas (Figure 15). Occasional spikes occurred at the residential areas of farms Goanikontes (PPDF07) and Palmenhorst (PPDF09), with PPDF09 exceeding the limit once in July 2015.

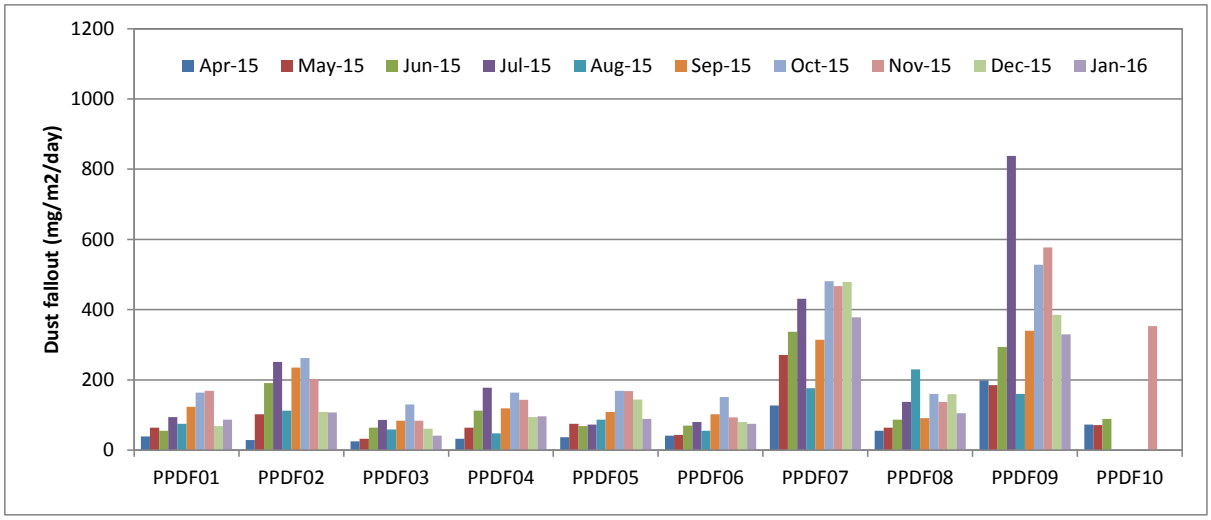


Figure 15: Bannerman Mining Resources Average Monthly Dust Fallout Concentrations

In 2015, Langer Heinrich Mine monitored dust fallout at 11 sites on and around the mine. The results (Figure 16) were generally below the SA NDCR limit for residential of 600 mg/m^2/day, especially at sites like Bloedkoppie where members of the public may camp. The limit for industrial areas of 1200 mg/m^2/day was exceeded on three occasions at Valley South CCD during the July-August east wind season and in November 2015. This site is in the centre of the processing plant close to dust generating sources. The results were in compliance with the SA NDCR standard which allows three exceedances per year.

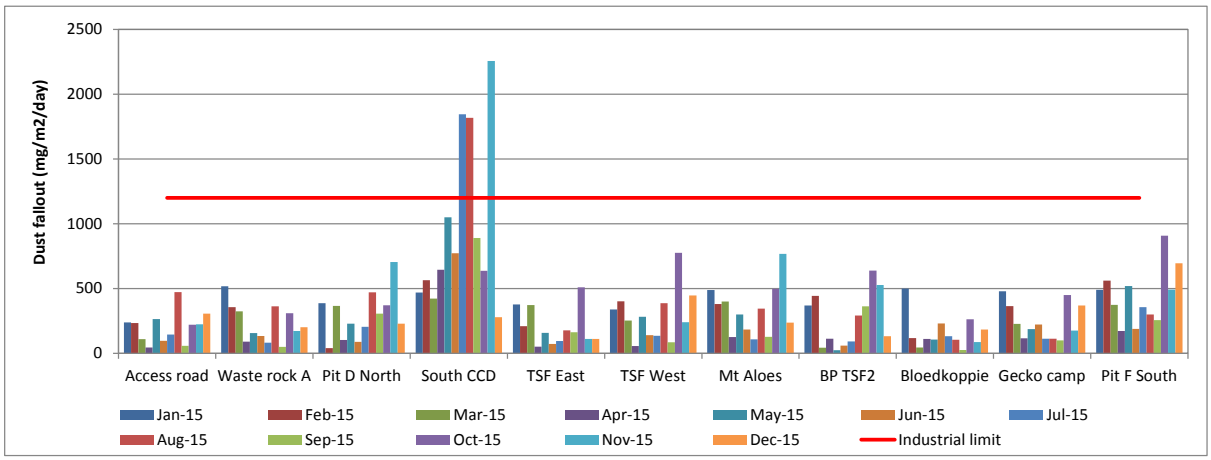
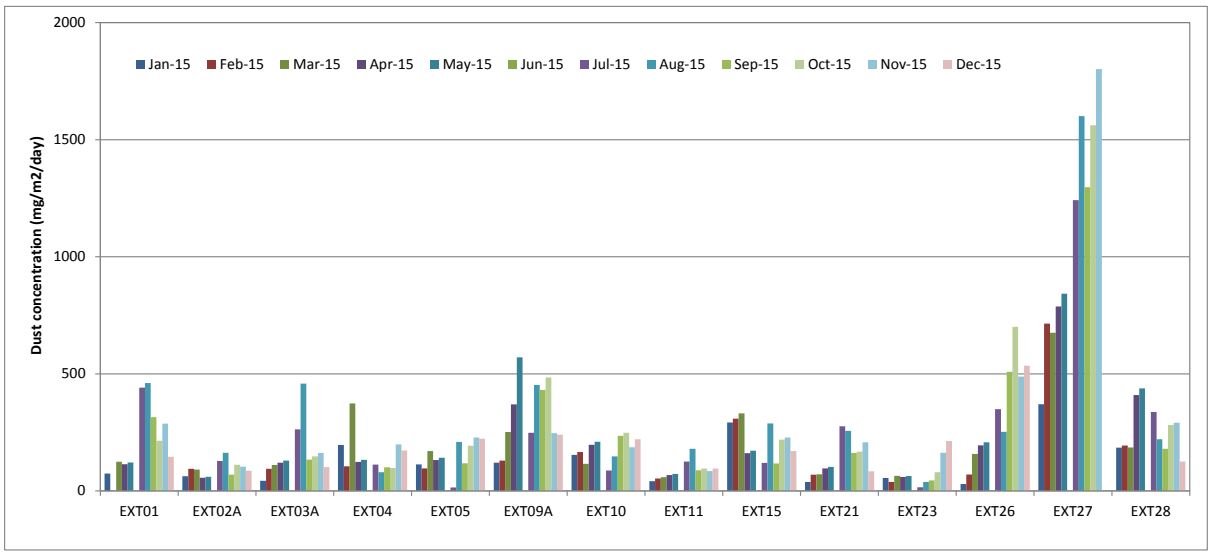


Figure 16: Langer Heinrich Mine Average Monthly Dust Fallout Concentrations

Rössing Uranium measured dust fallout at Arandis and at five sites on the mine boundary south-west and north-east of the open pit and tailings dam (Figure 17). These directions were chosen to correspond with the prevailing wind directions in the coastal region. In 2015, the company added seven dust buckets in line southwest of the tailings dam (DP1-DP7) and 10 buckets all around the tailings facility (TDDF1-TDDF10). The results for the background and DP sites were below 100 mg/m^2/day, except for a peak of 154 mg/m^2/day at DP2 in August 2015 (upper part of Figure 18). To keep the graph readable only the DP sites with highest figures are displayed in Figure 18. The TDDF sites were established in April-June 2015. They show results that are more typical for an industrial environment with a maximum reading of 1451 mg/m^2/day recorded at TDDF 4 in August 2015 (lower part of Figure 17). This was the only exceedance of the SA NDCR limit, while three would have been permissible.

Figure 17: Rössing Mine Average Monthly Fallout Dust Concentrations

Swakop Uranium monitored 28 dust fallout buckets at Husab mine in 2015 and added another four sites at the end of the year. The dust levels were generally below the SA NDCR limit for residential areas of 600 mg/m^2/day (Figure 18). Only the dust levels at EXT27 exceeded the industrial limit of 1200 mg/m^2/day on at least three occasions. A dust suppression system was installed in the dry area next to the primary crusher to mitigate dust pollution (CoM 2016).



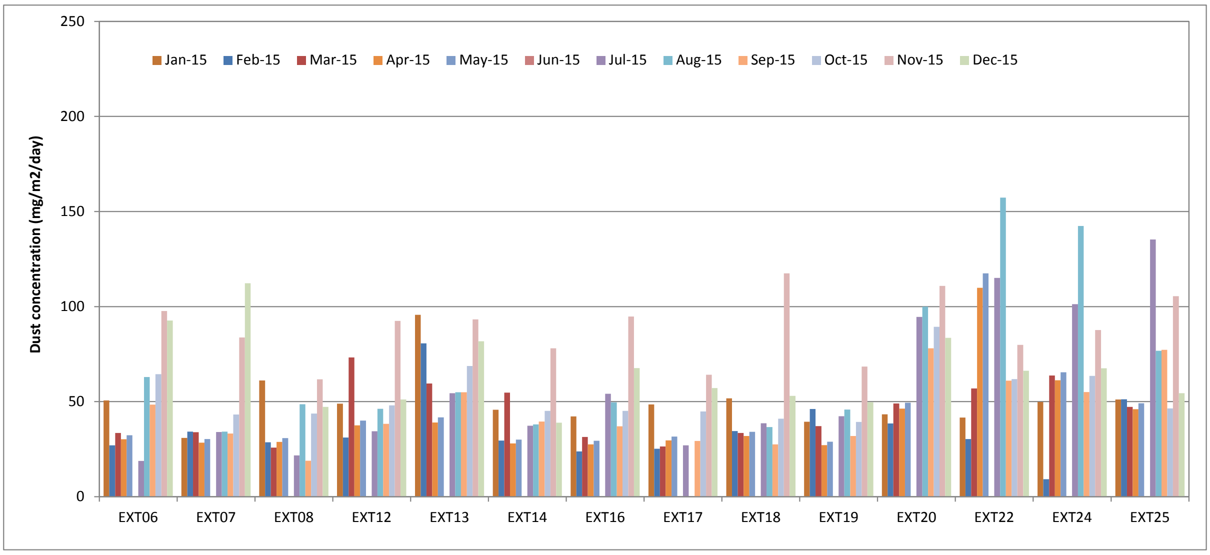


Figure 18 Husab Mine Average Monthly Dust Fallout Concentrations

Motivation of status: The indicator requires that mines implement dust fallout networks, measuring dust fallout at main dust generating sources and mine licence boundaries. This has been done as demonstrated by the results above. The indicator is therefore rated as **MET**.

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Summary of performance: EQO 5

Total no. indicators assessed: 3

	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: All three indicators that were assessed were rated as **MET** compared to 2014 when two indicators were MET and one was NOT MET. The latter was the indicator for continuous dust fallout measurements on a regional scale using the SEMP monitoring network. The network has served its purpose and become obsolete. It was proposed that dust monitoring in residential areas close to uranium mines will be sufficient to meet the intention of target 5.2.1. This should be confirmed by the regional advanced air quality management study that will commence in 2016.

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EQO 6. Health

Aims of this EQO: Workers and the public do not suffer significant increased health risks from uranium mining.

Radiation has existed in the universe since the beginning of time. Light, heat, infrared and ultraviolet rays have bombarded the earth since it was formed. We have learned to harness the energy of many types of radiation, such as radio waves, microwaves and the radioactivity emitted by unstable atoms of elements such as uranium, and we have added human-made sources to those that occur in nature. Because radiation occurs naturally on earth, both people and the environment have adapted to certain levels of ionising radiation. We are exposed every day to ionising radiation from cosmic rays, building materials, food, the earth we walk on, and the air we breathe. This naturally occurring radiation is known as background radiation and it constitutes by far the greatest percentage of each person's exposure.

People involved in uranium mining can potentially be exposed to what are in fact naturally-occurring radioactive materials (NORM). As for other occupational health hazards, monitoring and then controlling the risks is necessary. A dose is the amount of medically significant radiation a person receives. Although uranium itself is not very radioactive, the ore which is mined also contains decay products such as radon, and must be regarded as potentially hazardous, especially if it is high-grade ore. Radon gas emanates from the rock (or tailings) as radium decays. It then decays further into solid radon daughters, which are energetic alpha-radiation emitters. A number of precautions are therefore required at uranium mines to protect the health of workers and the surrounding environment. Dust levels and air quality as discussed in EQO 5 objectives also play an important role in relation to health. Adequate monitoring data must be available to assess the performance of the industry.

The National Radiation Protection Authority (NRPA) is a division within the Ministry of Health and Social Services (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 1 mSv per annum above background. Public dose assessments model the predicted dose to the group of residents that lives closest to the mine, the so-called "critical group". If several towns or settlements are situated around a mine there can be several critical groups.

Some of the predictions made in public dose models can be checked against actual measurements. Radon gas makes a significant contribution to the public dose: The weighted average for the Erongo region was estimated as 0.5 mSv/a in the SEA report (MME 2010). The SEMP Office therefore monitors and reports public exposure arising from the ambient concentration of radon and short-lived radon progeny at the three major coastal towns (Arandis, Swakopmund and Walvis Bay). Bannerman Resources and NUA supported the SEMP office by managing the radon monitoring equipment and downloading the data.

Before presenting the results for 2015 it is necessary to clarify the terminology used in Target 6.1.2 and Indicator 6.1.2.1. The Atomic Energy & Radiation Protection Act (Act No 5 of 2005) uses the term "occupationally exposed persons" for all mine workers and medical personnel who may be exposed to ionising radiation. There is no definition of "radiation workers" in the act and mining companies apply their own categories, e.g. based on potential exposure to 5 or 6 mSv/a for radiation workers. Though medical professionals are mentioned in 6.1.2.1, reporting their exposure as part of the SEMP feedback would be outside the scope of impacts related to uranium mining.

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:	**IN PROGRESS**

To date the only assessment that considered the cumulative impact of an increasing number of mines on the public dose in the Erongo uranium province was carried out as part of the SEA (MME 2010). Public dose assessments of existing mines and new projects determined the dose to the nearest critical group(s) or the dose at the mine boundaries in the absence of residents in the vicinity. The cumulative impact could be estimated by adding up the contributions of various mines to the total public dose. To improve on this method, the SEMP project will conduct an advanced air quality study for the uranium province in 2016 to update the 2010 model and radiation assessment.

As reported for the year 2014, the only new mine in development was Husab. Swakop Uranium conducted a public dose assessment as part of its latest EIA amendment (EIA report, 2013). The assessment identified all critical groups around the mine boundaries and took the presence of other mines into account by using a dose constraint of 0.3 mSv/a instead of the public limit of 1 mSv/a for a single operation.

Motivation of status: The 2016 update of the air quality and radiation study is expected to provide a comprehensive re-assessment of the cumulative impact. The indicator is therefore rated as **IN PROGRESS**.

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:	**IN PROGRESS**

The public dose assessments that AREVA (Blerk & Potgieter 2011), Swakop Uranium (NECSA 2013), Bannerman, Langer Heinrich and Rössing (NUA 2016) have carried out indicated additional doses to critical groups or persons present at the mine boundaries of 0-0.4 mSv/a as shown in Table 10. Pathways considered in the dose assessments were atmospheric (dust, radon gas, direct gamma ra-

diation). The water pathway is not applicable in the Erongo region because the groundwater that naturally occurs at the mines is too saline for human consumption.

The dose of 2.2 mSv/a at Langer Heinrich's mine boundary (entrance gate) includes the natural background radiation. There are no residents nearby because the mine is situated in the Namib-Naukluft Park; the critical group in this case consists of security guards manning the gate.

Table 10: Public Dose Assessment Results of Various Mines

Company	**Public dose assessment results (mSv/a)**		
	Additional dose at mine boundary	Dose to critical group	Critical group location
AREVA	0.04-0.4	0	Arandis
Bannerman	0	0	Goanikontes ware-house
Langer Heinrich	2.2	2.2	Entrance gate
Rössing	0.03	0.02	Arandis
Swakop Uranium	<0.1	0	Khan River, Wel-witschia plains

The SEMP Office has established three radon monitoring station at towns in the Erongo region to collect data on public radon exposure. The ambient radon concentrations measured in 2015 varied from 7.9 Bq/m^3 at Walvis Bay to 19.5 Bq/m^3 at Arandis (Table 11). Radon is emitted from any type of soil but not from ocean water, so one would expect lower values at the coast. Public doses calculated from the measured data are 0.4 mSv/a at Arandis, 0.3 mSv/a at Swakopmund and 0.2 mSv/a at Walvis Bay. These results are similar to the figures for 2014 and in line with the natural background doses from the SEA study (MME 2010).

Table 11: SEMP Radon Monitoring Network Results for 2014 and 2015

	Average Radon Concentration (Bq/m^3)		**Radon Dose (mSv/a)**	
	2015	**2014**	**2015**	**2014**
Arandis	19.5	20.3	0.4	0.4
Swakopmund	12.7	11.7	0.3	0.3
Walvis Bay	7.9	7.9	0.2	0.2

The doses were calculated as follows: Average radon concentration in Bq/m^3 * 0.4 (equilibrium factor between radon and progeny) * 0.00000556 mJ/m^3 (conversion factor) * 1.1 mSv (dose conversion factor) * 8760 hours.

Motivation of status: Radon monitoring confirmed that the contribution of radon to the public dose at Arandis, Swakopmund and Walvis Bay did not increase compared to the 2010 SEA baseline. Though the modelled radiation doses to critical groups did not exceed 1 mSv/a above background, the cumulative impact still has to be confirmed by the updated air quality model and radiological dose assessment in 2016. The indicator has therefore been rated as **IN PROGRESS**.

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 and medical professionals (radiation workers)**
Data Source	**NUA**
Status:	**MET**

The radiation dose to uranium mine workers may not exceed the legal limit of 20 mSv/a in addition to the natural background. The figures reported in Table 12 are 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. The monitoring results show that the doses varied from 0.3-1.3 mSv/a. The maximum individual doses at operating mines were 5.9-7.1 mSv/a.

Table 12: Radiation Dose to Uranium Mine Workers (mSv/a)

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)
AREVA	0.5	140	0	0	1.8
Bannerman	0.3	9	0	0	0.4
Langer Hein.	1.3	902	3	0	7.1
Rössing	1.0	980	2	0	5.9
Swakop U	0.3	1357	0	0	0.8

Motivation of status: None of the measured doses to workers exceeded the limit of 20 mSv/a in 2015. This indicator is 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:	**IN PROGRESS**

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

The previous two SEMP reports assessed these two indicators as NOT MET because there was no independent epidemiological study from which conclusions could be drawn. Rössing Uranium is now undertaking a comprehensive epidemiological study of former and current employees of the mine, which has been planned since 2011. The aim of the epidemiological study is to determine whether there is an excess, work-related cancer risk for uranium mining (Werner Duvenhage, Rössing Uranium, media briefing on 26 February 2016). A scoping process for the epidemiological study was completed by a consulting company in August 2014 and the research project was subsequently awarded to the University of Manchester's centres for Occupational & Environmental Health and Biostatistics, the Institute of Population Health and the Faculty of Medical and Human Sciences in August 2015.

The predictive power of epidemiology is largely dependent on the availability and quantity of data. Information on occupational hazards and potential impacts, such as health outcomes, need to be available with adequate accuracy. All former and current workers who have worked at the mine between 1976 and 2010 for more than one full year are suitable candidates for the study cohort. No new data will be collected and no new medical examinations will be taking place as the study will only use data that has already been collected.

The identities of individuals participating in the study will be protected. Only anonymised data will be used in this study, which means that personal data will not be traceable to individuals and will not be disclosed to anyone. Participants are also allowed the opportunity to withdraw their consent for the use of their information and the data will not be analysed. A scientific peer review process will be carried out once the study is complete and results from this review will be published in an international journal. Potential concerns and contributions from key stakeholders will be considered and integrated where needed(article in www.miningweekly.com, 13 May 2016). Former Rössing employees were informed about the study by letter or newspaper adverts.

Motivation of status: Seeing that the Rössing Uranium has been planned since 2011 and has actually started in 2016, the indicators can be upgrade to **IN PROGRESS**.

Target 6.1.4.	**No increase in road accidents directly attributable to uranium mining and its support industries.**
Indicator 6.1.4.1.	**Measured change in the number of fatal road accidents per road user over 1 year.**
Data Source	**NUA**
Status:	

The SEMP Steering Committee decided in 2015 to delete this indicator because the required data were never available and there are no plans to collect them in future (**NOT APPLICABLE**).

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:	**IN PROGRESS**
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:	**IN PROGRESS**
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:	**IN PROGRESS**

Ensuring the provision of quality health care is one of the most important goals of the Ministry of Health and Social Services (MHSS). Although efforts are being made to build capacity and skills of health workers to provide quality essential services, past research evidence shows that Namibia's public health facilities face several challenges related to governance, financing, resources, communication and coordination. Lack of proper maintenance has contributed to poor health care provision. Currently, the country has a health infrastructure network consisting of 295 clinics, 47 health centres, 30 district hospitals, three intermediate hospitals and one national referral hospital, nine sick bays, as well as various social welfare service points, private hospitals and clinics.

The population has 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 access private profit-making health care systems, while 85% of the population has access to public and non-profit health care. However, not all people have access to health care facilities, in some because they live in remote areas, in others due to the cost of private healthcare. Certain services like dialysis and organ transplantations are only available from private medical centres, putting them out of reach of the majority of Namibia's citizens.

The MHSS annual report of 2012/2013, the latest that is available, reported a total of 20 doctors in the region. With a population of about 160 000, the ratio of 1 doctor per 1000 population in the public sector is still far from reality and specialists are mostly hosted at the main hospitals at Windhoek and Oshakati. It was reported that there were 188 community health workers in the Erongo region, but the total number of qualified healthcare personnel and the number of ambulances was not provided. A number of health centres and clinics in the Erongo region were under construction or renovation at the time of reporting: Usakos Hakhaseb, Swakopmund and Mondesa (new clinic and staff accommodation), Swakopmund ART, Arandis, Kuisebmond, Tamariskia, Okombahe, Walvis Bay and Omaruru (MHSS 2012/13 report).

Motivation of status: Although there has been some improvement in the public health system, the indicators are rated **IN PROGRESS** since the due date is the year 2020. The private health care system's figures were not reviewed because it is not accessible to all, it can however be stated with confidence that the ratios are much closer to the indicator targets.

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Summary of performance: EQO 6

Total no. indicators assessed	8 (1 was NOT APPLICABLE)			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	0	7	1	0
Percentage of indicators in class	0%	87%	13%	0%

Overall performance: The two indicators related to public dose assessments were rated **IN PROGRESS** pending a comprehensive re-assessment of the cumulative impact as part of the 2016 advanced air quality and radiation study. The radiation dose to workers at mines did not exceed the legal limit, this indicator was **MET**. Another two indicators measuring the incidence of occupational diseases were **IN PROGRESS** because Rössing Uranium started an epidemiological study. The three ratios of healthcare professionals and facilities per number of population were rated **IN PROGRESS** since the due date is the year 2020 and MHSS is busy improving its services.

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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 number of tourists arriving in Namibia increased by 5% from 1.4 million in 2014 to 1.5 million in 2015. Most of these tourists were coming from Angola, South Africa, Zambia, Germany, Zimbabwe, Botswana, the USA and France (Namibian Statistics Agency 2016). The tourism industry's rising contribution to the GDP reflects the economic contribution of hotels, travel agents, airlines and other passenger transportation services, restaurants and leisure activities operators directly supported by tourists (WTTC 2015). With a total of almost 55% of all available tourism accommodation across Namibia occupied during 2015, the year ended just under 3% lower than the record year of 2014 (Hospitality Association of Namibia website). The bed occupancy rate in the Erongo Region is close to the national average, indicating that most tourists spend a few days at the coast.

Desired Outcome 7.1.	**Central Namib is accessible to the public (within the regulations of the National Park)**			
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, Kuiseb and Swakop 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:		**IN PROGRESS**		

The SEA envisaged that areas of importance for recreation would be 'red' or 'yellow' flagged, meaning that mining or prospecting would not be permitted in these areas. Although a legislative tool to enforce compliance with the principle of 'red' flagged areas is yet to be developed, the moratorium on new uranium EPLs was still in force in 2015. There were thus no new mining projects that caused a net loss in designated areas accessible to the public during the reporting period.

Motivation of status: As reported in the previous review this indicator remains **IN PROGRESS** due the lack of a legislative tool to enforce compliance with designated areas of importance for recreation.

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

None of the mining or exploration companies carried out or completed EIAs for new developments in 2015. It would be interesting to track whether current projects are actually implementing the commitments made in their EIAs and EMPs. A possible new indicator in this regard may be suggested by the SEMP Steering Committee.

Motivation of status: In the absence of EIAs completed in 2015 this indicator is rated as **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**	

Langer Heinrich mine updated its closure plan with the same provisions for public access as the previous version. No new exploration EMPs were published during the year under review.

Motivation of status: All mining companies have considered and made provision for public access in their closure plans; this indicator is therefore rated as **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 tourism survey conducted in 2014 and confirmed by checking the operators' tour packages that are advertised on the internet in 2016. Trips to the dunes, Moon Landscape and Welwitschia are offered by Living Desert Adventures, Charly's Desert Tours and Tommy's Tours, among others. Turnstone Tours and Swakop Tour Company conduct day trips in the Khan and Swakop River valleys, while Charly's Desert Tours offer trips to Spitzkoppe.

Seeing that these tour packages still include the sites listed in the indicator it can be accepted that the findings of the 2014 survey continue to be relevant. Tour operators (n = 12) interviewed during the 2014 survey, rated the Central Namib a median score range of 4 and 5 on a five-point scale (1=not used at all, 5=highly significant component) for the attractions listed in this indicator. When the tour operators' responses are clustered into three classes (i.e. not significant, significant or highly significant) for each attraction, more than 70% of operators rated the specific attraction as "significant" or "highly significant" (Figure 20).

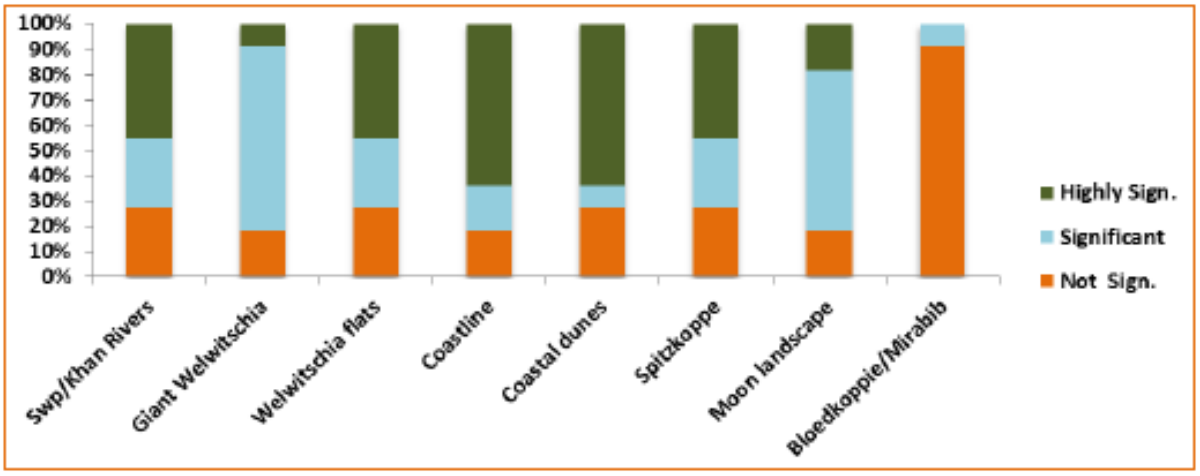

Figure 19: Significance of Particular Sites for Central Namib Tour Operators

The coastline and coastal dunes were most popular with the highest percentage of "highly significant" ratings. Sites closer to exploration or mining operations such as the Giant Welwitschia, Welwitschia Flats, Moon Landscape and the Swakop and Khan rivers were regarded as "significant" or "highly significant" by more than 70% of the respondents. Spitzkoppe is included in the indicator, but there is currently no uranium exploration in this area. The site with the least significance (Bloedkoppe/Mirabib) in this graph was not part of the initial SEMP 'yellow or red flag' areas reserved for tourism, but was listed by one operator as significant to his package.

Motivation of status: Because the majority (>70%) of tour operators still considers the attractions as a (highly) significant component of their tour packages, the indicator is rated **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**

For the first SEMP reports NERMU designed a questionnaire to gauge tourists' experience of the Namib Desert and got researchers to hand it out at hotels and tour companies. This approach was quite cumbersome and it did not result in a representative number of tourists being surveyed. For this 2015 report, it was decided to take advantage of internet sites that allow tourists to give feedback on their travel experience. The most widely used platform with thousands of reviews related to Namibia is TripAdvisor (www.tripadvisor.com). On the day of writing, they had 22,815 reviews of the Erongo Region, 4,348 of these about "Things to do in the Erongo Region", which include 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 13 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. Another limitation is that only reviews in English were evaluated, resulting in a total of 611 results.

Table 13: Tourist Ratings of Uranium Province Trips on TripAdvisor

Name	Excellent	Very good	Average	Poor	Terrible
Namib Desert	44	6	0	1	1
Welwitschia Plains	54	30	12	1	1
Living Desert Adventures	102	11	5	1	1
Charly's Desert Tours	38	10	0	1	0
Namibia Tours & Safaris	203	23	4	1	0
Turnstone Tours	52	5	3	1	0
Total	**493**	**85**	**24**	**6**	**3**

Tourists who went to the Welwitschia Plains also mentioned the Moon Landscape, which was rated "very good" to "excellent". Here is a typical review from a German visitor dated November 2015: *"The landscape is stunning. I've been there now for the third time, in differing weather conditions. Wonderful in rainy season with rainbows, sunny or misty in winter."*

People who gave "poor" or "terrible" ratings were disappointed by their tour guides, the number of animals seen, the cost of the trip, the distance to the Welwitschia plains and the plants being "boring". TripAdvisor has a function that allows the reviews to be searched for key words. To find out if anybody was put off by the impact of mining activities, the reviews were checked for the words "uranium", "mining", "mine", "pollution" and "radiation".

Only three reviews mentioned any of these key words and they were all about the Welwitschia Plains. A tourist from Durban who visited in August 2014 gave a "very good" rating and wrote as follows: *"The Welwitschia plain is quite a way from Swakopmund and there is a lot or road works and construction along this route as a result of the Uranium mines in the area. The actual Welwitschia stop point was a little bit disappointing due to the remoteness and there only being one picnic spot in this area. However this road also runs past an area called the Moon Landscape. This is a must if you are visiting in the area! The most unusual crater type landscape suddenly appears out of nowhere and was well worth the day's drive!"*

An "excellent" rating was allocated by a tourist from Pretoria in September 2014 with the following remarks: *"One of the truly amazing landscapes and most unique plant in the world, this beautiful and vast empty landscape is one of the last places where these ancient plants live in their natural habitat. Sadly this area is under severe threat by the increasing mining activities that may destroy this unique habitat forever? This is an easy self-drive trip close to Swakopmund (please get the permit to avoid stressing hard-pressed Conservation officials)."*

A visitor from the USA rated the drive "very good" in December 2012 with the following feedback: *"The Welwitschia Drive is definitely worthwhile while in Swakopmund or Walvis Bay. There are 13 markers along the drive that explain the different things you can see in such a beautiful and eerie landscape. Make sure you go all the way to where the oldest Welwitschia plant is. We were a little disillusioned by all the mining and likely polluting that is going on around the drive. It was a little scary to see devices to measure the amount of uranium pollution all along the drive. Hopefully, some environmental organization is involved!"*

Uranium exploration activities in the Namib-Naukluft Park were very visible in 2012-2014. None of the reviews from 2015 mentioned uranium mining, probably because there were was no more drilling. In spite of relatively critical thoughts like "*destroy this unique habitat forever"* and "*scary to see devices to measure the amount of uranium pollution"* these visitors still felt their overall experience was "very good" and "excellent". Nevertheless, these reviews are easily accessible on the internet and may influence prospective tourists who are opposed to mining or nuclear energy against visiting Namibia or the Erongo Region, which is exactly what the stakeholders involved in the SEA were concerned about.

Motivation of status: If "excellent" is defined as EXCEEDED and "very good" means MET the percentage of both ratings adds up to 95%, while the indicator just requires more than 80%. Critical remarks about uranium mining were made in only 3 out of 611 reviews or 0.5%, and there were no negative reviews for 2015. The indicator was **EXCEEDED**.

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

No new EIAs or EMPs were published during the current review, implying that the indicator could not be assessed in this report.

Motivation of status: Because no EIAs were published in 2015 the indicator was **NOT APPLICABLE**.

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:		**IN PROGRESS**		
Indicator 7.3.1.2.	**MME recognizes and respects 'yellow flag' status for areas regarded as being scenically attractive.**			
Data Source	**NERMU/MME**			
Status:		**IN PROGRESS**		

The implementation of Indicators 7.3.1.1 and 7.3.1.2 is delayed by the pending Policy on Prospecting and Mining in Protected Areas (NPPMPA) that is still awaiting submission to Cabinet. The policy is intended to address the principle of protected 'red' and 'yellow' flagged areas. Once the policy has approved the required legislation can be drafted, but this will be a lengthy process.

Motivation of status: The policy that is the first step towards enforcing compliance with the red and yellow flag principle is still pending. Both indicators therefore remain **IN PROGRESS**.

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:			**MET**	

The uranium EPL moratorium, which remains in effect, prohibits the issuing of new prospecting licenses in the area of relevance to the SEMP, therefore no new licenses were issued in 2015.

Motivation of status: With the moratorium still in effect, no new prospecting licences were awarded and the indicator continued to be **MET**.

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Summary of performance: EQO 7

Total no. indicators assessed:	7 (2 were **NOT APPLICABLE**)			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	0	3	3	1
Percentage of indicators in class	0%	43%	43%	14%

Overall performance: The results for indicators reviewed in this EQO changed slightly compared to the 2014 report because the two EIA-related indicators could not be assessed (NOT APPLICABLE). Tourists consistently reported that their expectations were **EXCEEDED**. Three indicators were **MET**, showing that tourism operators and mining industry manage to coexist in the Central Namib, though a degree of conflict seems to persist (NUA 2016). Conflicts between the need for public access and mining have so far been avoided and uranium mining did not prevent the public from visiting the usually accessible areas in the Central Namib for personal recreation and enjoyment. Three indicators concerning the Policy on Prospecting and Mining in Protected Areas that is required to enforce the protection of important tourism areas were **IN PROGRESS** and may still take a while.

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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.

Since 2011, the annual SEMP reports have offered an opportunity for the inhabitants of the uranium province to review and understand the cumulative impacts of uranium mining on their ecological environment. This was achieved through the assessment of indicators within this EQO, which also allows stakeholders to 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 the previous SEMP reports confirmed that the central Namib's conservation objective of species diversity and integration remained a priority, and efforts by both the regulating authorities and respective 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.

However, biodiversity conservation in other parts of the central Namib (outside the uranium mining area) 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. Additionally, many other developments are going ahead without much environmental assessment or planning which makes the SEMP process even more important.

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/MET**
Status:	**IN PROGRESS**

The status of this indicator has not changed from the previous report. Prior to the 2007 moratorium on uranium exploration EPLs, prospecting or mining applications were not by regulation expected to comply with the "red/yellow" flags principle. However, provision for consideration of "red/yellow" flagged areas (or a similar approach) will be afforded in the proposed National Policy on Prospecting and Mining in Protected Areas (NPPMPA) legislative framework and is expected to be enforced once the policy is ratified.

Motivation of status: While the policy to enforce the protection of important biodiversity areas is not yet in place the indicator remains **IN PROGRESS**.

Indicator 8.1.1.2.	**The EIAs need to follow the mitigation hierarchy and incorporate offsets as an option.**			
Data Source	**NERMU/NUA/MET**			
Status:		**IN PROGRESS**		

No new EIAs were completed in 2015. All activities conducted in the reporting period were guided by EIAs/EMPs that followed the mitigation hierarchy, except for the "offset" component. The offset option can still not be applied because there is no legislative framework for the protection of an offset once it has been established.

Motivation of status: Because there is still a need for legislation to create an enabling environment for biodiversity offsets the indicator remains **IN PROGRESS**.

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/MET**			
Status:				

The Ministry of Mines and Energy did not issue any new prospecting and mining licences during the current reporting period. Records of decisions made in relation to licence applications are kept at the Mining Directorate of the Ministry of Mines and Energy. The grounds for rejection are recorded in the minutes of Mining Advisory Council meetings. Environmental studies should also be taken into account when licence renewals are considered. EPL areas could be reduced as per MME guidelines at the time of renewals.

Motivation of status: The indicator is **NOT APPLICABLE** for 2015 because no new licences were issued.

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**	

There were no new projects in 2015. Operational mines indicated that avoidance is the preferred solution, but it is not always possible because large areas have to be disturbed to access and process the ore. Mining companies have specific programmes to actively avoid, mitigate, restore their impacts and these are documented in their EIAs, EMPs and company-internal policies (NUA 2016). For instance, Rössing Uranium reported that compliance with the Rio Tinto land disturbance control and

rehabilitation standard is mandatory. The standard prescribes the implementation of a land use management plan, which provides an overall land management direction, including biodiversity management. Concepts such as avoidance, mitigation and rehabilitation are well embedded in Rössing's land use decisions. All companies' internal environmental monitoring and rehabilitation initiatives are continuing as part of their EMP and ISO 14001 compliance requirements.

Motivation of status: EIAs and EMPs of operational mines comply with the mitigation hierarchy as stipulated in the SEMP and MET's ECC application assessment process, thus the indicator is **MET**.

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

All active mines have mapped sensitive areas within their mining licence areas and have programme in place to minimize the size of their footprint on sensitive biodiversity (NUA 2015). Because mining companies cannot always avoid causing disturbances, they also make provisions for rehabilitation of disturbed areas. The challenge remains that there is currently no means of verifying if rehabilitation is contributing to successful restoration of the disturbed habitats. Studies have however been initiated to address this shortcoming, e.g. Langer Heinrich took part in Gobabeb's GTRIP programme and AREVA Namibia has established restoration trial and monitoring sites.

An example of avoidance measures to protect sensitive areas was provided by Rössing Uranium. A "no-go area" was established adjacent to the tailings storage facility in response to the discovery of a globally significant population of stone plant (*Lithops ruschiorum*). These were identified during studies commissioned to assess the impact of a planned tailings dam extension (Burke, 2003; Loots 2005a; Loots, 2005b; Loots 2009). As a result of these studies, Rössing modified its plans and expanded the tailings facility vertically rather than horizontally, avoiding the loss of more than half the total number of stone plant recorded in the license area (Loots, 2009), a small number of endemic elephant's foot plants and almost 100 ha of natural habitat.

Motivation of status: All mines have mapped out sensitive areas within their MLs for which they continuously monitor impacts and mitigate accordingly, hence the indicator remains **MET**.

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 (e.g. 1 pipeline, not 3).**
Data Source	**NERMU/NUA**
Status:	

The three infrastructure indicators are grouped together because the same feedback applies to all of them. There were no new projects in 2015; it was thus not possible to assess these indicators.

Motivation of status: Because there were no new infrastructure projects during the current reporting period the indicator is rated **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/MET**
Status:	**MET**

AREVA Namibia, Rössing and Swakop Uranium are working together with the NamPower/NNF Strategic Partnership to monitor the impact of power line corridors on birds such as Ludwig's bustards, korhaans, raptors and flamingos. In 2015, the partnership installed mitigation measures to reduce bird collisions with power lines, e.g. where the power line to Husab mine crosses the Khan River. Some companies have contributed to the Swakopmund municipality's "Project Shine" that cleans up the road corridors along the B2. Formerly existing partnerships with conservation organisations have not been renewed because of resource constraints due to the current depressed uranium market.

Motivation of status: Mining companies have partnered with conservation organisations to some extent, as far as currently possible. This indicator is therefore **MET**.

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/MET**			
Status:		**IN PROGRESS**		

There is lack of legislation that would allow the uranium industry to implement a 'no net loss' policy and sustainable biodiversity offsets. Biodiversity offsets are included as a target in the second National Biodiversity Strategy and Action Plan (NBSAP2) that was approved by Cabinet in 2014. The mining industry is represented on the NBSAP2 Steering Committee and has started engaging with MET on biodiversity offset mechanisms in 2015. A study including this topic is in progress with completion planned for early 2017.

Major mining companies such as Rio Tinto have in the meantime reconsidered their commitment to no net loss, mostly due to difficulties experienced in the implementation of offsets and the downturn in global commodity markets (NUA 2016). Regarding partnerships with conservation partners, the envisaged Namibian biodiversity policy will probably specify who will be involved in the management of offset opportunities.

Motivation of status: Given the lack of a regulatory framework for the implementation of offsets, the indicator remains **IN PROGRESS**.

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/MET**			
Status:			**MET**	

Bannerman is a corporate 'Oryx' member of the Namibian Environmental and Wildlife Society (NEWS) and a 'Lion' member of Tourism Supporting Conservation (TOSCO). Several other companies have also become members of NEWS with the aim of promoting the sustainable use of natural resources. Bannerman has worked on several joint projects with local tourism operators and supports conservancies on an annual basis through the Hospitality Association of Namibia (HAN). HAN provides funds for skills-upgrading at joint venture lodges, e.g. in 2015 to the Salambala conservancy in the Zambezi region. Langer Heinrich is supporting the DRFN's Gobabeb Research and Training Internship Programme (GTRIP) aimed at in-service training of (post)graduates. For the past five years, GTRIP has focused on restoration ecology as a primary research topic, with the result of producing more skilled young Namibians, and also growing the knowledge base on the best techniques for the restoration of hyper-arid ecosystems. Rössing organised a bird-watching event as part of the NACOMA coastal biodiversity week. AREVA Namibia and Langer Heinrich mine scaled down their social responsibility programmes in terms of support to additional conservation projects.

Motivation of status: There was support from the uranium mining industry to additional conservation projects; this indicator is therefore **MET.**

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/MET**
Status:	**IN PROGRESS**

It will be necessary for Government to provide the legal framework for the protection and management of key biodiversity offset areas. As mentioned under Indicator 8.2.1.2, a study that will address this issue is being conducted under the guidance of the NBSAP2 Steering Committee.

Motivation of status: Seeing that a study is in progress and completion is planned for early 2017 the indicator can be rated as **IN PROGRESS.**

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/MET**
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/MET**
Status:	

During the review period, there were no new EIAs or EMPs published and thus no assessment of these two indicators could be made.

Motivation of status: Because there were no new EIAs for mining projects during the current reporting period the indicator is rated **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/MET**
Status:	**IN PROGRESS**

Bannerman Resources have demarcated the roads leading to their Demonstration Plant and provided turn-around points every 400 metres to restrict the environmental footprint and prevent illegal off-road driving. Contractors and employees were inducted in the rules of the National Park and no night work was allowed. Langer Heinrich mine distributes the park rules to all employees, contractors and visitors during environmental inductions. Strict waste management practices are applied in the mining licence and off-road driving is prohibited. Only existing roads are used; construction of new access roads for mining-related activities requires an EIA. Reptile Uranium employees and visitors receive a site induction where the Namib Naukluft Park rules and regulations are shared with all. This is the mandate of the Ministry of Environment and Tourism who continued to monitor, investigate and enforce the relevant remedial measures in 2015.

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 (NUA 2016). The incidents reported by the Ministry of Environment and Tourism were most probably caused by persons who not employed in the mining industry. Until this can be confirmed by the Ministry the indicator is rated **IN PROGRESS.**

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/MET**
Status:	**MET**

The Ministry of Environment and Tourism reported that there has been improved vigilance and visibility of law enforcement with support from the mines, public and members of MET from other units (pers. comm. R. Solomon, MET 2015). However, the Ministry of Environment and Tourism could not provide statistical data or information for assessment on the extent to which the situation has improved. The issue of honorary wardens is covered under EQO 10 where the relevant indicator was NOT MET.

Motivation of status: The Ministry of Environment and Tourism has made evident efforts towards improved vigilance and visibility of law enforcement personnel, therefore the indicator is **MET.**

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/MET**
Status:	**IN PROGRESS**

The NERMU baseline study on the health of riverine ecosystems and potential impacts due to the mines' use of groundwater showed that the abstraction was probably not having a direct impact on riverine vegetation (2013 SEMP report). Longer-term effects or indirect impacts could however not be ruled out. The study also showed high variability amongst individual plants to be a potential problem in the long-term implementation of a monitoring programme. NERMU planned further studies for 2015, but had to postpone them due to a lack of funds. Having obtained the necessary funding NERMU started a full survey in July 2016 in conjunction with a project for Swakop Uranium.

Motivation of status: Studies are being conducted to understand the impact of water abstraction on the riverine vegetation. This indicator is still **IN PROGRESS**.

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/MET**
Status:	**IN PROGRESS**

This indicator depends on the development of an established monitoring programme (which is in progress, see Indicator 8.5.1.1) and follow-up monitoring surveys. It is therefore not yet possible to meet the intention of the indicator in this regard. Efforts to foster a collaborative relation through a memorandum of understanding between NERMU and the Ministry of Environment and Tourism, through which long-term monitoring programmes could be initiated, were made. However, these discussions have not yet yielded any desired results. Once the programme is in place it will be possible to give feedback on the monitoring results to the relevant regulators and impacting companies.

Motivation of status: The development of a regular monitoring programme for riverine vegetation, springs and wetlands is still **IN PROGRESS**.

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/MET**			
Status:		**IN PROGRESS**		

The previous baseline study by NERMU (SEMP report 2013) showed higher mortality of Ana trees in the Langer Heinrich compartment of the Swakop River than in any other compartments or rivers investigated, but no effects of boreholes on the health status of the trees. Additionally, the time series is still too short to detect any changes that could be ascribed as "unusual loss". The significant effort involved in detecting these changes prompted the planning of a study to investigate the use of remote sensing for monitoring. However, this study, as well as any follow-up measurements of tree stress relative to borehole production figures had to be postponed to 2016.

Motivation of status: Because studies are still ongoing and will require a few more years' worth of data before any confident conclusions can be made, this indicator is still rated as **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/MET**			
Status:			**MET**	

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. In the previous baseline study conducted by NERMU (SEMP, 2013), the Swakop River showed higher mortality levels of this species compared to the Kuiseb and Khan rivers, suggesting that deep groundwater levels have been affected in the past and perhaps currently. However, the study could not show a clear link between tree stress and abstraction of water, meaning that there is not yet a viable mechanism tying plant health to abstraction. Follow-up studies are planned for 2016. The groundwater levels in 2015 as shown in EQO 4 were well within reach of documented rooting depths of the camelthorn (Schachtschneider, 2010).

Motivation of status: The indicator was **MET** because groundwater levels in 2015 were well within the reach of phreatophytes (see Indicator 4.2.1.2).

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Summary of performance: EQO 8

Total no. indicators assessed:	14 (6 were **NOT APPLICABLE**)			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	0	8	6	0
Percentage of indicators in class	0%	57%	43%	0%

Overall performance: Six of the Ecological Integrity (EQO 8) indicators were **MET** in 2015. It was confirmed that mines have specific programmes and projects to actively avoid, mitigate, restore or offset their impacts according to the mitigation hierarchy, and that they have mapped out sensitive areas within their mining licence areas where impacts are monitored and mitigated accordingly. Mining companies have also partnered with conservation organisations and supported additional conservation projects, as far as currently possible. The Ministry of Environment and Tourism has made evident efforts towards improved vigilance and visibility of law enforcement personnel. Lastly, the indicator of groundwater levels being within the reach of phreatophytes was also **MET**. Eight indicators covering a range of topics remained **IN PROGRESS**. One topic concerns the policy on mining in protected areas that is required to enforce the protection of important biodiversity areas and to create an enabling environment for biodiversity offsets (four indicators). Another issue relates to secondary impacts in protected areas, which the Ministry of Environment and Tourism reported without identifying whether they were caused by persons employed in the mining industry. Until a method can be found to identify the culprits the indicator will remain **IN PROGRESS**. The last three indicators are related to studies that are being conducted to understand the impact of water abstraction on the riverine vegetation and to develop a regular monitoring programme for riverine vegetation, springs and wetlands. The studies will require a few more years' worth of data before conclusions can be drawn. Six indicators were **NOT APPLICABLE** because 1) no new exploration or mining licences were issued, 2) no new EIAs for mining projects were carried out and 3) there were no new infrastructure projects in 2015. The performance of this EQO in 2014 was 40% **IN PROGRESS** and 60% **MET**. EIA-related indicators that were previously **MET** have now changed to **NOT APPLICABLE.**

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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 the evolution of the education sector in the Erongo region to ensure that school leavers will be well placed to find employment in the industry, either immediately after finishing school or when they have obtained a tertiary qualification. The Ministry of Education (MoE) has introduced free primary education in 2013 and decided to provide free secondary education in 2016. This will address the aim of "affordable access" to education, but may influence the "improved" performance of the schools, depending on whether the government will be able to provide sufficient resources to sustain the quality of free education.

The most important information about Grade 10 and Grade 12 performance, as well as tertiary and vocational training was accessible for evaluation, either through the Ministry of Education (MoE) or the relevant institutions. Two EQO 9 indicators could not be measured because the MoE does not collect or provide the required data. Information about indicators related to bursaries and skills development programmes for employees were contributed by the mining industry. In addition to this, many companies support education as part of their social responsibility programmes. There is no SEMP indicator for this topic, but it might be worth mentioning in this report. Rio Tinto finances and implements numerous education initiatives through the Rössing Foundation. Langer Heinrich supports maths and science development programmes at primary, secondary and tertiary level; sponsors prize-giving functions and school handbooks. Bannerman Resources donates school uniforms to primary schools in the Erongo Region and makes donations to various school funds. . In 2015, AREVA and Rössing introduced Project Safety W.I.S.E., a programme to teach safety awareness at primary schools in Arandis, Swakopmund and Walvis Bay.

Desired Outcome 9.1.	**Improved quality of school education.**
Target 9.1.1.	**Improved results.**
Indicator 9.1.1.1.	**75% of grade 1 enrolments complete grade 10.**
Data Source	**MoE**
Status:	
Indicator 9.1.1.2.	**75% of grade 12 graduates obtain 25 points in six subjects with a D in English.**
Data Source	**MoE**
Status:	

The Ministry of Education does not have records of the data needed to assess these two indicators on a regional basis for 2015. Available statistics indicate that in 2014, the primary school completion rate for Namibia was 89%, the secondary school completion rate stood at 46%, while those attaining 30 points and above at Grade 10 were 19% (article in The Namibian, 7 September 2016). According

to NDP5 consultations by the National Planning Commission reported in the same article, only 19,082 or 29% of the 66,736 pupils who enrolled for Grade 1 in 2001 completed Grade 12.

Motivation of status: It is not possible for the Ministry of Education to provide these two indicators on a regional basis. They should be re-assessed by the Steering Committee and in the meantime rated **NOT APPLICABLE**.

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 public (GRN) schools.**
Data Source	**MoE**
Status:	**NOT MET**

This indicator assesses the results of Grade 10 and Grade 12 ordinary and higher level together. The national examination results for grade 10 and 12 for 2015 are presented in the graphs below (Figures 20 and 21). The two grades performed well in English with more than 65% of students achieving a D symbol or better and poorly in Maths and Science with 40% of students merely obtaining a D symbol or better.

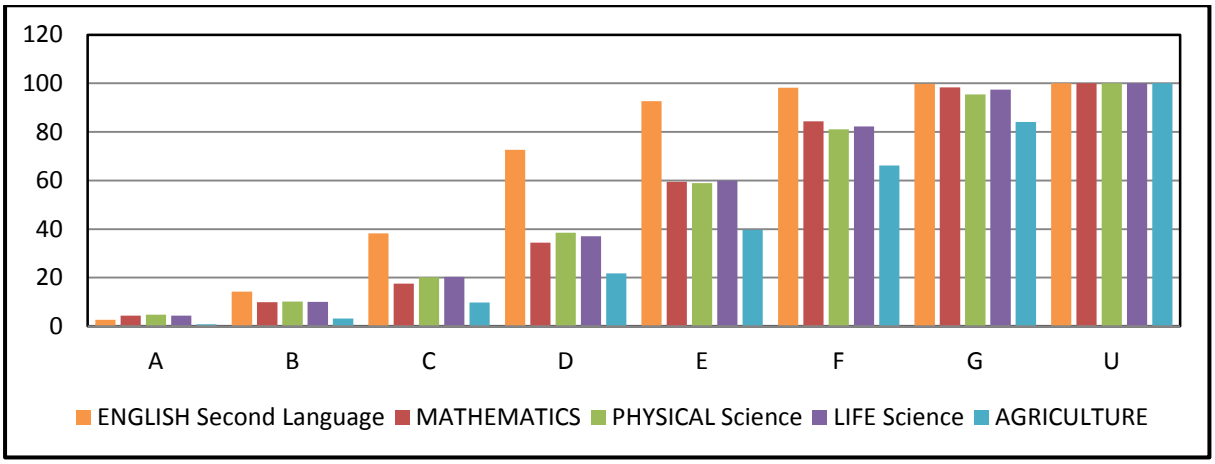

Figure 20: Cummulative percentage per symbol for Grade 10 National Examination results JSC

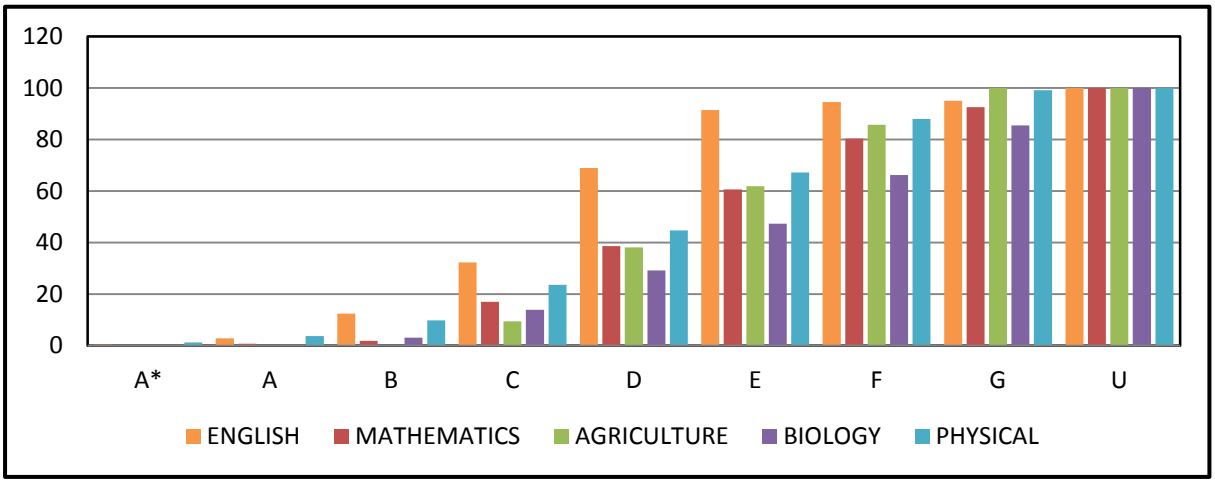

Figure 21: Cummulative percentage per symbol for Grdae 12 National Examination Results NSSC

Motivation of status:

Out of 5 subjects 50% of candidates only achieved a D symbol or better in one subject (English), whereas in maths and sciences the majority of candidates perfomed poorly. Therefore this indicator was **NOT MET**.

Indicator 9.1.1.4.	**Region improves performance in reading and mathematics.**			
Data Source	**MoE**			
Status:			**MET**	

To assess this indicator the SEMP uses the Namibian National Standardised Achievement Tests (SATs). These are annual assessments that are administered mainly to provide stakeholders with diagnostic information regarding learners' achievement of key learning competencies in the curriculum at Grades 5 and 7. A total of 61 016 Grade 5 learners (51.2% male and 48.8% female) from 1205 schools (66.6% rural and 33.4 % urban) and 47 586 Grade 7 learners (49.4% male and 50.6% female) from 1160 schools (67.6% rural and 32.4% urban) participated in SATs in 2015. The regional performance is relatively influenced by numerous dynamics of socio-economic and demographic elements. Hence, the performances of regions vary in Grades 5 and 7 Standardised Achievement Tests in English Second Language and Mathematics.

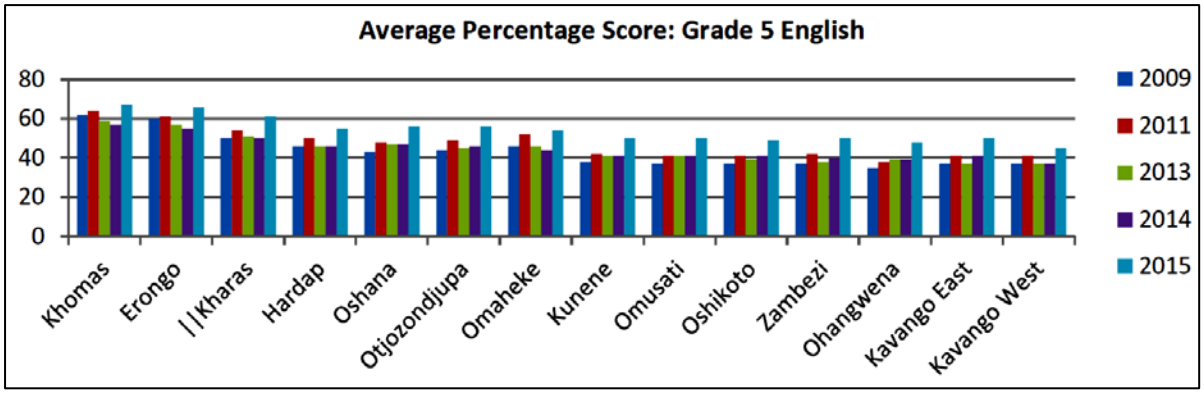

Figure 22: Average Percentage score – Grade 5 English 2nd Language

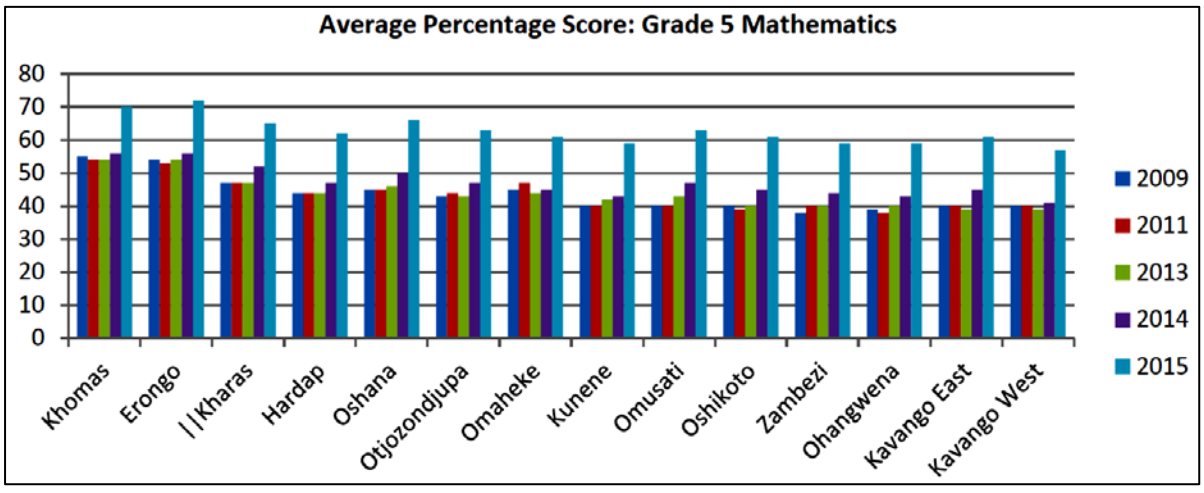

Figure 23: Average Percentage Scores – Grade 5 Mathematics

For Grade 5 on average, the performance in English Second Language across the fourteen regions has shown a fluctuating pattern over the years since 2009, however, in 2015 all regions have shown improvement in English Second Language. The average percentage scores from the highest to the lowest performing region ranges from 67% to 45% compared to 57% to 37% in 2014. It is encouraging to see that only three regions did not achieve an average score of at least 50% (Figure 22).

The regional performance in Grade 5 Mathematics shows a tremendous improvement when compared to previous years. All regions have recorded an improvement of 14% to 16% in Mathematics in 2015. All regions have achieved an average percentage score well above 50% (Figure 23). These improvements could have been attributed to the assumption that many of the schools continue to make use of the previous years' SATs reports to inform their planning of teaching and learning.

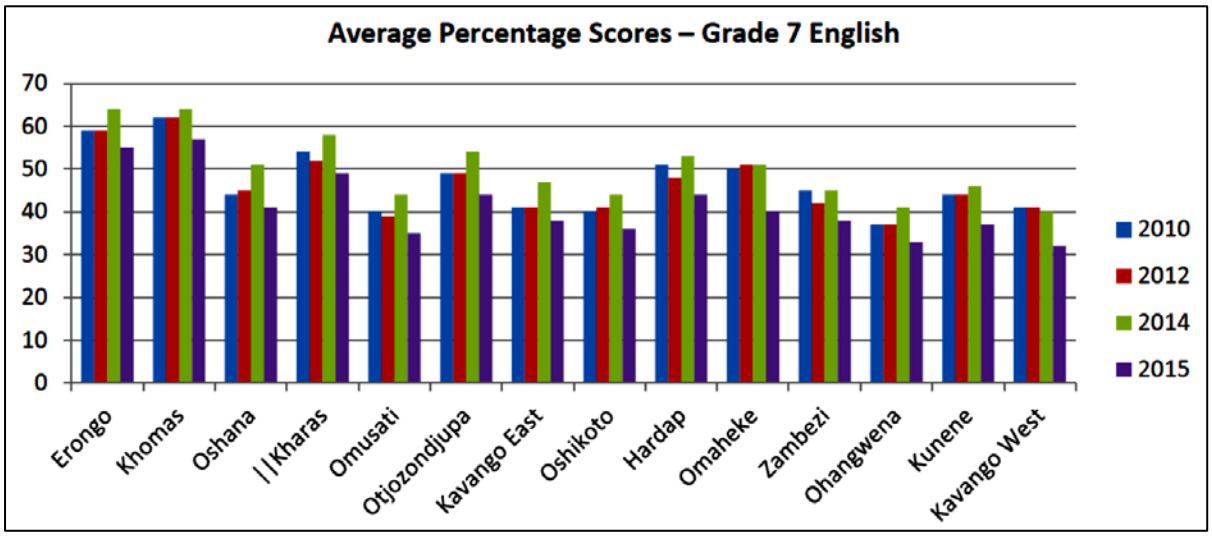

Figure 24: Average Percentage Score – Grade 7 English

As indicated earlier, due to different demographic and socio-economic factors the performance of regions vary in SATs. Figure 24 shows the overall Grade 7 English Second Language percentage scores of all 14 regions. The performance for Grade 7 English Second Language in 2015 has declined significantly, with only 50% of the regions achieving an average percentage score of 50% and above. Compared to 2014, the performance dropped with as much as 11% to 7%.

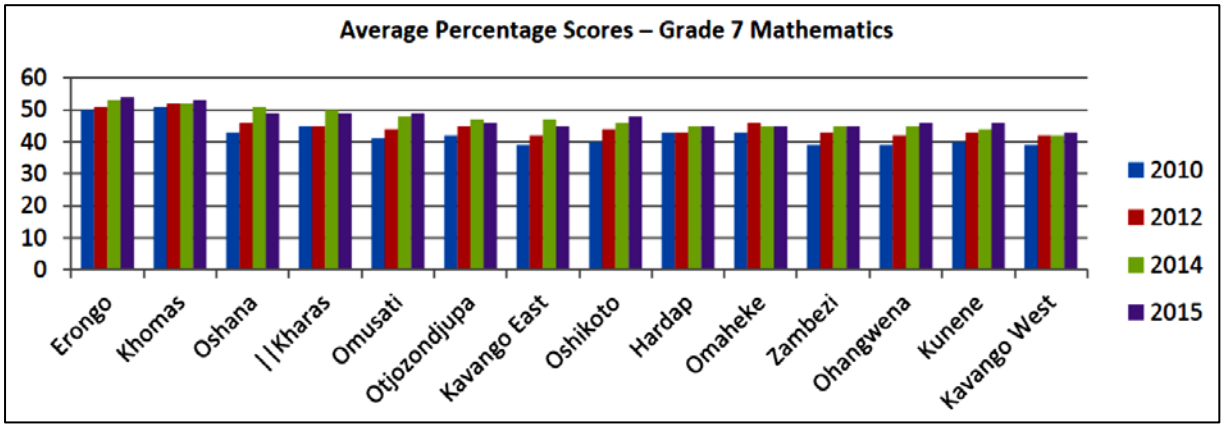

Figure 25: Average Percentage Scores – Grade 7 Mathematics

The national Grade 7 Mathematics percentage score for 2015 is the same as for 2014 at 48%. This means there has not been an improvement nor a decline in performance. However, considering the regions individually, a wide range of results could be observed; 50% of the regions obtained the average percentage scores higher than that of 2014, however, only two regions Erongo and Khomas scored an average of just over 50% (Figure 25).

The results of the 2015 Standardized Achievement Tests (SATs) reveal that learners have made substantial improvement particularly in Grade 5 Mathematics and English Second Language and a minimal improvement in Natural Science Grade 7, as compared to the previous years. In Grade 5 Mathematics, average scores increased by 16% percentage scores and in English there was a 10% increase. For Grade 7 the performance of English Second Language decline by 8%, in Mathematics there was no change in performance compared to 2014 and in Natural Science the average percentage scores increased by 1% compared to 2014.

Motivation of status:

The results of the 2015 Standardized Achievement Tests (SATs) reveal that learners in the Erongo region are doing better than most other regions and have improved in Grade 5 Mathematics and English Second Language and in Natural Science Grade 7 compared to previous years. Therefore, this indicator is rated **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, Polytechnic of Namibia (now National University of Science and Technology), proposed VTC facility in Walvis Bay and UNAM.**			
Data Source	**SEMP Office/UNAM/NUST/VTC/NIMT**			
Status:			**MET**	

Indicator 9.2.1.1 aims to assess whether the mining industry in the Erongo region is being supplied with the necessary skills that are required. Qualify artisans, technicians, geologists, accountants and engineers are needed in the uranium mining industry. The different institutions listed above cater to these careers and an increasing number of graduates from these institutions will show that the necessary skills are made available to the industry. The figure below (Figure 26) indicates clearly that there is a significant increase in the number of graduates every year. A total of 2892 candidates graduated from UNAM during the year under review representing an increase of 4.5% compared to 2014. Contrary to UNAM, 3234 candidates graduated from NUST decreasing with 5% compared to 2014. However, the general trend over time shows an increasing number of graduates.

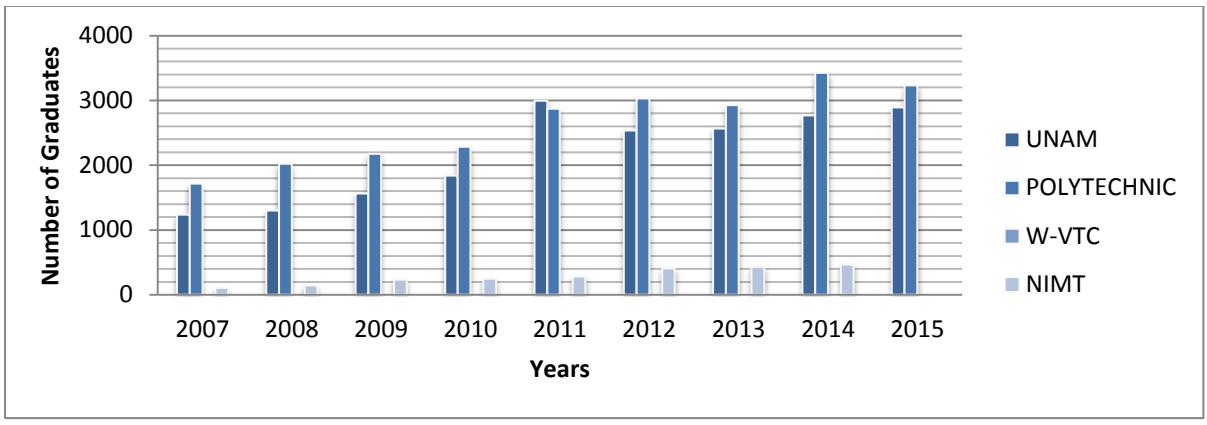

Figure 26: Total number of graduates from NIMT, UNAM and NUST

The mining industry contributed to vocational training by paying the VET levy in 2015 and by supporting a total of 150 apprentices at NIMT. Langer Heinrich subsidised 132 of these apprentices.

Motivation of status: the indicator was rated as **MET** because there is a clear and consistent increase in the number of graduates from the institutions over the last nine 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:				**EXCEEDED**

This indicator is only measured for operating mines (Langer Heinrich and Rössing), other companies are included in Table 15 for information. The percentage of wage cost allocated to skills development varied from 4% at Langer Heinrich to 10% at Rössing. Both companies exceeded the 3% target. AREVA, Bannerman and Valencia contributed 2-4% of wage cost to skills development programmes. Swakop Uranium spent N$91 million on education and skills development in 2015 (CoM 2016), but did not indicate the percentage of wage cost.

Table 14: The Mining Industry's Contribution to Skills Development in 2015

Company	**Skills development in 2015 (internal and external)**			
Number of:	NIMT apprentices	Work permits	Bursary holders	% of wage cost
AREVA Namibia	5	0	2	3%
Bannerman	3	0	1	3%
Langer Heinrich	132	38	4	4%
Rio Tinto Rössing	10	5	10	10%
Swakop Uranium	No data	No data	7	No data
Valencia	0	1	1	2%

Motivation of status: The two operating mines **EXCEEDED** the requirements of this indicator by 1% and 7%, respectively.

Indicator 9.2.1.3.	**Each mine has 10% more bursary holders than work-permit holders.**			
Data Source	**NUA**			
Status:		**IN PROGRESS**		

Of the two operating mines, only Rössing met this target in 2015. The number of work-permit holders at Langer Heinrich increased from 8 in 2014 to 38 in 2015, while the bursaries only doubled from 2 to 4. The company experienced a large number of resignations and struggled to attract the required skills from within Namibia. Due to financial constraints it was impossible to increase the

number of bursaries in line with the indicator. Over the next few years, local understudies for the work-permit holders will be developed as required by the Employment Equity Act.

Langer Heinrich mine's bursary holders are studying mining engineering, metallurgy, electrical engineering and mechanical engineering. The company also offered job attachments to students in the fields of mechanical engineering, electrical engineering, mining, surveying and metallurgy.

In 2015, ten students received bursaries from Rössing Uranium; seven of these were new bursaries in the fields of chemical, mining and mechanical engineering and chemistry in line with the mine's operational requirements. Rössing trained seven graduates in mining-related disciplines as part of the Rio Tinto graduate development programme. Ten trade apprentices completed their job attachment whereby they were exposed to on-the-job learning within their various disciplines. The educational assistance scheme for employee dependants supported 25 students at tertiary level.

AREVA Resources Namibia awarded two bursaries and Bannerman supported one bursary holder in 2015, though the companies employed no work-permit holders. Valencia only had one bursary holder for one work permit. Swakop Uranium awarded seven bursaries, but did not report the number of work permit holders.

Motivation of status: While Rössing met this indicator, Langer Heinrich had significantly more work-permit holders than bursary holders. As this situation is expected to be remedied during the coming years the indicator is rated **IN PROGRESS**.

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Summary of performance: EQO 9

Total no. indicators assessed	5 (2 were NOT APPLICABLE)			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	1	1	2	1
Percentage of indicators in class	20%	20%	40%	20%

Overall performance: The overall performance in 2015 is the same as in 2014, except for Indicator 9.1.1.3 that was previously IN PROGRESS and changed to **NOT MET** in the current assessment. Indicators 9.1.1.1 and 9.1.1.2 that require 50% of learners achieving a D or better in English, maths and science could not be measured due to lack of data.

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EQO 10. Governance

Aims of this EQO: Institutions that are responsible for managing uranium mining provide effective governance through good leadership, oversight and facilitation, so that all legal requirements are met by all parties involved, either directly or indirectly, in prospecting and mining of uranium.

Uranium exploration and mining activities occur in the Central Namib, an ecologically-sensitive area containing parts of the Namib Naukluft National Park and the Dorob National Park. Namibia is probably unique in the world for allowing mining in national parks, though a Policy for Mining and Prospecting in Protected Areas and National Monuments is being drafted to set conditions under which mining and prospecting will be permitted. The aim of the policy is to avoid prospecting and mining in environmentally high value, sensitive areas. These areas could be defined in terms of biodiversity, heritage or sense of place. The policy will make provision for the declaration of 'red flag' and 'yellow flag' areas where certain activities will be prohibited. It was completed before the national elections in 2014, but the new ministers of MME and MET are still to submit it to parliament. Mining is also 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 avoids 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 licenses are considered.**
Data Source	**SEMP Office/MME/MET**
Status:	
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:	
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/MET**
Status:	

Seeing that no new mineral licenses were issued in 2015, it was not possible to assess these three indicators.

Motivation of status: These indicators are rated as **NOT APPLICABLE**.

Indicator 10.1.1.4.	**No new power lines, pipelines or roads linked to uranium mining are routed through declared 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/MET/NUA**
Status:	

No new power lines, pipelines or roads linked to uranium mining were constructed through the 'red flag' areas proposed in the SEA report in 2015.

Motivation of status: The indicator is **NOT APPLICABLE** because no new power lines, pipelines or roads were built.

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 infrastructures.**
Indicator 10.2.1.1.	**Mineral licenses are given only after full consultation of, and consensus within, the Mineral Rights Committee and the relevant status of areas in question (red and yellow flag areas).**
Data Source	**SEMP Office/MME/MET**
Status:	**MET**

All mineral licences are issued to applicants after consulting the Mineral Prospecting and Mining Rights Committee (MPMRAC) and obtaining an Environmental Clearance Certificate (pers. com., Ms Flaviano, Directorate of Mines, 2016).

Motivation of status: This indicator is rated as **MET** because mineral licences are given only after consultation of the Mineral Rights Committee and the Ministry of Environment and Tourism.

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

Seeing that no new mineral licenses were issued in 2015, it was not possible to assess this indicator. The issue of corruption should be considered when granting or declining licence renewals.

Motivation of status: Since no licences were issued in 2015, this indicator is rated **NOT APPLICABLE**.

Indicator 10.2.1.3.	**No prospecting, mining or major infrastructure projects are permitted (anywhere) 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/MET**
Status:	

No new mineral licenses were issued in 2015; it was therefore not possible to assess this indicator. This indicator should not just apply to new licences, but also existing licences where the scope of project work could change. For example, clearance might have been given for standard exploration activities (drilling, soil sampling, trenching, etc.), but companies are also conducting bulk sampling or trial mining, which is allowed for by MME under EPLs. Development of support infrastructure is also allowed on EPLs, but may not be explicitly included in EIA studies.

Motivation of status: The indicator is rated **NOT APPLICABLE**.

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, MET, MAWF, MHSS) inspect active mines at least once per annum, and closed mines at least once every 3 years.**
Data Source	**SEMP Office/MME/MET/MAWF/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 current and abandoned mine sites. Abandoned mines are monitored according to the impacts they possess, those classified as Mining Environmental liability are regularly monitored and where necessary precaution measure are taken.

MET'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 spot checks. MAWF'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 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. Table 16 lists the government inspections conducted at mines and exploration sites in 2015.

Table 15: Government Inspections of Uranium Mines and Projects in 2015

Company	Government Agencies
AREVA Namibia	MHSS inspected first aid station and ambulance in Jul 15 NRPA site inspection and radiation management plan review in Jul 15
Bannerman	NRPA radiation safety assessment in Jun 15
Langer Heinrich	NRPA Oct 15, sampling of 10 boreholes around the mine as part of regulator monitoring MAWF/DWAF Law Department, Sep 15, discussion on reporting requirements and permits, combined with compliance visit MLIREC, Jul 15, general company visit Employment Equity Commission, Oct 15, verification that LHU, as a shortlisted employer for an EEC achievement award, does qualify for the award
Marenica	None, currently no activities on Marenica EPL
Reptile Uranium	All statutory reports completed and submitted as prescribed MET inspected and signed-off rehabilitated drill sites and tracks, regular interaction with NNN park wardens Applied for renewal of environmental certificates in 2015 (issued in 2016) Radiation management plan approved by NRPA
Rio Tinto Rössing	NRPA, Jul 15, visit to sample borehole water for radionuclide analysis
Swakop Uranium	NRPA site visit in Jul 15 to conduct baseline radiation assessments
Valencia	None, currently no activities on the mine site
Zhonghe	No information provided

Motivation of status: Some GRN agencies, notably MHSS and NRPA, are carrying out annual inspections at active mines, while others prefer to do spot checks or rely on the information that mining companies present in their (bi)annual reports. 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 should be inspected at least once every three years. Because there is room for improvement the indicator was considered to be **IN PROGRESS**.

Indicator 10.3.1.2.	Honorary conservators are appointed by MET to assist with monitoring, including of unauthorized secondary (off-mine) activities such as off-road driving, poaching and littering.
Data Source	SEMP Office/MME/MET
Status:	NOT MET

The Ministry of Environment reported that there was no legislative provision for the appointment of honorary conservators (pers. com. Hiwana, Ministry of Environment and Tourism). It remains to be seen whether this option will be taken up in the impending revision of the Namibian nature conservation legislation.

Motivation of status: Since it is currently impossible for MET to appoint honorary conservators this indicator was **NOT MET**.

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

The IAEA does not have statutory jurisdiction to do regulatory work in Namibia, except in the case of the application of nuclear safeguards (pers. comm. Dr. W. Swiegers, Chairman of the Atomic Energy Board). IAEA inspectors visited the operating mines in 2015 specifically to inspect accounting and control of the quantities for uranium exports or imports under the safeguards agreement (pers. comm. Dr. G. von Oertzen, Rössing). Other issues such as safety, security or environmental performance are beyond the scope of the safeguards agreement. There are no other international agencies mandated or qualified to inspect Namibian uranium mines. It is therefore suggested to delete this indicator from the next report.

Motivation of status: This indicator is rated **NOT APPLICABLE** because there are no international agencies mandated to provide an independent opinion on the Namibian uranium industry.

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

The annual SEMP report covers all the various monitoring aspects related to uranium mining. The reports are freely available to the public through the SEMP office, NERMU and the NUA. Moreover, the SEMP assessment findings are also presented to stakeholders through roadshows.

Motivation of status: Seeing that annual SEMP reports are freely available to the public, the indicator is **MET**.

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:	
Indicator 10.4.1.2.	**If impacts are not remedied, the operation is closed and the project authorisation is cancelled.**
Status:	
Indicator 10.4.1.3.	**Fines are issued for non-compliance.**
Data Source	**SEMP Office/MME/MET**
Status:	

Indicators 10.4.1.1, 10.4.1.2 and 10.4.1.3 are assessed together as they are similar. In case of environmental transgressions MET issues compliance orders to parties that do not comply; they are given 14 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 (pers. comm. Hiwana, Ministry of Environment and Tourism 2015). No cases of compliance orders or clearances being revoked were reported in 2015.

Motivation of status: All three indicators were rated as **NOT APPLICABLE** because no compliance orders were issued and no clearances were revoked in 2015.

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**

Currently, MET does not report non-compliance cases to the media, but plans are in place to table this as part of the environmental clearance process (pers. comm. Hiwana, Ministry of Environment and Tourism 2015).

Motivation of status: This indicator is rated **IN PROGRESS** because MET is planning to include public non-compliance reporting in the clearance process.

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Summary of performance: EQO 10

Total no. indicators assessed	5 (10 were **NOT APPLICABLE**)			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	1	2	2	0
Percentage of indicators in class	20%	40%	40%	0%

Overall performance: Two EQO 10 indicators were **MET**: Firstly, **g**ood governance is maintained when mineral licences are issued by following the defined process involving consultation of the Mineral Rights Committee and the Ministry of Environment and Tourism. Secondly, SEMP reports are published annually to disclose monitoring results, improve practice and inform the public.

Some GRN agencies, notably MHSS and NRPA, are carrying out annual inspections at active mines, while others prefer to do spot checks or rely on the information that mining companies present in their (bi)annual reports. 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 should be inspected at least once every three years. Because there is room for improvement the indicator was considered to be **IN PROGRESS**. Another indicator **IN PROGRESS** refers to non-compliance reporting that is currently done by the SEMP Office, but not publicised in the media, though MET is planning to include public reporting in the clearance process. The indicator concerning the appointment of honorary conservators was **NOT MET**. Ten EQO 10 indicators were **NOT APPLICABLE** in 2015.

The fact that no new licences for uranium prospecting and mining were issued means that environmentally high-value 'red flag' areas were not affected by mining, new power lines, pipelines or roads. It also implies that there was no corruption in the issuing of mineral licences. Compliance with the EIA indicator could not be assessed because no EIAs were conducted. The requirement for international agencies to regularly inspect mines and provide independent opinion on their performance should be removed because there are no international agencies mandated or qualified to inspect Namibian uranium mines. For comparison, in 2014 53% of the indicators were MET, 40% IN PROGRESS and 7% NOT MET.

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EQO 11. Heritage and Future

Aims of this EQO:

- **Namibia's international image is maintained and enhanced, as the 'Namib Uranium Province' builds a good international reputation as a result of generally reliable, ethical, trustworthy and responsible practices/behaviour and more specifically, because of environmentally, socially and financially responsible uranium mining operations.**
- **Uranium exploration and mining - and all 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 a secure and sustainable footing.**

The Heritage and Future EQO has two distinct components. The first two targets concern the future of Namibia's uranium industry, which can only be safeguarded if all stakeholders subscribe to an ethical conduct and internationally accepted social, environmental and economic standards. This is because nuclear power utilities prefer to purchase uranium from responsible mining companies. The industry's international image has up to now been assessed by reviewing the national and international online media to find any critical reports by key international stakeholders.

The SEA identified the heritage part of this EQO as a measure to protect the archaeological sites in the uranium province. The Central Namib is home to some of Namibia's key heritage resources with an archaeological history dating back to 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 have to 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.	**Namibian uranium is regarded as a 'green' product.**			
Target 11.1.1.	**The 'Namib uranium province' is regarded internationally as an area where reliable, trustworthy, ethical, and environmentally, socially and financially responsible companies prospect and mine uranium.**			
Indicator 11.1.1.1.	**<10% critical international voices about the operations and performance of the Namib Uranium Province among any key international stakeholders (other than those international stakeholders opposed to uranium mining and/or nuclear power anyway, in principle/on ideological grounds).**			
Data Source	**SEMP Office**			
Status:			**MET**	

A Google search revealed over 100,000 local and international online listings for Namibian uranium mining. A review of the most relevant pages found that apart from official websites of mining companies, NUA and other organisations, the publications fall into three main groupings:

- Publications for the mining industry (trade journals), such as Mining Journal, www.mining.com, www.miningweekly.com, etc. whose articles provide facts about new mine developments, projects, appointments, consultants and products, and who are by nature pro-mining.
- Newspaper articles or online news about government moves related to uranium mining or industry developments such as new mines, exploration projects, EIAs, etc. that are based on facts and therefore mostly neutral (neither positive nor negative), though some national newspapers tend to add critical remarks whenever uranium mines are mentioned.
- Critical reports about social, environmental, health or economic conditions at Namibian uranium mines by international organisations that are opposed to uranium mining and/or nuclear power.

The Google summaries are mostly undated and there is no option of filtering out 2015 postings only. To assess this indicator objectively it would be necessary to count the number of positive, negative and neutral reports. This would require reading all the newspaper articles to see in which category they fall. With the large number of articles this is clearly not possible and also pointless. The number of positive industry publications will probably always outweigh the critical international voices, especially if the anti-nuclear organisations are excluded from the count.

Nevertheless, a scan of the articles turned up three main issues that were published in the international media in or around the current reporting period. One topic is related to health concerns of Rössing Uranium mine employees, which dates back to the 1980s, and is occasionally brought to the public's attention by anti-mining organisations such as WISE, Ejolt, CRIIRAD, Earthlife Namibia and LaRRI. A recent example is a report by Earthlife Namibia and LaRRI that was taken up in international publications, e.g. "Uranium workers dying after time at Namibia mine, report warns" (The Guardian of 15 April 2014). As mentioned in EQO 6, Rössing is currently undertaking a comprehensive epidemiological study to determine whether there is an excess, work-related cancer risk for the company's former and current workers.

Another issue that had been in the media for some years and resurfaced in 2015 concerns allegations of fraud, corruption and bribery around AREVA and UraMin. The controversy over French state-owned company AREVA's US$2.5 billion purchase of UraMin in 2007 is the subject of a court case in France to investigate whether it involved fraud (miningawareness.wordpress.com, 15 May 2016). Corruption was alleged in articles such as "French nuclear giant Areva accused of bribery in South Africa, Namibia, Central African Republic" (anticorruptiondigest.com, 11 December 2015). Though this is basically a commercial issue between companies, it had repercussions in Namibia. Government approved the transfer of UraMin's mining licence for Trekkopje to AREVA and, when learning about the purchase price, felt that the state should have received a share of the profits UraMin made. The Minister of Mines and Energy announced that Government was considering a windfall tax (various online articles, May 2011). A provision in this regard has been included in the Income Tax Amendment Bill, 2015.

The third topic about the working conditions of pregnant women at Langer Heinrich was mainly published in the national press, e.g. "Langer Heinrich mine denies claims of ill-treatment" (Namibian Sun, 27 June 2013), but later taken up in international articles (see next paragraph). The Mineworkers Union of Namibia called for an investigation into claims of pregnant women working in dangerous conditions. Management rejected claims that pregnant employees were made to work in radiation areas, stating that the mine had been cleared of all allegations (Namibian Sun, 27 June 2013). This was after government agencies such as MHSS, NRPA and Ministry of Labour had conducted an investigation.

This 2013 case is mentioned here because a series of articles in July 2015 by the International Consortium of Investigative Journalists and The Namibian newspaper included a rehash of issues raised previously about Langer Heinrich and Rössing Uranium. The articles specifically targeted Australian mining companies with headlines such as "Aussies in toxic trail" and "Nam lucrative ground for Aussie speculators". Reptile Uranium and Craton Mining (not a uranium miner) were also listed as Australian speculators. These articles were widely taken up on other international websites. A critical reader would however not consider the content to be factual or unbiased. The articles are written in a manner that gives prominence to accusations by placing them first, and then they quote the statements issued by mining companies in response in a bland or banal way that will influence readers to rather believe the allegations.

In summary it can be concluded that a qualitative assessment of international media identified three groups of articles related to Namibian uranium companies Rössing, AREVA, Langer Heinrich and to a minor extent Reptile Uranium. Zhonghe was in the spotlight in 2013 when www.mining.com reported that Namibia's government released an environmental study of the Zhonghe uranium project two years after it was completed and four months after the mining licence was issued. A cursory internet search for other company names did not reveal any critical articles about Bannerman, Marenica, Swakop Uranium or Valencia. This does not mean there are no such articles; just that it was not possible to look at thousands of search results for each mine and therefore only the first three pages with the most relevant search results were checked.

Motivation of status: Within the limitations of the survey the indicator was **MET** because the number of critical voices was <10% of all articles excluding those by anti-mining or anti-nuclear organisations.

Indicator 11.1.1.2.	**There is <10% evidence of unreliable, unethical and/or environmentally, socially and financially irresponsible conduct by operating uranium mines or prospecting activities.**			
Data Source	**SEMP Office**			
Status:			**MET**	

As described above, the relevant articles that were found on the internet contained allegations of unreliable, unethical and/or environmentally, socially or financially irresponsible conduct by uranium mining companies. The critical articles referred to in the previous indicator did however not provide concrete evidence or judgements in court cases to support their claims. The issues were predominantly raised by anti-mining or anti-nuclear organisations.

In addition to this review of media reports, it should be mentioned that the regulatory authorities involved in SEMP reporting did not encounter any evidence of irresponsible conduct by the uranium industry.

Motivation of status: No evidence of unethical or irresponsible conduct by the uranium mines in the year 2015 was found, therefore this indicator is considered to be **MET**.

Desired Outcome 11.2.	**The integrity of archaeological and paleontological heritage resources is not unduly compromised by uranium mining.**
Target 11.2.1.	**Mining industry and associated service providers avoid impacts to archaeological resources, and where impacts are unavoidable, mitigation, restoration and /or offsetting are achieved.**
Indicator 11.2.1.1.	**All mining and related developments are subject to archaeological and paleontological assessment** **No unauthorised impact occurs**
Data Source	**NERMU/MET/NUA**
Status:	
Indicator 11.2.1.2.	**Mining companies adhere to local and international standards of archaeological assessment.**
Data Source	**NERMU/MET/NUA**
Status:	

No archaeological assessments for new projects or existing mines were carried out in 2015; it was therefore not possible to assess these two indicators.

Motivation of status: The two indicators are rated **NOT APPLICABLE**.

Desired Outcome 11.3.	**Integration of archaeological and environmental knowledge in a balanced working model of Namib Desert environmental processes.**
Target 11.3.1.	**Development of a general research framework to identify gaps in scientific knowledge.**
Indicator 11.3.1.1.	**Research in progress.**
Data Source	**NERMU/MET**
Status:	**MET**

The assessment of this indicator focuses on whether there is ongoing archaeological research in the Namib Desert. Information obtained from the permit register of the National Heritage Council showed only two archaeological study permits issued in 2015 (Table 17) (pers. comm. Helvi Elago, NHC 2017).

Motivation of status: Some research work on the Namib heritage/archaeology continued in 2015, even beyond the uranium province. Therefore, this indicator was **MET**.

Table 16: Permits issued for Archaeological Studies in the Central Namib

APPLICANT NAME(S)	PERMIT DATE	PRELIMINARY REPORT SUBMISSION MONTH	FINAL REPORT SUBMISSION MONTH	RESEARCH SITE	RESEARCH CONDUCTED	PERMIT NUMBER
Mrs. Barbara Dunn	27 February 2015	None	30 June 2016	AiAiba Rock Art Lodge, (Erongo Region)	Rock art sites	08/2015
Dr. John Kinahan	09 August 2015	None	30 September 2016	Twyfelfontein World Heritage Site (Kunene Region)	Evaluation of evidence concerning the Initiation of women in the rock art site of Twyfelfontein	12/2015

Indicator 11.3.1.2.	**Working model of Namib Desert developed.**			
Status:		**IN PROGRESS**		
Indicator 11.3.1.3.	**Model providing information to guide decision making about development in the Namib desert.**			
Status:		**IN PROGRESS**		
Indicator 11.3.1.4.	**Development of diachronic models to determine the effects of climatic and other environmental changes.**			
Data Source	**NERMU/MET/NUA**			
Status:		**IN PROGRESS**		

Although the models to which indicators 11.3.1.2, 11.3.1.3 and 11.3.1.4 refer have are not yet been developed, a large body of archaeological research has been assembled and publications have been produced according to Dr. John Kinahan, one of the drivers of the concept. This is expected to eventually lead to the development of the models (pers. comm. J. Kinahan, QRS 2014).

Motivation of status: Because archaeological research has been conducted with the aim of generating the data and knowledge needed to develop the models, the three indicators are rated as **IN PROGRESS**.

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Summary of performance: EQO 11

Total no. indicators assessed	7 (2 were **NOT APPLICABLE**)			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	0	3	4	0
Percentage of indicators in class	0%	43%	57%	0%

Overall performance: The “future” part of EQO 11 tries to gauge the international reputation of the Namibian uranium brand. The indicators specify that there should be <10% critical international voices about the operations and performance of the Namib Uranium Province among any key international stakeholders (other than those international stakeholders opposed to uranium mining and/or nuclear power anyway, in principle/on ideological grounds) and there is <10% evidence of unreliable, unethical and/or environmentally, socially and financially irresponsible conduct by operating uranium mines or prospecting activities. A qualitative assessment of internet search results for ”Namibian uranium mining” revealed that the number of positive industry publications will probably always outweigh the critical voices, especially if anti-nuclear organisations are excluded from the count. There were thus <10% critical reports in the year 2015 and no evidence of unethical or irresponsible conduct was found, resulting in both indicators being **MET**. The Heritage indicator referring to research in progress was **MET**, while the remaining three indicators remained **IN PROGRESS**. The latter are all related to the development of diachronic models of Namib archaeology, which not priority actions for heritage preservation in the context of uranium mining. In comparison to 2014 the indicators **MET** dropped slightly from 62% to 57%, while the ones **IN PROGRESS** increased from 38% to 43%. Two indicators were **NOT APPLICABLE** because no archaeological studies were commissioned by the mining industry in 2015.

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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 mining 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. 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. Sufficient personnel and financial resources must be allocated during and after mining to enable (progressive) rehabilitation and decommissioning of mine structures at final closure. Even though mining companies may not have sole responsibility for addressing the socio-economic impacts of mine closure, they are key players with significant power, influence and resources.

The Namibian Mine Closure Framework that was developed by the Chamber of Mines of Namibia (CoM) in May 2010 has the primary purpose of providing guidance for the Namibian mining industry on how to develop relevant, practical and cost-effective closure plans and to lay down minimum requirements for all Chamber members. Thus at the end of mine life, government agencies know what to expect, while companies are well prepared and have the necessary resources to implement the closure plan, ensuring that negative social, economic and biophysical impacts are minimized.

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**	

It is current practice in Namibia that operational mines are required to have a closure plan, while exploration companies only need a plan and financial provisions for items such as 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 18).

Namibian policies and regulations specific to mine closure are still under discussion, thus item 10 was mostly marked not applicable (N/A). Companies that answered "yes" have received an ECC for a closure plan that is included in their EMP.

Table 19 also contains feedback on the items listed under the bullet points of Target 12.1.1. Regarding item 1, Rössing's feasibility study was completed in the early 1970s when closure planning was not considered in mine development. All other companies started the closure planning process at the feasibility study stage. Item 2: The plans were generally based on expert input, though some companies also obtained stakeholder input (this is indicated by Y/N in Table 18, meaning yes for expert input and no for stakeholder input). Swakop Uranium did not provide feedback.

Table 17: Feedback from Mines Regarding Compliance with Closure Planning Requirements

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

Item 3: Most plans considered site risks, opportunities and threats, whereas cumulative issues (several mines closing at the same time) were not always taken into account (Y/N). Socioeconomic opportunities for communities and the workforce (item 4) were included in all available 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 under discussion. The companies that responded "yes" to item 8 were probably referring to closure plans that are included in their EMPs and as such approved by MET as part of the environmental clearance process. Accepted and agreed objectives, indicators and targets (item 6) can only be developed once specific regulations are provided by MME. Item 7: At this stage companies rely on corporate head offices or consultants to review the closure plans as there are no external reviews by government agencies.

Motivation of status: The two operating mines have closure plans consistent with the Namibian Mine Closure Framework and IAEA guidelines. Therefore the indicator is **MET**.

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 including:** • **employee costs (retrenchment provision, new employment opportunities, re-training costs);** • **social aspects (sustainability of associated communities), an 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 breakdown, 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).** **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 contained in the closure plan.**			
Status:			**MET**	
Indicator 12.2.1.2.	**Financial sureties are available.**			
Data Source	**SEMP Office/CoM/MME**			
Status:			**MET**	

Closure cost estimates are contained in the closure plans of operating mines and include the aspects listed in Target 12.2.1 as shown in Table 19. Mines in the development phase or under construction are not required to comply with these two indicators (Bannerman, Reptile, Swakop Uranium, Valencia), but some have provided information to indicate the status of their plans.

Table 18: Feedback from Mines Regarding Compliance with Closure Cost Provisions

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

Motivation of status: All mines operating in 2015 had closure cost estimations in their plans and financial sureties. Therefore the two indicators were rated as **MET.**

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**

The government is in the process of updating the relevant legislation in order to establish adequate regulations applicable to mine closure. The mining industry indicated that they need closure regulations that are adequate to govern review and approval of mine closure plans, financial guarantees and sureties, implementation review, as well as relinquishment and transfer of liabilities to the subsequent land owner.

Motivation of status: The indicator is **IN PROGRESS** because the government is busy updating the relevant legislation in order to establish adequate regulations applicable to mine closure.

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Summary of performance: EQO 12

Total no. indicators assessed	4			
	NOT MET	**IN PROGRESS**	**MET**	**EXCEEDED**
Number of indicators in class	0	1	3	0
Percentage of indicators in class	0%	25%	75%	0%

Overall performance: In 2015, the two operating mines had closure plans that were consistent with the Namibian Mine Closure Framework and IAEA guidelines, as well as closure cost estimations and financial sureties. The first three indicators were therefore **MET** (75%). The fourth indicator requires mine closure regulations that are adequate to govern the review and approval of mine closure plans; financial guarantees and sureties; implementation review, as well as relinquishment and transfer of liabilities to the subsequent land owner to be in place. It was rated **IN PROGRESS** because Govern-ment is busy updating the relevant legislation (25%). The EQO performance was the same as in the previous two reports.

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EVALUATION AND DISCUSSION

Indicators of Socioeconomic Development in EQO 1 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 2015 and previous years.

The only one indicator of Employment (EQO 2) has always been **MET** because the majority of the permanent workers at uranium mines are Namibian citizens. Mining companies, except for Swakop Uranium, have been reporting data on the AA compliance of their contractors since 2014. The operating mines reported that 87% of the contractors were compliant in 2015.

The infrastructure EQO 3 covers housing, transportation including roads, railways and harbour, electricity supply and renewable energy, as well as waste management and recycling. The two housing indicators continued to be **MET** because mining companies do not intend to establish on-site hostels or mine-only townships. Three indicators referring to road condition and maintenance were **MET**, while two about tarring a busy gravel road were still **IN PROGRESS** and one was **NOT MET**. The indicator of rail use for bulk goods was **NOT MET**. As in 2014, Namport's three efficiency indicators were **EXCEEDED, MET** and **IN PROGRESS**, respectively. The five indicators concerning the quantity and quality of electricity supply to the region continued to be **MET**, as they were in previous reports. The implementation of renewable energy projects at mines advanced from IN PROGRESS in 2014 to **MET** in 2015**.** Nine waste management indicators were **MET,** four were **IN PROGRESS** and two were **NOT MET** because there is no legislation for pollution control and monitoring. There was not much change regarding waste management compared to the previous report.

Five of the eight Water-related indicators in EQO 4 were **MET**, while three indicators related to water levels, comprehensive sampling and to disaster management were **IN PROGRESS**. The results indicate that drinking water for urban and rural communities was of acceptable quality and uranium mining did not compromise the water quality in the lower Khan and Swakop rivers, and neither was the water table lowered beyond the normal rate. NamWater's groundwater abstraction from the Central Namib water scheme did not exceed the aquifers' sustainable yield as determined by DWAF. Aquifer water was made available to domestic users at approved NamWater rates, even though it had to be augmented with desalinated water. There were no reports of industrial investors being lost due to water unavailability because desalinated water was available to meet the demand. The results were the same as for the previous two reporting years. Though it has now become easier to obtain the required data from the responsible stakeholders, DWAF still preferred to provide raw data as opposed to a written report on the interpretation of the water data. Both DWAF and SEMP Office staff have been trained in 2016 to address this issue, as well as the sampling and analysis of radionuclides in water.

All three Air Quality indicators in EQO 5 were **MET** in 2015 compared to 2014 when two indicators were MET and one was NOT MET. The latter was the indicator for continuous dust fallout measurements on a regional scale using the SEMP monitoring network. Desired outcome 5.2 should be omitted from the next SEMP report because the network has served its purpose and become obsolete. It is proposed that dust monitoring in residential areas close to uranium mines will be sufficient to meet the intention of target 5.2.1. This should be confirmed by the regional advanced air quality management study that will commence in 2016. Indicator 5.1.1.1 was changed to include other receptor locations as it previously only required ambient PM10 concentration at Swakopmund.

Concerning Health, the two EQO 6 indicators related to public dose assessments were rated **IN PROGRESS** pending a comprehensive re-assessment of the cumulative impact as part of the 2016 advanced air quality and radiation study. The radiation dose to workers at mines did not exceed the legal limit, resulting in this indicator being **MET**. Two indicators measuring the incidence of occupational diseases were **IN PROGRESS** because Rössing Uranium started an epidemiological study that will address at least part of these indicators. The three ratios of healthcare professionals and facili-

ties per number of population were rated **IN PROGRESS** given that the due date is the year 2020 and MHSS is busy improving its services.

The evaluation of the EQO 7 indicators suggests that the natural beauty of the desert and its sense of place have not been unduly compromised by uranium exploration and mining. Previous assessments for the 2011, 2012 and 2013 SEMP reports suggested that so far there has not been a significant reduction in visual attractiveness of the Central Namib in such a way that tourism activity declined (Mbura and Wassenaar 2015). Tourists consistently reported that their expectations were **EXCEEDED**. Three indicators were **MET**, showing that tourism operators and mining industry manage to coexist in the Central Namib, though a degree of conflict seems to persist (NUA 2016). Conflicts between the need for public access and mining have so far been avoided and uranium mining did not prevent the public from visiting the usually accessible areas in the Central Namib for personal recreation and enjoyment. Three indicators concerning the Policy on Prospecting and Mining in Protected Areas that is required to enforce the protection of important tourism areas were **IN PROGRESS** and may still take a while. The results for EQO 7 changed slightly compared to the 2014 report because the two EIA-related indicators could not be assessed (**NOT APPLICABLE**). The use of surveys to assess the opinions of tourists and tour operators was a challenge in previous reports, as the sample size was not addressed and efforts by NERMU to get the MET Directorate of Tourism as a key partner proofed futile. It is proposed in this report that the evaluation of internet postings, e.g. on TripAdvisor, could be a sustainable assessment method for these indicators.

Six of the Ecological Integrity (EQO 8) indicators were **MET** in 2015. It was confirmed that mines have specific programmes and projects to actively avoid, mitigate, restore or offset their impacts according to the mitigation hierarchy, and that they have mapped out sensitive areas within their mining licence areas where impacts are monitored and mitigated accordingly. Mining companies have also partnered with conservation organisations and supported additional conservation projects, as far as currently possible. The Ministry of Environment and Tourism has made evident efforts towards improved vigilance and visibility of law enforcement personnel. Lastly, the indicator of groundwater levels being within the reach of phreatophytes was also **MET**. Eight indicators covering a range of topics remained **IN PROGRESS**. One topic concerns the policy on mining in protected areas that is required to enforce the protection of important biodiversity areas and to create an enabling environment for biodiversity offsets (four indicators). Another issue relates to secondary impacts in protected areas, which the Ministry of Environment and Tourism reported without identifying whether they were caused by persons employed in the mining industry. Until a method can be found to identify the culprits the indicator will remain **IN PROGRESS.** The last three indicators are related to studies that are being conducted to understand the impact of water abstraction on the riverine vegetation and to develop a regular monitoring programme for riverine vegetation, springs and wetlands. The studies will require a few more years' worth of data before conclusions can be drawn. Six indicators were **NOT APPLICABLE** because 1) no new exploration or mining licences were issued, 2) no new EIAs for mining projects were carried out and 3) there were no new infrastructure projects in 2015. The performance of this EQO was better in 2014 with 40% **IN PROGRESS** and 60% **MET**. EIA-related indicators that were previously **MET** have now changed to **NOT APPLICABLE**. There is a need to develop a sustainable long-term monitoring programme to continue the riverine ecosystem health monitoring activity. NERMU has championed a pilot and two follow-up studies to define the basic framework for this activity but it may not have the resources necessary to carry-on the monitoring.

Education (EQO 9) did not change much from the previous reporting year. The first two indicators were intended to track whether 75% of grade 1 enrolments complete grade 10 and 75% of grade 12 graduates obtain 25 points in six subjects with a D in English. Because the Ministry of Education does not keep records of the data needed to assess these indicators on a regional basis. The performance of Grade 10 and 12 students in national examinations for 2015 in English, maths and science are similar. The two grades performed well in English with more than 65% of students achiev-

ing a D symbol or better and poorly in maths and science as only 40% of students obtained a D symbol or better.Therefore this particular indicator requiring National examination results in Grade 10 and 12 in maths, English and science to achieve a D or better for more than 50% of learners from public (GRN) schools was **NOT MET** in 2015.

Improvements in reading and English are assessed using Grade 5 and 7 SATs results. The SATs 2014 results reveal that learners in Grades 5 and 7 have made substantial improvement particularly in Mathematics as compared to the previous years. The Erongo Region performed well as it obtained second place in the Grade 5 SATs and first place in the Grade 7 SATs. The indicator was MET due to an improvement from 2013 when the region came second in both the grade5 and 7 SATs. There has been a consistent increase in the number of graduates from NIMT, the National University of Science and Technology and the University of Namibia over the last nine years. Even though there was no information from the Vocational College of Walvis Bay the indicator was rated as **MET**. In 2015, the two operating mines spent 4% and 10% of annual wage cost on skills development programmes for employees, which **EXCEEDED** the requirements of the indicator (3%). In addition each mine was supposed to have 10% more bursary holders than work-permit holders. While Rössing met this indicator, Langer Heinrich employed too many work-permit holders, resulting in an **IN PROGRESS** rating.

The following two EQO 10 (Governance) indicators were **MET**: Firstly, **g**ood governance is maintained when mineral licences are issued by following the defined process involving consultation of the Mineral Rights Committee and the Ministry of Environment and Tourism. Secondly, SEMP reports are published annually to disclose monitoring results, improve practice and inform the public. Some GRN agencies, notably MHSS and NRPA, are carrying out annual inspections at active mines, while others prefer to do spot checks or rely on the information that mining companies present in their (bi)annual reports. 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 should be inspected at least once every three years. Because there is room for improvement the indicator was considered to be **IN PROGRESS**. Another indicator **IN PROGRESS** refers to non-compliance reporting that is currently done by the SEMP Office, but not publicised in the media, though MET is planning to include public reporting in the clearance process. The indicator concerning the appointment of honorary conservators was **NOT MET**. Ten EQO 10 indicators were **NOT APPLICABLE** in 2015, e.g. the three indicators covering action taken and fines issued for transgressions or non-conformance could not be rated because no compliance orders were issued and no clearances were revoked in 2015. The fact that no new licences for uranium prospecting and mining were issued means that environmentally high-value ‘red flag’ areas were not affected by mining, new power lines, pipelines or roads. It also implies that there was no corruption in the issuing of mineral licences. Compliance with the EIA indicator could not be assessed because no EIAs were conducted. The requirement for international agencies to regularly inspect mines and provide independent opinion on their performance should be removed because there are no international agencies mandated or qualified to inspect Namibian uranium mines.

The Future part of EQO 11 tries to gauge the international reputation of the Namibian uranium brand. The indicators specify that there should be <10% critical international voices about the operations and performance of the Namib Uranium Province among any key international stakeholders (other than those international stakeholders opposed to uranium mining and/or nuclear power anyway, in principle/on ideological grounds) and there is <10% evidence of unreliable, unethical and/or environmentally, socially and financially irresponsible conduct by operating uranium mines or prospecting activities. A qualitative assessment of internet search results for ”Namibian uranium mining” revealed that the number of positive industry publications will probably always outweigh the critical voices, especially if anti-nuclear organisations are excluded from the count. There were thus <10% critical reports in the year 2015 and no evidence of unethical conduct was found, resulting in both indicators being **MET**. The Heritage indicator referring to research in progress was MET, while the remaining three indicators remained **IN PROGRESS**. The latter are all related to the development of diachronic models of Namib archaeology, which are important in their own right, but not

priority actions for heritage preservation in the context of uranium mining. In comparison to 2014 the indicators MET dropped slightly from 62% to 57%, while the ones IN PROGRESS increased from 38% to 43%. Two indicators were **NOT APPLICABLE** because no archaeological studies were commissioned by the mining industry in 2015.

The performance of EQO 12 on Mine Closure and Future Land Use was the same as in the previous two reports. In 2015, the two operating mines had closure plans that were consistent with the Namibian Mine Closure Framework and IAEA guidelines, as well as closure cost estimations and financial sureties. The first three indicators were therefore **MET** (75%). The fourth indicator requires mine closure regulations that are adequate to govern the review and approval of mine closure plans; financial guarantees and sureties; implementation review, as well as relinquishment and transfer of liabilities to the subsequent land owner to be in place. It was rated **IN PROGRESS** because Government is busy updating the relevant legislation (25%).

The overall performance of the 2015 SEMP showed a slight improvement compared to the preceding years. This is partly due to 19 indicators being rated **NOT APPLICABLE**, either because the relevant activity did not take place in 2015 or because the required information was never collected and is unlikely to become available in future. Some of the latter indicators have in the past been rated **NOT MET** or **NO DATA**. In summary, 60% of the indicators were **MET**, 34% were **IN PROGRESS**, 3% **EXCEEDED** and 3% **NOT MET** (Table 20).

Table 19: EQO Performance in 2015 Compared to Previous Years

Status (%)	NOT MET	IN PROGRESS	MET	EXCEEDED	NOT APPLIC.
2015	6 (5%)	35 (28%)	56 (46%)	3 (2%)	23 (19%)
2014	8 (7%)	40 (33%)	71 (58%)	3 (2%)	
2013	12 (10%)	36 (30%)	70 (59%)	1 (1%)	
2012	21 (18%)	37 (32%)	57 (49%)	1 (1%)	
2011	14 (11%)	44 (36%)	64 (52%)	1 (1%)	

Figure 27 on the next page displays the performance for each EQO, which can be summarised as follows:

- The Socioeconomic Development (EQO 1), Employment (EQO 2) and Air Quality (EQO 6) objectives were 100% **MET**.
- The objectives for Water (EQO 4), Governance (EQO 10), Heritage and the Future (EQO 11), as well as Mine Closure and Future Land Use (EQO 12) were mostly **MET** with some indicators **IN PROGRESS** or **NOT APPLICABLE**.
- Mixed results ranging from **EXCEEDED** to **NOT MET** were obtained for the Infrastructure (EQO 3) and Education (EQO 9) objectives.
- Effect on Tourism (EQO 7) shows the same percentages of indicators **MET** and **IN PROGRESS**, while one indicator was **EXCEEDED**.
- Areas where the number of indicators **IN PROGRESS** is higher than the ones **MET** are Health (EQO 6) and Ecological Integrity (EQO 8).
- Six indicators (3%) were **NOT MET**; these can be found under Infrastructure (EQO 3), Education (EQO 9) and Governance (EQO 10). The first two short-comings were due to the lack of legislation for pollution control and monitoring of waste sites. In Education there was a failure to achieve more than 50% D or higher symbols in the 2015 Grade 10 and 12 examinations. The problem in Governance was the the lack of legislation that would allow MET to appoint honorary wardens.
- The indicators that were rated as **EXCEEDED** were in the Infrastructure EQO (average waiting time for ships to obtain a berth at Namport was much lower than 12 hours), in Effect on Tourism (tourists' expectations of their visual experience in the Central Namib were mostly

exceeded) and in the Education EQO (percentage of wage cost allocated to skills development exceeded the 3% target at operating mines).

A gradual improvement in performance has been observed since the first SEMP report in 2011 (Figure 28). The number of indicators **NOT MET** has decreased and the percentage **IN PROGRESS, MET** and **EXCEEDED** has increased. Note however that the **NOT APPLICABLE** category has only been added in 2015.

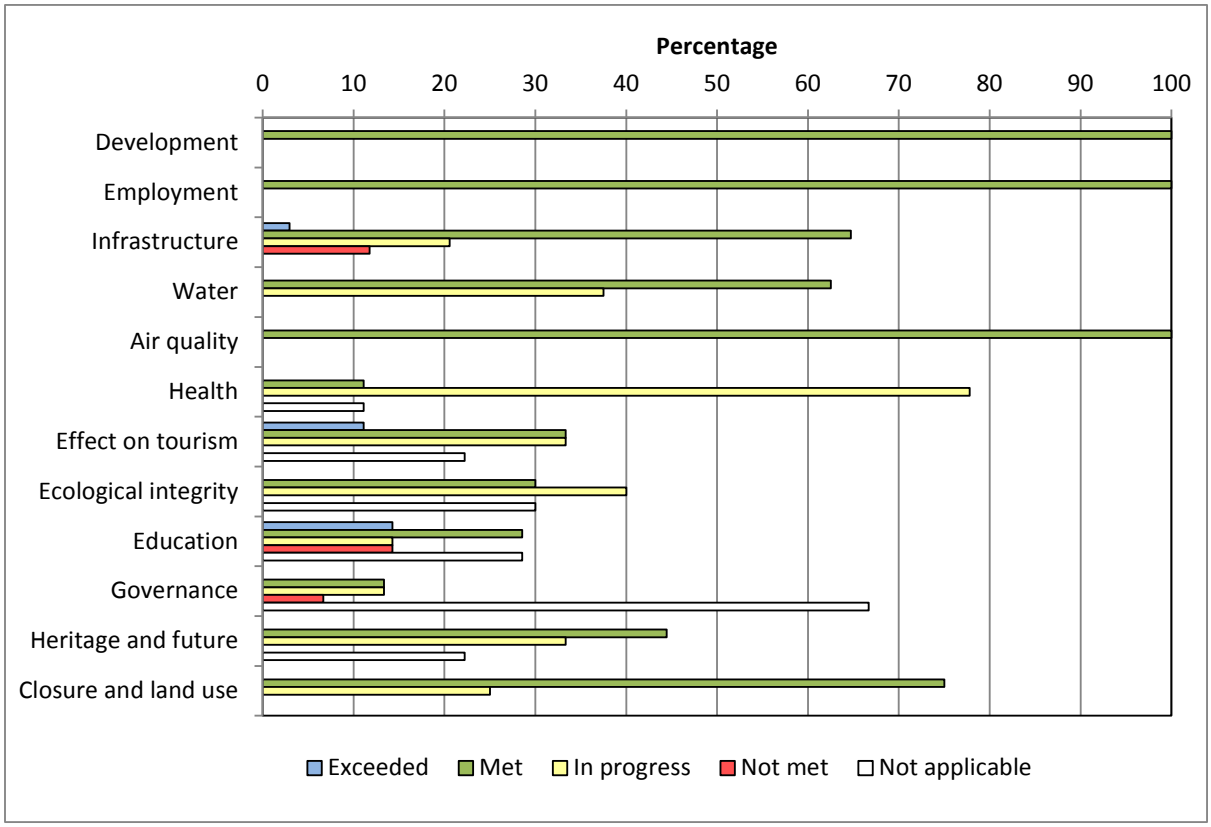

Figure 27: Performance per EQO in 2015

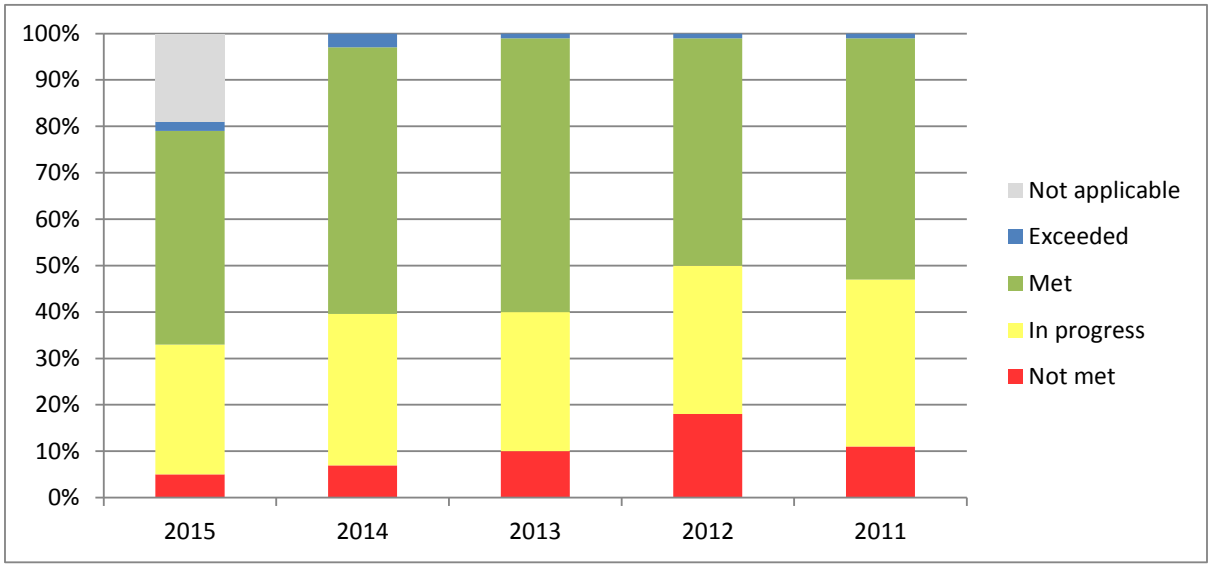

Figure 28: EQO Performance Trends

CONCLUSIONS

Currently in its fifth assessment period, the SEMP's achievements to date include the establishment of a long-term monitoring and decision-making tool through which potential impacts are highlighted so that measures can be developed to avoid unnecessary impacts or mitigate unavoidable impacts. The 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 region towards its desired future state of the SEMP.

To address a certain lack of commitment that was noticed while compiling the 2014 report, the SEMP office embarked on a roadshow in 2015. All government and parastatal institutions that are involved in data collection, monitoring and/or responsible for the implementation of certain targets were visited and informed about the objectives of the SEMP and the importance of their contributions.

The anticipated "uranium rush" that triggered the SEA and SEMP did not materialise due to the lower demand for uranium following the Fukushima disaster. The slower pace of development with only one new mine coming into operation has created an opportunity for government agencies and parastatals to catch up with the Erongo Region's infrastructure needs. Implementation of the SEMP will ensure that the region is well positioned and prepared for any future increases in uranium demand.

In 2014 and 2015 Swakop Uranium was able to absorb many of the mine workers and contractors that were retrenched from other companies. This was a lesson in how mining can become sustainable, provided that a "boom and bust" scenario is avoided in favour of opening up new mines as the old ones close or become less profitable. The main advantage, besides providing continuous employment, is that skilled and experienced workers can move between mines and the benefits of the training effort are retained within the industry.

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APPENDIX

EQO4 – Interpretation of Water Quality Analyses

The Namibian water quality standards (Table 22) classify water for human consumption as excellent quality (Group A), good quality (Group B) or water with a higher risk (Group C). Group C water may not be used for the bulk supply of large towns. The quality group is based on the overall salinity (measured as electrical conductivity or total dissolved solids) and certain major ions or trace metals that may cause health effects if present at high concentrations. Examples are fluoride, nitrate and sulphate among the major ions, and trace metals such as arsenic, cadmium, lead and uranium. The limits for these metals have been included in the table.

Table 20: Namibian Water Quality Standards and Groups*

	Recommended maximum limits for:			
	Human consumption			Livestock watering
	Group A	Group B	Group C	
pH	6-9	5.5-9.5	4-11	
Electrical conductivity	150	300	400	
Turbidity	1	5	10	
Total dissolved solids				6000
Total Hardness as $CaCO_3$	300	650	1300	
Ca-Hardness as $CaCO_3$	375	500	1000	2500
Mg-Hardness as $CaCO_3$	290	420	840	2057
Chloride as Cl^-	250	600	1200	1500-3000
Fluoride as F^-	1.5	2.0	3.0	2.0-6.0
Sulphate as SO_4^{2-}	200	600	1200	1000
Nitrate as N	10	20	40	100
Nitrite as N				10
Sodium as Na	100	400	800	2000
Potassium as K	200	400	800	
Magnesium as Mg	70	100	200	500
Calcium as Ca	150	200	400	1000
Arsenic as As	0.1	0.2	0.4	
Cadmium as Cd	0.01	0.02	0.04	
Lead as Pb	0.05	0.1	0.2	
Uranium as U	1.0	4.0	8.0	

*Source: DWAF (undated) THE WATER ACT (ACT 54 OF 1956) AND ITS REQUIREMENTS IN TERMS OF WATER SUPPLIES FOR DRINKING WATER AND FOR WASTE WATER TREATMENT AND DISCHARGE