Action for Air

2009 Update

Department of
Environment, Climate Change and Water NSW

Front cover left: View of North Sydney and Sydney (courtesy of Hamilton Lund / Tourism NSW)

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Executive summary

Action for Air, the NSW Government's 25-year air quality management plan for Sydney, Wollongong and the Lower Hunter has now been in place for ten years.

Air quality has improved over the past 10 years – many of the most dangerous pollutants are down by 30% and we consistently meet national air quality standards for four of six major air pollutants (lead, carbon monoxide, sulfur dioxide and nitrogen dioxide). These reductions are a significant achievement, particularly as over the past 20 years Sydney's population has grown by 21% and the number of passenger vehicles, the main contributor of several significant air pollutants, has increased by 58%.

However, we still face major challenges with ozone and particle pollution, and these are likely to be exacerbated by climate change. National standards for ozone are exceeded in Sydney as are particle standards in some regional areas. These exceedances generally occur between two and 20 days per year. Current and projected ozone and particle levels are a concern in view of growing evidence of the health impacts of air pollution.

The NSW State Plan makes cleaner air a priority, and sets a target requiring NSW to meet national air quality goals identified in the National Environment Protection Measure for Ambient Air Quality (the 'Air NEPM'). This review of *Action for Air* has been informed by the State Plan process, the comprehensive NSW air emissions inventory completed in 2007, and feedback from the community via stakeholder workshops and the 2007 Clean Air, Cool Climate Forum. It introduces an approach to air quality management that recognises the key issues of climate change, health and liveability which are also strong themes in the State Plan.

Action for Air also contains measures to reduce emissions from major industry and small businesses, and for making our homes and local environments even cleaner, healthier and more liveable. Recognising the whole community has a role in improving air quality, *Action for Air* includes a number of actions relating to communication and education about air quality, to help inform the public about pollutant sources and their impacts, and ways of reducing emissions.

Necessarily, there is a substantial focus on reducing motor vehicle emissions as these make a large contribution to ozone (photochemical smog) formation in Sydney. Projected growth in vehicle travel is also significant, particularly in road freight. Emission reduction strategies for this sector cover cleaner fuels, vehicles and fleets, reduced vehicle use through land-use changes, and sustainable transport initiatives including public and active transport.

While *Action for Air*'s primary focus remains reducing air pollutants, it also identifies air quality programs that reduce greenhouse gas emissions as a co-benefit. It aims to reduce the population's exposure to harmful air pollutants and to minimise the health impacts of air pollution, while making our communities cleaner, safer, healthier and more sustainable places to live. Combating air pollution and greenhouse gas emissions involves employing a variety of strategies across all sectors. For ozone in particular, the Department of Environment, Climate Change and Water NSW (DECCW) modelling results suggest that targeting a single source sector or single pollutant will not be sufficient to meet the Air NEPM standards. *Action for Air* therefore contains a range of measures to tackle air pollution from different sources.

In 2008 DECCW launched a new website which combines air quality monitoring data, weather forecasting and an air pollution alert system, giving the community up-to-date air quality information. The new website includes new statewide maps which provide hourly local air quality levels based on hourly monitoring of the six key pollutants, a new colour chart that provides a visual indication of air quality, a sign up function for Short Message Service (SMS) or email alerts for high pollution days and links to NSW Health for information on what to do on high pollution days.

Action for Air is a roadmap to achieve our air quality goals. It is a dynamic plan that is revised and adapted as new information and issues emerge.

Introduction

Clean air is fundamental to all people's health, with air quality particularly affecting the health of children and older people. It also affects the natural environment and the liveability of the communities in which we work and reside.

There have been significant improvements in air quality in NSW since the 1980s with initiatives to reduce air pollution implemented across industry, business, homes and motor vehicles. Concentrations of many of the most dangerous air pollutants have been reduced by nearly 30%. Concentrations of carbon monoxide, lead, nitrogen dioxide and sulfur dioxide now consistently meet national air quality standards.

Our air quality is considered good by world standards, but air pollution is sometimes still at levels that can harm human health and the environment, and the health costs of this pollution to the community are substantial.

Because of increases in population, motor vehicles and economic activity, ground-level ozone (photochemical smog or summertime white haze) and particle pollution (brown haze in cooler months) have shown no overall decline since the mid 1990s and currently exceed national air quality standards on a number of days each year. Climate change is expected to further exacerbate summertime smog as the number of days above 30°C increases.

Parts of regional NSW face considerable challenges meeting the particle standards. Bushfires, stubble burning, dust storms and woodheaters are the major emission sources in these regional areas. New approaches may be needed to reduce the community's exposure to pollution from local-level sources and natural events.

As well as being a ground-level air pollutant, ozone is the third most important greenhouse gas after carbon dioxide and methane, although it is not covered by the Kyoto Protocol due to its relatively short-term nature. It is important that we recognise the greenhouse benefits of reducing ozone formation along with the benefits for human health.

NSW State Plan

The NSW State Plan identifies cleaner air and progress on greenhouse gas reductions as priorities. It sets ambitious goals based in large part on broad-ranging community consultation and includes the following environmental targets:

- We will meet national air quality goals as identified in the Air NEPM.
- We will achieve a 60% cut in greenhouse gas emissions by 2050.

Photo: courtesy Hamilton Lund/Tourism NSW

NSW has agreed, through the Council of Australian Governments (COAG), to review all measures for greenhouse gas reduction to ensure they are complementary to the Commonwealth Pollution Reduction Scheme. The NSW Climate Change Action Plan (to replace the NSW Greenhouse Plan in 2009) will provide a strategic framework for assessing and dealing with the impacts of climate change. It will also reflect the realignment of State and Commonwealth roles in the context of the introduction of the Carbon Pollution Reduction Scheme.

At the same time, NSW air quality has the potential to benefit from programs that have a co-benefit in reducing greenhouse gases as well as conventional air pollutants like ozone and particles. A number of related priorities and targets in the State Plan are linked with air quality. They include:

- locating jobs closer to home – increasing the percentage of the population living within 30 minutes by public transport of a strategic centre in the Greater Metropolitan Region
- increasing the share of peak hour journeys on safe and reliable public transport
- improving the efficiency of the road network
- ensuring a reliable electricity supply with increased use of renewable energy and increased energy efficiency
- reducing avoidable hospital admissions
- improving health by reducing obesity, smoking, illicit drug use and risky drinking, and
- increasing the mode share of bicycle trips made in the Greater Sydney Region.

Action for Air is a key strategy for implementing the State Plan's cleaner air goals.

About Action for Air

Action for Air is the NSW Government's 25-year plan for managing air quality in Sydney, the Illawarra and the Lower Hunter. It began in 1998 and is a whole-of-government strategy covering the full array of sources that contribute to air pollution, from how we plan our cities, roads and public transport, to cleaner vehicles and fuel, and industrial and household emissions. DECCW leads the implementation of the State Plan cleaner air targets and *Action for Air*, in consultation with other agencies.

Action for Air is reviewed publicly every three years through a Clean Air Forum and updated to take into account changing circumstances and information. Clean Air Forums were held in 2001, 2004 and 2007, with updates following in 2002 and 2006.

Action for Air: 2006 Update (see www.environment.nsw.gov.au/resources/air/actionforair/actionforair06465.pdf) provides a comprehensive summary of the actions that have been taken and those underway to reduce emissions. The Update included around 140 individual actions which will continue to deliver air quality gains across NSW.

Background

Action for Air's aims

The aims of *Action for Air* are two-fold:

- reducing emissions so that we comply with the State Plan's cleaner air targets, that is, meeting the national air quality standards for six pollutants as identified in the Air NEPM, and
- reducing the population's exposure to air pollution, and the associated health costs.

Action for Air seeks to provide long-term ongoing emission reductions. It does not target acute and extreme exceedences from events such as bushfires.

The evidence base

Air quality data

The State Plan emphasises the importance of analysing the evidence base for new and existing policies, and being able to provide reliable data about our performance in regard to the cleaner air targets. This is partly achieved through the extensive NSW air monitoring program. It provides high quality data which can be used to measure progress against the targets and to assess the impact of pollution abatement programs.

In addition to the monitoring program, DECCW undertakes air pollution modelling. Most regional modelling of air pollution in NSW focuses on assessing how changes to emission sources affect ozone levels in Sydney. The chemistry of air pollution is very complex and the level of pollution depends on meteorology. DECCW is working with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to develop modelling capacity to forecast further into the future and take account of the impacts of climate change. Our ability to set long-term trajectories for particle pollution is being developed.

Results from DECCW's monitoring and modelling work are summarised in a technical report titled *Current and Projected Air Quality in NSW*, (see www.environment.nsw.gov.au/resources/air/07529cpairqual.pdf) released in November 2007. It summarises ambient air quality trends from 1994 to 2006 and details recent airshed computer modelling of possible emission reduction scenarios for meeting the standards for photochemical smog (as ozone) in Sydney.

DECC (now DECCW) finalised a new inventory of air emissions in 2007. The *2007 Air Emissions Inventory for the Greater Metropolitan Region in NSW* (see www.environment.nsw.gov.au/air/airinventory.htm) is the most comprehensive and up-to-date of its kind in Australia. It took three years to prepare and is considerably more detailed than the 1992 inventory. It identifies over 90 different pollutants and covers emissions from all source sectors, including vehicles, industrial, commercial and domestic sectors and natural sources.

The inventory is the foundation of a database which is linked to the latest air pollution models developed in Australia and overseas. The inventory and future linked applications represent a significant step forward in enabling NSW to tackle air quality. Emissions data can be obtained at a regional as well as a local level. The database can also forecast emissions up to the year 2031 and model the impact of policy scenarios. The 2007 inventory is a fundamental component of the evidence base for identifying and targeting key areas for pollution reduction programs.

Social research

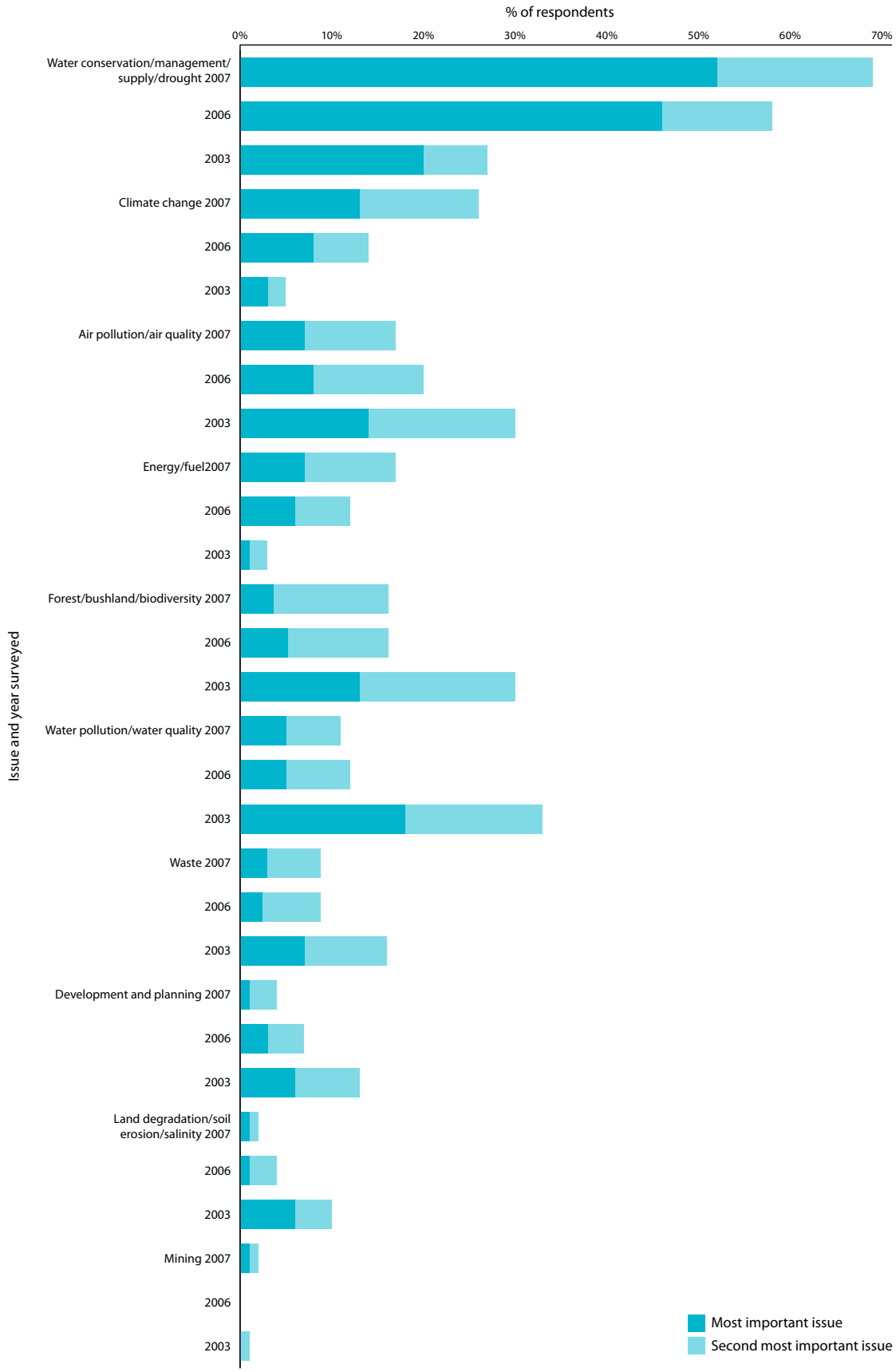
Who Cares about the Environment? is DECCW's triennial social research series that tracks the environmental knowledge, attitudes and behaviour of the people of NSW through surveys and focus groups. This research has been conducted every three years since 1994. The 2006 survey included a representative cross-section of 1724 NSW residents aged 15 or over, and focus group discussions with groups of people identified by their level of interest in the environment.

Who Cares about Water and Climate Change in 2007? is a follow-up survey to the 2006 main *Who Cares?* survey, with 825 of the respondents in the 2006 main survey (Figure 1). This follow-up survey was designed to assess whether public attitudes and priorities had shifted in the 12 months since the 2006 survey as a result of the substantial increase in public and media attention given to drought, water resources and climate change, and to assess views on climate change in a series of new questions.

Key findings and changes across the two surveys in terms of air quality

- In 2006 (as in 2003), people valued the environment highly as part of their lives and almost 90% were concerned about environmental problems.
- In both 2006 and 2007 air quality was not mentioned as a general priority issue for state government attention. However, climate change appeared in 2007 for the first time since the survey began, with 7% rating it one of the two top issues for NSW Government attention.
- In 2007 public transport became the equal top issue for NSW Government attention with health on 37%. Public transport had grown steadily as one of the top two issues, from 9% in 1997 to the third top issue, mentioned by 21%, in 2006.
- Air quality was the second most important environmental issue in 2006 (mentioned by 20%) and third in 2007 (17%). It has fallen steadily in the number of people who nominate it as the most important or second most important environmental issue from 32% in 1997.
- Residents of Sydney in 2006 were much more likely to see air pollution as one of the two most important environmental issues compared to all other areas (24% compared to 9–14%), and in 2007 residents of Sydney, Hunter/Illawarra and large towns were more likely than those in rural areas to see air pollution as an important issue (19–17% compared to 7% of residents in rural areas).
- In 2007 climate change was the second most important issue (after water conservation, supply and management/drought on 67%), doubling those nominating this issue from 13% in 2006 to 26% in 2007. Younger people (15–24) were more likely to nominate climate change (49% compared to 18–30% of other age groups).
- In 2007, air quality initiatives were nominated by 5% as the most important for the NSW Government to protect the environment. A further 14% identified energy and greenhouse, and 9% identified public transport initiatives as the most important.
- In 2006 perceptions of air quality measures were more negative than in previous years. Since 2003, those seeing deterioration in air quality, dealing with industrial emissions and encouraging alternatives to motor vehicles, increased by 7–11%. Those who most frequently engaged in a range of pro-environmental behaviours were most likely to think that air quality measures had deteriorated.
- The number of people often taking active steps to reduce fuel consumption/vehicle air pollution increased by 10% from 2003 to 2006 (from 38% to 48%) but declined slightly in 2007 to 44%. 17–18% said they never do this.
- In both 2006 and 2007 the most important reason for reducing fuel consumption (given by about 50%) was cost. However, those mentioning education/media or general environmental knowledge and awareness more than tripled from 6 to 20%.

Figure 1: Two most important environmental issues



Source: DECC 2007 *Who Cares about Water and Climate Change in 2007?*

Economic analysis

The State Plan also emphasises the need for detailed consideration of the cost and benefits when developing new approaches and strategies. DECCW has published a study of the health costs of air pollution which is currently being updated (see 'Key issues, Health implications'). Air pollution abatement costs of certain new programs have been considered as part of this review of *Action for Air*. This is discussed further under 'Appendix 1: Economic analysis'.

The review of air quality strategies has also been informed by overseas best practice and, where appropriate, advice from overseas experts.

Other supporting strategies

Action for Air is supported by a number of other linked strategies and statements by NSW Government agencies responsible for urban planning and development, transport planning, public transport network management, traffic management, energy, emissions controls and health. These include:

- *NSW Greenhouse Plan* – released in 2005 (to be replaced by the Climate Change Action Plan in 2009)
- *City of Cities: A plan for Sydney's future* (the 'Metropolitan Strategy') – released in 2005 (due for review in 2010)
- Draft Subregional Strategies under the Metropolitan Strategy – released in 2007–08
- *State Infrastructure Strategy New South Wales 2008–09 to 2017–18* – released in 2008
- *Towards 2030: Planning for our changing population* – released in 2008
- NSW Regional Strategies – released between 2006 and 2009.

The actions already underway under each of these strategies will continue to contribute towards air quality improvements across NSW. In addition a Transport Blueprint, a major strategy for transport planning and delivery will be released towards the end of 2009.

Photo: courtesy Hamilton Lund/Tourism NSW

Action for Air: 2009 Update

NSW has made significant gains in air quality over the past 10 years. At the same time there is a gap between what has been achieved so far and meeting the State Plan's target of achieving national air quality goals in the future for two of the six air pollutants. Currently we meet all the goals except those for ozone in Sydney and Wollongong, and particles in parts of regional NSW. These remaining challenges are significant.

Action for Air: 2009 Update looks at the current emissions profile for the Greater Metropolitan Region and the key sources of concern, based on DECCW's 2007 emissions inventory. It recognises that tackling transport-related air pollution remains a priority due to Sydney's growing population and increasing economic activity. The review analyses the emission reductions required to bring NSW into compliance with the air quality goals.

Action for Air remains a dynamic plan that can be adapted as new information and issues emerge, such as the changing global price of oil. It consists of actions that are currently being implemented in addition to those under development and evaluation. It is a process used to address air quality needs now and into the future.

Action for Air: 2006 Update identified the existing range of programs across government to reduce emissions from all sectors. This document does not seek to duplicate that task.

A Parliamentary Inquiry into the Health Impact of Air Pollution in the Sydney Basin was established in March 2006. DECCW, in consultation with other agencies, prepared the NSW submission, referring extensively to the *Action for Air: 2006 Update*.

Progress in developing further strategies and actions will be reported at the next Clean Air Forum, scheduled for 2010. Some potential new research areas are discussed in 'Future directions for air quality management' at the end of this report.

Community feedback on air quality

Consultation with stakeholders has been an important part of identifying the issues to address in the *Action for Air* review and in informing the further development of strategies to address these issues.

The State Plan priorities and targets were themselves developed after extensive community consultation across the State. Thirty-one forums were held across NSW in 2006 and 4000 people and organisations provided direct feedback. Consultation on an update to the State Plan was also conducted in 2009.

During 2007, DECCW held a series of workshops with key stakeholders to discuss the implementation of the State Plan targets and new directions for *Action for Air*. Details of key events are included in Appendix 2.

Mechanisms for further and ongoing community input to air quality management in NSW are discussed under 'The action plan – the actions, Objective 5: Communicate and educate about air quality'.

Experts Workshop

This initial workshop involved experts from a range of fields discussing new ways to address Sydney's greatest regional air quality issues: photochemical smog and particle pollution. Discussion also involved taking a broader perspective of air quality management that encompasses local exposure and liveability concerns, public health, and the air quality impacts of climate change. As well as representatives from academia, industry, government and non-government organisations, the workshop was attended by a representative from the US Environmental Protection Agency who provided information on recent successful US initiatives.

This was followed up with a series of targeted meetings with local government, industry and environment and health non-government organisations.

Vehicles Workshop

In June 2007 the Roads and Traffic Authority (RTA) and DECC (now DECCW) jointly hosted a Future Vehicles Roundtable with overseas and local speakers and around 200 participants. The Roundtable focused on the impact of transport on air quality and climate change and identified possible technological solutions to this problem.

Action for Air Local Government Workshop

The *Action for Air* Local Government Workshop was designed for local councils and industry associations in the Greater Metropolitan Region to discuss current thinking on air quality and climate change, and to give a perspective on the issues and needs of local councils in managing air quality in their jurisdictions. The workshop was well attended, with 25 representatives from councils, regional organisations of councils and associations, as well as speakers from the Sydney West Area Health Service and CSIRO.

Clean Air, Cool Climate Forum

The third Clean Air Forum held in November 2007 was themed *Clean Air, Cool Climate*. It explored the links between air quality and climate change and how governments are addressing these issues jointly. These encompass the health impacts of air pollution and exposure issues at the local level, progress on the State Plan targets and in meeting the national air quality standards, and new initiatives and programs for action under the State Plan to improve air quality and reduce greenhouse gas emissions. Many of these are documented in this review of *Action for Air*. Videos of the presentations are available online (www.environment.nsw.gov.au/air/actionforair/).

The Total Environment Centre Report

The Total Environment Centre provided a report reviewing implementation of *Action for Air* for the 2007 Clean Air, Cool Climate Forum, as it had done previously for the 2001 and 2004 Clean Air Forums.

Cleaner Vehicles and Fuels Strategy

The *NSW Cleaner Vehicles and Fuels Strategy* sets out an expanded list of NSW Government actions for cleaner fuels and a cleaner fleet. The plan also links with transport and planning actions to reduce vehicle dependence and traffic congestion.

The *Draft NSW Cleaner Vehicles and Fuels Strategy* was released for comment at the Clean Air, Cool Climate Forum on 23 November 2007. The Strategy has been finalised and is available online (www.environment.nsw.gov.au/air/actionforair/caf2007.htm).

The Strategy covers the following initiatives:

- Vapour recovery at service stations (Action 1.1)
- Summer lower volatility petrol (Action 1.2)
- NSW diesel retrofit program (Action 1.3)
- Environmental rating of heavy vehicles (Action 1.4)
- Benchmarking the vehicle fleet (Action 1.8)
- NSW Government FleetWise Partnership (Action 1.6)
- Alternative fuels (Action 1.7), and
- Community awareness and behaviour change education (Action 5.5).

Clean Air, Healthy Communities Fund

The NSW Environmental Trust has allocated approximately $5 million to the Clean Air, Healthy Communities Fund from July 2007 to June 2010. The funding available is:

- $1.5 million for 2007–08
- $2 million for 2008–09
- $1.5 million for 2009–10.

The Clean Air, Healthy Communities Fund is working to address a series of priorities in the State Plan associated with environment for living and urban living and transport, with a focus on making progress towards air and greenhouse targets. It also funds projects that have regional and local air quality benefits, comprising the following:

- Stage 2 vapour recovery (Action 1.1)
- Diesel retrofit (Action 1.3)
- NSW Government FleetWise Partnership (Action 1.6)
- Sustainable Mobility Initiatives for Local Environments (Action 1.19)
- Low Emissions Air Program for Smash Repairers (Action 2.5)
- Woodsmoke reduction program (Action 3.3)
- On Your Bike – making it easier to cycle (Action 3.7), and
- Community awareness and behaviour change education (Action 5.5).

Air quality goals

Air NEPM goals

Criteria pollutants

The national ambient air quality standards (Table 1) were agreed to in 1998 by all governments in Australia. They are intended to protect the community against the detrimental health impacts of air pollution. The Air NEPM requires that all states and territories meet the standards by 2008. In meeting the Air NEPM, one to five exceedences of the standards is allowed, to accommodate extreme meteorological conditions, such as bushfires and dust storms.

The State Plan cleaner air target requires meeting national air quality goals identified in the Air NEPM.

NSW meets four of these standards easily (carbon monoxide, nitrogen dioxide, sulfur dioxide and lead) as a result of programs conducted over the past 20 years. However, meeting the ground-level ozone and particle standards is difficult and additional air quality management strategies would be necessary.

Air toxics

A NEPM for Air Toxics was introduced in 2004. Its purpose is to improve the information base for ambient air toxics within the Australian environment to facilitate the development of standards. (This will follow a review of the NEPM, to be held within eight years of its introduction.) It establishes 'Monitoring Investigation Levels' for five air toxics (benzene, toluene, xylenes, formaldehyde and polycyclic aromatic hydrocarbons). The NEPM requires monitoring of these five air toxics:

- where significantly elevated levels are likely to occur
- where there is a likelihood of significant population exposure, and
- where there are not already programs in place to manage emissions of concern.

Elevated levels of air toxics could occur at locations close to specific sources, such as clusters of industrial sites, heavily trafficked or congested roads, busy airports and areas affected by woodsmoke.

An earlier monitoring program at sites in the Greater Metropolitan Region and some regional centres found that ambient concentrations of air toxics are mostly very low compared to international goals (see www.environment.nsw.gov.au/air/toxics.htm).

A small number of air toxics – benzene, 1,3-butadiene and benzo-α-pyrene – require ongoing assessment to ensure they remain at acceptable levels in the future. Strategies such as increasingly stringent regulation of motor vehicle emissions and fuel quality will assist in controlling air toxics.

Air quality: 1998 to 2007

As part of reviewing *Action for Air* and implementing the State Plan, DECCW has undertaken detailed analysis of air quality monitoring data and regional air quality modelling results since *Action for Air* was introduced in 1998. Results of the new inventory of air emission sources have also been analysed. The DECCW technical paper, *Current and Projected Air Quality in NSW* (see www.environment.nsw.gov.au/resources/air/07529cpairqual.pdf), summarises the results of this analysis and provides background information for developing new strategies.

As a result of industry, motor vehicle and fuel regulation and other programs, put in place progressively, particularly since 1985, concentrations of carbon monoxide, nitrogen dioxide, sulfur dioxide and lead are generally well below the Air NEPM standards.

Table 1: National ambient air quality standards

Pollutant	Averaging period	Maximum (ambient) concentration	Maximum allowable exceedences by 2008	NSW 2007 results (exceedence days per year)
Carbon monoxide	8 hours	9.00 ppm (parts per million)	1 day per year	8-hour max: 2.1 ppm no exceedences
Nitrogen dioxide	1 hour 1 year	0.12 ppm 0.03 ppm	1 day per year none	1-hour max: 0.055 ppm 1-year max: 0.013 ppm no exceedences
Sulfur dioxide	1 hour 1 day 1 year	0.20 ppm 0.08 ppm 0.02 ppm	1 day per year 1 day per year none	1-hour max: 0.06 ppm 24-hour max: 0.01 ppm 1-year max: 0.002 ppm no exceedences
Lead	1 year	0.50 µg/m^3 (micrograms per cubic metre)	none	Annual average 0.1 µg/m^3 from 2001–2004. Monitoring ceased 2004 as NEPM standard achieved.
Photochemical oxidants (as ozone)	1 hour 4 hours	0.10 ppm 0.08 ppm	1 day per year 1 day per year	**Sydney** 4-hour max: 0.12 ppm 11 exceedences **Illawarra** 4-hour max: 0.082 ppm 2 exceedences
Particles (as PM_{10})	1 day	50 µg/m^3	5 days per year	**Sydney** max: 70 µg/m^3 4 exceedences **Illawarra** max: 60 µg/m^3 7 exceedences **Albury** max: 198 µg/m^3 11 exceedences **Wagga Wagga** max: 105 µg/m^3 34 exceedences

Carbon monoxide

Motor vehicles are the dominant source of carbon monoxide. Concentrations of carbon monoxide have fallen over the past 20 years as a result of changes to motor vehicle technology.

Nitrogen dioxide

Motor vehicles are also the dominant source of nitrogen dioxide. Exceedences of the Air NEPM standard were commonly observed in the winter months during the early 1980s. Exceedences are now rare, and from 2002 to 2007 the highest 1-hour value recorded in Sydney was 75% of the standard. Over this period, maximum concentrations were even lower in the Illawarra and Lower Hunter regions.

Sulfur dioxide

Sulfur dioxide in the Greater Metropolitan Region originates mainly from industries such as metal processing, oil refining and coal-fired power generation. As a result of regulatory efforts, from 1994 to 2007 concentrations of sulfur dioxide were low, with no exceedences recorded in the Greater Metropolitan Region. Maximum hourly ambient concentrations in Sydney were less than 25% of the Air NEPM standard. Higher concentrations are observed in the Illawarra and Lower Hunter regions as a result of industrial emissions, however these are also below the NEPM standard.

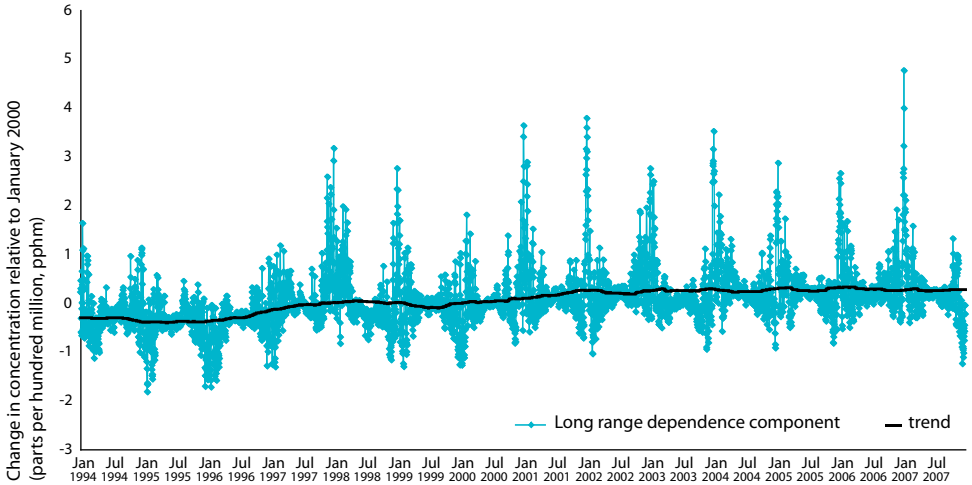
Lead

Changes to fuel formulation have reduced concentrations of lead in the atmosphere. Annual averages in Sydney are less than 20% of the Air NEPM standard. With a complete ban on lead in petrol now in force, the primary source of lead in air at the regional scale has been eliminated. Consequently, routine monitoring of lead was no longer considered necessary and ceased in December 2004.

Ozone

Ground-level ozone continues to be a problem in Sydney in summer. Ozone is a secondary pollutant formed in a chemical reaction when emissions of NO_x and VOCs combine in sunlight. The meteorology and topography of the Sydney basin play a significant role in the formation of ozone and in the year-to-year variations in concentrations in Sydney. There was a decline in peak ozone levels in the 1980s but currently there is no clear trend. Ozone levels are not decreasing and may actually be on a slight upward trend (Figure 2).

Figure 2: Trend in daily maximum 4-hour ozone concentrations in Sydney



Source: DECC 2007 (see www.environment.nsw.gov.au/aqms/aqi.htm)

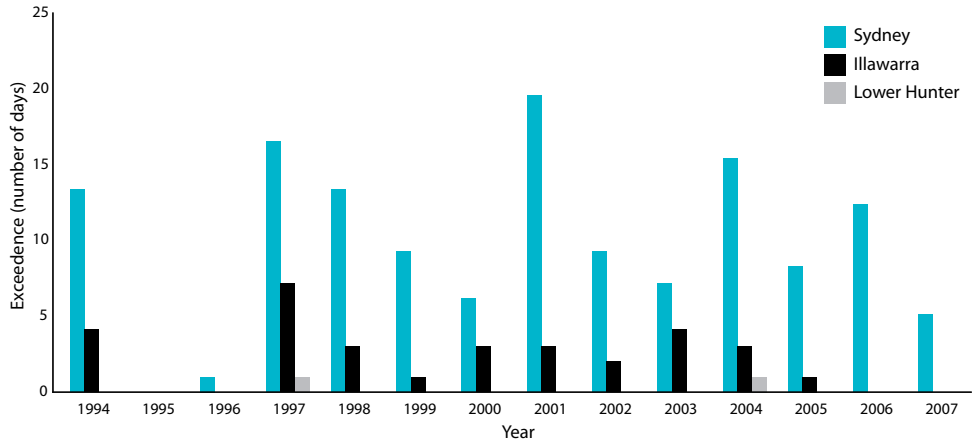
The Air NEPM sets two standards for ozone: a 1-hour standard and a 4-hour standard. The Air NEPM requires that by 2008 these standards not be exceeded on any more than one day per year at each monitoring site.

In Sydney in the years 1994 to 2007, the number of days on which concentrations exceeded the 4-hour standard ranged from 1 to 21, with 11 exceedence days in 2007. For the same period, exceedences of the 1-hour standard ranged from 0 to 19, with five exceedence days in 2007. Western Sydney tends to experience the highest ozone levels.

Exceedences are less frequent in the Illawarra, having occurred on up to seven days per year for either standard. The Lower Hunter region has only recorded one exceedence of the 1-hour standard since 1999.

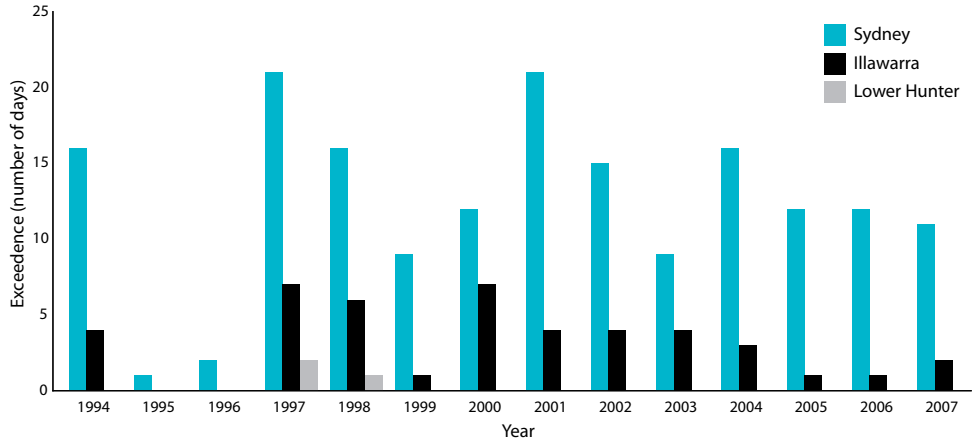
Figures 3a and 3b show exceedences of the Air NEPM standards for ozone between 1994 and 2007 in the Greater Metropolitan Region.

Figure 3a: Exceedences of the 1-hour Air NEPM standards for ozone in the Greater Metropolitan Region (only one exceedence permitted)



Source: DECC 2008 (see www.environment.nsw.gov.au/aqms/aqi.htm)

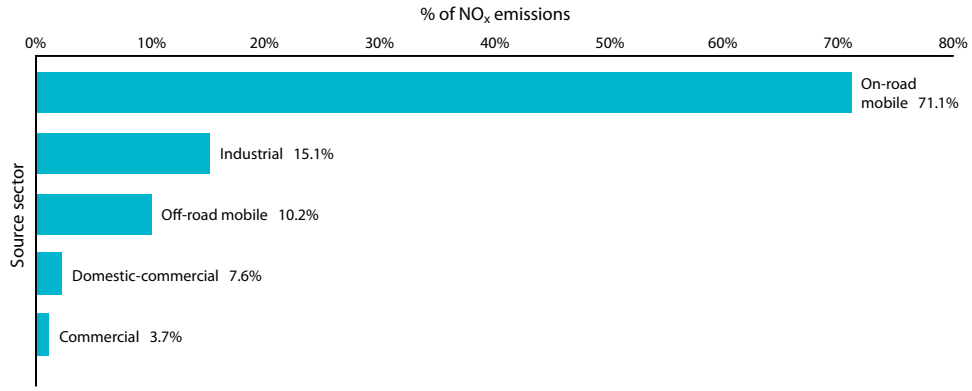
Figure 3b: Exceedences of the 4-hour Air NEPM standards for ozone in the Greater Metropolitan Region (only one exceedence permitted)



Source: DECC 2008 (see www.environment.nsw.gov.au/aqms/aqi.htm)

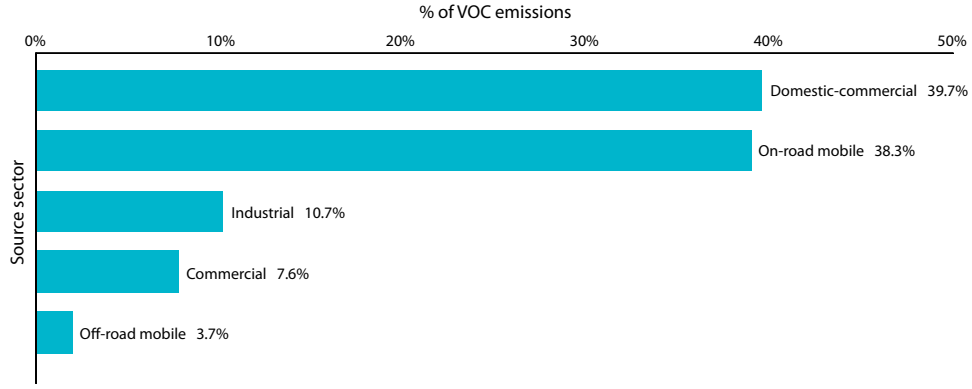
Figures 4 and 5 show the proportions of annual NO_x and VOC emissions in Sydney by sector. Motor vehicles (on-road mobile) are the main source of NO_x (71.1%) while motor vehicles (38%) and the domestic–commercial sector (39.7%) are almost equal as the main contributors of VOCs. Figures 6 and 7 provide a breakdown of sources for a typical summer month when ozone levels are at their highest.

Figure 4: Proportion of annual NO_x emissions in Sydney by sector



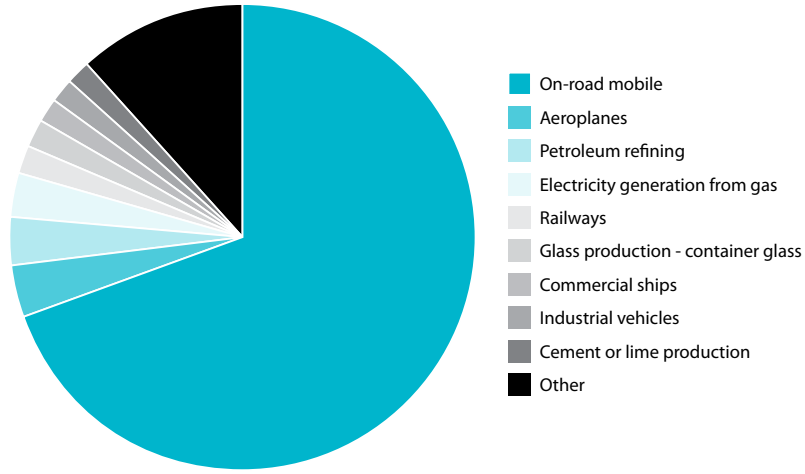
Source: DEC 2007 (see www.environment.nsw.gov.au/air/airinventory.htm)

Figure 5: Proportion of annual VOC emissions in Sydney by sector



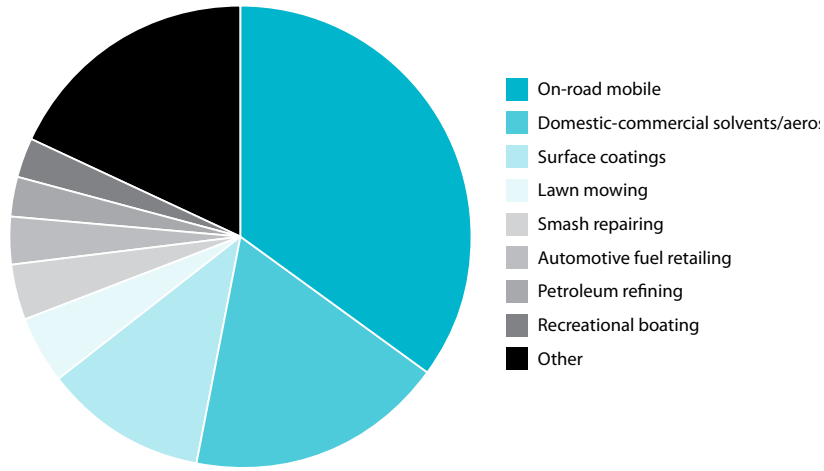
Source: DEC 2007 (see www.environment.nsw.gov.au/air/airinventory.htm)

Figure 6: NO_x emission sources for January in Sydney



Source: DEC 2007 (see www.environment.nsw.gov.au/air/airinventory.htm)

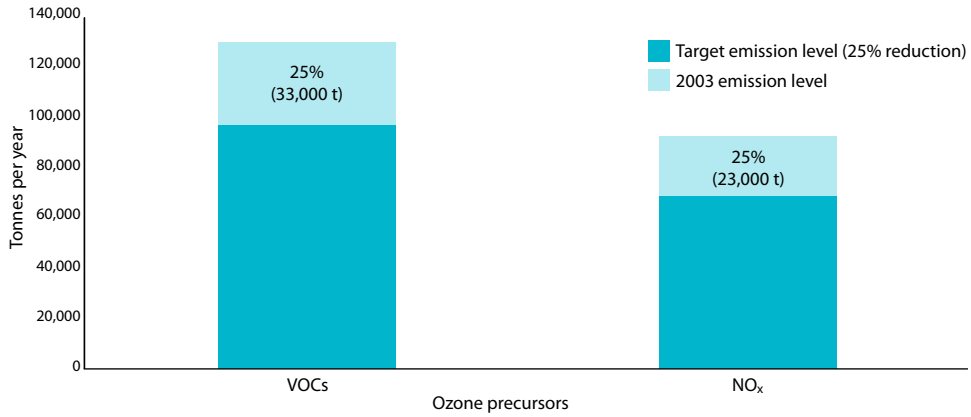
Figure 7: VOC emission sources for January in Sydney



Source: DEC 2007 (see www.environment.nsw.gov.au/air/airinventory.htm)

A broad range of additional emission reduction strategies will be required to meet the ground-level ozone standard in the Air NEPM. An estimated 25% reduction (from 2003 emissions) of the overall levels of NO_x and VOCs is needed to meet the ozone standard. This equates to a reduction of approximately 33,000 tonnes of VOCs and 23,000 tonnes of NO_x emissions annually, as shown in Figure 8.

Figure 8: Sydney VOC and NO_x total emissions and reductions required to meet the national ozone standard (as at 2006)



Particles

Particles remain a health issue, particularly at the local level (such as near busy roads), even when ambient levels are low. At greatest risk from particle pollution are people with heart or lung disease, older adults and children.

The Air NEPM sets a standard for particles less than 10 micrograms (PM_{10}) of 50 micrograms per cubic metre (1-day average), with a goal of no more than five exceedence days per year to allow for natural events such as dust storms and bushfires.

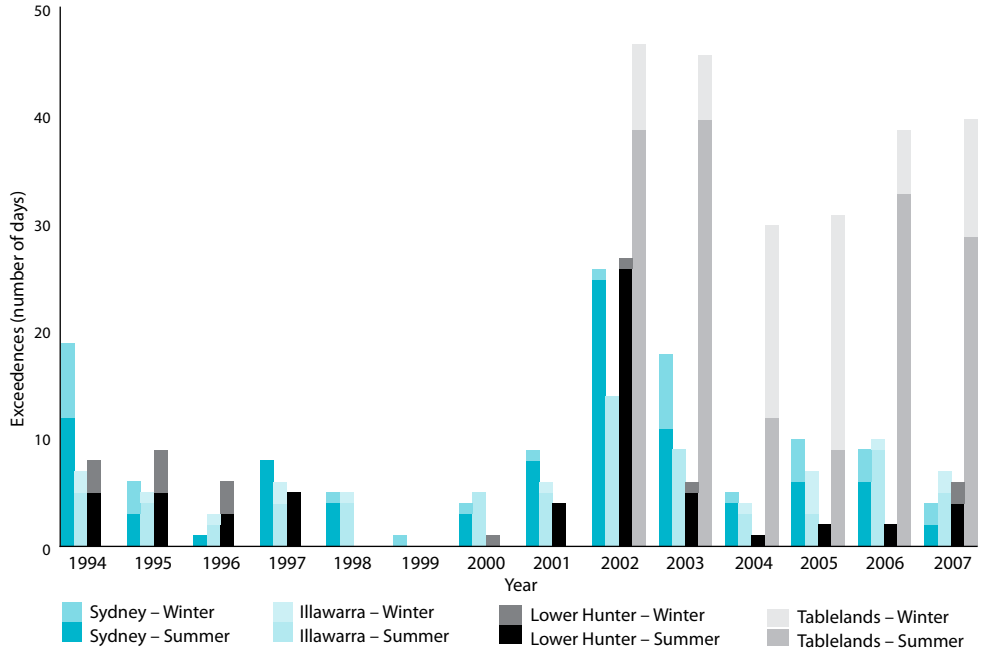
The national standard for PM_{10} is generally being met in Sydney, except in years with bushfires or dust storms. Figure 9 shows summer (October to March) and winter (April to September) exceedences of the Air NEPM standard for particles in NSW regions from 1994 to 2007. Bushfires in 1994 and 2001 to 2003 were responsible for the extremely high concentrations of particle pollution recorded in the Greater Metropolitan Region in those years. The number of exceedences varies greatly from year to year as shown by the marked drop in 2004.

In rural areas like Wagga Wagga and Albury there have been up to 37 (2006) and 29 (2003) exceedences (respectively) of the standard in a year, due primarily to bushfires, hazard reduction burning, agricultural stubble burning and the use of solid-fuel heaters. Meeting the particle standard in some regional towns will require a significant reduction in emissions.

Health research identifies particles of less than 2.5 micrograms ($PM_{2.5}$) as a particular concern because their smaller size means they can be inhaled deeper into the lungs, and because there is no safe threshold level to use for setting standards. Recognising that there is currently insufficient information to set a health-based standard, the NEPM was amended in 2003 to include advisory reporting standards for $PM_{2.5}$. In NSW $PM_{2.5}$ levels are generally below the reporting standard for a 24-hour level but are currently above the annual reporting level.

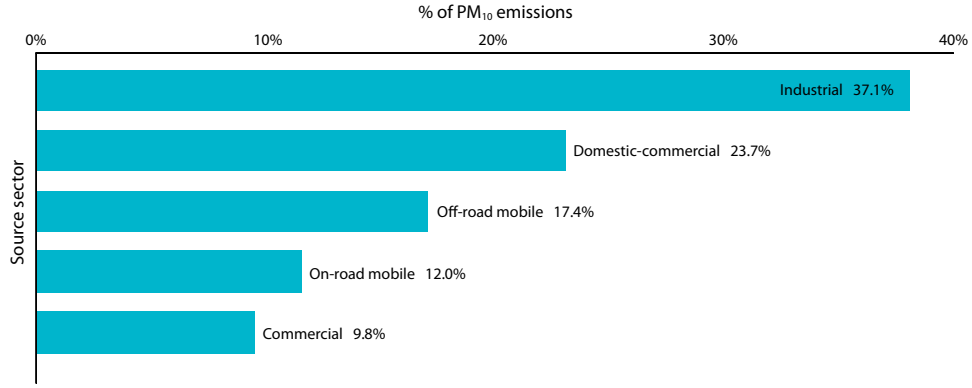
The major sources of anthropogenic particle emissions (PM_{10}) in the Sydney region are industry (37.1%), the commercial and domestic sectors (23.7%), off-road mobile (17%) and motor vehicles (12%). Off-road mobile includes aircraft, railways, boats, and non-registered mining, construction and industrial vehicles. Diesel vehicles are the major contributor to motor vehicle particle emissions, and domestic solid-fuel heating makes up a significant proportion of commercial and domestic emissions in winter. In many rural and regional areas, solid-fuel heaters contribute a greater proportion of particle emissions during the colder months. Emissions from agriculture and hazard reduction burning are also a factor in rural and regional areas. Figure 10 shows the sources of particle emissions in the Sydney region annually. Figure 11 provides a breakdown of sources for a typical winter month.

Figure 9: Exceedences of the 24-hour Air NEPM standard for particles (PM_{10}) in NSW regions



Source: DECC 2008 (see www.environment.nsw.gov.au/aqms/aqi.htm)

Figure 10: Proportion of annual particle (PM_{10}) emissions in Sydney by sector

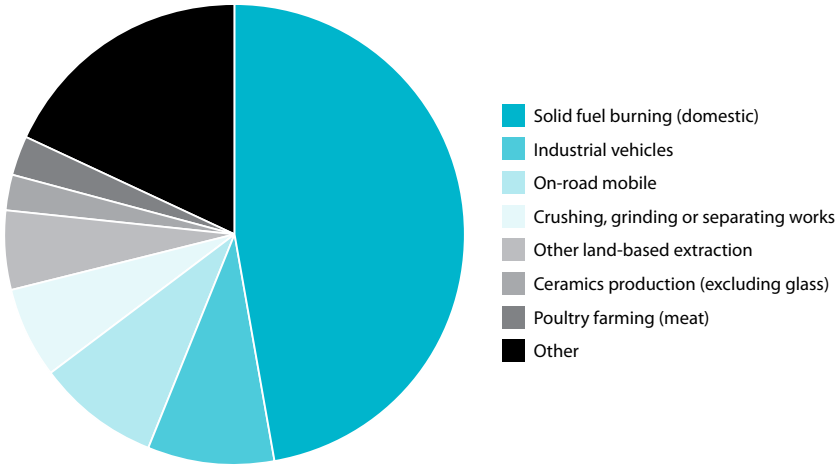


Source: DECC 2008 (see www.environment.nsw.gov.au/air/airinventory.htm)

The next 10 to 15 years

The projected performance for four of the Air NEPM pollutants is for stable levels or continuing reductions in concentrations. Carbon monoxide concentrations have continued to fall with the turnover of the vehicle fleet and older vehicles being replaced with newer vehicles with more stringent emission limits. Emissions of NO_x from motor vehicles are predicted to fall due to the progressive introduction of stricter standards for fuel quality and vehicle emissions, despite forecast increases in vehicle kilometres travelled. The regulation of emissions from industrial sources has helped to ensure that sulfur dioxide concentrations remain well below the NEPM standard.

Figure 11: Particle (PM_{10}) emission sources for a typical winter month in Sydney



Source: DECC 2008 (see www.environment.nsw.gov.au/air/airinventory.htm)

Modelling work undertaken by DECCW, as outlined in the technical paper *Current and Projected Air Quality in NSW*, shows that further emission reductions are needed to achieve ozone NEPM standards well into the next decade. This emphasises the need for ongoing reductions from all major sources of ozone precursors.

Motor vehicles will remain the most significant source of smog-forming pollutants in the Sydney region. Gains from tighter fuel and vehicle emission standards are likely to be partially offset by growth in vehicle numbers and travel, both private and commercial, and use of heavier vehicles. This will require a continuing focus on motor vehicle emissions, including emphasis on integrated land-use and transport planning and public transport planning.

Particle emissions in the Sydney region also need to continue to be addressed because sometimes concentrations approach the national standard for PM_{10} even in the absence of natural events such as bushfires and dust storms. In some rural and regional areas, exceedences of the national standard for PM_{10} highlight the need for better management of anthropogenic sources, particularly agricultural burning and emissions from solid-fuel heaters.

The Air NEPM is currently under review, with a report due to be considered by the Environment Protection and Heritage Council (EPHC) in 2010, which may also change the settings for *Action for Air.*

It is likely that weather patterns for NSW will continue to alter due to global climate change, with associated changes to air quality in metropolitan and regional areas. Increased temperatures may result in a longer season for elevated concentrations of summertime ozone. Dynamic downscaling modelling undertaken by the CSIRO[1, 2], with emissions of ground-level ozone precursors held at current levels, indicated the following:

- a 27% increase in the average number of days over the 1-hour ozone standard by 2021 to 2030, and a 45% increase by 2051 to 2060, and
- a 33% increase in the average number of days over the 4-hour ozone standard by 2021 to 2030, and a 75% increase by 2051 to 2060.

The geographical extent of ozone impacts is also expected to increase under these climate change scenarios.

Changes to rainfall, temperature and weather patterns may increase the frequency of dust storms and bushfire-related pollution events.

1 These best estimates are based on simulations using climate model results from the Intergovernmental Panel on Climate Change (IPCC) greenhouse gas emission scenario A2, and assume that urban smog precursor emissions remain at current levels.

2 Source: CSIRO 2008, 'A Methodology for Determining the Impact of Climate Change on Ozone Levels in an Urban Area' (see www.environment.gov.au/atmosphere/airquality/publications/pubs/climate-change.pdf).

Dust storms

Dust storms can result in widespread exposure to extreme levels of particles. For example, on 23 September 2009 a major dust storm covered most of NSW. This was also the largest dust storm to hit the eastern seaboard since air quality monitoring began. It resulted in extreme levels of particles over most of the state. The lower Hunter recorded the highest PM_{10} averages over 24 hours of 2425 µg/m^3, nearly 50 times the standard of 50 µg/m^3. Sydney, the Illawarra, Bathurst and Tamworth recorded PM_{10} concentrations ranging from 27 to 42 times the standard. The previous highest PM_{10} concentration recorded in NSW was at Wagga Wagga during a dust storm on 19–20 March 2003, when the PM_{10} 24 hour-average registered 970 µg/m^3, almost 20 times the standard.

The dust storm that covered NSW in September 2009 was the largest to hit the eastern seaboard since air quality monitoring began in NSW. Photo: A.Weeraratne/DECCW

Key issues

Climate change

Global emissions of greenhouse gases will affect our climate and, in turn, this is likely to increase key air pollutants such as ozone and particulates. This means that Air NEPM goals may be more difficult to achieve in the future. In some cases, reducing air pollutants can also cut greenhouse gas emissions.

There are important links between activities that emit air pollutants and those that create greenhouse gas emissions:

- air pollutants and greenhouse gases are often emitted by the same sources (e.g. fuel combustion)
- technical measures to reduce greenhouse gas emissions may affect emissions of air pollutants, and vice versa

In addition there are links between air pollutants and greenhouse gases:

- some air pollutants (such as ozone) contribute to regional air pollution and are also greenhouse gases affecting climate on a global scale
- higher temperatures caused by escalating greenhouse gas concentrations are expected to increase the formation of atmospheric pollutants such as ozone and secondary particles that form in the air as a result of various chemical reactions.

As a result, links can be made between policy responses to both issues. Obvious applications for this include the energy and transport sectors, which are key sources of both greenhouse gases and regional air pollutants, and where policies to reduce the impacts of one problem can have significant co-benefits for the other.

Programs such as improving combustion, engine and vehicle efficiency will reduce emissions of all pollutants (ozone precursors and $CO_{2\text{-}e}$) and switching to cleaner fuels will often have similar co-benefits. Strategies which encourage people to shift to a less polluting mode of transport and use more active transport will have considerable emission reduction benefits. Because ozone is also a potent greenhouse gas, in many instances policies to reduce emissions of ozone precursors will also contribute to greenhouse gas abatement.

It is beneficial to integrate climate change and air quality management policies, where appropriate, rather than tackle them separately. A coordinated approach also means we can use resources more efficiently, lowering the costs of abatement programs for greenhouse gases and other pollutants. This is because the benefits associated with reduced health impacts from particles and ozone exposure are combined with the benefits of reduced greenhouse emissions.

There are some instances where greenhouse and air emission measures are not aligned. For instance, the push toward cleaner heavy vehicles has resulted in a slight reduction in fuel efficiency for some vehicle classes due to the effect some control technologies have on engine performance. In some cases, avoiding air pollution emissions has an energy cost.

Approach adopted in Action for Air

- Actions targeting the transport sector are given a strong focus.
- Where air quality and climate change synergies are apparent, programs will be designed to reduce both air pollutants and greenhouse gases. An approach to vehicles that considers air quality and greenhouse gas reductions would encourage smaller or more fuel efficient vehicles.

- *Action for Air* seeks to manage and make explicit any trade-offs between greenhouse gas and air emission programs. For example, the development of more gas-fuelled power stations has positive impacts on greenhouse gas emissions and other pollutants (compared to coal). However, locating these new power stations in a region that already experiences ozone exceedences presents a challenge to air quality management, meaning that NO_x emissions from these new sources need to be appropriately controlled.
- Health is the primary driver for air pollution reduction in *Action for Air*. Air pollution abatement actions address both short-term health impacts and, in conjunction with greenhouse gas abatement programs, address broader climate change impacts in the longer term (e.g. increases in heat stress with a greater number of very hot days and cardiovascular impacts from increased exposure to ozone and particles).

The actions to address air pollution which also have climate change co-benefits are identified in 'The action plan – the actions'.

The NSW Government also has extensive existing commitments to cut greenhouse gas emissions over the next 20 to 45 years, as set out in the State Plan and the *NSW Greenhouse Plan* (see www.environment.nsw.gov.au/climatechange/greenhouseplan.htm).

Health implications

Air pollution, even at the relatively low levels common in many Australian urban environments, can have health impacts. Continued efforts to reduce exposure to air pollution are likely to reduce disease and provide additional health benefits and reduced health costs.

Air pollution is a persistent health concern in major cities in Australia and around the world. Continued exposure to common air pollutants such as ground-level ozone, nitrogen dioxide, carbon monoxide, and particulate matter (PM) can result in serious health impacts, including premature death and cardiovascular and respiratory illness. Those particularly susceptible to the health impacts of air pollution are the very young (because they are generally more active outdoors and their lungs are still developing), the elderly and those with pre-existing health conditions.

Since the early 1990s a substantial body of research has been published about the adverse health effects of air pollution. The research suggests that air pollution at the relatively low levels common in many urban environments of industrialised countries is a risk factor for health effects. An increasing range of adverse health effects has been linked to air pollution, especially particulate matter.

Short-term exposure exacerbates existing respiratory and cardiovascular symptoms and increases the risk of symptoms, hospitalisation, and death. Long-term exposure increases the risk of chronic respiratory and cardiovascular disease and death, impacts on birth weight, and can permanently affect the lung development of children[2].

In 2005 the European Union (EU) estimated that average life expectancy in Europe was reduced by over 8 months due to exposure to particle pollution (equivalent to 3.6 million life years lost annually). For ozone the EU estimated around 21,000 cases of hastened mortality in 2020 unless further actions are taken[3].

This new evidence is driving the need for new air quality management strategies around the world.

2 CA Pope, *New England Journal of Medicine,* Vol. 351, 9 Sept 2004, No. 11, p. 1132

3 Communication from the Commission to the Council and the European Parliament – Thematic strategy on air pollution (SEC (2005) 1132). Available from http://europa.eu/scadplus/leg/en/lvb/l28159.htm.

Impact on air quality standards

The health evidence has led to the tightening of air quality standards and health guidelines, particularly for particles and ozone. The World Health Organization (WHO) tightened its guideline values for ozone in 2006 and introduced new guidelines for PM_{10} and $PM_{2.5}$. WHO noted that the guidelines cannot provide full protection against health effects of particles and ozone because thresholds below which adverse effects do not occur have not been identified[4].

In 2006 the US EPA also revised its particle standards and in 2008 finalised a review of its ozone standards, adopting a tighter standard. The EU has also adopted new particle standards.

In Australia the Air NEPM is currently under review with final recommendations expected in 2010. As the State Plan and *Action for Air* targets are linked to the Air NEPM, the review may have direct bearing on the scope of future NSW strategies.

Costs and benefits

Although there is a growing consensus that exposure to relatively low levels of air pollution contributes to heart and respiratory illness, the cost implications of tightening health-based standards and requiring new pollution abatement actions are significant. The health impacts research is leading to more sophisticated methodologies for calculating health costs.

The health costs of air pollution to the NSW community are real and substantial. The estimated annual health cost (direct and indirect) of current levels of air pollution in the Greater Metropolitan Region is $4.7 billion, or $893 per head of population. Air pollution causes between 640 and 1400 deaths per year in Sydney, between 359 and 784 hospital admissions for respiratory conditions and between 561 and 1206 hospital admissions for cardiovascular conditions[5].

The Commonwealth Bureau of Transport and Regional Economics estimated that motor traffic pollution alone was responsible for health costs of $3.3 billion per year in Australian capital cities. Sydney's share of this was estimated at $1.5 billion[6].

Although Sydney has good air quality by world standards, a reduction in current air pollution levels would deliver significant long-term benefits for the population's improved health and reduced health costs. However, these benefits have to be balanced against the costs of additional abatement actions.

Particles and traffic pollution

There is still limited information on what component of particles is causing the health effects and what combustion sources are most critical. However, there is a growing body of research suggesting that particle pollution from vehicles is of major concern. The EU has identified its key priorities as particles, ozone and traffic-related air pollution.

The health evidence on particles and traffic, and the tighter air quality standards, have in turn driven policy approaches for more effectively controlling pollutants from vehicles. To address concerns about health impacts of traffic, countries and cities have implemented strategies such as speed reduction on major roads (The Netherlands), road pricing and congestion pricing (London and Stockholm), low-emission zones (Los Angeles), incentives for uptake of cleaner vehicles (Europe and the US), as well as tighter emission controls for new vehicles.
These strategies are designed to have multiple benefits and address transport, planning and greenhouse gas issues, in addition to health impacts.

4 WHO Geneva 2006, *Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide: Global update 2005*

5 DEC 2005, *Air Pollution Economics: Health Costs of Air Pollution in the Greater Sydney Metropolitan Region*, www.environment.nsw.gov.au/resources/aqms/airpollution05623.pdf

6 Bureau of Transport and Regional Economics 2005, 'Health impacts of transport emissions in Australia: Economic costs', Working Paper no. 63, Department of Transport and Regional Services, Canberra.

Planning for our changing population

In April 2008, the NSW Government released *Towards 2030: planning for our changing population*. *Towards 2030* complements the State Plan priorities and is a whole-of-government strategy to provide a range of practical ways in which NSW Government agencies can respond to the challenges of an ageing population. *Action for Air* recognises the important impact demographic change will have on NSW over the next 15–25 years and acknowledges that by 2030 the number of people aged over 65 living in NSW will have nearly doubled to 1.8 million, and increased by 86% in the Greater Metropolitan Region. The activities undertaken as part of Action for Air will assist in improving the quality of life for all NSW residents, including the growing number of people over 65.

Approach adopted in Action for Air

- *Action for Air* continues to focus on reducing ambient levels of particles and ozone.
- Actions will continue to improve the emissions of the vehicle fleet, to reduce exposure to vehicle emissions for people living or working on major transport routes and to ensure that predicted reductions in vehicle pollution are realised.
- The health benefits and abatement costs of actions that will lead to additional marginal improvements in air quality will be carefully evaluated.

Some of the actions underway will increase the evidence base for understanding the health impacts of air pollution from particular sources, such as traffic, and will help us to better target the management responses. They will also enable individuals and communities to be better informed and reduce their exposure to air pollution. These are identified under 'The action plan – the actions'.

Liveability

Liveability programs aim to create buildings, spaces and communities that are clean, safe, healthy and sustainable, with high accessibility to public transport, services, employment and open space and opportunities for physical activity and social interaction. Building communities this way can reduce car dependency and help reduce air pollution and greenhouse gas emissions.

There is growing recognition, both nationally and internationally, that some urban forms and associated transport patterns are related to public health issues, including exposure to air pollution, obesity, mental health and general wellbeing.

Action for Air transport initiatives are designed to reduce traffic congestion and air pollution.

Fires around Sydney can affect air quality.

'Liveability' is the concept that links these health, urban planning and environmental issues. Neighbourhood design, access to safe walking and cycling routes and mixed-use development provide health and environmental benefits by reducing car dependency and promoting physical activity. This is closely linked to other urban issues such as sustainable cities and urban mobility.

The State Plan sets a strong framework for developing liveability actions, by setting priorities across a range of issues directly related to or impacting on human and environmental health. These include improving health through reduced obesity, cleaner air and reduced greenhouse emissions, increasing the share of peak hour journeys on a safe and reliable transport system, improving the efficiency of the road network, locating jobs closer to home, and encouraging more people to use parks, sporting and recreational facilities.

The NSW Government already has a number of strategies and forums in place that relate to liveability, including its *Integrated Land Use and Transport Policy, City of Cities – A plan for Sydney's future* (the Metropolitan Strategy), *Planning Guidelines for Walking and Cycling*, Draft Subregional Strategies and the Premier's Council for Active Living. Initiatives underway include urban planning and design that make neighbourhoods, town centres and recreational destinations easier to access and move around by walking, cycling and public transport.

Overseas examples of government programs promoting liveability include:

- protecting and enhancing green zones and increasing and integrating transport choices, i.e. public transport, walking, cycling (Portland in Oregon, Vancouver)
- encouraging mixed-used development and higher density living to reduce the need for car travel (Vancouver)
- developing cycling plans with targets for increasing cycling as a mode of transport (London and Paris)
- providing traffic training for children so they have greater mobility choice (Odense in Denmark), and
- promoting walking by improving signage, surfacing, lighting, street furniture and map boards (London and Paris).

Non-government initiatives are also common, particularly in the US, including: green building design, innovative approaches to increase physical activity through community design, public policies and communications strategies combined with funding for community partnerships, demonstration projects, planning and design services, pilot projects, and training for local government planners.

Approaches incorporating liveability factors typically are not driven by high-level standards and targets for single issues, but focus on place-based planning and are characterised by multi-disciplinary approaches spanning urban planning and design, public health and environment protection. For this reason, the concept lends itself to local government initiatives supported by integrated local and regional planning.

Liveability-based approaches offer a number of synergies and potential co-benefits for reducing air pollution and greenhouse gas emissions. For example:

- through passive and active solar building design
- by reducing motor vehicle trips with improved access to jobs, schools, services and open space, and encouraging use of alternative transport modes, and
- by reducing our urban footprint and supporting increased green space and vegetation.

The benefits of trees and green space to human wellbeing are increasingly being recognised – encouraging outdoor activity, providing shade for walkable environments, offsetting the urban heat island effect, and serving as carbon dioxide sinks and filters for air pollutants. Utilising existing parks and gardens in and around urban areas is an important way to enhance liveability.

The liveability concept can also be clearly linked to the cleaner air goals in *Action for Air*, particularly via actions to reduce emissions from motor vehicles.

Approach adopted in Action for Air

- Link air quality and climate change goals to the goals for improved urban environments, and work with other agencies responsible for planning, transport and health to develop initiatives that serve multiple State Plan goals.
- Support local government in liveability planning that reduces air pollution and greenhouse gas impacts.
- Encourage private sector development projects based on sustainability and liveability.
- Increase greening of communities to promote liveability, air quality and greenhouse gas reduction goals.
- Using DECCW's Healthy Parks Healthy People program, promote the health benefits of our urban parks, and emphasise integration of national parks and communities via active and public transport.

New actions promoting improved liveability are identified in 'The action plan – the actions'.

Local exposure

Air quality management strategies need to address the exposure to emissions, particularly particle emissions, of populations in close proximity to local-level pollution sources. Local exposure can be a health concern even when regional pollution levels are low.

Closely related to health and liveability is the issue of local exposure. Locally exposed populations include people living and working alongside major road corridors, other high-volume transport precincts (e.g. ports, airports), and specific sites and facilities that emit noxious pollutants (e.g. industrial and commercial premises). Exposure of some populations to air and noise emissions may increase as a result of land-use planning designed to reduce overall travel demand and transport emissions (e.g. infill development, higher density living in existing areas).

Roadside remote sensing is used to profile vehicle emissions in Sydney.

Research in Australia and overseas has explicitly linked pollution exposure, particularly along road corridors, to health impacts. The community, through the State Plan and *Action for Air* consultation processes, has also expressed growing concern about exposure of local populations to emissions. This has prompted action to address the local exposure issue, especially for vulnerable populations such as children.

The State Plan's target for jobs closer to home will help address this issue. It has positive implications for trip patterns and vehicle use which link it with the priorities for cleaner air. Development patterns that allow people to travel smaller distances to work and other locations will result in opportunities to reduce motor vehicle use (and emissions), through reduced distance travelled or use of other modes of transport.

Development alongside major roads is now guided by the Government's Metropolitan and Subregional Strategies. Both these strategies and the Infrastructure State Environmental Planning Policy (Infrastructure SEPP) 2007 refer to interim guideline *Development Near Rail Corridors and Busy Roads* which addresses health and liveability issues associated with busy roads, including techniques like staggering land uses with less sensitive activities located closer to the road, avoiding 'canyons' that limit dispersion of emissions and orientating air conditioning intakes away from the roadway. Measures guided by the NSW Government's Metropolitan Strategy will encourage the use of public transport and other more sustainable transport modes by managing the supply and price of parking in centres and locations with good access to public transport.

Strategies for continuing emission reductions in the industrial, commercial and domestic sectors will help reduce local exposure for people near industry or small commercial premises such as service stations and smash repairers.

Approach adopted in Action for Air

- Reduce local exposure to transport emissions through appropriate urban planning and design.
- Continue to reduce emissions from industry, small businesses and homes through a multi-strand approach to cleaner business processes and consumer products.
- Provide the community with more information about air quality to help them reduce their exposure.

Actions that address local exposure are identified in 'The action plan – the actions'.