Quick Best Practices Guide
to consider
Air-related Human Health
in your Area

For South African Air Quality Officers and Environmental Health Practitioners
BACKGROUND

» South Africa has new air quality legislation since 2005
» Includes new National Standards for monitoring of ambient air pollutants
» There is a need for monitoring and evaluation of air-related health impacts as well
» Air Quality Officers and Environmental Health Practitioners agreed they need best practices to put health on the air quality management (AQM) agenda
» This Quick Guide was developed

OVERVIEW OF THE GUIDE

» Air quality and human health
  • The links between them
  • What do we know in South Africa?
» Why a Quick Guide?
» How does human health fit into AQM?
» Best practices to consider air quality and human health in your area
» Useful websites

Abbreviations: AQM, air quality management
AIR QUALITY AND HUMAN HEALTH

Air pollution comprises e.g.:

» **Outdoor (ambient) pollution:** fossil fuel burning (e.g. Power generation, cars); industrial non-fossil fuel emissions; natural emissions; pesticides etc

» **Indoor pollution:** burning coal, wood, paraffin for heating, cooking, lighting

Adverse health effects range from

» Nausea, difficulty breathing to …

» … birth defects, immuno-suppression, cancer

AIR QUALITY MONITORING AND EVALUATION…

» Aims to protect the receiving environment, including human health

» Is fundamental for assessing population exposure

» Aims to reduce or eliminate respiratory & other diseases through implementing effective air pollution mitigation measures

What should air quality monitoring and evaluation aim to do?

![Graph showing decrease in air pollution and increase in respiratory health over time]

As air pollution decreases, respiratory health should improve.
Air-related health outcomes include acute respiratory tract infections (e.g. pneumonia), chronic respiratory diseases (e.g. asthma) and other lung diseases (e.g. tuberculosis).

Indoor air pollution and urban air pollution are risk factors causing our burden of disease.

In 2007, outdoor air pollution was estimated to cause 3.7% of national mortality from cardiopulmonary disease, and 5.1% of mortality attributable to cancers of the trachea, bronchus and lungs in adults older than 30 years.

Indoor air pollution is a major problem, with ~ 20% of South African households exposed to smoke from burning solid fuels estimated to cause 2,489 deaths in 2000.

Several studies have considered the impacts of air pollution on human health. These include:

- Vaal Air Pollution Study in the 1990s
- Zwi Highveld Study in the 1990s
- Birth to Twenty Study in Johannesburg
- South Durban Health Study in 2005
- Vaal Comparative Study in 2010
- Child Highveld Priority Area Study in 2010

Contact cwright@csir.co.za for more details about these studies.
Quick Best Practices Guide to Consider Air-Related Human Health in Your Area

Air quality management aims to improve air quality for the benefit of the environment and people’s health.

Complete the 6 best practices or steps in this Quick Guide, and you can consider the ambient air and air-related health among the communities living in the local municipalities you manage.
BACKGROUND: HOW DOES HUMAN HEALTH FIT INTO AQM?

This is the Air Quality Management System proposed for implementation by the City of Tshwane. The star indicates where human health may be considered in AQM.

**Air quality monitoring system**

<table>
<thead>
<tr>
<th>Data transfer, validation, storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission inventory</td>
</tr>
</tbody>
</table>

- Automated analysis
- Dispersion modelling
- Health / Eco risk assessment
- Damage assessment
- Costing of impacts

*Source: Air Quality Management Plan for the City of Tshwane 2006-2008 Executive Summary (redrawn)*
BEST PRACTICES TO CONSIDER AIR QUALITY AND HUMAN HEALTH IN YOUR AREA

Assess ambient AQ against National Standards for criteria pollutants

Consider incidence of and mortality from acute respiratory tract infections (ARTIs) in children under 5 years of age

Consider incidence of and mortality from pneumonia in children under 5 years of age

Process your AQ complaints register data

Assess the percentage of households using coal, wood and kerosene

Consider AQM capacity and capabilities

**Abbreviations:**
AQ, air quality;
ARTIs, acute respiratory tract infections;
AQM, air quality management
Quick Best Practices Guide to Consider Air-Related Human Health in Your Area

1 ASSESS AMBIENT AIR QUALITY AGAINST NATIONAL STANDARDS FOR CRITERIA POLLUTANTS

» National standards were set using epidemiological studies on the impacts of human health from air pollution
» By comparing your monitored ambient air quality data against national standards, you can gauge an estimate of air pollution exposure for your community
» Exceedances of national standards indicates possible health risks and impacts
» For full details on how to prepare your monitored ambient air quality data, visit SAAQIS (www.saaqis.org.za) and download the National Ambient Air Quality Standards document.
» The National Ambient Air Quality Standards are given on the following page.

Purpose of step 1: To understand the quality of the ambient air in your community

You can have risk assessors calculate the risk of short- and long-term, cancer and non-cancer health risks to individuals for ambient pollution levels too.
Contact roosthui@csir.co.za
ASSESS AMBIENT AIR QUALITY AGAINST NATIONAL STANDARDS FOR CRITERIA POLLUTANTS

### National Ambient Air Quality Standards for Sulphur Dioxide (SO2)

<table>
<thead>
<tr>
<th>Averaging Period</th>
<th>Concentration</th>
<th>Frequency of Exceedence</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 minutes</td>
<td>500 ug/m3 (191 ppb)</td>
<td>526</td>
<td>Immediate</td>
</tr>
<tr>
<td>1 hour</td>
<td>250 ug/m3 (134 ppb)</td>
<td>88</td>
<td>Immediate</td>
</tr>
<tr>
<td>24 hours</td>
<td>125 ug/m3 (48 ppb)</td>
<td>4</td>
<td>Immediate</td>
</tr>
<tr>
<td>1 year</td>
<td>50 ug/m3 (19 ppb)</td>
<td>0</td>
<td>Immediate</td>
</tr>
</tbody>
</table>

*The reference method for the analysis of sulphur dioxide shall be ISO 6767*

### National Ambient Air Quality Standards for Nitrogen Dioxide (NO2)

<table>
<thead>
<tr>
<th>Averaging Period</th>
<th>Concentration</th>
<th>Frequency of Exceedence</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 hour</td>
<td>200 ug/m3 (106 ppb)</td>
<td>88</td>
<td>Immediate</td>
</tr>
<tr>
<td>1 year</td>
<td>40 ug/m3 (21 ppb)</td>
<td>0</td>
<td>Immediate</td>
</tr>
</tbody>
</table>

*The reference method for the analysis of nitrogen dioxide shall be ISO 7996*

### National Ambient Air Quality Standards for Particulate Matter (PM16)

<table>
<thead>
<tr>
<th>Averaging Period</th>
<th>Concentration</th>
<th>Frequency of Exceedence</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 hours</td>
<td>120 ug/m3</td>
<td>4</td>
<td>Immediate – 31 December 2014</td>
</tr>
<tr>
<td>24 hours</td>
<td>75 ug/m3</td>
<td>4</td>
<td>1 January 2015</td>
</tr>
<tr>
<td>1 year</td>
<td>50 ug/m3</td>
<td>0</td>
<td>Immediate – 31 December 2014</td>
</tr>
<tr>
<td>1 year</td>
<td>40 ug/m3</td>
<td>0</td>
<td>1 January 2015</td>
</tr>
</tbody>
</table>

*The reference method for the determination of the particulate matter fraction of suspended particulate matter shall be EN 12341*

### National Ambient Air Quality Standards for Ozone (O3)

<table>
<thead>
<tr>
<th>Averaging Period</th>
<th>Concentration</th>
<th>Frequency of Exceedence</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 hours (running)</td>
<td>120 ug/m3 (61 ppb)</td>
<td>11</td>
<td>Immediate</td>
</tr>
</tbody>
</table>

*The reference method for the analysis of ozone shall be UB photometric method as described in SANS 12964*

### National Ambient Air Quality Standards for Benzene (C2H2)

<table>
<thead>
<tr>
<th>Averaging Period</th>
<th>Concentration</th>
<th>Frequency of Exceedence</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>10 ug/m3 (3.2 ppb)</td>
<td>0</td>
<td>Immediate – 31 December 2014</td>
</tr>
<tr>
<td>1 year</td>
<td>5 ug/m3 (1.6 ppb)</td>
<td>0</td>
<td>1 January 2015</td>
</tr>
</tbody>
</table>

*The reference methods for the sampling and analysis of benzene shall either be EPA compendium method TO-14 A or method TO-17*

### National Ambient Air Quality Standards for Lead (Pb)

<table>
<thead>
<tr>
<th>Averaging Period</th>
<th>Concentration</th>
<th>Frequency of Exceedence</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>0.5 ug/m3</td>
<td>0</td>
<td>Immediate</td>
</tr>
</tbody>
</table>

*The reference method for the analysis of lead shall be ISO 9855*

### National Ambient Air Quality Standards for Carbon Monoxide (CO)

<table>
<thead>
<tr>
<th>Averaging Period</th>
<th>Concentration</th>
<th>Frequency of Exceedence</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 hour</td>
<td>30 mg/m3 (26 ppm)</td>
<td>88</td>
<td>Immediate</td>
</tr>
<tr>
<td>8 hour (calculated on 1 hourly averages)</td>
<td>10 mg/m3 (6.7 ppm)</td>
<td>11</td>
<td>Immediate</td>
</tr>
</tbody>
</table>

*The reference method for analysis of carbon monoxide shall be ISO 4224*

Source: Government Gazette 24 December 2009
ASSESS AMBIENT AIR QUALITY AGAINST NATIONAL STANDARDS FOR CRITERIA POLLUTANTS

Example from SAAQIS
CONSIDER INCIDENCE OF AND ANNUAL MORTALITY FROM ARTIS IN CHILDREN UNDER 5 YEARS OF AGE

Purpose of step 2: To understand the incidence of acute respiratory tract infections among children in your area

- National estimates are available at the World Health Organization website www.who.int
- Provincial estimates are available in the South Africa Demographic and Health Survey report http://www.mrc.ac.za/bod/sadhs.htm
- Contact your Provincial Department of Health for up-to-date rates
- If estimates for your area are higher than the national average, this may indicate a reason for concern

Abbreviations: ARTIs, acute respiratory tract infections
CONSIDER INCIDENCE OF AND ANNUAL MORTALITY FROM PNEUMONIA IN CHILDREN UNDER 5 YEARS OF AGE IN YOUR AREA

Purpose of step 3: To understand the incidence of pneumonia among children in your area

- National estimates are available at the World Health Organization website www.who.int
- Contact your Provincial Department of Health for up-to-date rates
- If estimates for your area are higher than the national average, this may indicate a reason for concern
Using your database of complaints relating to air quality made by the public, categorise each complaint and generate a graph to identify what type of complaint is most often made.

**Example from the City of Tshwane - % of total complaints made using 5 years of records**

**Purpose of step 4:**
*To understand the air pollution-related perceptions of your community*
Where are the complaints?

With the help of a Geographical Information Systems (GIS) technician, have these complaints mapped across your area. It will be helpful to know the predominant wind direction in your area to understand where the air pollution may be coming from.
4

PROCESS YOUR AQ COMPLAINTS REGISTER DATA

Tap into local NGOs incident / complaint registers – Here is an example from South Durban

Most complaints for smell

<table>
<thead>
<tr>
<th>Blaze, fire / fuel spill</th>
<th>Diesel spill</th>
<th>Oil spill / contamination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drowsiness</td>
<td>Electrical fault</td>
<td>Explosion / fire</td>
</tr>
<tr>
<td>Flare failure</td>
<td>Flaring &amp; smoke / smell</td>
<td>Injury / death</td>
</tr>
<tr>
<td>Leak of pipeline</td>
<td>Pump failure</td>
<td>Stack emission</td>
</tr>
<tr>
<td>Smell - sweet, egg, petrol</td>
<td>Toxic chemicals/gases</td>
<td>Violation of permit conditions</td>
</tr>
<tr>
<td>Bitumen plant failure</td>
<td>Complaints - other</td>
<td></td>
</tr>
</tbody>
</table>

Number of incidents / complaints

![Graph showing incident/complaint data over time.](image)
ASSESS THE PERCENTAGE OF HOUSEHOLDS USING COAL, WOOD AND KEROSENE

» Domestic energy or fuel use, depending on the type of fuel used, is a significant source of indoor and outdoor air pollution

Purpose of step 5: To understand the domestic fuel energy use in your community
Purpose of step 6:
To understand the air quality management capacity available in your area
CONSIDER AQM CAPACITY

This graph shows the requests for AQM service in the City of Joburg by region. This information helps determine whether you have sufficient capacity to address AQM in your area.

Abbreviation:
AQM, air quality management
Quick Best Practices Guide to Consider Air-Related Human Health in Your Area

PROBING QUESTIONS FOR YOU

» Are you meeting the National Standards for criteria pollutants?
» Does the public know who to log air-related requests and complaints with? Have you publicized the contact details?
» Do you log health symptoms when the public logs a complaint?

» Do you have enough capacity to handle all received requests?
» Is domestic fuel use a major source of air pollution in your area and if so, what can be done to reduce it?
» Are incident rates for acute respiratory tract infections and pneumonia in under 5 year olds being recorded at your local clinics? If not, should they be?
» Are incident rates for acute respiratory tract infections and pneumonia in under 5 year olds in your area higher than the National average?

So, now that you have worked through the best practices, think about these questions….
USEFUL WEBSITES

www.saaqis.org.za
www.environment.gov.za
http://www.who.int/topics/air_pollution/en/
http://www.unep.org/
http://www.highveldair.co.za/home/

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