Tracking air-related health should be an integrated part of air quality management in South Africa

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INTRODUCTION

Health surveillance is presently not an integrated part of air quality management in South Africa, although ambient air pollution standards are derived from epidemiological studies of personal exposure. A growing number of studies have shown that the largest burden of air pollution-related diseases is on developing countries where air pollution levels are also among the highest in the world.[1] Air pollution may cause symptoms ranging from eyes, nose and throat irritation, exacerbation of asthma and reduced lung function[2] to cardiovascular symptoms such as high blood pressure[3] and lung cancer. There is also a statistically-significant association between air pollution and mortality (death) from respiratory and cardiovascular illnesses.[1]

To ascertain the impact of implemented interventions beyond ambient air pollution reductions, indicators need to be identified and appropriate health data need to be routinely collected and made available to air quality officers (AQOs) and environmental health practitioners (EHPs). A discussion document describing such issues was compiled and distributed by the CSIR to all AQOs and EHPs in South Africa to gather their thoughts and comments, particularly with respect to practicability, implementation and uptake of proposed ideas and initiatives.

Here, results from the survey are discussed and using Tshwane as a case study, one proposed indicator is demonstrated.

METHODS

A discussion document (**Figure 1**) describing how AQOs can go about bringing health into air quality management, the relationship between air quality and health and recommended environmental health indicators for air pollution, was e-mailed as a pdf-attachment to all AQOs and EHPs, as listed by the Department of Environmental Affairs. Respondents were asked to read through the document and send via return e-mail their comments as well as possible current activities that addressed the ideas mentioned in the discussion document. The first survey was e-mailed on 28 January 2010 with a follow-up survey to non-respondents on the 5 March 2010. Response e-mail were printed and descriptive data (i.e. respondents' comments) was collated in EpiData Analysis V2.2.1.171. Each respondent's home province was also captured.
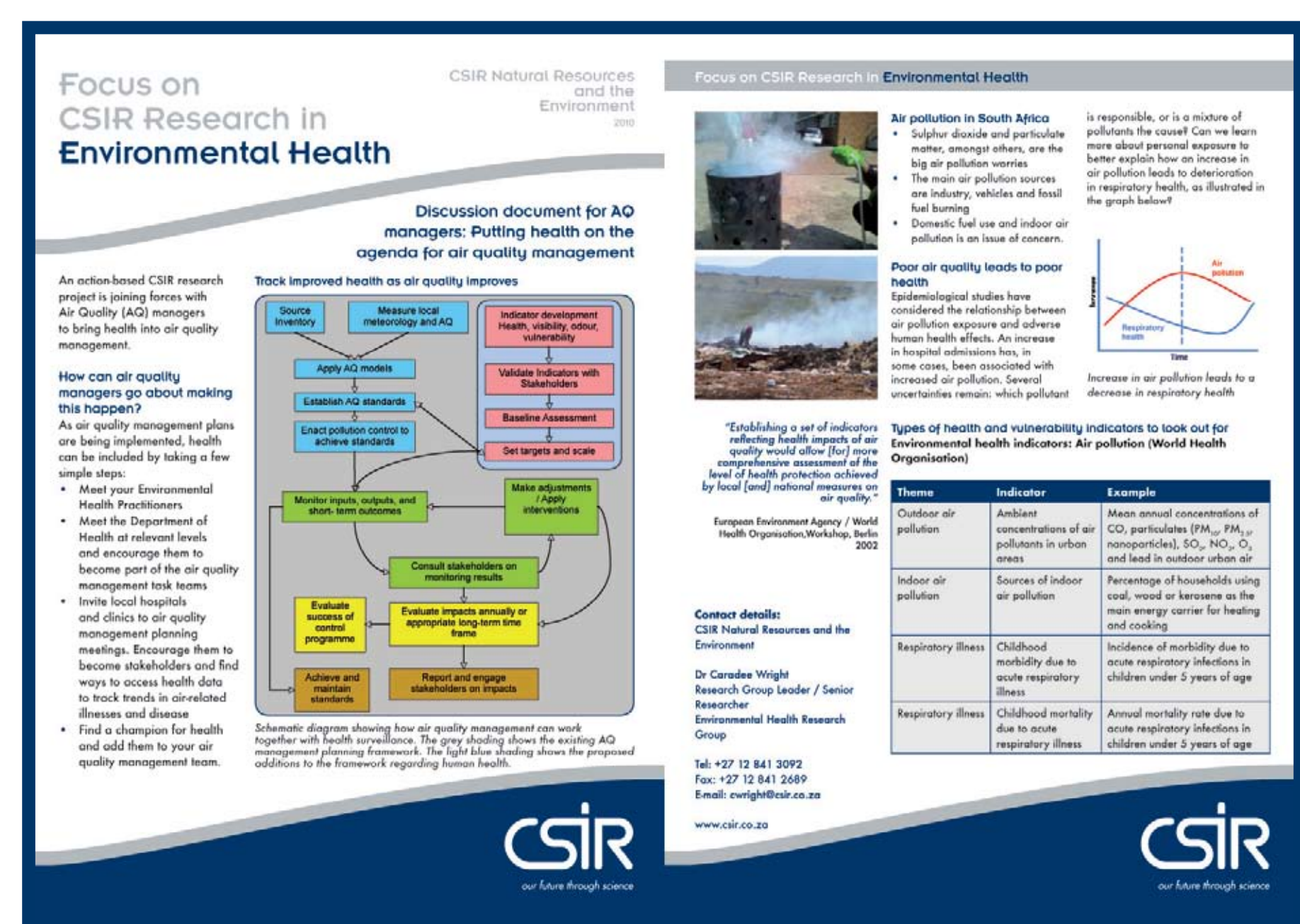

Figure 1: Discussion document: Putting health onto the air quality management agenda

RESULTS AND DISCUSSION

The discussion document was e-mailed to 426 listed e-mail addresses of which 65 no longer existed. The final sample size was 361 with a response rate of 6.3% (n = 23). **Figure 2** shows the number of respondents by province with most being from Gauteng (n = 7) and the Eastern Cape (n = 6). There were no respondents from Limpopo, North West and the Free State. The most likely reasons for non-response were considered to be inactive e-mail accounts; overloaded staff; lack of knowledge about air quality-related health; and apathy.

Percentage of respondents by province

- Western Cape
- Eastern Cape
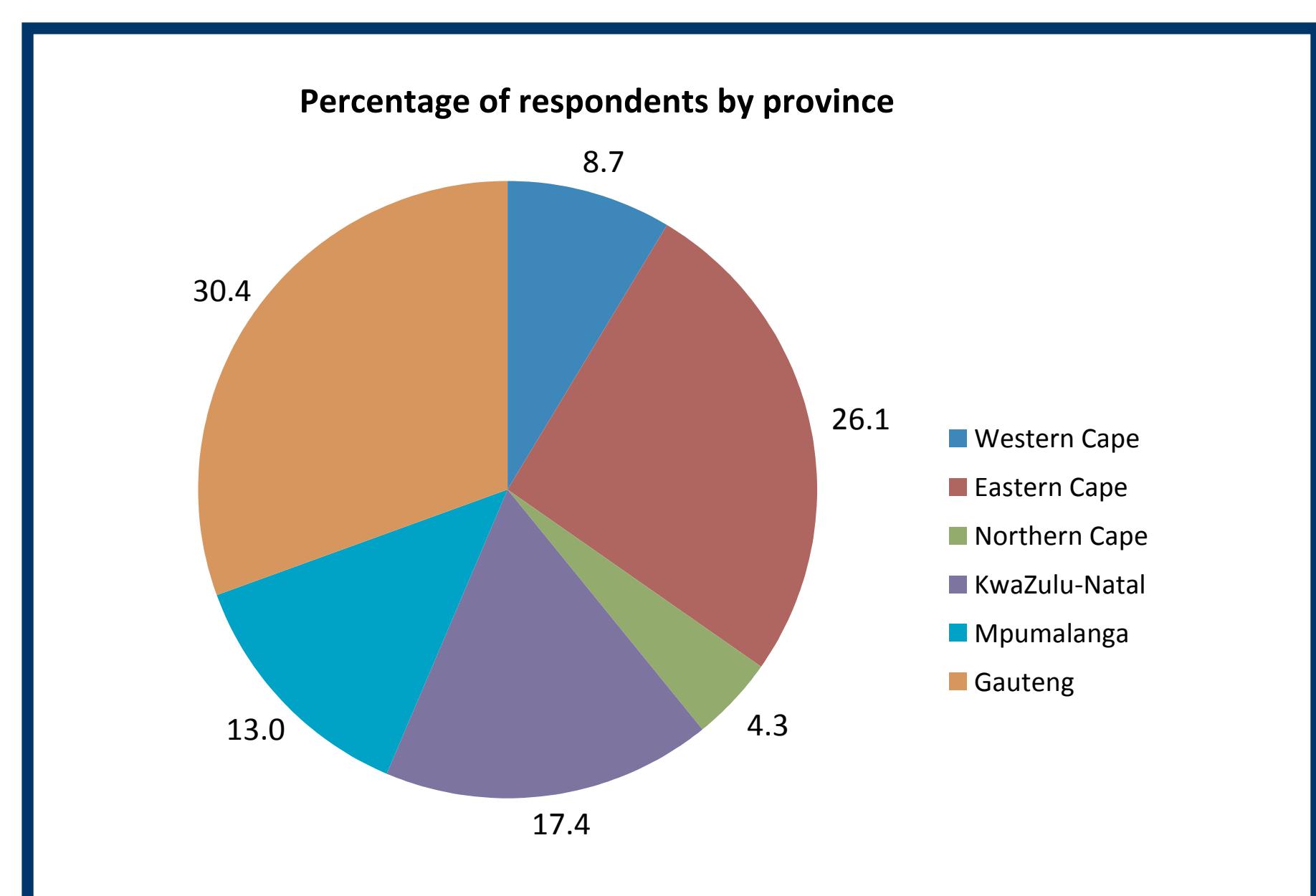- Northern Cape
- KwaZulu-Natal
- Mpumalanga
- Gauteng

Figure 2: Percentage of respondents per province (%)

The most common respondents' comments were 'this is an interesting article' (n = 6) and 'we agree with this approach' (n = 7). Respondents' comments (**Table 1**) were collated and grouped into five categories: 1) capacity and support; 2) data/statistics; 3) education; 4) steps made already; and 5) concerns.

Table 1: Respondents' comments on the discussion document in Figure 1

		Respondents' comments (number of respondents in parentheses)
1	Capacity and support	EHPs are involved in air quality management (1) EHPs and AQOs are overworked, cannot do this too (1) Training is required for skilled capacity (2) Lack of political support for AQMP (1) Clean air as a human right should be taken as seriously as is done for water (1) Health and AQ are not an integrated part of IDPs (1) Lack of funding to do both AQ and health improvements (1)
2	Data/ statistics	We need: • Reliable AQ monitoring data to be available (2) • Accurate and relevant health data to be available (2) • To determine major pollution sources per area (1) • To document society's perceptions of air-related health effects (1) • Research on biogenic aerosols (1) • To link emission control to epidemiological studies to determine impact (1) • Rural and urban environment data (1) • To find ways to integrate climate change into AQMP (1)
3	Education	Need to raise awareness among society to curb air pollution (1) Health facility staff and management need to realise importance of capturing air-related health data (2)
4	Steps already taken	Using complaints as an indicator, noticed decrease as AQ improved (1) Begun exercise to compare clinical data to AQ (1) Involved NGOs in AQMP annual reviews (1)
5	Concerns	Indoor AQ in informal settlements is a problem (3) How to manage division of indoor (DoH), occupational (DoL) and outdoor air (DEA) management (2) Weighting of health indicators by population size since AQ monitoring coverage is spare (1) No standard for PM2.5 in South Africa exists (1)

The greatest number of comments (n = 11) pertained to data and statistics, in particular, that we need reliable, readily available air quality and air-related health data, currently lacking in South Africa. One respondent mentioned the need to understand the public's perceptions of air-related health effects which links to the need to raise awareness among society to curb air pollution, especially tyre and biomass burning. One respondent in KwaZulu-Natal mentioned using air-related complaints as an indicator of public health and comparing them to ambient air pollution levels. In the absence of reliable health data, this might be a useful exercise for all AQOs and EHPS across South Africa to carry out. An example of how this might be done is provided below.

DEMONSTRATION OF A PROPOSED INDICATOR: CITY OF TSHWANE CASE STUDY

Public complaints routinely captured about odours, visible air pollution (**Figures 3a and 3b**) and symptoms perceived to be related to air pollution incidents for January 2005 to December 2009 were obtained by the CSIR from the City of Tshwane Department of Environmental Health. **Figure 4** shows the number of complaints per year. A statistically-non-significant downward trend ($R^2 = 0.66$) is apparent, however, the data span too few years to confirm this trend.
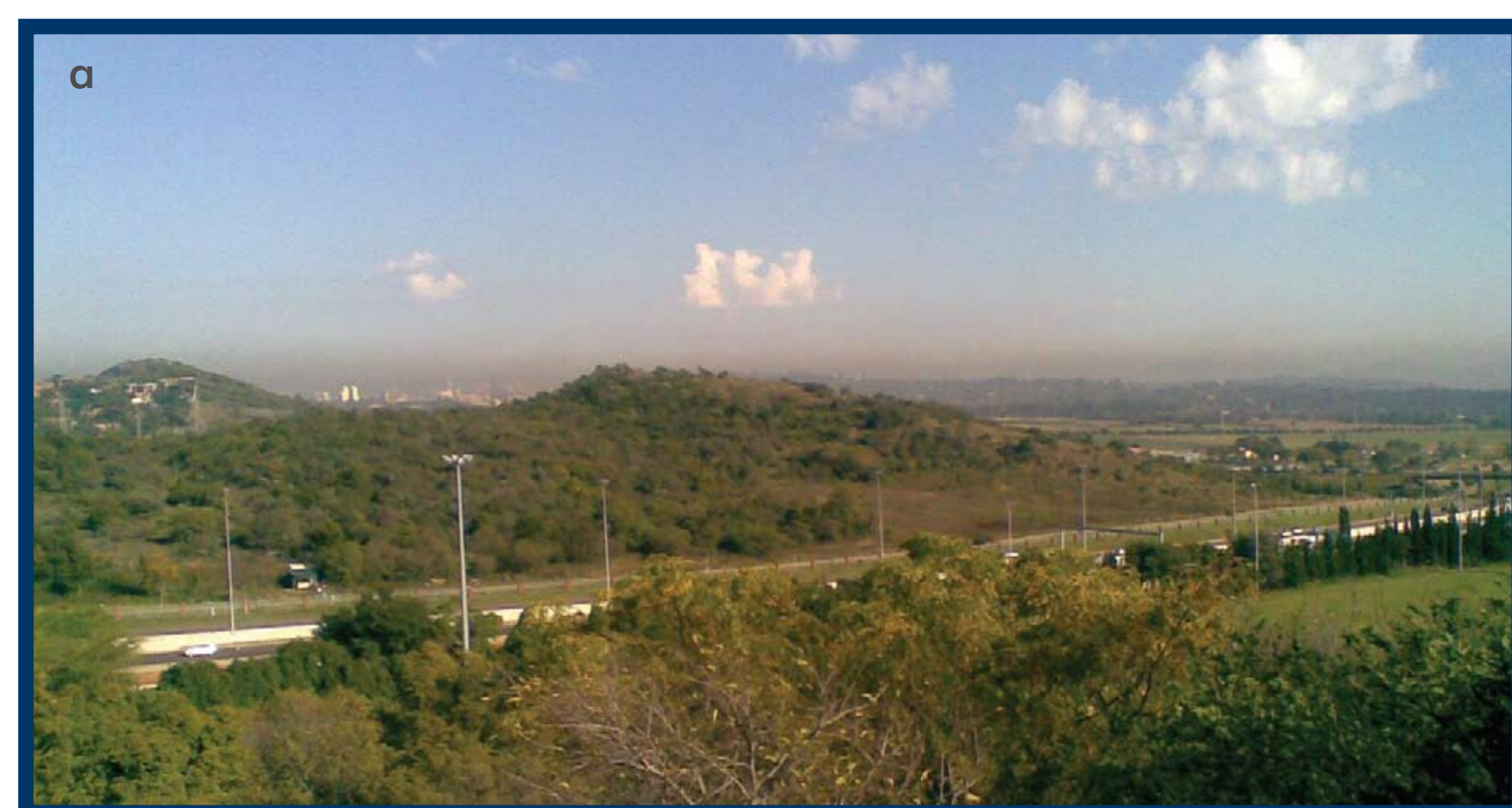
Figures 3a and 3b: Morning air pollution haze over Pretoria, City of Tshwane

In the absence of reliable health data, a simple exercise to compare air-related complaints with air quality can give some clues to where problems may exist.

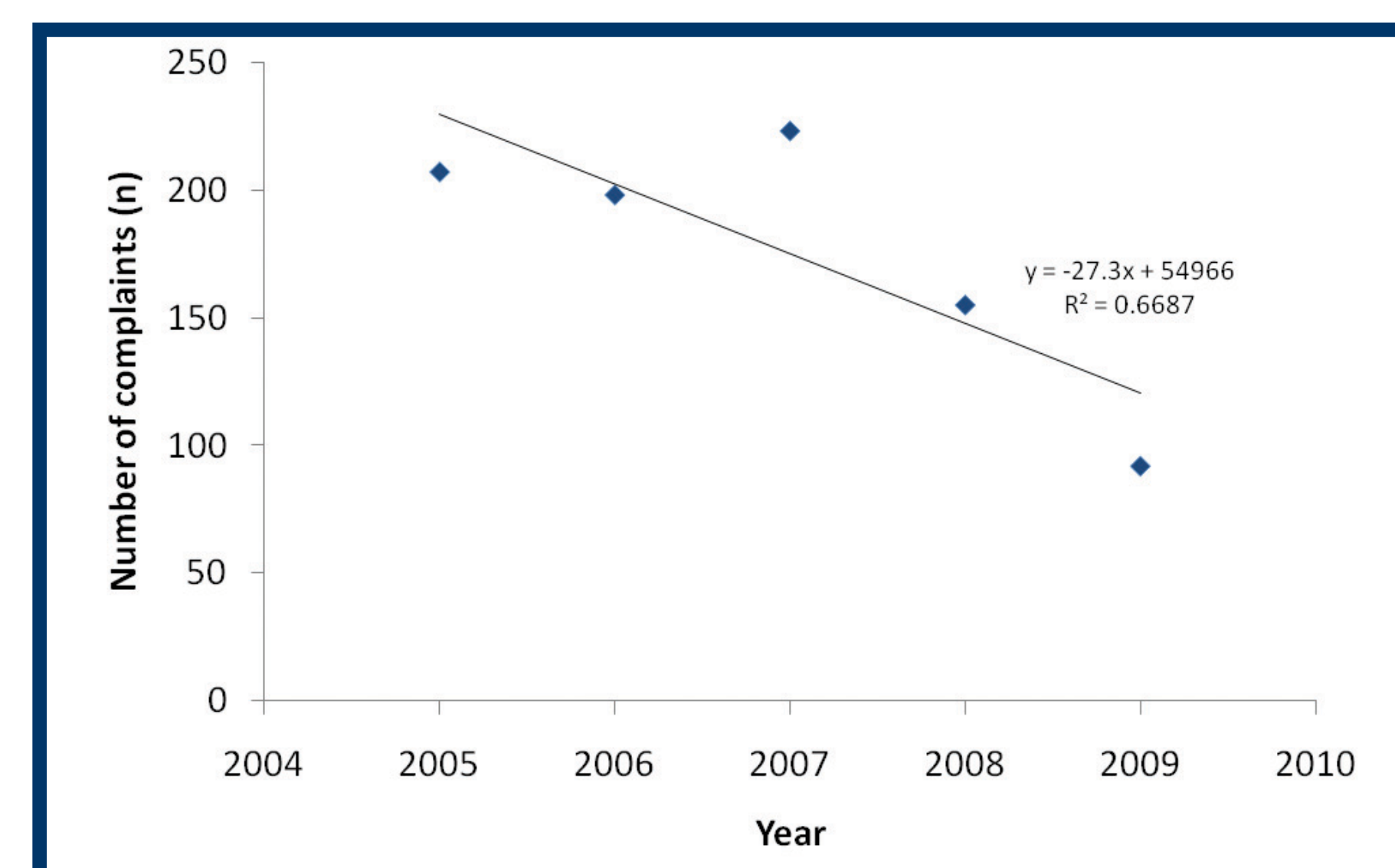$y = -27.3x + 54966$
$R^2 = 0.6687$

Figure 4: Number of public air-related complaints per year in the City of Tshwane

Using Geographical Information Systems, these complaints were mapped in relation to five permanent air quality monitoring stations maintained by the City of Tshwane Environmental Management division. Graphs of air quality data, specifically PM_{10} (airborne particulates with a diameter of $< 10 \mu m$) and SO_2 data, for the five stations (where available) were downloaded from the publicly accessible South African Air Quality Information System (SAAQIS) website (www.saaqis.org. za) and six of these were placed alongside their respective stations (**Figure 5**). The most number of complaints by region corresponded with those regions where PM_{10} levels ranged between 100-200 μg m^{-3} (well in excess of national standards) during winter month of 2007. However, missing data, no data available for certain air pollutants from some stations and the relatively short data time range, inhibit a full statistical analysis to determine real trends and associations. Nevertheless, in taking these few simple steps, one can begin to identify possible areas of air quality concern. However, the ultimate goal should be to use public health data, such as prevalence of respiratory tract infections, instead of air-related complaints, to track impacts of interventions to reduce air pollution.
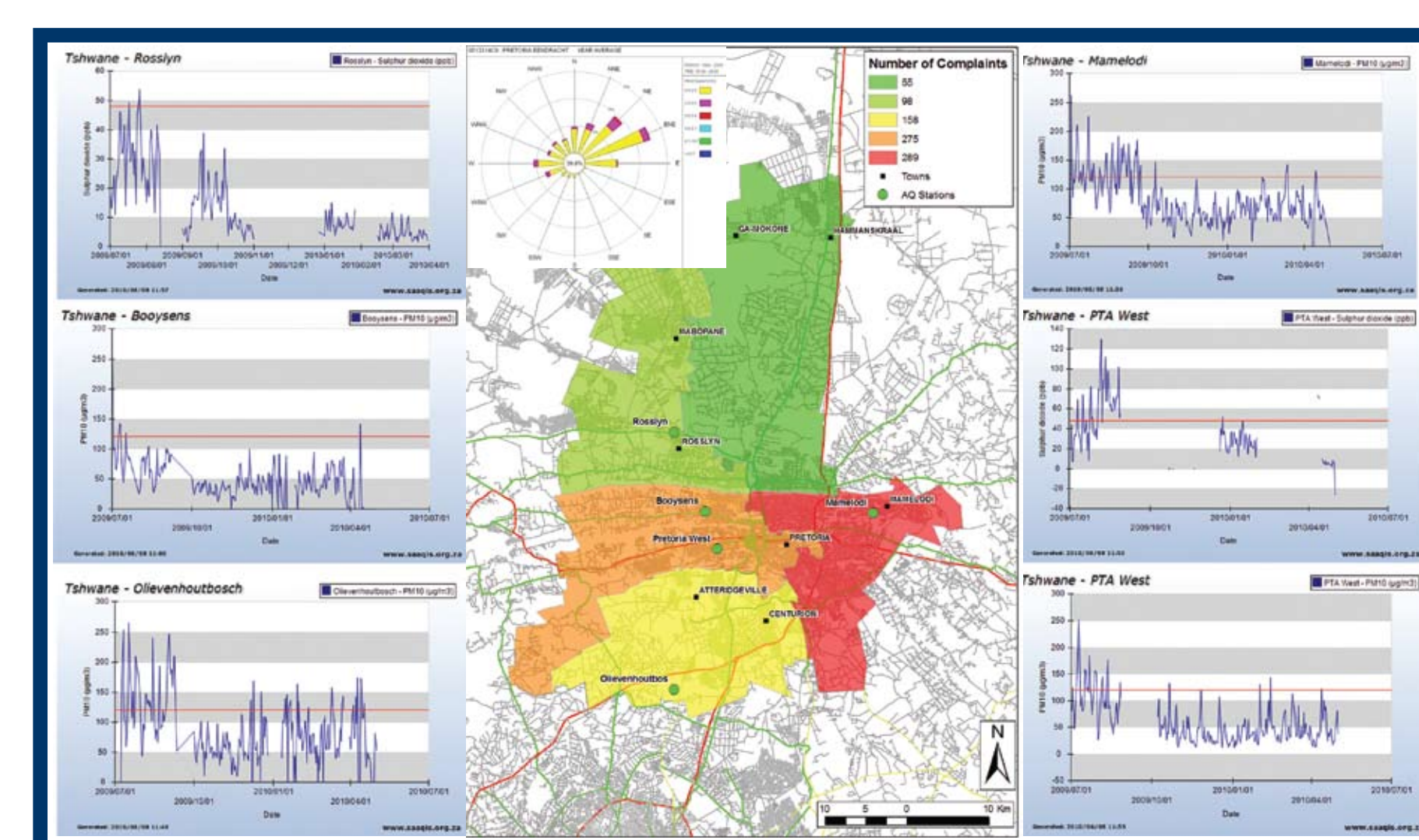

Figure 5: Map of air-related complaints and PM_{10} and SO_2 (24-hr averages) for each permanent air quality monitoring station in the City of Tshwane

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