AIR QUALITY MANAGEMENT PLAN FOR THE CITY OF TSHWANE METROPOLITAN MUNICIPALITY

2006-2008

EXECUTIVE SUMMARY

1. INTRODUCTION

In accordance with the Constitution, municipalities have executive authority over air pollution control. The new National Environmental Management: Air Quality Act of 2004[1] shifted the focus away from the centralisation of air pollution governance to the decentralisation of power, placing the responsibility for air quality management on the shoulders of local authorities. This responsibility includes the characterisation of baseline air quality, the management and operation of ambient monitoring networks, the licensing of listed activities, and the development of emission reduction strategies. To fulfil these responsibilities, local authorities will be required to develop air quality management plans (AQMPs) as part of their integrated implementation plans. The main objective of the Air Quality Act (AQA) is the protection of the environment and human health, in a sustainable (economic, social and ecological) development framework, through reasonable measures of air pollution control.

1.1 Response of the City of Tshwane Metropolitan Municipality

The City of Tshwane Metropolitan Municipality (CTMM) recognised the necessity to develop strategic planning processes to enable environmentally sustainable development in Tshwane. As a result, the Tshwane Integrated Environmental Policy (TIEP) was formulated by the Environmental Management Division, to form the foundation for the development of medium-term environmental management strategies by all the CTMM's departments. The TIEP will form an integral part of the Integrated Development Plan (IDP) process, incorporating both the State of the Environment Report and the Environmental Implementation Plan. Air quality management involves pollution minimisation, management and prevention, improving air quality in areas where it is poor, and maintaining it where it is good. It is in this context that the Environmental Health Division initiated the development of an Air Quality Management Plan (AQMP) for Tshwane.

The purpose of developing an AQMP is to empower the CTMM to meet its obligations as outlined in the Air Quality Act. The AQMP will initiate best practices in air quality management and ensure cost-effective and equitable reduction of emissions. This will improve air quality in Tshwane and reduce environmental and health risks in line with the requirements of the TIEP.

The main goals of the AQMP are to –

- achieve and sustain acceptable air quality levels throughout Tshwane;
- minimise the negative impact of air pollution on people's health and well-being and on the environment;
- promote the reduction of greenhouse gases in support of the CTMM's climate change protection programme; and

[1] The National Environmental Management: Air Quality Act (Act 39 of 2004), published in the *Government Gazette* on 9 September 2005 and implemented on 11 September 2005; sections omitted by the Minister of Environmental Affairs and Tourism from the implementation of the Act, are Sections 21, 22, 36 to 49, 51(1)(e), 51(1)(f), 51(3), 60 and 61.

- reduce the extent of ozone-depleting substances in line with national and international requirements.

Specific objectives of the AQMP include the following:

- To promote cleaner production processes and continuously improve best practices relating to air pollution prevention and minimisation
- To promote energy efficiency in all sectors, such as the industrial, commercial, institutional, mining, transportation and domestic energy use sectors

The CTMM's Social Development Department initiated the development of an AQMP for Tshwane, and Airshed Planning Professionals (Pty) Ltd was appointed to assist with formulating a detailed plan. Airshed subcontracted Zitholele Consulting to provide support services for the project, such as public notification of the project and consultation with interested and affected parties.

1.2 Scope of work

The AQMP is the management and performance-monitoring tool for air quality control and provides the basis for assessing air quality in Tshwane. The assessment of various categories of air pollutants is included in the plan, for instance toxic and odoriferous substances, greenhouse gases and ozone-depleting substances. Greenhouse gas emissions are, however, not addressed in detail since they were assessed when the Energy Strategy Report for the CTMM was developed, parallel to the AQMP process. The AQMP has omitted the issues of noise and radioactive pollution since the Municipality has addressed them internally.

The main objectives behind the comprehensiveness of the AQMP are the inclusion of –

- targets and projections; a financial plan (short, medium and long term) that is linked to the CTMM's IDP; and best abatement measures (plan, project and programmes for the CTMM);

- a source inventory, which is a comprehensive, accurate and current account of air pollutant emissions and associated data from specific sources over a specific time period, which includes the greenhouse gas emission inventory and reporting requirements of the CTMM;

- an air quality management information system containing air quality data that are compatible with acceptable modelling requirements and management information system requirements;

- the investigation of the critical implications of the AQMP for human resources, training and costs so as to develop a practical and feasible AQM system; and

In preparing the draft plan and compiling the final plan, peers in the technical field and air quality stakeholders were consulted. In addition, a baseline assessment of air pollution concentrations and air quality management practices in Tshwane was done, and an inventory of national and provincial requirements for AQMP development was drawn up. The following were also taken into account:

- Operational and functional structure requirements
- Air quality management system component requirements
- Source identification and prioritisation
- Implementable emission reduction measures
- Mechanisms for facilitating interdepartmental cooperation in the identification and implementation of emission reduction measures for certain sources
- Human resource development (training) requirements

The integration of technical evaluation and public issues was considered paramount in the AQMP development process to ensure that the project team did not function in isolation. The AQMP development process was divided into three components for planning and administrative purposes, namely a technical process, an advisory process and a consultation process. The technical process was the responsibility of the technical members of the project team, and comprised information syntheses, issue analyses and document drafting. The advisory process included cooperation between the project team, the Steering Committee, the Technical Working Group and the Stakeholder Group. The consultation process included the dissemination of information, invitations for public participation, the organisation of discussion workshops, and the collection and collation of comments for communication to the technical team.

2. BASELINE CHARACTERISATION

2.1 Background

Tshwane is located to the north of Johannesburg in the Gauteng Province, and extends from Centurion in the south to Temba in the north, covering an area of 2 200 km². Its population is about 2 million (according to the 2001 census), of which most live in Pretoria, Centurion, Temba, Soshanguve and Mabopane. The last two areas have a high population density.

Tshwane's topography consists of hills, ridges and undulating plains, with the Magaliesberg running from east to west through the northern suburbs, forming a shallow valley in the central part of Pretoria and the Crocodile River area called the Magalies Moot.

The dispersion potential of Tshwane is predominantly influenced by meso-scale processes including thermo-topographically induced circulations, the development and dissipation of surface inversions, and the modification by urban areas of the low-level wind field and stability regime. North to north-westerly winds prevail during much of the year, with a change to south to south-westerly winds during the winter months.

Figures 1 and 2 provide an aerial view of Tshwane. Figure 1 is a view from the south, and Figure 2 a view from the east.

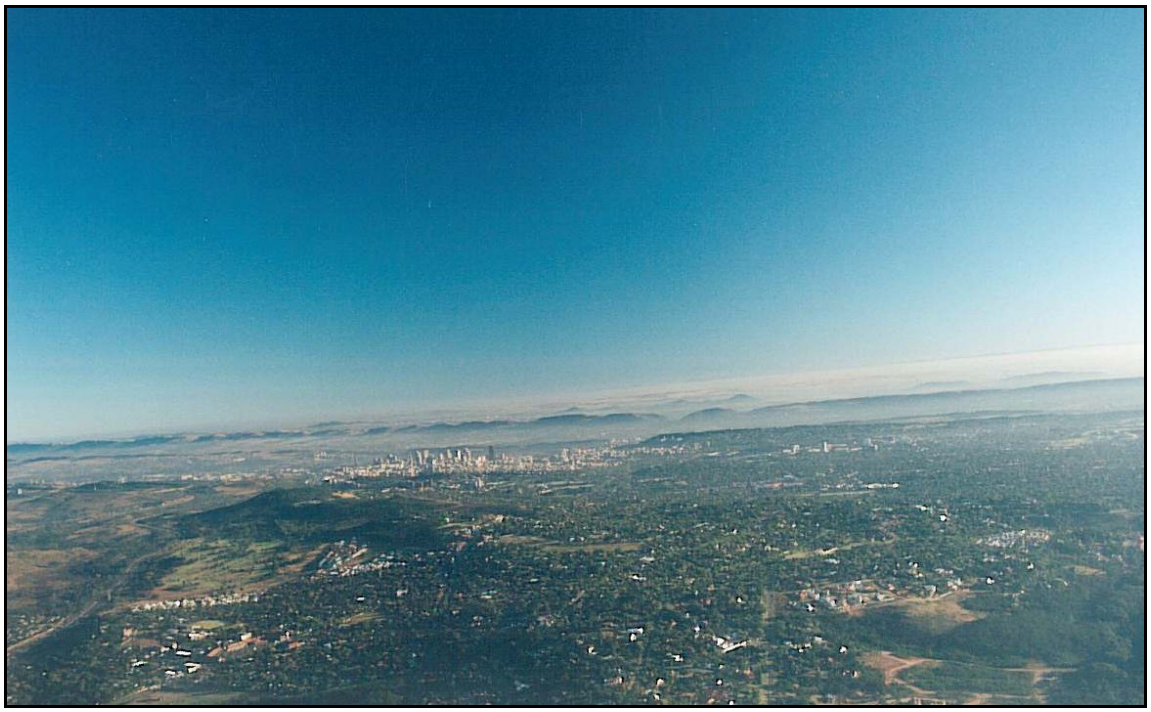

Figure 1: Aerial view of Tshwane from the south

Figure 2: Aerial view of Tshwane from the east

2.2 Main pollutants, sources of pollutants and areas in Tshwane affected by pollutants

The first step in designing an ambient air quality monitoring network is to identify the main pollutants of concern and the priority areas potentially affected by these pollutants. Table 1 provides a synopsis of the main pollutants, sources of pollutants and potential impact areas in Tshwane.

Table 1: Summary of priority pollutants, sources and areas

Pollutants	Main contributing sources	Key areas affected
Particulate matter with a particle size less than 10 or 2.5 microns (PM_{10}, $PM_{2.5}$)	- Power generation (Rooiwal and Pretoria West power stations) - Industrial processes (eg ceramic, cement, iron and steel) - Household fuel combustion - Other (vehicle entrainment of road dust, veld fires, tyre burning – significant when episodes occur) - Transport (diesel vehicle emissions)	Elevated concentrations over much of Tshwane resulting in widespread health risks, and significant health effects anticipated in fuel-burning residential areas
Nitrogen dioxide (NO_2) Nitrogen oxides (NO_x)	- Transport (petrol and diesel vehicles) - Power generation (Rooiwal and Pretoria West power stations) - Industrial processes (eg ceramic, cement, iron and steel) - Household fuel combustion - Other (veld fires, tyre burning, etc are minor sources)	Elevated concentrations expected close to busy roadways (i.e. N1, N4, N14,R80) Pretoria West and Moot areas because of power station and industries
Ozone (O_3)	- Secondary pollutant associated with NO_x and other precursor releases - Transport (petrol and diesel vehicles are key contributors) - Household fuel combustion - Industrial processes - Veld fires	Monitoring is required to confirm ozone levels.
Sulphur dioxide (SO_2)	- Power generation (Rooiwal and Pretoria West power stations) - Industrial and non-domestic fuel burning (eg cement, iron and steel industries) - Transport - Household fuel combustion - Veld fires, tyre burning	Elevated concentrations over much of Tshwane (Pretoria West and Moot areas) Informal settlements during winter months
Volatile organic compounds (VOC)	- Transport (petrol and diesel vehicles are key contributors) - Household fuel combustion - Industrial processes (eg ceramic, cement, iron and steel) - Veld fires	Zones in areas that are affected severely must be established through monitoring and modelling
Carbon oxide (CO)	- Transport - Household fuel combustion - Power generation (Rooiwal and Pretoria West power stations) - Industrial processes (eg ceramic, cement, iron and steel) - Veld fires, tyre burning	Markedly elevated concentrations near busy roadways Pretoria West and Moot areas
Air toxins	Incinerators, specific industries (printers, dyers, spray painters, etc)	Close to sources

The Moot area is clearly visible in Figure 3 that gives a view towards the west. Figure 4 gives a view of the Pretoria CBD taken from the north, clearly showing the air pollution.

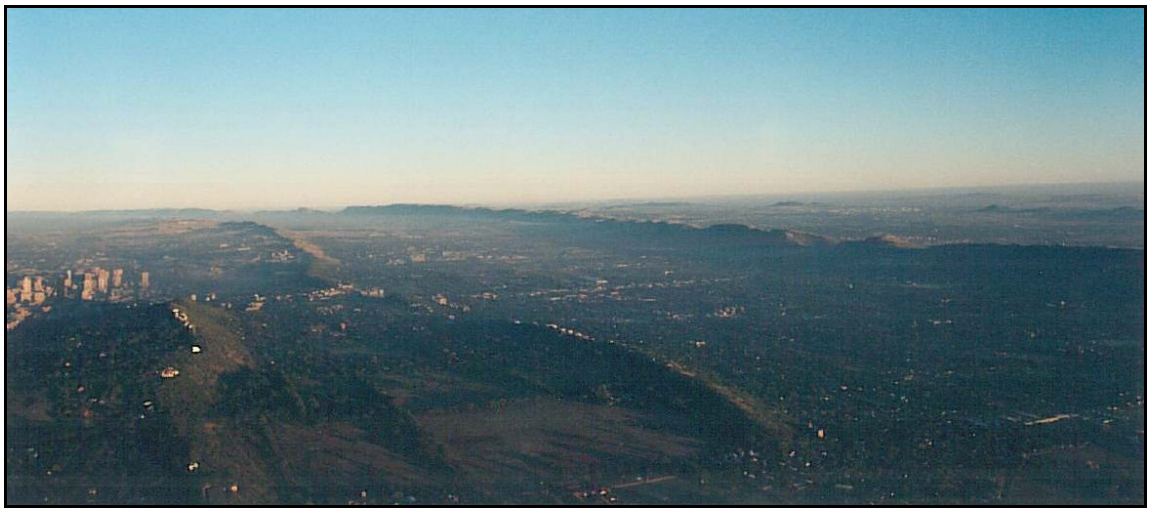

Figure 3: Aerial view of the Moot area bordered by the Magaliesberg

Figure 4: Aerial view of the Pretoria CBD

3. AIR QUALITY MANAGEMENT

3.1 Air quality management policy

A clear air quality management policy was required to inform the development, implementation, review and revision of an air quality management plan. In drafting this policy, account was taken of –

(i) the Constitution, Bill of Rights, National Environmental Policy (as documented in the General Environmental Management Policy for South Africa), the National Environmental Management Act, 1998 (Act 53 of 1998) and the Integrated Pollution and Waste Management White Paper;

(ii) the National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004); and

(iii) international trends in air quality management policies.

The CTMM's AQM policy embodies a paradigm shift from end-of-pipe air pollution control to pollution prevention and minimisation through proactive and integrated air quality management planning. The integration of air quality considerations into development, transportation, land-use planning and housing policies and programmes represents a key feature of the policy. The involvement of the public in the air quality management process is equally important.

The overarching principles of the Constitution, the General Environmental Management Policy for South Africa and the Integrated Pollution and Waste Management Policy White Paper underpin the CTMM's proposed AQM policy.

3.1 Local air quality objectives

Air quality guidelines and standards and other evaluation criteria are fundamental to effective air quality management, providing the link between the potential source of atmospheric emissions and the user of that air at the downstream receptor site. The AQA adopted the guidelines in the user guide published by the Department of Environmental Affairs and Tourism (DEAT) as interim national standards for particular pollutants (including particulates, sulphur dioxide, oxides of nitrogen, lead and ozone). It is, however, likely that the limit values of the Bureau of Standards will be adopted as national ambient air quality standards. Although the AQA does not make provision for the setting of legally binding local air quality standards by local authorities, local authorities may define air quality guidelines as internal objectives or targets to assist in ambient air quality management.

In selecting pollutants for which local guidelines must be established, attention was paid to the following:

- Pollutants that commonly occur in Tshwane and have relatively widespread exposure among residents

- Pollutants for which there are national air quality guidelines and for which national air quality standards are being established
- Pollutants for which guidelines/standards/goals are initially issued by other countries

A tiered approach was advocated for setting air quality evaluation criteria for Tshwane. It was recommended that the following thresholds be established:

1. *Limit values*, based on scientific information, to avoid, prevent or reduce harmful effects on human health and the environment: Limit values must be attained in a given period and must not be exceeded once attained.
2. *Information and investigation thresholds*, to highlight pollutant concentrations at which the public need to be informed that sensitive individuals might be affected and/or at which investigations into reasons for the elevated levels need to be initiated.
3. *Alert thresholds*, beyond which human health is at risk even after brief exposure: Exceeding such thresholds necessitates immediate steps.

A synopsis of the specific actions required and timeframes to be followed for establishing various local air quality objectives is given in Table 2.

Table 2: Actions and timeframes to develop local air quality objectives

Action	Target date
Short-term actions	
Adopt local ambient air quality objectives and dustfall evaluation criteria	On adoption of the AQMP
Revise local ambient air quality objectives and dustfall evaluation criteria	Immediately after the replacement of the interim national air quality standards by the DEAT
Medium-term actions	
Determine target timeframes for meeting local air quality objectives	June 2007
Determine local air quality objectives for PM2.5 (excluding timeframes for compliance)	June 2008
Define local alert and information thresholds	June 2008
DEAT and GDACE[2] complete motivation to investigate air quality criteria to protect local vegetation and ecosystems	December 2008
Adopt local objectives for the protection of vegetation and ecosystems	January 2010 – pending completion of the DEAT/GDACE investigation

4. AIR QUALITY MANAGEMENT SYSTEM

[2] Gauteng Department of Agriculture, Conservation and Environment

An AQMP cannot be successfully implemented and revised in the absence of an effective air quality management system (AQMS). It was proposed that the CTMM establish a system in the *short term (first two years after approval)*.

Although air quality objectives represent important AQM "tools", there are other essential tools like an emission inventory, air quality and meteorological monitoring and atmospheric dispersion modelling. A comprehensive emission inventory, together with monitoring and modelling, facilitates the effective characterisation of spatial and temporal variations in air pollutant concentrations. Such concentrations are evaluated based on local guideline values to determine the need for devising emission control strategies. Dispersion modelling is used to predict possible ambient air pollutant reductions through the implementation of specific emission control strategies. Emission control strategies may then be selected to ensure compliance with local guideline values, after their socio-economic acceptability and technological feasibility have been assessed. The control measures selected need to be enforced and if these are not achieved after a reasonable period of time the emission control measures may need to be revised.

An integrated air quality management system to be implemented by the CTMM is illustrated in Figure 5. System components proposed for implementation in the short term are indicated by solid lines, and components to be added at a later stage by dashed lines.

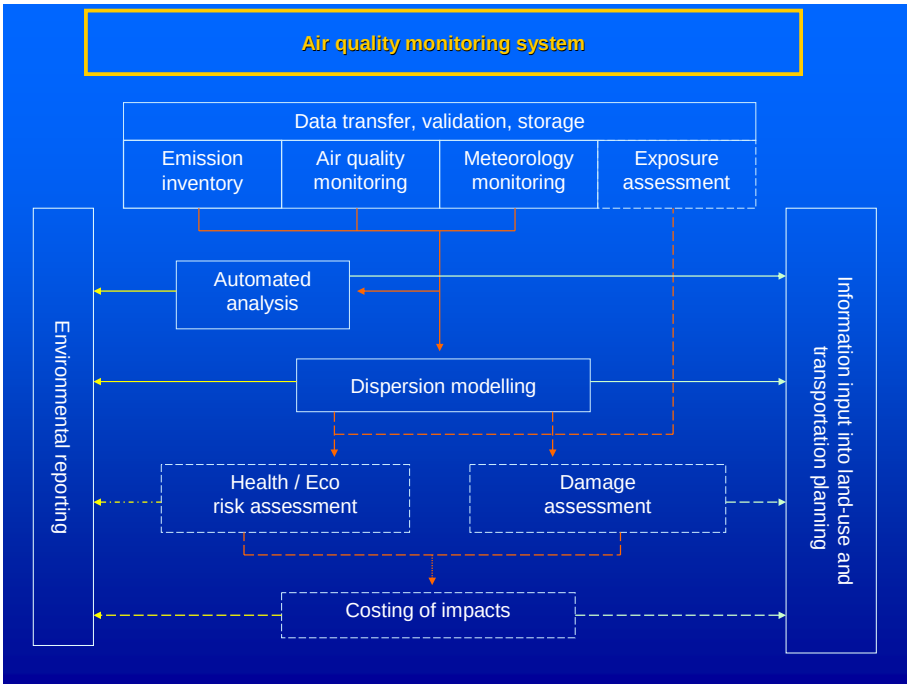

Figure 5: Air quality management system proposed for implementation by the CTMM

It was proposed that the CTMM develop a comprehensive and accurate emission inventory reflecting the status quo. This should reflect all point and non-point (fugitive) sources. The first-level emission inventory developed during the baseline assessment done for the CTMM in 2005 can be used as a basis.

In the development of an ambient air quality and meteorological monitoring network, careful consideration was given to the monitoring objectives, the parameters to be monitored and the locations of the stations.

The main air quality monitoring objectives adopted by the CTMM were to –

- determine compliance with air quality guidelines and standards;
- assess the exposure of people, addressing both the highest levels and the levels in areas where the general population is exposed;
- make adequate information available to the public;
- provide objective inputs to air quality management, transportation and land-use planning;
- track progress made through the implementation of pollution control measures;
- determine the contribution of different pollutant sources (e.g. by receptor modelling); and
- do spatial and temporal trend analyses (also to validate dispersion modelling)

Based on the main pollutants of concern identified during the baseline assessment and the lack of background information on concentrations, it was decided to focus on priority pollutants in the short term. Site selection was based on factors such as the locations of sources and their positions relative to sensitive receptor areas (eg residential areas, hospitals, schools), population density (specifically in informal settlements), topography (such as that of the Moot area), and the dispersion potential of the region (predominant wind fields). In addition, the results of the dispersion simulation conducted during the baseline assessment were used.

The minimum parameters to be measured are twofold:

- Meteorological parameters including wind speed, wind direction, sigma-theta, temperature
- Ambient concentrations of PM10, SO_2, NO, NO_2, NOx, CO and Ozone

The proposed site locations for stationary stations included the current locations in Rosslyn and Pretoria West, and additional locations in Mamelodi, the Moot (western section), and Centurion (Olievenhoutbosch). Mobile stations were be placed near busy road intersections such as the N1/N14 intersection (Highveld, Centurion) and the N1/N4 intersection (Pretoria East). Additional mobile station locations included the residential areas of Elarduspark and Rooihuiskraal, the Hammanskraal Community Centre, the Bodibeng Library in Soshanguve, the Ga-Rankuwa municipal offices in the north, Pretoria West, Pretoria North and the Pretoria CBD. These locations are merely suggestions and can be changed.

It is important to use the data from the monitoring network to establish data quality objectives, data processing and reporting protocols, and monitoring methods. It is imperative that the software used allows for interaction with any database.

Dispersion models calculate ambient air concentrations primarily as functions of source configurations, emission strengths, terrain features and meteorological characteristics, hence forming an integral part of air quality management and planning. It was proposed that an urban-scale dispersion model be selected, capable of modelling area point, and line sources, and chemical transformation (specifically ozone formation).

An aspect that the Air Quality Act emphasises is the involvement of the public in decision making. It is therefore important to make information regarding air quality in Tshwane available to the public, stakeholders and interested and affected parties. This necessitates a reporting protocol to ensure a standardised methodology and reporting format. In addition, a public consultation process should be followed taking into account specific aims and objectives to be met and media or other methods to be used. The current complaints register should be updated to allow for automatic logging and reporting. Public meetings must be held every six months at a central venue for the majority of interested and affected parties.

A synopsis of the specific actions that are required and the timeframes to be followed for establishing and implementing the AQMS is given in Table 3.

Table 3: Actions and timeframes for the development of the AQMS

Action	Target date
Short-term actions	
Consult with industries required to fund ambient air quality monitoring and integration of data of the monitoring into the CTMM's air quality database.	June 2005 Ongoing
Consolidate an ambient air quality and meteorological monitoring network which includes the three new stationary stations, the eight mobile stations/street boxes, and automated data transfer and first-order validation.	June 2006
Update and integrate the electronic, centrally-accessible complaints register (current Environmental Health Management Information System).	July 2006
Evaluate and do costing of passive diffusive monitoring and biomonitoring campaigns.	December 2006
Update source and emission data for all major sources (ongoing)	December 2006
Define and implement a schedule for routine reporting.	March 2007
Extend the ambient air quality and meteorological monitoring network to include two additional stations. Possible stations and sites include a stationary site in the West Moot and Centurion.	March 2007
Arrange, advertise and conduct six-monthly public meetings.	July 2007
Purchase and install emission inventory and air dispersion modelling software.	December 2007
Medium-term actions	
Investigate the feasibility of designating an air pollution hotline and air quality information and liaison officer.	December 2008
Collate source and emission data for all major sources (ongoing) and for the initial population of the emission inventory software.	December 2008
Populate the air dispersion modelling software and simulate the ambient air pollutant concentrations across the Tshwane area.	December 2008

4.1 Source quantification and emission reduction strategies

The main aim of developing an AQMS is to identify and implement emission reduction measures to improve air quality over a given period of time. Therefore, it is important that the main sources of ambient air pollution that have an impact on the environment is targeted and that the emission reduction measures or strategies that are proposed are indeed feasible and cost effective.

4.1.1 Domestic fuel burning

It was considered crucial that national, provincial and local initiatives aimed at reducing household fuel burning are conducted in a coordinated manner. The priority initiatives to be implemented by the CTMM must therefore reflect the priorities of national departments such as the Department of Minerals and Energy (DME) and the Department of Housing. The main strategies over the short term and the medium term are outlined in Table 4.

Table 4: Emission reduction strategies for domestic fuel burning

Strategy	Responsible parties	Initiation (duration)
Short-term strategies (1 to 2 years)		
The CTMM negotiates with the DME and DEAT to sponsor a project in Mamelodi and Marabastad that is similar to the Tembisa Basa Njengo Magogo (BNM) project. CTMM personnel must be involved in the project and will require training by the DME in the BNM method of ignition.	CTMM DME	July 2006 (18 months)
Involve the public and other organisations in teaching the BNM method. The National Zoo has indicated their willingness to train school groups in using the BNM method. Nissan SA recommended that a training DVD be made on this method for distribution to all industries to use in staff training and education.	CTMM, DMS, DEAT and industries	July 2006 (18 months)
Consider incorporating energy efficiency solutions in new low-cost housing areas. This should include passive solar designs, better insulation (specifically under tin roofs etc) and research into alternative building materials (such as certain inert waste materials that can be used).	CTMM Housing Division	January 2008 (ongoing)
Medium-term strategies (3 to 5 years)		
The CTMM must implement the BNM project in Soshanguve and Atteridgeville.	CTMM	July 2008 (12 months per settlement)
The CTMM must continue the surveys of households initiated when carrying out the State of Energy study and track the progress of the BNM projects there. The progress must be reflected in the revised AQMP and the State of Energy report.	CTMM Air Quality Section DME	July 2008 (6 months)
Update emission quantification and impact predictions (dispersion model) with new information on domestic fuel burning.	CTMM Air Quality Section	January 2009 (ongoing)
The CTMM must set up an urban air quality dispersion model to simulate pollution concentrations of domestic fuel burning emissions.	CTMM Air Quality Section	January 2009 (ongoing)
The CTMM must facilitate the investigation and identification of suitable alternatives to household fuel burning and look at low-smoke fuels, renewable energy, energy demand management, etc).	CTMM Air Quality Section	January 2009 (ongoing)

The energy efficiency measures intended for implementation in the short and the medium terms are in line with the DME's Energy Efficiency Strategy (March 2005) and the National Energy Regulator's Regulatory Policy on Energy Efficiency and Demand Side Management (EEDSM) for the South African Electricity Industry (May 2004).

4.1.2 Road transportation

Collaboration between local, provincial and national government is required to secure the effective regulation of vehicle emissions. Transportation management measures and emission testing strategies by local authorities are likely to be more successful if implemented uniformly across neighbouring cities and metropolitan municipalities. Critical to the success of the implementation of any emission reduction strategies by the CTMM is the relationship between its various departments, such as Transport Planning, Land-use Planning and Housing.

Emission reduction strategies proposed over the short and medium terms are provided in Table 5.

Table 5: Emission reduction strategies for transportation

Proposed strategy	Responsible parties	Initiation (duration)
Short-term measures (1 to 2 years)		
An Inter-departmental Transport Liaison Group (ITLG) consisting of the Environmental Health, Environmental Management, Transport, Housing and Land-use Divisions is to be established. This group must meet every month to set up information-sharing systems and subsequently implement short-term measures. The Integrated Transport Plan should be used as basis and must be updated continuously.	CTMM divisions coordinated by the Air Quality Section	December 2006 (6 months to establish, thereafter ongoing)
The ITLG should contact comparable groups in the Ekurhuleni and Johannesburg municipalities to learn from their experience, and establish an inter-municipal group for future planning and standardisation of procedures in Gauteng. The GDACE can be contacted to coordinate these meetings, which should take place quarterly.	CTMM ITLG and GDACE	June 2007 (ongoing)
Current diesel vehicle testing procedures are to be standardised and expanded for testing a target number of vehicles once a month. The CTMM fleet should be tested first. The results should be reported to the Transport Division, who should then report to the ITLG. The Metropolitan Police should be co-opted for the diesel vehicle testing.	CTMM Transport Division and ITLG	July 2007 (ongoing)
A comprehensive and effective vehicle emission testing programme is to be designed for the medium term in consultation with the Johannesburg and Ekurhuleni municipalities and the Gauteng government.[1]	CTMM Transport Division	July 2007 (12 months)
Monitored data from mobile stations near main highway intersections (see section 5) are to be reported to the Transport Division and the ITLG so as to inform transport planning and highlight air quality issues.	CTMM Air Quality Section, Transport Division and ITLG	Oct 2007 (ongoing)
It must be determined how the current transport model of the Transport Division (EMME2/2) can be utilised to better inform transportation emission calculation and how this can be used by the Air Quality Management Section. The Transport Division's capacity to update this model annually with relevant traffic count data is to be established. The assistance of the Metropolitan Police must be sought for gathering this type of information.	CTMM Air Quality Section, Transport Division and ITLG	Oct 2007 (ongoing)
Research should be encouraged on cleaner transportation technologies through liaising with the Transportation Planning project manager on the Clean Transport Technology Project via the ITLG. The CTMM will also have to liaise with the GDACE to integrate the findings from their cleaner technologies initiative and to avoid duplication.	CTMM ITLG and GDACE	December 2007 (ongoing)
Medium-term measures (3 to 5 years)		
Diesel vehicle emission testing procedures developed during the short term are to be implemented.	CTMM ITLG	July 2008 (36 months)
Systems for annual updates of vehicle count data obtained from short-term measures are to be implemented.	CTMM Transport Division	July 2008 (annually)
The Air Force is to be encouraged to compile an emission inventory and conduct an impact assessment of all their airports in Tshwane. The data should be incorporated into the CTMM emission database.	CTMM Air Quality Section	July 2008 (ongoing)
Transnet and private rail companies are to be encouraged to quantify emissions emanating from railroads, especially in Capital Park. The data should be incorporated into the CTMM emission database.	CTMM Air Quality Section	July 2008 (ongoing)

Proposed strategy	Responsible parties	Initiation (duration)
The customised EMME2/2 traffic model for providing emission data to the Air Quality Section is to be implemented, if feasible.	CTMM Air Quality Section	July 2009 (every three years)
An urban air quality dispersion model is to be set up to simulate pollution concentrations associated with vehicle emissions, particularly during peak traffic periods.	CTMM Air Quality Section	July 2009 (ongoing)
The dispersion modelling results are to be communicated to the Transport Division to assist in transport strategy development and implementation.	CTMM Air Quality Section	July 2009 (ongoing)
Based on information received from various tools, the aim should be to increase highway on and off-ramps to ease ordinary road congestion, and to identify alternative routes to be developed and introduce bicycle lanes. Bus lanes are to be increased (encourage private bus companies to run bus services on bus lanes on main routes, thus countering traffic congestion, and encourage people to use this service). Encourage the use of Compressed Natural Gas and/or Liquid Petroleum Gas buses.	CTMM Transport Division	July 2009 (ongoing)

Note: (1) This will not be required if the DEAT establishes new regulations under the Air Quality Act of 2004 for vehicle emission testing in the future.

4.1.3 Industrial sources

For the purpose of this document, the term "industrial sources" includes all scheduled and non-scheduled processes as well as energy generation activities in the CTMM.

A total of 103 permits have been issued for scheduled processes in the CTMM, including power generation activities (see Figure 6: Pretoria West Power Station). Very little information was available on control technology used by these scheduled and non-scheduled processes. Various smaller industrial and commercial operations are currently run in Tshwane, such as spray painting, sand blasting, dry cleaning, small boiler operations, incineration and materials handling. A total of 281 fuel-burning appliance certificates have been issued by the CTMM to date. No information was available on the actual amount of fuel used, the frequency and duration of the operation and control equipment in place at each of these locations. No information was available on other smaller industries in Tshwane and therefore most of these operations are not monitored.

Recommended strategies for scheduled and non-scheduled processes are listed in Table 6.

Table 6: Emission reduction strategies for scheduled and non-scheduled processes

Proposed strategy	Responsible parties	Initiation (duration)
Short-term measures		
The current CTMM emission inventory is to be updated.		
– Permits are to be obtained for scheduled processes and the processes have to demonstrate compliance with permit conditions.	CTMM Air Quality Section, Environmental Health DEAT CAPCO	July 2007 (12 months)
– Non-scheduled processes are to provide process descriptions and any available emission information.		July 2007 (12 months)
– The CTMM must identify industries and commercial/institutional concerns undertaking combustion to compile emission inventories and then report source and emission data to the CTMM. The CTMM will have to compile questionnaires to be sent out to these industries.		July 2007 (24 months)
The current reported emission reduction strategies are to be updated to ensure they are in line with the best international practices. – Industries are to be encouraged to investigate and implement the best control technology. – Power stations are to investigate and implement feasible desulphurisation options and use coal with lower sulphur and ash content.	CTMM Air Quality Section	July 2007 (24 months)
Relationships are to be developed with national and provincial government and related CTMM departments (i.e. Environmental Management and Environmental Health). – Until the AQA sections on emission licences have taken effect, the Chief Air Pollution Control Officer (CAPCO) has to inform the CTMM of any new scheduled process developments in Tshwane or any changes to existing permits. – The City Planning Division has to inform the Air Quality Section of any new industrial development zones and/or applications. – All EIA information on industrial development must be obtained from the	CTMM Air Quality Section DEAT CAPCO GDACE	July 2007 (24 months)

Proposed strategy	Responsible parties	Initiation (duration)
GDACE.		
The CTMM must adapt the existing database on fuel-burning appliances to include slots for: – location of appliance – company name and contact details – type of appliance – type of fuel in use – sulphur and ash content of fuel (where appropriate) – quantity of fuel used – scheduling of operation (continuous, intermittent – two hours per day, etc) – control measures in place and efficiency of these measures – stack parameters (height, inner stack diameter, gas exit temperature, gas exit velocity or volumetric flow) – stack monitoring data (where available) Any new fuel-burning appliances must be reported to the CTMM.	CTMM Air Quality Section and EHP's	July 2007 (24 months)
Medium-term measures		
Based on the outcome of the DEAT emission licence review,(1) permits must be reviewed based on an updated emission inventory and information on control equipment.	CTMM Air Quality Section, DEAT	July 2009 (36 months and ongoing)
Specifications are to be set for the combustion efficiency of all new coal-fired boilers in conjunction with the project initiated by the DME.(2) (This project looks at fuel switching, abatement technology implementation and improvements in energy efficiency.)	CTMM Air Quality Section, DME	July 2009 (36 months and ongoing)
Eskom must be consulted on demand-side management measures applicable to the commercial and industrial sectors. Electricity generated by the Pretoria West Power Station can be replaced by residential gas.	CTMM Air Quality Section, DME and Eskom	July 2009 (36 months and ongoing)
The potential for introducing alternative tariff structures to encourage on-site co-generation and the introduction of renewable energy are to be investigated. Waste gas streams from industries are to be utilised as an energy source and incentives should be offered for this.	CTMM Air Quality Section, Eskom	July 2009 (36 months and ongoing)
The potential for introducing market incentives and disincentives to encourage emission reduction by industrial and power generation processes is to be investigated. Examples include: – Iron and steel manufacturers: waste gas recovery and use and improvement of fugitive dust emissions; – Cement manufacturers: minimising fuel usage by preheating and precalcination (to the extent possible, given the existing kiln system configuration) and heat recovery from waste gas; and – Clay brick manufacturers: fuel switching from coal to gas. Such processes will be enhanced by partnerships between the CTMM and the main industrial roleplayers in Tshwane.	CTMM Air Quality Section, Environmental Management, Environmental Health	July 2009 (36 months and ongoing)
The CTMM should investigate the feasibility of decommissioning the Pretoria West Power Station and replacing it with a gas reticulation network.	CTMM Air Quality Section, Environmental Management	July 2009 (36 months and ongoing)
The CTMM is to set up an urban air quality dispersion model to simulate pollution concentrations associated with vehicle emissions, particularly for peak traffic periods.	CTMM Air Quality Section	July 2010 (ongoing)

Proposed strategy	Responsible parties	Initiation (duration)
The CTMM is to update the emission inventory to include emission reduction based on the outcome of measures implemented in the short term.	CTMM Air Quality Section	July 2010 (ongoing)
The CTMM should liaise with the DEAT and the Gauteng government to ensure that it stays abreast of new developments in the control of industrial and commercial sources. The proposed National Air Quality Database should be investigated to ensure that information generated by the CTMM can be incorporated into this database and that the CTMM itself can access the database.	CTMM Air Quality Section, Environmental Management	July 2009 (ongoing)

Notes: (1) Criteria to be used by the CTMM to determine which operations are required to compile emission inventories are provided in the appendix.
(2) The DEAT has called for tenders for an atmospheric licensing project, which aims to capture and review all existing registration certificates.

Figure 6: Pretoria West Power Station in the Pretoria West Industrial Area

Possible emission reduction measures to be implemented include:

- Iron and steel manufacturers – recovering waste gas, and using and improving fugitive dust emissions
- Cement manufacturers – minimising fuel usage by preheating and precalcination (to the extent possible, given the existing kiln system configuration), and recovering heat from waste gas
- Clay brick manufacturers – switching from coal to gas

4.1.4 Waste and disposal treatment

Medical waste incineration is controlled by the Department of Health. Incineration itself represents a "scheduled process" in terms of the Atmospheric Pollution Prevention Act and as such requires a permit from the DEAT. No information was available on the types of incinerators and the amount of waste being disposed of.

The CTMM currently operates nine general waste disposal sites. (In future the DEAT will issue permits for landfill sites.) The Environmental Health Division of the CTMM drafted a Waste Minimisation Strategy in June 2005 so as to minimise waste in Tshwane.

Strategies recommended for waste facilities are listed in Table 7.

Table 7: Emission reduction strategies for waste disposal facilities

Proposed strategy	Responsible parties	Initiation (duration)
Short-term measures		
The CTMM is to ensure that all waste disposal facilities meet the minimum requirements of the Department of Water Affairs and Forestry (DWAF).	CTMM Environmental Health	July 2006 (ongoing)
Large general sites not meeting the DWAF requirements should provide the CTMM with a speciated substance emission inventory based on surface gas network sampling, dispersion modelling showing predicted impacts together with a health-risk screening assessment and odour assessment. The CTMM should require a quantitative health risk study to be undertaken should the results indicate the potential for health risks.	CTMM Environmental Health	July 2006 (12 months)
Finalisation and implementation of the Waste Minimisation Strategy: The Environmental Health Division should report quarterly on progress in the implementation of the strategy and provide each facility with information on the quantities and waste streams.	CTMM Environmental Health	July 2006 (24 months)
The CTMM should provide residential bins for the segregation of domestic waste (i.e. glass and other).	CTMM Environmental Health	July 2007 (ongoing)
Sewage and waste water treatment facilities are to compile emission inventories, commission ambient air quality monitoring and undertake impact and risk-screening studies. These facilities should also undertake health-risk assessments should the findings of the screening studies indicate a potential for such a risk. This should be reported to the CTMM annually.	CTMM Environmental Health, Air Quality Section	July 2007 (12 months)
The CTMM is to update the emission inventory with information on monitored and estimated emissions from landfill sites and waste water and sewage treatment works.	CTMM Environmental Health	July 2007 (12 months)
Medium-term measures		
The Waste Minimisation Strategy proposes education of the public and stakeholders. This can be done in conjunction with other environmental awareness campaigns. For this purpose the CTMM could publish tips on waste recycling and reduction on its website and billboards.	CTMM Environmental Health	July 2008 (36 months and ongoing)
Additional waste segregation and recycling strategies for implementation in Tshwane are to be designed.	CTMM Air Quality Section, DEAT	July 2008 (36 months and ongoing)
Alternative waste treatment and disposal options are to be investigated. The cement industry can be approached to investigate the feasibility of hazardous waste incineration at cement kilns.	CTMM Air Quality Section, PPC	July 2008 (36 months and ongoing)
The CTMM is to set up an urban air quality dispersion model to simulate pollution concentrations associated with waste disposal facilities and waste water and sewage treatment works.	CTMM Air Quality Section	July 2009 (ongoing)
The CTMM is to update the emission inventory with information on monitored and estimated emissions from landfill sites and waste water and sewage treatment works.	CTMM Air Quality Section	July 2009 (ongoing)

4.1.5 Mining activities

There are 27 mines in operation in Tshwane, excluding various small sand quarries not listed. These mines are almost exclusively quarries operated by means of opencast or surface mining techniques, which are notorious for generating dust.

Recommended strategies for other sources are listed in Table 8.

Table 8: Emission reduction strategies for mining operations

Proposed strategy	Responsible parties	Initiation (duration)
Short-term measures		
The CTMM must join the inter-departmental committee tasked with the regulation of mining activities.	CTMM, DWAF, DME and GDACE	Dec 2006 (ongoing)
Mining companies must provide the CTMM with emission inventories for their operations, including their mineral processing plants.	CTMM Air Quality Section, Environmental Management	July 2007 (12 months)
All mines close to residential areas are to monitor dust fallout. The results must be reported monthly to the mine management and six-monthly to the CTMM.	CTMM Air Quality Section, Environmental Management	July 2007 (12 months)
All opencast mines are to compile and implement comprehensive dust management plans as part of their Environmental Management Programme Reports (EMPRs) and report on these to the CTMM.	CTMM Air Quality Section, Environmental Management	July 2007 (12 months)
Medium-term measures		
The CTMM must request the DME to ensure that all mines – – have approved EMPRs; – can demonstrate compliance with EMPR commitments and national ambient air quality standards; – determine the financial quantum and provide for the prevention and management of air pollution; and – are fined for not complying with EMPR requirements.	CTMM Environmental Management, DME and GDACE	Dec 2008 (ongoing)
All mines that close must comply with their closure commitments, specifically with dust management plans and rehabilitation objectives.	CTMM Environmental Management, DME and GDACE	Dec 2008 (ongoing)
The CTMM is to set up an urban air quality dispersion model to simulate pollution concentrations associated with fugitive dust from mining facilities.	CTMM Air Quality Section	July 2009 (ongoing)
The CTMM is to update the emission inventory with information on monitored and estimated emissions from mining sites, and include details on implemented mitigation measures and associated reductions.	CTMM Air Quality Section	July 2009 (ongoing)

4.1.6 Other sources

"Other sources" include sources identified by Tshwane's public, such as veld fires, tyre burning, agricultural emissions (eg wind-blown dust from open areas), vehicle entrainment on unpaved roads and railway transport.

Recommended strategies for limiting the effect of other sources are listed in Table 9. Figures 7 and 8 illustrate air pollution resulting from tyre burning.

Table 9: Emission reduction strategies for other sources

Proposed strategy	Responsible parties	Initiation (duration)
Short-term measures		
Identify and quantify emissions from other sources, i.e. vehicle entrainment on unpaved roads, agricultural activities (eg land tilling), veld fires, tyre burning and railway emissions.	CTMM Air Quality Section	Dec 2006
Establish routine data retrieval mechanisms for the purpose of updating the emission inventory (eg fire department request that data be kept on locations of veld fires and on extent of areas burned).	CTMM Air Quality Section	July 2007
Ensure that plants treating waste from abattoirs provide an inventory of waste received and treatment methods. Emissions should be quantified for the facilities and the information should be provided to the CTMM to be incorporated into the emission database.	CTMM Air Quality Section	July 2007
Control the burning of grass by municipal workers and contractors along highways and elsewhere.	CTMM Air Quality Section	July 2007
Support national legislation aimed at controlling copper wire burning for the purpose of wire stripping.	CTMM Air Quality Section	July 2007
Investigate by-law implementation regarding – – tyre burning; – the control of track-out from construction sites; and – dust fall monitoring and reporting of results during large-scale construction and demolition projects.	CTMM Air Quality Section	July 2007
Expand and enhance the Environmental Health One-Stop Service and incorporate information from the electronic complaints register into the management information system. Ensure that action procedures are set up for incidents of tyre burning and uncontrolled veld fires.	CTMM Air Quality Section, OHP	July 2007
Set up a communication plan to underpin the AQMP. This should include strategies for disseminating relevant air quality-related information to the public. Make use of the private and commercial sectors in distributing information (i.e. National Zoo's education plan, industry staff training programmes, the media, billboards, etc.)	CTMM Air Quality Section	July 2007
Medium-term measures		
Identify emission reduction measures for other sources on the basis of the quantitative emission inventory. Ensure that in-house atmospheric dispersion modelling or external studies yield positive results regarding health risks or nuisance impacts.	CTMM Air Quality Section	Dec 2008

Figure 7: Tyre burning in Rosslyn Klerksoord (1)

Figure 8: Tyre burning in Rosslyn Klerksoord (2)

4.1.7 Research initiatives

In order to ensure the effective implementation of the Air Quality Management Plan (AQMP), various research efforts will have to be undertaken internally by the CTMM (see Table 10).

Table 10: Recommended research initiatives

Research required	Purpose	Responsible	Schedule
Short-term measures			
Assess the problems and challenges faced by the Johannesburg and Ekurhuleni municipalities in the implementation of their AQMPs.	The CTMM should learn from the experience of the neighbouring municipalities to fast-track AQMP implementation.	CTMM Air Quality Section	July 2006 – June 2007
Assess the existing emission quantification tools of the CTMM (namely EMME2 traffic model) and its usefulness for the Air Quality Section.	Determine whether the existing traffic model could be used to estimate vehicle emissions based on locally developed emission factors.	CTMM Air Quality Section and Traffic Division	Dec 2006 – June 2007
Determine what emission quantification methods and tools are available for use by the CTMM, taking into consideration the specific sources that will have to be quantified by the CTMM (i.e. waste disposal facilities, domestic fuel burning, etc) and ascertain the potential for changing algorithms to suit local considerations and source types.	Although the CTMM can request emission inventories to be developed by industrial sources and mines, it will have to quantify emissions from remaining sources in-house.	CTMM Air Quality Section	Dec 2006 – June 2007
Assess and cost suitable passive diffusive and bio-monitoring methods to determine the potential for their implementation within Tshwane so as to inform air quality management.	Determine whether passive diffusive and/or bio-monitoring methods should be used in Tshwane – and if so, select suitable programmes for such monitoring.	CTMM Air Quality Section and Environmental Health	Dec 2006 – June 2007
Assess the ability of the CTMM's current and proposed software (Opsis system) for monitoring stations to (i) integrate the software with other databases such as MS Access or MS Excel; (ii) determine how this can be done automatically; and (iii) how it compares to other municipal/provincial systems.	The CTMM must determine how to seamlessly integrate all air quality-related data (including monitoring) into one database to be used by various divisions in the CTMM and provincial and national government.	CTMM Air Quality Section and Environmental Health	Dec 2006 – June 2007
Liaise closely with the University of Pretoria on the development of a three-dimensional diagnostic Winfield model.	This model will be useful to fill the gaps where no meteorological data have been recorded (i.e. northern part of Tshwane). It can also be used for real-time dispersion modelling and forecasting.	CTMM Air Quality Section, University of Pretoria	Dec 2006 – June 2008
Assess (i) current air pollutant concentrations, (ii) contributing sources, (iii) feasible implementation periods for select abatement measures and (iv) nationally set compliance timeframes (if available).	Stipulate permissible timeframes for ensuring compliance with local air quality objectives and national air quality standards.	CTMM Air Quality Section	Dec 2006 – June 2008

Research required	Purpose	Responsible	Schedule
Assess the most suitable placement for the additional two stationary monitoring stations based on updated emission data, results from the proposed monitoring network (March 2006) and air pollution complaints received.	The most suitable placement of the two additional stationary monitoring stations can be guided by the results of the "soon-to-be-implemented" monitoring network.	CTMM Air Quality Section	June 2007 – March 2008
Conduct an annual literature survey on international best practices in air quality management (AQM) and identify new focus areas.	Since AQM is dynamic, the CTMM should stay abreast of international trends.	CTMM Air Quality Section	Dec 2006 – ongoing

Research required	Purpose	Responsible	Schedule
Medium-term measures			
Select suitable information and alert interest groups to thresholds, taking into account (i) measured air pollutant concentrations, (ii) international air quality criteria and (iii) the socioeconomic and technical feasibility of attaching specific reporting, investigation and mitigation requirements to such thresholds.	Finalisation of information on air quality thresholds and determining requirements for reporting on conditions and for investigating and mitigating them.	CTMM Air Quality Section	Dec 2006 – June 2007
Identify suitable local PM2.5 guidelines and related compliance timeframes, taking into account (i) local PM2.5 concentrations, (ii) source contributions, (iii) feasible implementation periods for select abatement measures and (iv) internationally and nationally set PM2.5 standards and compliance timeframes (if available).	Stipulation of suitable local PM2.5 guidelines and permissible compliance timeframes.	CTMM Air Quality Section	Dec 2006 – June 2007
Collate and quantify source and emission data through emission factor application and/or emission modelling and/or acquisition of emission measurements undertaken by sources. (This could be the basis of a master's degree.)	Collation of first comprehensive emission inventory for Tshwane.	CTMM Air Quality Section	Dec 2006 – June 2007
Undertake atmospheric dispersion modelling, with model validation based on monitored results, so as to identify non-compliance with local air quality guidelines and national standards.	Determination of non-compliance zones in Tshwane.	CTMM Air Quality Section	July 2007 – Dec 2007
Conduct an annual literature survey on major sources (focusing on the most current information on pollutant types, emission estimation techniques, controls, etc).	(i) Informing the maintenance and further development of the emission inventory. (ii) Reporting survey results regarding vehicle pollution to the Transportation Planning Section.	CTMM Air Quality Section	Ongoing, starting Dec 2006
The CTMM is involved in the EnerKey project, which is a medium to long-term intervention.(1)	This project could be very useful in building design alternatives such as better insulation of low-cost housing and use of solar panels for energy supply.	CTMM SEED official and Air Quality Section	Ongoing, started June 2005

Research required	Purpose	Responsible	Schedule
The CTMM is to form close relationships with the University of Pretoria, Unisa and the Tshwane University of Technology.	Use of postgraduate studies on specific requirements for emission inventories or research initiatives. Information on relevant research that can benefit the CTMM's air quality management.	CTMM Air Quality Section	Ongoing, started June 2005

Notes: (1) The University of Johannesburg and the University of Stuttgart set up the EnerKey project to promote transformation towards sustainable energy provision in the greater Johannesburg area. A workshop was held in Johannesburg on 3 and 4 November 2005 to determine the main areas of research. The Tshwane, Johannesburg and Ekurhuleni municipalities are partners in this research.

4.1.8 General requirements

The following considerations are crucial over the *short term*:

- The CTMM Council must understand the need for a specialised air quality management section/unit and approve its establishment.
- The two crucial positions over the short term are those of an Air Quality Officer and a Senior Atmospheric Scientist. These positions are necessary to ensure relevant training in the interim and carry out the AQMP functions.
- The Air Quality Officer and the Senior Atmospheric Scientist will be responsible for initiating and implementing all identified tasks. Thus little distinction will be made between the responsibilities of the two incumbents. (The atmospheric licensing functions are expected to become the responsibility of local authorities within two years.[3])
- The DEAT is defining capacity-building requirements and training programmes for provincial and local authorities. The CTMM must communicate its specific training requirements to the DEAT so as to enable the latter to set up a timeframe for the provision of support in this regard.
- In the short term the contractors appointed to implement and manage the ambient monitoring stations are to train the CTMM's Environmental Health Practitioners to maintain and capture data properly. This training will produce in-house specialisation over the medium and long term.
- The officials responsible for the implementation of the AQMP should establish sound relationships with all relevant CTMM divisions (namely Environmental Health, Environmental Management, Transport Development, Housing and City Planning). The cooperation of these divisions will be crucial for the efficient implementation of the AQMP.
- Dispersion modelling software should be purchased. The emission inventory should be updated and an emission database should be established. All monitoring data must be downloaded onto a base station and stored in a central database. Provision should also be made for a data back-up at the CTMM.
- The complaints register should be integrated with the central database so the Air Quality Officer can immediately take action on reported incidents.

Capacity to be incorporated over the *medium term*:

- During the medium term the Air Quality Officer should be responsible for reviewing and issuing atmospheric licences for all listed activities in Tshwane. Given that all sources of air pollution should have been identified in the previous phase and that all industries should have supplied the CTMM with emission inventories, the task of the Air Quality Officer should become simpler.

[3] This is dependent on the outcome of an atmospheric licensing project, which commenced at the beginning of 2006 and will run for 18 months.

- The emission inventory should be updated annually to give an accurate and current reflection of the air pollution sources in Tshwane. An urban airshed dispersion model should be set up and be operational at this stage and be capable to run future scenarios. This information will be used by the Air Quality Officer to review and issue emission licences.
- A section/division head should be appointed in the medium term. This person should be responsible for managing the Air Quality Section and for ensuring that the AQMP is implemented and revised, that the communication systems operate smoothly and that inter-departmental information sharing continues. This person will also be the link to provincial and national departments to ensure data sharing and involvement in all air quality management projects initiated by the provincial and national governments. This function might be taken over by the Air Quality Officer, depending on the structure in operation.
- Depending on the automisation of the complaints register and how well air quality issues are captured and responded to, an air quality public liaison officer could be appointed in the Air Quality Section. The complaints register for air pollution issues should continue to be incorporated into the general complaints register.

4.2 AQM approval and review process

The following process was followed in the drafting of the Tshwane AQMP:

- The following structures were established to provide guidance to the AQMP development team:
  - *Technical working groups (TWGs)* – established to review the technical merit and feasibility of the plan during the development phase. TWG members included representatives of various CTMM departments, provincial government (GDACE) and national government (DEAT), academics (University of Pretoria and Tshwane University of Technology) and various experts in the private sector.
  - *Air Quality Stakeholder Group (AQSG)* – comprising parties interested in and affected by air pollution and those who may be affected by interventions aimed at reducing air pollution, such as business, industry, NGOs, CBOs and labour.
- Discussion documents and a draft Air Quality Management Plan were compiled for distribution among and workshopping with the TWGs and the AQSG (August to November 2005).
- All comments received from the TWGs, AQSG and CTMM were integrated, after which the draft final Air Quality Management Plan was compiled (4 November 2005).
- The draft final AQMP was presented at a public workshop (1 December 2005) and copies of it were placed in public places.
- All comments received from the TWGs, AQSG, Ekurhuleni municipality and the public were integrated, following which the AQMP was finalised (21 December 2005).

The approval of the AQMP is, however, not only dependent on stakeholder and general public acceptance but also on provincial and possibly national government review and authorisation. The methodology for the AQMP's approval has not yet been established.

Once approved by the CTMM in consultation with the DEAT and the GDACE, the AQMP and the functional and operational framework within which the plan is implemented will be reviewed regularly to ensure its continuing suitability, adequacy and effectiveness. The review will primarily be aimed at addressing gaps in the functional and operational structures, AQM systems, management objectives, etc in light of poor performance, changing circumstances and the commitment to continual improvement.

In future the Air Quality Management Plan will be reviewed on the basis of the following:

- Final stipulations of the National Air Quality Management Act
- National regulations on revised ambient air quality standards
- National regulations on ambient air quality monitoring for compliance assessment purposes
- National regulations on emission standards
- National regulations on source monitoring methods suited to assessing compliance with emission standards
- Proposed guidance reports to be issued on (i) air quality assessments, (ii) the use of indirect methods for air quality characterisation (eg modelling) and (iii) Air Quality Management Plan development and implementation
- New DEAT and GDACE criteria for air quality management and air pollution control

Progress in AQMP implementation will be reported on annually. The AQMP will be revised after two years, following which it will be revised every five years, unless otherwise required by the DEAT or the GDACE.