



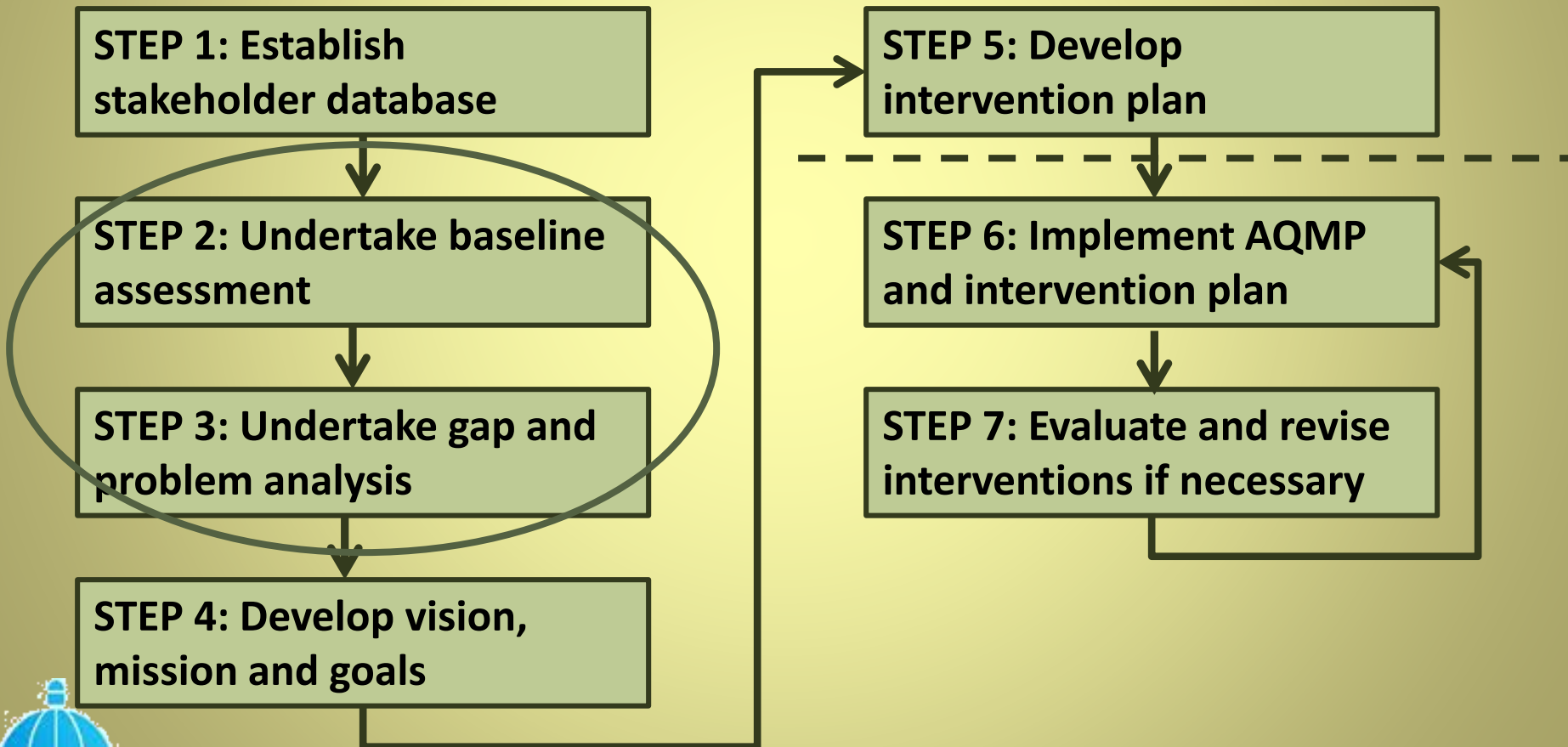
Assessment, Evaluation, Review and Updating of the Air Quality Management Plan (AQMP) for eThekweni

Air quality status quo

19, 20 and 26 May 2015



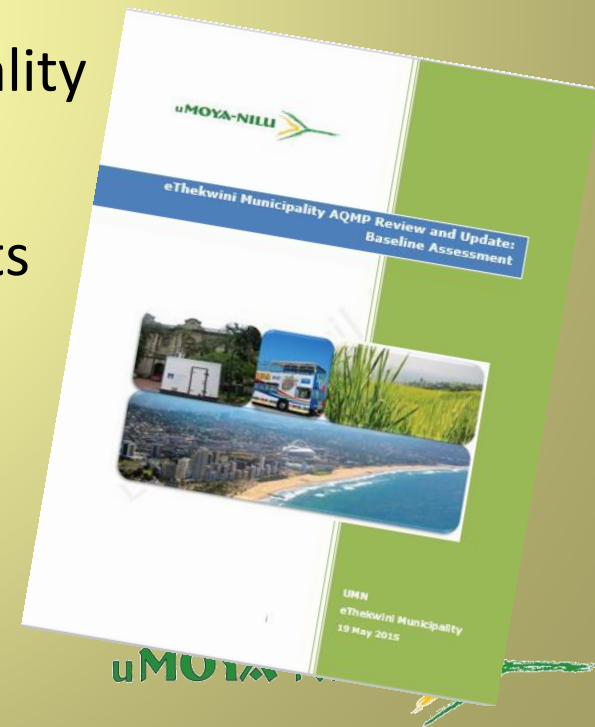
The AQMP development process





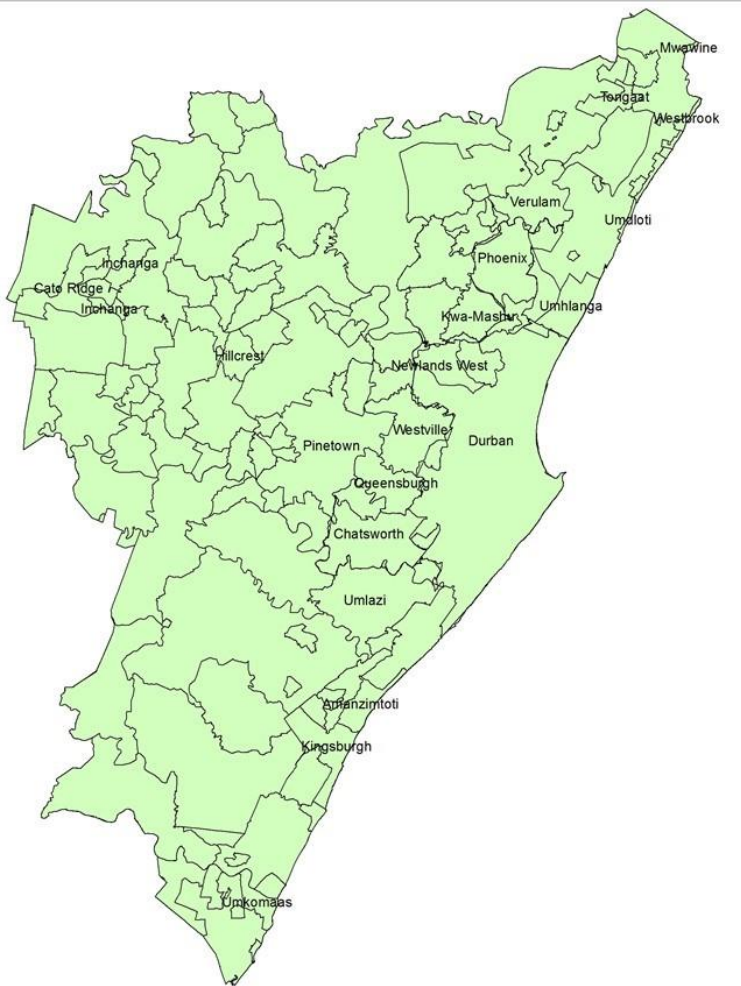
Status Quo Assessment Report

- The most comprehensive air quality baseline study to date for eThekweni
- Includes:
 - Contextual information important to air quality
 - Comprehensive inventory of emissions
 - Ambient monitoring data and model outputs
 - Capacity assessment
 - Potential effect of proposed development
 - Gaps, issues, problems, challenges





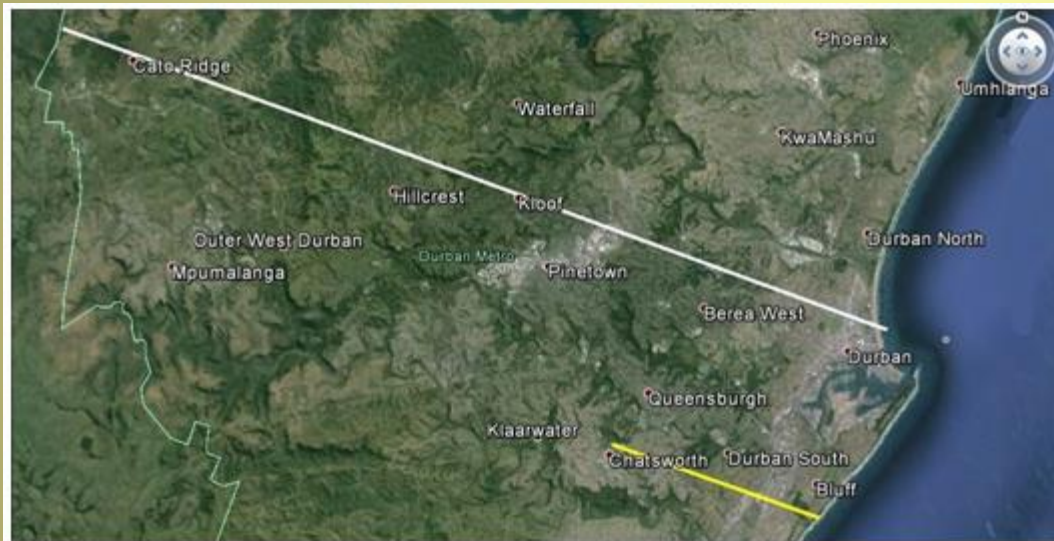
About eThekweni



- The only A-municipality in KZN
- Covers 2 295 km²
- Tongaat to Umkomaas, west to Cato Ridge
- Population of 3.5 million
- 103 municipal wards
- Port of Durban
- Major manufacturing hub
- Tourist destination



Topography of eThekweni

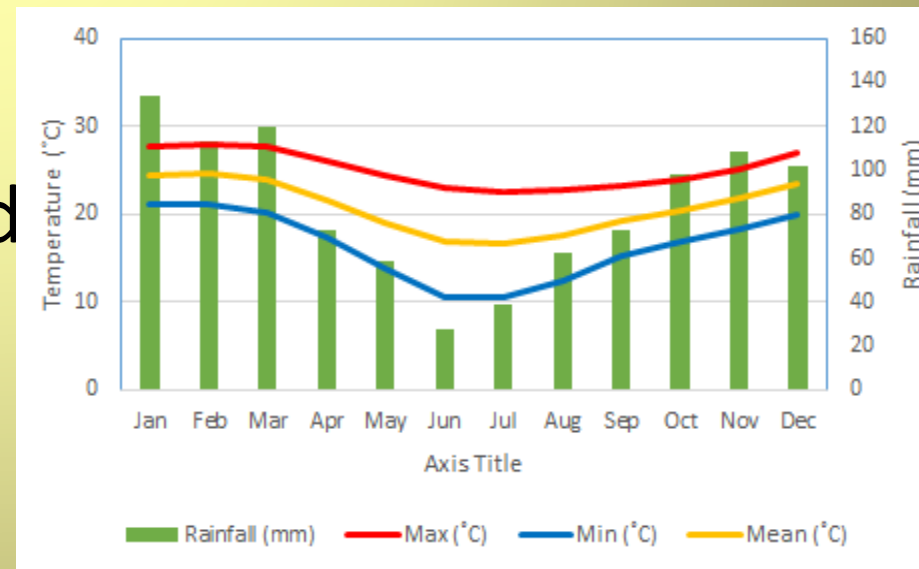
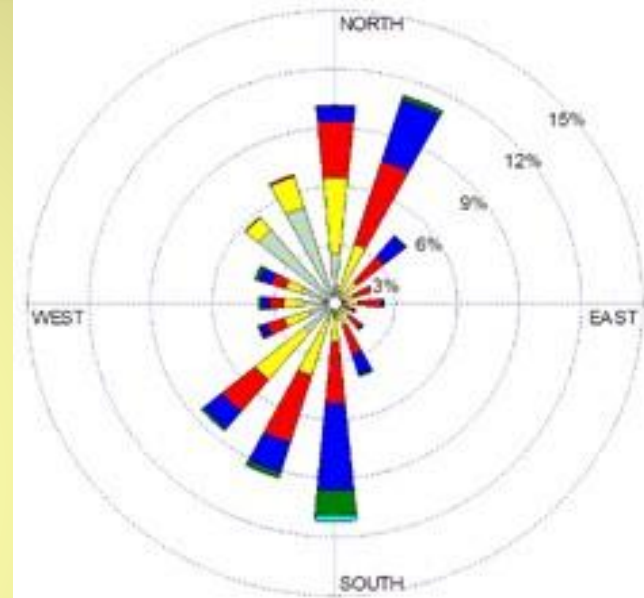


- Two marked ridges on the coast
- General increase in elevation westward
- Channelling effect along the coast
- Limits westward movement
- Promotes eastward drainage



eThekweni's climate

- Sub-tropical climate
- Warm summers, mild winters
- Rainfall in summer
- High frequency of moderate to strong wind
- Good air pollution dispersion potential





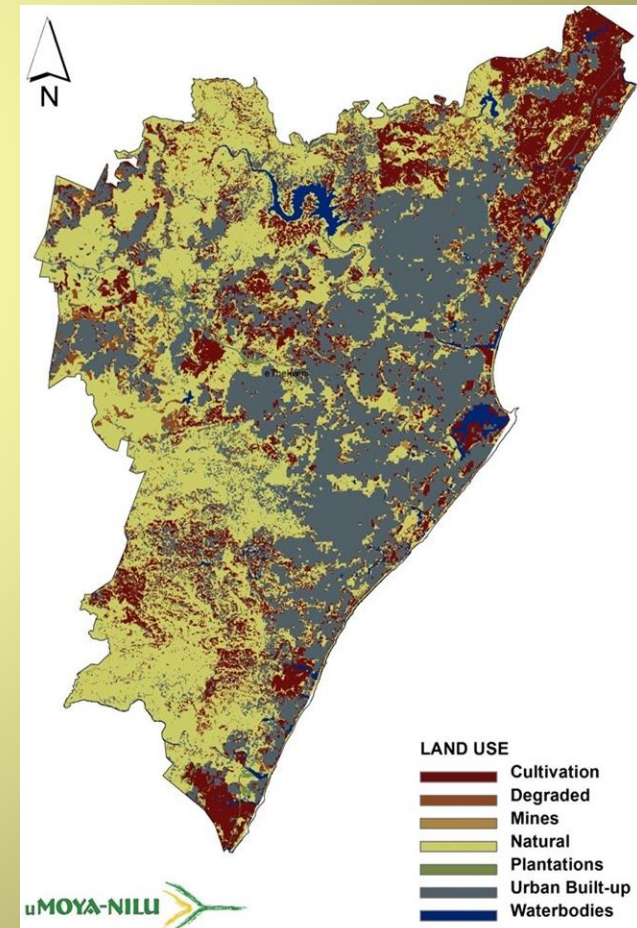
Durban health study (2004-2006)

- 12% of children in the south had persistent asthma, somewhat higher than the north
- Marked airway hyper-responsiveness was 3-fold higher in the south than in the north
- Adjusting for other causes of poor health, exposure to the air pollutants caused poorer lung function, worse in children with persistent asthma or a genetic profile for asthma
- The health status has since not been updated



Socio-economic status

- Population of 3 442 361 (Census 2011)
 - 33% northern regions
 - 34% central regions
 - 22% southern regions
 - 10% outer west
- 956 713 households
- 90% are electrified





Emissions vs Ambient Concentrations





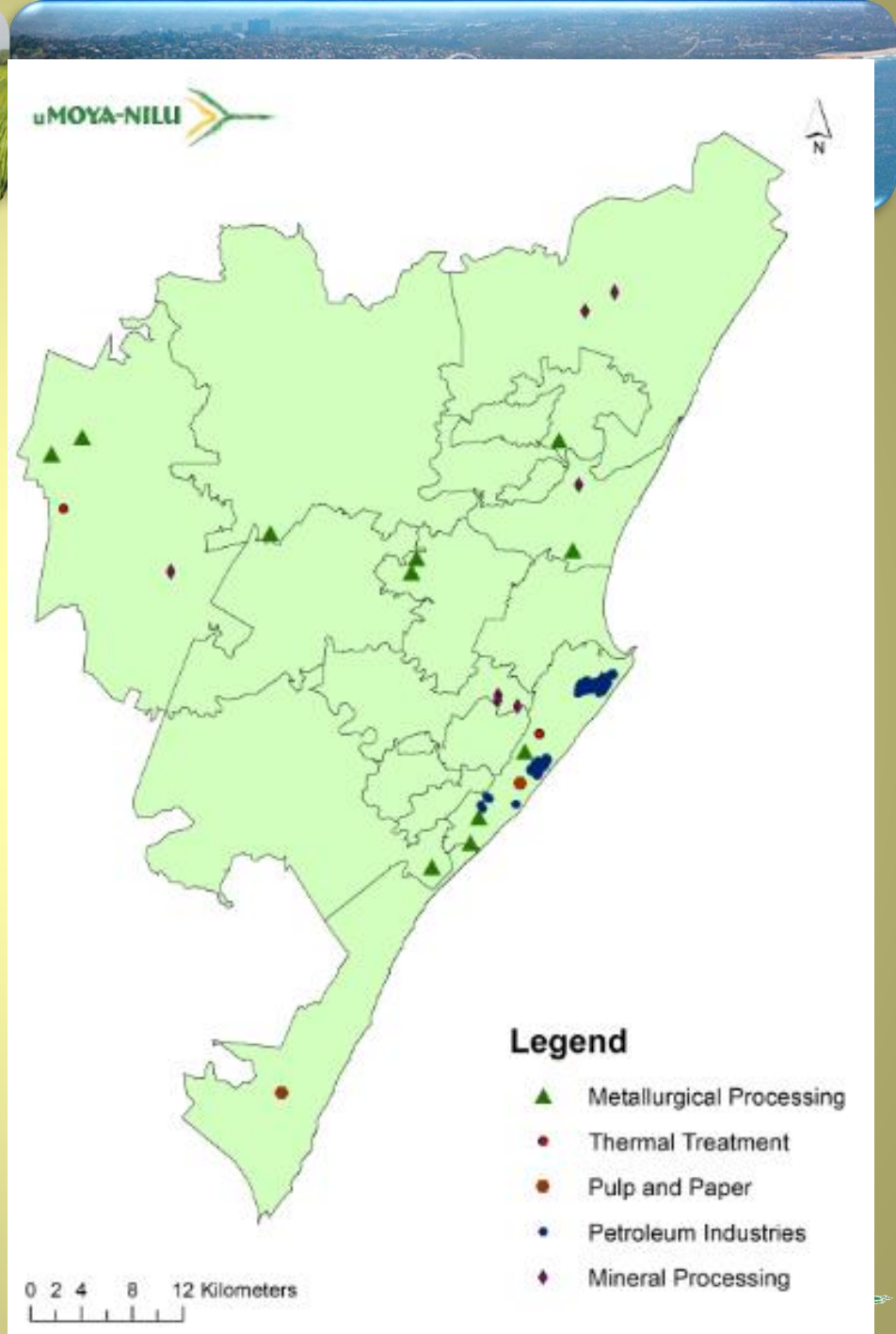
Emissions

- ***Emissions*** refer to pollutants released into the atmosphere
- Documented in an ***emission inventory***:
 - **Sources** (Industry, vehicles, port, KSIA, residential fuel, biomass burning, quarrying)
 - **Pollutants** (SO_2 , NO_x , particulates, CO, VOC)
 - **Location** (eThekweni Municipality)
 - **Gaps** (Waste management, biogenic emissions)



Listed Activities

- Industrial sources that require an AEL
- 85 facilities currently hold an AEL in eThekweni
- AELs and emission testing reports used for emission estimates
- Gaps – AELs not yet issued to all Listed Activities





Emissions in tons per year

Listed Activity	SO ₂	NO _x	CO	PM ₁₀	VOC	Benzene
Combustion installations	1 745	331	218	576	3	
Chemicals manufacture	32	95	22	12	1	
Metallurgical industry	2 321	1 660	904	566	15	
Mineral processing, storage and handling	882	133	401	109	177	
Petroleum industries	6 997	1 699	562	389	5 087	68
Pulp and paper	1 214	1 170	375	384	23	
Thermal treatment of waste	7	1	0	1	1	
TOTAL	13 197	5 090	2 482	2 036	5 307	68



Controlled Emitters

- Boilers < 50 MW, but > 10 MW heat input
- Regulated in terms of municipal by-law
- 13 facilities, operating 33 boilers
- Emission estimates using fuel consumption and type and emission factors
- Gaps – Database does not yet included all facilities

Emissions in tons per year				
SO ₂	NO _x	CO	PM ₁₀	VOC
5 845	895	425	1 055	2.4



Fuel Burning Appliances

- Refers to boilers < 10 MW heat input
- Regulated in terms of Scheduled Trade Permit
- 98 facilities operating 135 FBA
- Fuels include coal, HFO, LFO, diesel, kerosene, paraffin, wood and gas
- Gaps – Database does not yet included all facilities



Motor Vehicle Emissions

- Based on 2014 eNATIS registered vehicle data
- Motorcycles, passenger cars, LDVs, buses, HDVs
- Unleaded fuel, LRP, diesel
- Emissions estimated for licensing districts, not at street level



Emissions in tons per year

Licensing district	NO _x	SO ₂	PM ₁₀	NMVOC	Benzene
Amanzimtoti	4 752	108	159	1 261	1
Camperdown	1 306	29	43	514	2
Durban	41 501	976	1 556	16 828	24
Ndwewe	43	1	1	12	0
Pinetown	11 199	254	370	3 316	6
Umbumbulu	85	2	3	23	0
Umhlanga	4 194	96	138	1 241	2
Umlazi	1 490	34	48	412	1
Verulam	3 722	85	121	1 034	2
Total	68 292	1 585	2 439	24 642	38



Port of Durban

- Busiest port in Africa
- 21 km circumference
- 300 km of railway line, 4000 vessels per year
- Emission estimates based on 2010 activity
- Gaps – dated and generic information used





Emissions in tons per annum

Source	SO ₂	NO _x	PM	PM ₁₀	Benzene
Ships	5 187	6 520	733	-	
Commercial boats	7.6	115	12.6	-	
Motor vehicles	25	746	33	-	1.8
Locomotives	2.5	177		4.8	0.3
Boilers	268	30.1		15.7	
Storage piles	-	-	4.1	-	
Grain elevators	-	-	44.4	12.4	
Storage tanks					18.8
Total	5 490	7 588	827	32.9	20.9



King Shaka International Airport

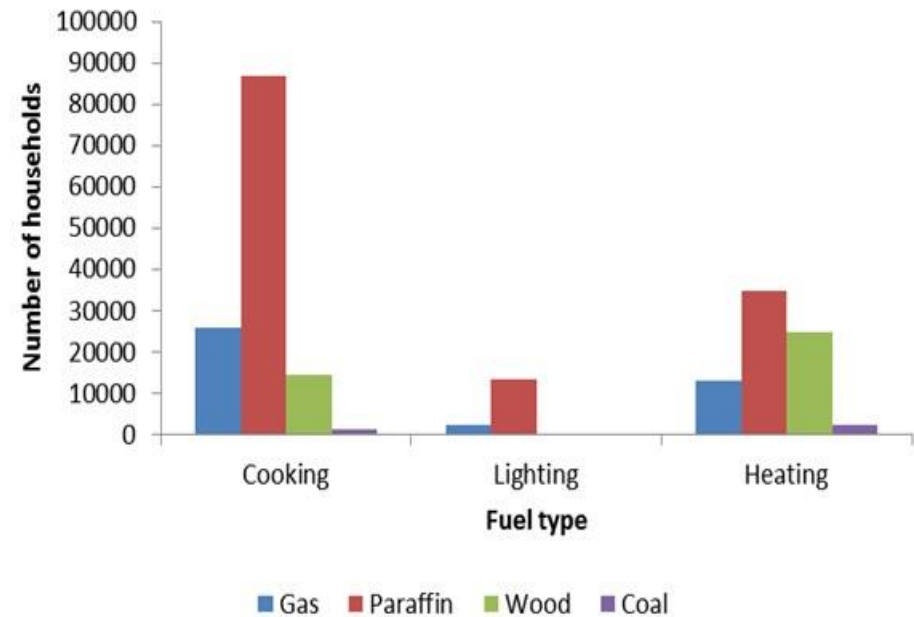
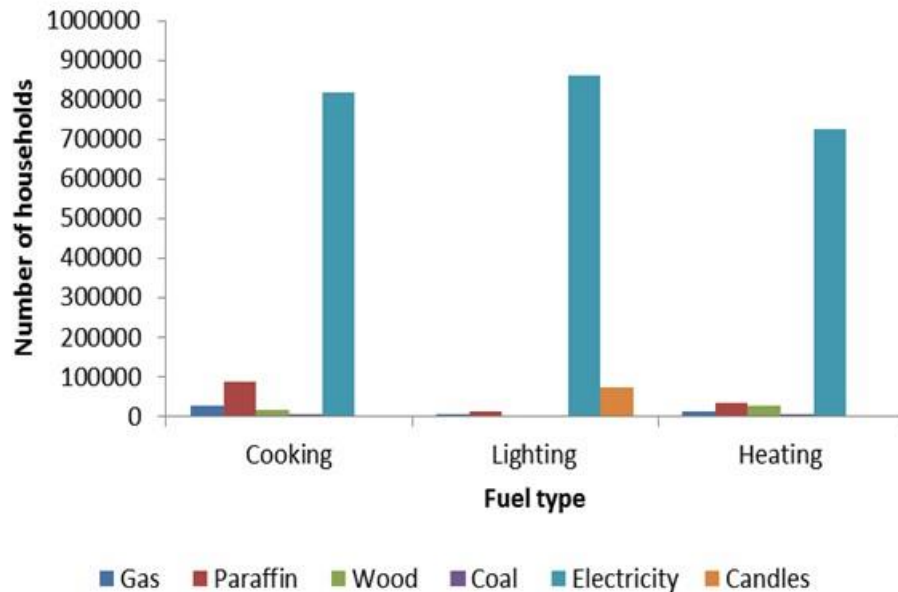
- 3rd busiest airport in the country
- 4.47 million passengers in 2013-2014
- 49 559 traffic movements
- Emission inventory by WSP in 2012

Emissions in tons per annum				
	NO _x	SO ₂	PM	HC
Aircraft	453.6	59.4	20.2	78.1
Vehicles	11.5	0.005	57.9	22.8
Fuel Storage				10.9
Generators	3.5	0.03	0.16	0.57
Total	468.6	59.4	78.3	112.4



Residential Fuel Burning

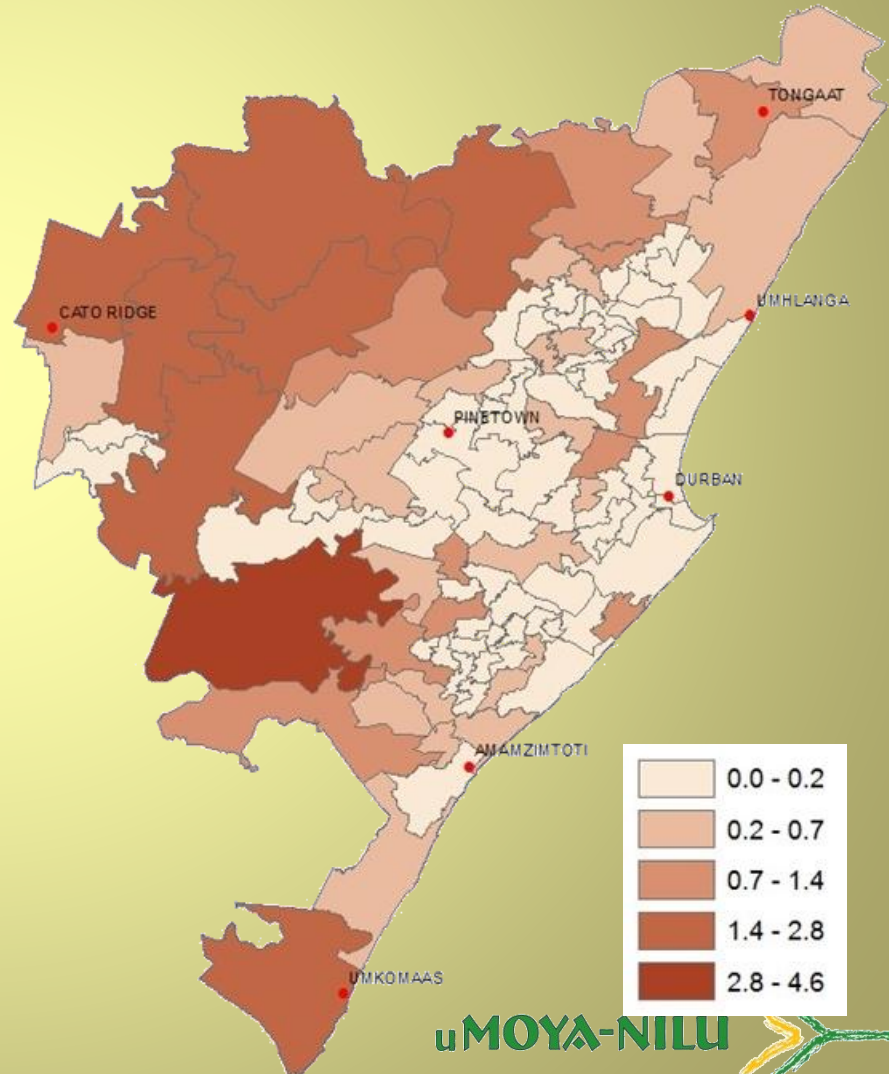
- 2011 Census energy use data
- Fuel use for cooking, lighting & space heating





Emission in tons per annum

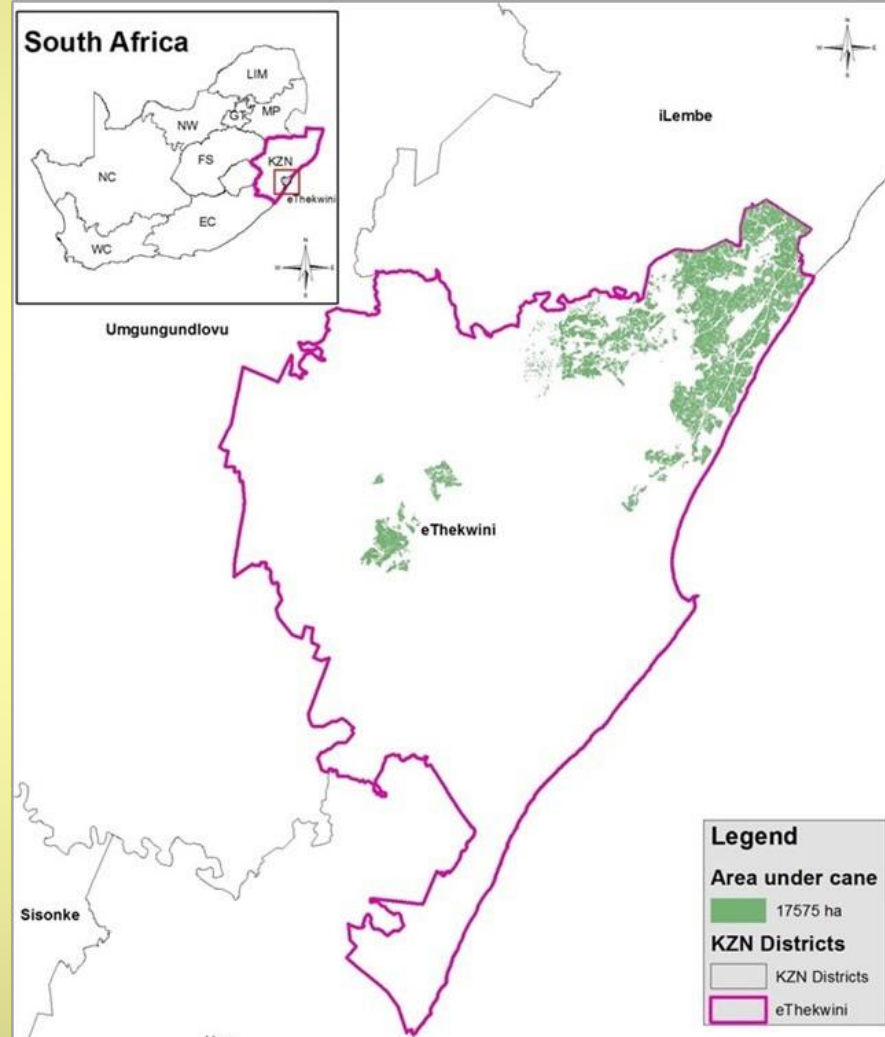
Fuel	SO ₂	NO _x	PM ₁₀
Gas	0.0	0.1	0.0
Paraffin	9.3	23.5	1.4
Wood	0.7	5.0	54.7
Coal	4.0	0.6	0.4
Total	14.0	29.2	56.5





Biomass Burning

- Refers to vegetation burning (controlled and uncontrolled fires)
- Assume all biomass burning is sugar cane
- Use area burnt, fuel load and emission factors



Emissions in tons per annum		
PM	NO _x	VOCs
68	25	151

A 4 000 MW power station emits up to 300 000 tons SO₂ per annum, eThekweni emission in 3 months

77 tons per year in Joburg from motor vehicles

ns (tons per annum)

Sectors	SO ₂	NO _x	PM ₁₀	VOC	Benzene
Listed Activities	97	5 090	2 036	5 307	68
Controlled emitters	45	895	1 055	2	
Residential fuels	4	29	56		
Motor vehicles	85	68 292	2 439	24 642	38
Port of Durban	490	7588	33	2 421	2 ¹
King Shaka IA	50	469	78 ²	112	
Biomass burning		25	68 ²	151	
Quarries			120 ²		
Total	26 191	82 388	5 885	32 635	108

1: Benzene from storage tanks included in Listed Activities

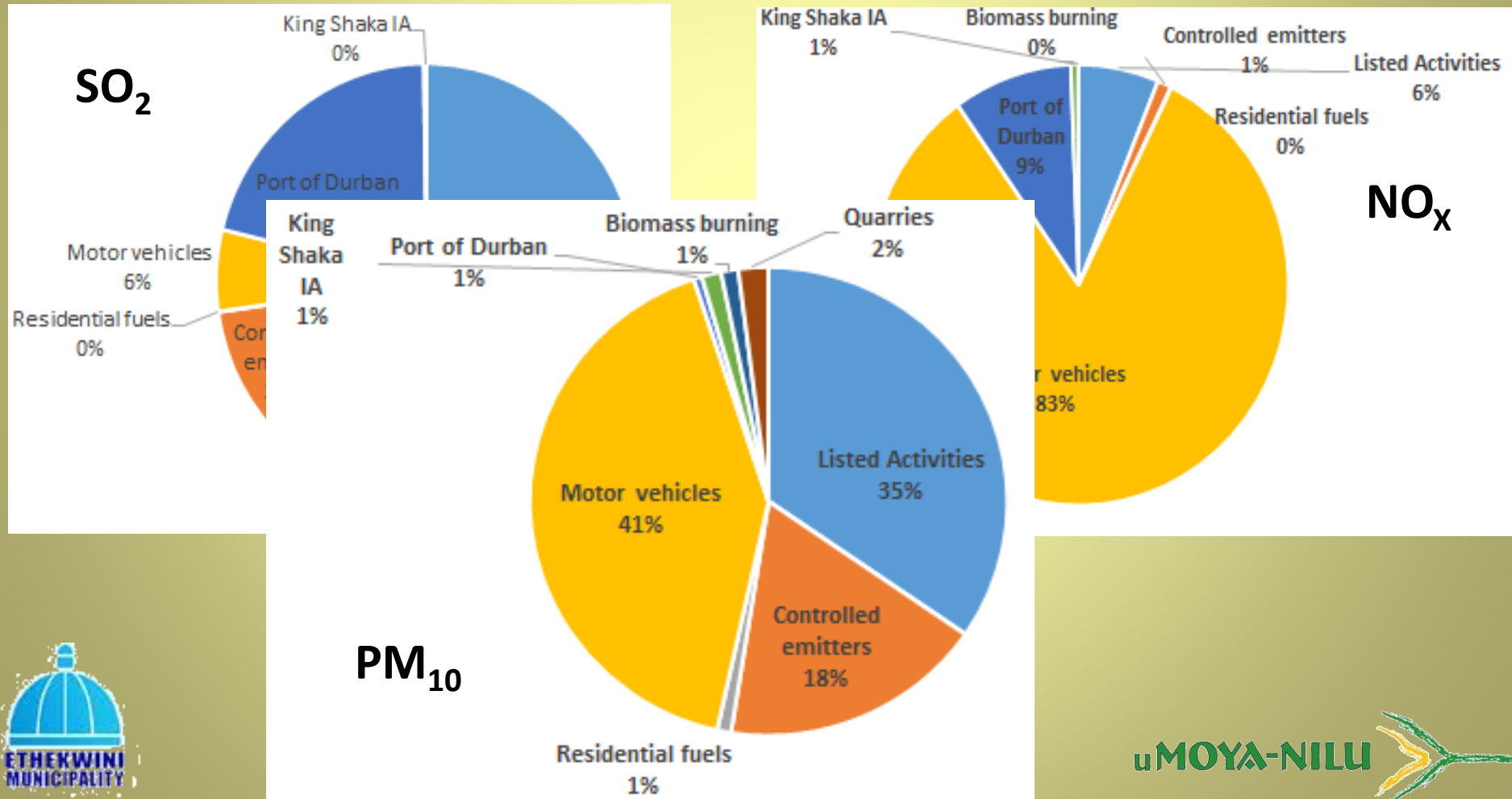
2: Total particulates

2nd highest metro in South Africa after Johannesburg

28 000 tons per annum in Rustenburg from mine tailings



Emission by sector





Ambient Air Quality

- The air that we breath
- Measured against the health-based NAAQS

Pollutant	Averaging Period	Limit value ($\mu\text{g}/\text{m}^3$)	Tolerated exceedances per annum
SO ₂	1 hour	350	88
	24 hour	125	4
	1 year	50	0
NO ₂	1 hour	200	88
	1 year	40	0
PM ₁₀	24 hour	75	4
	1 year	40	0
O ₃	8 hours	120	11
Benzene	1 year	5	0
Pb	1 year	5	0



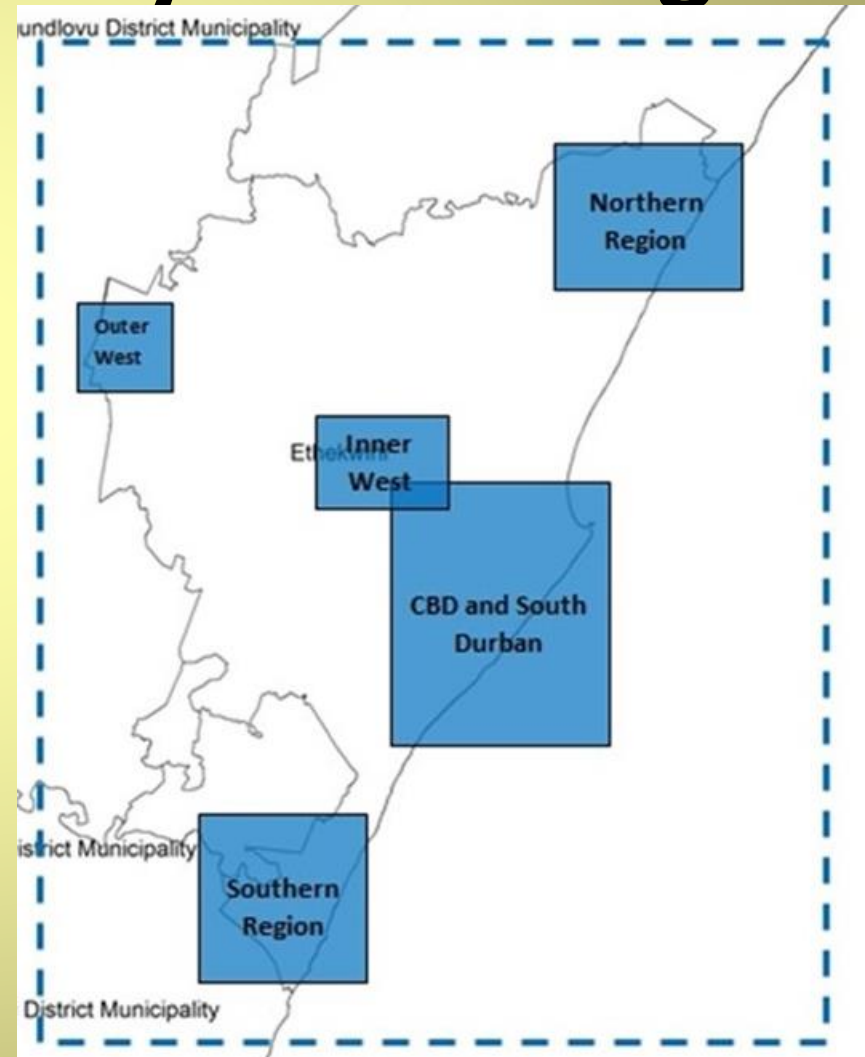
Ambient Air Quality Monitoring





Ambient Air Quality Modelling

- Augment monitoring
- Defined domains
- Included:
 - Listed activities
 - Controlled emitters
 - Port of Durban
 - KSIA



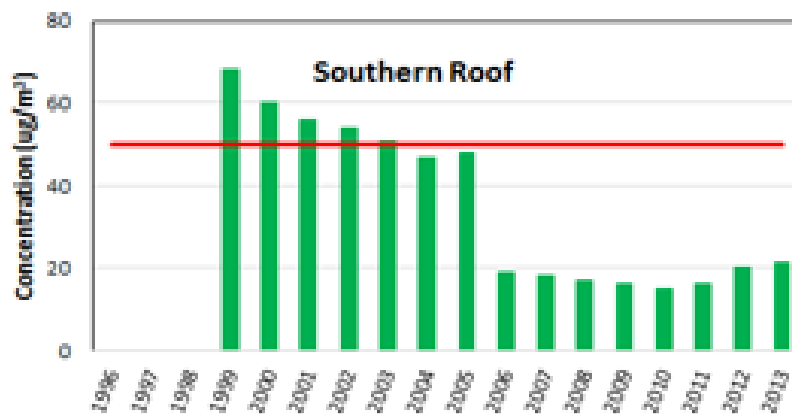
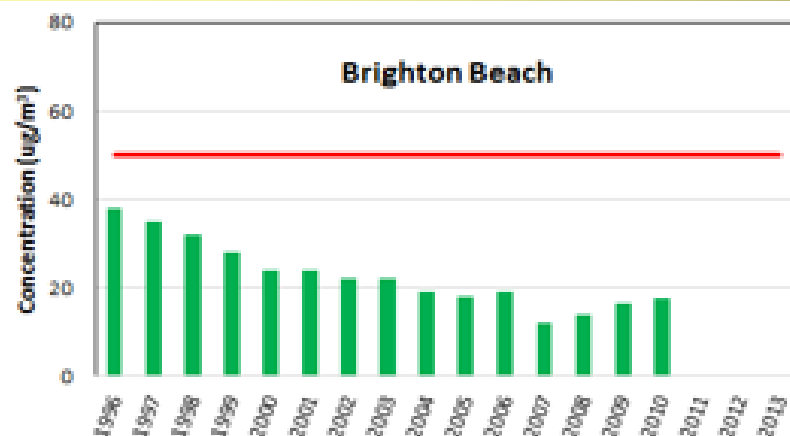
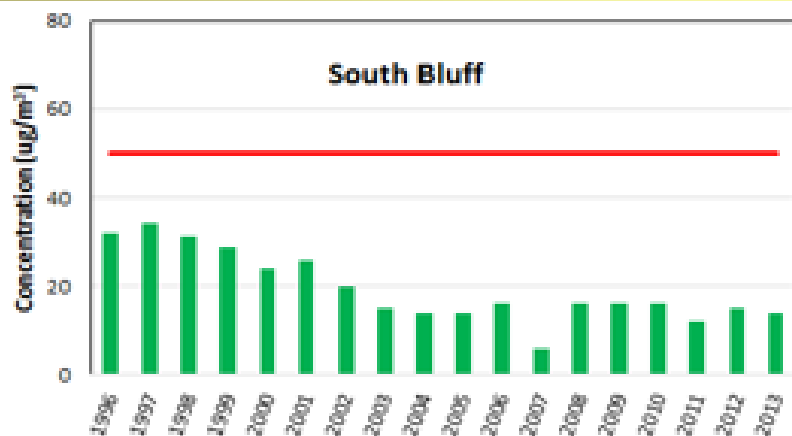


Sulphur dioxide (SO₂)

- Sulphur is a component of fossil fuels
- SO₂ is produced when these are combusted
- More than 26 000 tons emitted annually
- 73% by industry, 21% by the Port

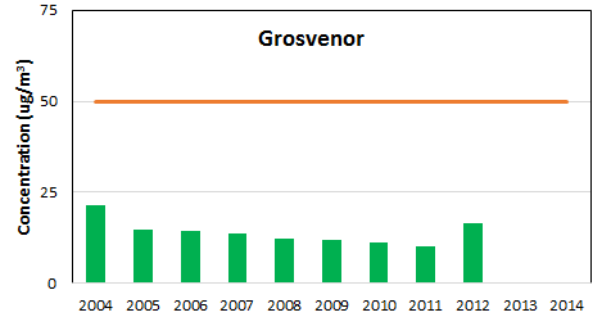
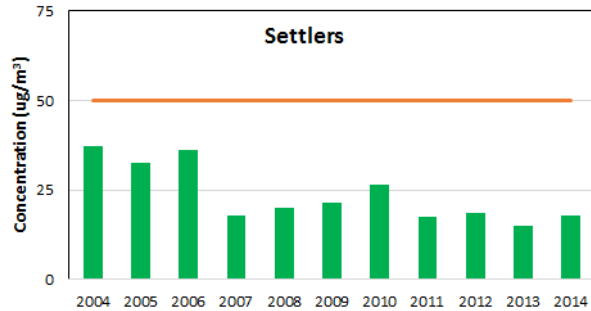
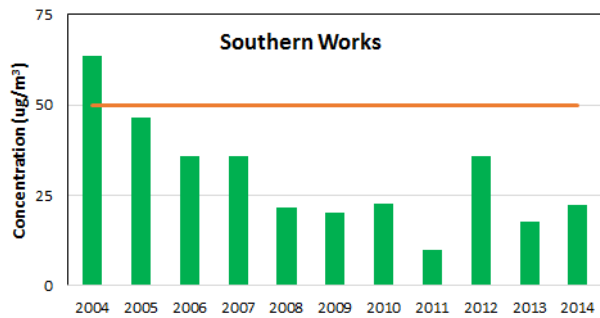
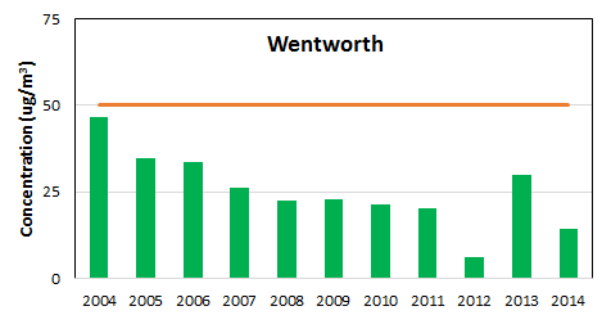
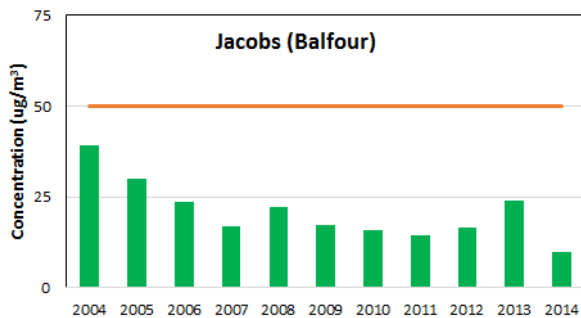
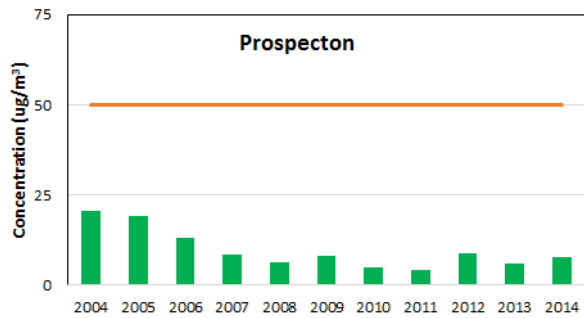


Annual SO₂ concentrations Bubblers



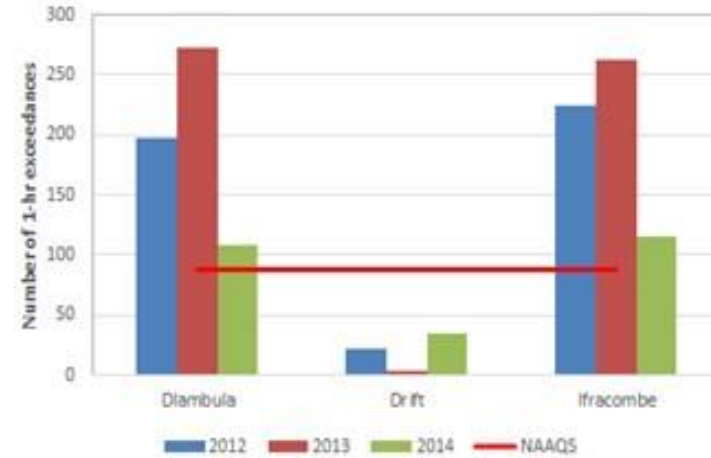
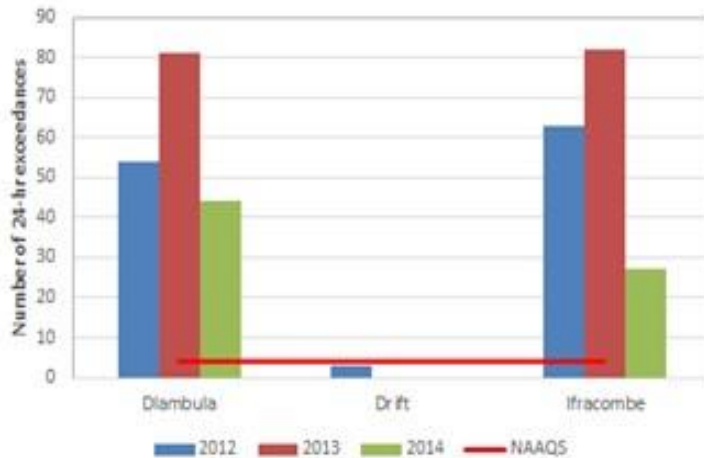
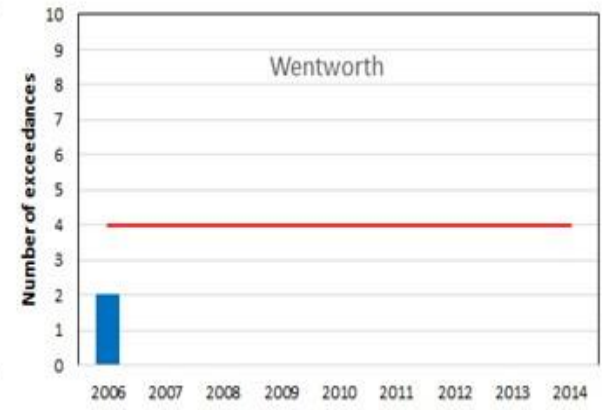
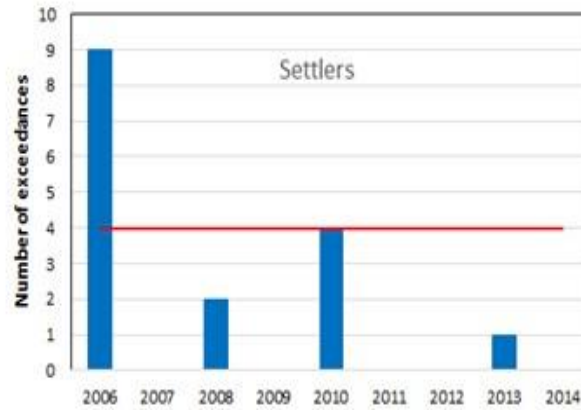
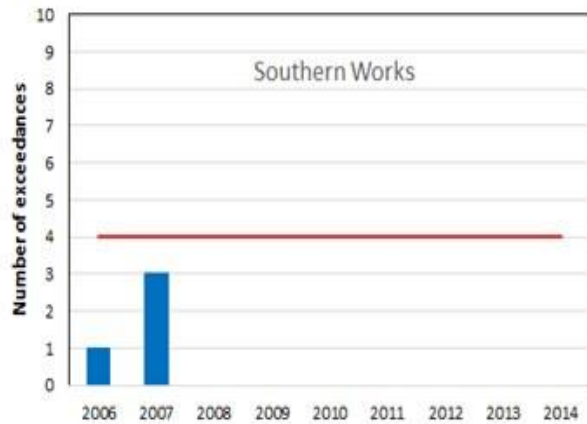


Annual SO₂ concentrations Continuous





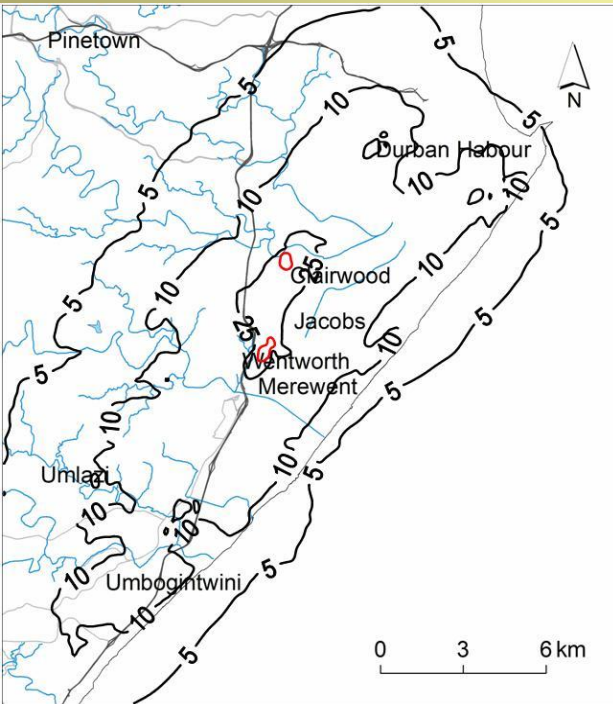
24-hour exceedances



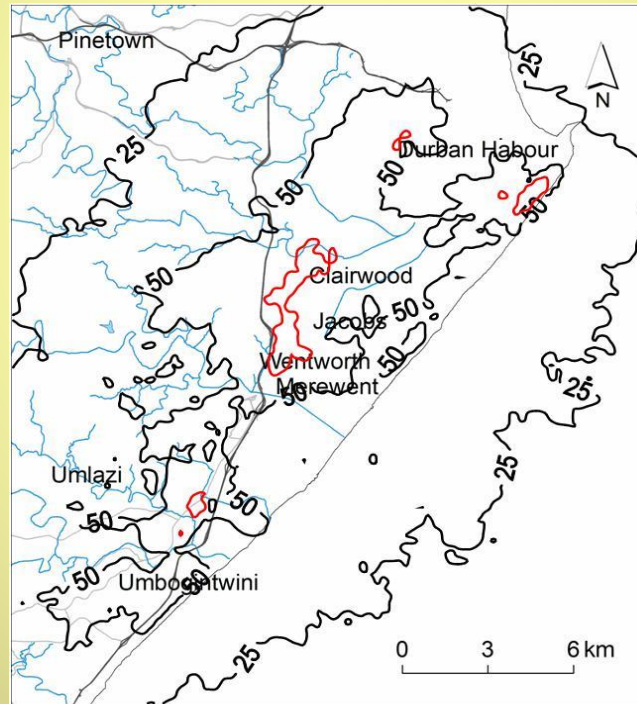


Modelled SO₂

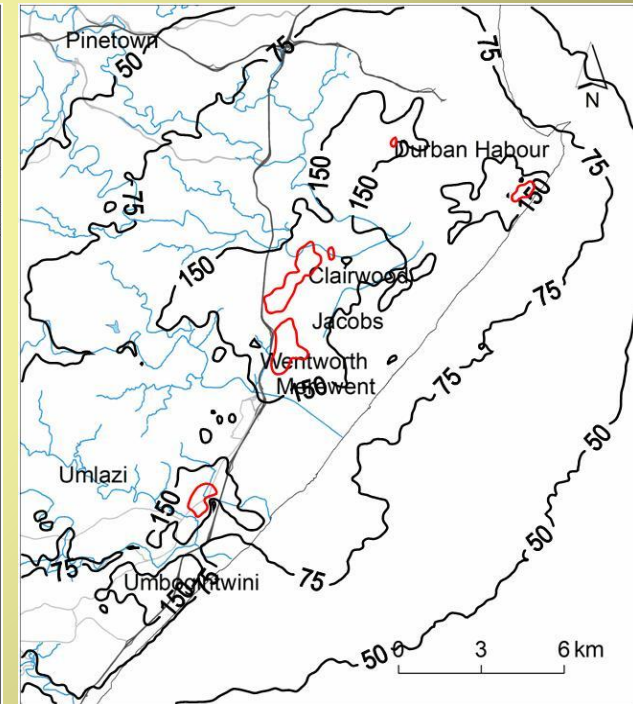
Annual



24-hour



1-hour





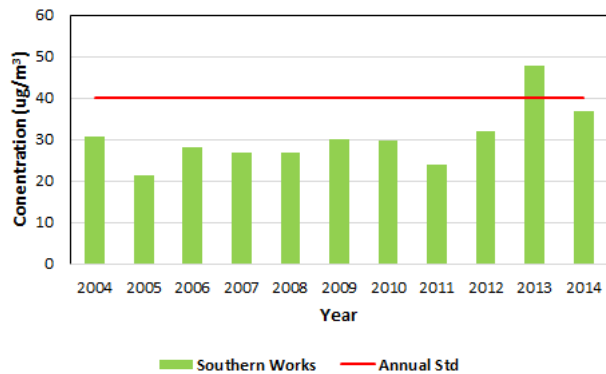
Nitrogen dioxide (NO₂)

- Product of high temperature combustion
- More than 82 000 tons emitted annually
- 83% by vehicles, 9% by the Port, 6% industry

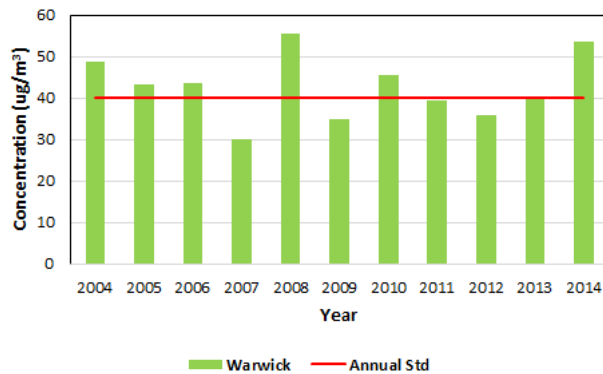


Annual NO₂ concentrations Continuous

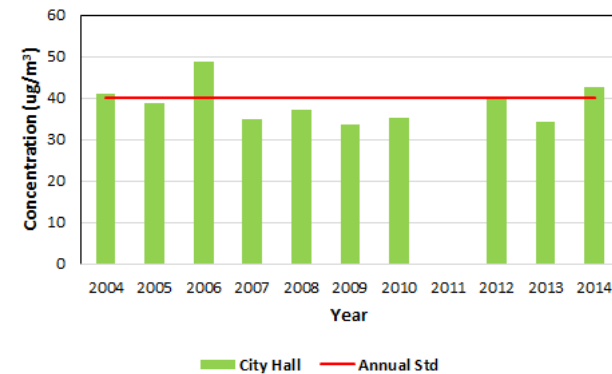
Southern Works



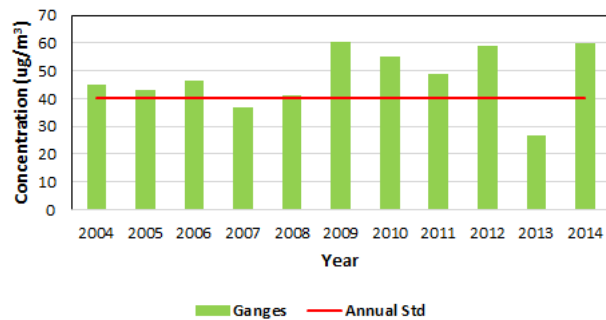
Warwick



City Hall



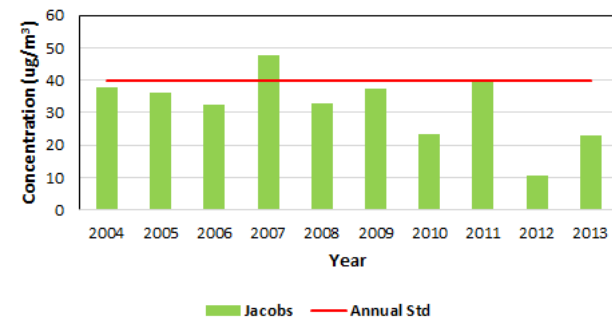
Ganges



Wentworth

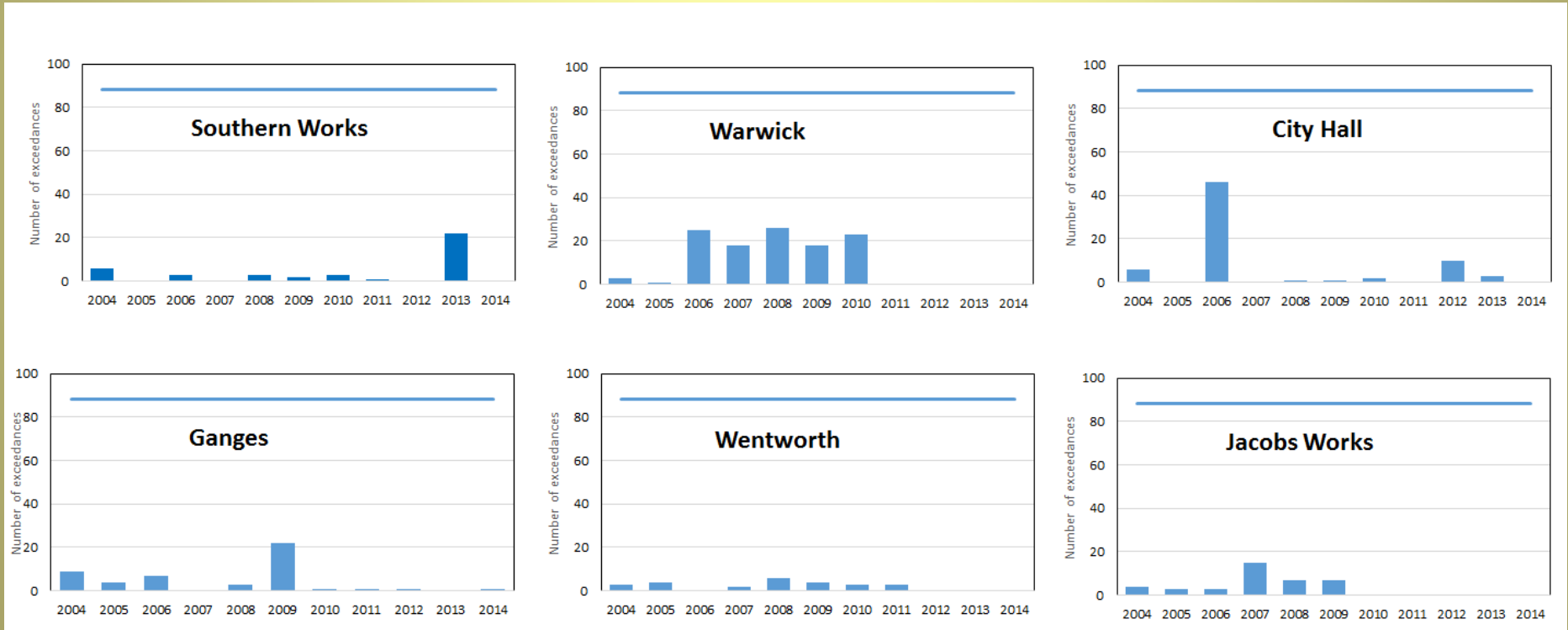


Jacobs





NO₂ 1-hour exceedances



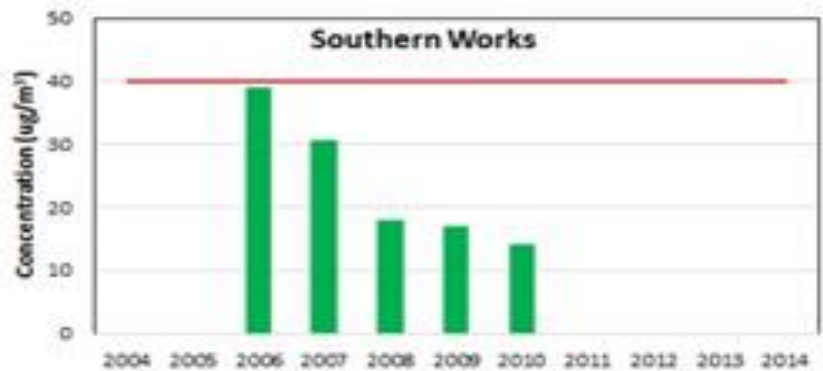
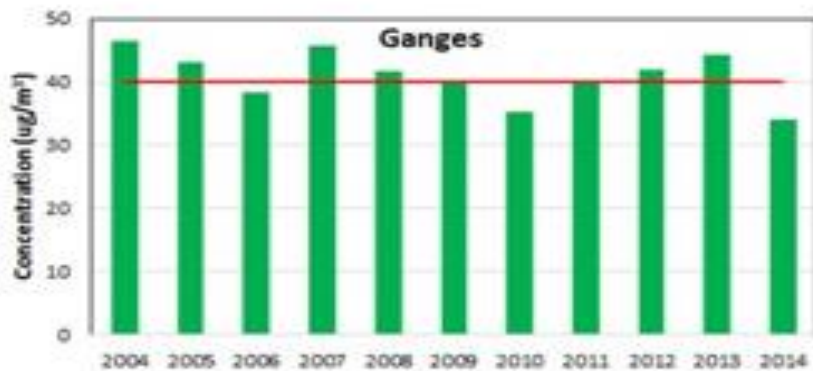
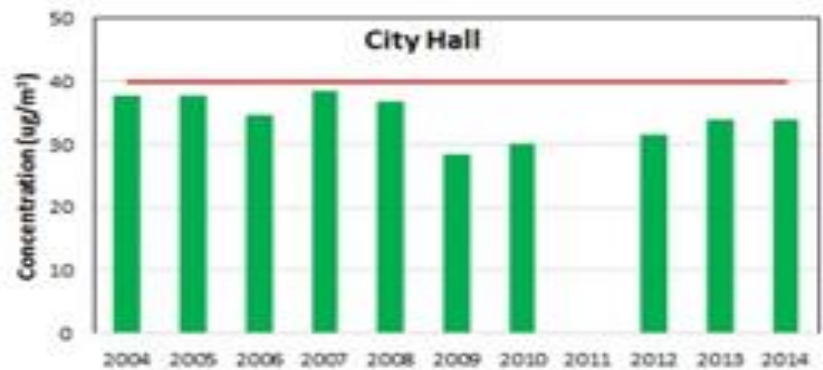
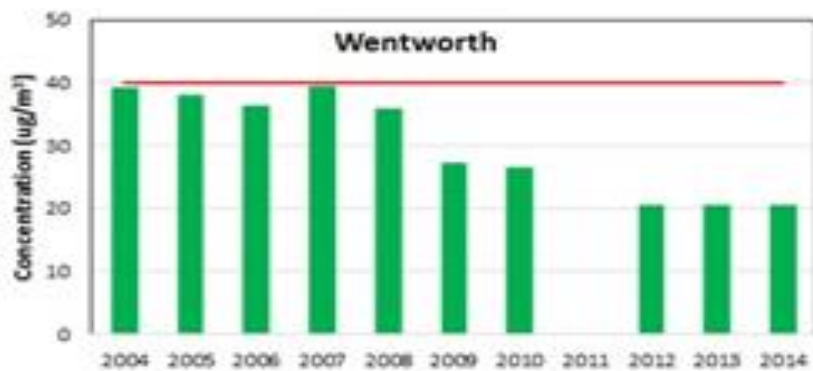


Particulate Matter (PM₁₀)

- Anthropogenic and natural sources as long range transport
- 5 885 tons per annul from eThekwini sources
- 52% from industry, 41% from vehicles
- Background concentration of about 16 $\mu\text{g}/\text{m}^3$

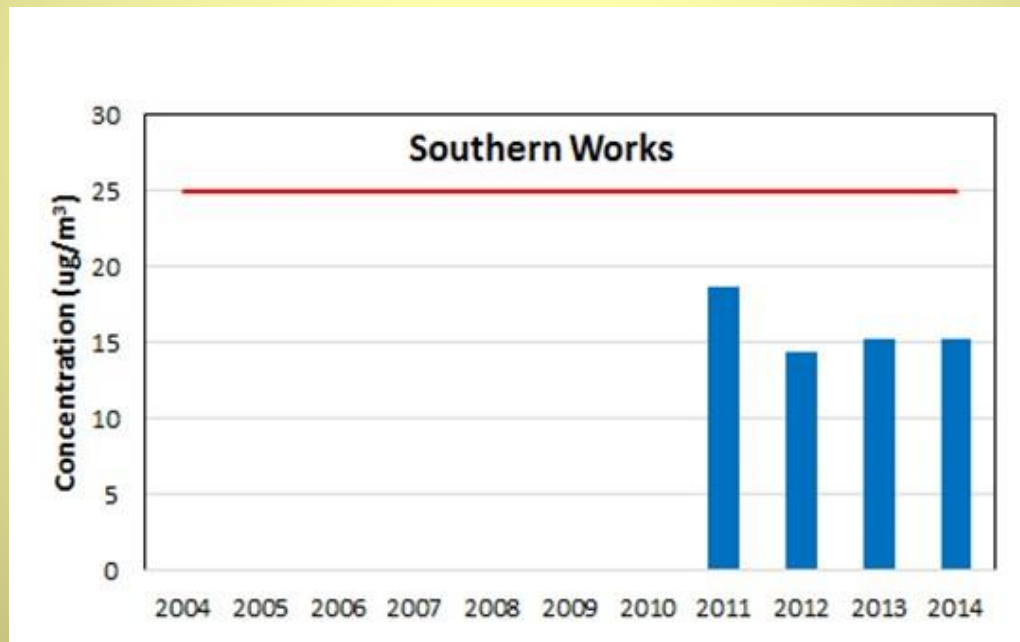


Annual PM₁₀ concentrations Continuous





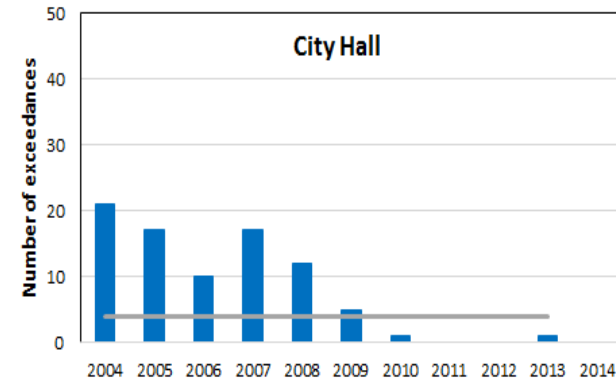
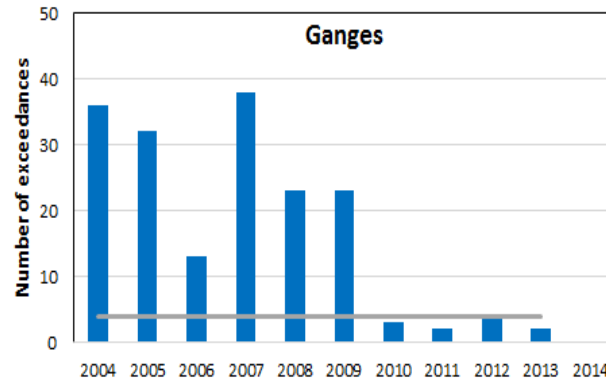
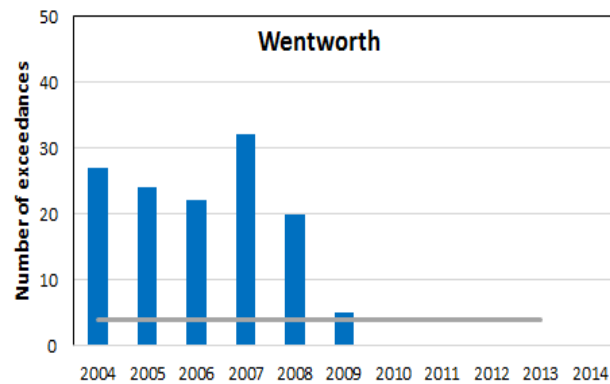
Annual PM_{2.5} concentrations Continuous



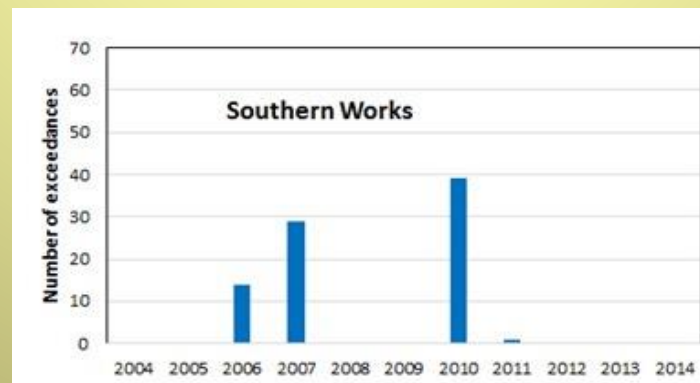


Number of daily exceedances

PM₁₀



PM_{2.5}



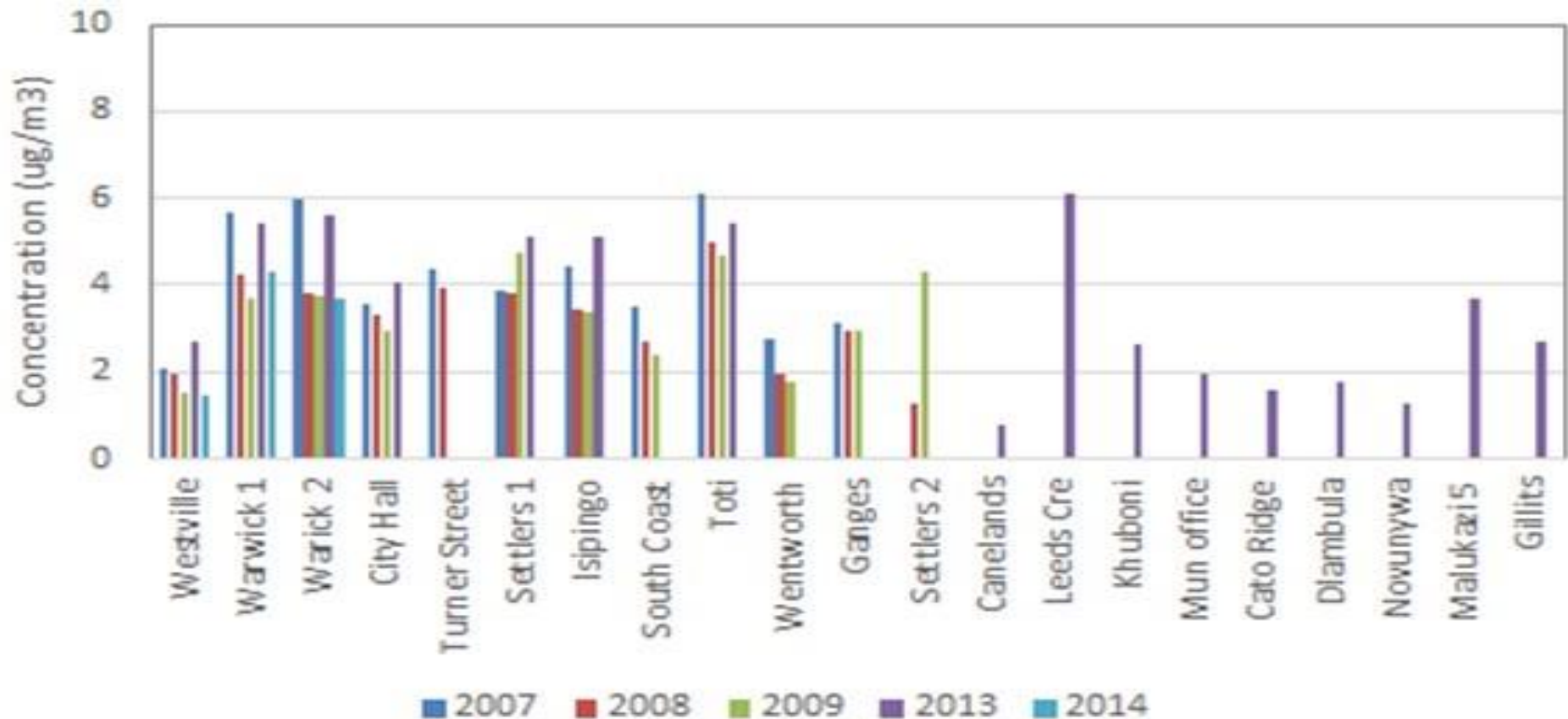


Benzene

- A natural component of crude oil
- Emissions from processing, storage & handling and combustion of petrochemical products
- 108 tons per annum in eThekweni
- 63% from Listed Activities, 35% from vehicles



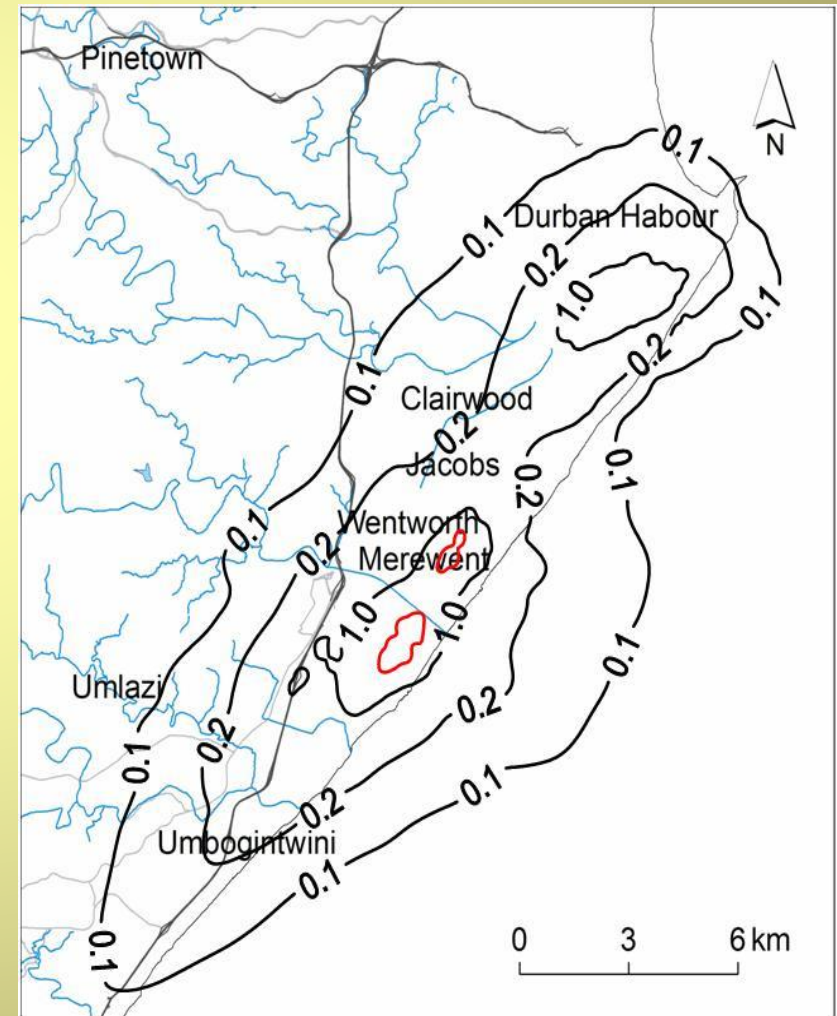
Benzene concentrations





Modelled annual benzene concentrations

Year	Annual average ($\mu\text{g}/\text{m}^3$)
2011	1.85
2012	5.04
2013	5.03





523 air quality complaints 12 month period

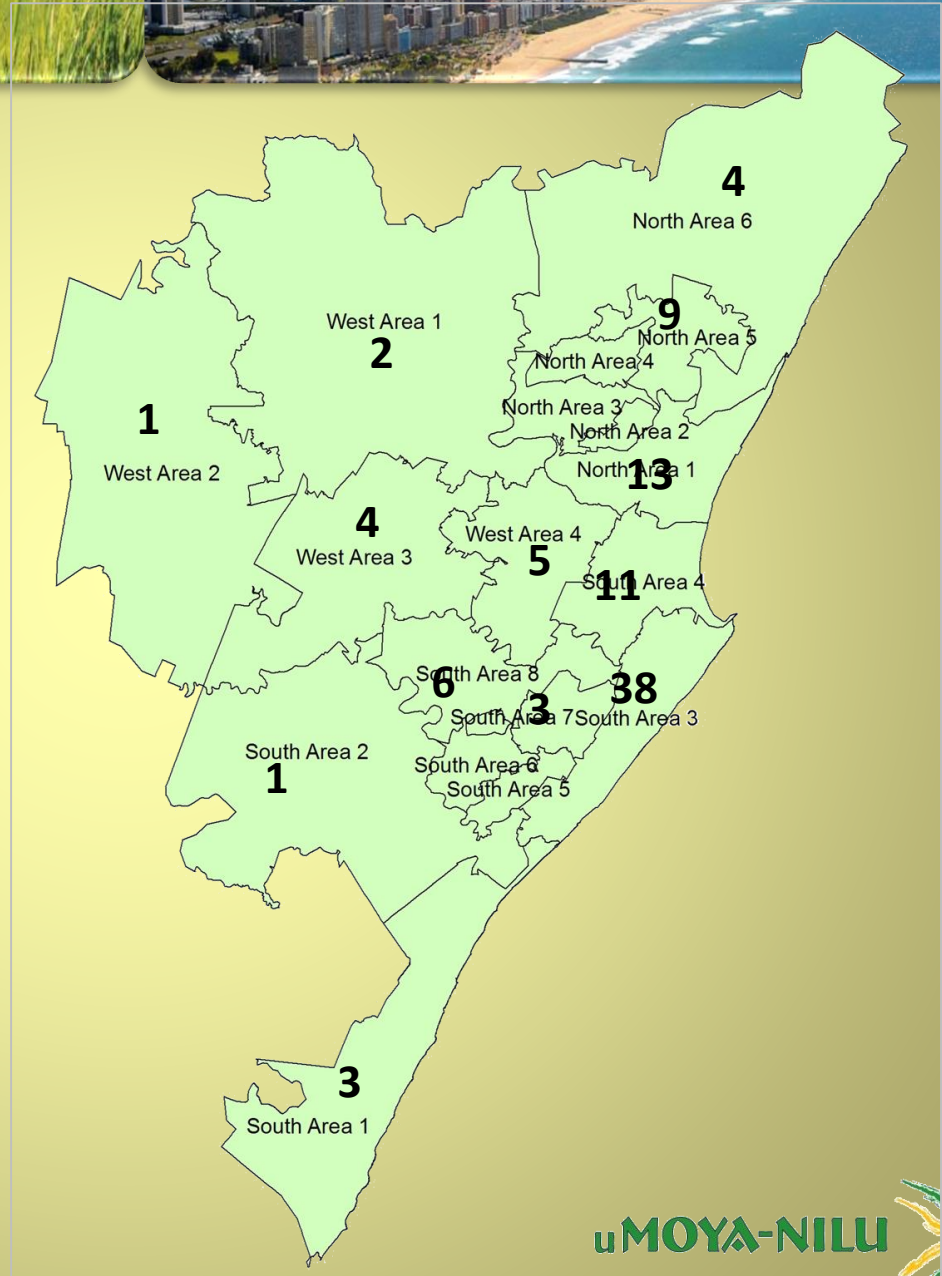
	Air pollution emissions	Chemical smell	Dust	Vehicle emissions
Number	115	126	66	6
Percent	22	24	13	1

	Odour	Smoke	Sugarcane burning
Number	166	42	2
Percent	32	8	< 1



Complaints

- Percentage of 523 complaints in 12 month period





Air Quality Management

- AQM active in eThekweni since late 1990's
- Significant increase in activity with MMP in 2003
 - Monitoring network of 14 stations
 - Technical capacity building
 - AQMP in 2007 and its implementation
 - Data capture and reporting
 - Dispersion modelling
- Health study in 2006
- Mandated function expanded in 2007 with AQA



Air Quality Management Capacity

- Capacity assessment used 6 'S' model:
 - Organisational Structure
 - Systems or tools available for AQM function
 - Incumbent Skills to perform the function
 - Strategy to achieve AQM goals
 - IncentiveS refer to motivational policies
 - InterrelationshipS with other departments and stakeholders



Structure

- AQM section is well established in Pollution Control & Risk Management in Health Department
- Air Quality Officer was designated in 2011
- Incumbent and capable technical staff in the regions
- AEL function is established
- Support and buy-in for AQM throughout eThekweni structures



Structure

- *Current organogram was developed prior to regulation of mandated functions of the NEM: AQA. Does not cater for:*
 - *AEL function*
 - *Compliance and enforcement*



Systems

- Current approach to AQM is defined by 2007 AQMP and mandated functions of NEM:AQA
- Extensive ambient monitoring network, expanded in 2014, *original equipment needs maintenance and replacement*
- Emission inventory developed, *needs on-going upkeep*
- Dispersion model set-up, *needs to be transferred to eThekweni*
- AEL function is in place, 85 AELs issued to date
- Air quality management by-laws in final draft



Skills

- Incumbent capability in ambient monitoring and data management
- *Loss of trained personnel*
- *Replacement with appropriate skilled capacity is difficult*
- *Technical training opportunities are limited in South Africa*



Incentives

- Significant investment made in AQM in 2014
- AQM a growing field with career opportunities
- AQM is challenging and rewarding career
- AQM needs partnerships, *but these are limited*
- *Opportunities for external funding have not been explored*



Strategy

- Strategy guided by AQMP developed in 2007
- AQMP revised in 2014-2015 for integration into the IDP to steer AQM for the next 5 years
- AQMP will includes an Implementation Plan for short, medium and long term goals



Inter-relationships

- Good relationship exists with the DEA and Province
- Established working relationships exist with other departments and agencies
- Good working relationships exist with most stakeholders



Summary

Our assessment shows that:

- Generally ambient air quality in eThekweni is good, and
- Air Quality Management in eThekweni meets the mandated requirements of the NEM:AQA

It also shows that there are:

- Gaps and issues that need to be addressed, and
- A number of challenges face eThekweni and other stakeholders



Discussion on the status quo assessment



Way forward

- Status quo assessment report will be available from 27 May 2015
- Available for download: www.projects.co.za/aqmp
- Comment period to Friday 27 June 2015
- Comments and response report will be developed
- Comments will be used to:
 - Finalise the status quo assessment report
 - Inform the development of the AQMP



Way forward

- Project team, with eThekwini will draft the AQMP
- Meetings with stakeholders where necessary
- Draft AQMP presented to stakeholders before the end of 2015