



# **DRAFT IMPLEMENTATION MANUAL**

## **FOR AIR QUALITY MANAGEMENT PLANNING**

As contemplated in Sections 15-17 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)

**February 2008**

# EXECUTIVE SUMMARY

## Introduction

This document provides guidance to National, Provincial and Local government authorities on air quality management planning. The manual establishes best practice guidelines on definition of objectives, strategies, plans and procedures for each sphere of government in order to meet the requirements of the National Environmental Management: Air Quality Act, (Act No. 39 of 2004) (hereafter referred to as the AQA), on good air quality management planning and reporting.

Each National department or province responsible for preparing an environmental implementation plan and/or environmental management plan is required to include an air quality management plan (AQMP) as part of that plan (Section 15(1) of Chapter 3 of the AQA) and each municipality is required to include an AQMP in its integrated development plan (Chapter 5 of the Municipal Systems Act). This manual provides a guide from inception of an AQMP through to completion and evaluation. The document should be read in conjunction with the National Framework for Air Quality Management in the Republic of South Africa (hereafter referred to as the National Framework), the AQA and guiding documents published by the Department of Environmental Affairs and Tourism (DEAT) on air and atmospheric quality.

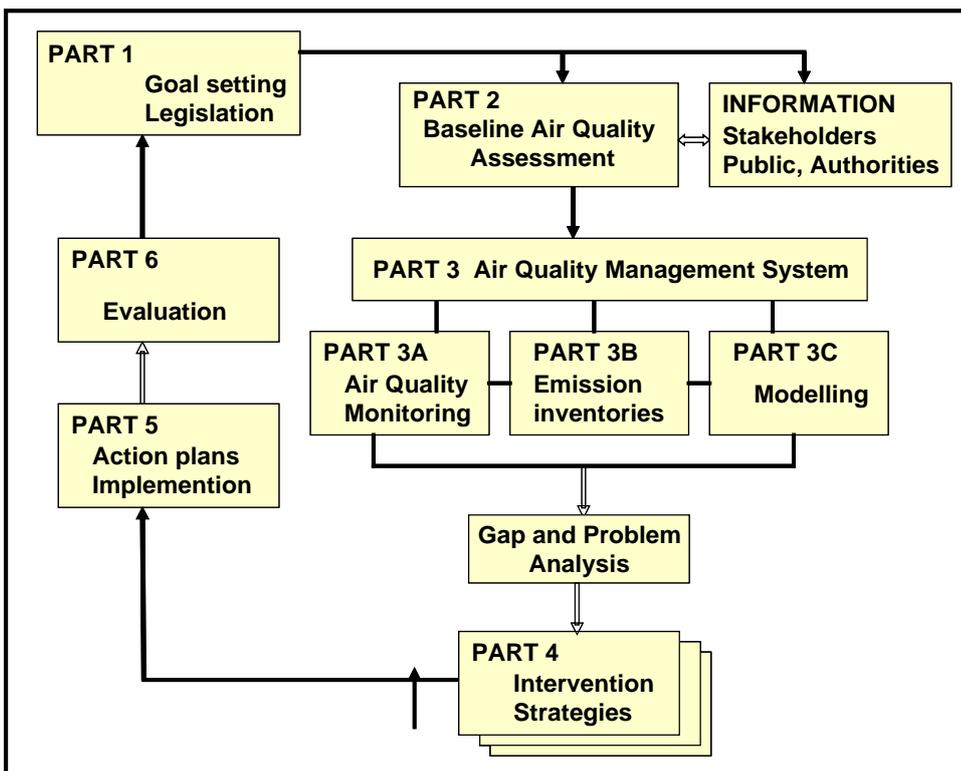
## Introduction to the AQMP Process

An AQMP describes the current state of air quality in an area, how it has been changing over recent years, and what could be done to ensure clean air quality in a region. The development and implementation of an AQMP is a dynamic process involving the following six steps:

- Goal setting
- Baseline air quality assessment
- Air quality management system (AQMS)
- Intervention strategies
- Action plans implementation
- Evaluation and follow up

The linkages between these steps are indicated in Figure A below.

Figure A: AQMP process as presented in Steps 1 to 6 of this manual



## Level of AQMP required

The number of steps required and degree of detail in each step will vary, depending on whether the AQMP is for a National department, Provincial department or municipality and the ambient air quality of the area under review. Thus,

- A **detailed AQMP** would involve all 6 steps to be addressed in detail, and
  - A **basic AQMP** would involve addressing steps 1, 2 (basic) and 6
- *DEAT's AQMP* - The National Framework serves as DEAT's AQMP and DEAT is also responsible for developing AQMP's for National priority areas where Provincial cross boundary pollution and pressing "hot spot" issues are of concern. A National priority areas is considered a poor ambient air quality area, hence requires a detailed AQMP as described above. This will entail all 6 steps being followed to complete an AQMP. The Priority Area AQMP would run independently of the National Framework and would be reported separately.
  - *Other National Department AQMPs* - The AQMP would be aimed at the activities specific to each of the National Departments and can be a brief document that highlights steps 1, 2, 4, 5 and 6 of the AQMP process.
  - *Provincial Department AQMPs* - The Provincial AQMP must draw on information from the various municipalities and districts AQMPs within the province and collate these into the Provincial AQMP. The Provincial AQMP should follow a similar process to that of the detailed AQMP; however the level of detail will depend to a large extent on the level of pollution in the province (see table A below).
  - *Metropolitan, District and Local Municipality AQMPs* - Each of the Local departments would have to implement an AQMP with varying degrees of detail depending on the ambient air quality area rating as identified in Table 24 of the National Framework.

**Table A:** Levels of AQMP required

Ambient Air Quality Rating	Level of AQMP	Steps to be included in plan
Acceptable	Basic AQMP	1, 2 (partial), 4(if necessary), 6
Potentially poor	Detailed AQMP (with certain exclusions)	1 – 6 (with certain exclusions)
Poor	Detailed AQMP	1 - 6

## Getting started

The following are important considerations before embarking on the AQMP process

- An AQMP "task team" should be initiated to develop and ensure implementation of the AQMP and provide technical advice (further described in section 4.1.1).
- Resources, both financial and human will need to be sourced both for the development of the AQMP and implementation of various strategies contained therein.
- Public participation is an integral part of the whole process and should be initiated from Steps 1 to 6. Emanating from this, an air quality stakeholder group should be established to review the AQMP process. There will be associated budget considerations.

Details of the main elements of the AQMP are set out below.

### Step 1: Goal setting

Goal setting provides the basis for the formulation of the rest of the AQMP and should be developed in consultation with a technical committee (further described in section 4.1.1) and stakeholders. The goals in the AQMP should be reflected in the vision and mission statements. How these goals are to be achieved needs to be addressed through objectives and targets. The goals should be consistent with the applicable South African legislation.

### Step 2: Baseline assessment

After setting the goals, a baseline air quality assessment must be undertaken to assess and evaluate the current air quality status. A baseline air quality assessment is an assessment of available air quality data, air pollution sources, and area data and should include:

- Area description and boundary definition
- Description of the meteorology and climate
- Population statistics

- Evaluation of air quality information based on available data
- Sources and emissions
- Pollutants of concern
- Priority air quality issues
- Evaluation of current management and tools
- Consideration air quality impacts of future developments
- Prioritising areas for intervention

The evaluation and assessment data in the baseline assessment will inform the decision on the need for a more advanced air quality management planning process to be undertaken in the area.

### **Step 3: Air Quality Management System (AQMS)**

The main elements of an AQMS include:

- *Monitoring* – the collection of data to provide necessary information to make informed decisions on improving air quality. The level of sophistication of the monitoring system will depend on the results of the baseline survey. While a sophisticated continuous monitoring network may be required for poor air quality areas, the use of passive samplers may suffice for potentially poor and acceptable air quality areas.
- *Emission inventories* - a list of all sources of pollution within the area, providing detail on the location and volume of pollutants emitted.
- *Atmospheric Dispersion Modelling* - air quality modelling combines knowledge of pollutant sources with meteorological data to estimate concentrations at receptor points. Models allow for the assessment of exposure and risk, impact areas and forecasting.

This information can then be applied to manage air quality through developing the best actions needed to improve air quality.

### **Analysis of outcomes from the baseline and AQMS**

*Gap analysis* - outcomes from the baseline assessment and AQMS will determine the intervention strategies that should be undertaken to mitigate air pollution in an area. A gap analysis will inform whether the past and current monitoring, emission inventory and modelling information is sufficient to address the air quality issues.

*Problem analysis* allows for the determination of the problems, associated cause of the problems and the effects.

*Prioritisation* - Once the problems, causes and effects have been identified, they must be prioritised so that interventions can focus effort on the most important areas that need to be addressed by the AQMP. Development of aims and targets, together with cost-benefit analysis of possible strategies, will assist priority setting and the construction of a schedule for mitigation of adverse air quality problems.

### **Step 4: Interventions**

The results of the gap and problem analysis should be used to give direction to the development of intervention strategies. These may include strategies to reduce air emissions and air pollution impacts, plans for capacity building or awareness campaigns or even further research. The objective is to identify the most cost effective measures and actions to reduce the air pollution impact by controlling the sources. This can be done by

- Identifying all potential intervention strategies and feasible time scales for implementation, and
- Assessing the possible emission reductions - the selection and most cost effective options will depend strongly on location, the area, topography, and source characteristics.

### **Step 5: Implementation of intervention strategies**

The action plan/ intervention strategy implementation ensures that the interventions identified in Step 4 are implemented. The objective is to:

- Implement the control strategies, including financing the control measures and setting a time frame
- Identify how to implement intervention strategies/ action plans
- Enforce the policies and regulations needed to implement the strategies

Rules for implementation can include

- the sequence of events, including priorities, time schedules and deadlines,
- time period the intervention will operate before assessment on its effectiveness, and

- roles and responsibilities for achievement of the interventions.

The implementation of the action plans should run for at least a period of one year before the evaluation of the intervention strategies is carried out. This will allow reporting within the annual reporting cycle and ensure that the action plans are evaluated at annual intervals. However, it must be noted that action plans can be continuously evaluated and not necessarily only on an annual basis.

Once the AQMP has been completed it should undergo an internal review. This provides the compiler of the AQMP an opportunity to check that all components of the AQMP have been included. A checklist developed for the process is intended to be informative, consistent and transparent and assists in this internal review of the AQMP.

### **Step 6: Evaluation and follow-up**

The following is necessary:

- *Review process of the AQMP* once internal evaluation is complete: The draft AQMP should be distributed to all key stakeholders, including DEAT, for review before being included as part of the IDP/EMP/ EIP submission.
- *Evaluation of the intervention strategies during and after implementation:* The effectiveness of each of the intervention strategies must be assessed to determine whether the goals are being achieved. Appropriate indicators must be developed to monitor progress towards achieving compliance. Key questions in assessing the effectiveness of the interventions include:
  - Have intervention strategies achieved their desired effect?
  - Does any information in the AQMP need updating or is any new information required?
  - Is there a need to change or modify the intervention strategy?
  - Does the vision statement or goals of the AQMP need revision or updating?
  - Can the targets be achieved within the time frames stipulated?
  - Is there a need for additional funds for implementation?
- *Reporting on air quality management planning* on an annual basis: The air quality officer's annual report, which has to be submitted by Provincial or Local authorities in terms of section 17 of the Air Quality Act, 2004 and section 16(l) (b) of the National Environmental Management Act, must contain the following information:
  - Implementation of its AQMP, including information on air quality management initiatives undertaken during the reporting period;
  - The level of compliance with ambient air quality standards;
  - Measures taken to secure compliance with those standards;
  - Compliance with any priority area AQMPs where applicable;
  - Air quality monitoring activities; and
  - Compliance monitoring and reporting.

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# 1. INTRODUCTION

## 1.1 Background

In late 2006, the National department initiated the *AQA Implementation: Air Quality Management Planning Project*. The overall objective of the project was to ensure that the air quality management planning and reporting regime as directed and/or implied by the National Environmental Management: Air Quality Act, (Act No. 39 of 2004) (hereinafter "the AQA") is efficiently and effectively implemented by all relevant spheres of government. The manual intends to establish best practice guidelines on definition of objectives, strategies, plans and procedures for each sphere of government, in order to meet the requirements of the AQA on good air quality management planning and reporting.

In developing this air quality management plan (AQMP) implementation manual, a review of all current South African air quality management planning initiatives was undertaken. This ensured that the process would be consistent in implementation of air quality management planning and reporting within the country using the best available practice. The review process entailed establishing a project reference group, which consisted of Air Quality Officers from all provinces of South Africa and representatives from municipalities with current AQMP initiatives. The reference group presented their air quality planning initiatives, shared information and formed cooperative partnerships and/or networks.

During the review process, the South Durban Basin air quality management system was highlighted and a Case Study was developed with a view to addressing recognised air pollution problems within the pollution "hot-spot" of the area. The experiences from this project were invaluable in testing and informing the development of this manual.

## 1.2 Legislative and Policy Context

Section 15(1) of Chapter 3 of the AQA requires each National department or province responsible for preparing an environmental implementation plan and or environmental management plan to include an AQMP as part of that plan. In the Local government sphere, Section 15(2) of the AQA requires each municipality to include an AQMP in its integrated development (IDP) plan required in terms of Chapter 5 of the Municipal Systems Act. The development of an AQMP is only required for those municipalities that have to develop an IDP.

The National departments required to include an AQMP in their environmental implementation plans and or environmental management plans include: Environmental Affairs and Tourism; Minerals and Energy, Health, Agriculture; Labour, Water Affairs and Forestry, Transport, Land Affairs, Provincial and Local government, Trade and Industry, Housing, Defence, Public Enterprises and Trade and Industry..

In terms of Section 17 of the AQA, an annual report on the status of the air quality management must also be submitted to the minister.

In order to assist government in developing AQMPs, the Department of Environmental Affairs and Tourism (DEAT) has developed this manual to harmonise the process of AQMP development and details the necessary steps that are required to undertake the implementation of the AQMP.

## 1.3 Purpose of the Implementation Manual

The purpose of the Implementation Manual: Air Quality Management Planning is to provide guidance on how to compile an AQMP to achieve the objectives of the AQA, as outlined in Section 15 and 16 of the AQA. The manual also maps out how the various government departments will coordinate and harmonise activities to minimise the duplication of procedures and functions and promote consistency in the exercise of functions.

The implementation manual is a guide and should be read in conjunction with the AQA, guiding documents on air quality monitoring, air quality planning and related activities, in particular the documents published by DEAT as part of DEAT's Air and Atmospheric Quality publications noted in Appendix A of the National Framework.

## 1.4 Structure of the document

This manual provides a step-by-step guide to assist national, provincial and local government in compiling an AQMP.

The outline of the document encompasses the following:

**Chapter 1: Introduction** – Provides the purpose of the manual and gives the scope

**Chapter 2: Roles and responsibilities** – Describes the overarching roles and responsibilities of the different levels of government

**Chapter 3: Different levels of AQM planning** – This section describes the different levels of AQM planning and the roles and responsibilities of the different levels of government at each of the AQMP process steps

**Chapter 4: The AQMP Process** – Describes the 6 step process involved in an AQMP

- Goal setting
- Baseline air assessment
- Air quality management system (AQMS) and gap and problem analysis
- Intervention strategies
- Action plans implementation
- Evaluation and follow up

## 2. ROLES AND RESPONSIBILITIES

### 2.1 Introduction

This chapter outlines the overall roles and responsibilities of different spheres of government relating to air quality management planning. Further detailed information on roles and responsibilities is provided in the National Framework and AQA.

Roles of each level of government are described independently here but it must be noted that the process of developing an AQMP is informed by contributions from all spheres of government and public stakeholders. The cooperation between National, Provincial and Municipal departments within government is critical to the successful implementation of an AQMP.

The flow diagrams and text in section 2.2 highlight the overarching responsibilities of governmental departments relating to AQM planning. Further detail of the requirements of each governmental department with regard to the development of an AQMP is noted in chapter 3.

## 2.2 Different spheres of government

### 2.2.1 National Departments

#### 2.2.1.1 DEAT

The National Framework serves as the Department of Environmental Affairs and Tourism's AQMP as contemplated in Section 15(1) of the AQA. The National Framework includes a logical description of the National department's interventions and required resources aimed at implementing a strategy or strategies to achieve the objectives of the AQA.

Further responsibilities include:

- Review of all other National (EMP), Provincial (EIM) and Local (IDP) AQMPs,
- Compilation of the department's AQMP reports,
- Compilation and implementation of priority area AQMPs,
- Support to other spheres of government

Figure 1 illustrates these responsibilities in relation to other National Departments. It must be noted that DEAT is also responsible for developing an EMP and IEP

#### 2.2.1.2 Other National Departments

There are a number of National departments that have an impact on air quality and, hence, have a responsibility in respect of managing atmospheric emissions within their jurisdictions as summarised in Table 2 of the National Framework.

The National Framework states: "With regard to specific air quality management responsibilities, National departments that are responsible for preparing an Environmental Implementation Plan (EIP) or Environmental Management Plan (EMP) in terms of Chapter 3 of the NEMA are responsible for:

- Including an AQMP in their respective plans
- Preparing an annual report providing information on progress regarding the implementation of its AQMP"
- These plans must be submitted to DEAT for review and then implemented by the National departments.

The main air quality management goal for other National government departments is:

- to ensure that activities that fall within their jurisdiction do not compromise ambient air quality;
- to ensure implementation of the Republic's obligations in respect of international agreements; and
- to ensure that their AQMP is coordinated with the National AQMP.

Figure 1 presents the above mentioned responsibilities in relation to activities linked to DEAT.

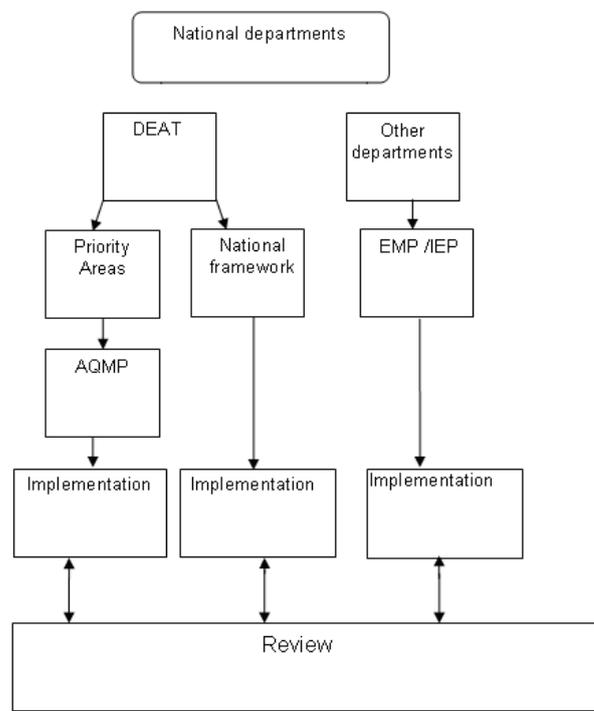


Figure 1: Roles of National Departments

#### Other National Departments include:

Environmental Affairs and Tourism; Minerals and Energy, Health, Agriculture; Labour, Water Affairs and Forestry, Transport, Land Affairs, Provincial and Local government, Trade and Industry, Housing, Defence, Public Enterprises and Trade and Industry..

### 2.2.2 Provincial

In terms of AQM planning, the overall Provincial roles and responsibilities include:

- Development, compilation and implementation of a Provincial AQMP as a component of the EIP and or EMP
- The compilation and implementation of Provincial priority area AQMPs
- Compilation of the department's AQMP reports,
- Support Local municipalities in AQM planning processes

The responsibilities of the Provincial sphere are illustrated in figure 2 and highlight the EIP/ EMP and priority areas aspects.

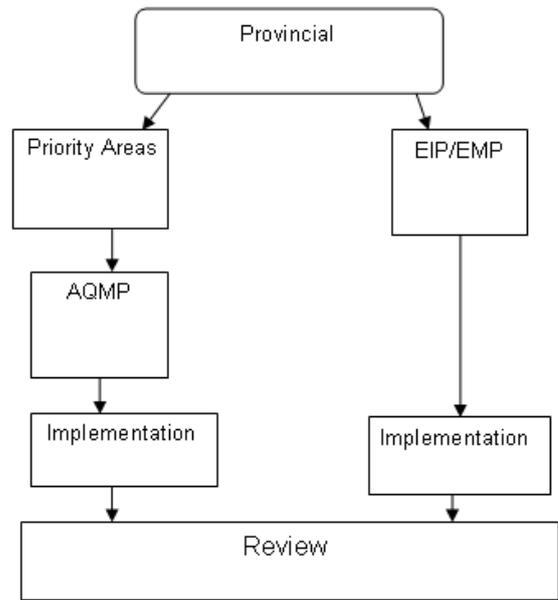


Figure 2: Roles of Provincial Departments

### 2.2.3 Municipal (Metro, District, Local)

Municipal responsibilities in terms of AQA and development of AQMPs are detailed below and illustrated in figure 3:

- Development and implementation of an AQMP as part of its Integrated Development Plan (IDP)
- Compilation of the department's AQMP reports,

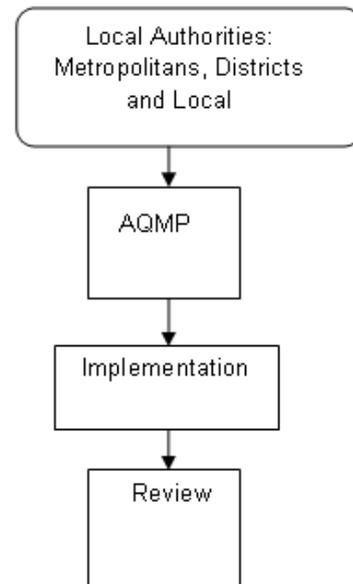


Figure 3: Roles of Local Departments

### 3. HOW DETAILED SHOULD AN AQMP BE?

#### 3.1 Introduction

This chapter describes the process of developing an AQMP and encompasses the steps required to complete an AQMP for each of the three ambient air quality areas documented in the National Framework, viz. poor, potentially poor and acceptable. The level of detail required for an AQMP by each level of government is provided along with a brief overview of the AQMP process. It must be noted that only an overview of the AQMP process is described in this chapter, while the full detail the process is given in Chapter 4 of the manual.

#### 3.2 Level of AQMP required

The development and implementation of an AQMP is a 6 step process which is further detailed in chapter 4. The AQMP is one that is revisited at intervals and follows continuous improvement logic. The different steps of the process do not have to be undertaken by each governmental department with the same degree of detail, as the complexity of the plan depends on the ambient air quality of the area under review.

DEAT conducted an initial assessment of the current air quality status of the metropolitan and district municipalities in South Africa, based on available information, to gain an indication of areas of concern with respect to air quality. The areas have been classified according to three ambient air quality ratings in the National Framework as follows:

- Acceptable – generally good air quality
- Potentially Poor – air quality may be poor at times or deteriorating
- Poor – ambient air quality standards regularly exceeded

The level of AQMP required within each of the ambient air quality rating areas is detailed in Table 1.

**Table 1: Levels of AQMP required**

Ambient Air Quality Rating	Level of AQMP	Steps to be included in plan
Acceptable	Basic AQMP	1, 2 (partial), 4(if necessary), 6
Potentially poor	Detailed AQMP (with certain exclusions)	1 – 6 (with certain exclusions)
Poor	Detailed AQMP	1 - 6

Table 2 below expands this concept and includes the roles of government in the development of an AQMP in each of the ambient air quality areas. The table also details each step of the AQMP process and the matrix illustrates the detail required by a government department for the development of an AQMP.

DEAT compiled a list of those metropolitan or district municipalities initially rated as having poor or potentially poor air quality, which are detailed in Table 24 of the National Framework.

- (a) If a municipality is listed in Table 24 of the National Framework as potentially poor or poor, the municipality will be required to develop a detailed AQMP.
- (b) If an area is not listed in Table 24 of the National Framework and the air quality is considered acceptable only a basic AQMP will be required as indicated in Table 1. The Provincial AQMP will provide the necessary overall guidance for the municipality's air quality management.

Table 2: Steps of the AQMP process to be undertaken within each air quality area class

AQMP Process step & governmental roles	Air quality area: Acceptable	Air Quality area: Potentially poor	Air Quality area: Poor
<u>Step 1: Goal setting</u>			
Develop mission and vision informed by existing policies and regulations	√	√	√
Determine what actions and tools are required	√	√	√
<u>Step 2: Baseline assessment</u>			
Area description and definition	√	√	√
Meteorology and climate description	√	√	√
Collect population data	√	√	√
Collect and evaluate baseline air quality data	√	√	√
Describe existing air quality monitoring programme	√	√	√
Evaluate the current air quality	√	√	√
Identify sources and pollutants of concern	√	√	√
Identify the main sources	√	√	√
Evaluate current management and tools available	√	√	√
Identify the main air quality issues	√	√	√
<u>Step 3: AQMS</u>			
Develop a short term monitoring system		√	√ *
Develop an integrated AQMS		√ **	√
AQMS outcomes:		√	√
- Gap analysis			
- Problem analysis			
<u>Step 4: Intervention strategies</u>	Only if available but not a requirement		
Identify objectives to be met			
Assessment of the pollution situation		√	√
Controlling the sources		√	√
Surveillance and monitoring changes and information to the public		√	√
Identify action plans and available emission reduction interventions		√	√
Assess impact of reduced emissions		√	√
Estimate cost implications		√	√
<u>Step 5: Action plan implementation</u>		√	√
<u>Step 6: Evaluation and follow up</u>	√	√	√

\*(Only in the absence of an AQMS or in parallel with continuous monitoring)

\*\*Only if available but not a requirement

An AQMP is a live document and should be reviewed and updated at intervals, depending on circumstances. During this time, if an area shifts from acceptable to potentially poor or poor (for example new industry that may have an impact on air quality is established), the Local authority will need to engage in a more detailed AQMP.

Table 2 represents graphically the steps to be undertaken in developing an AQMP within each of the air quality classification areas. This table and the explanation below should be read in relation to the continuous nature of the AQMP process as outlined in chapter 4.

Below is a summary of the expectation of each sphere of government in terms of the development and implementation of AQMPs.

### 3.2.1 DEAT's AQMP

The National Framework serves as DEAT's AQMP. DEAT is also responsible for developing AQMP's for National priority areas where Provincial cross boundary pollution and pressing "hot spot" issues are of concern.

A National priority area is considered a poor ambient air quality area, hence requires a detailed AQMP as described above. This will entail all 6 steps being followed to complete an AQMP. The Priority Area AQMPs would run independently of the National Framework and would be reported separately.

### 3.2.2 Other National Department AQMPs

The National Framework states that the main air quality management goal for National government departments is to: ensure that activities that fall within their jurisdiction do not compromise ambient air quality; to ensure implementation of the Republic's obligations in respect of international agreements; and to ensure that their AQMP is coordinated with the National AQMP."

AQMPs for National Departments will be more generic, but specific to the emissions from activities of the department concerned. The AQMP should be of a strategic nature taking into consideration that the activities that fall within their jurisdiction do not compromise ambient air quality.

A National department AQMP should comprise steps 1, 2, 4, 5 and 6 of the AQMP process described above. The AQMP would be aimed at the activities specific to each of the National Departments and can be a brief document that highlights the elements noted above. National Departments required to compile AQMPs include the following:

Department of Minerals and Energy (DME) – responsible for regulations, norms, standards and guidelines for dust control from mine spoil tailings and other mining operations, fuel specifications, and renewable energy initiatives.

Department of Health (DoH) - responsible for regulations and guidelines for medical wastes and treatment facilities, regulates the medical industry within the context of environmental and health legislation.

Department of Agriculture (DoA) - responsible for regulations on use of herbicides, sugar cane burning, dust from agricultural activities, etc.

Department of Labour (DoL) - responsible for regulations for air quality in the workplace

Department of Water Affairs and Forestry (DWAF) - responsible for regulations on forest and veld fires

Department of Transport (DoT) – responsible for regulations for various modes of transport, including planning on a national basis. Specific factors for consideration would be speed limits, improved and increased use of rail transport to reduce vehicular emissions, regulations on tail-pipe emissions, shipping.

Department of Land Affairs (DoLA) - deals with land-use issues

Department of Provincial and Local Government (DPLG) - responsible for regulations on emissions where natural disasters may occur

Department of Housing – responsible for regulations on emissions from coal and wood burning, especially in dense, low-income communities

Department of Defence - responsible for regulations on emissions from the use and/or testing of explosives and other weapons

Department of Public Enterprises - responsible for regulations on emissions from state-owned enterprises

Department of Trade and Industry - responsible for regulations on emissions resulting from technology choices

### 3.2.3 Provincial Department AQMPs

The Provincial AQMP should follow a similar process to that of the detailed AQMP; however the level of detail will depend to a large extent on the level of pollution in the province. The Provincial AQMP must draw on information from the local government AQMPs within the province and encompass a collation of all these AQMPs in the Provincial AQMP.

Provincial departments will need to develop a full AQMP for the priority areas within the province and should follow the requirements of a detailed AQMP as outlined for poor air quality areas detailed in table 2. The Priority Area AQMP implementation manual is included in Appendix 10 for reference.

### 3.2.4 Metropolitan, District and Local Municipality AQMPs

Each of the Local departments would have to implement an AQMP but with varying degrees of detail depending on the ambient air quality area rating. Table 2 details the steps required by the Local authority in each of the ambient air quality areas. If the municipality falls within a priority area, a detailed AQMP will still be required; however it should align itself with the priority area AQMP, and can draw on some of the information contained therein.

The requirements per ambient air quality area as per table 2 are as follows:

#### 3.2.4.1 *Acceptable:*

This area is required to complete the steps 1, 2, 4 and 6. The extent of detail required of each step is as follows:

Step 1: Complete goal setting

Step 2: Complete a baseline assessment up to and including the air quality evaluation as indicated in Appendix 1. If there is no data available for evaluation, a short term monitoring programme should be considered for baseline air quality assessment.

Step 4: This step is only required if the baseline assessment indicates that intervention measures are required.

Step 6: The AQMP needs to follow the evaluation process including the reporting protocol.

#### 3.2.4.2 *Potentially poor:*

This area is required to complete all 6 step of the AQMP process. The extent of detail required of each step is as follows:

Step 1: Complete goal setting

Step 2: Complete a baseline assessment. If there is no data available for evaluation, a short term monitoring programme should be considered for baseline air quality assessment.

Step 3: A monitoring system should be developed to monitor air quality. This does not need to be a full air quality management system. If one exists, continue to operate, however, if one does not exist, it would be sufficient to set up a short term monitoring system for example, passive samplers that can be used on a continuous cycle.

Step 4: Identify intervention strategies and assess the impact of reduced emissions.

Step 5: Implement action plans.

Step 6: The AQMP needs to follow the evaluation process including the reporting protocol.

#### 3.2.4.3 *Poor:*

This area is required to complete all 6 step of the AQMP process. The extent of detail required of each step is as follows:

Step 1: Complete goal setting

Step 2: Complete a baseline assessment. If there is no data available for evaluation, a short term monitoring programme should be considered for baseline air quality assessment.

Step 3: Develop an air quality monitoring system as described in section 4.5.

Step 4: Identify intervention strategies and assess the impact of reduced emissions.

Step 5: Implement action plans.

Step 6: The AQMP needs to follow the evaluation process including the reporting protocol.

## 4. THE AQMP PROCESS

National, Local and Provincial Air Quality Officers are primarily responsible for AQMP development and implementation within their respective areas. The AQMP process described in this chapter provides a guide on how Air Quality Officers (AQO) should develop and implement an AQMP.

Section 4.1 describes the items to consider prior to embarking on the development of the AQMP and includes considerations such as public participation while sections 4.2 to 4.8 describe the AQMP process.

### 4.1 Conceptualisation

#### 4.1.1 Getting started

At each level of government, an AQMP "task team" should be initiated to develop and ensure implementation of the AQMP. Below is how each of the spheres of government proceeds to do this.

##### National level

The National Air Quality Officer (DEAT), in terms of paragraph 5.9.1.3 of the National Framework has established the National Air Quality Reference group. At this level, a technical committee or National - Provincial Air Quality Officers Forum would comprise of the representatives from National and Provincial Departments whose functions are air quality related or who have a legal mandate to perform such functions.

##### Provincial

The structures vary between provinces so the committee established at this level should reflect the local settings. The ambient air quality rating within the area will determine the level of interaction of the technical committee with the municipal air quality officer or the department charged with the responsibility of leading air quality management functions.

At Provincial level, a technical committee or Provincial - Municipal Air Quality Officers Forum would comprise of the representatives from Municipalities and National Departments whose functions are air quality related or who have a legal mandate to perform such functions.

##### Municipal level

The AQO should consult with the department responsible for air quality within the municipal structure and outline the need to develop an AQMP. Consultation should take place with other spheres of government responsible for air quality in the area (Provincial and National) or with a forum or technical committee which may already be in place. A brief overview of what structures or information is already in place should be conducted.

##### *Technical committee*

If there is an existing technical committee, broad representation should be ensured. If there isn't an existing committee, one should be established. The committee could be known as the Air Quality Reference Forum, Technical Advisory Group; or Air Quality Management Committee. It should comprise of competent internal and external government officials whose departments have air quality related functions or concerns and could include expertise from the private sector. The committee should be able to contribute meaningfully in the development and implementation of the AQMP.

Depending on the municipality concerned, the committee may comprise of officials from:

Department of Health, Environmental Management, Environmental Development, Social Development, National and departments of Environmental affairs and Tourism, Minerals and Energy, Water Affairs and Forestry, and Agriculture and economic development.

This committee would champion the development of the AQMP with the AQO. The team would support the development of the AQMP through various activities, for example, arranging public participation meetings, sourcing current air quality data, management of consultants on the project and input from the different spheres. The size of the committee will depend on the level of detail required and scope and scale of issues that need to be addressed by the AQMP process. It may be necessary to develop sub-committees where there are many sources of air pollutants that need to be addressed.

### *Air Quality Stakeholder Group*

This should comprise stakeholders and interested and affected parties, including those affected by air pollution and those who may be affected by interventions aimed at reducing the impacts of air pollution, e.g. industry, business, labour NGOs and CBOs. This group will need to be consulted during the AQMP process and can act in a review capacity.

#### 4.1.2 Resources

The first critical task will be to establish the resources available for conducting an AQMP. Considerations include:

- Funding - Source the necessary funds for compiling the AQMP. This may be the implementing authority's funds and which may be supplemented by outside funding agencies. Compile a list of potential sponsors. Remember that sourcing funding may take time as various organisations have their own budget planning.
- Budget - Depending on the outcomes of the AQMP, a budget allocation or funds would need to be secured for various stages of the implementation of the AQMP, for example, monitoring systems, staffing, training and implementing intervention strategies.
- Timelines – Planning and timelines will need to be set out, which will link with the funding requirements.
- Human resources - determine the expertise required and available to assist in compiling the AQMP. The AQMP can be compiled in-house, with the help of this manual, depending on the how detailed the AQMP needs to be or depending on the ambient air quality in the area. In case there is a need for a very detailed AQMP and there is no local expertise in-house, a specialist consultant may be sourced or a combination of both consultants and in-house expertise used.

#### 4.1.3 Public participation

##### Stakeholders

Broad public participation in the AQMP process is an important step that will lead to greater “buy-in” and promotes the public’s involvement in the development of the AQMP. The potential benefits of public participation are numerous. “If well-planned and managed, public participation can bring new and important knowledge to the table, mediate between conflicting perspectives early in the process and facilitate more efficient air quality governance. Equally important, public participation in air quality management plays a vital role in strengthening and deepening democracy in South Africa and in giving effect to the constitutional right to an environment which is conducive to health and well-being.” (National Framework, 2007). Identify stakeholders that are responsible for emissions and those that are affected by the emissions. They may also assist in determining problem areas from complaints analysis. It’s important to engage stakeholders to help shape community goals and priorities so that they may help with implementation of the plan, while at the same time informing the public and assisting them to understand the technical issues and consequences of interventions. Stakeholder engagement should start as early in the process as possible so that the public is consulted throughout the process.

Public participation within the development of the AQMP would include the following:

- Inclusion of participation early at goal setting through consultation
- Consultation with the public to determine the priorities
- Workshop of the draft AQMP and collation of comments
- Submission of draft AQMP for public comment
  - Implement the plan and ensure that stakeholders are informed of the progress through regular media feedback (including governmental departments, industry and the public)
  - Inclusion in periodic review of the AQMP

Other considerations for public participation include

- Identify stakeholders that are responsible for emissions and those that are affected by the emissions.
- Planning and budget considerations
- Time considerations – provide adequate time for the public to review and comment
- Information dissemination and feedback - supply of information or materials for the public (advertising, newspaper articles, outreach campaigns, pamphlets, documentation, e-mail correspondence, websites)

## 4.2 Introduction – AQMP Process

An AQMP describes the current state of air quality in an area, how it has been changing over recent years, and what could be done to ensure clean air quality in a region. It provides goals and objectives for a region and prescribes short- and long - term policies and controls to improve air quality.

An AQMP sets a course of action that will attain air quality goals in a specified geographical area. It requires actions by government, business, industry, NGO's and the population, as its success will depend on support from all these sectors.

The main purpose of the AQMP development process is to establish an effective and sound basis for planning and management of air quality in selected areas. This type of planning will ensure that significant sources of impacts are identified and controlled in a most cost-effective manner. The best air quality management tools and practices are used in order to assure the most adequate solutions. The ultimate goal is to assure that health effects and impact on building materials and the environment will be minimised in the future.

In order to undertake the planning procedures aimed to identify and improve the air quality in a given area, 6 steps are identified:

- Goal setting
- Baseline air quality assessment
- Air quality management system (AQMS)
- Intervention strategies
- Action plans implementation
- Evaluation and follow up

The development of an AQMP is a dynamic process and is presented in Figure 4 below. This section of the manual is divided into the six parts highlighted above (section 4.3 to 4.11). Each of the sections describes the requirements of each step of the AQMP process.

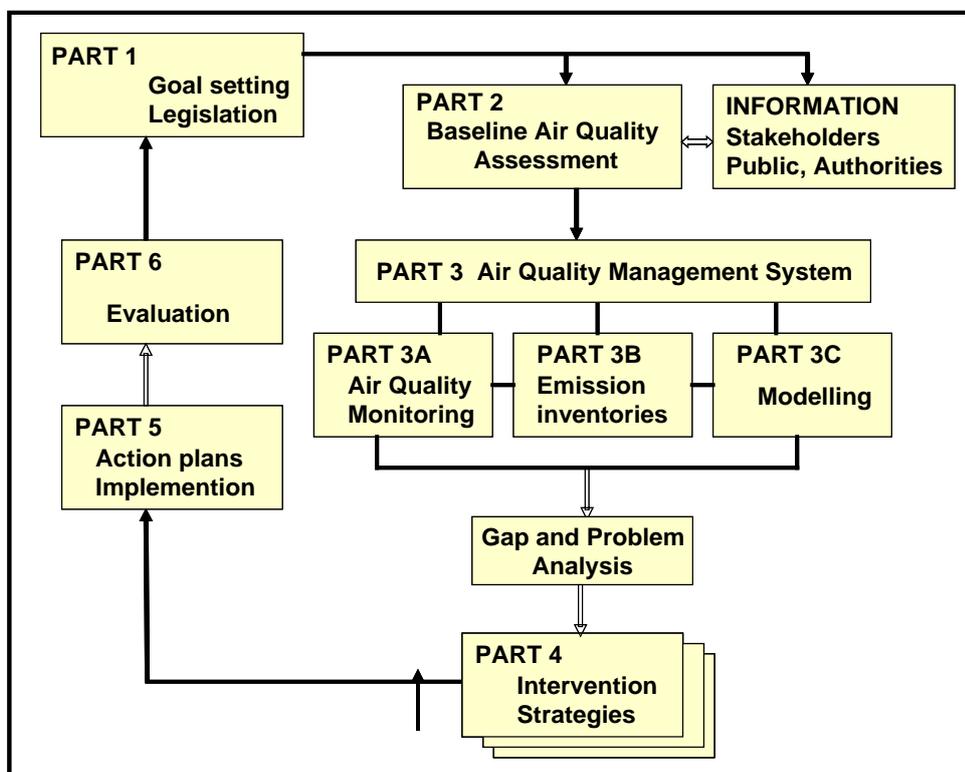


Figure 4: AQMP process as presented in Steps 1 to 6 of this manual

## 4.3 Step 1: Goal Setting

### 4.3.1 Introduction

Goal setting for an AQMP is primarily guided by ambient air quality standards and relevant legislation, emissions standards, stakeholders at a national, Provincial, municipal and public level, as well as by the resources available to the government department responsible for developing the AQMP.

### 4.3.2 Goals reflected in Vision and Mission Statement

The goals in the AQMP should be reflected in the vision statement.

"A vision statement ... is a broad overarching statement that reflects the constitutional right to an environment that is not harmful to one's health or well-being. It is a statement of intent that answers the question, "What is our preferred state of the ambient air currently and in the future?" It is through the vision statement that commitment is built to attain the vision.

The vision statements of AQMPs in South Africa should reflect the values embedded in AQA, the National Environmental Management Act (NEMA) (No. 107 of 1998) and the Constitution. The key elements are likely to relate to the need to minimize health risks from air pollution, a constitutional right to an environment that is not harmful to health and well-being, a global responsibility to minimize emissions to the atmosphere, as well as the need to foster sustainable development and to prevent ecological degradation. Additional elements may be added to express a particular local vision, for example, the improvement of visibility to meet the needs of the tourism industry.

The vision is achieved through a range of short, medium and long term goals. These goals identify the direction to be taken and where the emphasis is going to lie in achieving the vision." (DEAT AQ Publication Series 5, Book 1)

#### Example of Vision (City of Cape Town)

"To be the city with the cleanest air in Africa."

#### Example of Vision (City of Johannesburg)

Clean air is essential to a healthy population, a healthy environment, and, in turn, a healthy economy. The City of Johannesburg is committed to making the air in every community healthy to breathe, to reducing ecosystem damage from air pollution, and to doing its share to address global air quality problems. Air quality will be managed through the implementation of a coordinated approach to the control of air pollution and through the sustainable development of the built environment and transportation within the City. It is intended, in the long-term, that the air be rendered odourless, tasteless, look clear and have no measurable short- or long-term adverse effects on people, animals or the environment.

A mission statement indicates the purpose and explains how you would achieve the vision.

#### Example of Mission (Capricorn District Municipality)

Ensure the maintenance and improvement of current air quality through proactive and effective management principles that take into account the need for sustainable development into the future

### 4.3.3 Translating Goals into Objectives and Targets

To put the goals of an AQMP into action, one must translate them into objectives and targets. The level of detail will depend on air quality issues that need to be addressed.

**Table 3: Examples of objectives and targets**

Objectives	Targets
To achieve acceptable air quality levels throughout Johannesburg	<ul style="list-style-type: none"> <li>Establishment of the City of Jo'burg as a Smokeless Zone by 2015</li> </ul>
Meet ambient air quality standards	<ul style="list-style-type: none"> <li>Descriptive statistics and trends of monthly or annual ambient averages</li> </ul>

The setting of goals in the AQMP should highlight:

- Goals on meeting standards and regulations
- Identification and mitigation measures of primary and secondary pollutants of concern: a) health related b) environmental impact related
- Assessment of regional issues
  - acid rain
  - regional ozone
  - transboundary problems
- Global issues such as a) greenhouse gases b) persistent organic pollutants
- Training, institutional building and information management

### 4.3.4 Legislation

The following legislation should be considered in the process of setting goals:

- South Africa Constitution 108 of 1996
- National Environmental Management: Air Quality Act (Act No. 39, 2004)
- National Environmental Management Act (No. 107 of 1998)
- National Health Act 61 of 2003 –MHS
- Municipal Structure Act 117 of 1998 –Powers of (Ex.) Mayors
- Municipal Systems Act 32 of 2000 –IDP
- The 2007 National Framework for AQM in the Republic of South Africa

The objective of the AQA aims to protect the environment by providing reasonable measures for:

- The protection and enhancement of the quality of air in the country;
- The prevention of air pollution and ecological degradation; and
- Securing ecologically sustainable development while promoting justifiable economic and social development

### 4.3.5 Agreement on goals

The air quality vision and goals must be defined in consultation with the technical committee, relevant role-players and the public from the start of the process. This could involve a meeting with all stakeholders at the start of the process and getting feedback on issues within the area where improvement could be attained.

Once the goals are decided, this sets the basis for the formulation of the rest of the AQMP. These goals should be published and stakeholders made aware of the start of the AQMP process.

## 4.4 Step 2: Baseline Assessment

### 4.4.1 Introduction

After setting the goals, a baseline air quality assessment must be undertaken to assess and evaluate the current air quality status.

A baseline air quality assessment is an assessment of available:

- air quality data,
- air pollution sources, and
- area data.

Based on this assessment, it will be possible to identify the need for further studies and the necessity of performing a detailed integrated and complete AQMP.

Baseline assessments based on all available information must be conducted and reported for the area in question. These data will include:

- Area description and geography
- Description of the meteorology and climate of the area
- Population statistics
- Evaluation of air quality information based on available data
- Sources and emissions
- Pollutants of concern
- Priority air quality issues
- Evaluate current management and tools
- Consideration of future developments which may have an impact on air quality
- Prioritising areas for intervention

The level of detail required for the baseline assessment would depend on whether a basic or detailed AQMP is required, this being dependent on the air quality rating of the area concerned (refer Chapter 3.2 and Table 1).. If only a basic AQMP is required the baseline assessment would be a general overview including inventory of sources, whereas a more comprehensive assessment would be required for a detailed AQMP. The baseline assessment may reveal that more detailed investigations should be conducted either due to missing information or due to violation of air quality standards.

### 4.4.2 Elements to include in the baseline assessment

#### 4.4.2.1 Area description and definition

A baseline study starts with defining the area boundaries and giving area descriptions. The boundaries of the area must be clearly specified and possible Air-shed Priority Areas need to be specified. Area boundaries and maps must be included. The area boundaries can be defined by:

- Administrative boundaries
- Region or municipality
- Priority area definition
- Urban populated extension
- Urban agglomeration boundary

Topographical features such as mountains, valleys and waters should be identified and discussed relative to possible impacts on air pollution concentrations. In order to integrate all this information with air pollution data it is advisable to digitise maps and to develop a GIS based air quality management system. Geographical Information System (GIS) functionalities can be designed to offer several possibilities for understanding the problems of air pollution, by placing the air pollution sources at the correct location in relation to the total network of roads and traffic sources in the area and population. The GIS also makes it possible to search for geographically linked data in the database. If GIS is not an affordable option, a spatially referenced system should be sufficient.

#### 4.4.2.2 *Meteorology and climate description*

##### Describe the climate of the area

A brief introduction to the meteorological features and climate of the area must be presented. The description of the climate of the area must take into account the general climatic conditions as well as specific local conditions as there may be mesoscale and microscale influences.

##### Collect meteorological data

Data in the area concerning wind, temperature and precipitation should be collected and presented. Studies previously performed linked to air pollution investigations may give the best and most relevant data for assessing the meteorological conditions driving air pollution. Local data from the weather service can be used to study relevant parameters such as prevailing winds, temperatures humidity and precipitation.

##### Investigate air stability and temperature inversions

Atmospheric stability and the frequency of low level temperature inversions may adversely influence on local air pollution. The typical "African air pollution problem" is a combination of burning at the surface just after sunset and the creation of strong surface based inversions. This combination of burning and meteorology may trap pollution close to the surface, resulting in high pollutant concentrations. All pollutants emitted close to the ground (e.g. traffic emissions) may cause high impact during surface based inversions

#### 4.4.2.3 *Collect population data*

Information about the population distribution and population density must be collected and presented. The population distribution will also serve as an input to the emission inventory and to the exposure estimates. The population data should ideally be prepared on a GIS mapping system. Population distributions are used to distribute area source emissions when total consumptions are known and to combine with model estimated concentration distributions to estimate the exposure to people from air pollution.

#### 4.4.2.4 *Collect and evaluate baseline air quality data*

This comprises of a baseline characterisation to understand the current state of air quality within the area and assess compliance with ambient air quality standards. Part of this analysis is to identify areas and pollutants which exceed air quality standards and limit values.

##### Describe air quality monitoring programmes

Study the existing air quality measurement programmes and assesses how data are collected, quality controlled, transferred and stored. The description should include:

- Sites and site representivity
- Locations presented on a map
- Parameters and instruments used at each of the sites
- Data transmission and databases used
- Data quality assurance programme
- Data handling and statistics
- Data reporting

A summary of the existing air quality monitoring programme could be presented as shown in the example presented below.

**Table 4: An example of the existing air quality monitoring programme**

Site name	Region	Type of site	Parameters measured	Time resolution	Measurement period	Comments
City site A	Name	Road side	PM <sub>10</sub> , NO <sub>x</sub>	1 hour	Jan 2005 – present	

Evaluate Quality Assurance/Quality Control (QA/QC)

Before using the information and data from existing measurements, it is necessary to assess the quality of these data. A quality assurance and quality control (QA/QC) programme should be identified. It is important that all described standard operations procedures and calibration procedures have been followed. The final assessment of the current situation and the identification of priority issues are dependent on the quality of the data itself.

Evaluate the current air quality

When all available air quality data in the area have been collected, evaluated, quality assured and presented a summary of the results must be prepared to include:

- Annual average concentrations of all parameters
- Maximum hourly and daily average concentrations for indicators where limit values for these averaging times exist (and in the case of SO<sub>2</sub>, maximum 10-minute averages)
- Exceedances of standards or limit values; number and frequencies
- Trends and development of air quality over time
- Source receptor relationships (air quality vs. meteorology)

Where data does not exist as part of an established air quality monitoring system and information on ambient air quality is required for this study, a short-term assessment of air quality can be undertaken. For example, the use of simple inexpensive passive samplers could be used in a screening study of the area. Information from this type of monitoring can assist in informing whether a more comprehensive ambient monitoring system is necessary and if ambient standards are likely to be exceeded.

Are air quality standards met?

The evaluation of the air pollution situation based on existing information provides an understanding of the potential risk for health impacts and environmental degradation. The baseline characterisation provides the foundation for the development of the AQMP, which forms the detailed strategies and procedures in order to meet the set clean air objectives within a specific timeframe. It also provides the basis for deciding whether more detailed studies are needed in order to identify the most cost effective emission reduction strategies. Further studies may also need to be provided in order to determine the environmental impacts of alternative emission reduction measures. The impact on the environment from emission reductions or changes in technologies and infrastructures may also have to be studied using more advanced AQMP tools.

The baseline air quality assessment in the area must include the following tasks:

- Identification of sources and emissions which may cause deterioration of health and the environment
- Determination of National and Provincial requirements pertaining to air quality management planning within the area
- Decision on whether the current air quality management and operational structures within the area are adequate?
- Inventory of current procedures and methods adopted by National authorities to combat air pollution
- Review of best international practices pertaining to AQMP Plan development and implementation.

**4.4.2.5 Identify sources and pollutants of concern**

List pollutants and compounds

A list of priority air pollutants or indicators for further monitoring should be identified. The table below indicates some of the relevant pollutants for urban areas.

**Table 5: Priority pollutants and possible sources**

Priority Pollutant	Main sources
Sulphur dioxide (SO <sub>2</sub> )	Refinery, fuel based industry, process emissions, traffic emissions
Nitrous Oxide (NO <sub>3</sub> ) and Nitrogen dioxide (NO <sub>2</sub> )	Traffic and industry
Carbon Monoxide (CO)	Traffic
Particulate Matter (PM <sub>10</sub> )	Refinery, fuel based industry, process emissions, traffic emissions, biomass combustion
Ozone (O <sub>3</sub> )	Secondary pollutant, regional, industry and traffic
Benzene	Industry and traffic
Lead	Industry and traffic

Identify the main sources

As part of the baseline assessment the main sources of air pollution in the area must be identified. The sources should be listed according to type of source; stationary source, mobile source, area source or other. The significance and location of the sources must be mapped. An example of how these could be identified and classified is given below.

**Table 6: Example of table for identification of sources and associated pollutants**

Sources	PM	SO <sub>2</sub>	NO <sub>x</sub>	VOC	CO	CO <sub>2</sub>	HAP
Vehicle tailpipe							
Traffic dust							
Industries							
Coal burning domestic							
Power plants							
Incineration							
Biomass burning							
Mining							
Agricultural							
Transport (other)							
Trans-boundary							
Other							

Evaluate existing emission inventories

In order to identify possible effects of reduction measures in an area it is necessary to prepare a complete emission inventory including all sources in the area. The emissions inventory is a database of all sources of air pollutants in a region of interest containing information on the type, number, location and magnitude of sources.

By quantifying the amount of air pollutants released into an air shed, the inventory provides a basis for setting reduction targets and identifying priorities for air quality management. Any emission inventories already prepared in the area must

be studied and evaluated. These inventories can be used as a basis for updating and completing the information of sources and emissions and preparing these data for a more advanced air quality management planning process.

#### **4.4.2.6 Baseline assessment and priority Air Quality issues**

The elements of a baseline assessment are presented in flow charts in Appendix 1 for ease of reference when completing the assessment. The flow charts are a quick reference tool when conducting the final phase of the assessment.

##### What are the main priorities?

In the baseline assessment it is important to define the most important sources and impact areas. The descriptions must include compounds, source characteristics, potential impacts and description of the impacted areas. Specific areas or zones with anticipated adverse impact of air pollution must be identified. For these areas specific plans must be developed in order to reduce the negative impact on human health and the environment.

Examples include:

- Wind blown dust from gold mines tailings dumps are of some concern where such dumps are created near residential areas, or where residential areas develop near existing dumps.
- Vehicular transport also generates a number of pollutants, which result in high exposure to the people. Transport on sand and gravel roads results in particulate matter (dust) being dispersed into the air, particularly from heavy vehicles in the vicinity of mines.

During the evaluation of the main priorities, it would be prudent to set up a meeting with stakeholders within the area to determine what their perceptions are in terms of air pollution. This way, a holistic view of what the main priorities are can be assessed.

#### **4.4.2.7 Evaluate current management and tools available**

##### Air Quality Management officials

As part of the baseline assessment the capacity within the various spheres of government must be assessed. The existing organizational structure of air quality management may vary from one area to another.

In some Provinces and areas an inter-departmental task team may be formed to assist in the more effective management of air quality. Different role players may therefore be involved in the management, control of air pollution and monitoring of air quality within the area. These are typically:

- Department of Environmental Health
- Department of Environmental Planning and Management
- Pollution Control Task Team

The organization and management of existing air quality operations; monitoring and management systems may include:

- Local authorities
- Research institutions
- Consultants

A complete list of participants and tasks should be presented and the relevance as well as the ability to perform a complete integrated air quality planning process needs to be assessed.

##### Emissions Inventories

Different regions may have formulated different emission inventories with varying resolutions and information. An assessment of available emission data and emission inventories must be undertaken.

The emission inventory systems must be described as far as they exist and being applied in the area. An Evaluation of the content and relevance must be done with specific reference to the time period for the data collection.

It must be determined whether these emission inventories are adequate and sufficient to evaluate the relative importance of different sources, and whether they can be used in a more detailed study of the impact of emission reduction measures?

#### Existing Air Quality monitoring

In order to assess the tools available in the area it is also necessary to describe and evaluate the existing air quality monitoring programmes. As described in Section 3.3.2.4 the site suitability, locations and QA/QC programme must be evaluated as part of the decision process. If the need for additional or improved monitoring is identified it will be necessary to include this in a more advanced integrated air quality management system (AQMS), which will form the basis for the development of action plans.

#### Have models been applied in the area

Simple or more advanced atmospheric dispersion models may already have been used in the area. A discussion of the applicability of these models as tools for evaluating the impact of control measures must be presented.

The following questions should be asked:

- What kind of dispersion model has been used?
- Why was this model chosen for this area and “problem”?
- What was the main purpose of using the models?
- Have the models been tested and verified using measurement data?
- Have meteorological input data from the actual area been used as input?
- Has terrain from the actual area been used as input?
- Does the model include a complete emission inventory for all sources?
- Have background concentrations been included?
- Have appropriate approaches been used for secondary pollutants (e.g. ozone, NO<sub>2</sub>)?

#### Consideration of other issues

The following issues should also be considered during this process:

1. Climate change and the status of current interventions on the mitigation of greenhouse gas emissions to understand the parameters on management of this aspect of the DEAT’s mandate.
2. Aspects concerning future developments within the area.
3. Transboundary issues- the possible transport of pollutants from surrounding or remote areas.
4. If the baseline air quality assessment indicates poor air quality or air quality standards are not met, this could trigger a priority area assessment.

#### **4.4.2.8 Need for complete integrated assessment (AQMS)**

The evaluation and assessment of data in the baseline assessment will inform whether more advanced air quality management planning processes need to be undertaken. If the baseline assessment clearly indicates that air quality standards and limit values are exceeded, or if the public participation process has indicated air quality problems, it will be necessary to prepare and undertake a complete air quality management planning system in order to identify actions to reduce the air pollution in the area. However, if this is not the case, only a basic AQMP may be required depending on other information sourced.

During the baseline assessment it is possible to identify possible intervention measures. These measures are further explained in section 4.8.

## 4.5 Step 3: The Air Quality Management System (AQMS)

### 4.5.1 Introduction

An outline of the components of an AQMS is provided below. The main elements include:

- Monitoring
- Emission inventories
- Atmospheric Dispersion Modelling

An overview of AQMS is provided in *Government Publication Series 3, book 2: Introduction to AQM*.

The diagram below shows how the process starts by establishing the tools and collecting adequate data before steps 4 to 6 of the AQMP process is undertaken.

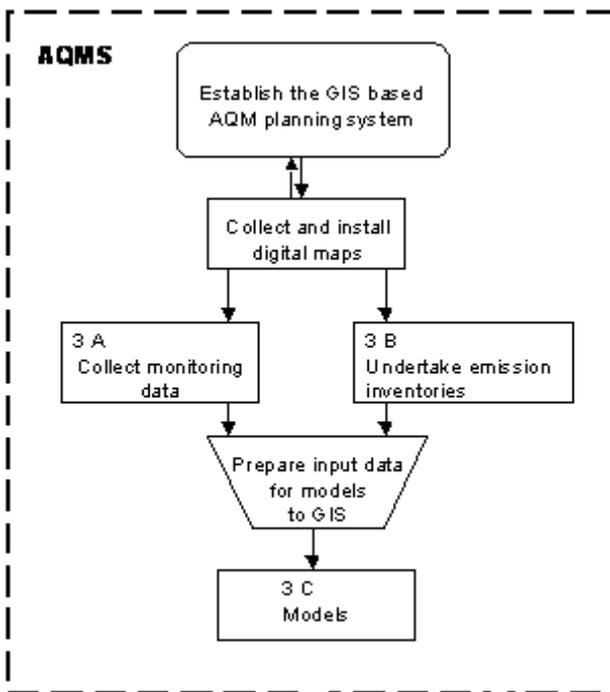


Figure 5: *Process of AQMS*

## 4.5.2 Monitoring

### 4.5.2.1 Introduction

In order to develop or implement an effective AQMP, it is necessary to obtain reliable information on ambient air pollution levels. This can only be done through ambient air monitoring, the ultimate purpose of which is not merely to collect data, but to provide necessary information to make informed decisions on improving air quality. The level of sophistication of the monitoring system will depend on the results of the baseline survey.

- If monitoring systems are already in place, data from these would already have been included in the baseline assessment, and a gap analysis (refer Section 4.6) could be conducted to determine additional needs. .
- If no monitoring systems are in place and the area falls within a “poor” ambient air quality area (refer Section 3.2) it is recommended that a full ambient monitoring network be established.
- If the area falls within a “potentially poor” ambient air quality area, a screening study using passive samplers may be sufficient (refer Section 4.5.2.3), however if poor air quality is indicated, a more detailed monitoring network may be necessary.
- If the area falls within an “acceptable” ambient air quality area (Section 3.2), a baseline study should suffice (refer Table 2), possibly supplemented by periodic passive sampling to gain an idea of background pollutant levels.

Sections 4.5.2.2 to 4.5.2.3 below describe the requirements for ambient air pollution monitoring.

### 4.5.2.2 The ambient air quality monitoring network

The air quality monitoring network must comply with some basic requirements:

- The monitoring is performed in accordance with accepted standard methods.
- The monitored data is subjected to data quality control procedures.
- The location of monitoring stations is based upon some process taking account of locations of main sources, topographical features and meteorological conditions, as well as urban features and population distribution.
- The monitoring covers all compounds of relevance in the area, based upon the sources in the area and their emissions of compounds relevant for air pollution and its effects.

Section 5.2.1.3 of the National Framework provides criteria for ambient air pollution monitoring networks. Further detail on air quality monitoring is contained in the information provided by the EPA accompanying this manual or alternatively on the DEAT website: <http://www.deat.gov.za/>

The flow diagram contained in Appendix 2 indicates the elements of the air quality monitoring network noted below. Further detail on each of these criteria can be sourced from the SAAQIS website.

- Define monitoring objectives
- Design the monitoring programme
- Site selection
- Evaluate and identify site classifications
- Select priority pollutants
- Develop a Quality Assurance and Quality Control (QA/QC) system
- Select data acquisition system
- Establish meteorological stations

### 4.5.2.3 Alternative monitoring methods

If baseline data is required and a continuous ambient air monitoring network is not available in an area, or may be too costly to implement, an alternative method of monitoring could be applied. These can act as short term monitoring methods instead of the continuous monitoring described above. An example is a passive sampling programme for a gaseous pollutant. This method is popular in terms of its affordability and effectiveness in classifying areas of pollution.

Passive sampling could be used as a baseline assessment tool or developed into a monitoring programme where sampling is repeated at certain intervals to assess air quality. Alternatively, passive sampling can be used as a tool in assessing the siting of ambient air monitoring stations within an ambient air quality monitoring network.

For “acceptable” and “potentially poor” ambient air quality areas, passive sampling can be used to assess air quality and the need for further monitoring.

### 4.5.3 Emission inventories

An emission inventory is a list of all sources of pollution within the area, providing detail on the location and volume of pollutants emitted. An emission inventory, like the monitoring process, can be used to inform an air dispersion model in providing spatially referenced current emission rates of industries and emission data from the area. A number of different methodologies exist for compiling an emission inventory using emission rates and emission factors. Additional information on compiling an emission inventory is available in the information provided by the EPA accompanying this manual or alternatively on the DEAT website, <http://www.deat.gov.za/>.

The emission inventory starts with identifying all relevant sources in the area. For each source that may emit air pollution and contribute to exposure, data must be collected on:

- Type of source ;( e.g. point, line, and area source).
- Location
- Amount of emission
- Variation of the emissions with time (hour of the day, day of the week and year).

#### 4.5.3.1 Types of sources

Pollutant sources are divided into the following categories:

Point source: Emissions from single activities of some size, like industrial plants, power plants, incinerators etc., characterised by emissions from individual stacks. It is important to identify the stacks, and to collect information about their height, physical parameters and the exact location so that it is spatially resolved.

Line source: Emissions from road traffic, streets and highways, railways. Emissions are usually estimated based on transportation data (e.g. traffic counts).

Area source: Area sources are smaller or more diffuse sources of pollution (e.g. home heating, public services, veld fires, agricultural activities). Input data for estimating emissions from these sources are provided on an area basis either for administrative areas, such as counties, municipalities or for regular grids.

A complete description of pollution types and sources is provided in *Government Publication Series 4, book 1: Types and sources of air pollutants*.

Flow charts of the various steps used to compile emission inventories for the above sources are shown in Appendix 3.

#### 4.5.4 Atmospheric Dispersion Modelling

Air quality models are used to establish a relationship between emissions and air quality. Air quality modelling combines knowledge of pollutant source strengths (i.e. emitted quantities per unit time) with meteorological data to estimate concentrations at the receptor points. Models have varying degrees of sophistication and accuracy and are rarely better than plus or minus 20-30 percent of the "actual value", unless the model is "tuned" by use of pollution monitoring data (stochastic modelling). Despite their limitations, air pollution models remain important tools for assessing emission reduction strategies, estimating ambient concentration and for gaining a better understanding of the economical aspects of air pollution.

Different types of models may need to be applied as part of the AQM process. Details of the various modelling methodologies are provided in Government Publication Series 4, Book 3: Atmospheric Modelling.

The flow diagram in Appendix 4 shows the inputs of various factors into the dispersion model. Once a model has been selected and input data such as meteorology and complete emission data being applied from the emission inventory, it is possible to test and verify the model performance against measured air pollution concentrations. This will give a model credibility and will support the application of models in the planning process.

Some of the parameters to consider when selecting a dispersion model include:

- Source characteristics,
- Complexity of transport of pollutants
- Topographical features
- Turbulence and atmospheric diffusion,
- Plume buoyancy,
- Deposition problems,
- Chemical reactions

#### Model applications

The following are some of the model outputs

- Exposure
- Health impacts
- Ecological impacts
- Impact on building materials
- What-if scenarios and forecasting
- Cost-benefit analysis
- Prioritising air quality issues

#### 4.5.5 AQMS outcomes

As described in figure 5, the AQMS is used to inform the intervention strategies that would be undertaken to mitigate air pollution in an area. Section 4.6 below highlights the gap analysis that is undertaken once the baseline assessment and AQMS is complete and section 4.8 describes the identification of intervention strategies.

## 4.6 Gap analysis

A gap analysis must be conducted to evaluate whether the past and current monitoring, emission inventory and modelling information is sufficient to address air quality issues. Consultation with stakeholders and the technical committee is necessary to understand what issues may be outstanding and what may need incorporation to “fill the gaps.”

Examples of gaps identified may include

- Monitoring data – gaps in data collection, insufficient monitoring stations, incorrect siting of monitoring stations, insufficient parameters measured, inadequate QA/QC, insufficient data for meaningful interpretation and therefore inadequate for comparison to standards
- Emission inventory – incomplete (e.g. lack of compliance from industry, sources not included), lack of supporting data for emission factor calculations, e.g. traffic counts, farm areas (ploughing, sugar cane burning estimates)
- Model output – insufficient or poor quality input data, output not detailed enough, model not trusted (doubtful results, poor agreement with measured or ground-truth data), calibration of model required
- Insufficient stakeholder consultation
- Complaints data may indicate that there is a problem in a particular area, but there is no data to back this up
- Licensing function - insufficient licensing and permitting procedures, lack of enforcement of permit conditions
- Capacity – insufficient staff in air quality management and lack of expertise and resources
- Funding constraints
- How to integrate with Climate Change issues, e.g. adaptation

Emanating out of the gap analysis, various research initiatives may be necessary.

## 4.7 Problem analysis

A problem analysis allows the determination of the problems, associated cause of the problems and the effects. A problem analysis could be conducted using the logical framework approach as highlighted in the Vaal Triangle AQMP. Appendix 5 describes the logical framework approach and an example of a problem tree is noted in Appendix 6.

The problem tree should be developed in consultation with stakeholders as noted in the baseline assessment process in Appendix 1. Once the problems, causes and effects have been identified using the problem tree approach, the problems must be prioritised. Section 4.7.1 below describes how to prioritise these problems.

### 4.7.1 Prioritise problems

Identify priority pollutant issues and areas that need to be addressed by the AQMP, based on the ambient air quality assessment and public participation process. The interventions should focus effort on those pollutants that are exceeding standards and other priority areas indicated in the problem analysis, e.g. those areas indicated by complaints data, gap analysis.

Determine the major sources of the priority pollutants identified. This should be based on modelling and emission inventories.

The following criteria could be used in the preliminary prioritisation assessment:

- Where are the problem areas?
- What are the priority pollutants?
- How toxic are the pollutants at the current concentrations?
- What are the priority sources?
- Population exposure to the impact?
- Frequency of the impact?
- Nature of the impact?
- Severity of the impact?
- Cost of the impact to communities and environment?
- Are sensitive ecosystems exposed?

- Meteorological constraints

Development of aims and targets, together with cost-benefit analysis of possible strategies, will assist priority setting and the construction of a schedule for mitigation of adverse air quality problems.

Priority setting will have temporal, geographical, sectoral and problem intensity aspects. The different approaches in the setting of priorities, and thus development of action plans, are:

- Temporal approaches
- Geographical approaches
- Problem intensity approach
- Sectoral approach

### ***Temporal approach***

Implementation measures can be scheduled in three stages:

- Short Term (1-2 years) - focus on establishing targets and building supporting structures/ capacity building;
- Medium Term (3-5 years),- focus on assessing successful attainment of targets, and the promotion of abatement through planning mechanisms
- Long Term (> 5 years). – focus on the attainment of long-term goals

### ***Geographical approach***

- Priority setting can also be expected to have a geographical expression.
- Air quality problems are not expected to be uniform across a Province or Municipality, and hence geographical zoning provides for dissimilar policies to be applied simultaneously according to location.
- This can be utilised as guidance for day-to-day management on the one hand, through to formal planning criteria at the other extreme.
- Zones may identify areas in which identifiable activities pose actual or potential risks to the population or the environment, or may identify hotspot areas in which particular pollutants pose actual or potential problems regardless of which activity emits them.
- The usefulness of zoning becomes more tangible during the compilation of baseline data on air quality, emissions, and activities, but can also emerge as an applicable tool at times into the future according to the developing management and air quality environment.

### ***Problem intensity approach***

Priority setting is also aided by the use of tiered air quality objectives:

- Limit values would be attained in a given timeframe and thereafter not exceeded and would be intended to prevent, avoid or reduce harmful impacts.
- It may require identification of threshold values when specific investigations have to be undertaken.
- Alert Thresholds need to be identified at concentrations when health may be impacted by short term exposure.
- Information threshold values need to be established, e.g. when should the public be informed that sensitive individuals may be impacted by particularly high concentrations?
- Actions would be instigated by air pollution concentrations at Information or Alert Threshold levels.

### ***Sectoral approaches***

Whilst each plan would be unique in the mix between the economic sectors it must manage, there are a number of typical sectors which may be found in many or all Provinces and Municipalities. These are some of examples of sectors:

- domestic fuel burning;
- transport and traffic;
- industry and fuel burning;
- waste disposal;
- agricultural;
- biomass burning; and
- mine tailings.

Based on the outcomes of the problem analysis and the goals of the AQMP, prioritise the time frame over which implementation is desired, the geographical areas that need to be focussed upon, the air quality objectives and the sectors which have most impact on air quality.

## 4.8 Step 4: Intervention strategies

The results of the gap and problem analysis should be used to give direction to the development of intervention strategies. These may include strategies to reduce air emissions, plans for capacity building or awareness campaigns or even further research. The objective is to identify the most cost effective measures and actions to reduce the air pollution impact by controlling the sources. This can be done by

- Identifying all potential intervention strategies and feasible time scales for implementation, and
- Assessing the possible emission reductions - the selection and most cost effective options will depend strongly on location, the area, topography, and source characteristics.

The problem tree should then be translated into an objectives tree where interventions are identified and then prioritised. Examples of interventions strategies are given below.

A flow diagram detailing the steps taken to develop intervention strategies is highlighted in Appendix 7. The diagram is a summary of the text that follows.

### 4.8.1 General intervention strategies

This section provides examples of the general problems and intervention strategies which are not directly related to emissions. Section 4.8.2 deals with intervention strategies relating to air quality specifically

#### 4.8.1.1 Example 1:

Some of the limitations identified in the AQMP development in South Africa have been for example:

- Decentralisation of current air quality functions between departments and sections (air quality, energy, climate change)
- Current organisational structures do not cater for effective air quality management
- Current budget is inadequate to address air quality management needs to make significant impact

*Intervention strategy:*

Experts may therefore have to provide assistance to the project partners during the initial phase of the air quality management planning process in pilot provinces and/or municipalities. This includes on-the-job training, support and follow up of the work of the project partners in pilot provinces and/or municipalities.

#### 4.8.1.2 Example 2

Air quality management planning procedures do not comply with internationally recognised standards.

*Intervention strategy:*

- Add updated and state-of-the-art AQM systems to the network
- Review and update the AQM planning procedures

#### 4.8.1.3 Example 3:

The licensing function within an area does not effectively manage the air pollution problem.

*Intervention strategy:*

Prepare and improve the licensing function.

## 4.8.2 Intervention strategies relating to air quality specifically

### 4.8.2.1 Identify available emission reduction interventions

For each source it is necessary to obtain information on existing emission reduction initiatives;

- Statement on their effectiveness;
- Identification of all potential reduction strategies. It is useful to divide these into short-, medium- and long-term strategies (see figure 6)
- A description of each strategy, including technical feasibility and socio-economic impacts, and a statement on implementation;
- Quantification (through dispersion modelling) of reduction in ambient pollutant levels as a result of the implementation of each emission reduction strategy;
- Estimation of expected costs and benefits; and
- Ascertain parties and apportion responsibility to implement the reduction strategy.

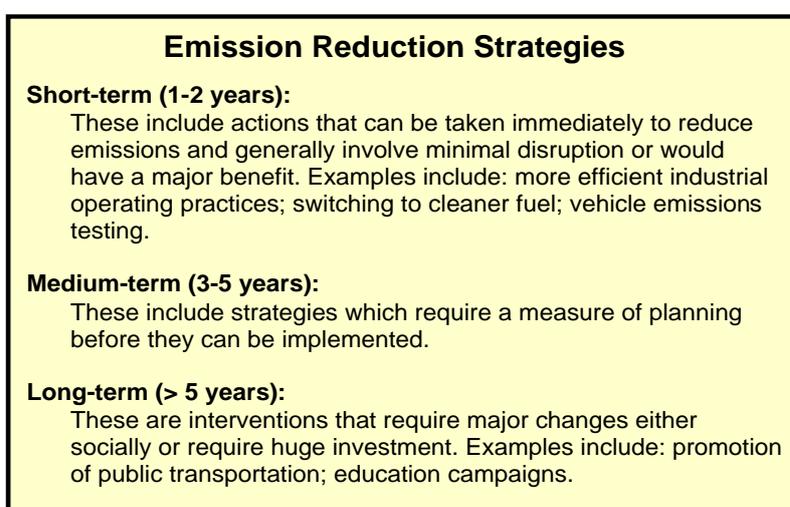


Figure 6: Emission reduction strategies divided into short and long term interventions

### 4.8.2.2 Assess possible emission reductions

#### Individual sources and point sources

A number of actions may be identified in order to reduce the emissions from point sources. The selection and most cost effective options will depend strongly on location, the area, topography, and source characteristics and can only be assessed using the complete Air Quality Monitoring System described in Section 4.5 of this manual.

Different industries resulting in various air pollution problems have been identified in South Africa. Some of these industries may have to be evaluated as part of assessing intervention strategies. Some of these are:

- Combustion processes
- Petroleum industry
- Coal gasification
- Metallurgical industry
- Mineral processing
- Organic industry
- Incineration process
- Waste handling
- Wood and paper
- Animal products

### **Reduce emissions from mobile sources**

In addition to measures introduced by National governments on emission reductions from individual vehicles, emission reduction strategies for the transportation sector also includes actions, which are closely related to land use planning and traffic plans. The co-ordination of several departments and stakeholders are important.

### **Reduce emissions from area sources**

Area sources may be difficult to control and in some cases hard to identify and quantify. Locally there are no doubt that ground based area source emissions may cause high exposure and adverse impact to the health of people. Some of these sources are:

- Domestic fuel burning
- Mine tailings
- Wildfires and
- Prescribed burning
- Landfills and waste burning
- Agriculture
- Tyre burning
- "Diffuse" transport

## 4.9 Step 5: Implementation of intervention strategies

The implementation of intervention strategies ensures that the interventions identified in Step 4 are implemented. This chapter describes the approaches to developing action plans and the implementation process for the interventions identified.

The objective is to:

- Implement the control strategies, including financing the control measures and setting a time frame
- Identify how to implement intervention strategies/ action plans
- Enforce the policies and regulations needed to implement the strategies

### 4.9.1 The implementation process

- Implementation of strategies at all levels requires formal structure and transparency.
- An implementation task team, consisting of representatives from government departments and multi-stakeholder groups should be established to oversee the implementation of action plans for the respective sectors. Representatives of the implementation task team (per sector) can be sought from the technical committee and air quality stakeholder group established early on in the AQMP process.
- Specific air pollution problems identified through the intervention strategies must be addressed, describing the control measures and strategies to be applied in order to attain and maintain air quality standards and resolve identified air quality issues.
- Issues such as financing for the development of the AQMP must also be considered.
- Develop rules for implementation such as
  - the sequence of events,
  - time period the intervention will operate before assessment on its effectiveness, and
  - roles and responsibilities for achievement of the interventions.
- Enforcement of regulations will ensure compliance. It is important to consider whether regulations are in place and whether there is sufficient available and trained staff to carry out this process.
- Emission source testing may be required to verify stack emissions

### 4.9.2 Develop implementation schedule (Time scale)

- A mitigation schedule should be tabulated in order to identify short term and long-term actions.
- Responsible bodies as well as time schedules and deadlines should be given.
- The timeframes for implementation would be at the discretion of the authority compiling the AQMP.
- A complete list of actions, priorities, responsibilities and time schedules must be developed as indicated below.

Table 7: Example of listed Actions to be undertaken as a result of the AQM Planning process

Sector	Action term	Description	Responsible	Time frame
Industry	Short	Specify combustion efficiency		
		Develop PM filter systems		
	Medium	Desulphurisation		
	Long			
Domestic	Short			
	Medium			
	Long			
Traffic	Short			
	Long			
Other		Source additional finance for development of the AQMP		
		Appoint a Consultant and draw up terms of reference		
		Issue checklist to industries for completion of identified mitigation measures		

The implementation of the action plans should run for at least a period of one year before the evaluation of the intervention strategies is carried out. This will allow reporting within the annual reporting cycle and ensure that the action plans are evaluated at annual intervals. However, it must be noted that action plans can be continuously evaluated and not necessarily only on an annual basis. Section 4.11 describes the evaluation of intervention strategies and reporting requirements.

## 4.10 Internal review of the content of the AQMP once complete

Once the AQMP has been completed it should first undergo internal review. Evaluation criteria have been developed to ensure consistency within the AQMP process, and fully address planning of reduction measures and action plans in a cost-effective and practical way. This set of evaluation criteria should be used for the appraisal of AQMPs.

A checklist of items to be addressed in the AQMP is provided in Appendix 8. The checklist is intended to be informative, consistent and transparent. These evaluation criteria compare AQMPs with international best practice, and highlight areas of possible improvement.

## 4.11 Step 6: Evaluation and follow up

This section describes each of the following in detail:

1. Review process of the AQMP once internal evaluation is complete.
2. Evaluation of the intervention strategies after implementation.
3. Reporting on air quality management planning on an annual basis.

### 4.11.1 Review process

Once all the steps have been implemented and the checklists have been completed, the draft AQMP should be distributed to all key stakeholders including DEAT. Once comment is received, the document should be updated and the final document subjected to the following process:

- Include as part of the IDP/EMP/ EIP submission
- Distribution of the AQMP to all key stakeholders for review/comment, including
  - All major industries,
  - Local and District Municipalities,
  - Provincial Authorities,
  - Relevant NGOs,
  - Public

A summary of key milestones should be developed identifying deadlines for each of the following actions:

- Working document released to key stakeholders for comment
- Comments received from key stakeholders
- Public participation meetings completed
- Draft AQMP document presented
- Approval of the AQMP as part of the IDP/EMP/EIP
- Implementation of the AQMP
- Installation of Air Quality Monitoring Network (if required)
- Implementation of Emission Reduction Strategies (if required)
- Updating of Emission Inventory (if required)
- Implementation of the Air Quality Modelling Capability (if required)
- Passing of appropriate legislation (if required)
- Review of the AQMP

### 4.11.2 Evaluate Efficacy of Interventions

The final step in the AQMP process is an evaluation of the effectiveness of action plans to implement intervention strategies and achieve compliance with standards and achievement of goals so that benefits are realised. This step essentially only takes place a year after the implementation of the AQMP intervention strategies.

This process of management then returns to a redefinition of the problem and the objectives. These include refined planning based upon the findings of the evaluation and whether the objectives have been redefined or remain the same. Ultimately, this loop continues until final attainment of the objective.

The effectiveness of each of the intervention strategies must be assessed to determine whether the goals are being achieved. Appropriate indicators must be developed to monitor progress towards achieving compliance and goals.

Key questions in assessing the effectiveness of the interventions include:

- Have intervention strategies achieved their desired effect?
- Does any information in the AQMP need updating or is any new information required?
- Is there a need to change or modify the intervention strategy?
- Does the vision statement or goals of the AQMP need revision or updating?
- Can the targets be achieved within the time frames stipulated?
- Is there a need for additional funds for implementation?

As described above, this evaluation is done on a continuous basis each year to assess the progress on the identified intervention strategies. After 5 years, the AQMP is revisited and the goals realigned and the process of developing an AQMP repeated.

### 4.11.3 Reporting on AQMPs

The annual report, which has to be submitted by Provincial or Local authorities in terms of section 17 of the Air Quality Act, 2004 and section 16(l) (b) of the National Environmental Management Act, must contain information on:

- Implementation of its AQMP, including information on air quality management initiatives undertaken by it during the reporting period
- The level of its compliance with ambient air quality standards;
- Measures taken by it to secure compliance with those standards;
- Its compliance with any priority area AQMPs where applicable
- Its air quality monitoring activities.
- Compliance monitoring and reporting

A checklist of those items to be included in the annual report as they relate to AQMPs is contained in Appendix 9.

Section 7.2 of the National Framework highlights the requirements of the Air Quality Officers' annual report and the reporting requirements in terms of the AQMP. Further to this, section 5.3.2.4 of the National Framework notes the timeframes for submission of the annual reports at each level of government, i.e. municipal and Provincial .

During the reporting and follow-up of the AQMP for annual reporting, a number of actions such as the following should be considered:

- Development and operations of monitoring programmes
- Reporting and assessment of changes in air quality
- Preparing and updating action plans
- Updating actions and control options
- Arranging workshops and seminars
- Involving stakeholders
- Identifying gaps and challenges
- Informing the public

## 5. CONCLUSION

An AQMP is a document that describes the air quality problems that an area is facing and outlines the recommended intervention strategies for improvement of air quality. The AQMP also defines the areas of responsibility of different levels of government, industry and relevant stakeholders.

The air quality management planning process should not be considered a once-off process to address air quality issues which ends after implementation but rather as a process that focuses on the long term goal of improving air quality and maintaining a healthy environment. This requires tracking progress of the plan on a routine basis (e.g. annually) to establish if intervention strategies have been effective.

The benefits of developing an AQMP include the following:

- Development of long term strategies for dealing with air quality issues
- Provides a mechanism for presenting the public with a comprehensive picture of what is happening with the air quality in their area
- Facilitate the potential affected sources to plan installation of controls and/or process changes
- Co-ordination of Local government, initiation of partnerships between stakeholders and public to work together on improving ambient air quality

The successful implementation of an AQMP is dependant on the involvement of all stakeholders and the adoption of an AQMP will yield many benefits for all.

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## ABBREVIATIONS

AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004).
AQM	Air Quality Management
AQMP	Air Quality Management Plan
AQMS	Air Quality Management Systems
AQO	Air Quality Officer
DEADP	Department of Environmental Affairs and Development Planning
DEAT	The Department of Environmental Affairs and Tourism
DLA	National Department: Land Affairs
DME	Department of Minerals and Energy
DoA	Department of Agriculture
DoE	Department of Energy
DoH	Department of Health
DoL	Department of Labour
DoLA	Department of Land Affairs
DoT	Department of Transport
DPLG	Department Provincial and Local Government
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
EIP	Environmental Implementation Plan as defined in the NEMA
EMP	Environmental Management Plan as defined in the NEMA
EU	European Union
GHG	Greenhouse Gases
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IPCC	Intergovernmental Panel on Climate Change
MSA	Municipal System Act
NAQMP	The National Air Quality Management Programme
NEMA	National Environmental Management Act (Act No. 107 of 1998).
NEM:AQA	National Environmental Management: Air Quality Act
NF	National Framework
PA-AQMP	Priority Area Air Quality Management Plan
PM	Particulate matter
QA	Quality assurance
QC	Quality control
SAAQIS	South African Air Quality Information System
SABS	South African Bureau of Standards
STANSA	Standards South Africa
UK	United Kingdom

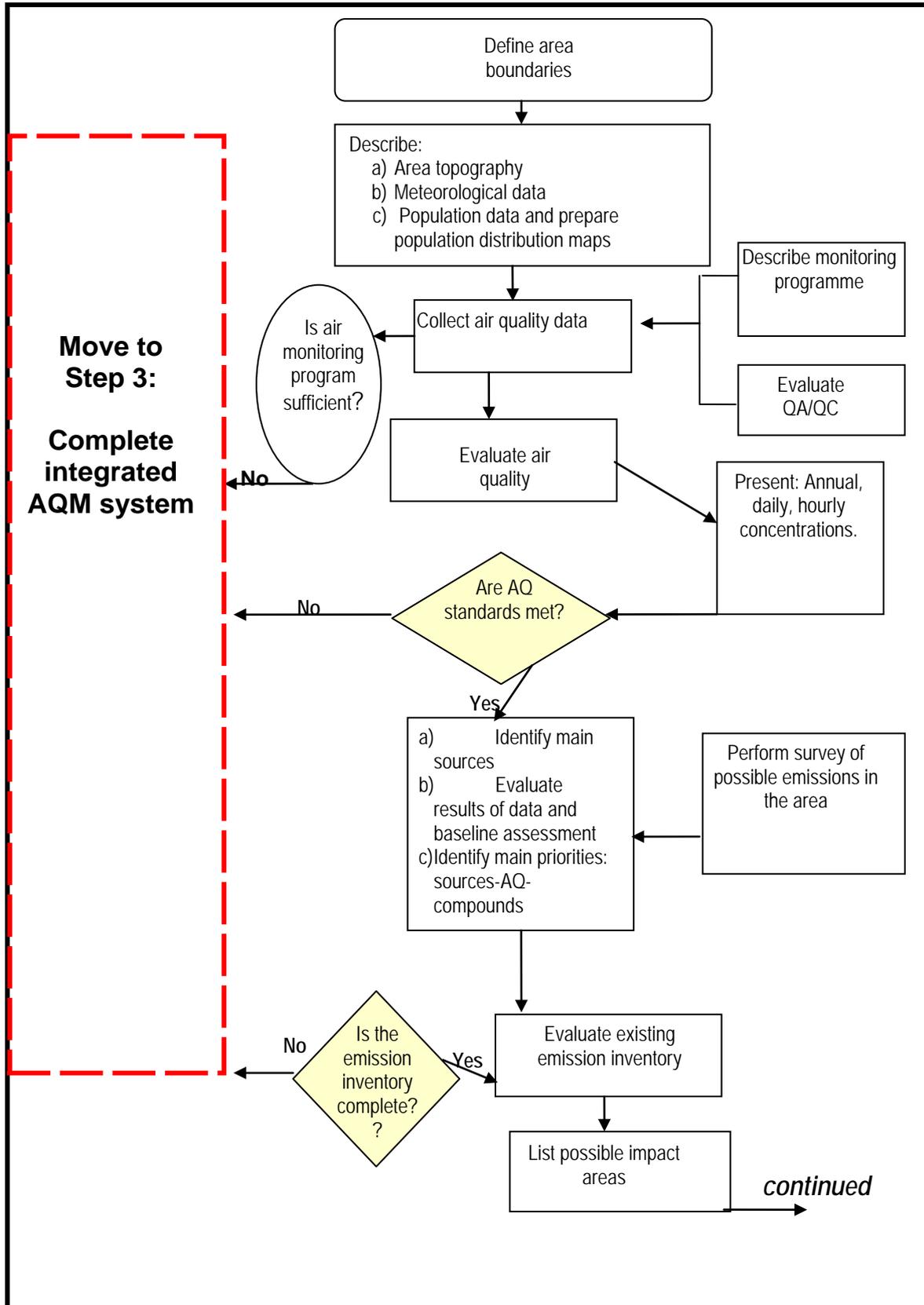
VOCs Volatile Organic Compounds  
WHO World Health Organization

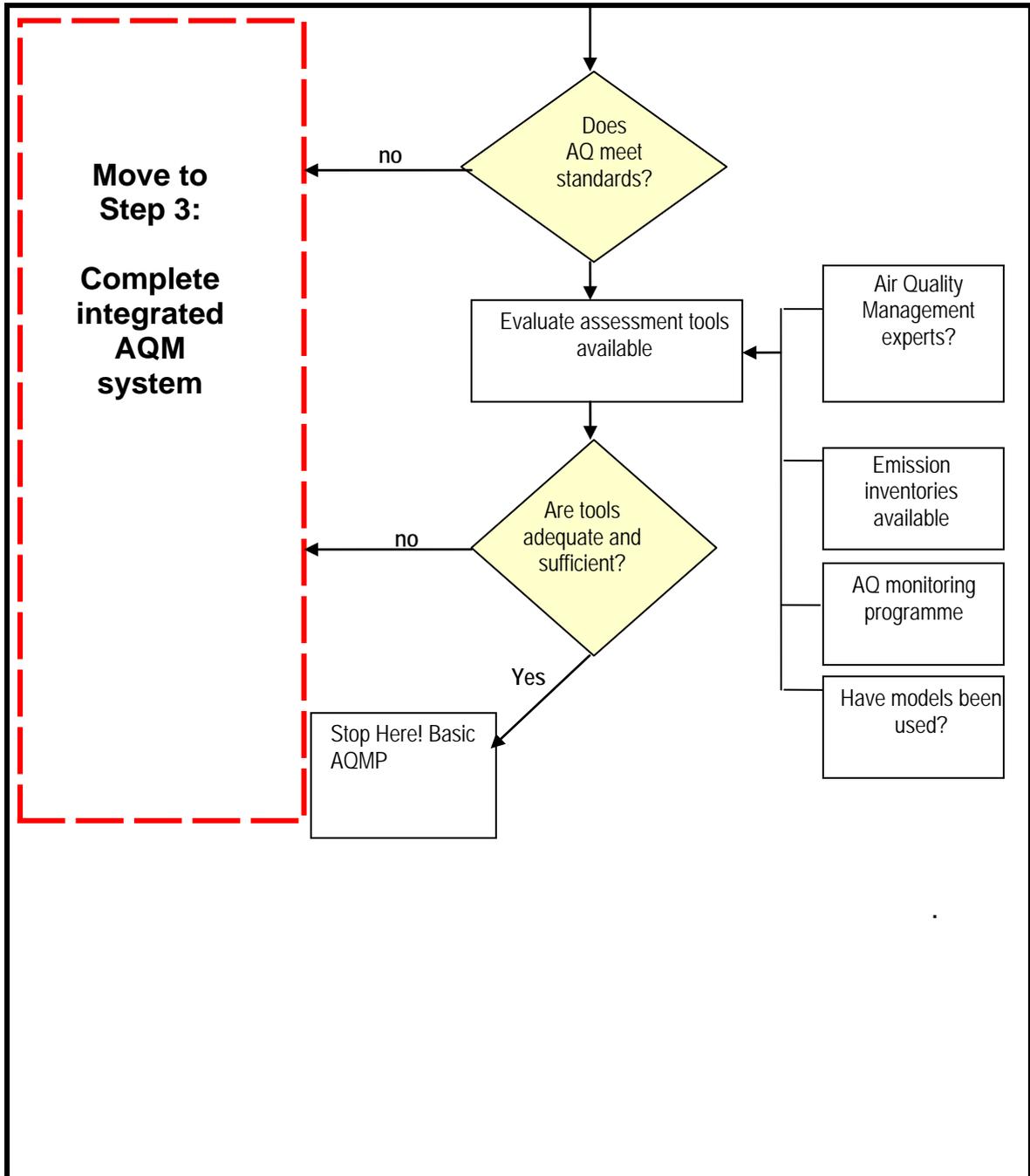
## GLOSSARY AND DEFINITIONS

<b>Air Quality Management Plan</b>	means a plan referred to in section 15 of AQA
<b>Air-shed</b>	Geographical areas that are defined according to topographical, meteorological, political or other criteria in order to address air quality issues that are common to the area. Similar concept to river catchments.
<b>Air Quality Officer</b>	means an officer appointed in terms of section 14 of AQA as an air quality officer
<b>Ambient Air</b>	Air in the environment, excluding indoor air.
<b>Ambient air quality standards</b>	values that 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
<b>Baseline air quality assessment</b>	A compilation of existing or current data and knowledge on air quality in a particular area. It forms an essential input into the subsequent formulation of the AQMP. It comprises an assessment of the current ambient air quality status; an assessment of current organisational structures for air quality management; and an assessment of current air quality initiatives to reduce air pollution.
<b>Continuous sampling</b>	Ambient air quality sampling conducted by drawing air into sampling equipment with real time analysis of concentrations using accepted reference methods. Measurement and recording is done in a continuous manner.
<b>Cost- Benefit Analysis</b>	the process that involves weighing the total accepted costs against the total expected benefits in order to choose the best option
<b>Dispersion Modelling</b>	Computer-based model that simulates the dispersion or movement of pollutants in the atmosphere based on a set of equations that are determined by the meteorological conditions of the atmosphere. The output is a set of predicted values of a pollutant for a defined location and time period.
<b>Emission</b>	Pollution discharged into the atmosphere from a range of stationary and mobile sources. These include smokestacks, vents and surface areas of commercial or industrial facilities; residential sources; motor vehicles and other transport related sources.
<b>Emission control Technology</b>	Technology that aims to reduce emissions into the atmosphere.
<b>Emission inventory</b>	a listing or register of the amount of pollution entering the atmosphere from all sources within a given time and geographic boundaries
<b>Emission reduction strategies</b>	An intervention designed to reduce emissions into the atmosphere.
<b>Emission standard</b>	A specific limit to the amount of pollutant that can be released to the atmosphere by a specified source.
<b>Environment</b>	The surroundings within which humans exist and that are made up of (i) the land, water and atmosphere of the earth; (ii) micro-organisms, plant and animal life; (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being (definition from the National Environmental Management Act - NEMA).
<b>Environmental Management Systems</b>	A part of the management system of an organisation in which specific competencies, behaviours, procedures and demands for the implementation of an environment policy are defined.
<b>Exceedances</b>	A situation in which a measured ambient air quality concentration (or emission rate) of a particular pollutant exceeds the ambient air quality guideline or standard (or emission limit) for that pollutant. Exceedances are normally expressed as a total number per time period and give an indication of the severity of the air pollution problem.
<b>Fugitive Emissions</b>	Emissions that are difficult to identify and quantify, such as gases that "escape" from badly managed or maintained processes, e.g. leak in pipes.
<b>Fugitive sources</b>	Sources of emissions that are difficult to identify and quantify. As the name implies, fugitive emissions include gases that "escape" from badly managed or maintained processes, e.g. leaky pipe-work
<b>Greenhouse gases</b>	Means gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit

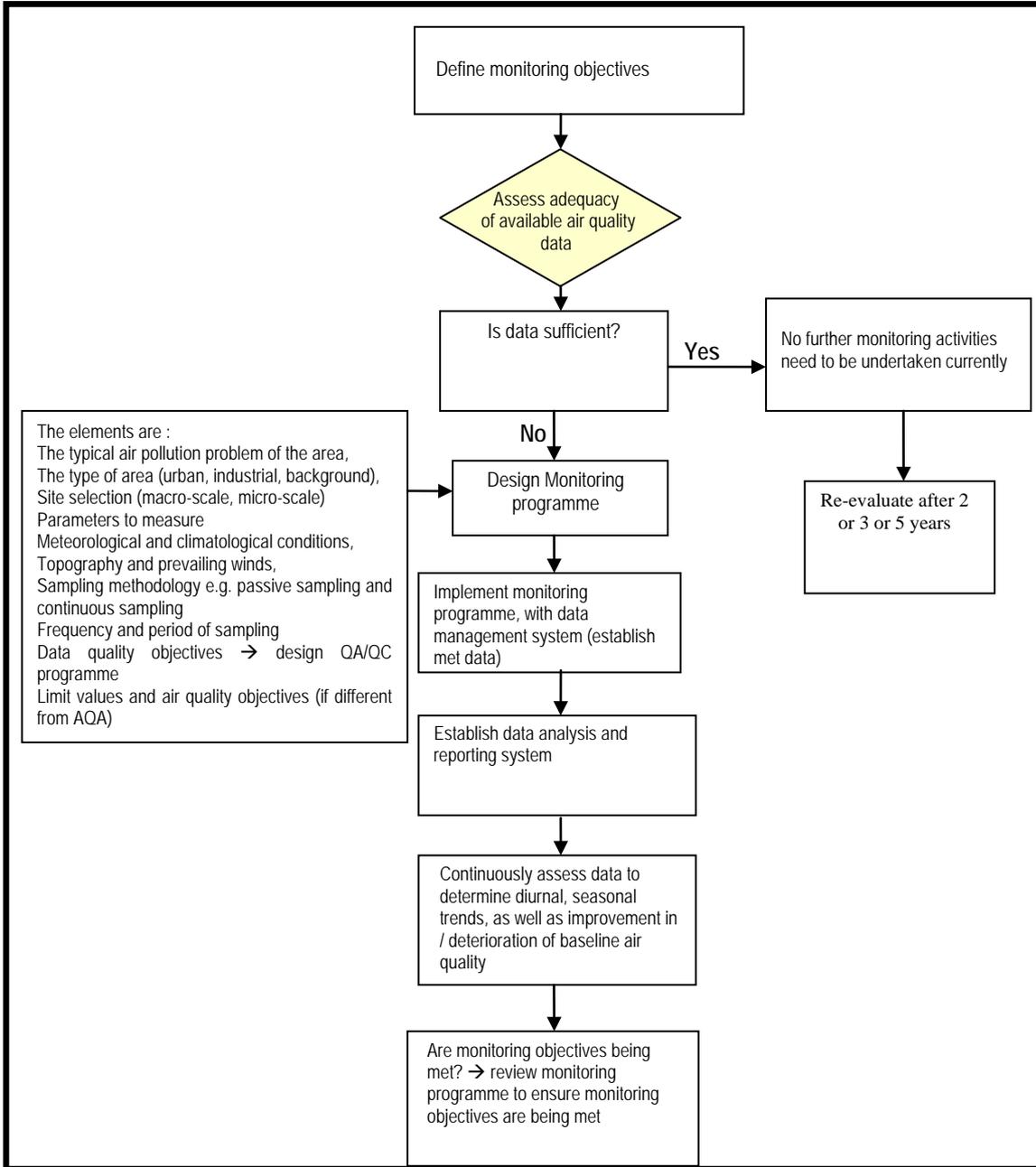
<b>(GHG)</b>	infrared radiation, and includes carbon dioxide, methane and nitrous oxide.
<b>Guideline</b>	A recommendation on the ambient concentration of a pollutant required for the protection of human health (or receptors in the environment) from the adverse effects of the pollutant. It is not restricted to a numerical value but might also be expressed, for example, as exposure-response information or as a unit risk estimate.
<b>Mitigation measures</b>	Efforts to attempt to prevent pollution or to reduce the effects of pollution that occur
<b>Mobile source</b>	Means a single identifiable source of atmospheric emission which does not emanate from a fixed location.
<b>Monitoring</b>	Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.
<b>National Framework</b>	“The 2007 National Framework for Air Quality Management in the Republic of South Africa” report produced for DEAT that provides detail on the practical implementation of the Air Quality Act (AQA) in order to achieve its objectives.
<b>Natural Sources</b>	Pollution sources that are related to natural processes as opposed to those which are due to human activities.
<b>Non-point source</b>	Means a source of atmospheric emissions which cannot be identified as having emanated from a single identifiable source or fixed location, and includes veld, forest and open fires, mining activities, agricultural activities and stockpiles.
<b>Passive sampling</b>	Air quality monitoring by means of exposure of the sampler to ambient air and adsorption of the pollution into the sampling medium. Sampling is over longer time periods and subsequent analysis is required to determine concentrations.
<b>Point source</b>	A single identifiable source of atmospheric emission from a fixed location, including smoke stacks and residential chimneys.
<b>Priority Area</b>	Means an area declared as such in terms of section 18 of AQA.
<b>Priority Area AQMPs</b>	means a plan referred to in section 19 of AQA
<b>Priority pollutant</b>	Pollutants which, through ambient concentrations, bioaccumulation, deposition or in any other way, present a threat to health, well-being or the environment. Factors that may influence whether a pollutant is identified as such include: its toxicity; the volume of emissions; or the proximity of the emission relative to sensitive receptors. A list of priority pollutants is contained in Chapter 5.3.2 of the National Framework (2007), Table 23.
<b>Transboundary air</b>	Air pollution can be released at one location and travel long distances through the atmosphere with prevailing winds. In this way, air pollution can affect air quality locally as well as many miles away.
<b>Quality Control</b>	The operational techniques and the activities used to fulfill and verify requirements of quality.
<b>Quality assurance</b>	Determining the actual quality of the data and if the data fulfils the Data Quality Objectives.

## APPENDIX 1: ELEMENTS OF A BASELINE ASSESSMENT



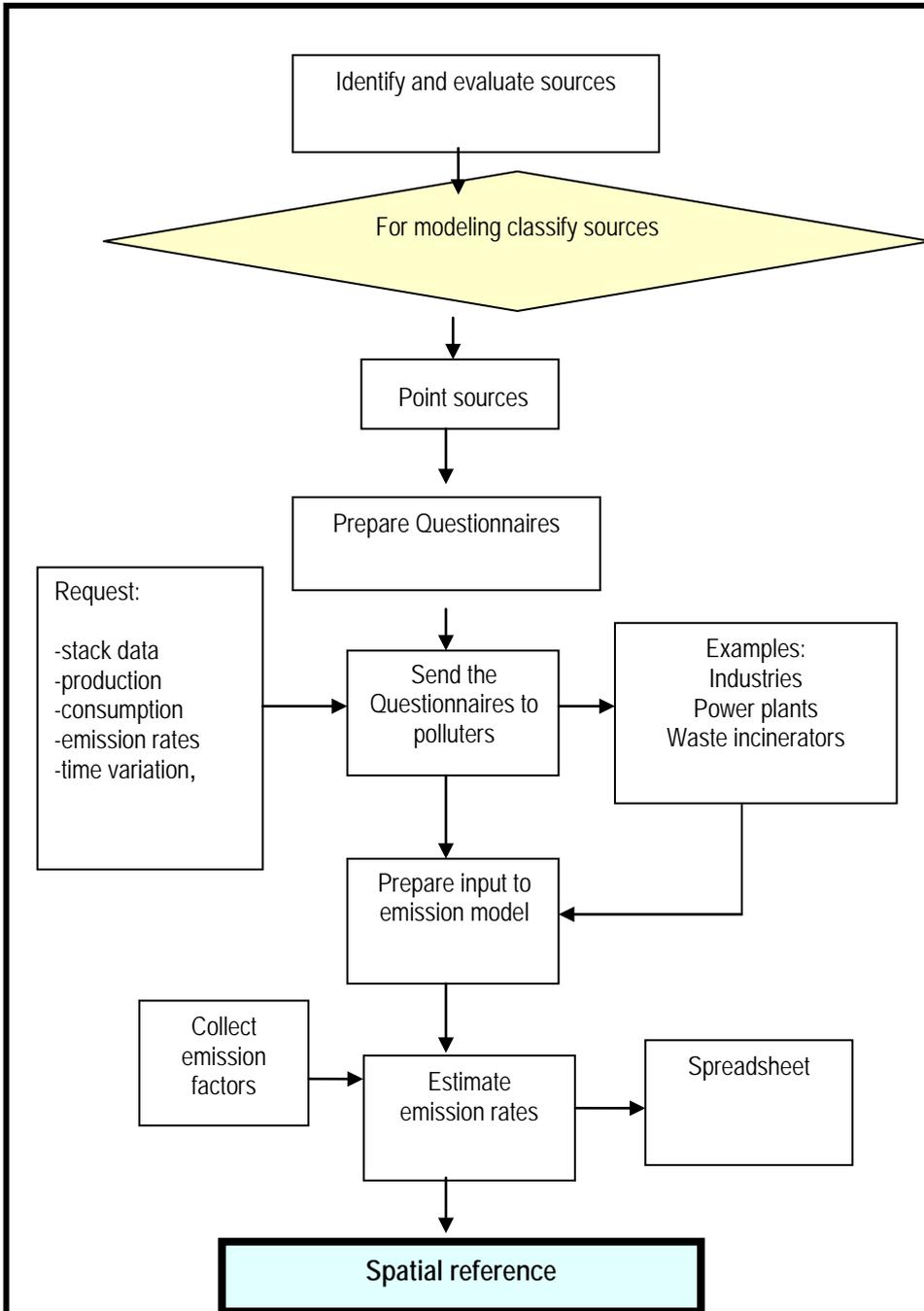


## APPENDIX 2: ELEMENTS OF AN AMBIENT AIR QUALITY MONITORING PROGRAMME

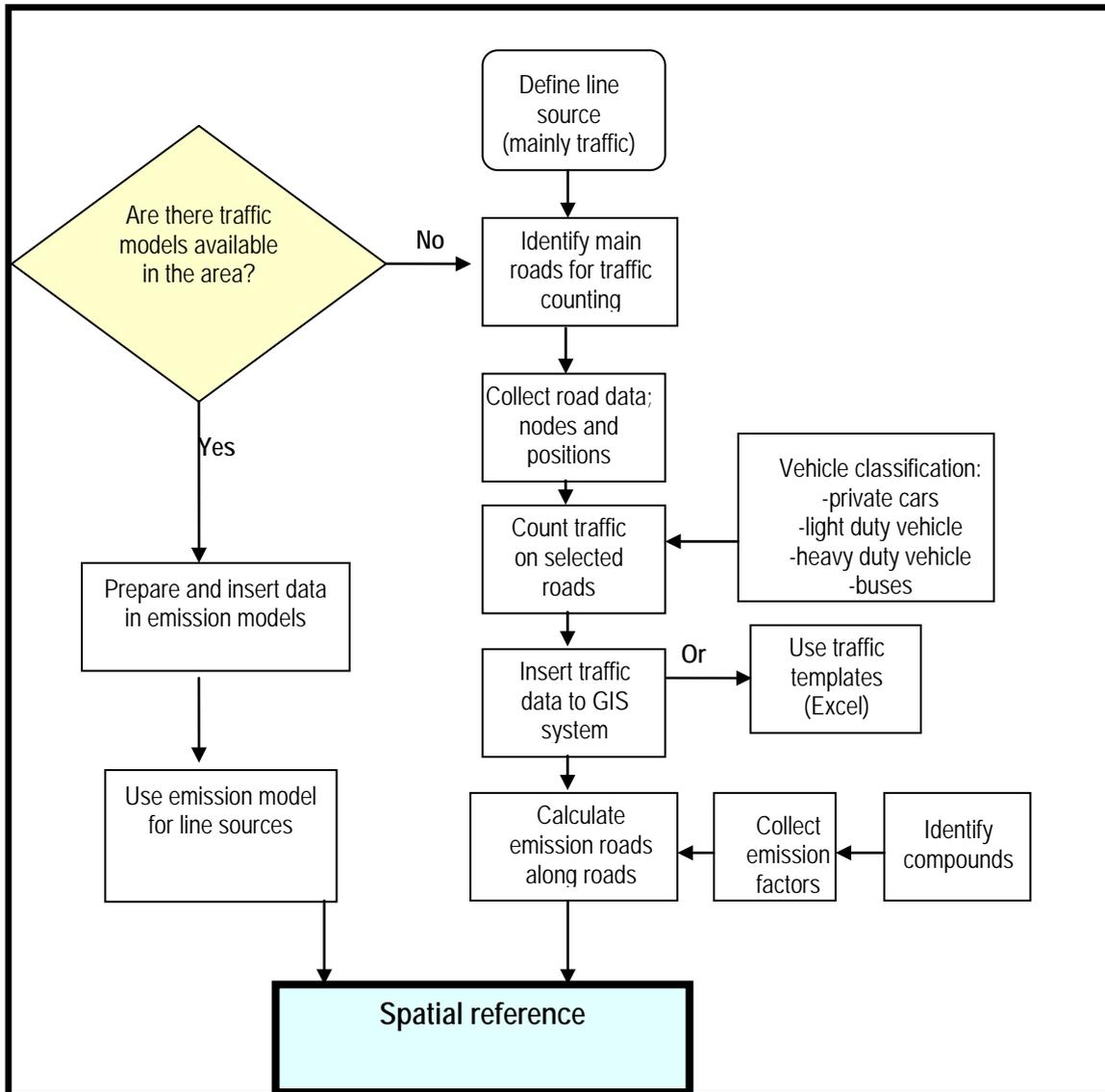


## APPENDIX 3: EMISSION INVENTORY FLOW CHARTS

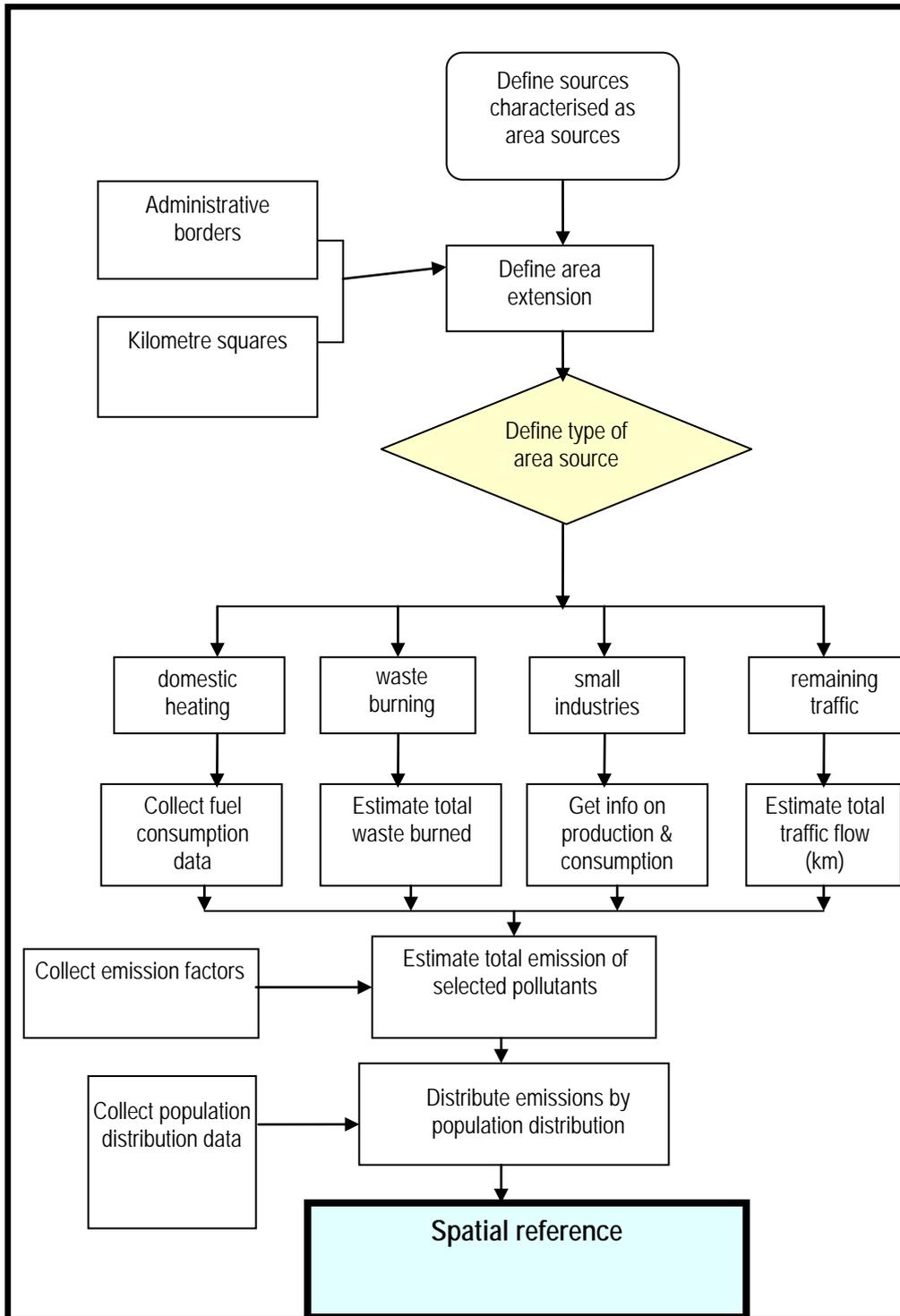
### EMISSION INVENTORY - POINT SOURCE



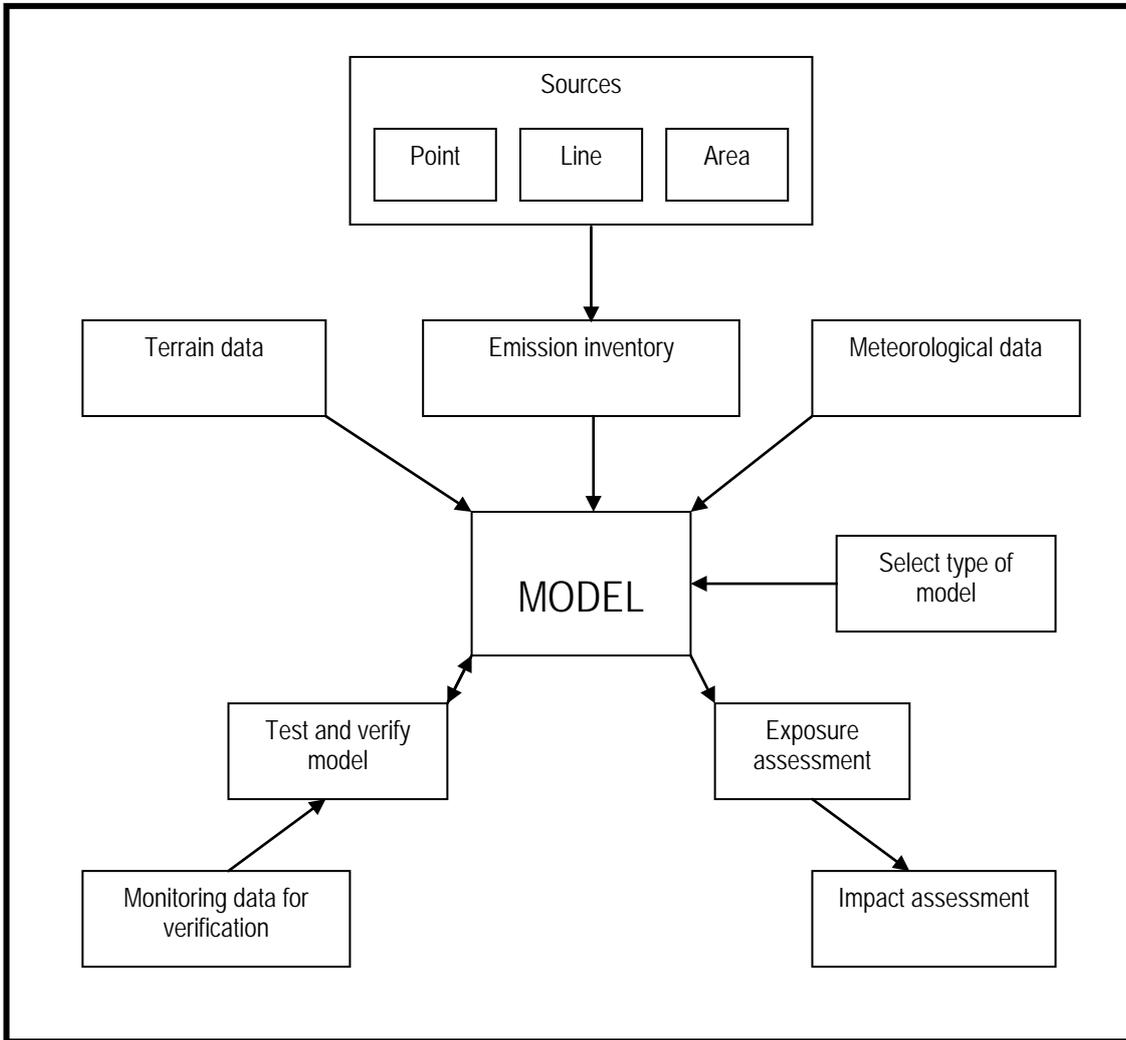
## EMISSION INVENTORY - LINE SOURCE



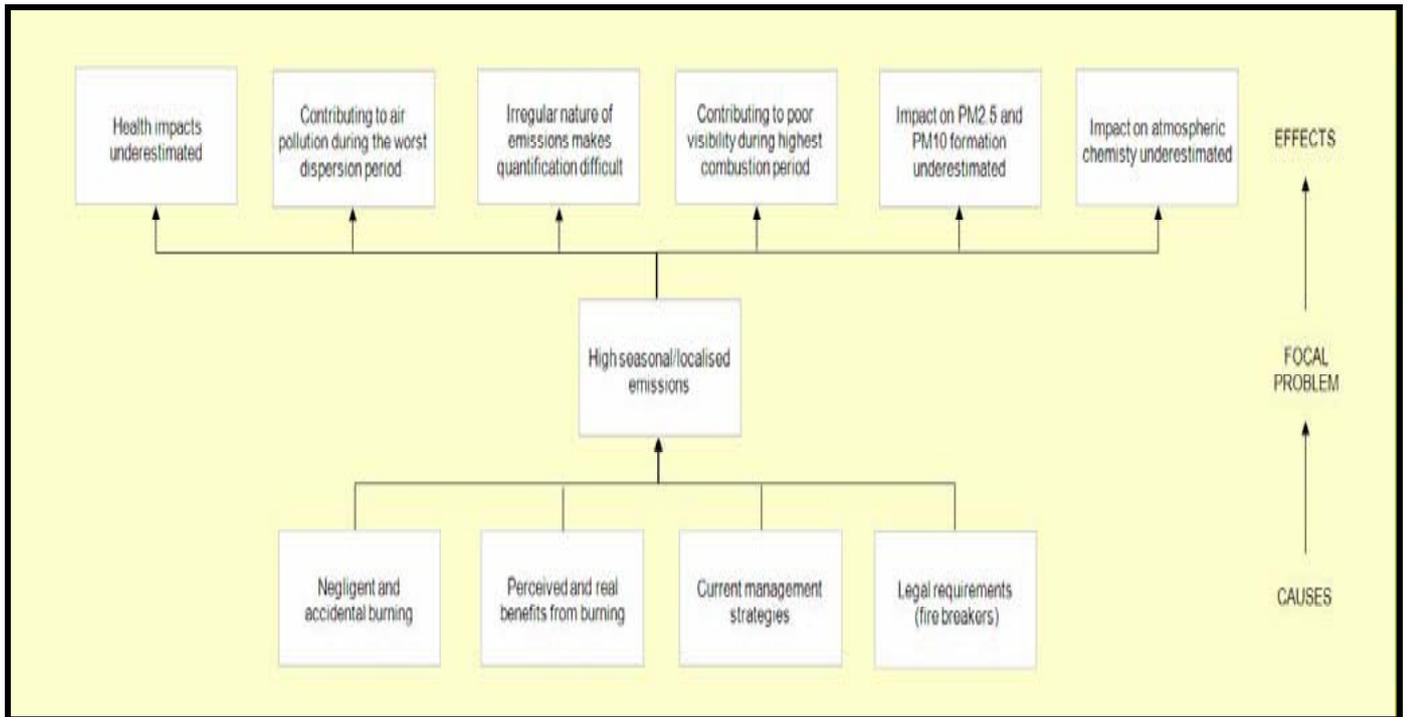
# EMISSION INVENTORY - AREA SOURCE



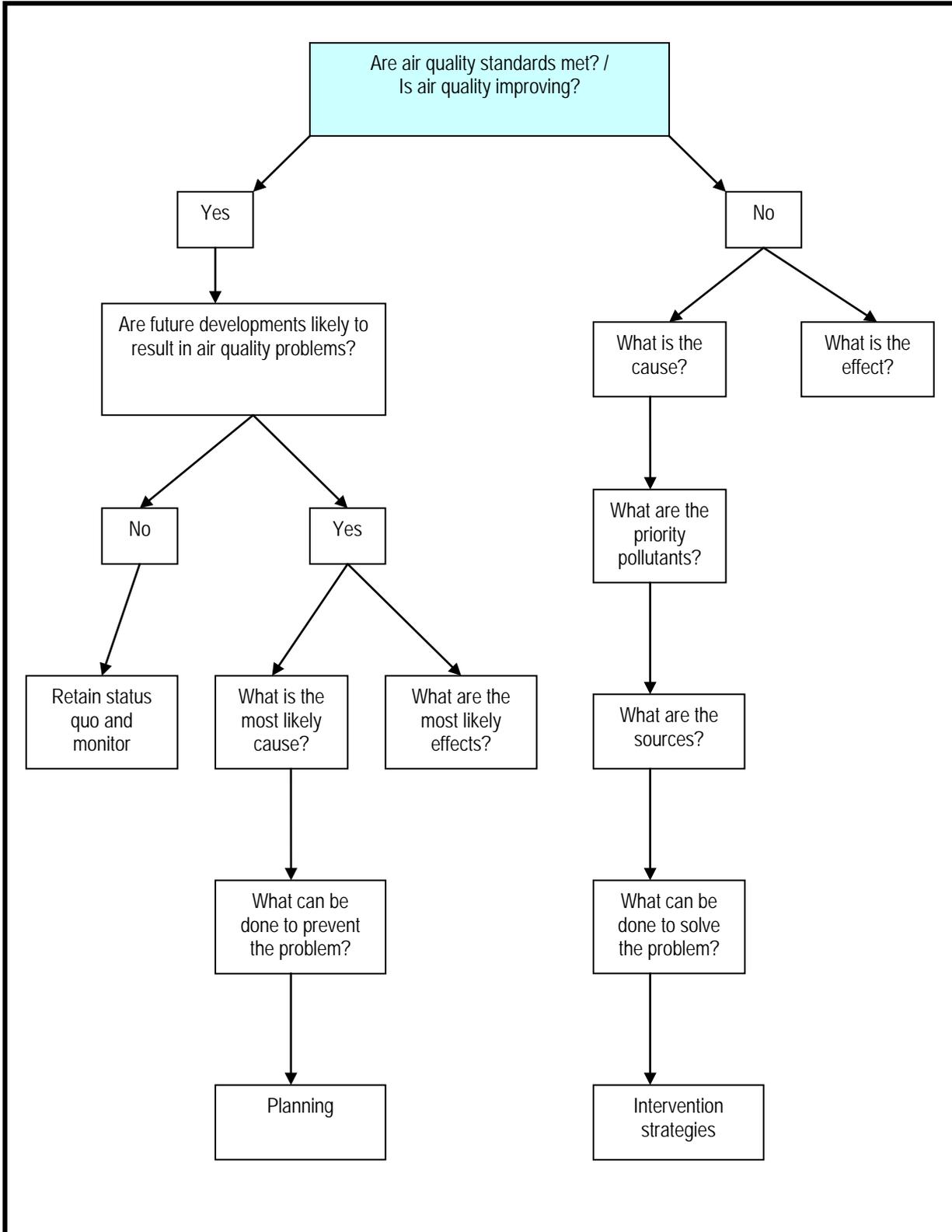
## APPENDIX 4: INPUTS TO DISPERSION MODEL



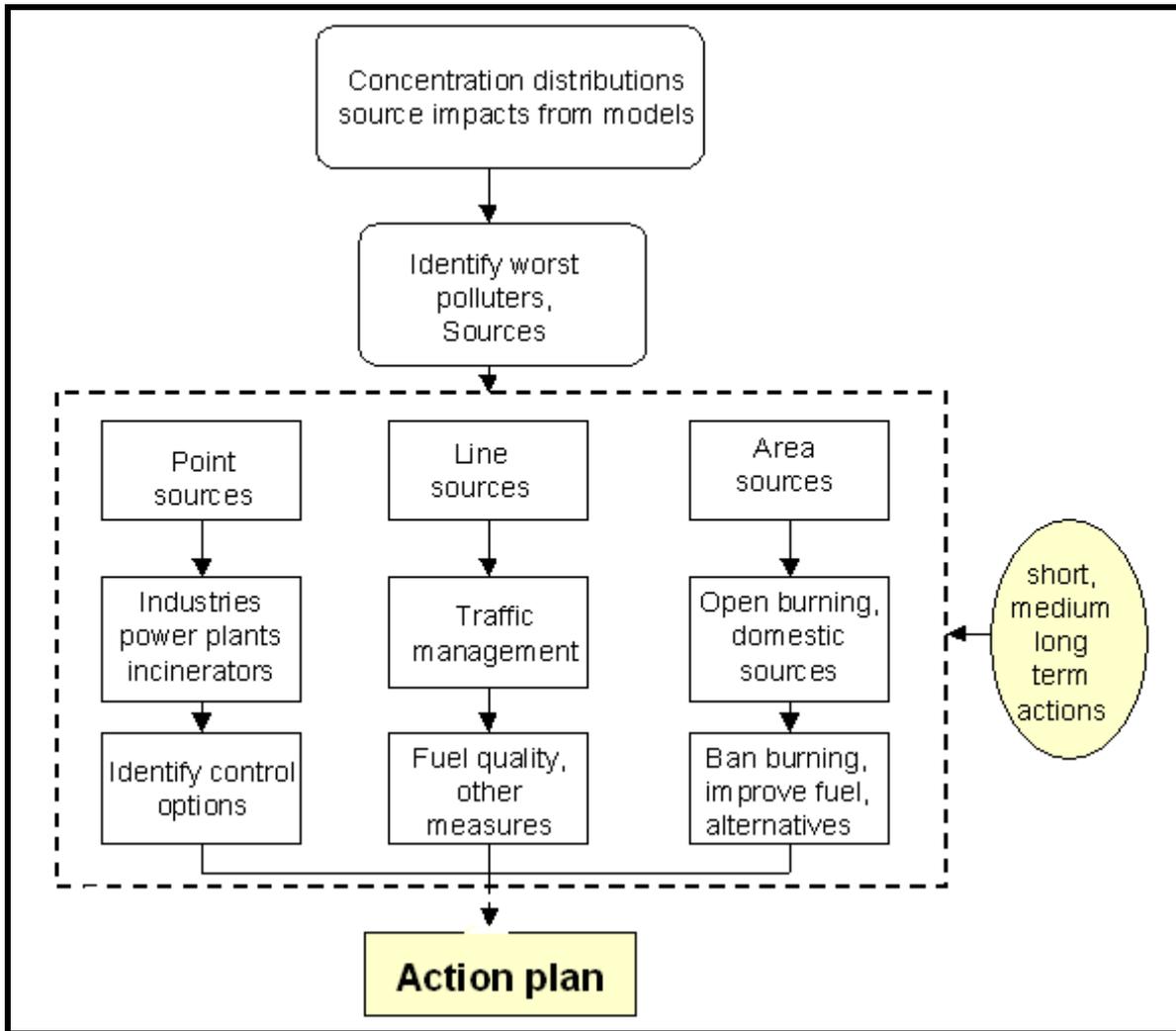
## APPENDIX 5: LOGICAL FRAMEWORK APPROACH



## APPENDIX 6: EXAMPLE OF PROBLEM TREE ANALYSIS



## APPENDIX 7: INTERVENTION STRATEGIES



## APPENDIX 8: EVALUATION CHECKLISTS

### Evaluation Checklists

The Evaluation Checklist is set out below. It contains two main parts:

- Summary and Response to Key Questions
- Evaluation Checklists

#### Summary and Response to Key Questions

This section of the Evaluation Report aims to provide an overview of the AQMP in relation to a number of Key Questions as set out below.

Have the priority pollutants been identified?	
Has a thorough air quality assessment been completed?	
Have constraints on the air quality assessment been identified?	
Has a strategy been proposed to remove any constraints on the air quality assessment?	
Is an adequate monitoring network in place?	
Have the key pollutant sources been identified and emissions quantified?	
Have appropriate intervention measures been identified?	
Is there an implementation plan in place for the key intervention measures?	

#### Evaluation Checklists

The detailed evaluation checklists are intended to incorporate criteria against which the AQMP is assessed. The evaluation is based upon a "Yes" or "No" response according to whether each individual criterion has been included, and whether it is judged to be acceptable. Commentary should be included for the purpose of clarification.

The detailed Evaluation Checklists contain two parts as per Appendix C:

#### **1. Air Quality Assessment Evaluation:**

Intended to evaluate whether the potential air quality problems have been correctly identified, drawing upon available air quality monitoring and modelling studies.

The key issues that must be considered are:

- **Pollutants, Sources and Standards:**  
Have the appropriate pollutants been considered; have the principal sources been identified; have the correct standards been applied?
- **Air Quality Assessment:**  
Has air quality monitoring been carried out/proposed; are appropriate monitoring techniques used; have appropriate monitoring sites been selected; is the meteorology adequately described; are suitable emissions inventories available/proposed; have dispersion modelling studies been carried out; has an appropriate model been selected/proposed; has the model output been verified?
- **Key Impacts:**  
Have the key pollutant hotspots been identified; have source apportionment studies been carried out/proposed; has relevant public and environmental exposure been taken into account; have key priorities for future assessment work been identified; does the air quality assessment reach the likely or expected conclusions?

#### **2. AQMP Evaluation:**

Intended to evaluate the development and design of the AQMP, and the specific interventions that are proposed.

The key issues considered are:

- **Process:**  
Has all appropriate guidance been taken into account; has reference been made to all appropriate local and national policies; has appropriate and thorough stakeholder consultation been undertaken?
- **Summary of AQMP Components:**  
Have the effects of the proposed interventions been quantified; have environmental and socio-economic aspects been adequately described; are realistic timescales for implementation provided; has resource availability and

capacity-building been adequately addressed; have the organisations responsible for implementation been identified; has a suitable mechanism for evaluating progress with implementation been provided?

- **Appropriateness and Proportionality:**  
Have all appropriate interventions been identified; are the interventions expected to deliver the required improvements; are the relevant air quality standards expected to be achieved; have the interventions been prioritised based on cost-effectiveness; have the other environmental and socio-economic impacts been quantified; are the proposed interventions compliant and consistent with national policies?
- **Implementation and Progress**  
Have the appropriate organisations responsible for implementation been identified; are the proposed timescales realistic; have costs and funding been identified; are mechanisms for evaluating progress and the outcome of the interventions proposed?
- **Intervention Measures:**  
Detailed checklists are provided to identify the proposed interventions on a source-by-source basis?

# Evaluation of Air Quality Management Plan for

**XXXXXXXXXX**

**Prepared by**

**XXXXXXXXXXXX**

**Date**

## EVALUATION REPORT

### FREQUENTLY USED ABBREVIATIONS IN THE EVALUATION REPORT

APPA – Air Pollution Prevention Act

AQ – air quality

AQA – Air Quality Act 2004

DAPC – Division of Air Pollution Control

DEAT – Department of Environmental Affairs and Tourism, South Africa

NEMA – National Environmental Management Act

SANS – South Africa National Standards

### BRIEF SUMMARY

Municipality & title of report:

Governance (i.e. those involved in Technical Working Group):

Those involved with developing AQMP:

Air quality vision or mission:

Vision statement:

Mission statement:

Strategic goals and objectives:

KEY QUESTIONS
Have the priority pollutants been identified?
Has a thorough air quality assessment been completed?
Have constraints on the air quality assessment been identified?
Has a strategy been proposed to remove any constraints on the air quality assessment?
Is an adequate monitoring network in place or proposed?
Have the key pollutant sources been identified and emissions quantified?
Have appropriate intervention measures been identified?
Is there an implementation plan in place for the key intervention measures?
Have stakeholders been actively involved in the assessment or AQMP process?

## EVALUATION CHECKLISTS

### AIR QUALITY ASSESSMENT EVALUATION

This section evaluates whether the pollutant problems have been correctly identified through the use of air quality monitoring and modelling. It includes an evaluation of monitoring networks and their results, emission inventories, and modelling. The evaluation checklist is divided into the following sub-sections:

#### Pollutants, Sources and Standards

- Pollutants included in assessment
  - Common Pollutants (for which standards are to be set)
  - Other Air Pollutants considered in the assessment
- sources included
- other pollutants or sources or pollutants considered in the assessment or plan
- standards applied
- general background information to locality

#### Air Quality Assessment

- air quality monitoring
- air quality modelling
- meteorological data
- estimating emissions
- other (non-air quality) assessments (where applicable)

#### Key Impacts

- pollutant hotspots
- general criteria

Key: Y = yes, N = no, n/a = not applicable, ? = uncertain

1.1 Pollutants, Sources & Standards	Included	Accepted	Commentary
Pollutants included in assessment  <i>Common Air Pollutants (for which standards are to be set)</i>			

<p>Sulphur dioxide (SO<sub>2</sub>)                  Nitrogen dioxides (NO<sub>2</sub>)                  Carbon monoxide (CO)                  Particulate Matter (PM<sub>10</sub>)                  Ozone (O<sub>3</sub>)                  Lead (Pb)                  Benzene (C<sub>6</sub>H<sub>6</sub>)  <b>Other Air Pollutants included in the assessment</b>                  Other Volatile organic compounds (VOC)                  Particulate Matter (PM<sub>2.5</sub>)                  Heavy metals (Ni, Cr)                  Carbon dioxide (CO<sub>2</sub>)                  Hazardous air pollutants (HAPs)                  Dust                  Other (specify)</p>			
<p>Sources included in assessment                  Major and minor sources identified                  Transport                  Industrial (Scheduled)                  Industrial (small, non-Scheduled)                  Power generation                  Domestic                  Mining                  Landfill &amp; Waste Disposal                  Agricultural (including biomass burning)                  Fugitive sources                  Trans-boundary sources                  Secondary pollutant source</p>			
<p>Standards applied                  Adopt National Air Quality Standards                  Specify own Standards                  Own Standards more stringent                  Alert Thresholds</p>			
<p>General background information                  Locality?                  Key impacted areas?                  Policy background (i.e. current policies)?                  Reference to appropriate National Policy?</p>			
<b>Comments</b>			

1.2 Air Quality Assessment	Included	Accepted	Commentary
<p>Air Quality Monitoring                  Is an appropriate network in place?                  Are plans for new/upgraded network appropriate?                  Is a central database in place/planned                  Are systems in place to disseminate monitoring data?</p>			

<p>Have appropriate monitoring methods/techniques been used?                  Has appropriate QA/QC been used?                  Has data capture and monitoring period been sufficient?                  Have the monitoring locations been adequately described?                  Have appropriate locations been used for monitoring?</p>			
<p>Meteorological Conditions                  Have the factors determining local and regional dispersion been adequately described?</p>			
<p>Emissions Inventory                  Is an appropriate emission inventory in place / to be implemented?                  Have appropriate source data been used (fuel usage, emission factors etc)?                  Road traffic                  Railways                  Aircraft                  Industrial                  Boilers                  Smaller industrial sources                  Domestic                  Landfill                  Mine tailings                  Agriculture                  Other (specify)</p>			
<p><b>Comments</b></p>			
<p></p>			

1.2 Air Quality Assessment (contd.)	Included	Accepted	Commentary
<p><b>Air Quality Modelling</b>                      Has appropriate modelling been carried out or is appropriate modelling planned?                      Have appropriate meteorological and terrain data been used?                      Have models used been validated?                      Have models been adjusted locally (i.e. verified)?                      Have background concentrations been properly added?                      Have appropriate source data been considered/used (see Inventory above)?                      Have appropriate approaches been used for secondary pollutants (ozone, NO<sub>2</sub> etc.)?</p>			
<b>Comments</b>			

1.3 Key Impacts	Included	Accepted	Commentary
<p><b>Pollutant Hotspots</b>                      Have key pollutant hotspots been identified?                      Is this based on modelling?                      Is this based on monitoring?                      Have all locations been considered (roadside, industrial and domestic etc.)?                      Has source-apportionment been undertaken?                      Relative importance of local sources                      Role of regional sources                      Long-range transport                      Has relevant exposure been considered?</p>			
<p><b>General Issues</b>                      Have the key priorities for further assessment work been identified?                      Are appropriate maps provided indicating key sources, monitoring locations, outcomes from modelling, etc.?                      Does the air quality assessment reach the likely or expected conclusions?                      Has the municipality taken full ownership of any</p>			

consultants' recommendations? Has the overall Air Quality Management System been described fully?			
<b>Comments</b>			

Summary of Errors / Inadequacies of Air Quality Assessment Work									
Pollutant	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	Pb	O <sub>3</sub>	CO	VOCs	Other a	Other b
Potentially sufficient to change conclusion/outcomes									
Significant but probably not sufficient to change conclusion									
Minor and not sufficient to change conclusion									
Insignificant or none									

Other a =  
 Other b =

**AIR QUALITY MANAGEMENT PLAN EVALUATION**

This section evaluates the development and design of the Air Quality Management Plan, as well as the specific interventions (i.e. measures) being developed.

The evaluation checklist is divided into the following sub-sections:

AQMP Process

- Stakeholders
- Guidance used
- Proposals for consulting stakeholders
- Policy, Plans and Strategies included and referenced

Summary of AQMP elements

Specific AQMP elements included

Appropriateness and Proportionality of AQMP

- Appropriateness
- Wider Impacts
- Cost Effectiveness
- Compliance

Implementation and Evaluation of AQMP

- Responsibility
- Timescales
- Financial Cost
- Evaluation and Monitoring

Interventions

Key: Y = yes, N = no, n/a = not applicable, ? = uncertain

Priority Pollutants in the Air Quality Management Plan														
	CO		Ben	Pb	SO <sub>2</sub>				NO <sub>2</sub>		O <sub>3</sub>		PM <sub>10</sub>	
	1-hr max	8-hr max			10-min max	1-hr max	24-hr max	Ann	1-hr max	Ann.	1-hr max	8-hr max	24-hr max	Ann.
AQMP														

2.1 AQMP Process	Involved/Included	Commentary
<p>Stakeholders</p> <p>Government Departments                      Env. Affairs &amp; Tourism (DEAT)                      Minerals and Energy (DME)                      Affairs and Forestry (DWAF)                      Other National or Provincial Departments</p> <p>Internal stakeholders (within LM or RM)                      Environmental Health Dept..                      Housing &amp; Planning Dept.                      Social Development Dept.</p> <p>Public authorities or agencies</p> <p>Business, industrial or commercial</p> <p>Other Stakeholders                      Non-governmental Organisations (NGOs)                      Community-based Organisations (CBOs)                      Academic Institutions                      Others (specify)</p>		
<p>Proposals for consulting stakeholders</p> <p>Initiatives?                      Timescales?</p>		
<p>Guidance used</p> <p>Official guidance used in the development and design of the AQMP</p>		
<p>Policy, Plans and Strategies included and referenced</p> <p>National Policy &amp; Plan appreciation?                      Transport Policy                      Air Quality Policy                      Environment Policy                      Other</p> <p>Other South Africa AQMPs?</p> <p>International progress with AQMPs</p>		

Local or Metropolitan Policy Transport Policy Local Transport Plans Integrated Development Plan (IDP) Others (specify)  Reference to relevant initiatives underway Nationally, Regionally or locally?		
<b>Comments</b>		

2.2 Summary of AQMP Elements	Included	Commentary
Specific AQMP elements included:  Emission reduction of interventions? Air quality improvements likely? Cost-benefit of interventions? Socio-economic impacts? Other environmental impacts? Climate change impact? Likely implementation of measure/intervention? Timescales involved? Capacity-building/training proposals? Responsibility for implementation? Future evaluation/monitoring of AQMP?		
<b>Comments</b>		

2.3 Appropriateness and Proportionality of AQMP	Commentary
Appropriateness  Proposals and recommendations outlined? Are the interventions proposed appropriate for the problem? Are the intervention measures likely to be effective? Are the air quality standards likely to be met as a result of the interventions?	
Wider Impacts  Have the wider impacts (i.e. socio-economic, climate change and other environmental impacts)	

been considered appropriately?	
<p>Cost Effectiveness</p> <p>Was the method for assessing costs appropriate?</p>	
<p><b>Compliance</b></p> <p>Do the AQMP interventions comply with national policy?</p>	
<b>Further Comments</b>	

<p>2.4 Implementation and Evaluation of AQMP</p>	<b>Commentary</b>
<p>Responsibility</p> <p>Have those responsible, and/or the powers necessary for implementing the intervention, been identified fully?</p>	
<p>Timescales</p> <p>Are the timescales identified realistic?</p>	
<p>Financial Cost</p> <p>Has the cost of implementation been secured?</p>	
<p>Evaluation &amp; Monitoring</p> <p>Do proposals include monitoring the implementation of the AQMP and its effectiveness? Do proposals include maintenance and updating of emissions database?</p>	
<b>Further Comments</b>	

## 2.5 Interventions

This section lists the specific intervention measures being considered on an emission-source basis. The checklist provides an indication as to the whether specific criteria or aspects of the Action Planning process have been considered.

Key: Y = yes, N = no, n/a = not applicable? = uncertain

### 2.5.1 Road Transport Intervention

Intervention	Have the following been addressed?									Commentary
	Likely emission reductions	Air quality improvements	Cost effectiveness	Socio-Economic impacts	Other Environmental impacts	Timescale s involved	Responsibility for implementation	Evaluation/ monitoring of measure	Likelihood of implementation	
Road Transport intervention commentary:										

### 2.5.2 Aviation Intervention

Intervention	Have the following been addressed?									Commentary
	Likely emission reductions	Air quality improvements	Cost effectiveness	Socio-Economic impacts	Other Environmental impacts	Timescale s involved	Responsibility for implementation	Evaluation/ monitoring of measure	Likelihood of implementation	
Aviation intervention commentary:										

2.5.3 Other Transport Intervention

Intervention	Have the following been addressed?									Commentary
	Likely emission reductions	Air quality improvements	Cost effectiveness	Socio-Economic impacts	Other Environmental impacts	Timescale s involved	Responsibility for implementation	Evaluation/ monitoring of measure	Likelihood of implementation	
e.g. ports, inland waterways, railways										
Other Transport intervention commentary:										

2.5.4 Industrial Intervention

intervention	Have the following been addressed?									Commentary
	Likely emission reductions	Air quality improvements	Cost effectiveness	Socio-Economic impacts	Other Environmental impacts	Timescale s involved	Responsibility for implementation	Evaluation/ monitoring of measure	Likelihood of implementation	
Industrial intervention commentary:										

2.5.5 Waste Disposal & Landfill Intervention

Intervention	Have the following been addressed?									Commentary
	Likely emission reductions	Air quality improvements	Cost effectiveness	Socio-Economic impacts	Other Environmental impacts	Timescale s involved	Responsibility for implementation	Evaluation/ monitoring of measure	Likelihood of implementation	
Waste Disposal & Landfill intervention commentary:										

2.5.6 Mining Intervention

Intervention	Have the following been addressed?									Commentary
	Likely emission reductions	Air quality improvements	Cost effectiveness	Socio-Economic impacts	Other Environmental impacts	Timescale s involved	Responsibility for implementation	Evaluation/ monitoring of measure	Likelihood of implementation	
Mining intervention commentary:										

2.5.7 Domestic Intervention

Intervention	Have the following been addressed?									Commentary
	Likely emission reductions	Air quality improvements	Cost effectiveness	Socio-Economic impacts	Other Environmental impacts	Timescale s involved	Responsibility for implementation	Evaluation/ monitoring of measure	Likelihood of implementation	
Domestic intervention commentary:										

2.5.8 Agricultural Interventions

Intervention	Have the following been addressed?									Commentary
	Likely emission reductions	Air quality improvements	Cost effectiveness	Socio-Economic impacts	Other Environmental impacts	Timescale s involved	Responsibility for implementation	Evaluation/ monitoring of measure	Likelihood of implementation	
Other interventions commentary:										

2.5.9 Other Interventions

Intervention	Have the following been addressed?									Commentary
	Likely emission reductions	Air quality improvements	Cost effectiveness	Socio-Economic impacts	Other Environmental impacts	Timescale s involved	Responsibility for implementation	Evaluation/ monitoring of measure	Likelihood of implementation	
Other interventions commentary:										

Conclusions	Commentary
Accept outright	
Accept with minor revisions	
Accept with major revisions	
Reject	
Example of good practice	

**FINAL COMMENTARY**

(e.g. comments on overall AQM system proposals, proposals for ambient air quality monitoring, perceived effectiveness of AQMP proposals and overall summary of evaluation)

## APPENDIX 9: CHECKLIST OF ITEMS TO BE INCLUDED IN THE PROVINCIAL OR LOCAL AUTHORITY AIR QUALITY OFFICER'S ANNUAL REPORT

No.	Item
<b>1.</b>	<b>Air Quality Management Planning</b>
1.1	Is AQMP in place or progress in compiling AQMP
1.2	Compliance with any applicable priority area air quality management plans
1.3	Air quality management initiatives undertaken (intervention strategies)
1.4	An evaluation of efficacy of interventions
<b>2</b>	<b>Standard-setting</b>
2.1	Have ambient air quality standards stricter than those formulated in accordance with the National Framework been adopted? If so, provide reasons for these.
2.2	Are ambient air quality standards included in by-laws?
<b>3.</b>	<b>Compliance Monitoring</b>
3.1	Number of ambient air quality monitoring stations and description
3.2	Number of Environmental Management Inspectors (EMIs) trained in air quality compliance monitoring
3.3	Ambient data validation
3.4	Ambient data assessment
3.5	Ambient data report, including status of air quality and trends
<b>4</b>	<b>Compliance with ambient air quality standards</b>
4.1	Number of ambient air quality exceedances
4.2	Measures taken to ensure compliance with standards
<b>5.</b>	<b>Emission inventory initiatives</b>
5.1	Municipal emission inventories
5.2	Greenhouse Gas Inventory
5.3	Emission data reporting module
5.4	Emission monitoring archive
5.5	Emission data assessment module
5.6	Database of Listed Activities
<b>6.</b>	<b>Atmospheric Emission Licensing</b>
6.2	Number of provincial or municipal officials trained in Atmospheric Emission Licensing
6.3	Number of provincial or municipal officials participating in the APPA Registration Certificate Review process
6.5	Number of municipal CAPCOs designated as part of the APPA-AQA transition process
6.6	Number of APPA Registration Certificates reviewed and converted to the AEL format
<b>7.</b>	<b>Compliance with Emission Licences</b>
7.1	Number of continuous stack emission monitoring reports submitted
7.2	Number of emission licence exceedances
7.3	Measures taken to ensure compliance, enforcement
<b>8.</b>	<b>Enforcement</b>
8.1	Number of EMIs designated
8.2	Model air pollution control by-laws
<b>9.</b>	<b>Capacity</b>
9.1	Staffing capacity
9.2	Training undertaken and additional training requirements
9.3	Guidelines, documents available
<b>9.</b>	<b>Information management</b>
9.1	Key stakeholder database
9.2	Air quality complaints register
9.3	Air quality complaints assessment and source apportionment (modelling?)
<b>10.</b>	<b>Awareness-raising</b>
10.1	Provide a list of air quality related publications in your area
<b>10.2</b>	<b>AQ media archive</b>

No.	Item
11.	Climate change response
11.1	Long term mitigation scenario process finalised
11.2	Climate change policy development process initiated
11.3	Sectoral CC mitigation and/or adaptation plans in place

## APPENDIX 10: PRIORITY AREA AQMP IMPLEMENTATION MANUAL