

AUDITOR-GENERAL'S REPORT

PERFORMANCE AUDIT

Managing Air Quality

Department of Environment and Conservation



The Legislative Assembly
Parliament House
SYDNEY NSW 2000

The Legislative Council
Parliament House
SYDNEY NSW 2000

In accordance with section 38E of the *Public Finance and Audit Act 1983*, I present a report titled **Managing Air Quality: Department of Environment and Conservation**.

A handwritten signature in black ink, appearing to read "R J Sendt".

R J Sendt
Auditor-General

Sydney
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Foreword

Air is fundamental to our existence.

The quality of our air is a key issue for everyone. It directly affects our health. It also affects our environment, and can even affect our economy.

And air pollution does not respect geo-political boundaries. Pollution produced locally may have regional and global implications.

The substances which may pollute our air can interact in complex ways, which even the best scientists do not fully understand. Strategies that reduce some types of air pollution can make others worse.

All this points to the need for a well-planned and coordinated approach with effective monitoring, review and reporting.

The Government's plans to address air quality issues place particular emphasis on pollution from road transport as a major contributor to air pollution. Managing these emissions is a critical issue facing governments everywhere, and is an important part of a broader challenge of developing sustainable cities.

This performance audit examines the New South Wales Government's approach to managing air quality. It is also one of several by my Office in recent times with an environmental focus.

These audits contribute to an understanding of complex issues in public administration and to public debate on issues that affect us all.

Bob Sendt
Auditor-General

April 2005

Executive summary

The audit

The quality of air is fundamental to sustaining life on earth. Human induced pollution is one of the greatest threats to air quality. There is a trade-off between the quality of air we breathe and the pace of economic progress.

This audit examines the NSW Government's efforts to improve air quality. In particular, it focuses on progress with the Action for Air and Action for Transport 2010 plans. These plans recognised road transport, especially private cars, as the most significant threat to air quality.

We reviewed the Government's efforts to curb motor vehicle usage, encourage greater use of public transport, promote cleaner cars and fuels, and integrate air quality in transport planning.

Audit opinion

NSW has made significant progress in controlling certain air pollutants since the release of Action for Air and Action for Transport. NSW has met four of the key national goals for air quality ahead of target. It is not likely, however, to meet the other two in the short term. They are the ozone and particles goals. Both are important, but the ozone goal is the bigger challenge for NSW.

Vehicles and fuels are increasingly more efficient and cleaner but this will not be enough to meet the ozone goal without reducing private car use. The Government is not succeeding in encouraging people to reduce their reliance on cars and promoting greater use of public transport. Private car use in NSW is growing faster than population.

We are also building more roads, but many of the major rail projects in Action for Transport have not proceeded.

Transport planning and assessment instruments need to influence these trends in travel. Incentives to encourage people to use less polluting cars are yet to be implemented, and local councils need more support for their role in reducing pollution.

Air quality cuts across government structures. No single NSW agency has responsibility and accountability for improving air quality. Current inter-agency mechanisms need to be strengthened to drive implementation of strategies and achievement of results. While the Department of Environment and Conservation (DEC) is responsible for monitoring air quality and coordinating Action for Air, it is not resourced or empowered to assure implementation, or to have a strong influence on transport planning. The DEC will need to continue exploring co-operative mechanisms with other key agencies in order to deliver on Action for Air.

Improving air quality in New South Wales will require greater co-ordination of effort. Action for Air and Action for Transport both need stronger monitoring and review processes, and an increased scope. The State of the Environment report, currently under review, and other reporting on air quality need to provide more useful information both to policy makers and the public.

Audit findings and recommendations

Chapter 1

Action for Air provides a framework for managing air quality over 25 years to achieve compliance with the national air quality goals, especially the ozone and particles goals. This framework covered transport planning, transport choices, cleaner vehicles, cleaner businesses and industries, cleaner homes, and managing open burning as the key emission sectors requiring management.

Private car use is the single largest source of pollutants that contribute to the formation of ozone in the Sydney region. Action for Air recognised the threat of road transport emissions, and set targets for reducing private car use. The complementary Action for Transport was to achieve these targets and other transport related objectives.

Since the release of Action for Air and Action for Transport 2010, aspects of air quality in NSW have improved substantially. NSW has met four of six national goals ahead of the 2008 target date, but is unlikely to meet the ozone and particles goals. NSW records the highest number of exceedences of the ozone goal in Australia. Recent studies suggest that there is no safe ozone level.

Vehicles are increasingly more efficient and fuels cleaner. More gains are expected. However, private car use and car ownership are increasing, and people are making more and longer trips by car, especially for non-work journeys. Improved public transport and integration of air quality in transport planning could influence these trends.

In terms of the monitoring, review and scope of both Action for Air and Action for Transport, we found that:

- while a number of strategies in Action for Air and Action for Transport have been implemented, it is not possible to assess overall progress as many strategies have no targets or timeframe, and monitoring and reporting processes need improvement
- Action for Air has a public review process, but it is difficult to track the new and revised strategies decided at that review. The Minister for the Environment announced recently plans to release a revised Action for Air in 2005
- Action for Transport on the other hand has not been reviewed since its release, despite changes in transport priorities and directions. The Metropolitan Strategy under development is expected to include a new transport plan. At present, it is not clear when the strategy and the plan are likely to be finalised
- air toxic substances have only emerged as important in recent times and therefore do not feature prominently in Action for Air. However, a study released in 2001 found that most air toxics levels in NSW are low and well below current international standards and benchmarks
- the impacts of greenhouse gas emissions on air quality are not addressed in Action for Air
- Action for Transport needs additional strategies to support better the objective of reducing car use.

We recommend that the DEC:

- strengthen monitoring of Action for Air by setting targets and timeframes for all component strategies. Targets and timeframes should be set in consultation with relevant stakeholders and cater for changes in priorities
- prepare an annual overview status report on Action for Air
- periodically update Action for Air by incorporating and prioritising the changes decided at the public review process
- consider broadening the scope of Action for Air with strategies for managing the impacts of air toxic substances and specific regional pollution issues on air quality, and by linking it to greenhouse gas abatement programs.

We recommend that the Minister for Infrastructure and Planning:

- expedite finalisation of the new transport plan to be developed as part of the Metropolitan Strategy, and ensure this plan includes a monitoring, review and reporting process.

Chapter 2

The Commonwealth regulates vehicle emissions and fuel quality in Australia. Stricter vehicle emissions and fuel standards are being phased in, and are catching up with those in Europe and the US. By 2020, this is expected to reduce significantly noxious vehicle emissions in NSW, despite a forecast increase in private car use. The DEC has played an instrumental role in the introduction of stricter national standards.

Still, stricter standards will not be sufficient for NSW to comply with all the national air quality goals, or address adequately serious concerns about the health effects of fine particle emissions, particularly from diesel-powered vehicles. They will also not be enough to stop the growth in greenhouse gas emissions from transport. Greenhouse gases such as carbon dioxide and methane affect climate, but also can affect air quality.

We recommend that:

- the NSW Treasury consider implementing the stamp duty incentive scheme envisaged in the 'Cleaner Vehicles Action Plan' as well as other incentives for less polluting vehicles
- the Roads and Traffic Authority (RTA) expand the emission testing of heavy diesel vehicles, and implement a similar program for light petrol vehicles once a national standard for these emerges
- the RTA and DEC assess the benefits and effectiveness of trials of diesel fuels, alternative fuels, particle traps and fuel cell technology.

Chapter 3

Poor transport infrastructure planning has the potential to induce more traffic and congestion, hence more pollution. A key objective of Action for Air was that transport planning better consider likely air quality impacts.

The current planning and assessment of transport infrastructure proposals can be improved to provide more information on the likely impacts of these proposals on air quality.

The NSW Government is introducing a new approach for dealing with transport infrastructure. This will give the Minister for Infrastructure and Planning a central role in endorsement of major proposals.

A defined role for the DEC and NSW Health in transport planning and assessment is crucial to minimising the environmental and health impacts of transport proposals.

Also, improved guidance to proponents on the requirements and use of modelling tools would strengthen the assessment of environmental and health impacts of transport projects. The impact of greenhouse gas emissions from such projects is currently not assessed adequately and consistently.

Road tunnels are used increasingly in NSW. The management of tunnel emissions for the safety of users and nearby communities is complex. We found that consent or approval conditions for road tunnel operations may need tightening and/or expanding over time. This may be difficult to do under current arrangements.

We recommend that:

- the Department of Infrastructure, Planning and Natural Resources (DIPNR) strengthen the evaluation and prioritisation of project concepts, the assessment of transport proposals, and the role of the DEC and NSW Health in transport planning and assessment
- DIPNR, the DEC and RTA provide improved guidance to proponents on the assessment of environmental and health impacts of roadways
- the RTA improve its estimation of the scope and cost of proposals, particularly road tunnels
- DIPNR monitor the need for retrospective changes to approval conditions for tunnel operations and submit proposals to the Cabinet Standing Committee for Infrastructure and Planning where changes are needed. This should be done in consultation with all relevant Ministers and their respective agencies, especially the DEC, RTA, NSW Health and Treasury, using agreed protocols for agency consultation and input.

Chapter 4

Air toxic substances are found in relatively small concentrations, but pose a serious risk to human, plant and animal life. Vehicles are a major source of air toxic substances. Understanding of the characteristics and risks of these substances is evolving, and there are no national air toxic standards.

The levels of most air toxic substances in NSW are generally low. NSW is more advanced than other Australian jurisdictions in its understanding of air toxics and has introduced a range of control measures for these substances. NSW also influenced national initiatives, including the introduction of a National Environment Protection Measure for air toxics substances (NEPM) in 2004. Work underway as part of this NEPM is likely to inform the development of national air toxics standards.

Notwithstanding NSW's good performance in this area, given the risk that these substances pose, the breadth of existing initiatives and the anticipated growth in national requirements, there is a need for a more strategic approach to air toxics.

We recommend that the DEC develop an air toxics strategy as a basis for:

- prioritising, resourcing, expanding, reviewing and reporting on initiatives and programs, within the NEPM context and broader air policies and programs
- ensuring early compliance with national goals as these emerge.

Chapter 5

Greenhouse gases affect climate, but can also affect urban air quality through their interaction with urban pollutants.

Australia has the highest greenhouse gas emissions per capita in the developed world. This is more than double the 'developed' world average. NSW ranks 16 in the world's per capita emissions.

NSW has led Australia in addressing greenhouse gas emissions from the stationary energy sector. Still, emissions from this sector and transport will continue to increase unless significant action is undertaken. While the NSW Greenhouse Gas Abatement Scheme for the stationary energy sector and initiatives such as BASIX (an initiative to reduce water and energy use in new homes) have the potential to make improvements, a broader and stronger regulatory framework is likely to be needed.

The recently established NSW Greenhouse Office is developing a comprehensive, integrated whole-of-government approach to greenhouse gas emissions. The following recommendations would assist this process.

We recommend that the Cabinet Office work with other agencies to:

- fast track the development of an energy policy that incorporates greenhouse gas emissions in the decision making process, supported by a State Environmental Planning Policy (SEPP) and environmental impact assessment guidelines on energy and greenhouse gas emissions
- improve the evaluation and prioritisation of infrastructure proposals in terms of their contribution to greenhouse gases, and strengthen the role of DIPNR and the DEC in the assessment of energy intensive developments
- implement reporting provisions for greenhouse gas emissions if a national scheme for industry reporting and disclosure is not introduced
- increase investment in demand management in the energy sector.

Chapter 6

Monitoring air quality and estimating emissions from sources of pollution are crucial to the development of targeted pollution control programs.

The DEC operates the largest network of air quality monitoring stations in Australia. The network is facing increasing demands and more stringent national requirements. Lack of historical permanent funding has prevented long term planning of network operations. The DEC has recently secured permanent funding for the network and is now well positioned to develop a long-term plan.

However, due to recent budget reductions, the DEC has had to reduce the number of stations by about one quarter. The impact of this significant reduction in monitoring capacity should be reviewed in the future.

The DEC is updating all data sources (or pollution inventories) used in estimating emissions from sources of pollution. Validation of estimates is resource intensive, but necessary to ensure control programs are based on the best available information.

Pollution created locally affects regional air quality. Currently, there is no formal mechanism to monitor effectively the performance of local councils in managing local air quality.

We recommend that the DEC:

- finalise the development of an air quality monitoring strategy that encompasses the existing monitoring plan for reporting against the national standards
- validate all updated pollution inventories
- develop a strategy to assist local councils in managing local air quality.

Chapter 7

The DEC publishes various reports on air quality. Through the State of the Environment Report, the DEC collects substantial information on the environment. This can influence environmental policy and management. Currently, the report, and reporting generally, does not include recommendations to government for remedial actions nor inform the public in a user-friendly way of progress in managing air quality.

The DEC provides on its website extensive air quality monitoring data. There have been extended delays in the release of some monitoring data due to resource limitations, time-consuming quality assurance processes and lack of online access to some monitoring stations.

We recommend that the DEC:

- improve and broaden the scope of the state of the environment report
- rationalise and improve the timeliness of reported air quality data, and ensure more user-friendly reporting style and online access to real time data.

Refer to Appendix 1 for responses from agencies.

1. Reforming the air quality management framework

At a glance

In 1998, 'Action for Air' proposed a range of strategies to tackle key sources of pollution over 25 years. Its objective was to meet all the national air quality goals, particularly the ozone and particles goals as the two most concerning air pollution issues identified at the time.

The plan set targets for reducing private car use as the single largest source of pollutants that contribute to the formation of ozone in the Sydney region. It also sought to promote cleaner cars and fuels, and integrate air quality in urban transport planning.

The complementary Action for Transport 2010 plan was to deliver on commitments made in Action for Air as one of its core objectives.

This chapter examines progress with these plans, and key factors that affect their success in delivering on stated objectives.

1.1 Action for air

First comprehensive air quality plan

NSW was the first Australian jurisdiction to release a comprehensive 25-year air quality management plan. 'Action for Air' is an ambitious plan that reflects the Government's aspirations and long-term commitment to improving urban air quality in the Greater Metropolitan Region (GMR). The GMR comprises Sydney, the Lower Hunter and the Illawarra, which contain about 78% (4.5 million) of the State's population.

The release of this plan followed a four-year Metropolitan Air Quality Study (MAQS) which identified the major sources of pollution and their impact on air quality. Photochemical smog (ozone) and particles less than 10 micrometres in diameter (PM₁₀) were identified as major threats to urban air quality.

Plan focused on ozone and particles

Action for Air proposed a range of strategies for tackling pollution from transport, industrial and domestic activities with the objective of complying with all the national air quality goals. Its focus, however, was on the progressive long-term reduction in ozone and PM₁₀.

Car use the largest contributor to ozone

Private car use is the single largest contributor to ozone formation in the Sydney region. Action for Air placed a high priority on reducing road transport emissions, particularly private car use. It sought to:

- reduce our reliance on the car by providing more and better public transport
- promote cleaner cars and fuels
- integrate air quality in urban transport planning.

Plan set targets to reduce car use

Action for Air set targets for reducing car use, measured in vehicle kilometres travelled (vkt). These targets were to halt the growth in:

- car use per head of population by 2011
- total car use by 2021.

Action for Transport adopted these targets

In 1998, the Government also released Action for Transport 2010 as a complementary plan to Action for Air. Action for Transport 2010 provided a package of infrastructure development, service improvement and demand management strategies. It committed to meeting the car use targets as one of its core objectives focusing on:

- improving the quality, safety and reliability of public transport
- expanding the capacity of the public transport network
- integrating air quality in urban transport planning.

Action for Air and Action for Transport are linked through common objectives and targets. A number of government agencies have responsibility for implementing component strategies of these plans, including the Department of Environment and Conservation (DEC), the Department of Infrastructure, Planning and Natural Resources (DIPNR), and the Roads and Traffic Authority (RTA).

1.2 National air quality goals

Air quality assessed against national goals

NSW and other Australian jurisdictions assess air quality against national goals for six pollutants, referred to as *criteria* pollutants, covered by the National Environment Protection Measure for Ambient Air Quality (Air NEPM). In 1998, the National Environment Protection Council (NEPC) introduced the Air NEPM which sets maximum permissible concentrations (goals) for each criteria pollutant. NEPC expects all Australian jurisdictions to meet these goals by 2008.

In addition to the six criteria pollutants, NSW reports against *advisory* reporting goals for fine particles less than 2.5 micrometres in diameter (PM_{2.5}), as part of the development of a national goal.

National goals for ambient air quality			
Criteria pollutant	Averaging period	Maximum concentration	Goal by 2008 Maximum allowable exceedences
Carbon monoxide (CO)	8 hours	9.00 ppm	1 day a year
Nitrogen dioxide (NO ₂)	1 hour	0.12 ppm	1 day a year
	1 year	0.03 ppm	None
Photochemical oxidants (as ozone)	1 hour	0.10 ppm	1 day a year
	4 hours	0.08 ppm	1 day a year
Sulfur dioxide (SO ₂)	1 hour	0.20 ppm	1 day a year
	1 day	0.08 ppm	1 day a year
	1 year	0.02 ppm	None
Lead (Pb)	1 year	0.50 µg/m ³	None
Particles as PM ₁₀	1 day	50 µg/m ³	5 days a year
Advisory reporting goals			
Particles as PM _{2.5}	1 day	25 µg/m ³	The aim is to gather sufficient data nationally to facilitate a review of the goal.
	1 year	8 µg/m ³	

Source: DEC

Health effects likely below national goals

Scientific evidence suggests that pollution exposure below these concentrations can affect health and that perhaps no completely safe threshold exists. Also, the cumulative and synergistic effects of pollutants on human health, and the effects of long-term exposure to pollution are not well understood worldwide. For these reasons, there is a process for reviewing and tightening national goals. For example, the sulfur dioxide and ozone goals are currently under review, and a comprehensive review of the Air NEPM is planned for this year.

DEC influences setting of national goals

The DEC contributes to the setting of national standards such as through:

- the development of standards for all six criteria pollutants
- data collection for the development of standards for PM_{2.5}
- the working group for the Air Toxics NEPM.

1.3 Compliance with national air quality goals

Assessing air quality against the national goals is a valid indicator of the impact of Action for Air on air quality to date.

Scope for more improvement

We found that some aspects of air quality in NSW have improved significantly since Action for Air was introduced in 1998, but other aspects need to improve more. Ozone and, to a lesser extent, PM₁₀ are still a significant threat to urban air quality. Private car use remains the single largest contributor to ozone formation in the Sydney region despite increasingly efficient vehicles.

NSW meets four of six goals

NSW already meets the national goals for lead, carbon monoxide, sulfur dioxide and nitrogen dioxide ahead of the 2008 target. Long-term trends show a steady fall in concentrations of these pollutants. NSW does not meet the national goals for ozone and PM₁₀. Trends indicate that NSW is unlikely to meet the national goals for ozone in major urban areas, and PM₁₀ in rural areas, by 2008.

Summary of NSW performance against the national goals		
Criteria pollutant	Compliance with standards/goals	
Nitrogen dioxide (NO ₂)	✓	Levels were below national goals in the Illawarra and the Lower Hunter and around the goals in Sydney before 1998. Levels have since fallen across the GMR.
Sulfur dioxide (SO ₂)	✓	Levels were well below national goals in 1998 and have since been maintained. Although SO ₂ is still an issue near point sources.
Lead (Pb)	✓	Levels were below national goals in the GMR before 1998 and have since fallen steadily due to the banning of leaded petrol and the introduction of unleaded petrol. Lead is still an issue near point sources.
Carbon monoxide (CO)	✓	Levels were around national goals in 1998 but have since fallen below the national goals due to stricter motor vehicle emission controls.
Photochemical smog (Ozone)	✗	Levels are still above the national goals in Sydney and the Illawarra. There are indications of a continuing underlying problem with ozone into the future, given pressures from a growing population, urban expansion and increase in motor vehicle use.
Particles as PM ₁₀	✗ ✓	Levels are still above the national goal, particularly in rural areas. NSW exceeds the national goal due to extreme events such as dust storms, bushfires, and hazard reduction burning. But the underlying levels are low.

Also, concentrations of PM_{2.5} exceed the annual *advisory* reporting goal, particularly in the Sydney region.

Threats to air quality vary between regions

Overall, the threats to air quality are:

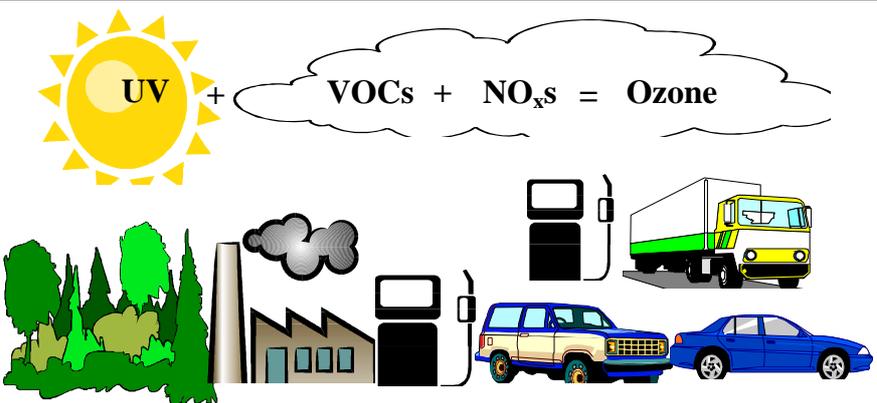
- motor vehicle emissions in the Sydney region
- industrial facilities in the Hunter and Illawarra regions
- the use of solid fuel home heating in winter in the tableland cities.

Vehicle emissions major contributor to ozone

Vehicle emissions remain the largest contributor to ozone formation and as such a challenge in that:

- NSW is not likely to meet the national goals
- NSW records the highest number of exceedences of the national ozone goal in Australia
- there is no safe ozone level. Recent health studies show a relationship between hospitalisations and deaths for certain health conditions and elevated ozone levels.

Ozone formation



$UV + VOCs + NO_x = Ozone$

Ozone forms in urban airsheds¹ when oxides of nitrogen (NO_xs) and volatile organic compounds (VOCs) react in sunlight, especially on hot sunny days. The relationship between ozone formation and these primary pollutants (VOCs and NO_xs) is complex, and the optimum control strategy for VOCs and/or NO_xs to achieve air quality objectives is not always easy to determine.

Vehicle emissions are a major source of VOCs, NO_xs and particles. In the Sydney region emissions from mobile sources (largely motor vehicles) account for:

- 76% of NO_xs emissions
- 43% of VOCs emissions
- 18% of particles emissions.

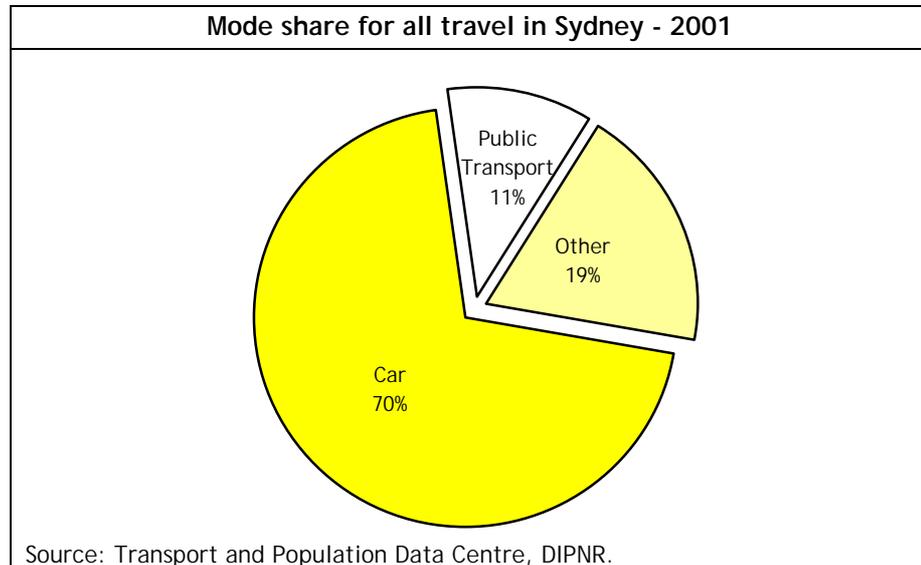
Car dependence increasing

We also found a substantial gap between the Government's stated objective and trends in transport and travel. In NSW, private car use is increasing and public transport use is decreasing:

- in 2001-02, total car use and car use per head of population increased by 3.1% and 2% respectively
- in 2001-02, each car in NSW travelled 15% more than the year before with around 70% of car use occurring in urban areas
- by 2020, car use is expected to increase by 32%, irrespective of land use and transport strategies currently in place
- the share of total travel by public transport, particularly rail, is declining - in the past few years passenger volumes for CityRail have declined.

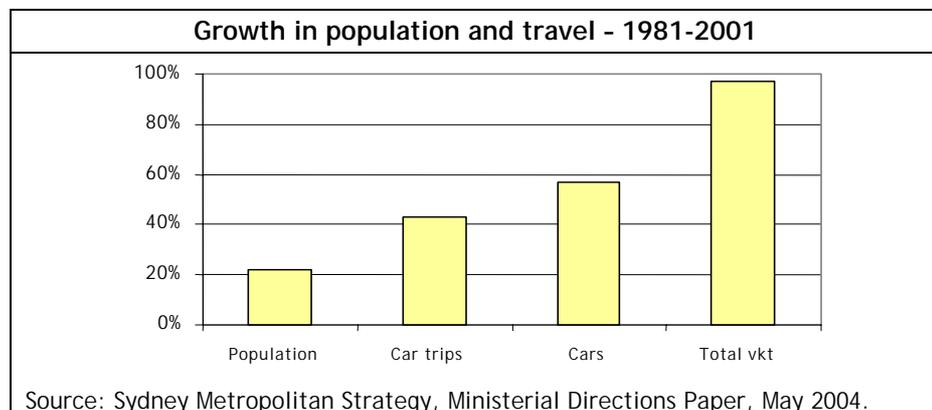
¹ The region across which air pollutants can be transported and recirculated, as defined by the combination of topography and meteorology, is often referred to as an airshed.

Currently, the share of car travel stands at 70% of all transport modes and is increasing. The share of public transport is 11% and decreasing.



Growth in car use expected in future

In fact, private car use in NSW is growing faster than population. In the last 20 years car use has grown four times faster than population growth. Car ownership is increasing, and people are making more and longer trips by car. Non-work travel has grown significantly in the last 10 years. For example, in 2001, 75% of all weekday trips were for reasons other than work, such as social, recreational, and dropping children at school. All this indicates that our public transport system has been steadily outgrown by rapid urban development and overtaken by car use.



Cleaner fuels and cars not enough to meet ozone goal

Despite a forecast increase of 32% in car use by 2020, noxious vehicle emissions are expected to fall significantly due to stricter national standards for vehicles and fuels. Still, these reductions will not be enough to:

- meet the ozone goals in the longer term
- address serious health concerns about emissions of PM_{2.5} and toxic substances from road transport. Air toxics substances differ from the six criteria pollutants in their characteristics and risks to human, plant and animal life. Also, there are no national standards for these substances. See chapter 4, section 4.1
- stop the forecast 43% growth in greenhouse gas emissions from road transport by 2020. Greenhouse gases affect climate, and through their interaction with urban pollutants can also affect air quality.

Transport trends not sustainable These trends are clearly unsustainable when broader environmental, social and economic costs of transport are taken into account. For example, transport's contribution to local pollution worldwide is responsible for about 1.1 per cent of all deaths annually.

Planning critical factor Transport planning is central to meeting future transport needs in a sustainable way. We found air quality issues can be better integrated into transport planning.

In the next sections we consider areas where Action for Air and Action for Transport could be strengthened to increase the likelihood that stated objectives will be achieved.

1.4 Monitoring implementation of the plans

Strategy prioritisation, targets, timeframes and reporting processes are important to:

- monitor progress with the plans
- assess the impact of implementation delays
- hold agencies accountable for responsibilities under the plans.

Action for Air progress difficult to monitor Many strategies in Action for Air have been implemented or are progressing. However, not all strategies have set targets, or timeframes, nor have they all been prioritised. So it was not possible for us to assess whether implementation of some strategies was progressing as planned. For example, Action for Air:

- set targets for reducing private car use, but set no targets for increasing public transport use and walking and cycling
- envisaged the formulation of a State Environmental Planning Policy (SEPP 66) to guide transport planning in new urban areas. The purpose of SEPP 66 is to encourage mixed-use developments so as to maximise access to services by non-motorised modes such as walking and cycling. The existing SEPP 66 has been in draft form for a number of years and is yet to be finalised.

DIPNR advised that:

- the principles of the draft SEPP 66 have been used in the planning for the South-West and North-West new release areas
- the Integrating Land Use and Transport (ILUT) policy package also provides guidance.

Action for Air needs stronger oversight A Senior Officers Group headed by the DEC is responsible for monitoring and reporting on air quality management efforts in NSW. This group coordinates a stock take of Action for Air achievements every three years. However, there were no evident processes for regular agency reporting against the plan. The RTA is the only agency that reports on Action for Air in its annual Environment Report. The stock take also does not address or explain the implications of implementation delays.

Minutes of meetings suggest that this group had not met for almost two years as at April 2004. This group resumed its role shortly after to coordinate a stock take of achievements for a public forum on Action for Air.

Action for Transport progress not as planned Action for Transport committed significant funds to investment (\$4 billion to 2010) in transport infrastructure with a mix of projects that reflected the transport priorities at the time. For example, the Government committed about \$300 million a year to 2010 for new rail projects alone.

Transport priorities changed

While some major key transport projects have been completed, a number of projects have been brought forward, others deferred, and new ones have emerged. Overall, there have been more road projects implemented than planned, but most rail projects have not proceeded as planned. Recently the Government committed to spending \$1 billion on rail clearways to increase the reliability and frequency of services as a new priority.

Examples of implementation progress ¹	
Projects completed	Projects deferred/delayed ²
<ul style="list-style-type: none"> ▪ Airport Rail Link ▪ Liverpool to Parramatta transitway ▪ M5 East; Eastern Distributor ▪ Cumberland Highway upgrade ▪ Lilyfield extension of the light rail. 	<ul style="list-style-type: none"> ▪ Parramatta - Strathfield transitway by 2002³ ▪ St Mary - Penrith transitway - stage 1 by 2003 and stage 2 by 2008 ▪ Parramatta -Blacktown transitway by 2004 ▪ Blacktown Wetherill Park transitway by 2006 ▪ Sydney - Wollongong High speed rail by 2010 ▪ Sydney - Newcastle high speed rail by 2010 ▪ Hurstville - Strathfield rail link by 2014 ▪ Liverpool Y link by 2010 ▪ North West rail link by 2010 ▪ Parramatta - Epping rail link.
Proposed projects	
<ul style="list-style-type: none"> ▪ Widening of the Spit Bridge ▪ Extension of the M4 eastwards ▪ National link between the F3 and the Sydney Orbital. 	
Projects brought forward	
<ul style="list-style-type: none"> ▪ Windsor Road upgrade ▪ North - West transitway 	
<p>1. This table only examines infrastructure projects listed in Sydney Action for Transport. This plan only covered strategic projects.</p> <p>2. RTA advised that a number of transitways have been deferred due to slower than anticipated private sector development of new suburbs, eg. St Marys to Penrith (Australian Defence Industries site) and Blacktown to Wetherill Park (Boral Greystanes site).</p> <p>3. A cross-regional bus service has been introduced between Parramatta and Strathfield, rather than a full transitway.</p>	

Impact of changes not assessed

Agencies involved in Action for Transport report progress with projects to Premier's Department on a quarterly basis. The impact of changes in priorities and directions on overall progress, and the contribution of new projects to stated objectives are not addressed.

1.5 Reviewing and updating the plans

Regular reviews and evaluations of the plans can inform the development of new and revised strategies, and update the plans with new and emerging knowledge.

Action for Air reviewed

There is a public review process for Action for Air, which seeks input from a broad range of stakeholders on the future directions of the plan. This results in new and revised strategies to align the plan with new developments and priorities. Action for Transport has no similar review process.



The DEC is required to hold a broadly based forum on Action for Air within six months of the publication of each *NSW State of the Environment Report* (SoER) every three years. The forum encourages input from key stakeholder groups on air quality trends and strategies, and this informs future development of the plan.

The DEC reports the proceedings of the forum, and the Government's position on new and/or revised strategies suggested by the forum in an 'Action for Air Update'. The DEC issued an 'update' on the 2001 forum. An update on the 2004 forum is expected in 2005.

Difficult to track decisions of review

Many of the new and revised strategies from the first forum do not have targets or timeframes and have not been prioritised in the 'update', and in relation to other strategies in the plan. Monitoring progress will be difficult over time, especially with eight separate updates expected by 2023.

We also found that there is uncertainty among stakeholders as to whether the 'Action for Air Update' represents a revised plan or a supplement, and which document is being monitored.

The DEC believes it would be impractical to amend the plan after each forum reflecting changes in strategies, targets, timeframes, priorities and responsibilities for actions. We think that doing so would improve the transparency of this process, and strengthen monitoring of progress and accountability for results. As a compromise, we would recommend at least periodic updates be made to the plan.

In November 2004, the Minister for the Environment announced at the Clean Air forum that a revised Action for Air would be issued by the middle of 2005.

Action for Transport not reviewed

Action for Transport 2010 has not adapted to changes in transport priorities and directions that have occurred since 1998. This plan has no review process or public reporting on its broader impacts to assist public scrutiny and value for money assessments.

New transport plan expected

DIPNR advised that the Metropolitan Strategy under development will include a new transport plan. While DIPNR has not indicated when the new plan is likely to be finalised, we believe this plan should have a process for regular monitoring, review and reporting.

1.6 Broadening the plans

Broadening the scope of the plans to account for other important contributors to air pollution would strengthen the management of air quality in NSW. Some examples follow.

Action for Air needs regional strategies

Different regions have different pollution issues. These require specific responses. Developing 'Regional Action for Air' plans as part of Action for Air would help local authorities in developing targeted 'local Air Quality Management' plans. Local Government is well positioned to have a critical impact on air quality. See chapter 6, section 6.3.

Air toxic substances do not feature prominently in Action for Air, as understanding of these substances was evolving and national standards were not available when the plan was launched. Yet vehicles, particularly diesel-powered vehicles, are by far the largest source of air toxics.

Action for Air needs air toxics strategy

NEPC has recently introduced benchmarks of acceptable performance for air toxics. Such benchmarks could guide the development of an air toxics strategy to ensure compliance with national goals when these emerge.

Action for Air recognised the broader air quality planning context of greenhouse gases and climate change. However, to date, greenhouse gas abatement strategies do not comprehensively address emissions from all sectors, such as transport.

Greenhouse gases and most criteria pollutants are often emitted from a common source, such as vehicles or industries. Greenhouse gases and urban pollutants also interact in certain weather conditions leading to some combined effects (greater than individual effects) that can potentially damage urban air quality.

Action for Air needs links to greenhouse gas abatement programs

Generally efforts to address urban air pollution also reduce greenhouse gas emissions, and the reverse is also true. However, there are instances where efforts to reduce greenhouse gas emissions might adversely impact local emissions. Therefore, it is important that the management of these activities be integrated.

Examples of contradictory strategies

Diesel-powered engines are less greenhouse gas intensive than petrol powered engines, but more damaging to urban air quality. Increased use of diesel vehicles may lead to lower greenhouse gas emissions but higher local emissions such as particles and air toxics.

Cogeneration involves the generation of combined useful heat and electricity from a single fuel. While this technology is beneficial in terms of greenhouse gas emissions, it may have adverse impacts on urban air quality.

Conversely, catalytic converters reduce local emissions but increase fuel use, and in doing so, lead to an increase in greenhouse gas emissions.

The second Clean Air Forum held in November 2004 raised and reviewed the relationship between, and the impact of, climate change and air quality.

Action for Transport needs strategies to reduce car use

Action for Transport could also be strengthened if the objective of reducing private car use is supported with:

- a long-term plan for improving the accessibility, quality, reliability, affordability and frequency of public transport services, and integrating public transport services (buses, trains and ferries) and walking and cycling
- the integration of this plan with strategies for road planning and pricing.

Currently, it is not clear if public transport services have improved as a result of projects implemented. Building more roads without improving public transport services can encourage more private car use.

Need flexible transport options

Traditional public transport can efficiently move large numbers of people. This form of transport is less effective at catering for the diverse range of non-work trips. Action for Transport would benefit from a strategy for capturing these growing non-work journeys with cheaper and more flexible and desirable forms of public transport.

Need integrated public transport services

The integration of public transport services (buses, trains and ferries) and walking and cycling is also likely to encourage greater use of public transport. Action for Transport is yet to include an integrated public transport strategy. The recent Ministerial Inquiry into Public Transport by Professor Tom Parry and the review of bus services by the Honourable Barrie Unsworth should inform such strategy.

DIPNR advised that the new transport plan to be developed as part of the Metropolitan Strategy will cover integration of public transport services.

**Need
additional
measures**

There are additional measures that could also potentially reduce road use and pressure for expansion of the road network. While NSW has introduced measures to restrict parking, increase car occupancy and promote cycling, there is scope for more.

Parking restrictions

Stricter parking strategies can reduce congestion by increasing the cost of travel. They are used as a key element of transport policy in many countries. Some European cities have banned parking and driving in the CBD.

The former NSW Department of Transport worked for three years on a metro parking policy, but with the recent restructuring of this Department into three portfolios, the responsibility for parking policy is unclear. The Ministry for Transport advises that:

- the Parking Strategy for Sydney will be part of the overall Metropolitan Strategy development by DIPNR
- RTA is responsible for legislation and policy covering street parking restrictions and permit parking
- actual application of parking restrictions is generally a matter for local councils except for clearways
- the Minister for Transport retains responsibility for the Parking Space Levy Act 1992 (PSLA) which aims to discourage car use in business districts. This Act is currently under review.

Increased car occupancy

The average car occupancy rate in Australia and NSW is about 1.1 persons. This means high emission levels per passenger kilometre travelled, and places pressure on the road transport network.

Promoting cycling

A third of all car trips in Australia are less than three kilometres. Short car trips are the most environmentally damaging. Cycling or walking such short distances offer significant environmental and health benefits.

The share of cycling in Australia is less than one per cent of all trips. In The Netherlands it is 28%, and in West Germany 12% of all urban trips.

NSW 'Action For Bicycle' plan set a target for building an additional 200 kilometres of cycle ways a year, but set no target for the uptake in cycling. The national 'Cycling Australia' plan set targets to double bicycle use by 2004.

Road use charges

Charging motorists the full cost of road use (eg infrastructure costs, space allocated for parking, and damages from vehicle emissions such as noise pollution, air pollution, deaths, accidents and congestion) would encourage more efficient use of the network. Due to equity considerations, this measure is difficult to implement without substantial improvements in public transport services.

Sydney has a relatively high congestion cost per vehicle kilometre as compared with most other states. NSW congestion cost accounts for approximately 81% of the external costs of road transport, which include accidents, noise pollution, air pollution and congestion.

The Government has recently established a Transport Working Group to provide advice in the development of the Metropolitan Strategy. We suggest this group consider some of these measures and other incentives to address complex issues such as:

- newer cars travel more than older cars, but generally produce less noxious emissions due to the more stringent national standards for vehicle design and fuel. However, they still play a part in congestion and expansion of the road network
- gains from a reduction in car use can be offset by the use of more powerful and heavier vehicles with higher fuel consumption and greenhouse gas emissions
- experts suggest that air pollution from vehicle emissions is more intense with short trips, varies with the driving speed and almost doubles in congested traffic conditions - due to longer idling times, stop start driving and less than optimal speeds.

We recommend that the DEC:

- strengthen monitoring of Action for Air by setting targets and timeframes for all component strategies. Targets and timeframes should be set in consultation with relevant stakeholders and cater for changes in priorities
- prepare an annual overview status report on Action for Air
- periodically update Action for Air by incorporating and prioritising the changes decided at the public review process
- consider broadening the scope of Action for Air with strategies for managing the impacts of air toxic substances and specific regional pollution issues on air quality, and by linking it to greenhouse gas abatement programs.

We recommend that the Minister for Infrastructure and Planning:

- expedite finalisation of the new transport plan to be developed as part of the Metropolitan Strategy, and ensure this plan includes a monitoring, review and reporting process.

We examine in:

- Chapter 2, vehicle emission reduction strategies and opportunities for further reductions
- Chapter 3, transport planning and how it could integrate better air quality issues
- Chapter 4, early management approaches to air toxic substances, and the significance of these substances in terms of vehicle emissions
- Chapter 5, the management framework for greenhouse gas abatement strategies and areas for consideration in the soon to be released greenhouse strategy
- Chapter 6, the importance of the air quality monitoring network and estimation of pollution from sources, and the role of local councils in managing regional air quality
- Chapter 7, reporting on air quality and how this could better inform policies, programs and the public.

2. Strategies for reducing vehicle emissions

At a glance

A key objective of Action for Air and Action for Transport was to promote the use of cleaner cars and fuels in order to reduce noxious vehicle emissions.

The Commonwealth Government regulates vehicle emissions and fuel quality in Australia and is progressively introducing stricter standards.

NSW has a range of initiatives, including the 'Cleaner Vehicle Action Plan' to encourage the uptake of cleaner cars, and emission testing programs for older vehicles, especially the more polluting heavy diesel vehicles.

This chapter examines progress with and impact of Commonwealth and State initiatives in reducing noxious vehicle emissions.

2.1 Factors governing vehicle emissions

Vehicle emissions are a function of the distance travelled and governed by two important factors: fuel efficiency and emission intensity.

Key factors governing vehicle emissions		
Total vehicle kilometre travelled (vkt)	Fuel efficiency (fuel consumption per vehicle kilometre)	Emission intensity (emission per litre of fuel)
Car dependency is influenced by systemic factors such as accessibility, reliability and quality of public transport.	Fuel consumption depends on factors such as efficiency of engine technology, engine power, and vehicle weight.	Emission intensity varies with engine technology and fuel type (eg Petrol, Diesel, LPG, CNG).

Fleet features determine total emissions

Many factors affect total emissions from vehicles on the road, including:

- the age profile of the vehicle fleet
- the distribution of vehicles in the fleet meeting certain emission standards
- the distance travelled by each vehicle in each of these age/emission standard groups in the fleet
- the driving conditions.

Urban features determine pollution levels

However, the contribution of total vehicle emissions to air pollution is determined by the complex interaction of those emissions with each city's meteorological, topographical and other urban design features.

2.2 National vehicle emissions and fuel standards

The Commonwealth Government regulates vehicle emissions and fuel quality in Australia.

Stricter vehicle emissions and fuel standards are being phased in, and are catching up with those in Europe and the US. This is expected to lead to significant emission reductions by 2020 even with a forecast 32% increase in car use over the same period. However, greenhouse gas emissions from road transport will continue to grow and fine particles of diameter smaller than 2.5 micrometres (PM_{2.5}) will remain a serious health concern.

Commonwealth regulates vehicle emissions The Commonwealth sets vehicle emission standards for *new* cars in the Australian Design Rules (ADRs)². These are enforced as national standards for both vehicle safety and environmental performance, under the Commonwealth *Motor Vehicle Standards Act 1989*. The Commonwealth also introduced emission standards for *in-service* diesel vehicles, but not in-service petrol vehicles.

Vehicle emissions standards in Australia		
	New cars	Old cars (or in-service)
Diesel powered vehicles	✓	✓
Petrol powered vehicles	✓	✗

Emission standards catching up with world's best Australian emissions standards are aligned with international standards, referred to as the 'Euro Standards'. The Commonwealth is progressively upgrading the ADRs in line with world's best. The phasing in of these standards will take to the end of this decade. At present, diesel standards are closer to world's best practice than Australian petrol vehicle standards. For example, Europe implemented the Euro 2 and Euro 3 standards in 1996 and 2000 respectively. Australia implemented the Euro 2 for cars in 2003 and will adopt the Euro 3 this year.

Implementation dates of Euro standards to new vehicles in Australia					
Emissions standards for light duty petrol vehicles			Emission standards for heavy duty diesel vehicles		
Standard	Implementation date		Standard	Implementation date	
	New vehicles	All vehicles*		New vehicles	All vehicles*
Euro 2	2003	2004			
Euro 3	2005	2006	Euro 3	2002	2003
Euro 4	Proposed for 2008	Proposed for 2010	Euro 4	2007	2008
Euro 5 (not finalised)	N/A	N/A	Euro 5	Proposed for 2010	Proposed for 2011

* This refers to all new vehicles, not in-service vehicles.
Source: RTA and DEC

Commonwealth regulates fuel quality The Commonwealth also regulates fuel quality in Australia under the *Fuel Quality Standards Act 2000*. The first set of national standards for petrol and diesel came into effect in January 2002.

Fuel quality, particularly the sulfur content in fuels, is a key factor in determining what vehicle technologies can be used. High sulfur content hinders the uptake of new engine technologies needed to meet emission standards. It can also affect the efficacy and durability of a range of emission and fuel consumption reduction technologies.

Stricter fuel standards phased in The Commonwealth imposes higher excise on high sulfur content diesel and offers production grants as incentives to fast track the production of lower sulfur diesel. Sulfur and benzene content in petrol and diesel are being tightened.

² ADRs adopt international standards in the form of United Nations Economic Commission for Europe (UN ECE) standards which have been developed in Europe and are colloquially known as Euro standards.

Regulation of fuel quality in Australia: implementation of sulfur and benzene limits		
Benzene content limit	Sulfur content limit	
In Petrol	In Petrol	In Diesel
<ul style="list-style-type: none"> ▪ 5% applies now ▪ 1% to apply from 2006 	<ul style="list-style-type: none"> ▪ 150 ppm³ applies now to all petrol grades ▪ 50 ppm to apply to all petrol grades from 2008 	<ul style="list-style-type: none"> ▪ 1500 ppm applied in 1998 ▪ 500 ppm applies now ▪ 50 ppm to apply from 2006 ▪ 10 ppm to apply from 2009
Source: RTA and DEC		

Stricter standards not enough to meet ozone goal

The phasing in of stricter emission and fuel quality standards is expected to achieve emission reductions substantially higher than what was envisaged in 1998. Motor vehicle emissions of carbon monoxide, volatile organic compounds, oxides of nitrogen and particles (PM₁₀) are forecast to fall in NSW by 62%, 40%, 55% and 40% respectively by 2020, despite a forecast 32% increase in car use in that period. Still, these reductions in vehicle emissions may not reduce concentrations of ozone to levels that would ensure compliance with national goals.

Greenhouse gas emissions increasing

Also, greenhouse gas emissions from road transport are growing at a rate of 43% with increases expected well into the future. According to the Bureau of Transport and Regional Economics, current emission reduction strategies for road transport would not be sufficient to reduce greenhouse gas emissions from road transport without further increases in vehicle fuel efficiency beyond those envisaged by 2008.

Fine particles a health concern

Further, vehicle emissions, particularly diesel emissions are of concern even with stricter standards. Diesel fuels produce disproportionately high amounts of fine particles (PM_{2.5}). These are associated with hospital admissions for chronic respiratory and heart disease and have been linked with increased mortality. The Californian Air Resources Board (CARB 1998) estimated that 98% of particles from diesel are less than PM₁₀, 94% less than PM_{2.5} and 92% less than PM₁.

Also, the incomplete combustion of diesel fuels produces numerous toxic compounds (eg polycyclic aromatic hydrocarbons) which adhere to other particles resulting in serious risk to human health. For example:

- particles and toxic compounds aggregate and may be inhaled deeply into the lungs. This can damage lung tissue, impair lung function, and seriously threaten the health of people with chronic heart conditions and respiratory illnesses such as asthma, bronchitis and emphysema
- some toxic compounds are carcinogenic and mutagenic.

2.3 State initiatives for reducing vehicle emissions

NSW introduced a range of initiatives to encourage cleaner cars and cleaner fuels. Some initiatives have succeeded, the benefits of other initiatives are uncertain, and some initiatives with potential for significant benefits have not been implemented.

³ Parts per million

Plan to encourage uptake of cleaner vehicles

In November 2001, the NSW Government launched a 'Cleaner Vehicles Action Plan'. The five-point plan was to encourage the early uptake of cleaner vehicles - cars, trucks and buses - to maximise the environmental benefits from improved engine technology. It has specific measures for greening the Government fleet and private sector's fleet, and information on the environmental performance of vehicles. More than 50% of new vehicles are fleet vehicles.

Key elements of the 'Cleaner Vehicles Action Plan'	
1.	Clean car benchmarks - categorise the environmental performance of light vehicles (DEC)
2.	Green guide - gives consumers information on the environmental performance of new cars and light trucks (under 3.5 tonnes gross vehicle mass) (RTA)
3.	Stamp duty based on benchmarks - cars with improved environmental performance to pay less stamp duty (Treasury)
4.	Clean Government fleet - improve the environmental performance of the NSW Government fleet (State Fleet)
5.	A voluntary clean fleet program for private companies - recognises private sector fleet operators for the implementation of environment friendly practices (RTA).

Stamp duty incentive scheme not implemented

The first two components of the plan have been finalised. The third component, the stamp duty incentive scheme, awaits approval. This scheme is central to the plan as it provides incentives to purchase less polluting vehicles. It involves a system of taxes (fees) for more polluting vehicles, and rebates for less polluting vehicles to raise consumer awareness about the impact of vehicle choice.

The fourth component of the plan, the Clean Government fleet program, requires government agencies to incorporate petrol/electric hybrid motor vehicles into their fleet with targets of:

- at least one hybrid vehicle for fleets of 25 to 99 vehicles
- one per cent hybrid vehicles for fleets of 100 or more vehicles.

Clean vehicle targets not met

Although some agencies have made gains, these targets have not been met and compliance reporting by government agencies could be improved.

The NSW Government has announced recently mandatory emission reduction targets for its fleet instead of specifying vehicle or fuel type. This is a more desirable option, as it would give agencies the flexibility to achieve the reduction targets in the most cost effective manner.

Eight cylinder vehicles will no longer be available for purchase through the Government contract; and every Government agency will be required to:
<ul style="list-style-type: none"> ▪ develop a fleet improvement plan by 1 July 2005 to meet targets ▪ improve the average 'environment performance score' of their fleet using the NSW Clean Car Benchmarks ▪ progressively reduce annual greenhouse gas emissions to achieve a 20% reduction by 2007-08 (based on 2004-05 performance).
The Government is expected to set new targets in 2007.

Gross polluters targeted The DEC operates jointly with RTA the 'smoky vehicle program' that targets vehicles on the road emitting visible smoke for more than 10 seconds.

The performance of vehicles over time is an important factor to maintain acceptable emission limits. The NSW Government has targeted diesel-powered vehicles, as these are disproportionately high polluters. Commercial diesel engine vehicles, particularly trucks are fewer in number and kilometres travelled, but are a significant source of noxious emissions, and visible smoke.

Diesel vehicles highly polluting Diesel powered vehicles constitute only 8.4% of the motor vehicle fleet in NSW, but are responsible for approximately 22% of oxides of nitrogen emissions and 51% of particle emissions. These vehicles have been the focus of in-service programs. The National Environment Protection Measure for Diesel Vehicle emissions (diesel NEPM) introduced in 2001 has guided the development of these programs.



GOOD PRACTICE

RTA has implemented an emission-testing program for the in-service heavy diesel vehicle fleet (private, council and government) and developed the Clean Fleet audited maintenance program. This involved developing business rules, a communication program and testing of over 2000 vehicles, including around 1400 diesel buses. This program has achieved an average emission reduction of 25% for identified high polluters.

The RTA is progressively rolling out this scheme to the 25 largest fleet operators. It has also developed a diesel emissions training course available through TAFE to diesel mechanics and fleet/workshop managers.

Older diesel vehicles a major source of particles A large proportion of emissions from the diesel fleet are from older vehicles. The RTA is now testing a range of diesel and alternative fuels to establish the fuels most likely to reduce particle emissions if used in existing diesel vehicles. Particle traps are also being tested. The RTA and DEC are expected to trial a significant number of particle traps and oxidation catalysts on older diesel vehicles with a view to demonstrating their benefits and effectiveness in reducing emissions.

Emission testing of petrol vehicles not implemented The implementation of an emission-testing and maintenance program for light petrol-powered vehicles has not progressed for reasons, including:

- there is no petrol NEPM to guide testing of in-service petrol-powered vehicles
- RTA found no conclusive evidence as to the efficacy of emission testing programs used elsewhere that could be adopted.

The Commonwealth is conducting a National In-Service Emissions testing program. Information from this study will determine the need for and the type of in-service programs for light petrol-powered vehicles. In the meantime, the RTA offers the public free voluntary emissions testing of petrol vehicles at its Botany and Penrith facilities, and also tests modified vehicles referred by the DEC.

Limits set on petrol volatility The NSW Government has also introduced a law for regulating petrol volatility in summer in the Sydney region. Petrol is highly volatile, and in summer, evaporative emissions are a significant source of volatile organic compounds which contribute to ozone formation. This law sets the lowest petrol vapour pressure limit of any Australian jurisdiction.



GOOD PRACTICE

In the longer term, fuel cell vehicles offer the promise of almost eliminating emissions. It is important that fuel cell bus trials currently underway are monitored to identify opportunities for use of this technology.

We recommend that the NSW Treasury:

- consider implementing the stamp duty incentive scheme envisaged under the 'Cleaner Vehicle Action Plan' as well as other incentives for less polluting vehicles.

We recommend that the RTA:

- expand the emission testing of in-service heavy diesel vehicles
- implement a similar program for in-service light petrol vehicles once national standards emerge to guide this program
- assess the benefits and effectiveness of trials underway of diesel fuels, alternative fuels, particle traps and fuel cell technology.

3. Integrating air quality into transport planning

At a glance

Poor transport infrastructure planning has the potential to induce more traffic and congestion, hence more pollution.

A key objective of Action for Air was to integrate air quality in transport planning so as to minimise any likely adverse impacts of transport infrastructure on air quality.

Three key decision making points are important to strategically guide development and infrastructure so that air quality objectives and other objectives can be achieved. They are strategic planning, strategy prioritisation and project assessment.

This chapter examines aspects of the transport planning and assessment process, and the M5 East road tunnel as a specific case study to illustrate findings and lessons learnt.

3.1 Improving project evaluation and prioritisation

Projects announced before evaluation

Many transport projects are announced and funding commitments made prior to evaluation of project concepts against a consistent framework. Evaluation of project concepts should occur at the strategic planning level prior to any announcement or funding commitments. Once proposals reach the assessment stage, there is increased pressure to proceed, as significant costs have already been incurred. Earlier assessment would avoid wasting time and money on projects which contradict stated objectives, and prevents the Government being caught with announcements or investigations which commit them to varying degrees to projects.

There is a need for a consistent framework for the evaluation of all project concepts prior to their inclusion in the strategic plan. Such evaluation should consider the contribution of proposals to stated objectives, eg improving air quality, increasing public transport use, reducing greenhouse gas emissions, etc.

The level of assessment is minimal at this stage because the concepts are not well defined. The UK New Approach to Transport Appraisal (NATA) provides some guidance to approaches of this kind.

Proposals not prioritised

Even after concepts are included in the plans, prioritisation should occur. We noted that projects included in the strategic plan and new projects announced have not been prioritised in terms of long-term impacts and flow on effects.

At this level it is vital that the *needs* in the location are clearly defined and that strategies/projects are evaluated based on meeting those needs in the long term. For example, in transport terms the ability of transport proposals to increase access for people to jobs and services.

This evaluation would focus on the long-term impacts of strategies and the flow on effects. For example, while strategic road network upgrades will continue to be required given Sydney's rapid population growth, additional road space can induce more traffic over time. On the other hand, public transport can encourage people to be more physically active on a daily basis in getting to the train or bus and thus improves their health. These overall costs and benefits need to be taken into account.

 **GOOD PRACTICE**

The NSW Government is introducing a new approach for dealing with transport infrastructure as part of the Metropolitan Strategy. This sets out a clear expectation that the Minister for Infrastructure and Planning will be central to the review and endorsement of major infrastructure proposals at the earliest possible stage.

The review of projects will, however, need to be supported by a consistent evaluation framework. Finalising the Metropolitan Strategy will be crucial to this framework and the role of the Minister.

Projects costing not adequate

We also noted that in some cases, the final cost estimates of some key projects have doubled and tripled original estimates. This prevents proper up-front evaluation of relative costs and benefits, and affects decisions on other projects. This also reflects on the adequacy of initial project development and estimation of the scope and cost of work.

	Cross City Tunnel	Lane Cove Tunnel
Original cost estimate	\$200 million (1999)	\$550 million (1999)
Final cost estimate	\$680 million (2002)	\$1100 million (2003)
Increase in ventilation cost	\$40 million	\$60 million
<p>The RTA advised that the final cost estimate of:</p> <ul style="list-style-type: none"> ▪ the Cross City Tunnel increased due to a revision of the project scope by the Premier. Also, following an EIS in 2000, proposals were invited for a privately funded tunnel. The preferred proposal was for a longer tunnel. A supplementary EIS prepared for this proposal resulted in additions to the approved project, including more stringent air quality measures, post-approval consultation and other work. These changes resulted in additional costs not included in the contracted price. ▪ the Lane Cove Tunnel increased due to the need to address issues raised in responses to the Overview Report and by the community; scope increases; and conditions of planning approval which required further consultation. 		

Underestimation of project costs is, however, not limited to road projects, eg Epping to Chatswood Rail Link.

3.2 Improving project assessment

The final point of intervention in major infrastructure projects for Government is via the *Environmental Planning and Assessment Act 1979* (EP&A).

We believe there is a need for a stronger and more defined role for the DEC and NSW Health in the assessment of transport proposals.

Role of Health in assessment not defined

NSW Health has no clear role in the assessment process. This is despite a strong link between transport pollution and human health. Analysis of short term, long term and cumulative health impacts of proposals on communities should be integral to the assessment process.

The role of the DEC in the assessment process is set out in the *Protection of the Environment Operations Act 1997* (POEO) and the *EP&A Act* for development requiring a *licence*.

Role of DEC in assessment limited	<p>The DEC has a statutory role as a determining authority arising from licensing construction of freeways and tollways, but not their operation. The <i>POEO Act</i> identifies freeway and tollway construction as a scheduled activity requiring an Environment Protection Licence, but not their operation. This means there is no legal requirement for the involvement of the DEC in the <i>assessment</i> of proposals, beyond licensing construction. However, planning approval may contain provisions which vest the DEC with an on-going role in respect of design and air quality monitoring for some projects.</p>
No Protocols for agency involvement in assessment	<p>In practice, DIPNR almost invariably seeks technical advice from the DEC and NSW Health in the assessment of transport proposals. This is done mostly through informal relationships at officer level. DIPNR has no control over these agencies, but it could accept or reject their advice, or ask for additional assessment work to be undertaken by other agencies. There are no agreed protocols defining which proposals require input from which agencies.</p> <p>Our 2001 Performance Audit Report on the Environmental Impact Assessment of Major Projects in NSW recommended the drafting of a Memorandum of Understanding between DIPNR (then DUAP) and the other environmental regulatory authorities likely to have an input in the assessment process. This would allow DIPNR to actively manage this process, and provide a transparent assessment process and clear agency accountability, and should remain a priority.</p> <p>DIPNR advised that:</p> <ul style="list-style-type: none">▪ the then Planning NSW and EPA drafted a Protocol and agreed in principle roles and responsibilities. The protocol was not endorsed because of re-organisation of government functions▪ it has established a working group with the DEC for protocol discussions but no meeting has occurred while the protocol process has been on hold▪ the protocol can be re-activated and provides a solid framework for cooperation that should be supported by agreed procedures. <p>The purpose of an air quality impact assessment is to determine if emissions from premises will comply with the appropriate environmental outcomes. We believe the requirements and guidance on such assessments should be improved.</p> <p>The DEC's 'Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW' (Approved Method) provides guidance for the modelling and assessment of air pollutants from stationary sources. It also specifies impact assessment criteria for a wide range of pollutants, which reflect the environmental outcomes adopted by the DEC.</p>
Need methodology for assessment of roadways impacts	<p>Use of the Approved Method is recommended for stationary sources i.e. major industrial sources. Roadways are not stationary sources, although in the case of a road tunnel, a ventilation stack would be a stationary source. There is a need for a methodology for the assessment of impacts of non-stationary sources, such as roadways and road tunnels.</p>
Modelling requirements not specific	<p>All modelling tools for the assessment of air pollution have inherent strengths and weaknesses. Use of a range of modelling tools is often necessary for validation purposes. The Approved Method lists a number of these tools. However, there needs to be specific requirements from the DEC for each proposal as to what the models must calculate (eg concentration limits, dispersion of pollutants, etc) and the type of meteorological conditions (worst conditions) to be modelled for roadways, particularly road tunnels.</p>

Such requirements are not always clearly specified up-front. We noted that the DEC routinely requires proponents to do additional work, and often several times.

Validation requirements not specific

Proponents must often validate the results of modelling roadway impacts by comparison with actual monitoring data. We found no guidance for proponents on how they should conduct such validation for roadways or tunnels, to ensure a consistent approach to the assessment of relevant impacts.

Limited assessment of cumulative impacts

Currently, the assessment of cumulative impacts (for multiple pollutants) of proposals on local air quality accounts for existing local and regional sources in setting limits or caps on emissions. Such assessments, however, do not account for the impacts of interregional pollution transfer i.e. the impact of pollution from one region on another.

No guidance on assessment of pollutants synergies

Transport is a major source of urban pollution and greenhouse gas emissions. Complex interactions can occur between urban pollutants as well as between urban pollutants and greenhouse gas emissions. Such interactions can lead to serious combined and cumulative adverse impacts on urban air quality.

Greenhouse gas emissions are considered as part of the air quality assessment of large infrastructure projects. However, there are no guidelines for the assessment of roadway impacts to ensure a consistent and comprehensive approach across all projects.

The separation of agencies' roles and responsibilities in managing urban air quality and reducing greenhouse gas emissions has meant that there is no single agency responsible for assessing the impacts of greenhouse gas emissions from road transport. At present, the DEC has a lead role in managing air quality. The recently established Greenhouse Office has a lead role in greenhouse gas emissions reduction.

We found that consent/approval conditions for road tunnels may need tightening and expanding over time for reasons we discuss in the next section. This is difficult to implement under current arrangements.

Most major infrastructure projects are assessed under *Part 5* of the *EP&A Act*. *Part 5* of the *EP&A Act* usually requires an Environmental Impact Statement (EIS) and the approval of the Minister for Infrastructure and Planning for a major project.

The RTA acts as the proponent for such projects (i.e. the RTA applies for the Minister's approval) and is also the 'determining authority' under *Part 5* of the *EP&A Act*. This means the RTA is responsible for compliance with the Minister's conditions of approval, even if the RTA contracts out the construction or operation of the project.

Retrospective changes to approval conditions difficult

Unlike the conditions of an environment protection licence, the conditions of approval for major road infrastructure projects *cannot* be tightened/modified over time by the Minister for Infrastructure and Planning, as the approval authority. Only a proponent can initiate modifications, but there is no incentive for the proponent to do so where the modification would require significant additional costs (such as changing some air quality requirements for tunnel operations).

In December 2003, the Government established a Cabinet Standing Committee to support the Minister for Infrastructure and Planning in reviewing and endorsing major infrastructure proposals. A key role of this committee is to consider standards that may have an impact on the design and cost of infrastructure, and proposals to review and remake existing standards.

Cabinet Standing Committee can consider changes

This means this committee can examine, amongst other issues, proposals for retrospective changes to conditions of approval for tunnel operations. This is important for changes that may involve:

- committing government to spending significant funds
- a policy decision about adopting new or more stringent national air quality requirements
- important public health and environment protection issues.

**Relevant parts of Premier's Memorandum No. 2003 - 17
Major Infrastructure Proposals**

- All Ministers should ensure that major infrastructure proposals are provided to the Minister for Infrastructure and Planning at the earliest possible stage and before detailed design and planning occurs.
- The Minister for Infrastructure and Planning will refer such proposals to the Cabinet Standing Committee on Infrastructure. Consideration and approval of proposals by this Committee will be required before they can be presented to the Standing Committee on the Budget, included in forward estimates, capital investment strategic plans and statements of business intent, considered for in-principle approval as projects of State Significance (in the case of Government businesses), or released for public comment.
- The Cabinet Standing Committee on Infrastructure and Planning will also consider standards that may have an impact on the design or cost of infrastructure. This will mainly include standards relating to safety, construction or environmental performance.
- Ministers should ensure that proposals to review and remake standards, or to establish new standards, are submitted for consideration by the Committee prior to advancing any relevant legislation, regulation, policy statement or, in the case of national standards, endorsement of proposed standards in any Ministerial or other national forum. The submission should be accompanied by appropriate cost-benefit analysis.

Not clear which agency advises committee on changes

The Cabinet Standing Committee will rely on Ministers/agencies submitting proposals or advice. It is not clear which Minister or agency is responsible for submitting proposals for retrospective changes to conditions of approval for tunnel operations, if changes are needed.

DIPNR should advise committee

We believe that it is important to have a non-proponent agency assume responsibility for monitoring the need for changes to approval conditions for tunnel operations, and advising the Cabinet Standing Committee. It would be appropriate for DIPNR to assume this role given that for *Part 5* projects, DIPNR:

- provides independent assessment reports to the Minister for Infrastructure and Planning, as the approval authority
- regulates tunnel operations via the Minister's approval conditions.

DIPNR should consult with agencies

In assuming this role, DIPNR should consult with all relevant Ministers and their respective agencies, especially the DEC, RTA, NSW Health and Treasury. It should also develop agreed protocols for agency consultation and input.

3.3 Illustrating the need for integration

We looked at the various planning and assessment approaches taken to air quality issues with several of the major road tunnel projects completed in Sydney, as more tunnels are being built or planned.

The tunnel with the greatest amount of exposure and examination appears to have been the M5 East Tunnel. It is also the largest. As such it represented an ideal case study to examine.

This case study highlighted several opportunities for strengthening the current assessment and approval process of major road infrastructure proposals.

Road tunnels have advantages

Road tunnels are used increasingly in NSW to facilitate integrated motorway systems. Tunnels overcome some of the disadvantages of surface motorways in terms of localised air pollution, noise, and loss of amenity to local residents.

Road tunnels have disadvantages

However, tunnels are generally expensive to build. They are also difficult to ventilate efficiently. Another drawback of tunnels is that technical developments and improved understanding of the adverse health impacts of vehicle pollutants can overtake decisions made about appropriate ventilation technologies.

The M5 East proposal resulted from a study in 1992-93 on possible transport options, although what was built, as approved, differs markedly from what was proposed as a concept in the study.

The M5 East Motorway project involved the design, construction, operation and maintenance of a 10km long, four-lane motorway between the existing M5 West at King Georges Road, Beverly Hills and General Holmes Drive at Mascot. The project includes a direct 4 km road tunnel between Bexley North and Arncliffe.

The project was funded from taxes and assessed under *Part 5* of the *EP&A Act*, as RTA was the proponent for the M5 East. Currently DIPNR regulates the operation of the M5 East under the *EP&A Act* via the Planning Minister's Conditions of Approval.

The DEC, former Environment Protection Authority (EPA), had a statutory role as a determining authority arising from licensing the construction of the M5 East. While tunnel stacks are stationary pollution sources, emissions from a tunnel stack are considered too small compared to major industrial point sources to require a licence.

DEC and Health involved in M5 assessment

The assessment of the M5 East presented some complex air quality issues, as all tunnels do. In preparing advice for the Minister for Planning, DIPNR sought advice from EPA and NSW Health. EPA advised on the assessment and management of operational air quality impacts of tunnel emissions. NSW Health advised on air quality health impacts, including appropriate health-based goals for in-tunnel and ambient air quality.

As discussed previously:

- there was no legal requirement on DIPNR to adopt such advice and no legal basis to hold agencies accountable for advice given
- the requirements and guidance in assessing relevant health and environmental impacts were not, and still are not, well defined.

Guidance on monitoring requirements limited

At the time of the assessment of the M5 East, there were no published and agreed guidelines on air quality assessment requirements for roadways and tunnels. The RTA has recently called for tenders to develop guidelines for air quality assessments requirements for roadways and tunnels, as well as monitoring requirements.

The range of pollutants currently monitored in the tunnel and in the tunnel stack may need to be broadened and tightened over time as new knowledge of health impacts of pollutants and new monitoring requirements emerge. For example:

- the ambient air quality objectives for emissions from a road tunnel *stack* should be no different than for any source of air pollution in that the national air quality goals for pollutants should not be exceeded. These goals are reviewed and tightened over time as discussed in chapter 1. Also, national standards for air toxic substances and fine particles less than 2.5 micrometres in diameter (PM_{2.5}) are expected soon
- the monitoring of *in-tunnel* air quality is currently focused on visibility and levels of carbon monoxide. DIPNR wrote to the RTA to increase the scope of monitoring of carbon monoxide for the M5 East. This is reflected in current approval conditions for newer tunnels. Also, an Interagency Working Group has been established to determine the need for in-tunnel nitrogen dioxide standards, and to provide a framework for the development of such standards if a need is identified.

Licensing tunnels allows retrospective changes, but not viable

It is not clear whether new and revised air quality standards will apply to existing tunnels given that approval or consent conditions cannot be tightened over time. Licensing tunnel operations as a point source would allow retrospective changes. While the *POEO Act* does not identify tunnel operations as scheduled activities requiring a licence, the Act does not preclude it.

Licensing does not address cost implications

However, licensing road tunnel operations could give rise to significant implications for the costing of major transport infrastructure projects in terms of who bears the costs of conforming with developing or changing goals for air emissions. So, instead of licensing tunnel operations, we believe DIPNR should be responsible for monitoring the need for changes to conditions of approval relating to air quality requirements, and advising the Cabinet Standing Committee for Infrastructure and Planning where changes are needed.

This would provide greater assurance for the public and regulatory authorities as regards the ongoing assessment and management of the impacts of tunnel operations. This is important in view of:

- the evolving knowledge of pollutant impacts on human health
- the need for ongoing tightening and broadening of air quality requirements
- the proximity of tunnels emissions to urban populations.

Role of NSW Health not clear

Health studies point to serious health effects from fine particles, nitrogen dioxide and air toxics. Vehicles are a major source of these harmful substances. In addition to current monitoring, specific monitoring and sampling of these substances, focusing on their toxicity, would be prudent considering that the annual average daily traffic in the tunnel now exceeds 91,000 vehicles. This is important for health risk assessments and reviews of monitoring requirements. The role of NSW Health in these activities should be clearly articulated and formalised.

 **GOOD PRACTICE**

Lessons learnt from the M5 East are being applied to other tunnels. For example, DIPNR has imposed relatively more stringent approval conditions on the Cross City tunnel in terms of air quality, ventilation, tunnel design, etc.

Different conditions across tunnels

While this is good practice, it will mean the M5 East, the Cross City and the Lane Cove tunnels will have different monitoring and reporting requirements, and new tunnels even more different requirements. This may raise community concerns in the long term.

Two separate Parliamentary Inquiries (2001 and 2002) have recommended filtration of tunnel emissions from the M5 East. It is not clear if the RTA will implement this recommendation. However, we noted that the RTA is investigating various tunnel filtration technologies for tunnel emissions.

Need improved cost estimations

Tunnel filtration technology and compliance with air quality requirements add significant costs to road tunnel projects, as discussed in section 3.1. The whole lifecycle costs of building and operating tunnels and filtration systems, as part of road projects, are essential in evaluating project concepts. We believe cost estimations should be improved.

Need multi modal assessments

Recent announcements by Rail Corporation also suggest that the M5 East may have contributed to a reduction in patronage on the East Hills train line. These outcomes conflict with the aim of increasing the use of public transport. Up-front assessments of such broader impacts should be improved. The RTA disputes this explanation for declining patronage.

During the course of the audit we sought RTA's views as to whether:

- the M5 East tunnel's ventilation system is capable of managing pollution within relevant requirements in terms of planned and current usage patterns
- the ventilation system in the tunnel has additional capacity to minimise the harmful impact of pollutants in the tunnel to an acceptable level of risk in the event of a serious accident in the tunnel such as a fire
- the air in the tunnel has, since the tunnel was opened, not met regulatory limits for air quality (and if so on how many occasions).

The RTA's response indicated that the M5 East is operating in accordance with conditions of approval, in that:

- the tunnel infrastructure and associated ventilation systems design meet the air quality standards
- the tunnel is equipped with a variety of safety systems for both fire and other incidents, which meet relevant international standards and were developed in consultation with relevant fire safety experts, and key stakeholders
- there has only been one instance of exposure to levels of carbon monoxide in excess of what is prescribed by the World Health Organisation for more than 15 minutes.

The RTA also advised that:

- as part of the determination of the stack height for the M5 East, a matrix of stack emission concentrations for particles (PM₁₀) and oxides of nitrogen (NO_x) in addition to the carbon monoxide (CO) goal in the original approval was introduced
- measurement during the first two years of operation resulted in matrices well below the levels proposed by the DEC/DIPNR
- the network of air quality monitoring stations demonstrates that the M5 East stack has had no discernable impact on ambient air quality.

M5 East background

The tunnel part of the M5 East is the longest road tunnel in Australia and one of the longest urban tunnels in the world. It is 4 km long with a single ventilation stack 35 metres. The stack has a square cross section tapering from nine square metres at the base to seven square metres at the top. The stack is located in a valley and linked to the main tunnel through an 830 metres long tunnel.

Two Environmental Impact Statements were prepared for this proposal. The potential for the tunnel ventilation stack to concentrate pollutants and the discharging of these pollutants without filtration led to community concerns and opposition to the proposal. As a result, the RTA changed the original design by reducing the number of ventilation stacks from three to a single stack.

The community challenged this decision in the Land and Environment Court on grounds that design changes were made without community consultation. The Court upheld RTA's decision.

The M5 East ventilation system was examined by independent local experts, a Legislative Council Inquiry, the Tunnel Ventilation Workshop and by the CSIRO (for DIPNR). Government agencies (DIPNR, RTA etc) sought numerous expert advice and made several overseas trips to learn about tunnel ventilation systems elsewhere.

The M5 East was approved on 9 December 1997 and opened on December 2001, costing approximately \$800 million to build. The initial cost estimate was \$520 million. The 1998 and 2003 Auditor-General's reports to Parliament (Volumes Three and Five respectively) discussed the reasons for this cost increase and commitments made by RTA to improve its estimation techniques.

We recommend that DIPNR:

- strengthen the evaluation and prioritisation of project concepts, the assessment of transport proposals, and the role of the DEC and NSW Health in transport planning and assessment
- monitor the need for retrospective changes to approval conditions for tunnel operations and submit proposals to the Cabinet Standing Committee for Infrastructure and Planning where changes are needed. This should be done in consultation with all relevant Ministers and their respective agencies, especially the DEC, RTA, NSW Health and Treasury, using agreed protocols for agency consultation and input.

We recommend that DIPNR, the DEC and NSW Health:

- improve the guidance to proponents on the assessment of environmental and health impacts of roadways.

We recommend that the RTA:

- improve the estimation of the scope and cost of proposals including whole lifecycle costs of building and operating tunnels and filtration systems.

4. Air toxic pollutants strategies

At a glance

Air toxic substances are present in the air in low concentrations, but are a hazard to human, animal and plant life because:

- of their toxicity which can be enhanced as they adhere to other pollutants
- they persist in the environment for decades
- they can be transported long distances.

Current understanding of the characteristics and risks that these substances pose is evolving; management approaches are still developing worldwide; and there are no national standards for these substances.

Vehicles on the road, particularly diesel-powered vehicles, are by far the largest source of air toxic substances.

This chapter examines the NSW's management approach to these substances within this national and international context.

4.1 Air toxics

The Environment Protection and Heritage Council (EPHC) defines air toxic substances as:

Gaseous, aerosol or particulate pollutants which are present in the air in low concentrations with characteristics such as toxicity or persistence so as to be a hazard to human, plant or animal life.

Road transport major source of air toxics

Air toxics are emitted in the air from a variety of sources. Vehicles on the road, particularly diesel-powered vehicles are by far the largest source of air toxic substances in NSW. Other significant contributors include major industries, solid wood heaters, and bushfires. Air toxic substances include dioxins, organic compounds such as benzene and 1,3-butadiene, polycyclic aromatic hydrocarbons, and metals such as lead and arsenic.

Air toxics associated with serious health effects

Scientific understanding of the characteristics and risks of air toxic substances to human health and the environment is still evolving. There is, however, evidence that links exposure to these substances to cancer, birth defects, genetic damage, immunodeficiency, and respiratory and nervous system disorders. The effects of air toxic substances on human health depend on the intensity, duration and frequency of exposures, as well as the toxicity of the chemicals and the person's state of health.

Since 1990, international concern about air toxic substances increased when the US introduced a list of 189 air toxic substances that the US Environment Protection Authority now regulates.

4.2 Air toxics in NSW

The precautionary principles in State environmental legislation bring an expectation that NSW would respond to the threat of air toxic substances despite limited scientific understanding.

NSW leads in understanding air toxics

NSW was the first Australian jurisdiction to undertake an extensive study of air toxic substances when national standards did not exist. As a result, NSW is more advanced than any other Australian jurisdiction in terms of its understanding of air toxic sources and levels.

The DEC (then EPA) conducted an air toxics pilot project between 1995 and 1996 and a more comprehensive air toxics study between 1996 and 2001 at a cost of \$1.4 million. The study measured the concentrations of over 80 substances in 25 sites representative of general urban air quality - in Sydney, Newcastle and Wollongong, and some large regional centres such as Armidale, Cooma, Lithgow, Nowra, Orange and Tumut.

Air toxic levels low in NSW

The study found most air toxic levels to be generally low and well below then current international standards/goals and benchmarks. The study also highlighted areas for ongoing attention.

Summary of the 2001 study findings and initiatives for reducing air toxics in NSW			
Air toxics examined	Sites	Concentrations	Management initiatives
17 Dioxins	Sydney Wollongong Central-Western NSW	Below Europe and US standards, and measured concentration in other countries.	Banning backyard burning. Closing hospital incinerators. Licensing/regulation of industrial sources. Reducing emissions from solid fuel heaters.
41 Organic compounds	Sydney Newcastle Wollongong	Below international standards for all substances. However, benzene and 1,3-butadiene approached the standards.	National emission standards. National fuel quality standards; limiting benzene in petrol to 1% from 2006. Lower volatility petrol in summer in Sydney. Cleaner Vehicles Action plan. Voluntary emission testing for cars. Encouraging alternative forms of transport to reduce vehicle use.
11 PAHs*	Sydney and larger centres in the Great Dividing Range	Below proposed international standards in outer Sydney, Newcastle and Wollongong. In the vicinity of the standards in Sydney CBD. Higher than standards in winter in large regional centres.	Reducing usage of solid fuel heaters burning wood in affected areas.
12 Heavy metals	Urban sites	Low compared to overseas levels.	Monitoring concentrations near industrial sites as part of licensing industrial facilities.

* Polycyclic aromatic hydrocarbons.

Source: DEC

The findings of this study triggered many management responses at national and State levels. While some responses were primarily aimed at reducing ozone and particles, potentially they could also reduce air toxics. For example, air toxic substances such as toluene and chromium can contribute to the formation of ozone and particles respectively.

Limited monitoring of air toxics in NSW

The DEC also introduced limited monitoring for 41 organic air toxic substances at five sites, but does not report the results because:

- there is no statutory obligation to do so
- data collection methods and quality assurance processes are still not agreed nationally. However, the DEC follows recognised monitoring protocols and standards (including those from the United States Environment Protection Authority) and has its own quality assurance and quality control procedures.

Routine monitoring stopped

The DEC advised that it stopped the routine monitoring of organic air toxic substances in August 2004, but that it intends releasing monitoring data collected between 2001 (the end of the air toxics research study) and 2004. This however, is low priority due to resources and the concentration on the six criteria pollutants. See chapter 1, section 1.2.

In April 2004, the National Environment Protection Council (NEPC) released a National Environment Protection Measure (NEPM) for five air toxics:

- Benzene
- Toluene
- Xylenes
- Formaldehyde
- Benzo (a) pyrene - a marker for polycyclic aromatic hydrocarbons (PAHs).

Work is also underway to identify additional air toxics for possible inclusion in the Air Toxics NEPM. The DEC has had extensive involvement in this process.

Work underway may inform development of standards

The NEPM gives a consistent national framework for estimating human exposure to these five air toxics, so that sufficient information can be gathered within an eight-year period for the development of national standards. By mid 2005, all Australian jurisdictions are expected to complete their identification and prioritisation of potential monitoring site locations, and submit a monitoring program to NEPC. Jurisdictions are also expected to report monitoring results against set benchmarks of acceptable performance at the end of years two to eight. These results will indicate where further action is needed.

The DEC adopted in its five-year study a 'general exposure model' with protocols recommended for ambient air pollutants, i.e. the six criteria pollutants. This was the accepted method at the time. The Air Toxics NEPM now requires a more stringent localised monitoring (at 'hot spots') with protocols different than those for ambient air pollutants.

Air toxics levels need re-checking

Given the difference in measurement protocols, the air toxic levels in NSW will need to be verified using the more stringent localised monitoring. This has serious implications for: risk assessments, laws, regulation, policies and programs, monitoring locations, and resource requirements.

Need to reassess resources and regulation

Implementation of the Air Toxics NEPM may require:

- expansion, refocusing, resourcing and greater flexibility in monitoring activities
- new programs targeting unregulated activities
- more stringent regulation of existing and/or planned industries subject to the DEC regulation, and possibly a review of relevant laws.

Section 128 of the *Protection of the Environment Operations Act* regulates emissions from industrial stacks and the *Clean Air (Plant and Equipment) Regulation (CAPER)* sets out the emission limits for a large number of pollutants, including some toxic substances (heavy metals and Dioxins). These limits provide minimum performance standards that are required at the planning stage.

The DEC advised that a re-evaluation of existing control programs, within the NEPM framework, would be completed within the next 18 months.

Need an air toxics strategy

Given current knowledge of the characteristics and risks air toxic substances pose, the breadth of existing initiatives, and the NEPM's performance benchmarks, there is a need for a more strategic approach to the management of these substances.

We recommend that the DEC develop an air toxics strategy as a basis for:

- prioritising, resourcing, expanding, reviewing and reporting on initiatives and programs, within the NEPM context and broader air policies and programs
- ensuring early compliance with national goals as these emerge.

5. Fitting into the bigger picture

At a glance

Greenhouse gases affect primarily climate, but through their complex interaction with urban pollutants they can potentially damage urban air quality.

The Kyoto Protocol provides the international framework for managing the global threat of greenhouse gas emissions on climate. The Commonwealth and State governments have separate and joint responsibilities for the management of greenhouse gas emissions.

The electricity generation sector is the single largest source of greenhouse gas emissions in NSW. The transport sector is the third largest and fastest growing source of greenhouse gas emissions. Most transport emissions come from road transport.

This chapter examines the approach to the management of greenhouse gas emissions from these two dominant sources within relevant international and national contexts.

5.1 Global impacts of greenhouse gas emissions

The 'enhanced greenhouse effect' refers to the phenomenon whereby greenhouse gases build up in the lower atmosphere and prevent heat from the sun's rays escaping into space. This effect is thought to increase temperatures at the Earth's surface and affect climate.

Changes in the global climate present a serious long-term risk to the environment with profound effects on the Earth's ecosystems, landforms and human society. Some of the impacts of climate change include changing weather patterns, increased temperatures, more frequent droughts, sea level rise, more frequent extreme weather events, reduced agricultural productivity and the wider distribution of some tropical and water borne diseases. Robert T Watson, Chief Scientist, World Bank wrote:

unless we act now to limit human-induced environmental degradation, history will judge us a having been complacent in the face of compelling scientific evidence that humans are changing the Earth's environment with predominantly adverse effects on human health, ecological systems and socio-economic sectors.

The question is not whether climate will change further in the future in response to human activities, but rather by how much, where and when.

The most important greenhouse gases are:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)
- Hydro fluorocarbons (HFCs)
- Per fluorocarbons (PFCs)
- Sulfur hexafluoride (SF₆).

Total emissions of all greenhouse gases are generally expressed as equivalent amount of carbon dioxide (CO₂), or CO₂-e.

While climate change is a global challenge requiring global solutions, action to address climate change is also required on a local and regional level.

Greenhouse gases and urban pollutants are often emitted from a common source and impact climate and urban air quality respectively. The interaction between urban air pollution and greenhouse gases is complex and presents a heightened danger to the environment and human health. It is therefore imperative to address urban pollution and greenhouse gases at their common sources.

The challenge is to ensure policy instruments that are beneficial in terms of greenhouse gas emissions reduction do not damage urban air quality. This requires a cross-sector policy framework for assessing decisions that can potentially impact air quality.

5.2 Global framework for greenhouse gases

The potential impact of greenhouse gas emissions on global climate change led to an international response to reduce global greenhouse gas emissions. In 1992, the United Nations Framework Convention on Climate Change (FCCC) was agreed at the Rio Earth Summit. In 1997, the Kyoto Protocol to the FCCC provided a global framework for mandatory emission reductions.

Kyoto Protocol ratified by 34 countries

In February 2005, the Kyoto Protocol entered into force. This imposes legally binding, quantifiable emission reduction targets on 34 countries, for the period 2008-2012. It also requires ratifying countries to introduce a carbon-emissions trading scheme.

The Kyoto Protocol is the only multilateral framework for reducing global emissions that has achieved widespread support. However, the Protocol has some serious limitations.

Limitations of the Kyoto Protocol
<p>The Kyoto Protocol:</p> <ul style="list-style-type: none"> ▪ covers only about one quarter of global emissions with the withdrawal of the US and the exclusion of developing countries ▪ targets beyond 2012 are yet to be negotiated ▪ will have limited influence on atmospheric concentrations of greenhouse gases, which are affected by emissions over about the last 50 years ▪ does not cover other pollutants that influence temperatures through their contribution to the formation of ozone and aerosols, eg carbon monoxide (CO), oxides of nitrogen (NO_x), and non-methane volatile organic compounds (NVOCs).

5.3 National framework for greenhouse gases

Australia did not ratify Protocol

In August 2002, the Federal Government decided not to ratify the Kyoto Protocol, but committed to meeting Australia's target, as a non-participant in the treaty regime. The Federal Government also decided against implementing a national carbon-emissions trading scheme.

<p>Australia's target is to contain the increase in its greenhouse gas emissions to eight per cent (40 MT) above the 1990 emissions (503 MT) in the period 2008-2012. This is a generous target compared to the average five per cent target for other industrialised nations. In the Kyoto Protocol negotiations, Australia argued that the costs of abatement were higher in Australia due to the fossil fuel dependence of the Australian economy, and that Australia deserved a more lenient reduction target.</p>
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The Federal Government has responsibility for meeting Australia's international obligations under the FCCC and Kyoto Protocol. Australia's response is coordinated through the Australian Greenhouse Office (AGO), a National Greenhouse strategy (NGS), and a number of programs.

Key Commonwealth programs for greenhouse gas emissions reduction

- Greenhouse challenge (voluntary industry program)
- Greenhouse Gas Abatement Program (funding projects)
- Energy Star Labelling and minimum energy performance standards
- Mandatory renewable energy target (of 2%)
- National Carbon Accounting System
- Funding cooperative research centres
- Department of Industry, Tourism and Resources, eg former Energy Efficiency Best Practice Program
- Alternative fuels program
- Fuel quality standards and fuel consumption labelling.

National policy and management framework lacking

A national policy and a framework for managing greenhouse gas emissions in Australia is currently absent. As a result, Australian jurisdictions have adopted different approaches to managing their greenhouse gas emissions, particularly from the stationary energy sector. Also, a national carbon-emissions trading scheme is yet to be developed. This is at a time where internationally, emissions trading initiatives are growing.

International initiatives

The UK commenced a voluntary emissions trading scheme in March 2002 so that its industries gain experience in trading and emissions reduction, and access new economic opportunities. Germany and Denmark have similar schemes. The EU emissions trading scheme, introduced in January 2005, is the first cross-border emissions trading scheme in the world, and could have up to 30 countries participating by 2012.

Little progress on carbon-emissions trading scheme

A 1997 study by the NSW Government concluded that competition in the National Electricity Market would make unilateral approaches for state-based carbon-emissions trading schemes inefficient and of limited impact. State governments are now pursuing emissions trading cooperatively, according to a recent statement by Energy Ministers.

Australia dependent on fossil fuels for energy

In general, greenhouse gas emissions reflect energy consumption. In 1999 around 80 percent of Australia's emissions resulted from the burning of fossil fuels - coal, petroleum, and natural gas - to produce electricity and power transport vehicles. Australia:

- contributes 1.5 per cent of the world's total energy-related carbon emissions (125 million tonnes of carbon⁴ in 1999)
- has the highest greenhouse gas emissions per capita in the developed world - emissions are more than double the 'developed' world average.

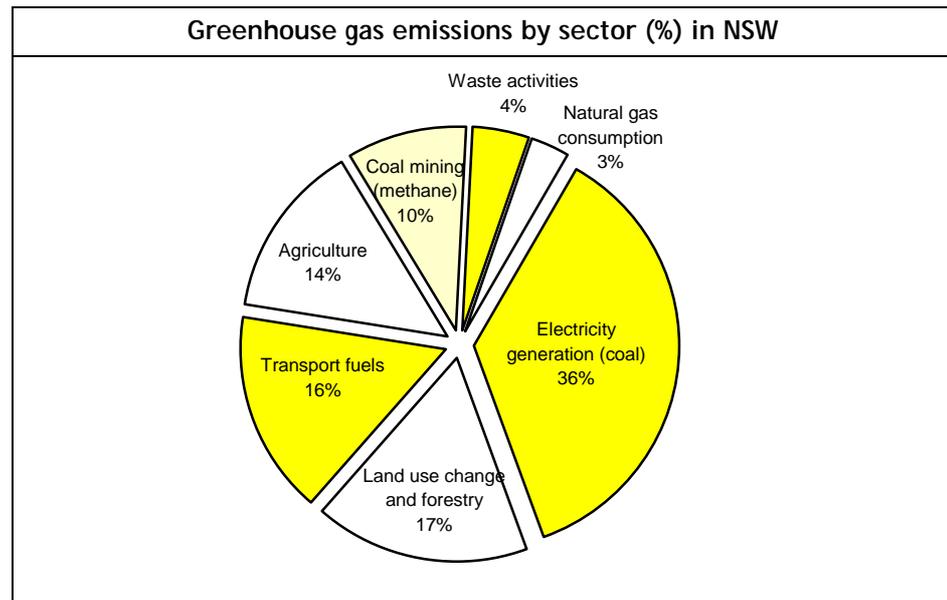
Energy sector largest source of greenhouse gases

The stationary energy sector, through its heavy reliance on coal, is the largest single source of greenhouse gas emissions in Australia. It accounts for about half of Australia's greenhouse gas emissions followed by agriculture (20%) and transport (14%). Road transport is, however, the fastest growing sector accounting for over 85% of all transport emissions.

NSW ranks 16th in world's per capita emissions

According to the Australian Greenhouse Office figures, NSW and the ACT contribute just under a third of Australia's total CO₂ emissions, and NSW ranks 16 in the world's per capita emissions. The stationary energy, agriculture and transport in NSW are also major emission sources.

⁴ One tonne, or 1000 kilograms, of carbon is equivalent to 3.67 tonnes of CO₂.



Source: DEC

Naturally, emission reduction efforts have targeted the stationary energy sector given its large contribution to emissions. The focus has been on:

- reducing emissions through legislation and policies
- promoting energy efficiency, renewable energy and alternative fuel technologies through funding initiatives and programs.

5.4 State emission reduction initiatives

NSW 1st in Australia to address greenhouse gases

While NSW is only now developing a comprehensive greenhouse strategy, it started addressing climate change long before any other Australian jurisdiction. NSW led Australia in addressing greenhouse gas emissions through the *Electricity Supply Act 1995*, and the recent introduction of the world's first legislation to enforce reduction of greenhouse gases in the electricity supply industry.

NSW Greenhouse Office is developing a strategy

The recently established NSW Greenhouse Office is developing a comprehensive, integrated whole-of-government approach to greenhouse policy for NSW. This will be outlined in a NSW Greenhouse Strategy. A draft of this document is expected for public comment by the end of this year. The NSW Greenhouse Office advised that this strategy would strengthen and build on current initiatives, as well as expand the scope of the current regulatory and management framework.

The Office's responsibilities will also include:

- development, review and coordination of relevant program directions
- leading a national carbon-emissions trading scheme.

The NSW Greenhouse Office is working with other States on developing a model for a national carbon-emissions trading scheme. This is in recognition of the need to substantially reduce NSW's emissions and the emissions trading market envisaged under Kyoto.

Currently NSW regulates emissions from the stationary energy sector through the NSW Greenhouse Gas Abatement Scheme (GGAS). This Scheme applies to NSW electricity retailers and other participants including large users who choose to manage their own emissions under the Scheme. The Scheme imposes penalty on non-compliant retailers and other participants and has been in operation for only one year. The Independent Pricing and Regulatory Tribunal (IPART) administers the Scheme.

Aspects of Greenhouse Gas Abatement Scheme need examination

While the Greenhouse Gas Abatement Scheme (GGAS) focuses on emissions reduction through mandated benchmarks, it may not deliver on the intended goal without further action. Currently the Scheme allows for retailers purchasing interstate generated 'low emission' electricity from gas or lower emission coal to have credit, even when such generators may have been established in a business as usual context without regard for emissions reduction. This, and other potential issues need further investigation as the Scheme develops.

The first annual report on compliance with the GGAS was released in September 2004. It indicates that over 7 million tonnes of emissions reductions have been registered through 113 abatement projects.

Need planning guidelines

Other opportunities for reducing emissions require active consideration, including:

- developing planning guidelines (Environmental Impact Assessment guidelines) for proponents regarding Government requirements in respect of energy and greenhouse gas emissions. The Department of Infrastructure, Planning and Natural Resources (DIPNR) has been working on these guidelines for some time

Need stronger role for DIPNR and DEC in project assessment

- there is an important role for the Infrastructure Coordination Unit and the Office of Sustainable Development, Assessments and Approvals in DIPNR in the evaluation of projects in terms of contribution to increased greenhouse gas emissions. It is also important to strengthen the role of DIPNR and the DEC in the assessment of energy intensive developments

Need improved project evaluation and prioritisation

- there is a need for improved evaluation and prioritisation of proposals for increased electricity generation and network capacity. Specifically, the contribution of these projects to increasing greenhouse gas emissions needs to be scrutinised.

These are important measures given that almost 92% of NSW electricity is generated from coal. Significant investment in generation capacity is required with projections showing a need for a 25% increase in energy generation to meet peak demands in NSW. Depending on the choice of technology, NSW emissions will be impacted significantly.

Government released an Energy Directions Green Paper

In December 2004, the NSW Government released 'an Energy Directions Green Paper' for public comment. The paper outlines electricity supply and demand considerations for NSW, with the objective of providing regulatory certainty and facilitating new investment in the future. A White Paper is expected for release this year.

Some of the energy policy options developed through this process will be progressed through an Energy Sector Planning Policy and supported by a regulatory structure, such as a State Environmental Planning Policy (SEPP), covering greenhouse gas emissions for new electricity generators, demand management and energy efficiency.

Supporting guidelines to this SEPP are likely to include revised and updated draft environmental impact assessment (EIA) guidelines on energy and greenhouse gas emissions.

Need to tackle energy efficiency

Energy generation is influenced by consumer demand. Reducing electricity consumption by way of demand management is important. Currently, there are limited price signals and incentives for households and industries to reduce energy consumption, as the cost of energy in Australia is the third lowest in the world. Increased energy efficiency requires more focus on the end users by:

- informing consumers about the impact of their activities on greenhouse gas emissions, and possible savings options
- introducing differentiating pricing structures to send a price signal, eg applying levies and rebates to impact behaviour
- removing institutional and structural barriers that prevent consumers from effectively managing their energy use, eg lack of information, opportunity or capital to implement energy efficiency improvements
- supporting consumers that wish to reduce their demand through community initiatives, incentives and targeted information services.

Two important initiatives targeting energy efficiency in NSW
<p>BASIX</p> <p>The Government is progressively implementing the Building Sustainability Index (BASIX), through the development approval process from 1 July 2004 in Sydney and from 1 July 2005 throughout NSW. The aim is to ensure that new homes meet the NSW Government's water and energy efficiency targets - 40% less mains water supply and 25% less greenhouse gas emissions than average housing of the same type. The greenhouse target will rise to 40% from July 2006. BASIX is a web-based planning tool designed to assess the potential performance of residential developments against a range of sustainability indices.</p> <p>GEMP</p> <p>The Government Energy Management Program (GEMP) sets target for the reduction of energy consumption in government buildings to lead by example. These targets have not been met and it is unlikely that they will be. The structure of the GEMP targets did not adequately capture the growth in government services.</p> <p>The GEMP targets are to be supported by the implementation of the Australian Building Greenhouse Rating Scheme (ABGR), which operates in the following way:</p> <ul style="list-style-type: none"> ▪ government agencies were to ensure that their buildings and tenancies were rated by the end of 2004 ▪ by July 2006, all new government buildings are to achieve a 4.5 star rating and all existing buildings to achieve a 3-star rating where cost effective (or 4 stars for major upgrades) ▪ by July 2006, all existing government tenancies are to achieve a 4-star rating where cost effective (4.5 stars for fit outs and refurbishments).

Demand Management Taskforce announced

In late 2003 the NSW Premier announced the establishment of a Taskforce to advise on setting up new energy demand management initiatives, including the potential introduction of an Energy Demand Management Fund. The Taskforce is considering a range of approaches to demand management to provide an effective response by NSW and achieve greenhouse abatement. The Energy Directions Green Paper also includes demand management issues.

Commonwealth considering an industry reporting and disclosure scheme

Currently, there is no requirement on industries to report on greenhouse gas emissions. The NSW Government is participating on an inter-governmental working group that is considering a national greenhouse reporting and disclosure scheme for industry. The DEC is represented on this group which is expected to report on findings this year.

However, if a national scheme is not introduced, the DEC can potentially address greenhouse gas emissions from the industry sector through the industry-licensing scheme, and as a consent authority for new industrial developments.

Inclusion of greenhouse gas in licence conditions considered

The NSW Government has considered the inclusion of greenhouse gas emissions in industry licence conditions, such as load based charging or regulation. This option may have merit, but should be pursued with care so as to not duplicate initiatives in the Federal Government Energy White Paper.

In the US it is mandatory for the industry sector to provide information about their greenhouse gas emissions.

To increase awareness and influence electricity demand, the Victorian Government requires the industry sector to report annually on energy consumption and identify opportunities for reducing consumption. Energy efficiency projects with a payback of less than three years are implemented through this program.

Need to manage transport emissions

To date, there has been no clear policy framework for managing the cumulative impact of greenhouse gas emissions from sectors other than the stationary energy sector, particularly road transport. A number of existing programs and funding initiatives for these sectors have been on a project-by-project basis.

Limited initiatives for reducing transport emissions

For example, the NSW Government has introduced measures to address greenhouse gas emissions from transport, primarily through the following components of the 'Cleaner Vehicles Action Plan':

- environmental performance benchmarks to inform consumers which are the cleanest cars on the market. These benchmarks encompass both greenhouse gas emissions and noxious pollutants in assessing vehicle performance
- support for the development of a consumer green guide for new cars and light trucks
- a voluntary clean fleet program to encourage private firms with large vehicle fleets to adopt environmentally friendly practices.

While the NSW Government has shown leadership on this issue, the stamp duty incentive scheme for less polluting cars has not been implemented, as discussed in Chapter 2, section 2.3.

The NSW Government's greenhouse strategy is expected to provide a cohesive and detailed greenhouse response across all sectors, including adaptation to the impacts of climate change. The following recommendations would assist this process.

We recommend that the Cabinet Office work with other agencies to:

- fast-track the development of an energy policy that incorporates greenhouse gas emissions in the decision making process, supported by a State Environmental Planning Policy (SEPP) and environmental impact assessment guidelines on energy and greenhouse gas emissions
- improve the evaluation and prioritisation of infrastructure proposals in terms of their contribution to greenhouse gases, and strengthen the role of DIPNR and the DEC in the assessment of energy intensive developments
- implement reporting provisions for greenhouse gas emissions if a national scheme for industry reporting and disclosure is not introduced
- increase investment in demand management in the energy sector.

6. Improving the knowledge base

At a glance

The DEC monitors regional air quality through a large network of stations. It uses the monitoring data and a range of other data to estimate emissions from sources of pollution. These activities inform the development of targeted programs and the forecasting of future emissions.

Pollution created locally impacts regional air quality. The role of local government in assessing and managing local pollution is, therefore, central to the management of regional air quality.

This chapter examines the management and planning of network operations, the reliability of air quality monitoring data and estimation techniques, and the role of local councils.

6.1 Air quality monitoring network

Robust air quality monitoring systems and quality assured data are crucial for timely and appropriate management responses. Meeting increased demand for air quality monitoring efficiently and effectively requires flexibility and long-term planning of network operations.

The DEC operates the largest number of air quality monitoring stations (the network) in Australia. It has rigorous processes for ensuring monitoring data is collected according to recognised standards and validated using stringent quality assurance practices. A long-term strategy for planning and managing network operations is needed to meet the increasing demand on network services.

Monitoring air quality is a critical part of the DEC's role. Monitoring data informs all aspect of work on air quality within the DEC and across government agencies, and influences national initiatives. Such data is useful for:

- describing regional air quality levels and long-term trends in the context of the national standards
- setting new standards or amending existing standards
- evaluating the effectiveness of emission reduction programs, developing new emission strategies, and assessing the impacts of new emission sources
- statutory reporting
- health and other research programs
- public awareness, education and consultation.

NSW had the largest number of monitoring stations in Australia

In 2003-04, the DEC operated a statewide air quality monitoring network (SAQMN) which is the largest in Australia with:

- 25 multi-parameter monitoring stations in the Greater Metropolitan Region (two of which were industry-owned sites), four rural Air NEPM campaign sites and five smaller single parameter campaign sites
- 17 of 25 stations monitoring compliance against national standards in the industrial and high population region of Newcastle, Sydney and Wollongong
- routine monitoring of some air toxic substances and fine particles (PM_{2.5}) in limited locations
- an estimated replacement value of \$10 million
- a recurrent and capital budget of about \$2.26 million.

Number of stations reduced by a quarter

The DEC advised that its resources have since been cut back, and as a result

- it now operates 24 monitoring stations, with 14 in Sydney, three in the Illawarra, three in the lower Hunter, and four in rural NSW
- the 2004-05 recurrent and capital budget for the network is estimated at just over \$2 million.

The impact of this significant reduction in monitoring capacity should be reviewed in the future.

Data validity assured

The network is subjected to a bi-annual accreditation process to ensure monitoring data is measured and reported according to recognised standards and protocols. Collected data undergoes various quality assurance and analysis processes to ensure its validity and reliability.

The existing network was upgraded in the 1990's to gain a better understanding of the formation of ozone, as part of the Metropolitan Air Quality (MAQ) study. This included stations where the maximum level of ozone was expected but where the population may have been very sparse. The network now provides information for reporting against the Air NEPM, which has as its focus, the exposure of the general population to the six criteria pollutants.

Demand on network increasing

The NEPC requirements are growing and placing increased pressure on the network. There is also an increasing demand for more locally based monitoring that is more relevant and meaningful to local populations. All this will require greater flexibility and regular revisiting of network planning.

Need strategy for network activities

While the DEC has recently reviewed its network planning, it has also recognised the need for a more strategic approach to network planning. A draft strategy is in development, but will need fast tracking. Such strategy would provide a sound basis for planning and managing the operations of the network so it could meet:

- air quality and public health priorities
- increased demand
- information needs of policy makers, researchers and the public.

Lack of historical permanent funding has been a key barrier to long term planning of network operations. Only recently, permanent funding has been established as part of the DEC base funds. With this funding certainty, the DEC is well positioned to finalise the monitoring strategy.

6.2 Estimating emissions from pollution sources

The results of air quality monitoring should form a key part of strategic and operational decisions. Determining the contribution of various sources to air pollution is a complex and lengthy process, but one which is critical for:

- assessing the impacts of various sources
- targeting policies and programs
- forecasting future emissions scenarios.

Three major sources of pollution

The management of air quality is divided into three broad sectors/sources:

- Major industrial sources - including aluminium smelters, steel mills, and oil refineries, which are within the control of the DEC. The principal regulation for controlling these sources is the *Clean Air Plant and Equipment Regulation 1997* (CAPER). Conditions and pollution reduction programs attached to environment protection licences complement this regulation. Licence fees, based on pollutant load, give licensees an incentive to reduce emissions.
- Area sources - include small commercial and domestic activities, which are within control of local councils but are largely unregulated
- Mobile sources - are largely transport related, eg motor vehicle exhaust and evaporative emissions.

Estimating pollution from sources using inventories

The DEC uses various data sources (referred to as pollution inventories) to estimate emissions from sources of pollution. Most of this work is based on the Metropolitan Air Quality Study inventory which has six components relating to area, industrial, biogenic, off-road, commercial and motor vehicle sources.

The following table shows the most recent emissions estimates of particles and primary pollutants that form ozone, i.e. volatile organic compounds (VOCs) and oxides of nitrogen (NOxs), using this inventory.

Estimated annual emissions by source - 2003						
Source	NOxs (%)		VOCs (%)		Particles (%)	
	GMR	Sydney region	GMR	Sydney region	GMR	Sydney region
Mobile	37	76	47	43	12	18
Area (domestic/commercial)	3	6	39	41	16	42
Industrial	60	18	14	16	72	40

Source: DEC

The DEC is currently undertaking a comprehensive update of the entire air emissions inventory. The DEC expects to complete this update late this year at a cost of half a million dollars.

Validation of inventories crucial

We believe once this update is completed, validation of the updated inventory should follow i.e. comparing modelling results with observed data. This would ensure air quality programs are based on the best available information.

6.3 Managing local air quality

Local level assessment and management of pollution from Area sources is essential given the significant contribution these make to those pollutants of most concern (particles and VOCs which contribute to ozone formation).

Local Government is well positioned to have a critical impact on air quality. We see an opportunity for a stronger strategic alliance between the DEC and Local Government to ensure more effective management of air quality in NSW.

Such an approach should include programs with agreed outcomes, more targeted assistance, exchange of information, transfer of technical knowledge and skills, etc.

There is a requirement on local councils to prepare local air quality management plans. Currently, there is no formal mechanism to effectively monitor the performance of local councils in managing local air quality.

**Need influence
more local
councils**

The DEC's local government strategy does not recognise the management of air quality as a key priority, though there are various initiatives targeting this sector. We believe the DEC could have a greater influence on local councils' management of air quality.

Initiatives aimed at reducing pollution from Area sources
<p>The DEC has several initiatives aimed at assisting local councils better manage air quality. Such initiatives include:</p> <ul style="list-style-type: none"> ▪ the ongoing development of a 'tool kit' for local councils so that they could measure local emissions and assess the impact of development proposals on air quality in a consistent way ▪ provision of financial assistance to local air improvement projects - about \$400,000 was provided from the Environmental Trust to local councils projects last financial year ▪ a training course in environmental issues for local officers, and educational programs for small business ▪ working with councils on the 'Wood Smoke Reduction Program'.

We recommend that the DEC:

- finalise the development of an air quality monitoring strategy (which encompasses the existing monitoring plan for the Air NEPM) with agreed review protocols and processes for rationalising, expanding or re-focusing existing monitoring activities
- validate all updated pollution inventories
- develop a strategy to assist local councils in managing local air quality.

7. Accountability through reporting

At a glance

The DEC publishes various reports on air quality in print and electronic media in compliance with statutory and national requirements, and for education and public awareness purposes.

The DEC collects substantial information on the environment through the State of the Environment Report. This information is important for the evaluation of environmental performance, assessment of risk, identification of change and planning for the future. It can therefore influence environmental policy or management.

The quality and timeliness of reporting have significant implications for strategic and operational responses, and reporting in a user friendly way helps the public understand progress in managing air quality.

This chapter examines these aspects of reporting on air quality.

7.1 State of the Environment Report

State of the environment reports can be seen as conceptual equivalents to state of the economy reports, provided they integrate environmental issues into sectoral decision-making, economic policy and the management of natural resources.

The DEC publishes a State of the Environment Report (SoER) every three years. These reports cover themes such as: human settlement, biodiversity, the atmosphere, the land, inland waters, estuaries and the sea. We focused on the atmospheric component of the SoER and whether this meets key legislative requirements and aligns with better practices elsewhere.

NSW first to require SoER

NSW was the first Australian jurisdiction to enact legislation requiring regular state of the environment reporting. Despite significant improvements in SoERs, these are yet to influence government policies and programs and thereby fulfil their potential as tools for change.

Many countries around the world produce SoERs in accordance with legislative requirements. In NSW, the DEC prepares SoERs under section 10 of the *Protection of the Environment Administration Act 1991* (POEA).

POEA Act 1991, section 10

State of the Environment reports

1. The Authority is required to make a report on the state of the environment every three years
2. Each such report is to be given to the Minister and tabled in both Houses of Parliament
3. A report on the state of the environment is to include the following matters:
 - a) An assessment of the status and conditions of the major environmental resources of New South Wales
 - b) An examination of environmental trends, including the implications for the environment and human health
 - c) A review of the programs and activities of public authorities and of the private sector related to environment protection
 - d) An examination of trends in economic analysis and of the costs and benefits (including economic evaluation) of environment protection
 - e) Any general *recommendations* for future legislative or other action which the Authority considers appropriate to discharge its responsibilities with respect to environment protection
 - f) A statement on the performance of environmental education programs in the State as referred to in section 27 (1) g.

SoERs need recommendations The DEC has produced SoERs in 1993, 1995, 1997, 2000 and 2003.⁵ A 'Future Directions' statement included in the 2003 SoER provided, for the first time, policy makers with suggestions for government, business and others. However, these suggestions are not formulated into specific recommendations for remedial actions. This would be of significant use to policy makers.

The trend internationally in state of the environment reporting is towards reporting on the broader issues encompassed in sustainability, i.e. describing the linkages between the environmental, social and economic components.

Sustainability reporting

Nationally and internationally sustainability reporting is not well advanced. However, many jurisdictions have either considered moving to a sustainability reporting framework or have already developed environmental, economic and social indicators. Tasmania, Queensland and the ACT have already committed to a sustainability-reporting framework and have made some progress in this regard.

Need to broaden reporting to sustainability

The DEC has recognised the need to integrate economic, social and environmental matters in reporting on sustainability, as identified in its 2001 study into 'Benchmarking of International State of Environment Reporting Processes'. Lessons learnt from this study are yet to be implemented, but the DEC has advised that it is planning a review of the SoER.

Currently, NSW adopts the 'pressure-state-response' model (PSR) of the Organisation for Economic Co-operation and Development (OECD) in its SoERs. The model uses indicators to assess:

- the pressure on the environment from human interactions (pressure indicators)
- the state of the environment (state indicators)
- the response to the pressure (response indicators).

Indicators need targets

These indicators are important tools for the evaluation of environmental performance, assessment of risk, identification of change and planning for the future. NSW uses the Australian and New Zealand Environment Conservation Council (ANZECC) core set of indicators. These have no associated targets, which limits their value.

Need links to planning and decisions

There are currently no institutional arrangements to link effectively the findings/suggestions in SoERs with planning and decision-making across government.

Better practice

The Netherlands has successfully integrated its state of the environment reporting and environmental policy making/management. SoERs are linked to the development and review of national environmental policy plans. A series of policy-orientated indicators are presented annually to Parliament, accompanied by a national budget proposal for expenditure on environmental issues.

⁵ There was a change from a two to a three-year reporting cycle for the SoER 2000 report (following amendments to the POEO Act 1991).

Need focus on sectors of the economy

The SoER could be re-oriented to focus on distinct issues or sectors of the economy within the framework of sustainability. Currently the NSW SoER and most Australian SoERs are structured around environmental media (land, air, water, etc.). Such structure is valuable for environmental scientists, but not so useful for policy makers who are charged with making decisions in relation to human activities, and more specifically in relation to sectors of the economy.

Transport is a classic example, whereby it is generally only discussed in the Air section of a SoER. This ignores the impact that transport has on land, stormwater pollution, and more broadly on issues such as social equity and health.

Need multiple SoER products

Writing a single report that will be accessible and useful for everyone from NSW 'lay' citizens to scientific experts to politicians may be difficult to achieve. However, different state of the environment report products can be designed to meet different needs.

SoER need be independent from policy

The SoERs that are considered benchmarks for institutional effectiveness are those that are managed by an agency with a degree of independence from the operating or policy units. Such SoERs have a good level of external acceptance and take-up by the agencies concerned. The DEC has a significant role in developing environmental policies and programs, but is not in a position to review the performance of other relevant agencies and manage cross-sectoral programs.

Need public input

For a state of the environment report to be used to create change, either in government policy or in the broader community, it needs to engage a range of people and stakeholders in preparing the report and developing its conclusions and recommendations. Such processes can create useful reports for policy makers and participatory education. The DEC involves a broad range of stakeholders and experts in the development of the SoER. These processes, however, do not provide for effective community participation and input.

The NSW Council on Environmental Education points to the current shift from viewing learners as 'audiences/target groups' who are reached by information provision to 'participatory/experiential' learning, community development and capacity building. This is in line with the trend towards dialogue in science communication.

 **GOOD PRACTICE**

Highly developed programs in environmental education are currently being undertaken by the DEC, institutions within the education system and a range of other government and non-government organisations. These programs are being further developed through the Government's Environmental Education Plan 2002-2005. This plan includes actions for integrating environmental education in corporate policies and work practices, improving program planning and delivery, and building knowledge of environmental education.

The DEC advised that it is undertaking an overall assessment of the approach used to prepare the NSW SoER.

7.2 Regional pollution index (RPI)

The DEC calculates twice daily a Regional Pollution Index (RPI) for each of Sydney, Newcastle and Wollongong, and provides forecasts for the next day's RPIs. A Regional Pollution Index (RPI) is a measure of the worst pollutant of the day in a region, although at times two pollutants could be high, but only one RPI published.

RPI not comparable across jurisdictions

The DEC reports RPIs in electronic and print media, describing them as low, medium or high. An RPI greater than 50 is high and indicates that at least one pollutant (nitrogen dioxide, ozone or fine particles) in that region was above a set goal. RPIs are not comparable across Australian jurisdictions and countries, as there is no universally agreed method for their calculation.

Reporting of RPIs as abstract numbers does not provide useful information to the public. RPIs can potentially have both a preventative and informative value if associated with health warnings. The public could then understand the health implications of pollution and take precautionary measures.

 **GOOD PRACTICE**

The DEC has recently introduced a health alert system with the RPIs. This is the most comprehensive system of its type in Australia, as it includes extensive health information. This information is available through a direct web link from the DEC website to the website of NSW Health.

 **GOOD PRACTICE**

Also, NSW Health has produced a brochure on the issue for the public, as well as a similar brochure for health professionals advising them on how to use the air pollution health alerts to help patients improve management of chronic conditions such as asthma and angina.

7.3 Air quality reports

The DEC produces a range of other reports, including:

- annual reports to NEPC - on compliance with national standards for the six criteria pollutants in nominated NEPC sites
- quarterly reports on the website - providing detailed air quality monitoring data from all monitoring stations
- daily summaries on the website - providing air quality data for six pollutants at locations monitored on the previous day.

We believe there is scope to improve the timeliness, user-friendliness and consistency of publicly reported air quality data.

Delays in data provision

There have been extended delays in the release of some information due to resource limitations, time-consuming quality assurance processes, and lack of online access to some monitoring stations. For example:

- the quarterly reports have been released on the web up to 18 months following the end of the quarter, with the latest report released nine months after the end of the quarter
- on occasions, daily summary reports for some monitoring stations were not available on the website.

The DEC advised that:

- delays with the quarterly report have been addressed
- daily summary reports are always posted on the website, unless there is a technical problem, eg an instrument failure.

Need more information and less data

Delays can have significant implications for strategic decisions, the timeliness of operational responses and the public understanding of air quality. We believe the DEC should rationalise data provision and focus on data interpretation to enhance its usefulness to a range of stakeholders, including local authorities and the public at large. Such interpretation should clarify whether there has been no change, an improvement or deterioration in air quality.

**Need
change
reporting
style**

The DEC should also provide most of the air quality monitoring data on line in real time, as is the case in some other jurisdictions. The DEC will require additional resources to allow for this change in reporting style on the web, even after rationalising its existing reporting.

**Need
address
inconsistencies**

We have noted some inconsistencies in data in various reports. For example, the DEC reports different sets of data in compliance reports, state of the environment reports and in various website information. While these inconsistencies are a result of differing requirements for the Air NEPM and SoER, they can effectively lead to different interpretations, and should be addressed.

We recommend that the DEC:

- improve and broaden the scope of the state of the environment report
- rationalise and improve the timeliness of reported air quality data, and ensure more user-friendly reporting style and online access to real time data.

Appendices

Appendix 1: Agency Responses

Response from the Department of Environment and Conservation

Thank you for your letter of 2 March 2005 providing the final draft report of the performance audit Managing Air Quality, and the opportunity for the Department of Environment and Conservation (DEC) to provide a formal response.

I appreciate the Audit Office's interest in air quality management issues, and the professional and cooperative manner in which the audit was conducted. As you know, both DEC officers and your staff devoted a significant amount of time and effort to this audit exercise. The end result, I believe, is a constructive report with some useful analysis of issues and recommendations that, in most cases, affirm the directions we are taking to manage air quality in NSW and help ensure that we remain focused on this task.

The report recognises the significant gains we have made in controlling certain air pollutants, and appropriately acknowledges the key regional challenges we continue to face - namely ozone and particle pollution, and specifically, the contribution of the transport sector to this pollution.

You will find that the programs and activities already underway at the DEC will in many cases go a long way towards addressing the issues raised in the report. In particular, DEC in consultation with other relevant agencies, has recently commenced a revision of Action for Air which will cover new and emerging issues and priorities, and be aligned with other Government strategic policy documents concerning metropolitan land use and transport planning, energy use and climate change. This revised plan, which is expected to be released in the second half of this year, will be subject to ongoing review, making it a sound framework for tackling air quality management challenges into the future.

I would like to make a general comment to clarify issues raised about State of the Environment (SoE) reporting in the text of Chapter 7 of the audit report. The audit report suggests that the SoE report should be seen as a sustainability report that integrates environmental issues into sectoral decision making and economic policy. DEC is currently undertaking a reassessment of its approach to SoE reporting. However, it should be noted that by statute the SoE report is not a sustainability report nor a state of the economy report. Rather it is an environment report. The NSW SoE report does not make specific policy recommendations to other agencies, as this is not its purpose.

I have provided more detail on the specific recommendations in your report that involve the DEC in the attached pages.

(signed)

*Lisa Corbyn
Director-General*

Dated: 24 March 2005

Recommendation	Supported/ Already underway/ Not supported	Comment
Chapter 1		
<p><i>That DEC strengthen monitoring of Action for Air by setting targets and timeframes for all component strategies. Targets and timeframes should be set in consultation with relevant stakeholders and cater for changes in priorities.</i></p>	<p><i>Not supported</i></p>	<p><i>Action for Air is a strategic framework document which is publicly reviewed every three years. Timeframes are included where appropriate but may not be applicable to all component strategies. DEC will continue to chair a Senior Officers Group comprising representatives from the transport, planning, roads, health, greenhouse, energy and other relevant portfolios to track progress in implementing the strategies and actions contained in Action for Air, and has requested that the Transport CEOs re-list air quality as a discussion item. Emerging issues and changing Government priorities and directions will be considered as input to the formal public review of Action for Air.</i></p>
<p><i>That DEC prepare an annual overview status report on Action for Air.</i></p>	<p><i>Not supported</i></p>	<p><i>The current three-year review is comprehensive and public and includes a triennial public forum. The ongoing meetings of the Senior Officers Group also provide opportunity to report on the implementation status of Action for Air.</i></p>
<p><i>That DEC periodically update Action for Air by incorporating and prioritising the changes made at the public review process.</i></p>	<p><i>Already underway</i></p>	<p><i>DEC, in consultation with relevant agencies, is revising Action for Air in 2005 to align it with other Government strategic policy documents (Metropolitan Strategy, Greenhouse Strategy, Energy Policy). The revised plan will also reflect changes in policy and administrative arrangements, new knowledge of air pollutant sources and health impacts, and stakeholder feedback on strategies for responding to future air quality challenges. A further review of Action for Air will be undertaken in 2006 following the completion of the DEC's air emissions inventory project, to take account of new information and priorities identified in the inventory. Action for Air will continue to be reviewed on an ongoing, regular basis, in conjunction with the public forum process, to ensure that it remains effective and up to date.</i></p>
<p><i>That DEC consider broadening the scope of Action for Air with strategies for managing the impacts of air toxic substances and specific regional pollution issues on air quality, and by linking it to greenhouse gas abatement programs.</i></p>	<p><i>Already underway</i></p>	<p><i>This is being considered in the 2005 revision of Action for Air and will also be a factor in reviewing the findings of the inventory project vis a vis Action for Air. The updated emissions inventory will greatly facilitate this process, as it will improve DEC's capacity to model regional air quality scenarios and provide a current database to undertake future modelling of the regional impacts of ozone, particle and air toxics pollution, and the impacts of climate change on these pollutants. The Government's Greenhouse Strategy will cover greenhouse gas abatement initiatives, so it is not appropriate to duplicate these in Action for Air.</i></p>

Recommendation	Supported/ Already underway/ Not supported	Comment
		<i>However, the 2005 revision of Action for Air will highlight the emerging links between climate change and air quality, and make appropriate reference to the Government's Greenhouse Strategy.</i>
Chapter 2		
<i>That the RTA and DEC assess the benefits and effectiveness of trials of diesel fuels, alternative fuels, particle traps and fuel cell technology.</i>	<i>Already underway</i>	<i>The RTA and DEC are jointly undertaking a Diesel Retrofit Demonstration Project investigating technical, operational, cost and other issues associated with the retrofitting of after treatment devices (such as particulate traps) on the exhausts of diesel vehicles. The project is funded by the NSW Environmental Trust. The project will inform future decisions on regarding a broader retrofit program once feasibility and benefits to be gained from these devices is established. The DEC is also committed to investigating and publicising the benefits of environmentally friendly fuels. DEC has funded extensive biodiesel trials which were undertaken by Camden and Newcastle City Councils. The DEC will liaise with RTA to evaluate current fuel cell bus trials to identify future opportunities for use of this technology.</i>
Chapter 3		
<i>That DIPNR strengthen the evaluation and prioritisation of project concepts, the assessment of transport proposals, and the role of the DEC and NSW Health in transport planning and assessment.</i>	<i>Supported</i>	<i>The audit report indicates that this is underway as part of the Metropolitan Strategy. It is important that the DEC continues to be actively involved early in the strategy development/review process.</i>
<i>That DIPNR, the DEC and NSW Health provide improved guidance to proponents on the assessment of environmental and health impacts of roadways.</i>	<i>Supported</i>	<i>DEC does not have a statutory role in managing environmental impacts of roadways. Impacts from a segment of road cannot be considered in isolation. Road proposals must be assessed in the context of the whole road network, and strategic environmental assessment could play an important role in the development of the whole transport network. Hence it is appropriate for DIPNR to lead implementation of this recommendation. DEC is willing to provide appropriate support and available expertise.</i>

Recommendation	Supported/ Already underway/ Not supported	Comment
Chapter 4		
<p><i>That DEC develop an air toxics strategy as a basis for:</i></p> <ul style="list-style-type: none"> • <i>prioritising, resourcing, expanding, reviewing and reporting on initiatives and programs, within the NEPM context and broader air policies and programs</i> • <i>ensuring early compliance with national goals as these emerge.</i> 	<p><i>Already underway</i></p>	<p><i>The DEC's ongoing response to managing air toxics will be undertaken within the Air Toxics National Environment Protection Measure (NEPM) framework since it provides an appropriate platform for monitoring, reporting and reviewing program effectiveness.</i></p> <p><i>One aim of the Air Toxics NEPM is to provide a consistent National framework for estimating human exposure to five air toxics, so that sufficient information can be gathered within an eight year period to facilitate the development of standards. To achieve this, the DEC will complete a desktop analysis at the conclusion of year one of the NEPM, to identify and prioritise potential monitoring site locations and submit a monitoring program to the Environment Protection and Heritage Council based on these findings. The DEC will repeat the desktop analysis during the eight year period and amend the monitoring program where necessary. The DEC will also report on the results of any ambient monitoring conducted in accordance with the monitoring program, and report on actions taken to reduce air toxics, if the monitoring investigation levels are exceeded.</i></p> <p><i>The process for reviewing the Air Toxics NEPM commenced during June 2004, with the objective of identifying additional air toxics, for possible inclusion in the NEPM. A team of specialists, including a DEC representative, has started work on implementing the NEPM.</i></p>
Chapter 5		
<p><i>That the Cabinet Office work with other agencies to improve the evaluation and prioritisation of infrastructure proposals in terms of their contribution of greenhouse gases, and strengthen the role of DIPNR and the DEC in the assessment of energy intensive developments.</i></p>	<p><i>Supported</i></p>	<p><i>This is currently under active government consideration as part of the development of the Greenhouse Strategy. The Cabinet Office, is the lead agency for this initiative.</i></p>

Recommendation	Supported/ Already underway/ Not supported	Comment
<p><i>That the Cabinet Office work with other agencies to implement reporting provisions for greenhouse gas emissions if a national scheme for industry reporting and disclosure is not introduced.</i></p>	<p><i>Supported</i></p>	<p><i>This could be considered if a national approach is not introduced. DEC supports emissions reporting, but recognises that it is desirable to have a national framework if possible.</i></p>
<p>Chapter 6</p>		
<p><i>That DEC finalise the development of an air quality monitoring strategy that encompasses the existing monitoring plan for reporting against the national standards.</i></p>	<p><i>Already underway</i></p>	<p><i>A DEC internal draft strategy has been prepared and needs to be revised and developed in light of recent changes to the monitoring network and resourcing.</i></p>
<p><i>That DEC validate all updated pollution inventories.</i></p>	<p><i>Already underway</i></p>	<p><i>The DEC is comprehensively updating the air emissions inventory using state-of-the-art emission factors and estimation techniques from Australia and overseas, as well as industry specific data, where available. The DEC is also gathering up-to-date activity data through several thousand industrial, commercial and domestic surveys. This information will be combined to produce robust emission estimates, which are based upon methodologies that are consistent with contemporary National and International techniques. Quality Assurance and Quality Control (QA/QC) is an essential feature of the project and this will be handled within the emissions data management system. In addition, emissions estimates will be compared with existing NSW and NPI inventory data to ensure accuracy, and the DEC intends to consult with relevant stakeholders to ensure the emission estimates are accurate, prior to public release of the data. QA/QC, emissions estimate comparisons and consultation with stakeholders comprises the DEC's proposed emissions validation program.</i></p> <p><i>Strictly speaking, air pollution modelling is not appropriate for inventory validation. It is not achieved by running airshed models with the new inventory and comparing against monitored levels. Rather, the process is much more rigorous and requires substantial ambient pollutant measurements in the airshed and studies to check</i></p>

Recommendation	Supported/ Already underway/ Not supported	Comment
		<p><i>the emission factors used in the inventory against real world data.</i></p> <p><i>Nonetheless, as part of the proposed inventory analysis phase of the project, air pollution modelling will be undertaken for the Greater Metropolitan Region in NSW for a range of air pollutants to assist in identifying priority sources and pollutants for the future and inform new control strategies. The extent of this work will depend upon the availability of resources.</i></p>
<p><i>That DEC develop a strategy to assist local councils in managing local air quality.</i></p>	<p><i>Already underway</i></p>	<p><i>The DEC has a number of projects and programs targeting local air quality. It is currently undertaking a comprehensive air emissions inventory which will assist in guiding the development of air quality projects and policies. The DEC is committed to continue working with local councils to assist them in managing local air quality. This includes an education program (Toolkit) for local government which is being developed to help local councils better manage emissions from small, non-licensed businesses, financial assistance to councils to undertake local air improvement projects and woodsmoke reduction programs.</i></p>
<p>Chapter 7</p>		
<p><i>That DEC improve and broaden the scope of the state of the environment report.</i></p>	<p><i>A review of SoE is already underway</i></p>	<p><i>DEC's current review of its approach to State of the Environment (SoE) reporting will identify areas for improvement. DEC's review coincides with a separate review of SoE reporting by the Audit Office. Comments on specific recommendations will be deferred until the completion of these reviews.</i></p>
<p><i>That DEC rationalise and improve the timeliness of reported air quality data, and ensure more user-friendly reporting style and online access to real time data.</i></p>	<p><i>Supported and planned for 2005-07</i></p>	<p><i>There are various reporting protocols that DEC must adhere to, so any rationalisation must take account of these statutory requirements. An Air Quality Monitoring System Data Base Project (AQMSDB Phase 3) was proposed in 2002 to re-develop the front end and public reporting aspects of the Air Quality Monitoring Network. The earliest that reports can currently be published is 4 months after the end of the quarter being reported. DEC's lead times are similar to other jurisdictions.</i></p>

Response from the Roads and Traffic Authority

The Roads and Traffic Authority (RTA) is pleased to submit comment on the Performance Audit: Managing Air Quality in NSW final report. The comment relates to chapter 3 of the audit report.

The audit report recommends that the RTA 'improve the estimation of the scope and cost of proposals including whole lifecycle costs of building and operating tunnels and filtration systems'. The RTA notes that the Audit office has based this recommendation on a comparison of the final costs for the Cross City and Lane Cove Tunnels with strategic estimates prior to full concept development. It is important to understand that the increase in costs for both the Cross City Tunnel and Lane Cove Tunnels was due to the need to address issues raised through community consultation and development of the project concepts, during the environmental assessment and approval processes. This resulted in changes to the project scope and the requirement for the projects to comply with more stringent air quality goals than had been imposed on previous Sydney tunnel projects.

Cross City Tunnel scope increases included;

- *the provision of a longer tunnel, and other works,*
- *a change in air quality standards increasing the ventilation cost by approximately \$40m,*
- *the preparation of a supplementary Environmental Impact Assessment.*

Lane Cove Tunnel scope increases included;

- *provision for widening sections of the tunnels to three lanes,*
- *improved urban design and landscaping features,*
- *additional property costs.*

Whole of lifecycle costs for these major tunnel projects are taken into account in the project evaluation. The evaluation process takes into account changes in scope and these are included in the Budget approval process.

Additionally, the RTA is required to follow the NSW Government's 'Working with Government - Guidelines for Privately Financed Projects' which require the RTA to seek approval from the Budget Committee of Cabinet, for these and similar projects, at various stages of the project development and procurement processes.

In 1999 the RTA undertook a review of project estimating processes with the following outcomes;

- *the development of procedures and guidelines for preparation of estimates,*
- *the incorporation of these procedures and guidelines into a revised estimating manual,*
- *the development of a database of historical tender rates for use in preparing estimates, and*
- *a project estimate review process by the RTA's project management office.*

The RTA recognises that there are significant challenges involved in balancing accurate estimates of project lifecycle costs and provision for future project modifications. The RTA has provided for the future installation of filtration systems for the M5 East, Cross City and Lane Cove Tunnels should the need arise for their installation. The Audit report also notes that vehicle emissions including carbon monoxide, volatile organic compounds, oxides of nitrogen and particulates (PM₁₀) are forecast to fall in NSW by 62%, 40%, 55% and 40% respectively by 2020. The reductions in vehicle pollutants is expected to result in excess ventilation capacity in tunnels such as the M5 East, Cross City and Lane Cove tunnels during their design life. The RTA is keen to continue working with the other Government agencies to continue to achieve this balance between cost and appropriate project provisions.

The audit report states that 'only a proponent can initiate modifications (to Approval Conditions) but there is no incentive to do so where the modification would require significant additional costs (such as changing some air quality requirements for tunnel operators)'. However, the RTA considers that sufficient regard should be given to:

- the fact that the RTA is the proponent for all major road tunnel projects in NSW to date; and
- the RTA's status as a government authority.

The RTA has a responsibility to act in the public interest. The RTA takes its environmental obligation seriously and as such is keen to achieve good environmental outcomes in the exercise of its functions, but must also consider matters such as its role as a steward of public resources. In addition, the RTA is subject to the control and direction of the Minister for Roads. In these circumstances, the RTA considers that there is incentive for a proponent to initiate a modification of an approval for a road tunnel project.

The audit report recommends that DIPNR "monitor the need for retrospective changes to approval conditions for tunnel operations and submit proposals to the Cabinet Standing Committee for Infrastructure and Planning where changes are needed. This should be done in consultation with all relevant Ministers and their respective agencies...". The RTA understands that an approval issued under the Environmental Planning and Assessment Act 1979 can only be modified by the proponent (as the audit report acknowledges), and also changes to approval conditions could only take effect prospectively. In addition, if a recommendation such as this were to be implemented, the RTA suggests that consultation with the RTA occurs prior to any decision to make a submission to the Cabinet Standing Committee for Infrastructure and Planning, to allow relevant information and comments to be provided for input into that decision making process.

(signed)

Paul Forward
Chief Executive

Dated: 22 March 2005

Response from the Department of Infrastructure, Planning and Natural Resources

I refer to your letter of 2 March 2005, seeking comments on the above audit report.

As you are aware there has been extensive consultation between the Audit Office and the Department and a number of the issues and concerns raised with earlier drafts have been addressed. I note however that additional recommendations have since arisen which the Department has not previously been asked to comment on until now.

It should be noted that as part of the Planning Reforms to achieve a strengthened "whole of government" assessment and approvals outcomes, it is intended to establish a CEOs Forum to provide for participation of all relevant agencies in the development of integrated performance criteria and assessment approaches. The CEOs Forum will therefore deliver the outcome previously intended through protocols with individual agencies (pp. 32 and 38). As a result, both the Department of Health and the Department of Environment and Conservation will be involved along with other agencies in agreeing on air quality and other performance criteria for assessment and monitoring for major projects.

It should also be noted that the Infrastructure Planning Committee of Cabinet (IPCC) has the responsibility to review the making of standard proposed to apply to new infrastructure. However, the manner in which this matter is discussed on pp. 34 and 38 could be misinterpreted. It should be clarified that the IPCC does not have the jurisdiction to modify or retrospectively change the conditions of approval for tunnel operations of projects approved by the Minister for Infrastructure and Planning. The ability to make retrospective changes to approval conditions is currently under consideration by DIPNR as part of its broader review of Part 4 and Part 5 of the Environmental Planning and Assessment Act 1979.

However, the IPCC can review and make recommendations to DEC or DIPNR regarding the appropriate standards to apply to new infrastructure proposals or proposals to upgrade existing infrastructure. It may be more appropriate that the agency with regulatory responsibility (ie DEC with respect to changes to air quality standards) be the agency to instigate changes.

With regard to the recommendation on p. 52, it should be noted that the Government is currently developing an Energy Directions Statement and a Greenhouse Strategy. As a result, it would appear to be inappropriate for recommendations to be made unilaterally with regard to energy and greenhouse outcomes.

Regarding transport planning issues, the suggestions on page 18 on improving Action for Transport 2010 assumes that the document will be re-issued under the same name. While Action for Transport 2010 will not be re-issued, the issues are being addressed through ongoing transport planning work in Metro Strategy. The vehicle-emission related issues raised on page 19 may be more appropriately addressed in the Greenhouse Strategy, rather than through the Metro Strategy.

On other transport issues, data and statements have not been clearly specified or sourced (p. 13, 14) which could prove misleading. Examples include:

- *statements about future car use are based on assumptions of continuing trends;*
- *Action for Transport 2010 covered more than strategic road projects (p. 16)*

Thank you for providing a copy of the completed audit report.

(signed)

S Haddad

*for Jennifer Westacott
Director General*

Dated: 24 March 2005

Response from the Ministry of Transport

As you are aware the Ministry provided the Audit Office with a comprehensive submission in January 2005. In light of this submission, the Ministry has no further comment to make regarding the performance audit as drafted.

Given that the report is a retrospective look at Action for Air, and elements of Action for Transport 2010, I would like to advise you of some of the actions that the Ministry is involved with which will address the issues raised in your report. These include:

- *Participation in a Senior Officers' Group, convened by the Department of Environment and Conservation to review Action for air; and*
- *Listing of "air quality" as a standing item on the agenda for the Transport CEOs Committee.*

In addition, the Ministry will continue to work with the Department of Infrastructure, Planning and Natural Resources as it develops an integrated transport plan. Other initiatives are as outlined in our previous correspondence.

(signed)

*John Lee
Director General*

Dated: 24 March 2005

Response from the Cabinet Office

Thank you for your recent letter inviting comment on the performance audit of the Department of Conservation: Managing Air Quality.

The chapter Fitting into the bigger picture covers greenhouse issues and therefore falls within the responsibilities of The Cabinet Office, through the NSW Greenhouse Office.

The Cabinet Office is broadly supportive of the recommendations in this chapter. They are being addressed through a number of processes and policies currently being developed, including:

- *An Energy Directions White Paper, to address future demand and supply options for the State, including consideration of greenhouse emissions;*
- *A NSW Greenhouse Plan, which will outline a range of measures to improve greenhouse performance across sectors, including consideration of industrial, commercial and residential energy use; and*
- *Participation on an inter-jurisdictional working group to develop a framework for industry reporting and disclosure on greenhouse emissions.*

The NSW Government is also chairing an inter-jurisdictional emissions trading working group, comprising all State and Territory Governments, and tasked with developing a model for a national emissions trading scheme. An emissions trading scheme provides a flexible approach to achieving greenhouse gas emissions abatement, and establishes a market to promote low cost abatement options.

The NSW Government is strongly committed to actions that reduce greenhouse emissions and combat global climate change.

(signed)

*John Schmidt
A/Director General*

Dated: 29 March 2005

Appendix 2: About the Audit

Audit objective	The objective of the audit was to assess whether the protection of air quality in NSW is managed efficiently and effectively.
Audit scope	The audit examined: <ul style="list-style-type: none">▪ key aspects of the protection of air quality from urban air pollutants, air toxic substances and greenhouse gas emissions▪ linkages between road transport, in particular private car use, and air pollution.
Audit criteria	The audit reviewed whether existing: <ul style="list-style-type: none">▪ strategic and operational plans for the protection of air quality are clearly articulated and communicated, form a comprehensive and coherent framework, and reflect environmental priorities and key risks▪ governance and management arrangements for the protection of air quality provide a structured approach to enable effective coordination, communication and reporting, and clear accountability▪ planning, implementation, monitoring and reporting on air protection activities and programs provide assurance that desired goals are being achieved.
Audit approach	<p>The audit acquired subject matter expertise through:</p> <ul style="list-style-type: none">▪ interviews with relevant DEC staff, State and Federal government agencies involved in managing air quality, and various stakeholders▪ review and analysis of relevant documents▪ research into practices elsewhere. <p>This was supplemented with external subject matter expertise by the Institute for Sustainable Futures, University of Technology, Sydney. We contracted the Institute to provide expert advice and contribute to the development of the audit report.</p>
Acknowledgements	<p>We gratefully acknowledge the cooperation and assistance provided by representatives of:</p> <ul style="list-style-type: none">▪ State agencies including: the Department of Environment and Conservation; the Department of Infrastructure, Planning and Natural Resources; Roads and Traffic Authority; NSW Health; NSW Greenhouse Office; NSW Treasury; the Ministry of Transport; the Department of Commerce; the Department of Energy, Utilities and Sustainability; and IPART▪ Commonwealth agencies including the Department of the Environment and Heritage, the Department of Transport and Regional Services, and the Australian Greenhouse Office▪ CSIRO, University of NSW, Macquarie University, Sydney University, Newcastle University, the Australian National University▪ NSW Council on Environmental Education▪ Local councils of Sydney, Newcastle and Wollongong▪ stakeholder groups including: Total Environment Centre; Nature Conservation Council of NSW; Australian Environment Business Network; NSW Road Transport Association; Residents Against Polluting Stacks; Sydneysiders Against Polluting Stacks; Cross City Tunnel Action Group; and Lane Cove Tunnel Action Group.
Audit team	Our team leader for this performance audit was Henriette Zeitoun, who was assisted by Bettina Ocias. Direction and quality assurance was provided by Denis Streater initially, and then Stephen Horne and Sean Crumlin.
Cost	Including printing and all overheads the estimated cost of the audit is \$518,510.

Performance Audits by the Audit Office of New South Wales

Performance Auditing

What are performance audits?

Performance audits are reviews designed to determine how efficiently and effectively an agency is carrying out its functions.

Performance audits may review a government program, all or part of a government agency or consider particular issues which affect the whole public sector.

Where appropriate, performance audits make recommendations for improvements relating to those functions.

Why do we conduct performance audits?

Performance audits provide independent assurance to Parliament and the public that government funds are being spent efficiently and effectively, and in accordance with the law.

They seek to improve the efficiency and effectiveness of government agencies and ensure that the community receives value for money from government services.

Performance audits also assist the accountability process by holding agencies accountable for their performance.

What is the legislative basis for Performance Audits?

The legislative basis for performance audits is contained within the *Public Finance and Audit Act 1983, Part 3 Division 2A*, (the Act) which differentiates such work from the Office's financial statements audit function.

Performance audits are not entitled to question the merits of policy objectives of the Government.

What conducts performance audits?

Performance audits are conducted by specialist performance auditors who are drawn from a wide range of professional disciplines.

How do we choose our topics?

Topics for performance audits are chosen from a variety of sources including:

- our own research on emerging issues
- suggestions from Parliamentarians, agency Chief Executive Officers (CEO) and members of the public
- complaints about waste of public money
- referrals from Parliament.

Each potential audit topic is considered and evaluated in terms of possible benefits including cost savings, impact and improvements in public administration.

The Audit Office has no jurisdiction over local government and cannot review issues relating to council activities.

If you wish to find out what performance audits are currently in progress just visit our website at www.audit.nsw.gov.au.

How do we conduct performance audits?

Performance audits are conducted in compliance with relevant Australian standards for performance auditing and operate under a quality management system certified under international quality standard ISO 9001.

Our policy is to conduct these audits on a "no surprise" basis.

Operational managers, and where necessary executive officers, are informed of the progress with the audit on a continuous basis.

What are the phases in performance auditing?

Performance audits have three key phases: planning, fieldwork and report writing.

During the planning phase, the audit team will develop audit criteria and define the audit field work.

At the completion of field work an exit interview is held with agency management to discuss all significant matters arising out of the audit. The basis for the exit interview is generally a draft performance audit report.

The exit interview serves to ensure that facts presented in the report are accurate and that recommendations are appropriate. Following the exit interview, a format draft report is provided to the CEO for comment. The relevant Minister is also provided with a copy of the draft report. The final report, which is tabled in Parliament, includes any comment made by the CEO on the conclusion and the recommendations of the audit.

Depending on the scope of an audit, performance audits can take from several months to a year to complete.

Copies of our performance audit reports can be obtained from our website or by contacting our publications unit.

How do we measure an agency's performance?

During the planning stage of an audit the team develops the audit criteria. These are standards of performance against which an agency is assessed. Criteria may be based on government targets or benchmarks, comparative data, published guidelines, agencies corporate objectives or examples of best practice.

Performance audits look at:

- processes
- results
- costs
- due process and accountability.

Do we check to see if recommendations have been implemented?

Every few years we conduct a follow-up audit of past performance audit reports. These follow-up audits look at the extent to which recommendations have been implemented and whether problems have been addressed.

The Public Accounts Committee (PAC) may also conduct reviews or hold inquiries into matters raised in performance audit reports. Agencies are also required to report actions taken against each recommendation in their annual report.

To assist agencies to monitor and report on the implementation of recommendations, the Audit Office has prepared a Guide for that purpose. The Guide, *Monitoring and Reporting on Performance Audits Recommendations*, is on the Internet at www.audit.nsw.gov.au/guides-bp/bpqlist.htm

Who audits the auditors?

Our performance audits are subject to internal and external quality reviews against relevant Australian and international standards. This includes ongoing independent certification of our ISO 9001 quality management system.

The PAC is also responsible for overseeing the activities of the Audit Office and conducts reviews of our operations every three years.

Who pays for performance audits?

No fee is charged for performance audits. Our performance audit services are funded by the NSW Parliament and from internal sources.

For further information relating to performance auditing contact:

Stephen Horne
Assistant Auditor-General
Performance Audit Tel (02) 9275 7278
email: stephen.horne@audit.nsw.gov.au

Performance Audit Reports

No	Agency or Issues Examined	Title of Performance Audit Report or Publication	Date Tabled in Parliament or Published
65	Attorney General's Department	<i>Management of Court Waiting Times</i>	3 September 1999
66	Office of the Protective Commissioner Office of the Public Guardian	<i>Complaints and Review Processes</i>	28 September 1999
67	University of Western Sydney	<i>Administrative Arrangements</i>	17 November 1999
68	NSW Police Service	<i>Enforcement of Street Parking</i>	24 November 1999
69	Roads and Traffic Authority of NSW	<i>Planning for Road Maintenance</i>	1 December 1999
70	NSW Police Service	<i>Staff Rostering, Tasking and Allocation</i>	31 January 2000
71*	Academics' Paid Outside Work	<i>Administrative Procedures Protection of Intellectual Property Minimum Standard Checklists Better Practice Examples</i>	7 February 2000
72	Hospital Emergency Departments	<i>Delivering Services to Patients</i>	15 March 2000
73	Department of Education and Training	<i>Using Computers in Schools for Teaching and Learning</i>	7 June 2000
74	Ageing and Disability Department	<i>Group Homes for People with Disabilities in NSW</i>	27 June 2000
75	NSW Department of Transport	<i>Management of Road Passenger Transport Regulation</i>	6 September 2000
76	Judging Performance from Annual Reports	<i>Review of Eight Agencies' Annual Reports</i>	29 November 2000
77*	Reporting Performance	<i>Better Practice Guide A guide to preparing performance information for annual reports</i>	29 November 2000
78	State Rail Authority (CityRail) State Transit Authority	<i>Fare Evasion on Public Transport</i>	6 December 2000
79	TAFE NSW	<i>Review of Administration</i>	6 February 2001
80	Ambulance Service of New South Wales	<i>Readiness to Respond</i>	7 March 2001
81	Department of Housing	<i>Maintenance of Public Housing</i>	11 April 2001
82	Environment Protection Authority	<i>Controlling and Reducing Pollution from Industry</i>	18 April 2001
83	Department of Corrective Services	<i>NSW Correctional Industries</i>	13 June 2001
84	Follow-up of Performance Audits	<i>Police Response to Calls for Assistance The Levying and Collection of Land Tax Coordination of Bushfire Fighting Activities</i>	20 June 2001

No	Agency or Issues Examined	Title of Performance Audit Report or Publication	Date Tabled in Parliament or Published
85*	Internal Financial Reporting	<i>Internal Financial Reporting including a Better Practice Guide</i>	27 June 2001
86	Follow-up of Performance Audits	<i>The School Accountability and Improvement Model (May 1999)</i> <i>The Management of Court Waiting Times (September 1999)</i>	14 September 2001
87	E-government	<i>Use of the Internet and Related Technologies to Improve Public Sector Performance</i>	19 September 2001
88*	E-government	<i>e-ready, e-steady, e-government: e-government readiness assessment guide</i>	19 September 2001
89	Intellectual Property	<i>Management of Intellectual Property</i>	17 October 2001
90*	Intellectual Property	<i>Better Practice Guide</i> <i>Management of Intellectual Property</i>	17 October 2001
91	University of New South Wales	<i>Educational Testing Centre</i>	21 November 2001
92	Department of Urban Affairs and Planning	<i>Environmental Impact Assessment of Major Projects</i>	28 November 2001
93	Department of Information Technology and Management	<i>Government Property Register</i>	31 January 2002
94	State Debt Recovery Office	<i>Collecting Outstanding Fines and Penalties</i>	17 April 2002
95	Roads and Traffic Authority	<i>Managing Environmental Issues</i>	29 April 2002
96	NSW Agriculture	<i>Managing Animal Disease Emergencies</i>	8 May 2002
97	State Transit Authority Department of Transport	<i>Bus Maintenance and Bus Contracts</i>	29 May 2002
98	Risk Management	<i>Managing Risk in the NSW Public Sector</i>	19 June 2002
99	E-Government	<i>User-friendliness of Websites</i>	26 June 2002
100	NSW Police Department of Corrective Services	<i>Managing Sick Leave</i>	23 July 2002
101	Department of Land and Water Conservation	<i>Regulating the Clearing of Native Vegetation</i>	20 August 2002
102	E-government	<i>Electronic Procurement of Hospital Supplies</i>	25 September 2002
103	NSW Public Sector	<i>Outsourcing Information Technology</i>	23 October 2002
104	Ministry for the Arts Department of Community Services Department of Sport and Recreation	<i>Managing Grants</i>	4 December 2002

No	Agency or Issues Examined	Title of Performance Audit Report or Publication	Date Tabled in Parliament or Published
105	Department of Health Including Area Health Services and Hospitals	<i>Managing Hospital Waste</i>	10 December 2002
106	State Rail Authority	<i>CityRail Passenger Security</i>	12 February 2003
107	NSW Agriculture	<i>Implementing the Ovine Johne's Disease Program</i>	26 February 2003
108	Department of Sustainable Natural Resources Environment Protection Authority	<i>Protecting Our Rivers</i>	7 May 2003
109	Department of Education and Training	<i>Managing Teacher Performance</i>	14 May 2003
110	NSW Police	<i>The Police Assistance Line</i>	5 June 2003
111	E-Government	<i>Roads and Traffic Authority Delivering Services Online</i>	11 June 2003
112	State Rail Authority	<i>The Millennium Train Project</i>	17 June 2003
113	Sydney Water Corporation	<i>Northside Storage Tunnel Project</i>	24 July 2003
114	Ministry of Transport Premier's Department Department of Education and Training	<i>Freedom of Information</i>	28 August 2003
115	NSW Police NSW Roads and Traffic Authority	<i>Dealing with Unlicensed and Unregistered Driving</i>	4 September 2003
116	NSW Department of Health	<i>Waiting Times for Elective Surgery in Public Hospitals</i>	18 September 2003
117	Follow-up of Performance Audits	<i>Complaints and Review Processes (September 1999)</i> <i>Provision of Industry Assistance (December 1998)</i>	24 September 2003
118	Judging Performance from Annual Reports	<i>Review of Eight Agencies' Annual Reports</i>	1 October 2003
119	Asset Disposal	<i>Disposal of Sydney Harbour Foreshore Land</i>	26 November 2003
120	Follow-up of Performance Audits NSW Police	<i>Enforcement of Street Parking (1999)</i> <i>Staff Rostering, Tasking and Allocation (2000)</i>	10 December 2003
121	Department of Health NSW Ambulance Service	<i>Code Red: Hospital Emergency Departments</i>	15 December 2003
122	Follow-up of Performance Audit	<i>Controlling and Reducing Pollution from Industry (April 2001)</i>	12 May 2004
123	National Parks and Wildlife Service	<i>Managing Natural and Cultural Heritage in Parks and Reserves</i>	16 June 2004

No	Agency or Issues Examined	Title of Performance Audit Report or Publication	Date Tabled in Parliament or Published
124	Fleet Management	<i>Meeting Business Needs</i>	30 June 2004
125	Department of Health NSW Ambulance Service	<i>Transporting and Treating Emergency Patients</i>	28 July 2004
126	Department of Education and Training	<i>School Annual Reports</i>	15 September 2004
127	Department of Ageing, Disability and Home Care	<i>Home Care Service</i>	13 October 2004
128*	Department of Commerce	<i>Shared Corporate Services: Realising the Benefit including guidance on better practice</i>	3 November 2004
129	Follow-up of Performance Audit	<i>Environmental Impact Assessment of Major Projects (2001)</i>	1 February 2005
130*	Fraud Control	<i>Current Progress and Future Directions including guidance on better practice</i>	9 February 2005
131	Follow-up of Performance Audit Department of Housing	<i>Maintenance of Public Housing (2001)</i>	2 March 2005
132	Follow-up of Performance Audit State Debt Recovery Office	<i>Collecting Outstanding Fines and Penalties (2002)</i>	17 March 2005
133	Follow-up of Performance Audit	<i>Management of Intellectual Property (2001)</i>	30 March 2005
134	Department of Environment and Conservation	<i>Managing Air Quality</i>	April 2005

* Better Practice Guides

Performance Audits on our website

A list of performance audits tabled or published since March 1997, as well as those currently in progress, can be found on our website www.audit.nsw.gov.au

If you have any problems accessing these Reports, or are seeking older Reports, please contact our Executive Officer on 9275 7220.