



NSW Cleaner Vehicles and Fuels Strategy

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Contents

1 Introduction	1
The NSW Government is committed to improving air quality	1
Significant successes in air quality management	1
Despite the successes, more needs to be done	1
Motor vehicles will continue to be the main source of air pollution in Sydney	2
The NSW Cleaner Vehicles and Fuels Strategy will continue to reduce emissions	2
2 The evidence – sources and impacts of air pollution	3
The air emissions inventory	3
Current and projected air quality in NSW	3
Ozone	3
Volatile organic compounds as air toxics	7
Fine particles	8
Diesel particles	9
3 Strategic focus areas and guiding insights	12
Focus area 1 – Cleaner fuels	12
Focus area 2 – Cleaner vehicles	12
Focus area 3 – Cleaner private sector and government fleets	14
4 Cleaner vehicles and fuels strategy	15
5 Initiatives to achieve the strategy	17
Initiative 1: Vapour recovery at service stations	17
Initiative 2: Summer Low-Volatility Petrol Program	18
Initiative 3: Alternative fuels	19
Initiative 4: NSW Diesel Retrofit Program	20
Initiative 5: Measuring emissions from vehicles	21
Initiative 6: NSW Government Smoky Vehicle Detection Program	22
Initiative 7: Community awareness and behaviour change education	23
Initiative 8: Environmental rating of heavy vehicles	24
Initiative 9: Government leading by example	25
Initiative 10: NSW FleetWise Partnership	26



1 Introduction

The NSW Government is committed to improving air quality

Action for Air is the NSW Government's 25-year air quality management plan for Sydney, the Illawarra and the Lower Hunter.

Action for Air contains a range of measures to reduce emissions from transport, industrial, commercial and domestic sources to control the two main air pollutants of concern: photochemical smog (ozone at ground level) and fine particle pollution.

The *State Plan: a new direction for NSW* (NSW Government 2006) sets targets to improve outcomes and services for the people of NSW. State Plan Priority E3 commits the NSW Government to:

- achieving a 60% cut in greenhouse gas emissions by 2050
- achieving a return to year 2000 greenhouse gas emissions by 2025
- meeting the goals of the National Environment Protection Measure for Ambient Air Quality (Air NEPM). These national health-based goals apply to six air pollutants: carbon monoxide, lead, sulfur dioxide, nitrogen dioxide, ozone and fine particles.

Significant successes in air quality management

There have been significant improvements in air quality in NSW since the 1980s, with initiatives to reduce air pollution implemented in motor vehicles, and across industry, business and homes. These improvements include:

- banning backyard burning in all metropolitan and many regional areas
- removing lead from petrol and paints
- progressively tighter emission standards for industry, and motor vehicles and fuels.

As a result, levels of toxic air chemicals, including dioxins and heavy metals, are well below international standards and NSW consistently meets the Air NEPM goals for carbon monoxide, lead, sulfur dioxide and nitrogen dioxide.

These are significant achievements, particularly as over the last 20 years Sydney's population has grown by 21%, and the number of cars has increased by 58%.

Despite the successes, more needs to be done

Although NSW has made significant gains in air quality over the past 10 years, there is a gap between what has been achieved and meeting the State Plan's target of achieving national air quality goals in the future. Currently, the NSW Government meets the goals, except those for ozone in Sydney and Wollongong and those for fine particles in parts of regional NSW.

These remaining challenges are significant. Ground-level ozone (photochemical smog in summer) 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 some days each year, due to increases in population, motor vehicles and economic activities. Climate change is expected to further exacerbate summertime smog as the number of days above 30°C increases.



The health costs of air pollution in NSW are substantial. Although Sydney has good air quality by world standards, a reduction in current air pollution levels would continue to improve the population's health in the long-term. The estimated annual health cost of current levels of air pollution in the greater metropolitan area is \$4.7 billion, or \$893 per head of population. Health experts estimate that air pollution causes between 640 and 1400 deaths per year in Sydney, and between 900 and 2000 hospital admissions for respiratory and cardiovascular illnesses. These estimates have risen over the past years as medical science gains a better understanding of the link between air pollution and health problems. There is increasing medical evidence, both in Australia and from overseas, that both fine particles and ozone contribute to premature mortality by affecting the heart and lungs.

Motor vehicles will continue to be the main source of air pollution in Sydney

Even with the introduction of cleaner vehicles and fuels, motor vehicles will continue to be the main source of air pollution in Sydney as the city continues to grow and the number of vehicles increases. The large number of older vehicles still being used also delays the benefits of tighter new vehicle emission standards.

The transport sector accounted for 14.4% of Australia's total greenhouse gas emissions in 2005, and the projected growth in road transport increases the challenge of reducing these emissions. Analysis of the projected growth in total greenhouse gas emissions suggests that most growth will be derived from increasing road travel.

As motor vehicles are the major contributor to smog, this means significant new actions are needed to reduce vehicle-related emissions as well as emissions from other sources, in order to meet the Air NEPM goals.

The NSW Cleaner Vehicles and Fuels Strategy will continue to reduce emissions

Objective 3 of Action for Air is to make cars, trucks and buses cleaner. Significant gains have been made since Action for Air was released in 1998, due largely to national actions strongly advocated by NSW.

The NSW Cleaner Vehicles and Fuels Strategy builds on these actions to reduce pollution from vehicles. It sets out an expanded list of actions governments and the private sector can implement to reduce air pollution and greenhouse gas emissions from motor vehicles and fuels (see section 5).

Planning strategies to reduce the growth of vehicle kilometres travelled (VKT) are and will continue to be important in managing transport systems. VKT is a generalised indicator of motor vehicle impacts on air quality. This strategy also therefore links with transport and planning actions the NSW Government is undertaking to reduce VKT, people's dependence on private transport, and traffic congestion.



2 The evidence – sources and impacts of air pollution

The air emissions inventory

The Department of Environment and Climate Change (DECC) has developed a detailed air emissions inventory covering the Greater Metropolitan Region (GMR). The GMR comprises Sydney, Newcastle and Wollongong – see Figure 1. The inventory provides as complete a measurement as possible of emissions from over 90 air pollutants from all sources being released into the atmosphere. The inventory includes emissions from biogenic (i.e. natural) and anthropogenic (i.e. human) sources. Emissions are from:

- natural sources such as bushfires, trees and windborne dust
- commercial business operations such as quarries, service stations and smash repairers
- domestic activities such as house painting, lawn mowing and using wood heaters
- industrial premises such as oil refineries, power stations and steelworks
- off-road mobile uses such as aircraft, railway operations and recreational boats
- on-road mobile vehicles such as buses, cars and trucks.

The base year of the inventory is 2003.

Air emissions inventory reports are available on www.environment.nsw.gov.au/air/airinventory.htm.

Current and projected air quality in NSW

DECC has undertaken a detailed analysis of air quality monitoring data, regional air quality modelling results and the new air emissions inventory. The DECC technical paper, *Current and projected air quality in NSW: a technical paper supporting the Clean Air Forum 2007* (see www.environment.nsw.gov.au/air/cpairqual.htm) presents the results of this analysis and provides background information on developing new strategies to improve air quality.

The main sources of air pollution, the impacts of each source on human health and results of monitoring these sources are provided below.

Ozone

Ozone occurs in both the upper atmosphere (the ozone layer) and at ground level. The ozone layer protects life by shielding the earth from harmful ultraviolet radiation from the sun.

However, exposure to ozone is not beneficial to human health. At ground-level, ozone is a secondary pollutant formed in sunlight by chemical reactions between nitrogen oxides (NO_x) and volatile organic compounds (VOCs). Elevated concentrations of ozone occur in Sydney in the warmer months when there are more sunlight, high temperatures and appropriate wind conditions.

Health effects

Ozone is a respiratory irritant. Exposure to high levels of ozone can affect healthy adults and children. Such exposure restricts breathing and can cause coughing, chest tightness, and pain on taking a deep breath, especially during exercise. Some people, such as asthmatics, are sensitive to ozone at low concentrations, so there does not seem to be a safe level for exposure. During periods of high ozone concentration, hospital admissions for asthma and other respiratory conditions increase.



Figure 1: Extent of the Greater Metropolitan Region (GMR)





Compliance with goals

Sydney will not meet the Air NEPM ozone goals by the compliance date of 2008 (see Figure 2).

Photochemical modelling conducted by DECC indicates that a 25% reduction in 2003 emissions of both NO_x and VOCs is required to meet the ozone goal. This requires a reduction in annual emissions of approximately 23,000 tonnes of NO_x and 33,000 tonnes of VOCs.

An analysis of current ozone emissions (see Figure 3) suggests that they have been increasing slightly from the mid-1990s.

Figure 2: Historical ozone exceedences in Sydney and Air NEPM compliance requirements (four-hour ozone standard)

The horizontal line on the graph indicates the level needed to attain the Air NEPM ozone goal. To meet this goal, only one exceedence of the goal per year is allowed.

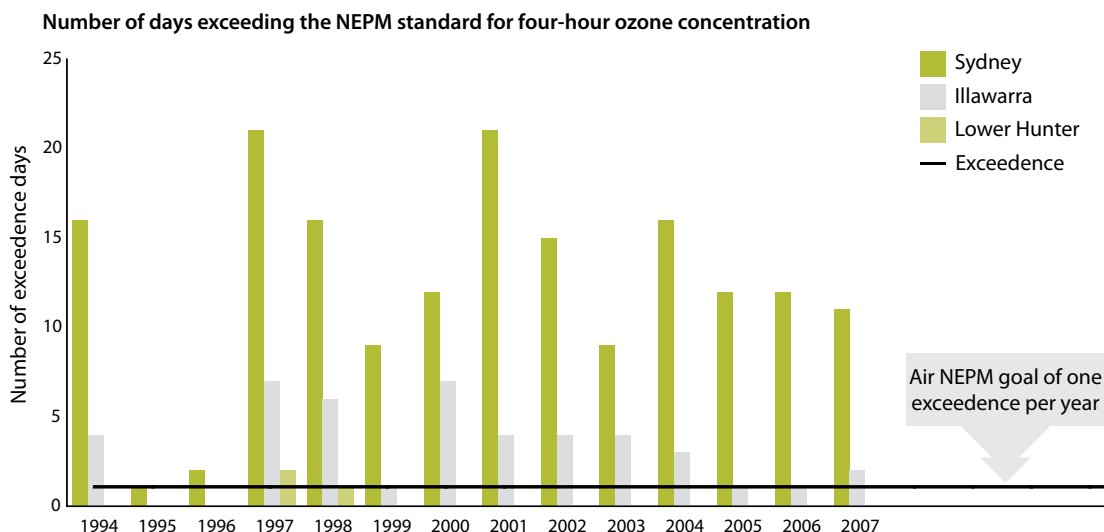
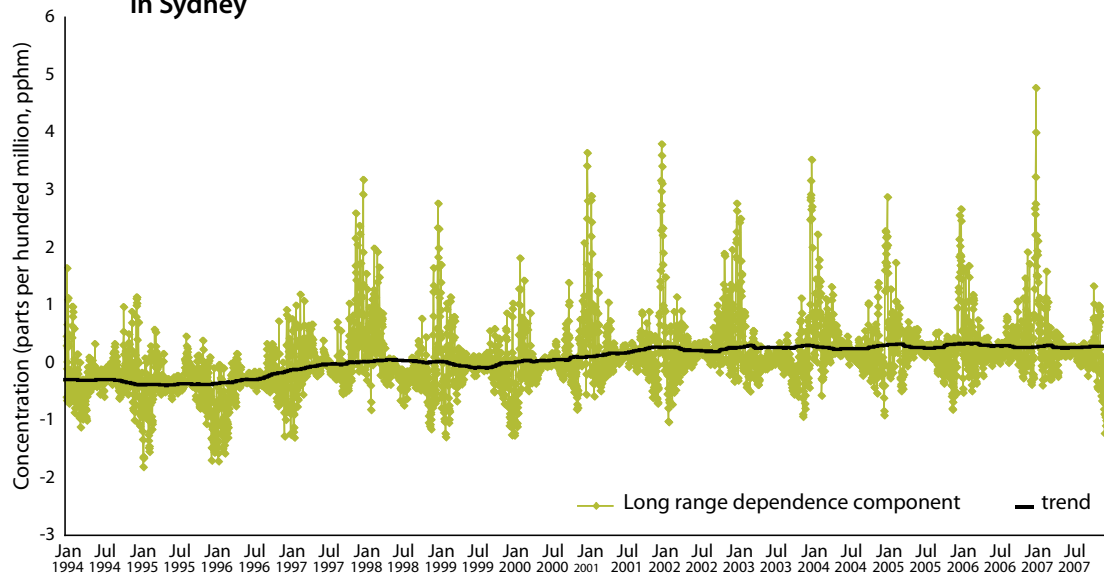


Figure 3: Trend analysis for daily maximum four-hour ozone concentrations in Sydney





Impact of climate change

Global warming is expected to exacerbate ozone formation in Sydney, making national standards even more difficult to achieve. High ozone events in Sydney are correlated with days when the temperature exceeds 30°C. CSIRO’s preliminary prediction is that the number of days in Sydney which exceed 30°C could double by 2030 and quadruple by 2060, leading to a 30% increase in the number of days that exceed the Air NEPM ozone goal by 2030, and a 70% increase by 2060. These best estimates are based on simulations using climate model results from the Intergovernmental Panel on Climate Change’s greenhouse gas emission scenario A2, and assume that urban smog emissions remain at current levels.

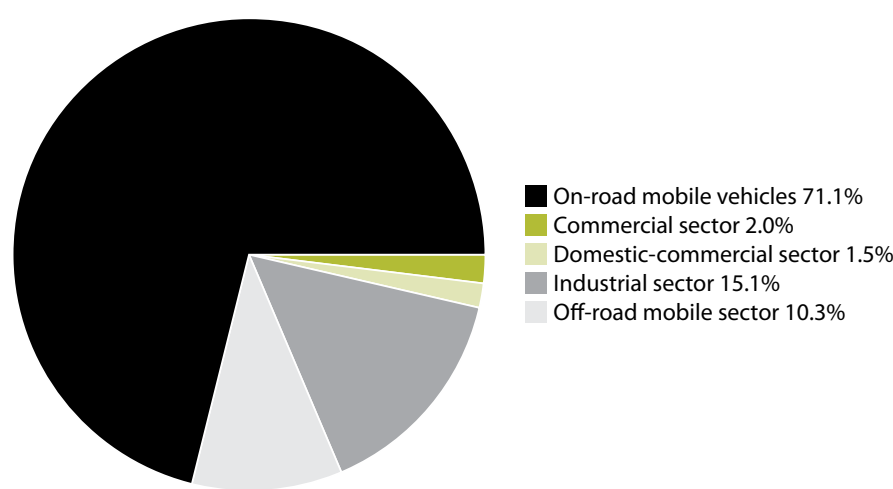
Contribution of motor vehicles and fuels

Motor vehicles and fuels are the main sources of the ozone-forming pollutants (NO_x and VOCs) in Sydney.

Nitrogen oxides (NO_x)

Nitrogen oxides (NO_x) form when fuel burns at high temperatures, such as in motor vehicle engines. The two main nitrogen oxides are nitric oxide (NO) and nitrogen dioxide (NO₂). Motor vehicles such as on-road cars, trucks and buses contribute over 70% of NO_x emissions in Sydney.

Figure 4: Annual NO_x emissions in Sydney



On-road mobile vehicles percentage breakdown

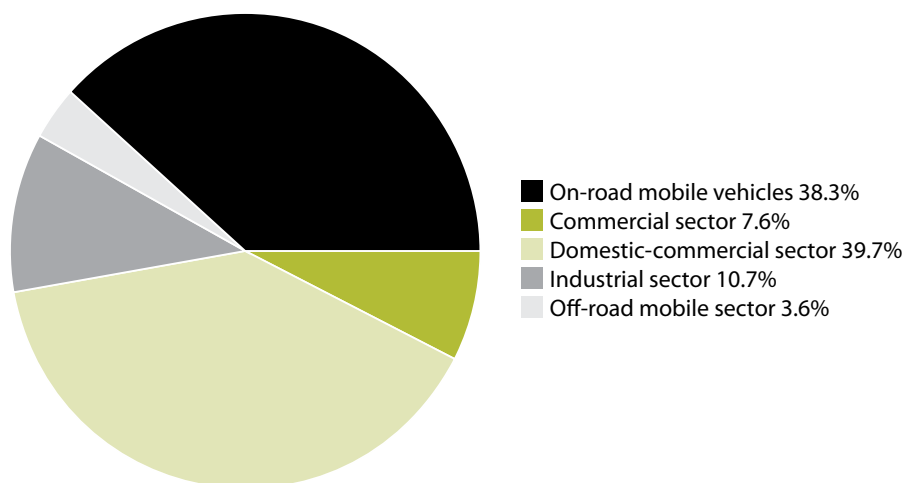
Vehicle class	% of NO _x emissions
Petrol-fuelled passenger cars	41.2%
Heavy-duty diesel vehicles such as long-haul trucks and buses	18.2%
Light-duty petrol-fuelled vehicles such as small vans	4.9%
Light-duty diesel vehicles such as minibuses and small trucks	4.6%
Other vehicles such as motorbikes	2.2%
Total	71.1%



Volatile organic compounds (VOCs)

Motor vehicles emit over 38% of VOC emissions in Sydney. Emissions from refuelling motor vehicles contribute a further 4% to 5% of VOC emissions.

Figure 5: Annual VOC emissions in Sydney



On-road mobile vehicles percentage breakdown

Vehicle class	% of VOC emissions
Petrol-fuelled passenger cars	19.9%
Heavy-duty diesel vehicles such as long-haul trucks and buses	2.0%
Light-duty petrol-fuelled vehicles such as small vans	3.5%
Light-duty diesel vehicles such as minibuses and small trucks	0.7%
Other vehicles such as motorbikes	3.2%
Evaporative emissions from petrol-fuelled vehicles	9.0%
Total	38.3%

Volatile organic compounds as air toxics

Some VOCs are toxic air pollutants, such as benzene, 1,3-butadiene and polycyclic aromatic hydrocarbons (PAHs). There is mounting scientific evidence that exposure to these substances can be linked to cancer, birth defects, genetic damage, immune deficiency, and respiratory and nervous system disorders.



Compliance with goals

Although the ozone goals are exceeded in Sydney, ambient levels of most air toxics in NSW are very low, and are well below Australian and international goals. The results of a NSW air toxics monitoring program showed that only three pollutants were at levels exceeding Australian and international standards: benzene, 1,3-butadiene and PAHs.

Contribution of motor vehicles and fuels

Motor vehicles contribute over 60% of benzene and 1,3-butadiene emissions, and over 40% of PAH emissions. People's local exposure to air toxics from motor vehicles and fuels, such as when they are near service stations and busy roads, is an area of growing international concern. Based on increased knowledge about such risks, the National Fuel Quality Standards included a limit on benzene in petrol in 2006. This limit is expected to significantly reduce community exposure to benzene, and is part of a comprehensive tightening of the National Fuel Quality Standards.

Fine particles

Health effects

Many recent scientific studies have confirmed that exposure to fine particles (PM_{10}) and ultra-fine particles ($PM_{2.5}$) is associated with increased mortality and hospital admissions among people with heart and lung disease. Some people are sensitive to fine particles at low concentrations, and there is no safe threshold for exposure.

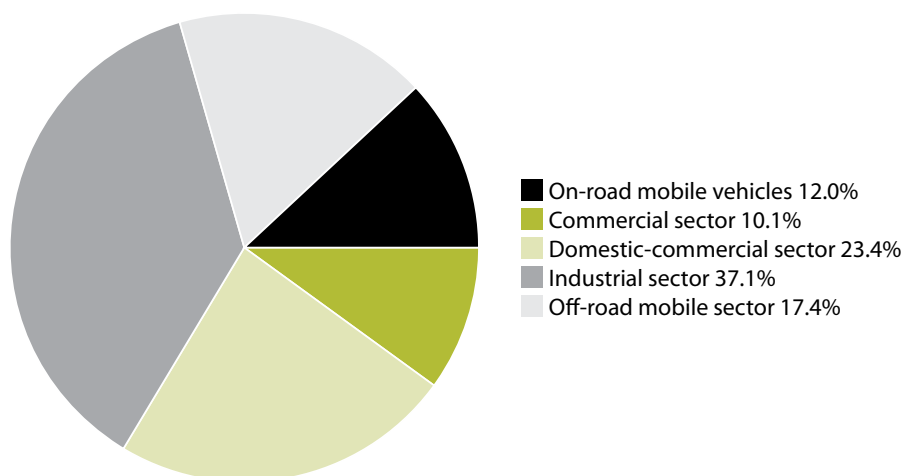
Compliance with goals

Sydney periodically exceeds the Air NEPM particle standards because of dust storms, bush fires and solid fuel burning. The standards are also regularly exceeded in some large rural centres due to agricultural activities, dust storms, bush fires and solid fuel burning.

Contribution of motor vehicles and fuels

Motor vehicles contribute 12% of PM_{10} and 18.5% of $PM_{2.5}$ in Sydney.

Figure 6: Annual PM_{10} emissions in Sydney





On-road mobile vehicles percentage breakdown for PM₁₀ and PM_{2.5} emissions

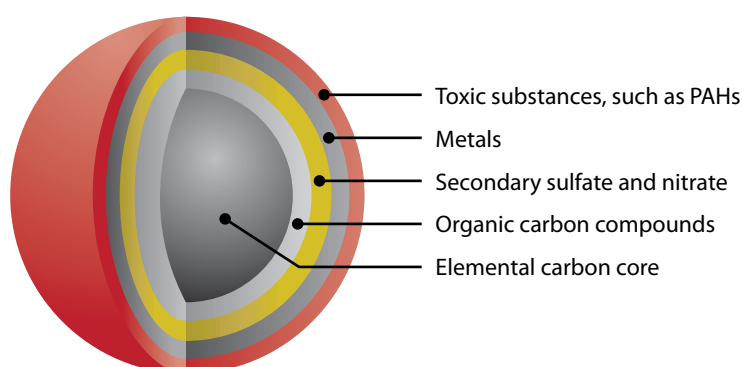
On-road vehicle class	% PM ₁₀	% PM _{2.5}
Petrol-fuelled passenger cars	4.1%	6.1%
Light-duty diesel vehicles such as minibuses and small trucks	4.1%	6.4%
Heavy-duty diesel vehicles such as long-haul trucks and buses	3.3%	5.2%
Other vehicles such as motorbikes	0.3%	0.4%
Light-duty petrol vehicles such as small vans	0.2%	0.4%
Total	12%	18.5%

People's local exposure to fine particles, such as when they are near busy roads, is an area of growing international concern. Figure 8 on the next page shows that exposure to fine particles is likely to be significantly higher near major arterial roads.

Diesel particles

Diesel engines emit considerably more particle pollution than petrol engines. Diesel particles are particularly harmful fine particles. Toxic substances such as heavy metals and PAHs from diesel engines coat the diesel particles, as shown in Figure 7.

Figure 7: Diesel particle (Courtesy of the Clean Air Task Force, Boston, MA, USA)

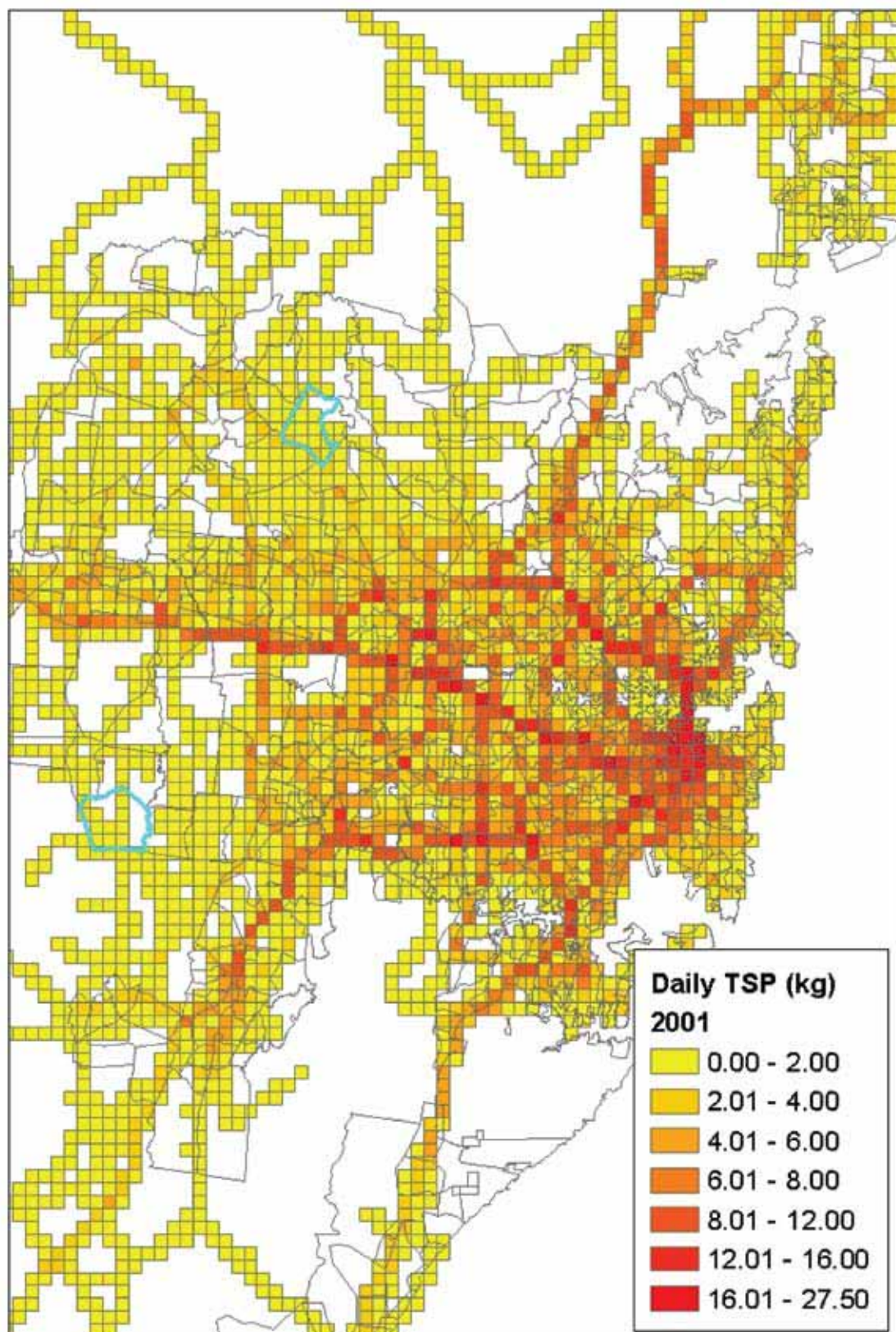


In 1989, the International Agency for Research on Cancer classified diesel exhaust as a probable human carcinogen. In 1998, the US State of California identified diesel particulate matter as a toxic air contaminant owing to its potential to cause cancer, premature death and other health problems. Those most vulnerable are children, whose lungs are still developing, and the elderly, who may have other serious health problems.

The health costs of diesel particle emissions have been estimated at \$257,000 per tonne. In Sydney, over 1500 tonnes of diesel particles are emitted each year, resulting in a potential health cost of over \$400 million.



Figure 8: Spatial distribution of total solid particle (TSP) emissions in Sydney in 2001
(Western Sydney Modelling Project, Department of Environment and Conservation 2004)





A significant proportion of commercial diesel vehicles that are still being used were built before the introduction of improved heavy vehicle emission standards in 1990 (see Table 1).

Table 1: Proportion of NSW heavy vehicles on the road that were manufactured before 1990

Commercial diesel vehicles	Percentage built before 1990
Heavy rigid trucks	45%
Articulated trucks	27%
Light rigid trucks	30%



3 Strategic focus areas and guiding insights

Focus area 1 – Cleaner fuels

Insight 1a Cleaner fuels are a prerequisite for cleaner vehicles

Fuel quality standards that reduce sulfur content in petrol and diesel have allowed more effective emissions control equipment to be fitted on vehicles. 'Dirty' fuels (e.g. high sulphur fuels) can clog such equipment.

Insight 1b Cleaner fuels can reduce emissions directly

The current summertime requirements for low-volatility petrol in NSW reduce VOC emissions from motor vehicles by an estimated 19% (over 3000 tonnes per year).

Insight 1c In the future, biofuels, especially biodiesel, may offer lower greenhouse gas emissions than petrol or diesel

The life-cycle emissions from biofuels depend on the method of producing the fuel. Technologies that are heat efficient and use waste products are generally better. However, production of these biofuels are limited because many of the waste products they use are also used for animal feed. 'Second generation' biofuels that are now being developed, such as cellulosic ethanol and biobutanol, which do not rely on such waste products, may have lower life-cycle emissions than current biofuels.

Focus area 2 – Cleaner vehicles

Insight 2a Tighter vehicle emissions standards have enabled emission reductions, even with increasing car use and ownership

Significant emission reductions have been achieved in Sydney through tightening emissions standards for new vehicles. Overall, emissions from motor vehicles have fallen even though the number of motor vehicles and vehicle kilometres travelled has increased.

For example, the introduction of Australian Design Rule (ADR) 37/01 in 1997 for light-duty petrol-fuelled vehicles reduced NO_x emissions by 67% and VOC emissions by 32%, compared with the 1986 standard. See insights 2b and 2c below, and section 5, Initiative 8, for more information on ADRs.

Insight 2b New vehicle emissions standards introduced between 2007 and 2009 will achieve significant emission reductions

Vehicle emissions standards for new heavy- and light-duty vehicles are expected to further reduce levels of NO_x. The introduction of ADR 80/02 for trucks in 2007–08 is expected to lower NO_x levels from new vehicles by 43%, compared with previous standards. The planned introduction of ADR 79/02 for petrol-fuelled cars in 2009 will reduce NO_x levels from new vehicles by 46%, compared with previous standards.

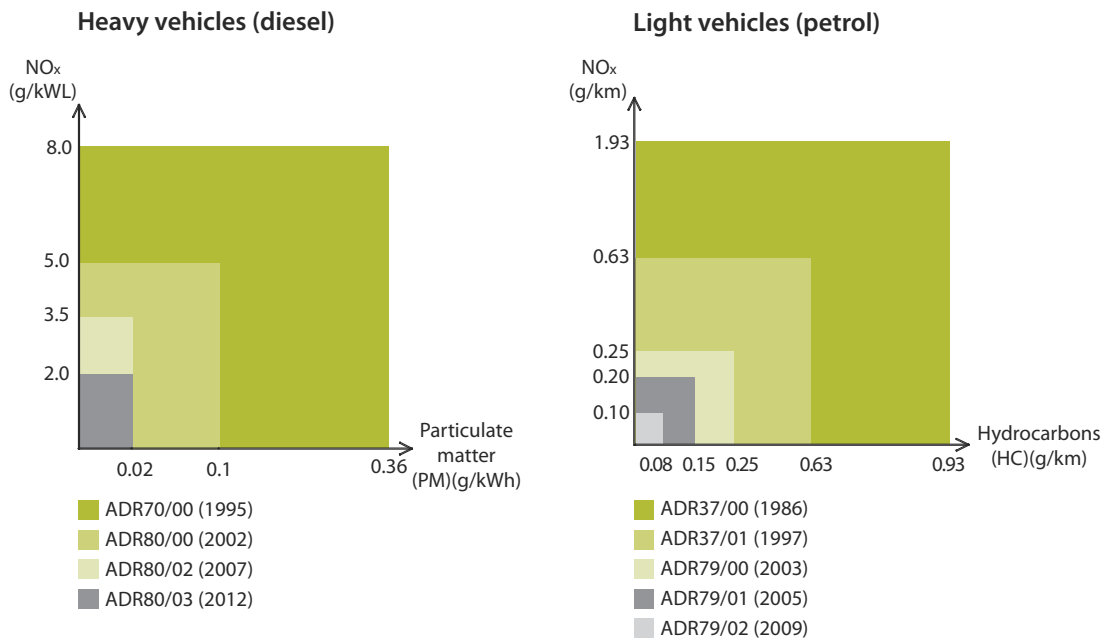


Insight 2c Further tightening of new vehicle emissions standards beyond the foreshadowed changes appears to deliver only marginal benefits

The opportunity for deriving significant emission benefits from further tightening the vehicle emissions standards appears to be marginal when the likely high cost of technology development is considered (the law of diminishing returns). See Figure 9.

The size of the theoretical air quality benefits derived from the transition from ADR 70/00 (1995) to ADR 80/00 (2002) for heavy diesel vehicles, for example, is significantly larger than the subsequent changes to vehicle emissions standards. This suggests that further changes to new vehicle emission standards for maintaining regional air quality cannot purely be relied on in the face of forecast growth in road travel. Tighter vehicle standards and other new initiatives will also be needed.

Figure 9: Comparison of emission reductions through changes in emission standards





Focus area 3 – Cleaner private sector and government fleets

Insight 3 Older vehicles contribute a disproportionate amount of emissions

The air quality benefits of tightening vehicle emissions standards are being delayed by the relatively old age of vehicles in vehicle fleets, and the slow rate of fleet turnover. This is particularly the case for diesel vehicles.

Table 2: Average age of vehicles in NSW

On-road vehicle class	Average age in NSW (years)
Heavy rigid trucks	14.0
Articulated trucks	10.3
Light rigid trucks	10.7
Urban bus fleet	11.1
Passenger vehicles	9.0

Table 3: Relative contribution to air pollution by vehicle age

Year of manufacture	Percentage of light vehicle fleet	Percentage of carbon monoxide emissions	Percentage of hydrocarbon emissions	Percentage of nitrogen oxide emissions	Percentage of particulate matter emissions
1958–1992	12	33	40	25	32
1993–1997	18	29	23	32	26
1998–2002	32	25	22	30	25
2003–2007	38	13	15	13	17

Data sourced from preliminary results of a survey of 20,564 light vehicles conducted in March–April 2007 in Sydney, using remote sensing technology.

These results are backed up by international findings, which also reveal that a small number of older vehicles contribute a disproportionate amount of pollution (see section 5, Initiative 5).

Significant emissions reductions could be achieved in the short-term by accelerating the rate of replacement of older high polluting vehicles.



4 Cleaner vehicles and fuels strategy

The NSW Cleaner Vehicles and Fuels Strategy aims to reduce emissions through promotion of cleaner fuels, cleaner vehicles and a cleaner private sector and government fleet. Figure 10 outlines:

- the outcomes of the strategy
- actions to be taken under the strategy to achieve the outcomes*
- planning and transport actions already being undertaken by the NSW Government that will help this strategy achieve cleaner air.

The strategy focuses on specific NSW initiatives and strategically important national initiatives where NSW leadership is important. The government can reduce emissions from vehicles and fuels through several approaches:

- innovation, trials and pilots
- education, awareness raising and partnerships
- economic incentives
- regulation and standards
- mandatory and voluntary reporting
- transport and planning actions, including:
 - strategic planning
 - road improvements
 - transport integration
 - demand management
 - sustainable transport.

The combination of approaches listed above will achieve a significant reduction in NSW emissions of air pollutants and greenhouse gases over the 10 years of the State Plan (2006–2016) and beyond, delivering significant greenhouse, health and liveability benefits.

* Initiatives 1, 4, 7 and 10 are Clean Air, Healthy Communities initiatives, assisted by the NSW Government through its Environmental Trust. Clean Air, Healthy Communities brings together a range of initiatives and partnerships to reduce air pollution and greenhouse gas emissions in NSW.





Figure 10: NSW actions to achieve cleaner air and reduced greenhouse gas emissions





5 Initiatives to achieve the strategy

Initiative 1: Vapour recovery at service stations

Program summary

The program proposes to:

- introduce stage 2 vapour recovery (VR2) in a targeted way in the GMR
- extend the use of stage 1 vapour recovery (VR1) throughout the GMR.

Background

Stage 1 vapour recovery (VR1)

VR1 captures VOC emissions that are vented from underground storage tanks as they are filled by road tankers. Since 1986, NSW legislation has required VR1 controls to be fitted at most service stations in the Sydney region.

Stage 2 vapour recovery (VR2)

VR2 captures and recycles the VOCs that would otherwise be emitted into the atmosphere during refuelling of vehicles at the bowser. VR2 can reduce emission of VOCs at service stations by 95%.

VR2 technology was first introduced in parts of California in 1973, and nationally in the USA, and Europe, in the mid-1990s. It is now required in many parts of the USA, Europe and Asia, but it has never been mandated in Australia.

The potential implementation of VR2 in Sydney has been evaluated through a 12-month equipment trial that included management and user surveys, an independent economic analysis and industry consultation. The equipment trial demonstrated that VR2 works successfully and reliably under Australian conditions.

In November 2007, the NSW Government announced its intention to expand vapour recovery at service stations in the NSW GMR by requiring VR2 technology to be implemented at service stations in Sydney, Newcastle, Wollongong and the Central Coast regions. The implementation will be phased-in over a nine-year period from 2008–2016, to allow adequate time for industry to install the new equipment.

The geographic area where service stations are required to install VR1 will also be extended to include the Sydney, Lower Hunter, Illawarra and Central Coast regions. This will be phased-in over a six-year period from 2008–2013.

A two-year lead in from 2008–2010 will be provided to resolve a range of issues including equipment certification, industry up-skilling, resolution of technical issues and development of industry codes and guidelines.

Responsibility/participation

The introduction of VR2 and the expansion of VR1 will be implemented by DECC through regulation, with appropriate timeframes for industry compliance. Through the Clean Air Healthy Communities Fund, the Environmental Trust will provide funding to manage implementation of the new regulation for one year.



Outcomes

- The cost to the community if passed on by service stations is estimated to be less than one-quarter of a cent per litre of fuel.
- The cost of implementing VR2 is estimated to be between \$20,000 and \$450,000 per service station, depending on the size of the service station and the timing of refurbishment. This cost includes the equipment's capital and installation costs, business disruption costs during refurbishment and compliance costs. DECC will give service stations enough lead-time to factor this work into their maintenance cycles wherever possible.
- The proposed expansion of vapour recovery in the NSW GMR will reduce VOC emissions by over 5000 tonnes per year, which is 15% of the required 33,000 tonne reduction needed to meet the Air NEPM target (see section 2).

Initiative 2: Summer Low-Volatility Petrol Program

Program summary

The Government is examining tighter petrol volatility limits to maximise VOC emission reductions while minimising impacts on industry. In summer, fuel evaporates faster than in winter and extra measures are needed to reduce pollution. Reducing petrol volatility is the single largest measure to reduce ozone formation in summer when breaches of the national ozone standards occur.

Background

Volatility is an indication of how quickly fuel evaporates. The gases released when petrol evaporates are VOCs. Decreasing petrol volatility means less evaporation of petrol, leading to reduced emissions of VOCs that are precursors to the formation of smog. The volatility of petrol is reduced at the refinery by removing some VOCs during the refining process. Importers can specify lower volatility when importing fuels.

While the Commonwealth regulates national fuel quality standards, state governments are responsible for managing petrol volatility in their states or territories, to take account of the different regional, climatic and seasonal requirements. In NSW, petrol volatility requirements are regulated through the Protection of the Environment Operations (Clean Air) Motor Vehicles and Motor Vehicle Fuels Regulation.

The current Regulation sets a monthly summer average volatility limit for petrol of 62 kPa, with an absolute maximum limit for any individual batch of 64 kPa. These limits are the strictest in Australia. Limits apply to petrol refiners, importers and blenders that supply petrol to the GMR over the summer.

Compliance with the current limits reduces VOCs from motor vehicles by 19% each summer. Further reductions in limits would further reduce VOCs emissions and provide additional health benefits. Further tightening of volatility limits is being considered for 2009.

Responsibility/participation

Tightening of volatility requirements will be implemented by the NSW Government through regulation.

Outcomes

- A draft proposal for tightening petrol volatility requirements is currently being developed.



Initiative 3: Alternative fuels

Program summary

NSW Government actions focus on encouraging fuels which reduce emissions of both greenhouse gases and noxious gases.

Background

Government vehicles

All NSW Government vehicles are now required to use alternative fuels such as liquid petroleum gas, compressed natural gas (CNG), ethanol–petrol blend and biodiesel, wherever practicable and cost effective.

NSW fuels contract

The new NSW Government fuels contract supports alternative fuels by incorporating LPG, ethanol–petrol and biodiesel suppliers into its list of approved suppliers.

Biodiesel

The NSW Government is committed to investigating and publicising the benefits of environmentally friendly fuels. Reduced particle and greenhouse gas emissions are the most significant potential environmental advantages of biodiesel.

A 2007 CSIRO study, *The greenhouse and air quality emissions of biodiesel blends in Australia*, reported reductions of 4% in particle emissions from B5 diesel blend and reductions in particle emissions of 16% from B20 diesel blend. The same CSIRO study also indicated that 100% biodiesel reduces greenhouse gas emissions by 90% if it is produced from waste cooking oil, 29% if from tallow, and 23% if from canola oil.

Actions to encourage the sustainable uptake of biodiesel are under development by the Office of Biofuels, Department of State and Regional Development.

Compressed natural gas (CNG)

Twenty-one percent of the State Transit Authority (STA) bus fleet (203 buses) now runs on CNG. Under a new contract announced by the STA, a further 255 CNG buses are currently being purchased with total uptake expected by 2011.

Ethanol

NSW recently introduced a 2% ethanol mandate. This effectively means that 20% of the petrol sold in NSW contains 10% ethanol. Under the mandate:

- petrol wholesalers report quarterly (since 1 October 2007) on the volume of ethanol and total petrol they sell in NSW
- petrol wholesalers face a financial penalty unless ethanol makes up at least 2% of the total volume of petrol they sell in NSW.

New actions to encourage the sustainable uptake of biofuels are under development by the Office of Biofuels, Department of State and Regional Development.



Responsibility/participation

DECC, the STA and the Department of Commerce are all involved in promoting alternative fuels that can reduce pollution and greenhouse gases.

The Minister for Regional Development administers the Biofuels (Ethanol Content) Act 2007, and the Department of State and Regional Development manages reporting under and compliance with the Act.

Initiative 4: NSW Diesel Retrofit Program

Program summary

A staged expansion of the Diesel Retrofit Program that:

- reduces harmful diesel particle emissions
- delivers greenhouse gas emission reductions
- takes advantage of Commonwealth financial incentives
- moves towards self-funding.

Background

Diesel vehicles produce about 60% of the particulate matter emitted by road transport and are increasing as a proportion of total transport on the roads. The health costs of particle emissions from diesel vehicles are estimated to be around \$257,000 per tonne of emissions.

Strict new diesel vehicle emission limits were introduced in 2002. However, diesel engines are very durable, and older vehicles with high emissions will continue to operate for many years. The NSW Diesel Retrofit Program was established in 2005 to fit existing vehicles with exhaust treatment devices to capture particle emissions. The program demonstrated the effectiveness of the technology in Australian conditions, and has shown that retrofitting older vehicles can reduce particle emissions by at least 46%, at a cost of around \$7600 per vehicle, avoiding \$17,000 in health costs. The program has thus proven to be a viable and cost-effective strategy for reducing air pollutant emissions.

Existing program

The demonstration of the technology continued through 2006 and 2007 with over 200 vehicles being retrofitted at no cost to vehicle owners.

The NSW Government has also committed \$4 million to retrofitting over 500 Sydney buses operated by the STA.

The \$6 million for the existing program will reduce particle emissions by almost 80 tonnes and avoid approximately \$19 million in future health costs.

Program expansion

Through the Clean Air Healthy Communities Fund, the Environmental Trust will fund DECC to extend the Diesel Retrofit Program. The next stage of the program will involve:

- seeking a co-funding contribution by vehicle owners for the retrofit
- taking advantage of Commonwealth financial incentives
- an education component to encourage participation.



The Commonwealth diesel rebate allows pre-1996 heavy vehicles to claim an 18 cents per litre rebate if they comply with emission standards. The use of partial filters is expected to assist older trucks to meet the diesel rebate criteria. An existing tax depreciation rate of 30% applies to diesel retrofit equipment, providing a further financial incentive for owners to retrofit their trucks.

DECC will encourage the uptake of retrofitting by seeking 'sustainability partners' and by targeting owners of smoky vehicles in pollution hotspots, such as in the M5 East tunnel. Information will be provided outlining the financial aspects of the diesel rebate, tax deductions for capital depreciation, and maintenance and driving techniques that save fuel and reduce emissions. An education strategy will target truck owners fined for operating smoky vehicles and fleet partners under Initiatives 8–10.

Investigation of a self-funding program with significant greenhouse gas emission reductions

The USA has successfully encouraged private retrofitting through the SmartWay Transport Partnership and its SmartWay Upgrade Kits. The kits contain both fuel efficiency and emission control devices, so the truck owners benefit financially through reduced fuel use. The Partnership overcame the problem of capital cost by establishing private sector finance programs to make loans available to purchase the kits. The fuel costs saved by truck owners more than covered the cost of loan repayments.

DECC and the Roads and Traffic Authority (RTA) are currently evaluating possible fuel efficiency devices that might be combined with diesel exhaust treatment retrofit to form a NSW Smart Trucks Program, based on the US SmartWay program. The aim is to develop an efficient program that will provide a positive financial incentive to truck owners by enabling them to take advantage of Commonwealth funding, while reducing greenhouse gas emissions and increasing fuel efficiency.

Responsibility/participation

The NSW Diesel Retrofit Program involves DECC, the STA and the RTA. Partnerships with commercial diesel vehicle and fleet owners are being established through the Program to improve the fuel efficiency and emission performance of diesel vehicles.

Outcomes

The Diesel Retrofit Program will:

- reduce particle emissions by almost 80 tonnes for the estimated remaining life of the vehicles already retrofitted
- avoid approximately \$19 million in health costs.

Initiative 5: Measuring emissions from vehicles

Program summary

The NSW Government, in partnership with other states and the Commonwealth, is measuring motor vehicle emissions using a remote sensing device, then recording the results in a database. The information will be used to improve understanding of vehicle emissions and to better target programs to improve urban air quality.



Background

One of the NSW and Commonwealth governments' efforts to control pollution has been the development of inventories of all major sources of pollution. At present, a number of assumed factors are used to calculate motor vehicle emissions and their contribution to total air pollution.

Remote sensing is now being used to allow a broad cross-section of Sydney and national vehicles to be measured. Remote sensing uses monitoring equipment located on the roadside which measures the pollutant levels in a vehicle's exhaust as it drives under normal conditions.

Monitoring has already been conducted in Parramatta, Marrickville, Baulkham Hills, Blacktown and Leichhardt local government areas, with remote sensing equipment taking over 20,000 vehicle measurements.

Preliminary results suggest that older diesel vehicles, particularly light commercial vehicles, are responsible for a disproportionate amount of pollution.

This is consistent with international findings which reveal that a small number of poorly maintained vehicles contribute a disproportionate amount of pollution. In California, these vehicles are classed as 'gross polluters', and although they represent only 10% to 15% of all vehicles, they are estimated to be responsible for more than half of all vehicle emissions.

Emissions are also being monitored in Queensland and WA to more accurately calculate the pollution caused by light vehicles.

Responsibility/participation

The Commonwealth Department of Environment, Water, Heritage and the Arts is coordinating the project to study vehicle emissions using remote sensing. The national project includes the environment and transport departments of NSW, Western Australia and Queensland.

DECC and the RTA have both contributed funds to carry out the program in NSW.

Outcomes

- A national database of emission measurements for light-duty vehicles, to facilitate development of policy options to target the worst-polluting vehicle categories.

Initiative 6: NSW Government Smoky Vehicle Detection Program

Program summary

DECC operates the Smoky Vehicle Detection Program to reduce emissions from identified smoky vehicles, and provide a deterrent to other vehicle owners.

Background

Exhaust smoke emissions, particularly from diesel vehicles, can be highly visible and foul smelling. These emissions are the most obvious and objectionable form of vehicle pollution and a common cause of complaint. Diesel smoke comprises mainly fine respirable particles that contain carcinogenic compounds and are otherwise unhealthy.



Excessive smoke from engines can be caused by a number of different factors that result in incomplete combustion. Vehicle smoke in Sydney adds generally to air pollution caused by particulates, and contributes to brown haze. It is also a major cause of soiling city buildings and of the griminess of urban areas. While diesel vehicles are the most obvious source of exhaust smoke, petrol engines are also the subject of some complaints.

The Smoky Vehicle Detection Program aims to reduce vehicle emissions by ensuring that owners properly maintain their vehicles. A smoky vehicle is regarded as any motor vehicle that emits visible smoke continuously for over 10 seconds. Under NSW environmental legislation, it is an offence for a vehicle to emit visible air impurities for more than 10 seconds.

Responsibility/participation

The legislation is enforced by authorised DECC, RTA and local council officers.

Authorised officers and the general public can report smoky vehicles. Reporting of a smoky vehicle results in a warning letter to the owner indicating a possible problem with the vehicle. Repeated reporting of a smoky vehicle can lead to a defect notice, which requires the vehicle to be repaired.

To increase ease of reporting and to broaden public participation in the program, an online system has been established (see www.environment.nsw.gov.au/edsmaryapp/startup.asp).

Outcomes

- 238 reports of smoky vehicles received from the public each month, indicating a high level of awareness in the community of the unacceptability of excessive smoke emissions.
- 94 warning letters issued per month.
- 44 penalty infringement notices (fines) issued per month to vehicle owners authorised officers consider are emitting excessive amounts of smoke.

Initiative 7: Community awareness and behaviour change education

Program summary

This program is intended to increase community understanding of air pollution and its health and environmental impacts. It includes the following key components:

- research, evaluation and consultation
- public communications, including advertising, media releases, online resources and promotions
- targeted community education and integration of air messages into existing programs for households, industry, ethnic communities and councils
- capacity building through providing education, and establishing networks, professional development and resources for educators.

Background

This initiative is related to the other initiatives outlined in this strategy that promote public awareness and aim to change behaviour. By increasing community understanding of air pollution, this initiative will build support for the other initiatives that propose to improve air quality and reduce greenhouse gas emissions.



The program will promote:

- fuel efficiency
- buying cleaner vehicles
- properly maintaining vehicles
- active transport such as walking and cycling.

Responsibility/participation

Through the Clean Air Healthy Communities Fund, the Environmental Trust will fund DECC to deliver the program. A steering committee will oversee the program. Stakeholders and providers of air education will be consulted and participate in the program as required.

Outcomes

- A coordinated education program that supports Clean Air Healthy Communities program goals.
- The increased capacity of governments and external education providers to deliver air behaviour change programs.
- Potential decreases in target communities' contributions to air pollution (particles, ozone, greenhouse gases).

Initiative 8: Environmental rating of heavy vehicles

Program summary

This program aims to assist the Commonwealth with establishing a national environmental rating scheme for heavy vehicles.

Background

Australian Design Rules (ADRs), published by the Commonwealth Department of Infrastructure, Transport, Regional Development and Local Government, are national standards for vehicle design features such as emission control devices and fuel consumption devices. Emissions data for light vehicles is disclosed in these ADRs, and also in the Green Vehicle Guide, published by the Australian Government.

However, heavy vehicles are more difficult to rate in terms of environmental performance than other vehicles as:

- they carry loads of between 3 and 20 tonnes, and the truck weight and payload dramatically affect fuel use
- they vary a great deal, as they can be smaller trucks, long-haul road trains, buses or garbage trucks that start and stop constantly
- there are a wide variety of heavy vehicle configurations available for specific purposes, and relatively few in each class are sold, so performance testing of each vehicle type becomes a significant cost compared with the price of the vehicle
- disclosure of emission and fuel economy information is required as part of the light-vehicle ADR, but not as part of the heavy-vehicle ADR
- there is not yet a European directive for rating heavy vehicles or an agreed-on international approach.



The increasing use of road freight is a significant challenge, and replacing or retrofitting older heavy vehicles as soon as possible will greatly reduce greenhouse gas emissions and improve air quality.

There is considerable demand for fuel efficiency information by purchasers of heavy vehicles, as fuel consumption is a significant business cost. However, vehicle manufacturers may be reluctant to make such information public through fear of a competitive disadvantage.

Responsibility/participation

The lead agency for development of the measure would be the Commonwealth Department of Infrastructure, Transport, Regional Development and Local Government. DECC would be the lead NSW agency.

Outcomes

NSW is working with the Commonwealth to develop a national rating scheme for heavy vehicles. Suggestions for future actions include disclosing qualitative information on vehicle fuel performance, including alternative fuels, and preparing a guide to choosing fuel efficient heavy vehicles.

The outcomes of this work will inform the baseline methodology for the heavy vehicles component of the NSW FleetWise Partnership (Initiative 10).

Initiative 9: Government leading by example

Program summary

The NSW Government has a range of programs for vehicles in government and private sector fleets, to maximise the benefits from improved vehicle standards, encourage early uptake of cleaner vehicles, and encourage better maintenance of, and lower emissions from, vehicles.

Under the Cleaner NSW Government Fleet Initiative, NSW Government agencies are required to:

- identify the current environmental performance of their motor vehicle fleet
- develop a fleet improvement plan
- monitor and report their performance against environmental and greenhouse gas reduction targets.

The STA is providing \$4 million to retrofit older diesel buses operating in Sydney to reduce their particle emissions, and replacing older buses with new ultra-low-emission Euro 5 diesel buses and CNG buses in heavily trafficked inner city areas.

Background

The NSW Government's vehicle fleet is one of the largest in the country, containing about 25,000 vehicles. Actions taken to improve the environmental performance of the fleet have a major impact on emissions and a flow-on effect for NSW when the vehicles are sold.

The Cleaner NSW Government Fleet Initiative applies to passenger and light commercial vehicles of less than 3.5 tonnes. It aims to:

- encourage procurement of smaller, cleaner and less polluting vehicles
- reduce fuel consumption and greenhouse gas emissions
- save vehicle purchase and running costs.



V8-powered vehicles have now been removed from the Government's general Motor Vehicle Contract owing to their poor fuel efficiency, high emissions and high maintenance costs.

Responsibility/participation

All Government agencies are responsible for reducing the emissions from their vehicle fleets. The Department of Commerce coordinates the Cleaner NSW Government Fleet Initiative. The STA is responsible for the cleaner bus fleet.

Outcomes

- Achievement of the performance targets will see a 20% reduction in greenhouse gas emissions and a 20% improvement in overall environmental scores.
- 505 new low-emission buses will save over 190 tonnes per year of greenhouse gases, 7.2 tonnes per year of particles and over 170 tonnes per year of NO_x.
- The Cleaner NSW Government Fleet initiative will save substantial costs and reduce greenhouse gas emissions by over 55,000 tonnes over three years through increased fuel efficiency.

Initiative 10: NSW FleetWise Partnership

Program summary

The NSW FleetWise Partnership (FleetWise) aims to improve both the procurement and the operation of light and heavy vehicle fleets in NSW, by:

- encouraging the procurement of smaller, cleaner and less polluting vehicles
- reducing fuel consumption, reducing greenhouse gas emissions and improving air quality
- saving on vehicle purchase, running and maintenance costs.

Background

FleetWise is a voluntary partnership program between DECC and the operators of private sector and local government fleets in NSW.

FleetWise has two main components.

A light-vehicle partnership

Passenger fleet operators are being encouraged to improve the sustainability of their fleets, in a similar way to the NSW Government's commitment to move to smaller, cleaner four-cylinder vehicles. A benchmarking exercise, the NSW Clean Car Benchmark, will be used to rate the environmental performance of new passenger vehicles, measure improvements in performance over time, and encourage the purchase of cleaner, more efficient vehicles. In addition, participating organisations will be encouraged to improve the operational performance of their fleets through practices that reduce the use of the fleet, such as working from home, or that optimise the environmental performance of particular vehicles, such as improved maintenance of vehicles or switching to less emissions intensive fuels.

A heavy-vehicle research project

The outcomes of Initiative 8 will be used to inform this step.



The project will identify sustainability opportunities, such as cleaner fuels and technologies, and improved operational and maintenance practices, to develop a model for more sustainable heavy vehicle fleets. This project will involve developing a similar benchmarking exercise to the one used in the light-vehicle partnership.

The project will:

- identify cleaner, more efficient heavy vehicles that reduce greenhouse and noxious emissions
- implement superior operational and maintenance practices (such as driver training and in-service inspection and maintenance programs, to ensure that vehicles are operating to their maximum efficiency
- use better technologies, such as hybrid electric vehicles.

Responsibility/participation

FleetWise is a voluntary partnership between DECC, business leaders in sustainability (corporate fleets) and the freight transport sector, which is funded by the Environmental Trust under the Clean Air Healthy Communities Fund.

Outcomes

- Reductions in NO_x, VOC, particle and greenhouse gas emissions
- Corporate sector engagement in reducing emissions
- Enhanced sustainable fleet management practices.

