

Climate Change and Air Quality



Briefing by the Department of
Environmental Affairs on the status
of air quality in South Africa



environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA



Presentation Overview

- To provide the legislative overview of air quality in the country;
- An overview of the 2019 State of Air Quality (2007-2018) as measured

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Legislative Framework

Since the dawn of democracy, government spared no effort in overhauling archaic laws that in many ways did not defend our citizen`s right to air that is not harmful to their health and well-being. As a result Section 24 of the Constitution of the Republic enshrines everyone`s right:

- To an environment that is not harmful to their health or well-being; and
- To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:
 - ❖ Prevent pollution and ecological degradation;
 - ❖ Promote conservation; and
 - ❖ Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development

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Legislative Framework

- The National Environmental Management: Air Quality Act (39) of 2004 “AQA” is an objectives-based legislative approach that is aligned to South Africa’s Constitution.
- Ambient standards define targets for ambient air quality – the quality of the air that we breathe
- The Act also creates mechanisms and tools to achieve the desired ambient air quality

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History of Air Quality Management in South Africa

Atmospheric Pollution Prevention Act, 1965

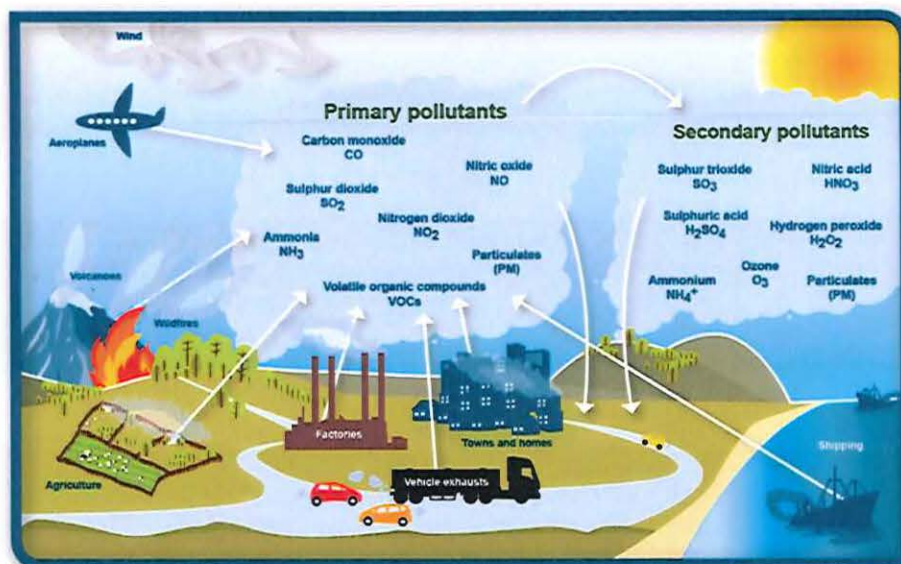
1. Point source focused
2. Ambient air quality not considered
3. Resulted in the creation of air pollution hotspots
4. Poorly crafted conditions
5. Limited monitoring of emissions
6. Most Registration Certificates had no reporting requirements
7. Lack of transparency

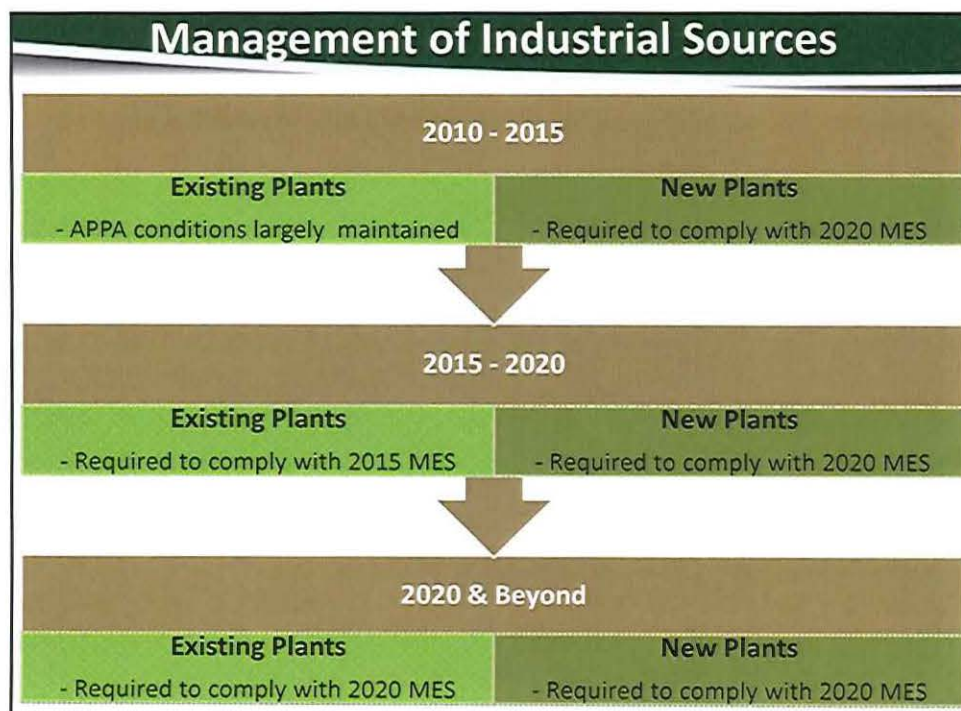
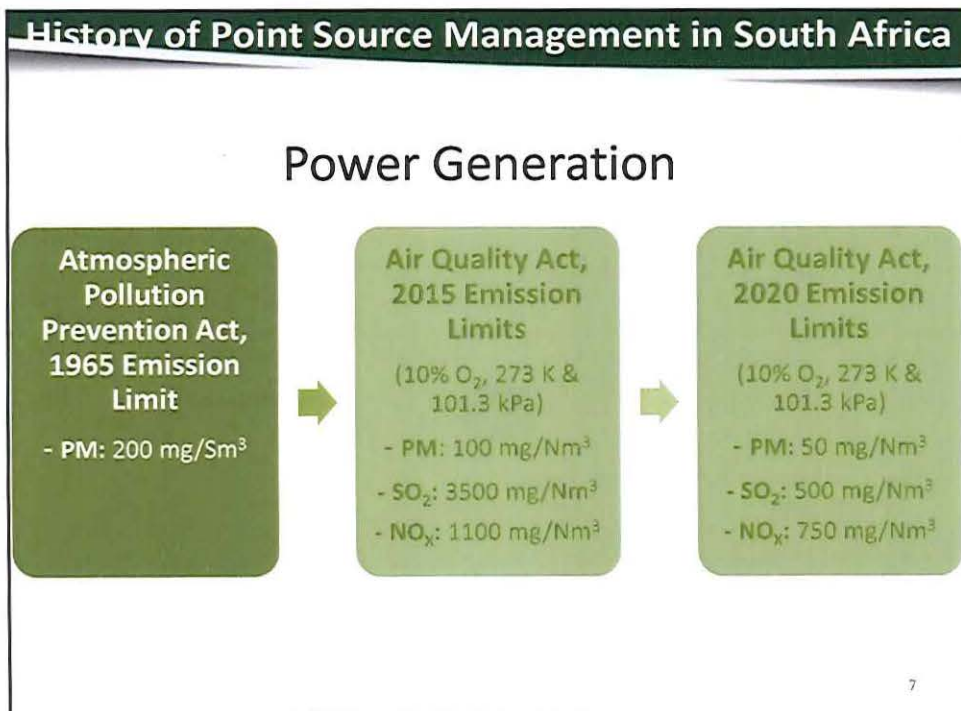


National Environmental Management: Air Quality Act, 2004

1. National Ambient Air Quality Standards established (24 December 2009)
2. Minimum Emission Standards established (31 March 2010)
3. Improved emission source management through AEL
4. Emission measurement & reporting requirements established for all sources:

Air-Shed Management





Minimum Emission Standards (MES)

- Emission standards are established for emission sources that have a potentially significant impact on air quality, taking into account severity of these impacts
- Large scale activities which, as individual emission sources, result in significant atmospheric emissions are managed as “*Listed Activities*”, and require both emission standards and atmospheric emission license to operate.
- The Minister or MEC must also set minimum emission standards for specified pollutants emitted by the identified industries
 - In this regard, the permissible amount, volume, emission rate or concentration of the pollutant or mixture of pollutants must be specified as well as the manner in which measurements of such emissions must be carried out
 - The Act also specifies the emission monitoring and reporting requirements

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Key Achievements from the Implementation of MES

- Benchmark has been set for all new facilities going forward. Any potential new entry in the market will know what emissions are expected and will design a plant accordingly,
- Even though it was always going to be difficult to address historic issues, the MES have resulted in improved management of emissions from existing facilities through:
 - ✓ Clear monitoring & reporting requirements,
 - ✓ Improved enforceability of conditions and subsequent fines in cases of non-compliance, and
 - ✓ Transparency of applicable emission limits for respective facilities.

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Ambient Air Quality Monitoring: Legislative Context

- It is a legal requirement to monitor ambient air quality **S8(b)(i)** to assess compliance with ambient air quality standards **S8(c)(ii)**
- To determine and report the state of ambient air quality in an area so as to understand whether people enjoy their right to air that is not harmful to their health and well being

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Ambient Air Quality Standards

- **Ambient standards** define targets for air quality management and establish the permissible amount or concentration of a particular substance in or property of discharges to air based on what a particular receiving environment can tolerate without significant deterioration
- South Africa has set National Ambient Air Quality Standards (NAAQS) for particulate matter, sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone, benzene and lead
- Government is mandated to monitor ambient air quality in terms of the NEMAQA to report compliance with ambient air quality standards
- The stations are in areas with the highest density of people to measure human exposure to air pollution. They provide a means to assess compliance with ambient air quality standards and the impact of intervention strategies aimed at addressing air pollution

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Air Quality Act Tools

1. **Atmospheric Emission Licensing (AEL) System:** regulates all activities listed by the Minister in terms of Section 21 of the AQA & has provisions for penalties and fines in cases of non-compliance;
2. **Controlled Emitters Regulations:** regulate mobile or temporal emission sources. To date, the Department has promulgated small boilers, *temporal asphalt plants and Small-scale char and small-scale charcoal plant* regulations;
3. **National Dust Control Regulations:** these regulations empower air quality officers across the country to address fugitive dust emission from any source that impacts ambient air quality;
4. **National Atmospheric Emission Reporting Regulations:** regulate the reporting of data and information from an identified point, non-point and mobile source of atmospheric emissions towards the compilation of atmospheric emission inventories.
5. **Strategy to Address Air Pollution in Dense Low-Income Settlements:** this strategy provides a coordinated approach in implementation of efforts directed at ensuring that ambient air quality in dense low-income settlements is in compliance with the national ambient air quality standards;

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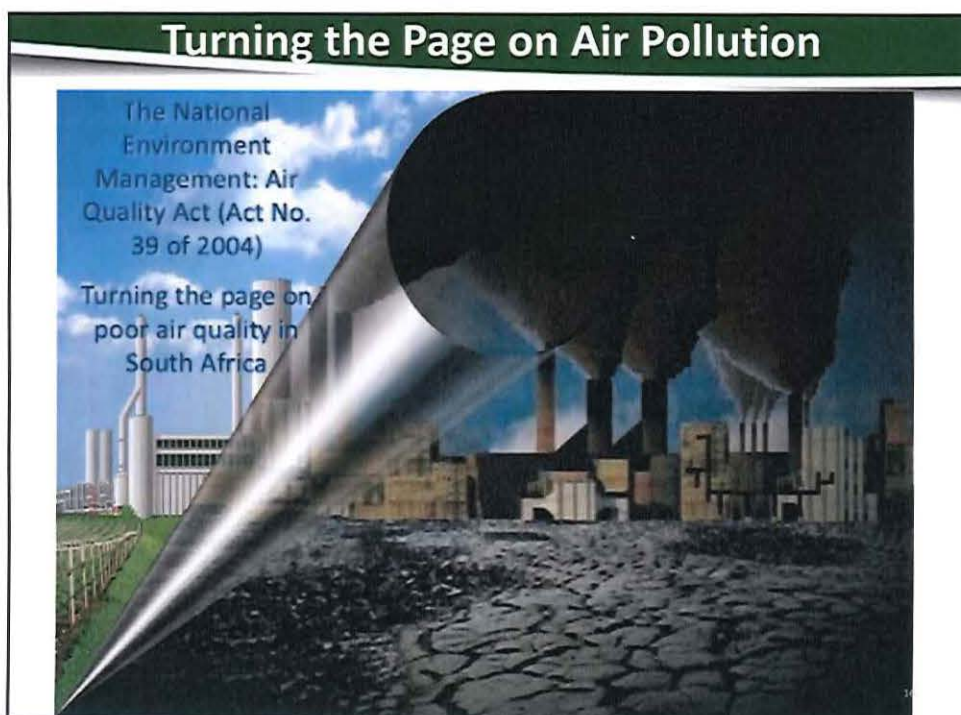
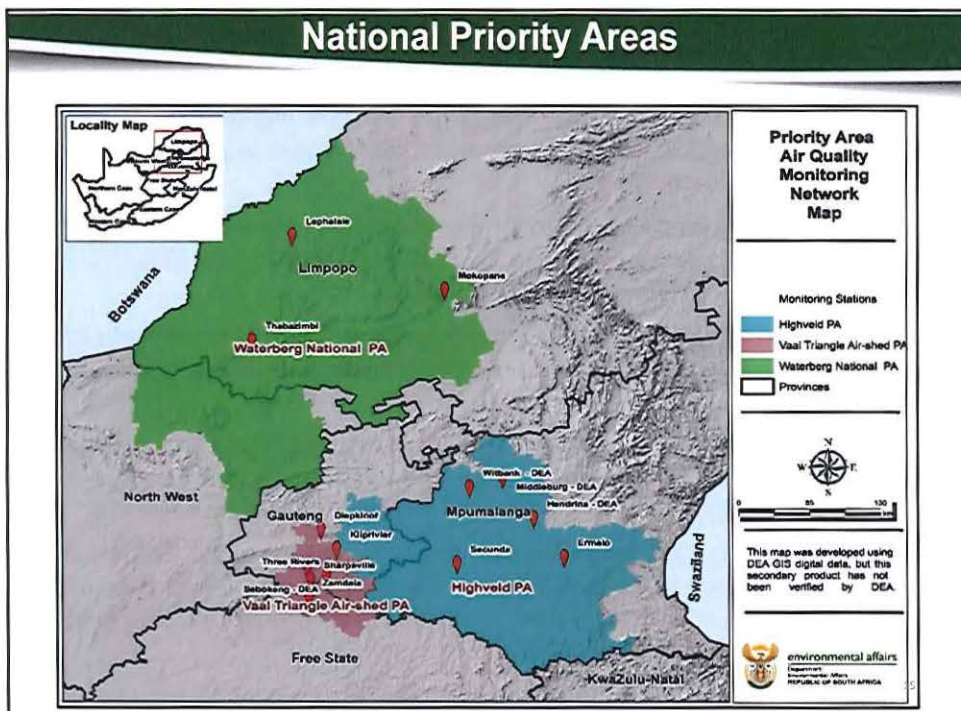
National Priority Areas

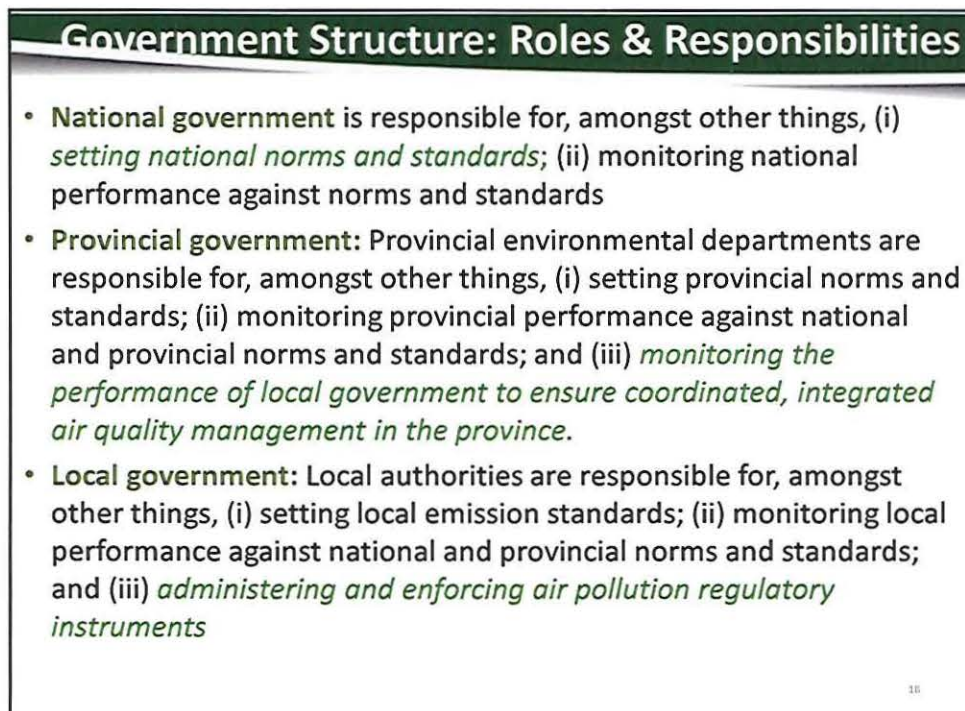
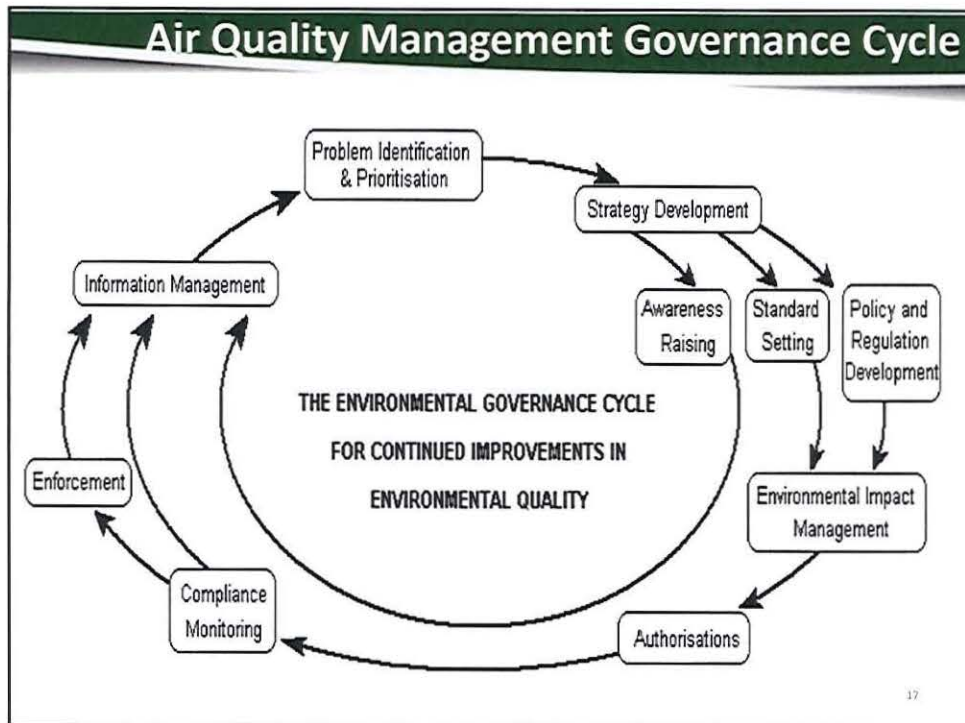
The Minister of Environmental Affairs has to date declared three (3) National Priority Areas in terms of Section 18(1) of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (AQA) namely, the:

- Vaal Triangle-Airshed Priority Area (VTAPA) in 2006,
- Highveld Priority Area (HPA) in 2007, and
- Waterberg-Bojanala Priority Area (WBPA) in 2012.

The declaration of the VTAPA and the HPA came about as a result of poor air quality due to industrial activities, domestic fuel burning, waste burning, and mining activities in these areas. The WBPA declaration was in line with the precautionary principle of the National Environmental Management Act (Act No. 107 of 1998) due to planned developments for the area.

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The History of Air Quality Management in SA

- The transition from the APPA to the AQA resulted in AQM being a concurrent function across all three spheres of government, with following functions being common across the spheres:
 - ✓ Atmospheric emission licensing
 - ✓ Ambient air quality monitoring
 - ✓ Air Quality Management Plan development & implementation
- These additional functions mostly fall on Metropolitan and District municipalities and as a result they have been required to *increase their staff compliment and training of existing staff in order to execute these functions*. Over the years since the promulgation of the AQA, municipalities have made significant strides in fulfilling the required AQM functions . However *capacity constraints still existing* across the country, especially in the areas of *licensing* and *ambient air quality monitoring*.

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Management of Industrial Sources

- As part the transition in air quality management, municipalities facilitated the conversion of *Registration Certificates* issued in terms of the Atmospheric Pollution Prevention Act into *Atmospheric Emission Licenses (AEL)* issued in term of the Air Quality Act

Power Generation

Atmospheric Pollution
Prevention Act, 1965
Emission Limit

- PM: 200 mg/Sm³



Air Quality Act, 2004
Emission Limits

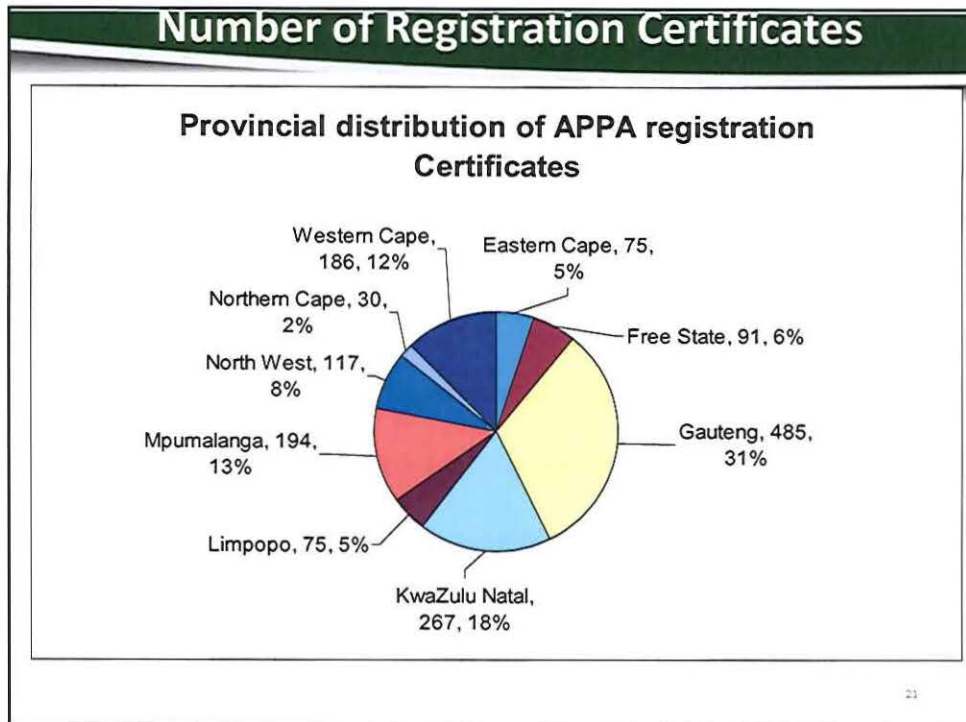
(10% O₂, 273 K & 101.3 kPa)

- PM: 100 mg/Nm³

- SO₂: 3500 mg/Nm³

- NO_x: 1100 mg/Nm³

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Highveld Priority Area Performance

Indicator	Prior to the declaration	Current
Number of AQOs appointed at district	0 out of 3 municipalities	3 out of 3 municipalities
Number of districts with AQMPs	1 out of 3 municipalities	2 out of 3 municipalities
Number of compliance and enforcement inspections	unknown	91 between 2015 and 2017

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Developments In AQ Monitoring Since NEMAQA

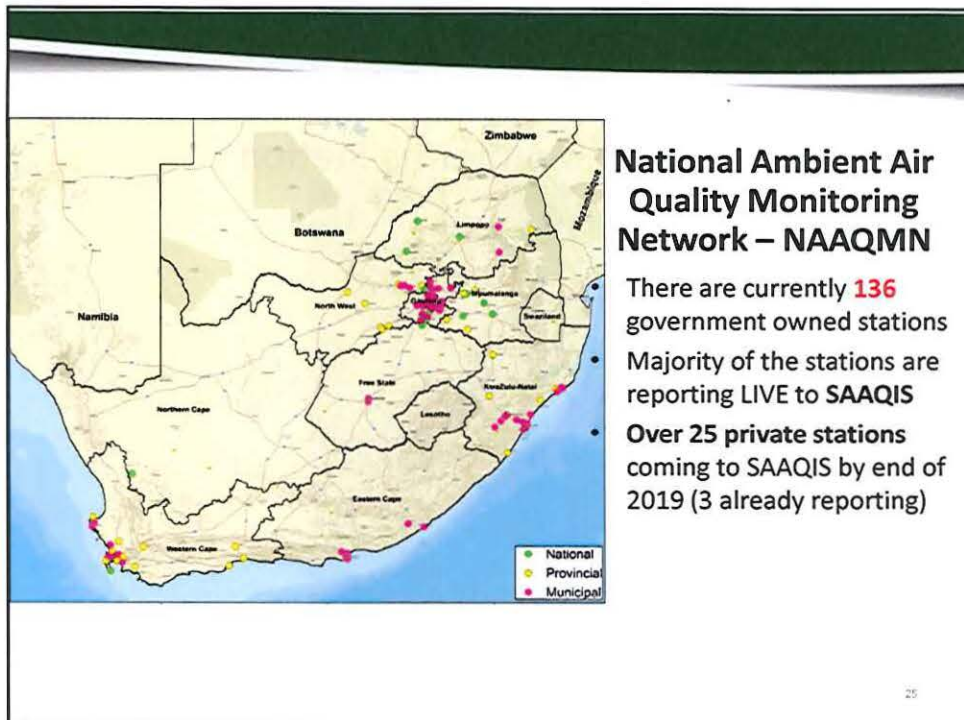
- Establishment:
 - National Air Quality Monitoring Network – NAAQMN, 136 stations commissioned by all spheres of government since 2005
 - South African Air Quality Information System (2009 and upgrade in 2017)
 - National Ambient Air Quality Standards for criteria pollutants – Section 9 of NEMAQA
 - National Air Quality Indicator network management (43 stations) until 2022
 - NAAQMN Quality Management System under development

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National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging time	Concentration	Frequency of exceedance per year	Compliance date
Sulphur dioxide (SO ₂)	10 minutes	500 µg/m ³ (191 ppb)	526	Immediate
	1 hour	300 µg/m ³ (134 ppb)	88	Immediate
	24 hours	125 µg/m ³ (48 ppb)	4	Immediate
	1 year	50 µg/m ³ (19 ppb)	0	Immediate
Nitrogen dioxide (NO ₂)	1 hour	200 µg/m ³ (106 ppb)	88	Immediate
	1 year	40 µg/m ³ (21 ppb)	0	Immediate
Ozone (O ₃)	8-hour (running hourly average)	120 µg/m ³ (60 ppb)	11	Immediate
Carbon monoxide (CO)	1 hour	30 mg/m ³ (26 ppm)	88	Immediate
	8-hour (running hourly average)	10 mg/m ³ (8.7 ppm)	11	Immediate
Lead (Pb)	1 year	0.5 µg/m ³ (19 ppb)	0	Immediate
Benzene (C ₆ H ₆)	1 year	10 µg/m ³ (3.2 ppb)	0	Immediate
Particulate matter (PM ₁₀)	24 hours	5 µg/m ³ (1.6 ppb)		01 Jan 2015
		120 µg/m ³	4	Immediate
	1 year	75 µg/m ³	4	01 Jan 2015
		10 µg/m ³	0	Immediate
Particulate matter (PM _{2.5})	24 hours	5 µg/m ³	0	01 Jan 2015
		65 µg/m ³	4	Immediate
	1 year	40 µg/m ³	4	01 Jan 2016
		25 µg/m ³	4	01 Jan 2030
1 year	25 µg/m ³	0	Immediate	
	20 µg/m ³	0	01 Jan 2016	
	15 µg/m ³	0	01 Jan 2030	

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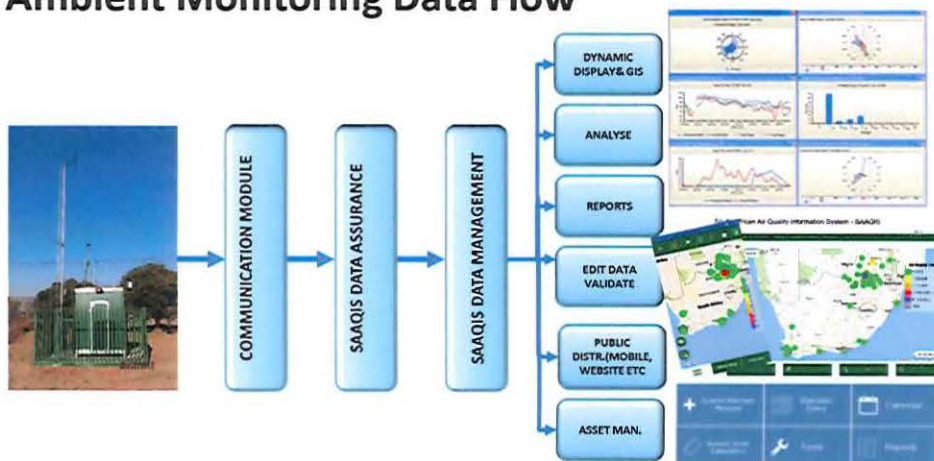


Inside a Monitoring Station



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Ambient Monitoring Data Flow



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Data Recovery in the National Ambient Air Quality Monitoring Network

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Priority Areas, West Rand

National Department			MONTH											
Department of Environmental Affairs - DEA			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	HPA	Ermelo	94	99	83	89	95	97						
2		Hendrina - DEA	87	84	82	87	84	87						
3		Middelburg - DEA	100	99	90	89	83	88						
4		Secunda	99	91	91	80	80	70						
5		Witbank - DEA	88	67	68	69	71	65						
6	VTAPA	Danpkoof	80	79	83	92	84	84						
7		Kliprivier	82	81	88	95	87	85						
8		Sebokeng	90	83	83	87	47	66						
9		Sharpsville	92	89	76	85	89	88						
10		Three Rivers	84	86	84	72	85	87						
11	WPA	Zamdenia	89	84	80	89	82	82						
12		Lephalale	71	83	84	88	89	100						
13		Mokopane	88	85	80	89	89	100						
14		Thabazimbi	75	84	89	88	82	87						
15		Wenadur	81	73	82	82	88	90						
16	OTHERS	Shongweni												
District and Local Municipality			MONTH											
West Rand District Municipality			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
134	Mogale City													
135	Randfontein													
District and Local Municipality			MONTH											
South African Weather Service			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
136	Cape Point		100	89	85	80	78	74	68					
137	Karoo		100	89	100	99	100	18	100					

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KZN, Limpopo and NW

Provincial Department - Kwa-Zulu Natal		MONTH											
Department of Economic Development, Tourism and Environmental Affairs - DEDTEA		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
17	Empangeni												
18	Escourt												
19	Newcastle												
20	Pietermaritzburg												
21	Port Shepstone												
22	Stanger												
Provincial Department - Limpopo		MONTH											
Department of Economic Development, Environment and Tourism - LEDET		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
23	Phalaborwa	26	88	75	100	88	100	88					
24	Steelpoort				61								
Provincial Department - Mpumalanga		MONTH											
Department of Agriculture, Rural Development, Land and Environmental Affairs - DARDLEA		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
25	Balfour	80	90	85	85	95	95						
26	Delmas - MP	80	94	92	84	90	94						
27	Middelburg - MP	94	99	93	90	87	95						
28	Standerton - MP	79	82	61	85	83	78						
29	Withank - MP												
Provincial Department - North West		MONTH											
Department of Rural, Environment and Agricultural Development - DREAD		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
30	Damsville - Mafikeng	34	23	99	72	82	83						
31	Jouberton	85	90	95	80	7	32						
32	Karane			3	64	88	78						
33	Khuma	94	64	85	17	100	72						
34	Lichtenburg	80	88	91	85	72	100						
35	Makeng	91	91	57	80	80	90	83					
36	Phokeng	100	89	100	70	85	16						

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Western Cape, Buffalo City and Cape Town

Provincial Department - Western Cape		MONTH											
Department of Environmental Affairs and Development Planning - DEADP		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
37	Dans Bay	100	83	68	48	58	64						
38	Oriskany												
39	Osizwa	88	80	85	100	100	80	88					
40	Wiermanus	80	42	65	11	80	80						
41	Wolke Bay	77	38	26	38	63	60						
42	Steylitzia - WVC Province												
43	Malmesbury	80	85	80	80	87	100						
44	Outshoorn	100	80	85	84	80	100						
45	Paarl Traffic Department						45	88					
46	St. Helena Bay					48	80	81					
47	Stellenbosch	80	80	80									
48	Worcester	65	66	71									
49	Worcester	81	85	84	100	80	100	100					
Metropolitan Municipality		MONTH											
Buffalo City Metropolitan Municipality		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
50	East London	80	87	84	71	69	74						
51	Beulah	45	80	80	80	80	80						
52	Tweeloh	74	80	81	100	17							
Metropolitan Municipality		MONTH											
City of Cape Town Metropolitan Municipality		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
53	Altona												
54	Atlantis												
55	Barbours Bay												
56	Boesmansig	80	80	80	80	80	80						
57	City Hall	100	80	80	80	80	80						
58	Franschoeg	100	80	100	13	74	100	100					
59	Greenwood	100	80	80	100	100	100	83					
60	Schampsig - CT Metro												
61	Motheo		32	80	80	100	22						
62	Plettenberg	100	80	80	100	100	80						
63	Protetium		31	43	48	65	80	80					
64	Supermarket West	100	80	80	100	80	80						
65	Tyden Vlei	80	80	80	100	100	80	80					
66	Waldeneers	84	80	80	80	61	80						

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Ekurhuleni and eThekweni

Metropolitan Municipality		MONTH												
Ekurhuleni Metropolitan Municipality		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67	Bedfordview	90	93	81	96	90	90	97						
68	EThekweni	100	98	98	100	77	98	89						
69	Germiston - Delville				40	81	65							
70	Leonvale													
71	Oliver-Tshobane	26	80	85	87	93	100	50						
72	Spinney	88	88	100	88	79	81	81						
73	Tembisa													
74	Thokoza	88	23	12	61	94	85	63						
75	Tsakane													
76	Wetville													

Metropolitan Municipality		MONTH												
eThekweni Metropolitan Municipality		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
77	Alverstone	91	97	88										
78	Amantsovo	32	44	81	71	40	34							
79	Cato Ridge	97		48	68	64	87							
80	City Hall - Durban	90	88	88	97	82	98	88						
81	Garden		17	88	100	88	88							
82	Greenevlei													
83	Hambanathi Tongaat	99	98	97	98	91	98	88						
84	Jacobs Rafter													
85	New Germany	88	77	87	98	88	88	88						
86	Prospecton	67	52	78	84	35	47	62						
87	Spandor			5	88	87	88	88						
88	Southern Works	56	61	88	69	88	73	88						
89	Ullensmoen													
90	Warwick													
91	Wentworth Reserve	90	81	68	51	88	81	88						

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Johannesburg, Mangaung, Nelson Mandela Bay and Tshwane

Metropolitan Municipality		MONTH												
City of Johannesburg Metropolitan Municipality		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
92	Alamanda	100	98	98	100	98	98	88						
93	Bucktown	19	40	46	71	88	81	32						
94	Devonsonville													
95	Edile Park													
96	Cherrywood	88	32	58	100	8								
97	Isipingo Park			34	66	24								
98	Johannesburg	100	87	37	28	98	98	98						
99	Midrand													
100	Oranje Farm	97	88	88	88	43	88							

Metropolitan Municipality		MONTH												
Mangaung Metropolitan Municipality		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
101	Raywater Clinic													
102	Keapengone Community Centre													
103	Mosong	100	98	98	87	87	88	87						

Metropolitan Municipality		MONTH												
Nelson Mandela Bay Metropolitan Municipality		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
104	Alton Park Clinic													
105	Mathew Goniwe Day Hospital	27	42	48	63	88	38							
106	PE Centre (Old Caravan)													
107	Uitenhage	38	13	17	20	50	17							
108	Waterfall	97	41	87	87	81	88	88						

Metropolitan Municipality		MONTH												
City of Tshwane Metropolitan Municipality		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
109	Evolution	91	81	88	88	88	88	88						
110	Botswana	97	88	88	88	88	88	88						
111	Ikhenkhen	100	88	100	88	88	73							
112	Marshallmore	63	88	78	88	100	88							
113	Mamelodi	88	88	88	88	88	88							
114	Oliver-Tshobane					100	88	88						
115	Pretoria West													
116	Roosendaal	100	88	88	88	88	88	88						
117	Tshwane Market	71	88	88										

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Limpopo, Saldanha, Sedibeng, Sekhukhune, Steve Tshwete, uMhlathuze

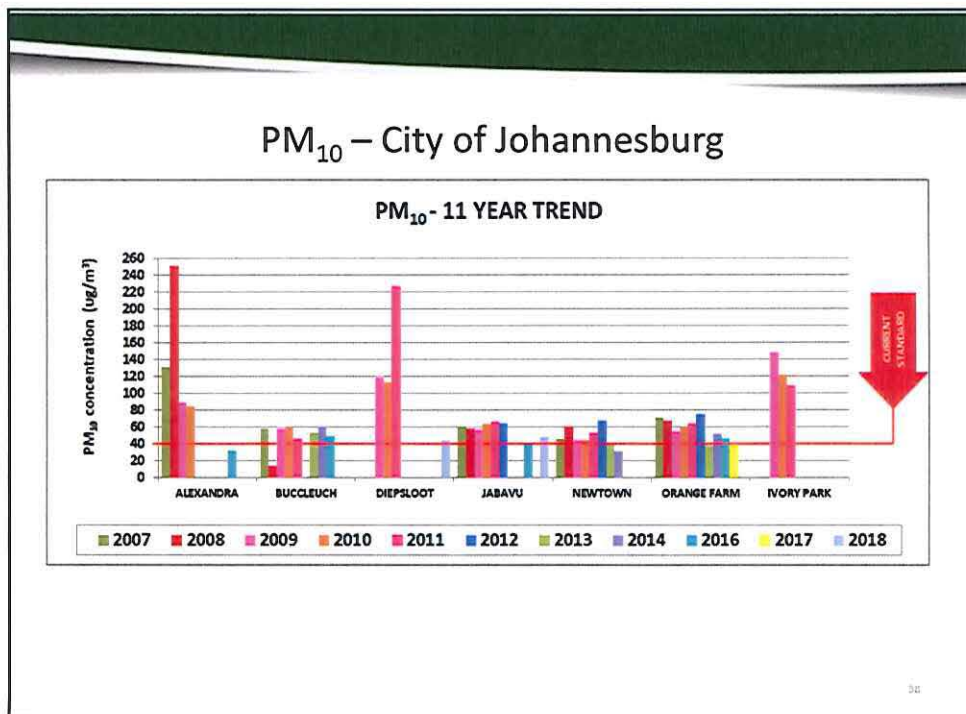
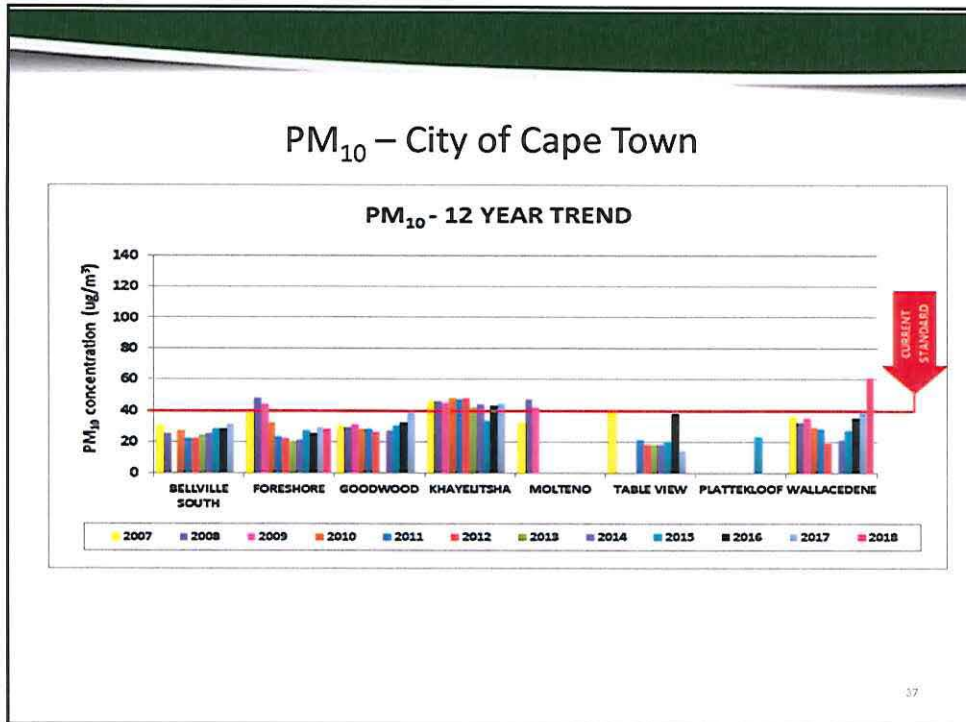
District and Local Municipality	MONTH											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
118 Tzaneen Disaster Centre Mogani District Municipality												
119 Edenburg Mogani District Municipality												
120 Pietermaritzburg - CBD Mogani District Municipality												
121 Pietermaritzburg Airport - Okavango Mogani District Municipality												
122 Botetong Rustenburg Local Municipality												
123 Marburg Community Centre Rustenburg Local Municipality												
124 Tshaneane Rustenburg Local Municipality												
125 AQM1 - Sabane Bay Sedibeng Local Municipality												
126 AQM2 - Vrederburg Sedibeng Local Municipality												
127 Meyerton Sedibeng District Municipality												
128 Vanderbijlpark Sedibeng District Municipality												
129 Dikong Sekhukhune District Municipality												
130 Gha(zi) (Mintshum) Steve Tshwete Local Municipality												
131 Asoerum - Water Facility uMhlathuze Local Municipality												
132 Brackenham - uMhlathuze uMhlathuze Local Municipality												
133 Eekhaleni uMhlathuze Local Municipality												

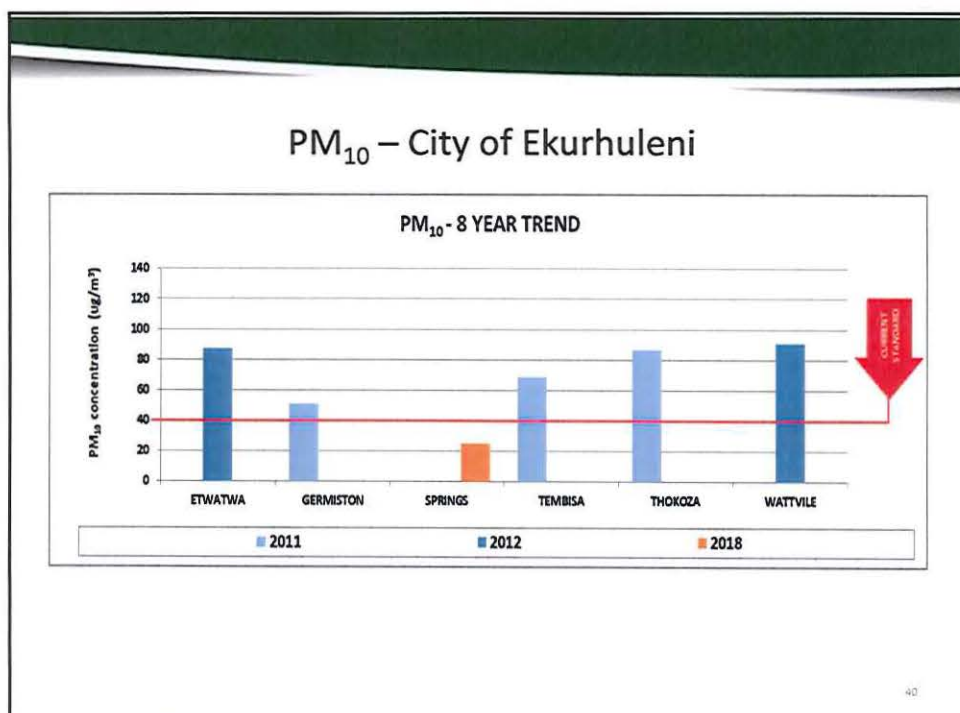
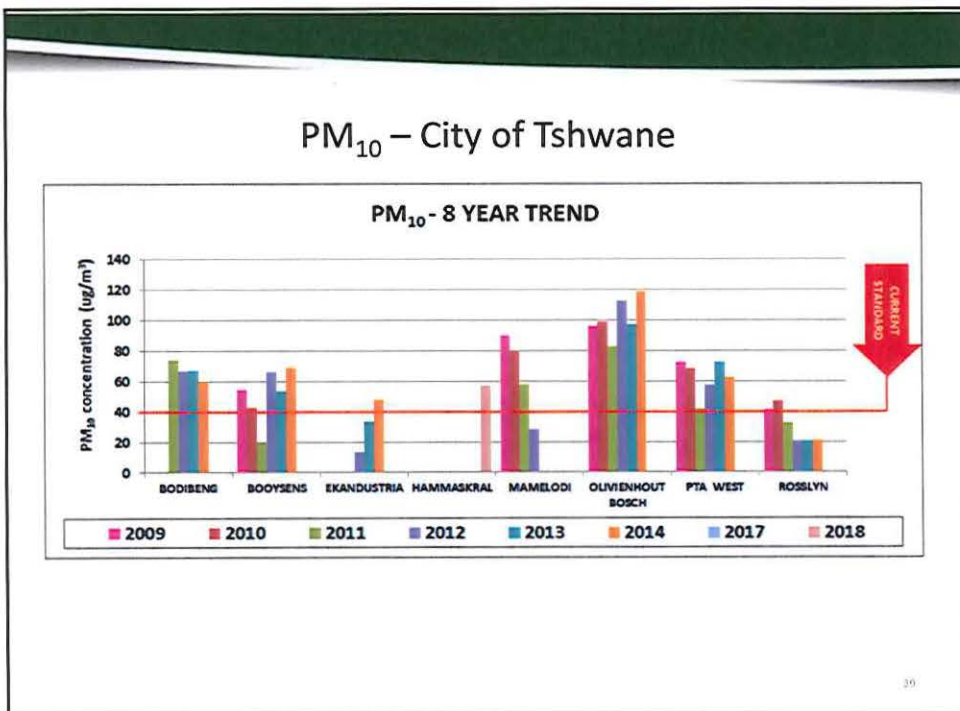
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State of Air Quality in South Africa

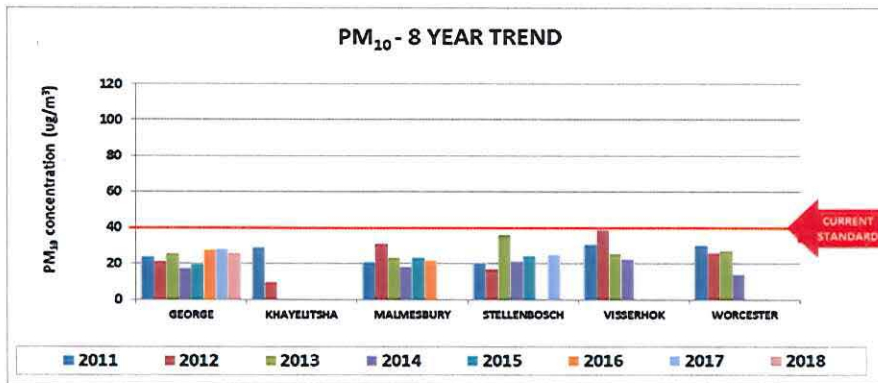
- Particulate matter with diameter less than or equal to 10 micrometres is PM₁₀
- Particulate matter with diameter less than or equal to 2.5 micrometres is PM_{2.5}
- Sulphur dioxide is SO₂
- Nitrogen dioxide is NO₂

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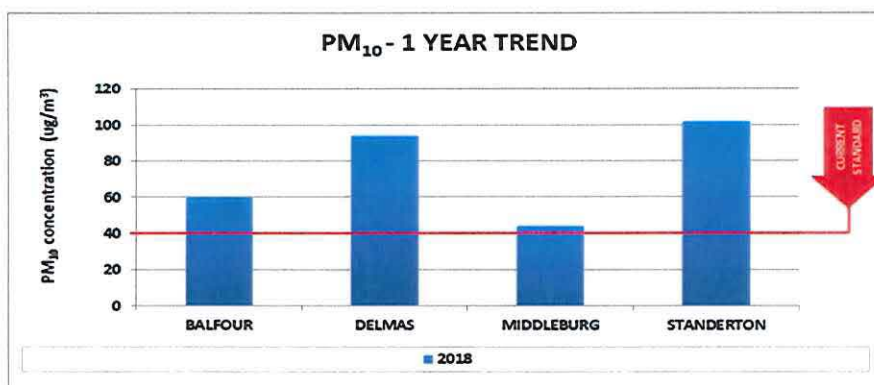


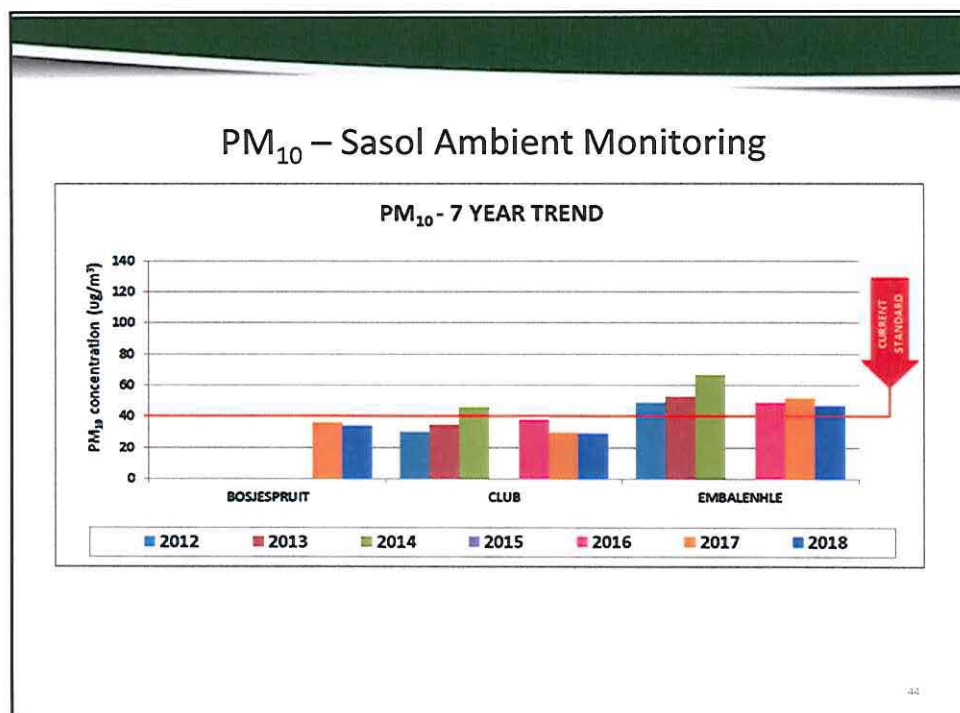
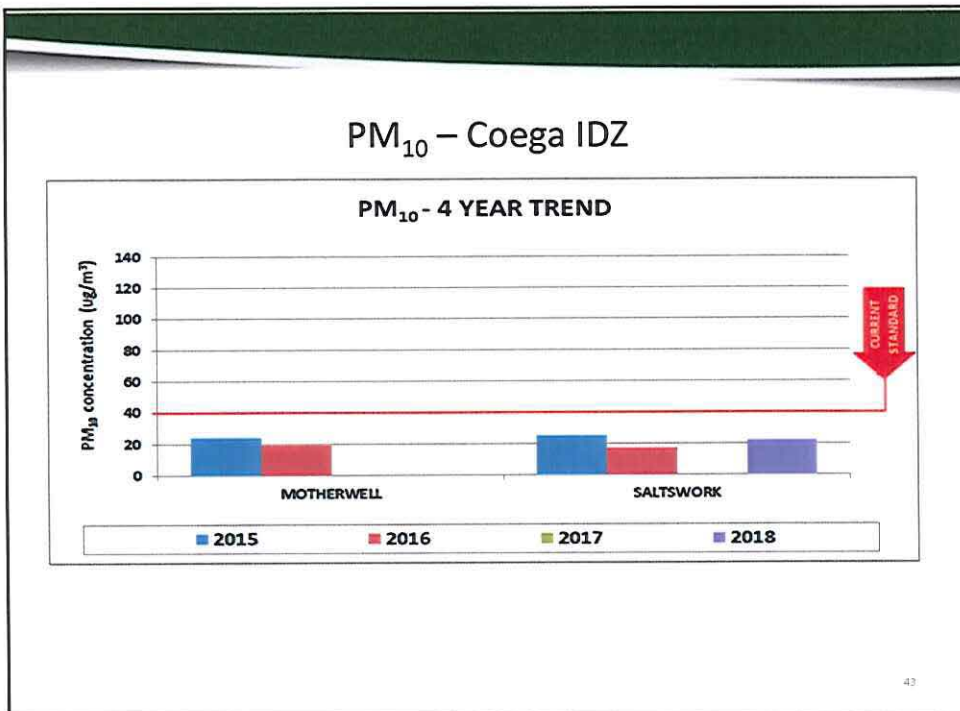


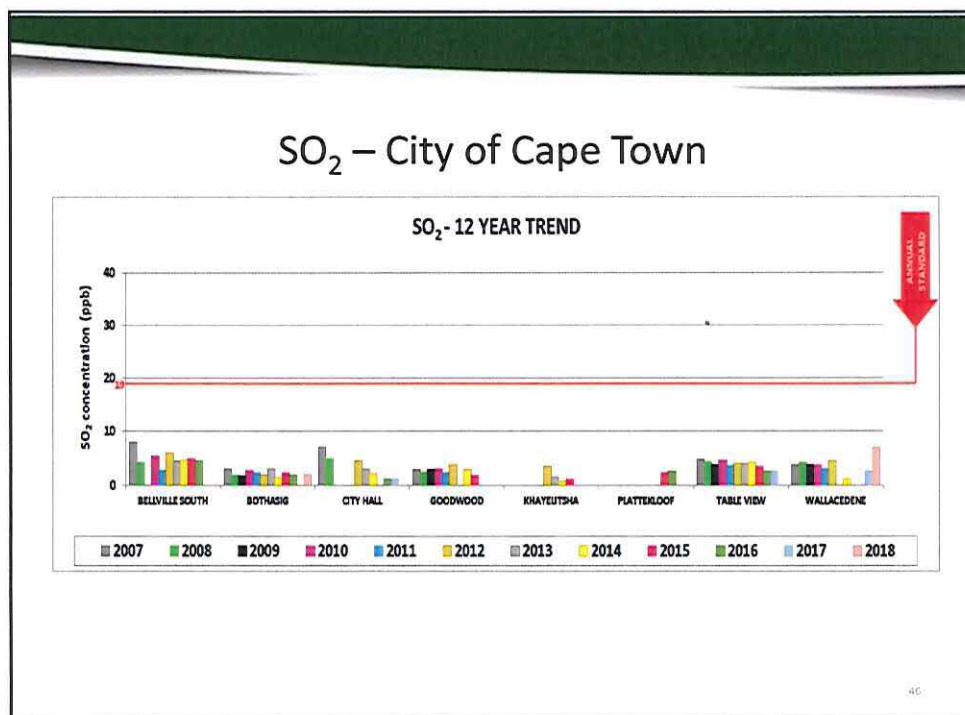
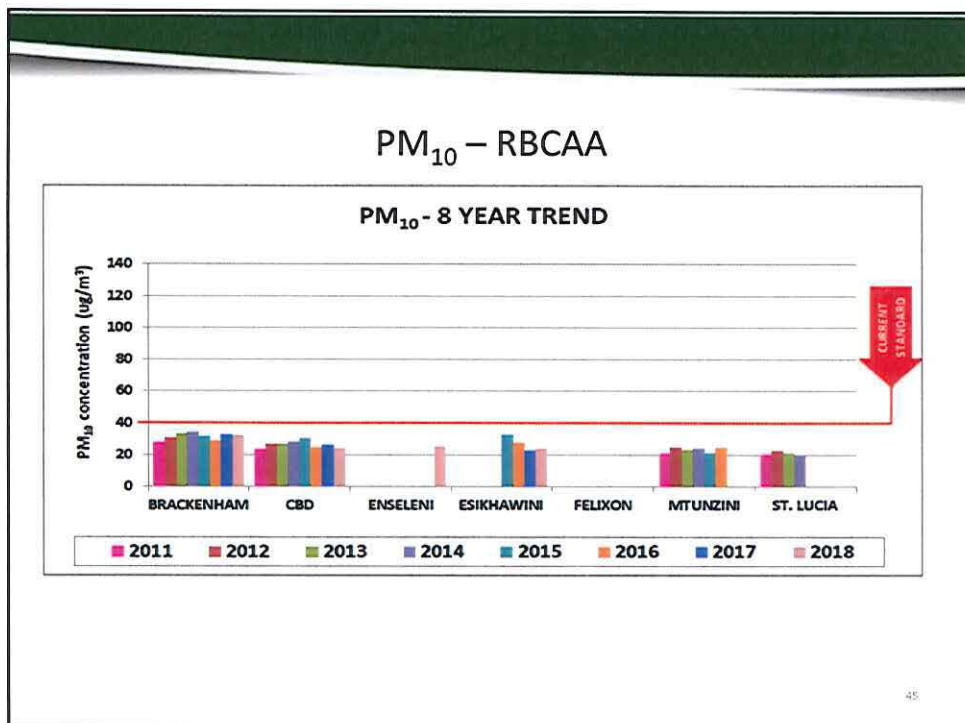
PM₁₀ – Western Cape Province

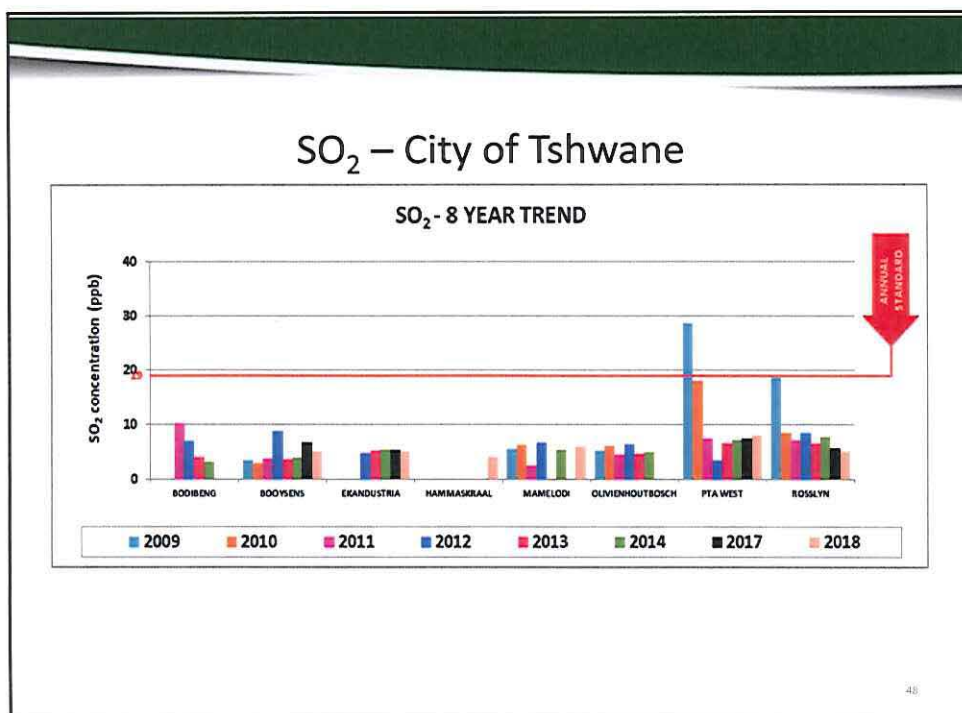
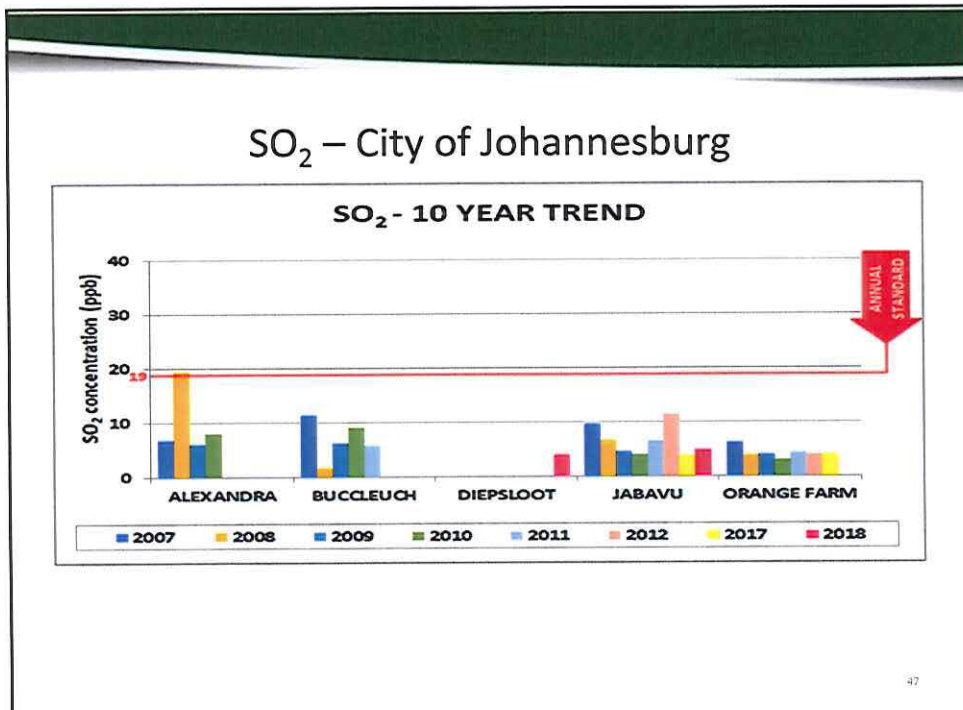


PM₁₀ – Mpumalanga Province

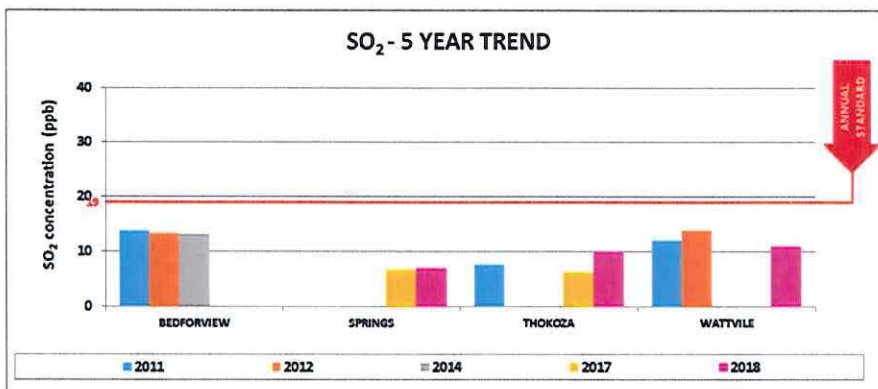






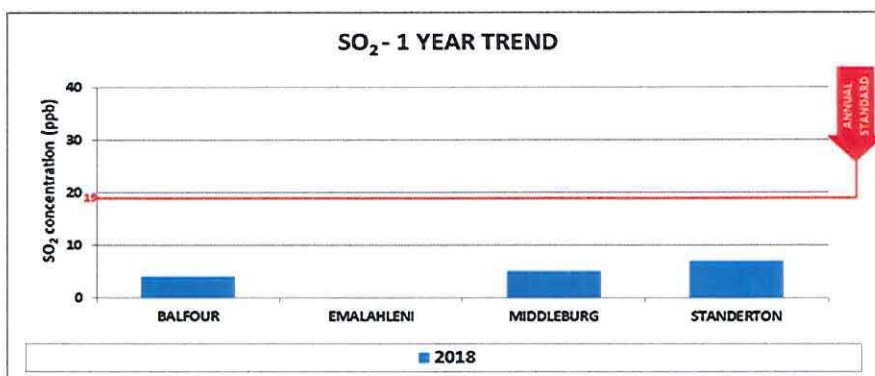


SO₂ – City of Ekurhuleni

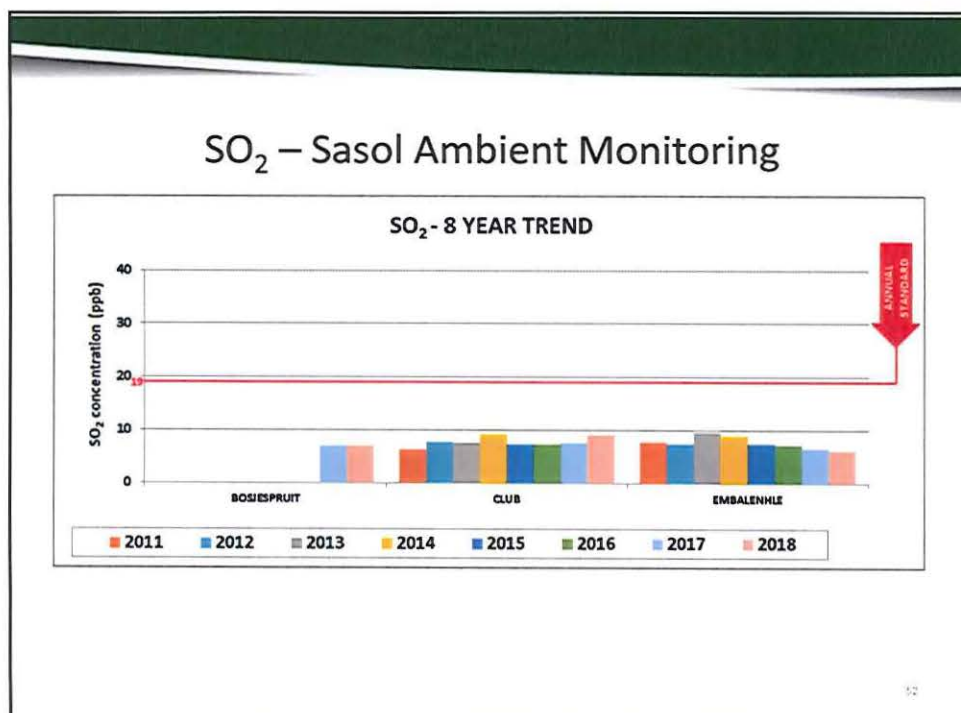
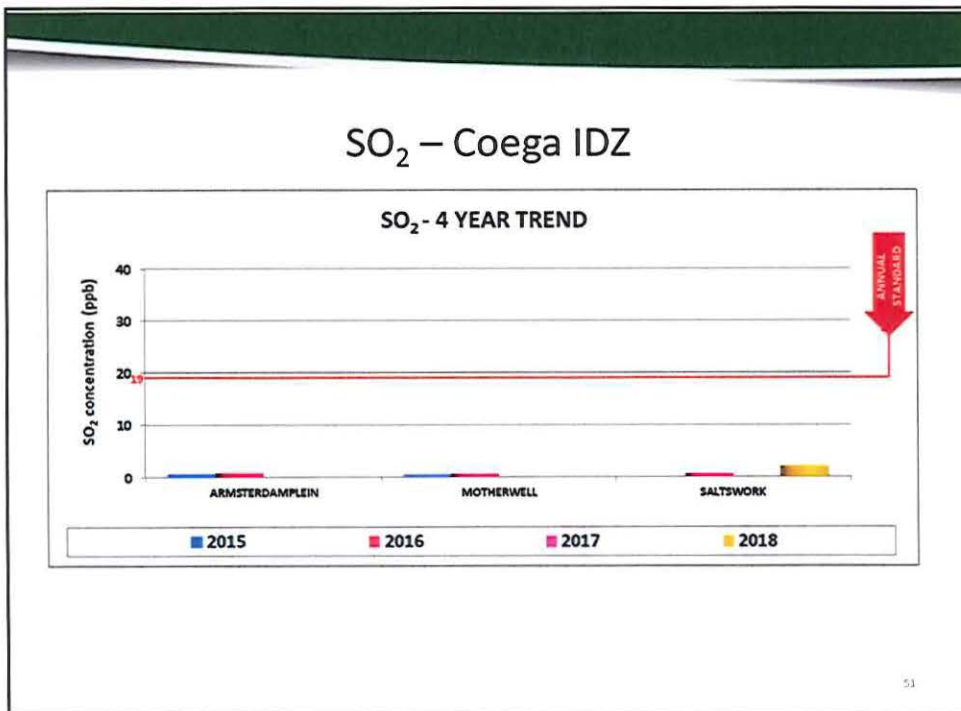


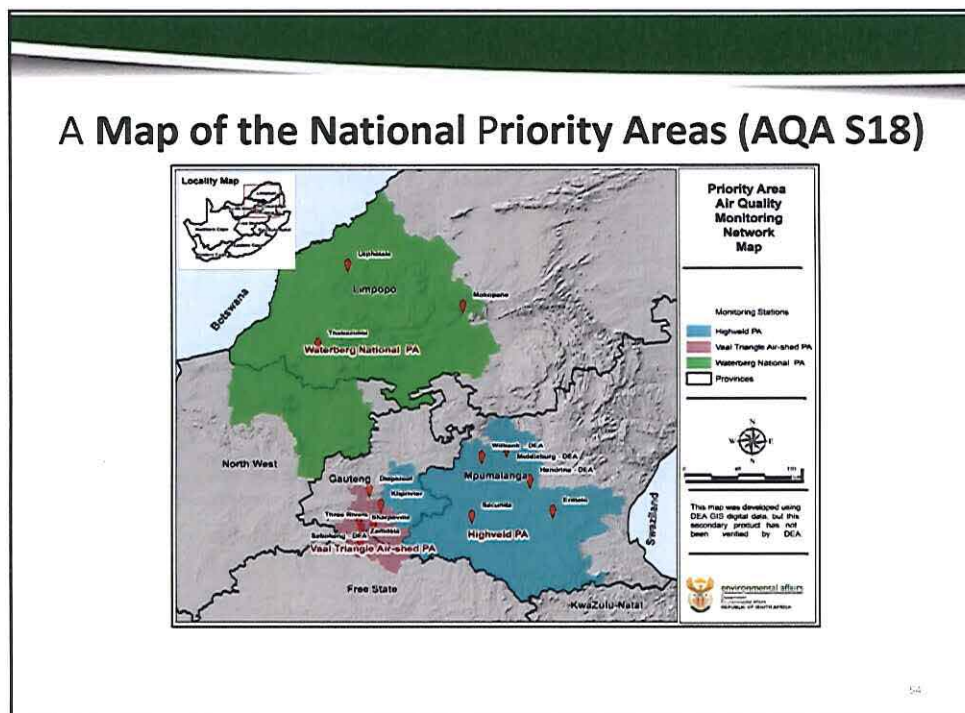
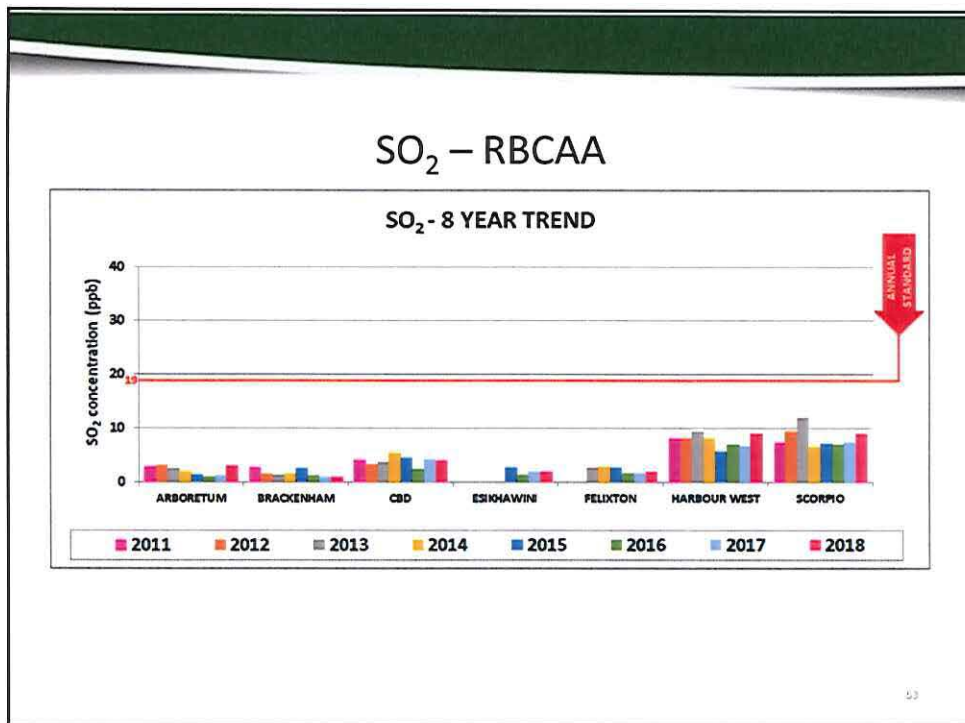
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SO₂ – Mpumalanga Provincial Stations

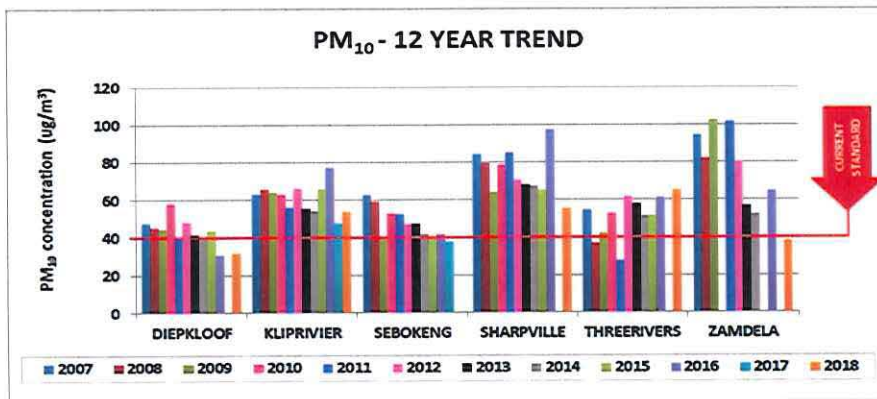


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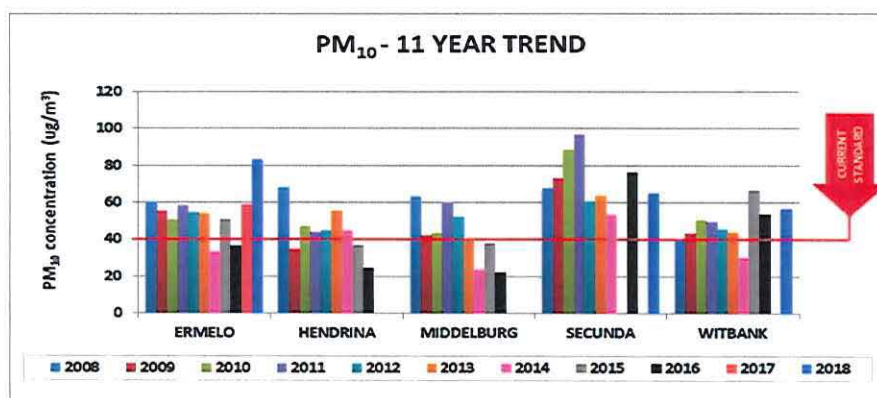


PM₁₀ – Vaal Triangle Airshed Priority Area (VTAPA)



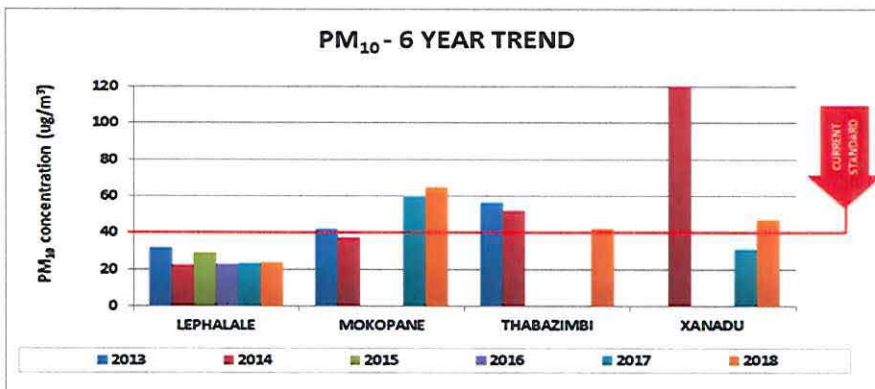
55

PM₁₀ – Highveld Priority Area (HPA)



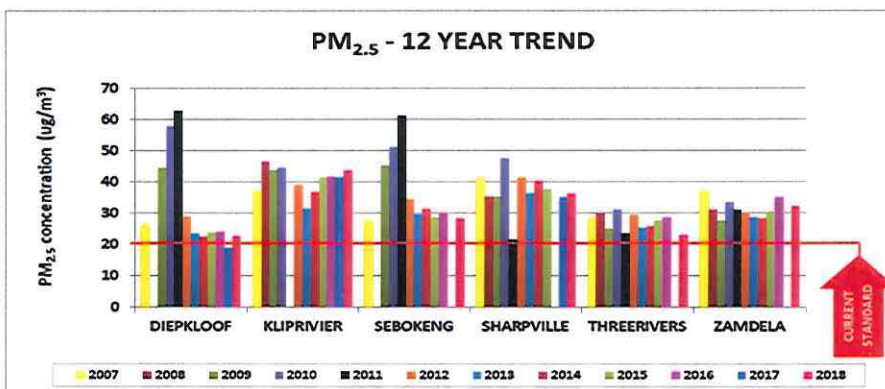
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PM₁₀ – Waterberg-Bojanala Priority Area (WBPA)

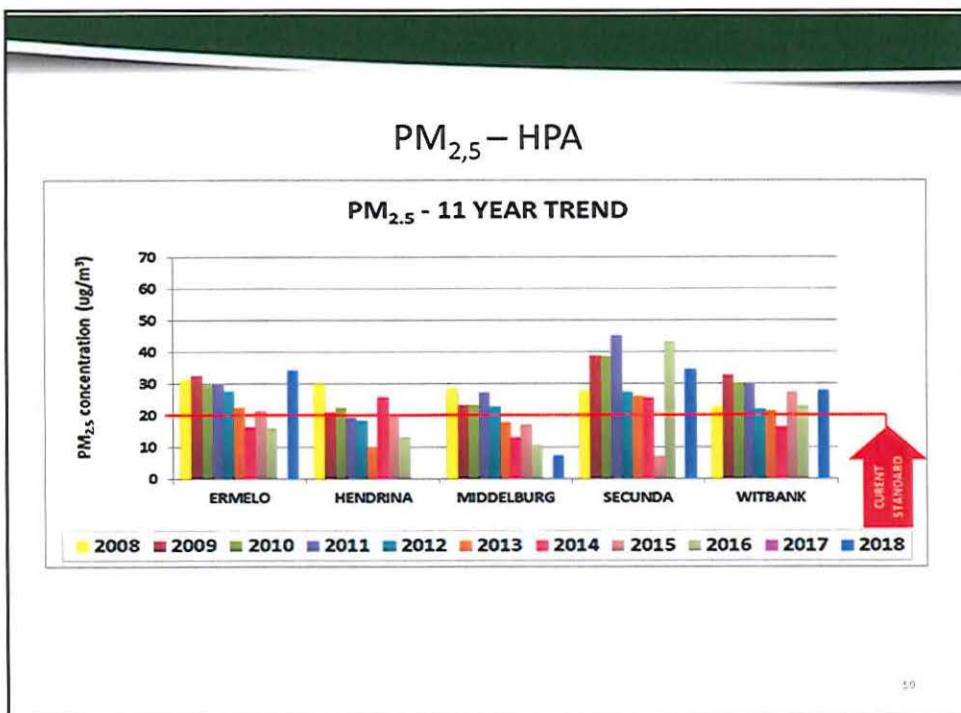


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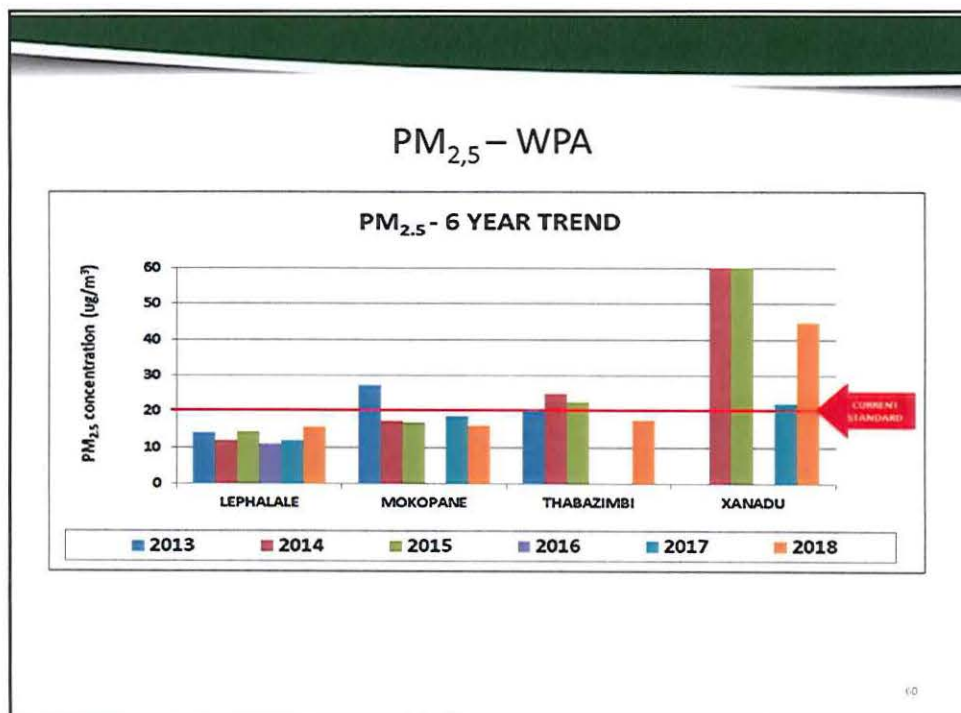
PM_{2,5} – VTAPA



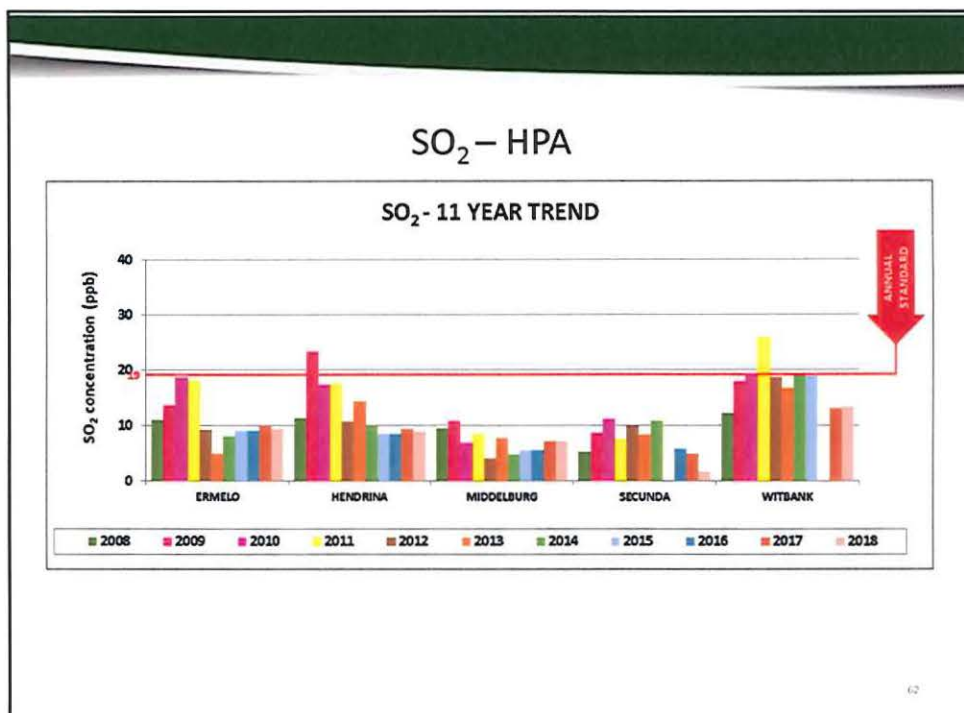
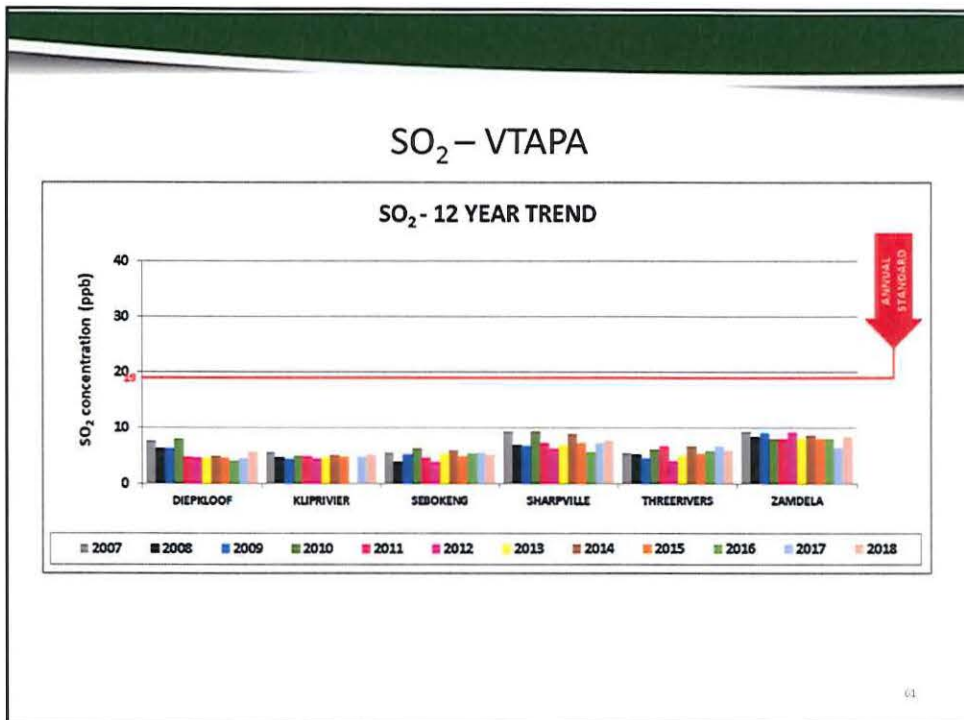
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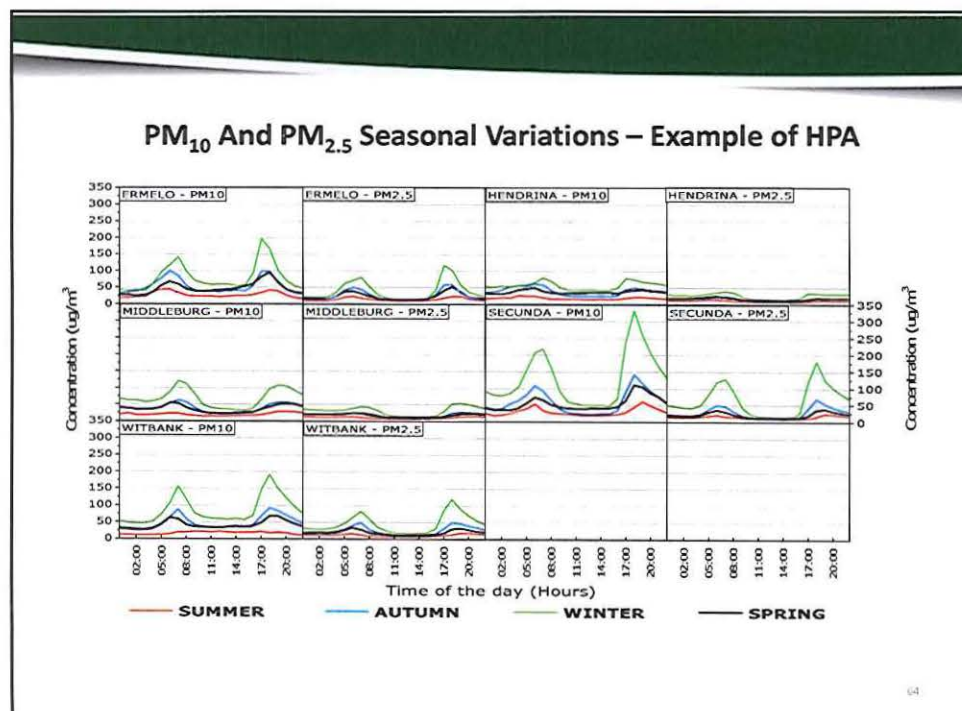
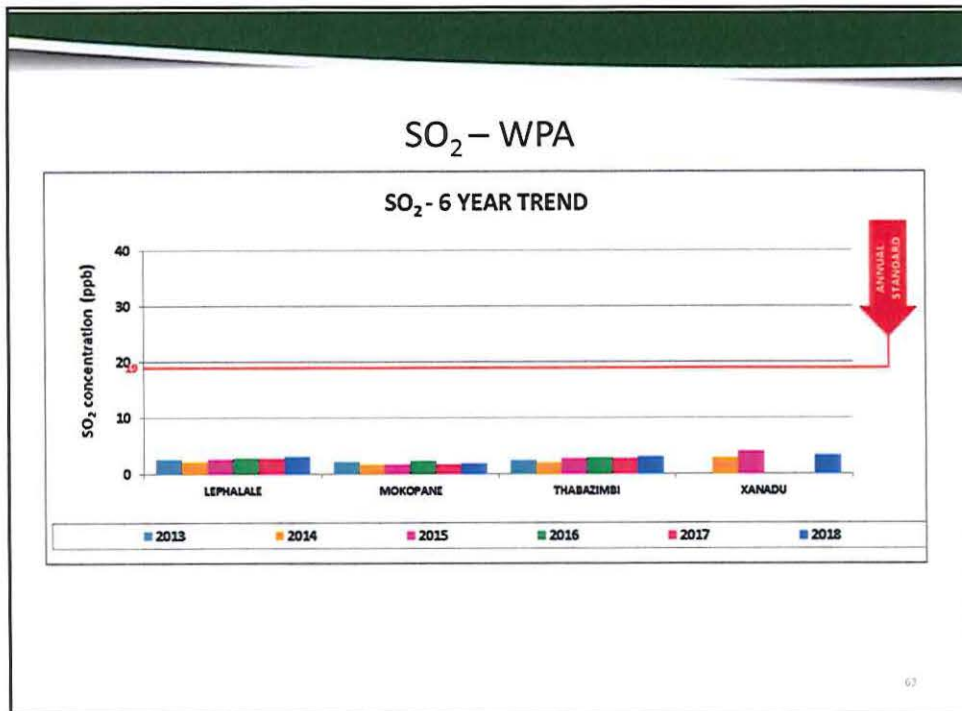


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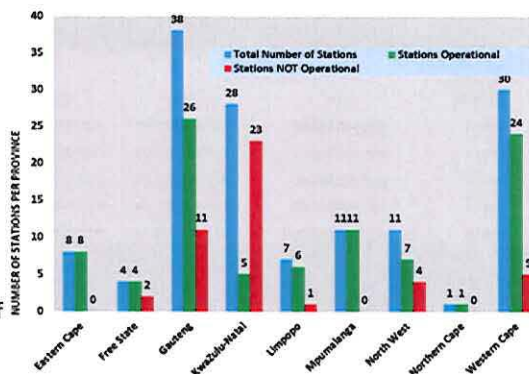
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Primary Challenges with Ambient Monitoring Stations

- Power failures – affect analysers and reduce data recovery
 - Solar panels – get stolen but also do not provide sufficient power for all the equipment
 - Generators will corrupt measurements
- Vandalism and security risks
- Lack of capacity to maintain the network at Municipality level
- Insufficient budget allocations – network requires between 10-15% of the capital investment annually for maintenance



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Interventions in Monitoring Networks Challenges

- **Power Failures** – installing Uninterrupted Power Supply (UPS) systems across stations to reduce equipment damage and improve data recovery during power failures
- **Vandalism and security risks** – adding armed response and additional security at stations
- **Capacity** – national intervention in managing 43 NAQI stations for a period of 5 years while building capacity at municipal and provincial level until 2022
- **South African Weather Service** - managing 18 priority area stations since 2011

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Cost of Maintaining the Current NAAQMN (5 year)

	Cost of Managing a Stations Per Year (at 370K per station per year)	Technician Salaries (R300k per annum)	Data Analyst Salaries (at R300k per annum)	Chief Technician/Manager (at R700k per annum)	Vehicle Costs (Initial Costs)	Total Operational Budget per annum
Numbers across the country networks	134	36	25.00	8.00	12	
Year 1	R49 580 000.00	R10 800 000.00	R8 750 000.00	R5 600 000.00	R7 800 000.00	R82 530 000.00
Year 2	R54 538 000.00	R11 880 000.00	R9 625 000.00	R6 160 000.00		R82 203 000.00
Year 3	R59 991 800.00	R13 068 000.00	R10 587 500.00	R6 776 000.00		R90 423 300.00
Year 4	R65 990 980.00	R14 374 800.00	R11 646 250.00	R7 453 600.00		R99 465 630.00
Year 5	R72 590 078.00	R15 812 280.00	R12 810 875.00	R8 198 960.00		R109 412 193.00
Total Over the 5 Years	R302 690 858.00	R65 935 080.00	R53 419 625.00	R34 188 560.00	R7 800 000.00	R464 034 123.00
Total Over 5 Years	R303mil	R66mil	R54mil	R34mil	R7.8mil	R464mil

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Proposed Approach for Future Stations Management

- In view of challenges identified as well as the prohibitive costs of maintaining stations, it is recommended that the following approach be considered:
 - Government maintains the current NAAQM and keeps it functional and meeting minimum data requirements – as these are already heavy investments.
 - There are low-cost devices with far less maintenance requirements can purchase and install in areas where there is no monitoring.
 - Only in the event that low cost monitors record high levels of pollutants – necessary investments on instruments that constitute approved methods for reporting compliance may then be purchased and installed

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