NSW EPA

Our reference: DOC13/8241
Contact: Alethea Morison

Dr I Holland
Committee Secretary
Senate Standing Committee on Community Affairs
Email: community.affairs.sen@aph.gov.au

Dear Dr Holland

The NSW Environment Protection Authority (EPA) has prepared the attached submission for consideration by the Senate Committee on Community Affairs as part of its current inquiry into the health impacts of air pollution in Australia.

The EPA has prepared the submission with advice from the NSW Department of Health and NSW Roads and Maritime Services.

The submission presents information held by the EPA on air quality monitoring and air emissions inventory findings and on the legislative and policy framework and current programs for managing air quality and reducing particle emissions in NSW. The submission also provides links to EPA published materials and materials from other sources relevant to the terms of reference.

I trust this information will be useful to the committee.

Yours sincerely

14 MAR 2013

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SENATE STANDING COMMITTEE ON COMMUNITY AFFAIRS
INQUIRY INTO THE IMPACTS ON HEALTH
OF AIR QUALITY IN AUSTRALIA

NSW ENVIRONMENT PROTECTION AUTHORITY SUBMISSION

March 2013

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EXECUTIVE SUMMARY

This submission addresses Terms of Reference (a), (b) and (c) and provides links to NSW Environment Protection Authority (EPA) published material and material from other relevant sources.

In relation to Terms of Reference (TOR) (a), *particulate matter – its sources and effects*, the submission presents evidence from the NSW Air Emissions Inventory on the sources of particle emissions in the Greater Metropolitan Region[1] (GMR), also with specific reference to the Upper Hunter region. The submission presents current evidence on the impacts of particles in NSW including costs to the community, and the health impacts from both short-term and long-term exposure.

Under TOR (b) and (c), *those populations most at risk and the causes that put those populations at risk*, and *the standards, monitoring and regulation of air quality at all levels of government*, the submission identifies areas where NSW air quality monitoring shows that national health-based standards are achieved and where they are exceeded. It presents NSW monitoring data for particles and ozone, which are the only air pollutants for which national goals are not always met in NSW.

The submission then outlines the framework and current actions for managing and improving air quality in NSW, again making specific reference to the Hunter region. The submission also refers to air quality management at national level, in particular NSW's involvement in developing the National Plan for Clean Air and current opportunities for the Commonwealth to improve air quality in Australia by introducing national standards for products and equipment, consistent with international best practice.

The information and analysis included in this paper is taken largely from the air pages of the EPA website (at http://www.environment.nsw.gov.au/air/) and the atmosphere chapter of the 2012 NSW SOE Report (at: http://www.environment.nsw.gov.au/soe/soe2012/).

NSW GOVERNANCE FRAMEWORK

The NSW EPA is the State's lead environmental regulator. It is responsible for regulating a diverse range of activities that can have an impact on the health of the NSW environment and its people, including activities that result in air emissions.

The EPA licenses scheduled industry activities, implements environmental regulatory requirements and conducts compliance and enforcement programs. It also combines regulation with other tools, including education, partnerships and economic mechanisms.

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1 Sydney, Hunter Valley, Central Coast, Blue Mountains and Wollongong regions.

The EPA works cooperatively with the Office of Environment and Heritage (OEH) to protect and improve ambient air quality in NSW and improve public health outcomes. The OEH conducts monitoring of ambient air quality across NSW, undertakes in-house research and modelling and partners with external researchers in air quality related fields.

The EPA and OEH also work closely with other Government agencies including NSW Health, Roads and Maritime Services, the Department of Planning and Infrastructure, the Department of Trade and Investment, Regional Infrastructure and Services and Transport for NSW.

The EPA's responsibilities relate to managing ambient air quality in NSW. Other agencies, principally NSW Health and WorkCover, have lead responsibility in relation to indoor air quality and exposure of workers to harmful emissions.

TOR (A): PARTICULATE MATTER SOURCES AND EFFECTS

NSW Air Emissions Inventory 2008

The NSW Air Emissions Inventory is the most comprehensive study of air emissions in Australia and is an important tool for calculating emission levels, understanding air pollution issues and pinpointing major emission sources for action. Data is gathered from a wide range of government and industry sources and through domestic surveys. The EPA updates the inventory every five years. The most recent update was published in 2012.

The current inventory presents data for the 2008 calendar year, detailing emissions and their sources for over 850 pollutants in NSW's greater metropolitan regions (GMR) of Sydney, Wollongong and Newcastle (which includes the Hunter region). About 75% of the NSW population resides in the GMR.

The inventory includes emissions from biogenic (i.e. natural and living), geogenic (i.e. natural non-living) and anthropogenic (i.e. human-made) sources, as follows:

- natural (e.g. bushfires, marine aerosols and vegetation);
- commercial businesses (e.g. non-EPA licensed printers, quarries and service stations);
- domestic activities (e.g. residential lawn mowing, portable fuel containers and wood heaters);
- industrial premises (e.g. EPA-licensed coal mines, oil refineries and power stations);
- non-road vehicles and equipment (e.g. dump trucks, bulldozers and marine vessels); and
- on-road transport (e.g. registered buses, cars and trucks).

The pollutants covered include:

- common pollutants, such as ammonia, carbon monoxide (CO), lead, oxides of nitrogen (NO_x), particulate matter ≤ 10 (PM_{10}) micrograms (μm), particulate matter ≤ 2.5 μm ($PM_{2.5}$), sulfur dioxide (SO_2) and total volatile organic compounds (VOC);
- organic compounds, such as 1,3-butadiene, benzene and formaldehyde;
- metals, such as cadmium, manganese and nickel;
- PAH (polycyclic aromatic hydrocarbons), PCDD (polychlorinated dibenzo-p-dioxins) and PCDF (polychlorinated dibenzofurans); and
- greenhouse gases (carbon dioxide, methane and nitrous oxide).

The updated inventory for the 2008 calendar year shows that from 1992 to 2008,

emissions of PM_{10} (↓35%) have steadily decreased in the Sydney region, along with emissions of NO_x (↓28%), VOC (↓42%), even though gross state product (↑68%), vehicle kilometres travelled (↑26%), energy consumption (↑28%) and population (↑18%) have steadily increased during the same period. Air pollution reductions have in part occurred through the success of state-based industry regulation and national vehicle emission standards.

In contrast to the Sydney region, in the GMR emissions of PM_{10} (↑20%) have increased, which is largely due to increased coal mining, primarily in the Hunter Valley. Growth in emissions has largely occurred in regional areas. NO_x emissions (↑30%) also increased in the GMR between 1992 and 2008, mainly because of growth in coal fired electricity generation.

Unregulated sources of air pollution are now becoming more significant, with growing contributions to primary and secondary particle pollution coming from wood heaters, non-road diesel fuelled equipment such as used in mining and 2-stroke petrol fuelled engines such as used in boating.

Figures 1 and 2 present trends in gross state product, vehicle kilometres travelled, energy consumption, population and emissions for the Sydney region and GMR respectively.

The full inventory findings are available on the EPA website at:
www.environment.nsw.gov.au/air/airinventory.htm.

A summary of the findings is contained in *Air Emissions Inventory for the Greater Metropolitan Region in New South Wales, 2008 Calendar Year, Technical Report 1, Consolidated Natural and Human-Made Emissions: Results, Executive Summary*, included as Appendix 1 and available at:
http://www.environment.nsw.gov.au/resources/air/120255AEITR1NatHumanES.pdf.

Figure 1: Trends in gross state product, vehicle kilometres travelled, energy consumption, population and emissions in the Sydney region

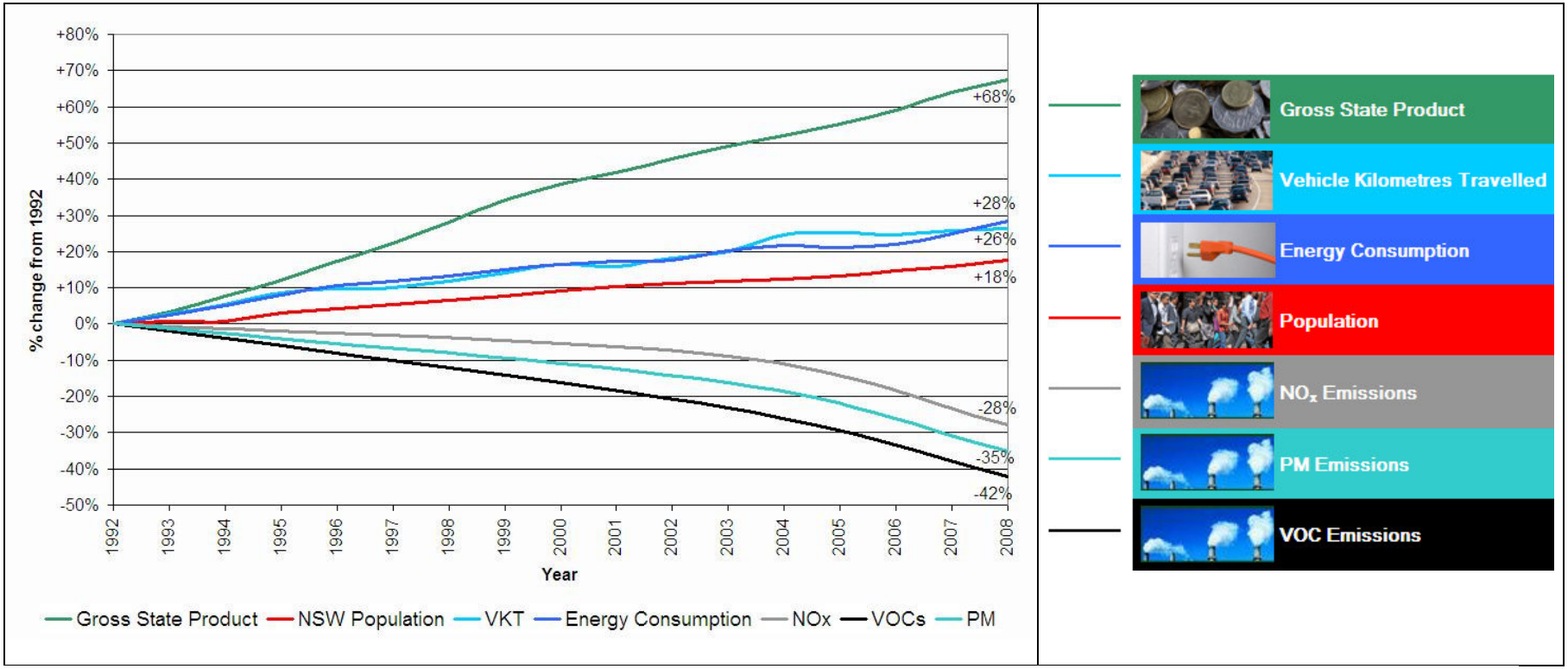
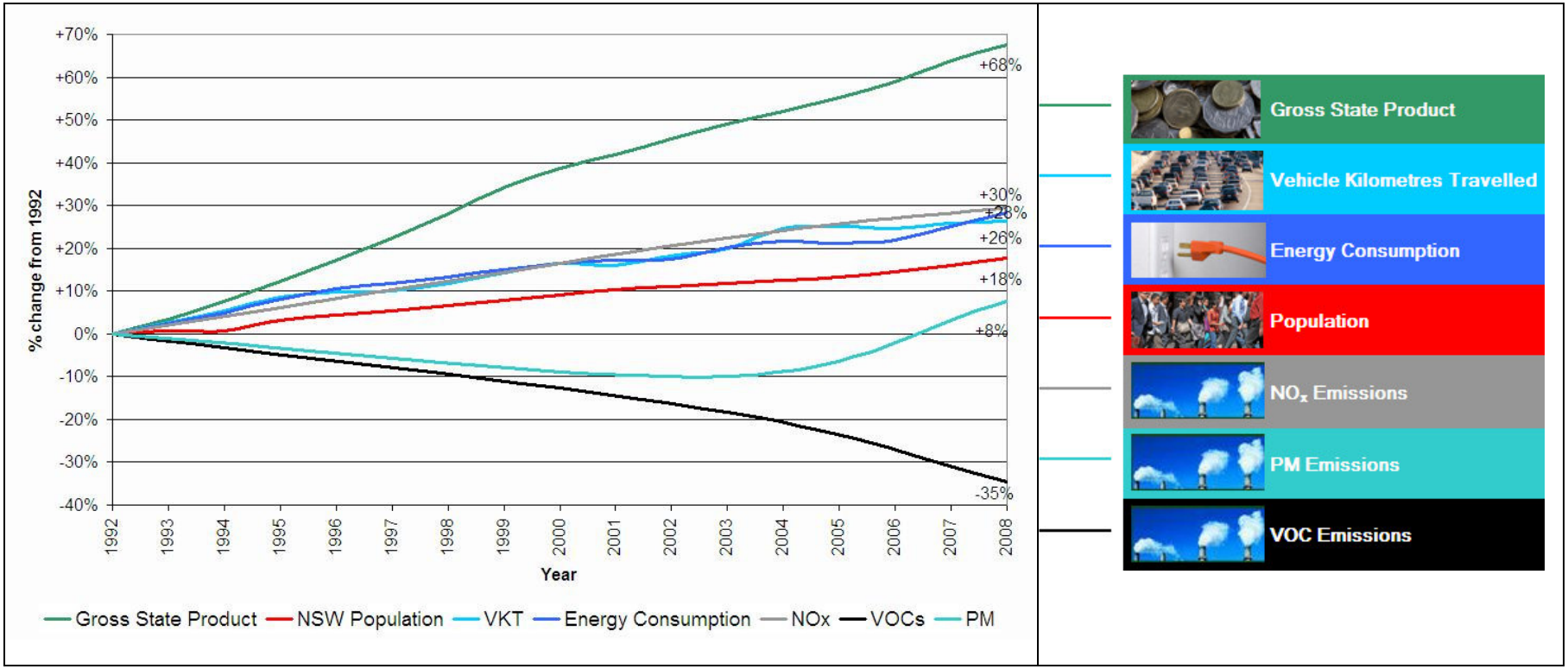


Figure 2: Trends in gross state product, vehicle kilometres travelled, energy consumption, population and emissions in the GMR



PARTICLE SOURCES IN SYDNEY AND THE NSW GREATER METROPOLITAN REGION

The charts below show the major human activity emitting $PM_{2.5}$ in Sydney is solid fuel heating. This is also the foremost source of PM_{10}. Other significant sources include heavy vehicles and shipping.

Figure 3: Top 10 sources of $PM_{2.5}$ in Sydney

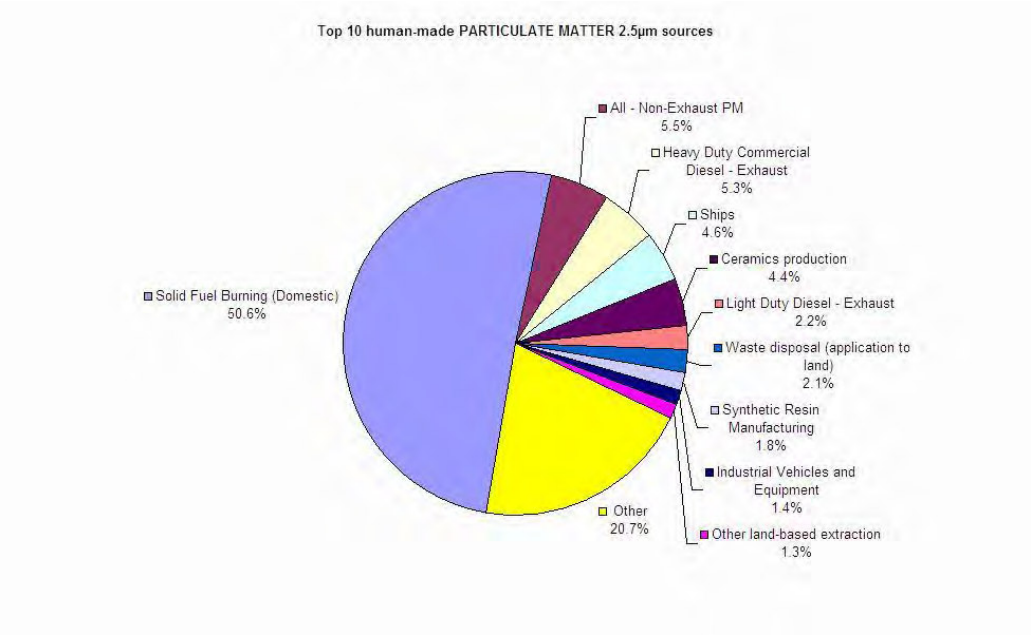
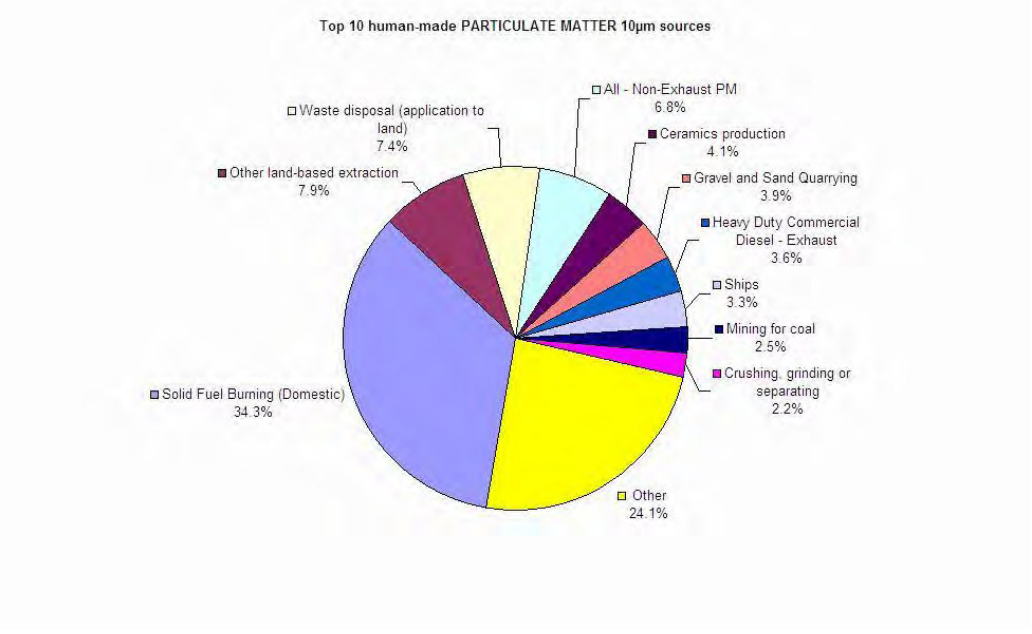


Figure 4: Top 10 sources of PM_{10} in Sydney



The dominant source of particles in the GMR is coal mining (nearly 60% of PM_{10} emissions). Other major sources are solid fuel heaters, power generation and industrial vehicles and equipment.

Figure 5: Top 10 sources of $PM_{2.5}$ in the GMR

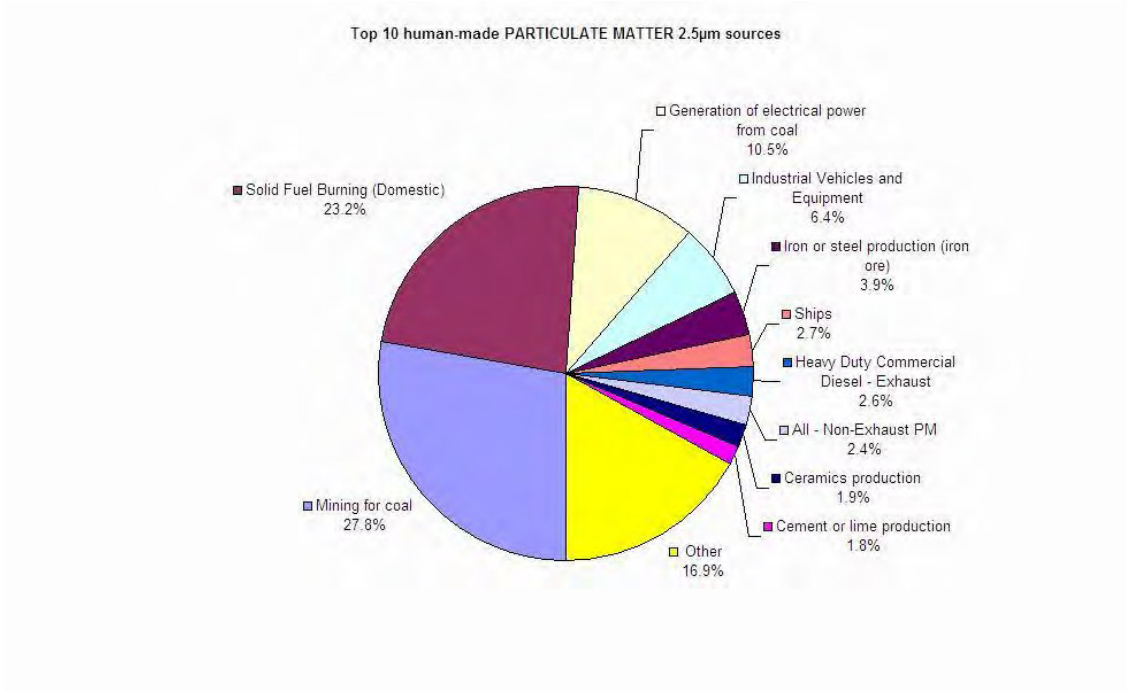
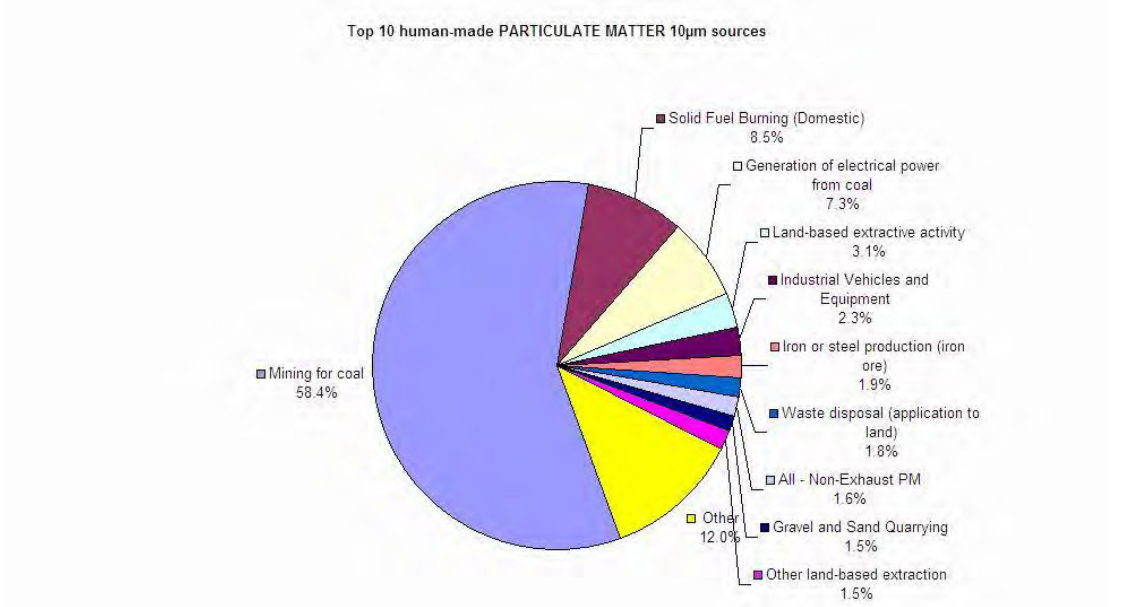


Figure 6: Top 10 sources of PM_{10} in the GMR



PARTICLE EMISSION TRENDS AND SOURCES IN THE HUNTER

The 2008 inventory report shows PM_{10} emissions from Upper Hunter industrial activity doubled, from approximately 25,000 tonnes in 2003 to 50,000 tonnes in 2008.

Industrial emissions of $PM_{2.5}$ also increased, from approximately 4,300 tonnes in 2003 to 9,600 tonnes in 2008. $PM_{2.5}$ emissions from non-road diesel equipment, which is primarily used at mine sites, also grew.

Figures 7 and 8 show the proportionate contribution of PM_{10} and $PM_{2.5}$ by various sectors in 2008. Figures 9 and 10 present a comparison of 2003 and 2008 emissions.

Figure 7: PM_{10} emissions all sectors Upper Hunter Region

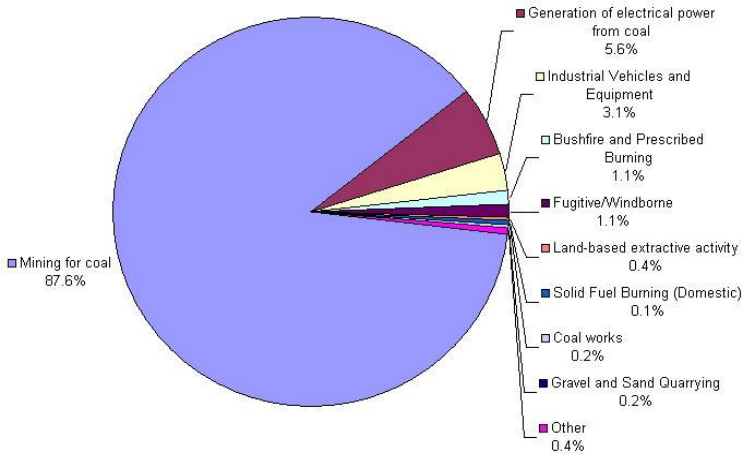


Figure 8: $PM_{2.5}$ emissions all sectors Upper Hunter Region

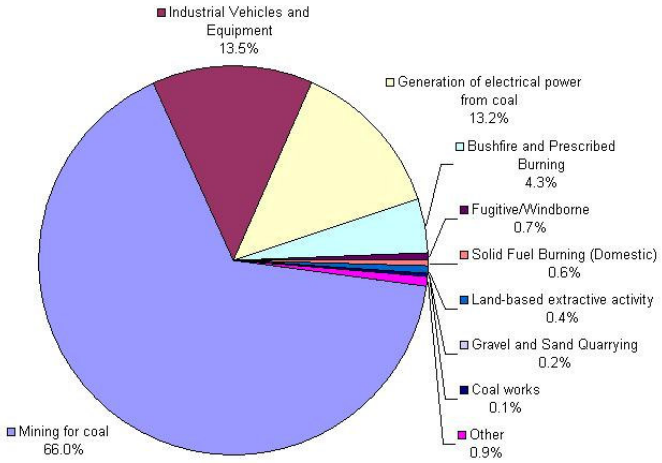
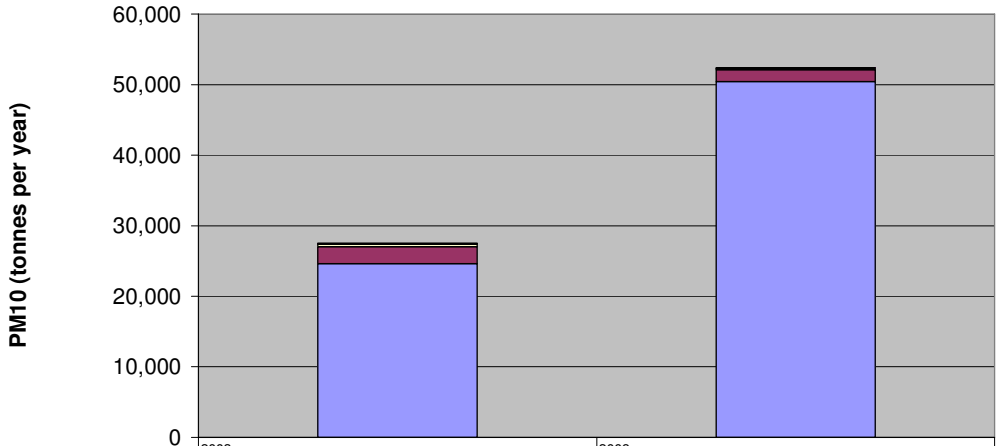
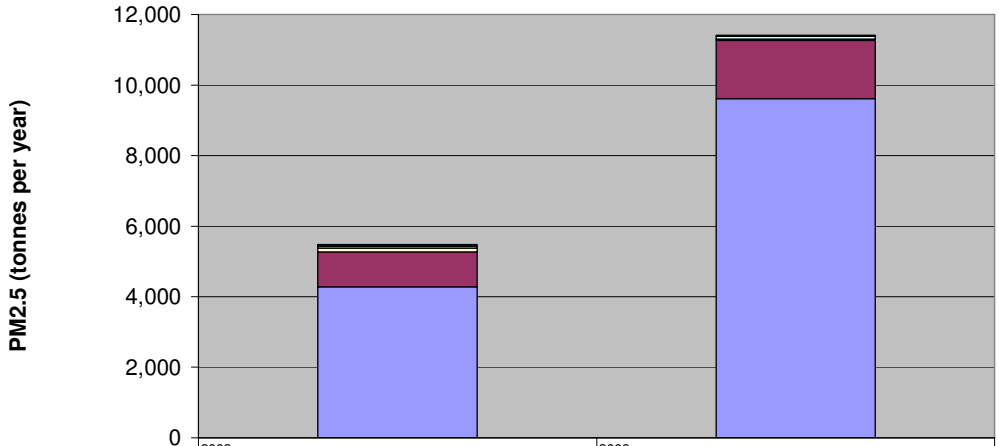


Figure 9: Comparison of contribution by different sectors to PM_{10} emissions Upper Hunter, 2003 to 2008



	2003	2008
On-Road Mobile	48.4	44.1
Domestic-Commercial	53.3	82.1
Commercial	375.2	148.5
Off-Road Mobile	2,368.8	1,699.2
Industrial	24,648.5	50,432.0

Figure 10: Comparison of contribution by different sectors to $PM_{2.5}$ emissions Upper Hunter, 2003 to 2008



	2003	2008
On-Road Mobile	46.5	34.8
Domestic-Commercial	51.5	78.9
Commercial	106.6	37.2
Off-Road Mobile	992.0	1,647.8
Industrial	4,279.0	9,618.3

PARTICULATE MATTER EFFECTS

According to the World Health Organisation (WHO), particulate matter affects more people than any other pollutant and its effects on health occur at levels of exposure currently being experienced by most urban and rural populations in both developed and developing countries. (See World Health Organisation, *Air quality and health fact sheet*, available at www.who.int/mediacentre/factsheets/fs313/en/index.html.) In Australia, peak particle levels occur at or above current national air quality standards in major cities and some regional centres.

Short-term and long-term exposure to particulate matter are associated with mortality and morbidity from cardiopulmonary disease. Over the short-term, increases in 24hr average concentration of PM2.5 and PM10 are associated with mortality and hospitalizations from cardiovascular and respiratory diseases. In the longer term, a robust association has also been demonstrated between annual average PM2.5 and mortality from all-causes and cardiopulmonary causes.

Short-term and long-term exposure are thought to have different mechanisms of effect. Short-term exposure appears to exacerbate pre-existing diseases while long-term exposure most likely causes disease and increases the rate of progression. The evidence is clear that long-term exposure to PM2.5 has a larger health effect than short-term exposure, suggesting that strategies that provide long-term reductions in particulate pollution are likely to produce the greatest health benefit.

Fine particles are those of greatest health concern. Fine particles include both primary particles and secondary organic and inorganic aerosols, resulting from atmospheric reactions involving oxides of nitrogen, volatile organic compounds, sulfur dioxide and ammonia. While larger particles generally settle close to their source, smaller particles can remain suspended in the air and be carried over large distances, potentially causing impacts in areas far from their source. Further information on $PM_{2.5}$ is available at:
http://www.environment.nsw.gov.au/air/particlepollutionPM2.5.htm.

The following documents present summaries of the latest health evidence that is supporting policy on managing particles, including in the United States, Europe and Australia:

- World Health Organisation report on Review of evidence on health aspects of air pollution, released in January 2013, available at: http://www.euro.who.int/en/what-we-do/health-topics/environment-and-health/air-quality/publications/2013/review-of-evidence-on-health-aspects-of-air-pollution-revihaap.

- US EPA National Ambient Air Quality Standards for Particulate Matter Final Rule, January 2013, and supporting documents, available at: http://www.epa.gov/airquality/particlepollution/actions.html#dec12.

- Australian review of the National Environment Protection (Ambient Air Quality) Measure – Discussion Paper, July 2010, available at: http://www.ephc.gov.au/taxonomy/term/23.

- International Agency for Research on Cancer (part of WHO) declaration of diesel exhaust as a human carcinogen, June 2012, available at: http://www.iarc.fr/en/media-centre/iarcnews/2012/mono105-info.php.

COSTS TO THE COMMUNITY OF PARTICLE POLLUTION

The cost associated with morbidity and premature mortality attributable to air pollution at 2005 levels in the metropolitan centres of Sydney, Wollongong and Newcastle was estimated to be $4.7 billion or $893 per head of population. (See *Health Costs of Air Pollution in the Greater Sydney Metropolitan Region* at: http://www.environment.nsw.gov.au/resources/aqms/airpollution05623.pdf). Looking at motor vehicle pollution alone, the Australian Bureau of Transport and Regional Economics estimated health costs of $3.3 billion per year in the country's capital cities with Sydney's share $1.5 billion. See Health costs of transport emissions in Australia at: http://www.bitre.gov.au/publications/2005/files/wp_063.pdf. Particle pollution is the driver for the high public health costs of air pollution.

There are large benefits available to the community and economy from reducing air pollution and associated health impacts.

In the United States, the US Office of Management and Budget (OMB) stated in a 2011 report to Congress that regulation of particle sources generated not only the bulk of benefits from *environmental* regulation but the bulk of benefits from *all* US federal regulation. Of all major US Federal Rules and programs reviewed by the OMB over the 10 years to 2010, US EPA air rules accounted for 62-84% of all estimated benefits. Most of this is attributable to the reduction in public exposure to fine particulate matter. (See *US 2011Report to Congress on the benefits and costs of Federal regulation and unfunded mandates on State, Local and Tribal Entities,* at: http://www.whitehouse.gov/sites/default/files/omb/inforeg/2011_cb/2011_cba_report.pdf).

In Australia, the review of Euro 5/6 Light Vehicle Emissions Standards in 2010 found that harmonising Australian vehicle standards with Euro 5/6 standards would deliver a net benefit to the community of up to $807 million mainly linked with particle reductions, depending on the implementation option chosen. See the Final Regulation Impact Statement at: https://www.infrastructure.gov.au/roads/environment/files/Final_RIS_Euro_5_and_6_Light_Vehicle_Emissions_Review.pdf.

TOR (B) POPULATIONS MOST AT RISK AND CAUSES

NSW has good air quality by international standards. However, pollution levels and emission sources can vary in different parts of the state. NSW compliance with the air quality goals under the *National Environment Protection (Ambient Air Quality) Measure* (Air NEPM), including where exceedences occur and likely causes, are discussed in annual jurisdictional compliance reporting. The latest published NSW report for 2010 can be found at: http://www.scew.gov.au/nepms/reports.html#aaq-annual.

Some groups, such as those living near roads or industrial emissions sources, are at greater risk because they are more likely to be exposed to high levels of air pollution. Individual susceptibility to air pollution also depends on personal characteristics such as age, behaviour, socioeconomic status, and underlying health status. Groups that are more susceptible to air pollution include children, older adults and people with underlying cardiac or pulmonary disease.

PARTICLES EXPOSURE

Highest exposure to fine particles in NSW occurs during severe bushfires and dust storms. During these events, peak PM_{10}, $PM_{2.5}$ and nephelometer readings can greatly exceed the relevant standards, reporting guideline or goal. Dust storms are responsible for the greatest spatial extent and bushfires for the longest exposure to elevated concentrations of fine particles in NSW. The greatest 24-hour average PM_{10} concentration recorded in NSW was recorded at Newcastle on 23 September 2009 during a severe dust storm. Severe bushfires can cause high concentrations of fine particles that persist above the relevant standards for several weeks.

The use of solid-fuel heaters during winter can be a significant source of fine particle emissions throughout NSW. PM_{10} data shows that exceedences in the Sydney region, especially during autumn and winter, tend to be strongly local events confined to a few sites, rather than widespread. Exceedences are more likely in the warmer months of the year and are often associated with bushfire events. A greater proportion of exceedence days occur in winter for the $PM_{2.5}$ advisory reporting standard.

A report on the first full year of data for the Upper Hunter Air Quality Monitoring Network (UHAQMN) was released in February 2013 and showed that particle pollution in the population centres of Singleton and Muswellbrook exceeded national standards and was higher than the network average for the Greater Metropolitan Region. Further detail on the report findings is included below under the section on Monitoring Findings.

As indicated already (see Figures 7 and 8), particle emissions in the Upper Hunter are dominated by coal mining (66% of $PM_{2.5}$ and 87.6% of PM_{10}). Other important

sources of fine particles are power generation (13.5% of $PM_{2.5}$ and 5.6% of PM_{10}) and non-road diesel equipment (13.2% of $PM_{2.5}$ and 3.1% of PM_{10}).

The full report, *Hunter Valley Annual Air Quality 2012: Fine Particles*, is available at: http://www.environment.nsw.gov.au/resources/aqms/20130037HunterAir2012.pdf.

Exposure Reduction

Population risk to the health impacts of air pollution is a function of both levels of pollution and the extent to which people are exposed to pollution. Some populations are exposed to pollutants through living close to industrial or traffic sources, for example along busy roads. Recognising these interactions, some jurisdictions, including NSW, have introduced planning policies to reduce exposure of sensitive land uses (such as residential uses) to high emission sources (such as busy roads); see:
http://www.planning.nsw.gov.au/planningsystem/pdf/guide_infra_devtrailroadcorridors_interim.pdf.

Ozone Exposure

Sydney exceeds Air NEPM ozone standards in most years. The main sources of ozone precursors in Sydney are motor vehicles (NOx from exhaust and VOCs from evaporative emissions) and, increasingly, emissions from unregulated sources such as aerosols and solvents and small petrol-powered engines as used in gardening equipment and recreational boating.

While ozone sources are distributed throughout the Sydney basin, the nature of ozone formation and meteorology and topography of Sydney mean that ozone tends to impact mainly on western Sydney. A spatial analysis included in the *Current Air Quality in NSW* (2010) showed that exceedences occur throughout the Sydney Basin but are most common in western and south-western Sydney. See:
http://www.environment.nsw.gov.au/air/cpairqual.htm.

TOR (C) STANDARDS, MONITORING AND REGULATION OF AIR QUALITY AT ALL LEVELS OF GOVERNMENT

National Air Quality Goals

NSW monitors and reports on air quality in accordance with the National Environment Protection (Ambient Air Quality) Measure (Air NEPM) and complies with national air quality goals for four of the six major criteria air pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide and lead. However the national standards for the other two criteria pollutants – ozone and particle pollution, can be exceeded in Sydney and some regions in some years. The Air NEPM can be found at: http://www.ephc.gov.au/airquality/aaq_nepm.

The Air NEPM sets health-based air quality standards to be achieved at cities and large towns across Australia. For PM_{10}, it sets a compliance standard, of 50 µg/m^3 as a 24-hour calendar day average, with a maximum five allowable exceedences permitted per year in recognition of natural events such as bushfires or dust storms. The Air NEPM also sets 8 µg/m^3 as an annual average and 25 µg/m^3 as a 24-hour calendar day average as advisory reporting standards for $PM_{2.5}$. The annual standard for $PM_{2.5}$ is currently the tightest standard in the world.

NSW Air Quality Monitoring

NSW's Air Quality Monitoring Program is currently the largest in Australia, with a comprehensive monitoring network consisting of 40 monitoring stations across the State. Sydney's air has been monitored for a range of pollutants since the 1960s. Current reporting on ambient air quality levels is referenced against the NEPM.

Under the Air NEPM, in order to measure achievement against the standards and goals, NEPM air quality monitoring stations must be located to obtain a representative measure of air quality likely to be experienced by the general population in the region. The NEPM network is a sub-set of the total Air Quality Monitoring Network (AQMN) operated by NSW OEH.

In 2012, the NSW Government completed a 14 station industry-funded air quality monitoring network in the Upper Hunter Valley and opened two new air quality monitoring stations in the Sydney Region – one at Camden in Western Sydney and one at Wyong on the Central Coast. This brought the number of air quality monitoring stations to 15 in Sydney and to 40 across NSW. Information from the network of air quality monitoring stations is reported on the OEH website at: www.environment.nsw.gov.au/AQMS/aboutaqi.htm.

This website combines air quality monitoring data with weather forecasting and an air pollution alert system to provide the community with up-to-date air quality information. The website includes maps showing the location of monitoring stations and provides hourly updates to local air quality levels based on six key air pollutants, a colour chart that provides a visual indicator of air quality and a sign up function for

SMS or email alerts for high pollution days. It also provides links to NSW Health for information on air quality and health issues.

In consultation with the Newcastle community, via the Newcastle Community Consultative Committee on the Environment, the EPA is also working towards establishing new industry funded ambient air quality monitors in suburbs near the Port of Newcastle. In the interim, while this network is being established, Orica has constructed a monitoring station at Stockton, measuring PM_{10} and $PM_{2.5}$ particles and other pollutants. The data is publicly available in real time and in the form of regular reports at: http://www.stocktonairqualitymonitoring.com/.

The NSW Government's New England North West Strategic Regional Land Use Plan also includes an action to progressively establish a regional air monitoring network in the New England North West as coal mining activity increases, following the Upper Hunter industry-funded model. Its initial focus will be to obtain baseline data in population centres. The Plan is available on NSW Department of Planning and Infrastructure's website at: http://www.planning.nsw.gov.au/srlup.

MONITORING FINDINGS

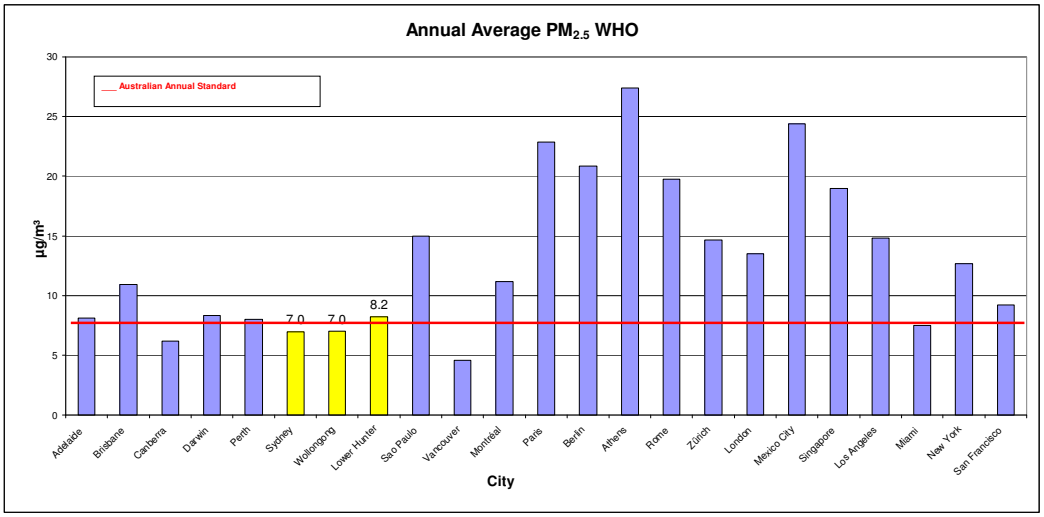
Air quality in NSW has improved significantly since the 1980s with initiatives to reduce urban air pollution implemented across industry, business, homes and motor vehicles. NSW generally achieves compliance with the Air NEPM goals for all pollutants except ozone and particles. Levels of carbon monoxide, nitrogen dioxide and sulfur dioxide continue to be well below Air NEPM standards. Monitoring for lead as a regional pollutant ceased in NSW from January 2005 in response to the extremely low concentrations of lead found in ambient air (as a result of the phasing out of lead in petrol).

Data from the total NSW Air Quality Monitoring Network (AQMN) network for all pollutants monitored are reported at:
http://www.environment.nsw.gov.au/AQMS/aqi.htm.

The latest published annual report for NSW compliance with the Air NEPM is at:
http://www.scew.gov.au/nepms/reports.html#aaq-annual.

Figure 11 presents a comparison of $PM_{2.5}$ levels in NSW with Australian and international cities and shows that NSW levels are generally good by world standards. (A PM_{10} comparison is not presented because PM_{10} measurements are not readily available across jurisdictions).

Figure 11: International comparison of $PM_{2.5}$ levels



Source: World Health Organisation, Department of Public Health and Environment Geneva, Switzerland. Urban Outdoor Air Pollution Database. Published September 2011.

Figure 12 on the following page is a map from WHO showing exposure to PM_{10}, based on the mean annual concentration, in 1100 urban areas worldwide, for 2003-2010.

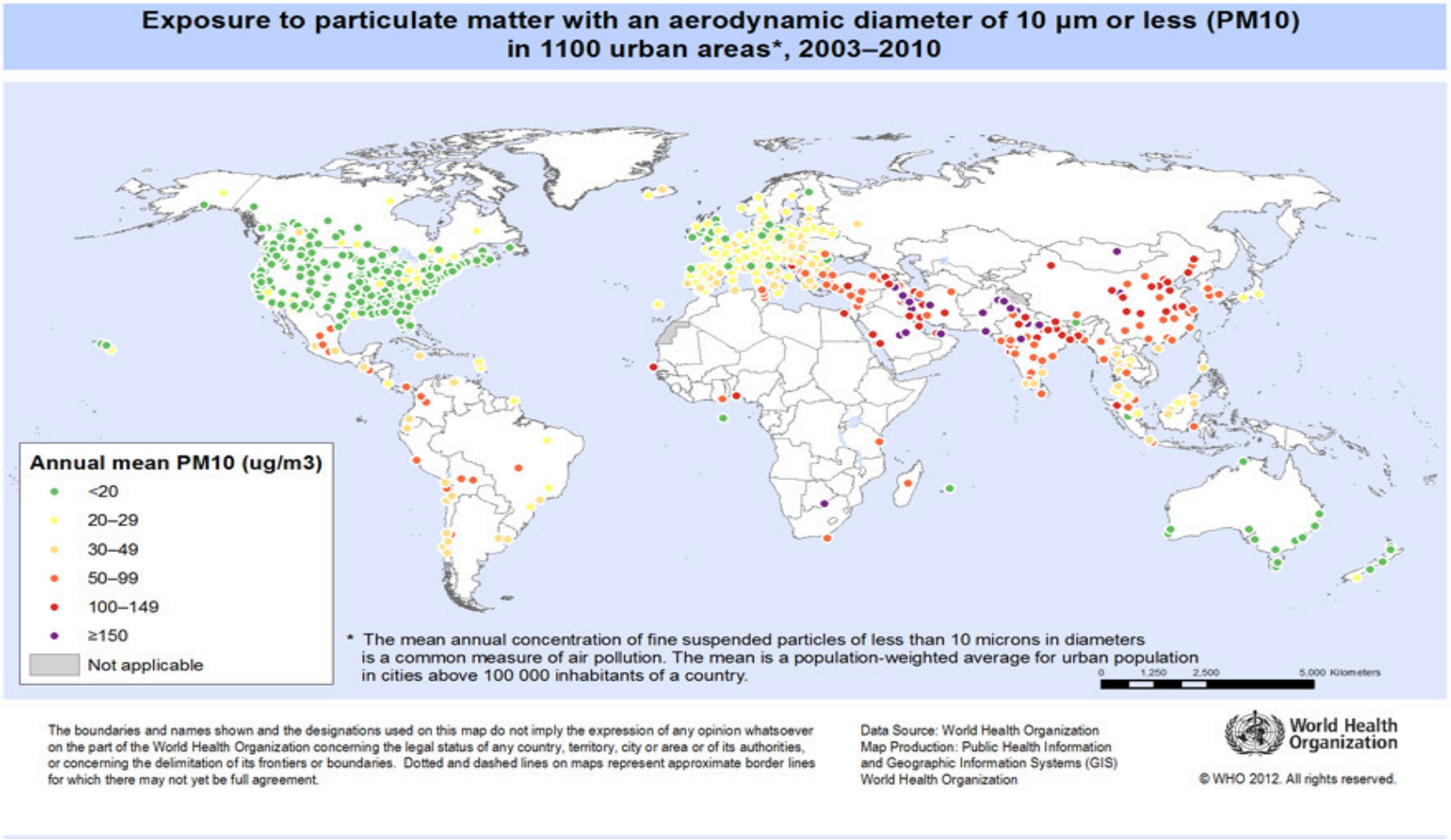


Figure 12: Urban areas worldwide exposure to PM_{10} 2003-2010, WHO.

PARTICLE POLLUTION LEVELS IN NSW

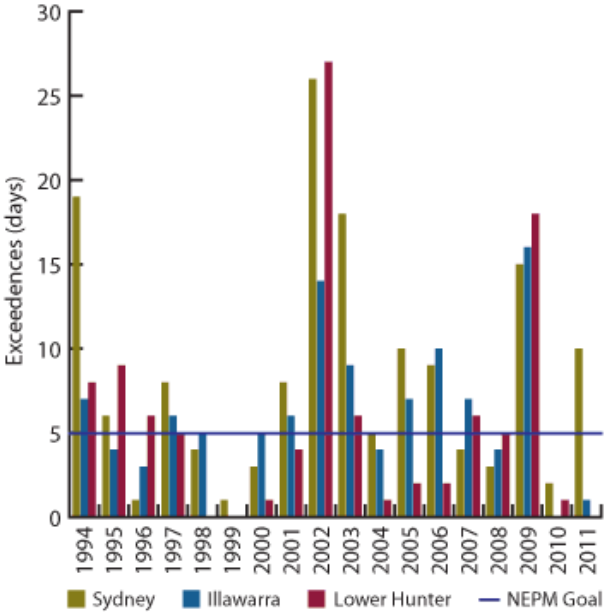
The Air NEPM sets a standard for PM_{10} of 50 micrograms per cubic metre ($\mu g/m^3$) (24-hour calendar day average). The goal set was that by 2008 the standard would not be exceeded on more than five days per year, thus making an allowance for the occurrence of extreme, potentially unavoidable events, such as dust storms, bushfires and hazard reduction burning.

Figures 13 -16 below show levels of compliance of NSW monitoring regions with PM_{10} and $PM_{2.5}$ for the years 1994-2011. The figures are taken from the Atmosphere chapter of the recently released 2012 NSW State of the Environment report. The full report is available at: http://www.environment.nsw.gov.au/soe/soe2012/.

PARTICLES AS PM_{10}

Except during times of increased bushfires and dust storms, PM_{10} pollution generally meets the standards in Sydney. The number of exceedences varies greatly from year to year.

Figure 13: Exceedences of the Air NEPM standard for particles (PM_{10}) in the GMR, 1994–2011



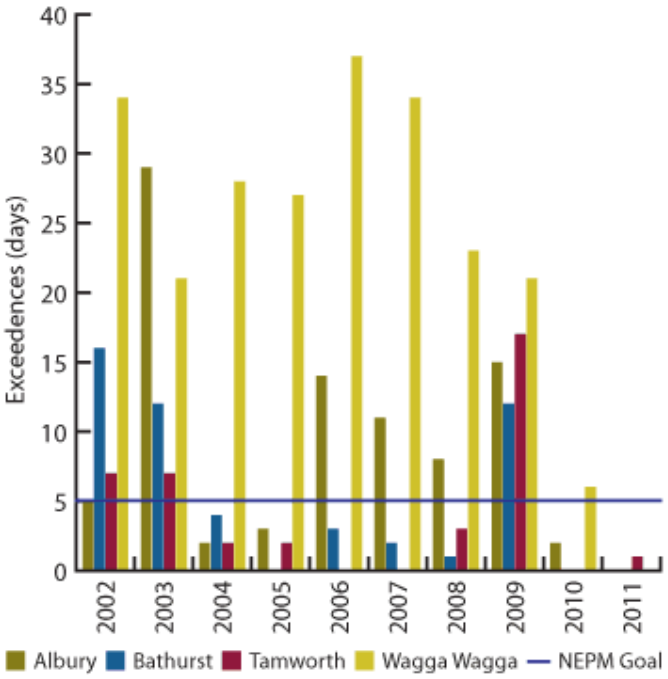
Source: OEH data 2012

The national goal for PM_{10} is not being met in some regional centres, with bushfires, stubble burning, dust storms, coal mine dust and wood heaters the major causes. The levels recorded in these centres are generally representative of the air quality in the surrounding regions. PM_{10} concentrations are monitored in Albury (NSW–Victoria border), Bathurst (Central Tablelands), Tamworth (North-West Slopes) and Wagga Wagga (South-West Slopes).

The general run of high exceedence years in the years to 2009 was due to factors such as dust storms, bushfires and other conditions associated with the prolonged drought, agricultural stubble burning, and the use of wood heaters in the region.

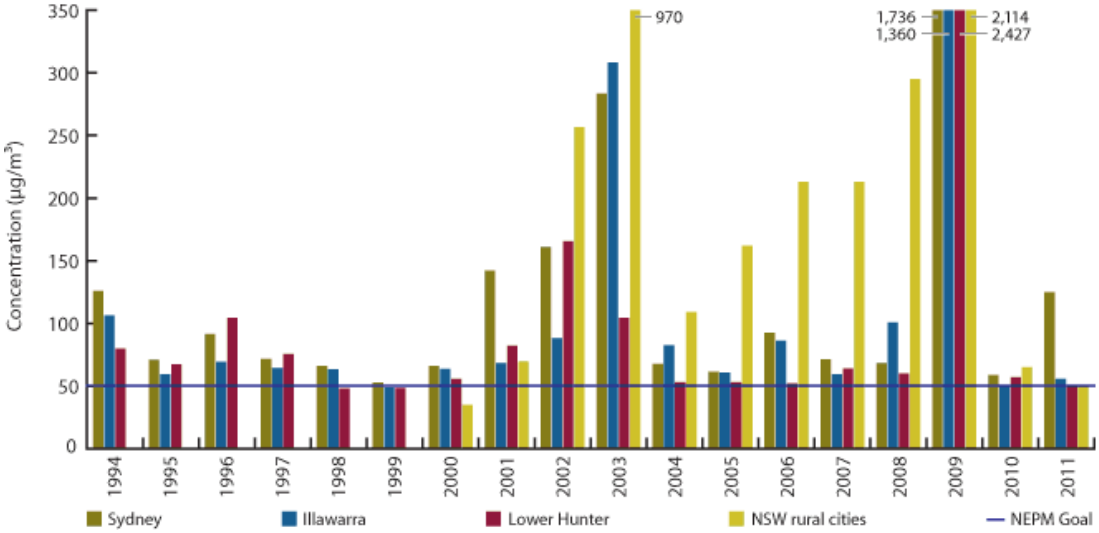
While large-scale dust storms are uncommon events, they can result in widespread exposure to extreme levels of particles (DECCW 2010). For example, on 23 September 2009, the largest dust storm to hit NSW since air quality monitoring commenced resulted in extreme levels of particles over most of the state. The incidence of dust storms is a function of soil dryness, ground-cover density and wind speed (Lu & Shao 2001) and increases with the frequency of droughts. The incidence of drought is projected to increase as a result of climate change (CSIRO 2007) and so dust impacts on air quality may also be expected to increase.

Figure 14: Exceedences of the Air NEPM standard for particles (PM_{10}) in NSW rural cities, 2002–11



Source: OEH data 2012

Figure 15: Annual maximum 24-hour-average concentrations for particles (PM_{10}) in the GMR and NSW rural cities, 1994–2011



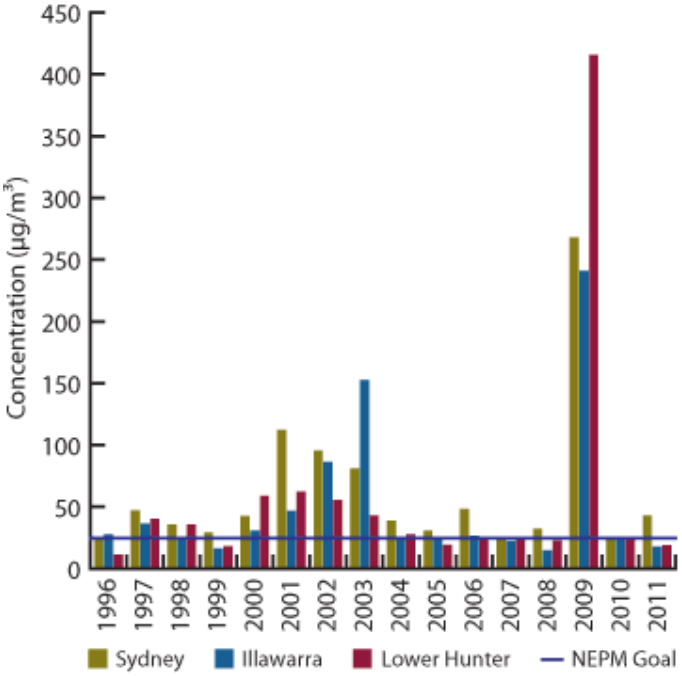
Source: OEH data 2012

PARTICLES AS $PM_{2.5}$

$PM_{2.5}$ advisory reporting standards – a 24-hour calendar day average of 25 µg/m^3 and an annual average of 8 µg/m^3 – were added to the Air NEPM by an amendment in 2003. In NSW measured $PM_{2.5}$ concentrations have generally been at or below the 24-hour-average advisory reporting standard but for some years above the annual average advisory reporting standard.

Figure 16 shows the highest daily average concentration of $PM_{2.5}$ recorded each year in the GMR_2 subregions. After four years of elevated maximums from 2000 to 2003, seven of the past eight years have seen the maximum measured 24-hour-average $PM_{2.5}$ concentrations return to levels closer to the advisory reporting standard for the daily average, except for 2009 which had the highest peaks ever recorded due to the September dust storms.

Figure 16: Annual maximum 24-hour-average concentrations for particles ($PM_{2.5}$) in the GMR_2, 1996–2011



Source: OEH data 2012

The particle (as PM_{10} and as $PM_{2.5}$) goals present a challenge in NSW, particularly in rural population centres where mining, agricultural activities, relatively high use of solid fuel heaters and climate produce elevated levels of particles in autumn and winter.

UPPER HUNTER PARTICLE POLLUTION

The 14 station Upper Hunter Air Quality Monitoring Network has been fully operational since February 2012. The 14 monitoring stations have been located to provide coverage of air quality levels in larger population centres, small communities, close to mining activities and at background sites at the northern and southern ends of the Upper Hunter region. Figure17 below shows daily average PM_{10} levels in 2012 for all 14 sites.

The network has been delivering information on air quality in the two major population centres of Singleton and Muswellbrook since December 2010. This data provides a representative measure of air quality likely to be experienced in population centres in the Upper Hunter region. Figure 18 below compares annual average $PM_{2.5}$ levels in Singleton and Muswellbrook with average levels across sites in Sydney, Wollongong and Newcastle.

Figure 17: Upper Hunter network 2012 – box plots for daily average PM_{10}. (Numbers denote days exceeded)

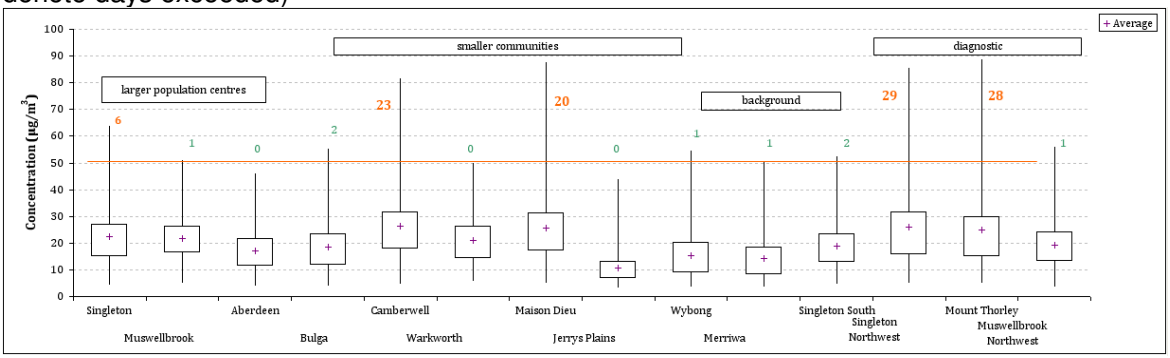
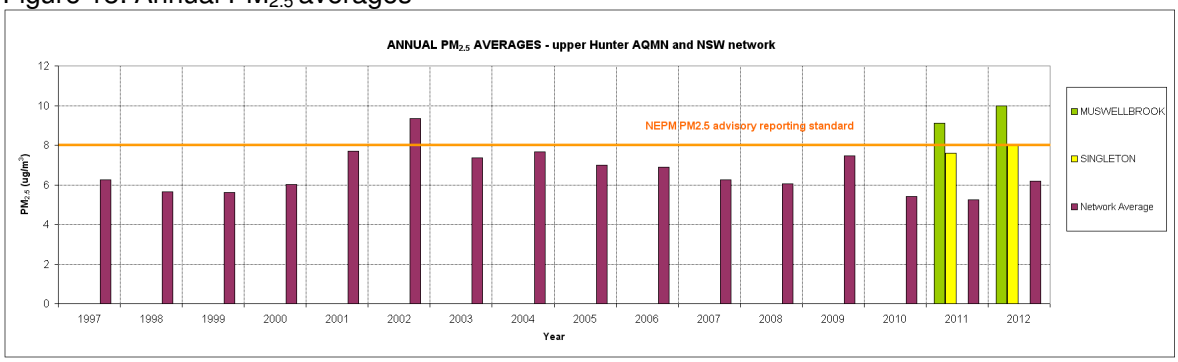


Figure 18: Annual $PM_{2.5}$ averages



The full report, *Hunter Valley Annual Air Quality 2012: Fine Particles*, is available at:
http://www.environment.nsw.gov.au/resources/aqms/20130037HunterAir2012.pdf

AIR QUALITY REGULATION AND MANAGEMENT IN NSW

AIR QUALITY MANAGEMENT FRAMEWORK

The *Protection of the Environment Operations Act 1997* (POEO Act) is the key piece of environment protection legislation administered by the EPA and provides the statutory framework for managing air emissions in NSW. The Act is supported by:

- the *Protection of the Environment Operations (Clean Air) Regulation 2010*, which provides regulatory measures to control emissions from industry, motor vehicles and fuels, domestic solid fuel heaters and open burning.
- the *Protection of the Environment Operations (General) Regulation 2009*, which establishes a licensing scheme for major industrial premises and provides economic incentives for licensed businesses and industry to reduce pollution– including emissions to air.

The EPA implements environmental regulatory requirements, licenses scheduled industry activities and conducts compliance and enforcement programs under the statutory instruments above. The EPA also develops and implements a range of non-statutory policies, programs, and strategies to improve air quality. The Air NEPM goals provide benchmarks against which progress in managing air quality can be assessed.

In 2011, the NSW Government introduced reforms to establish the NSW EPA as an independent regulatory authority and strengthen requirements on industry in relation to managing and reporting pollution incidents. Provisions included:

- requiring immediate notification of a pollution incident to all relevant authorities;
- doubling to $2 million the maximum penalty for failure to notify a pollution incident in accordance with the requirements of the POEO Act;
- requiring licensees to prepare and implement pollution incident response management plans;
- requiring licensees to publish monitoring results or otherwise make them available to the public;
- new explicit powers for the EPA and Ministry of Health to require, in certain instances, payment for an analysis of the human health and environmental risks arising from an incident;
- expanded powers to require a mandatory environmental audit; and
- expanded information to be included on the public registers of Appropriate Regulatory Authorities website.

Air quality management in NSW is guided by the Government priorities presented in such policies as:

- the Government's ten year plan for change in NSW *NSW 2021: A Plan to Make NSW Number One*; and
- Strategic Regional Land Use Plans for the Upper Hunter and New England North West regions (at http://www.planning.nsw.gov.au/srlup).

The NSW EPA has identified the following broad management principles, which it follows in giving effect to Government's priorities for air.

1. ENGAGE AND INFORM THE COMMUNITY

NSW 2021 includes commitments to increasing transparency and participation in decision-making, particularly at regional level. Goal 22, "Protect our Natural Environment", commits specifically to providing information on air to local communities through expansion of air quality monitoring. The Government has also made extensive use of community forums and consultative committees, to inform stakeholders and gain their input on major air management issues.

2. MANAGE PARTICLES TO ACHIEVE THE HEALTH BASED NATIONAL AIR QUALITY GOALS

The National Environment Protection (Ambient Air Quality) Measure sets air quality standards to be achieved at cities and large towns across Australia.

3. REDUCE EXPOSURE AND PROMOTE CONTINUOUS IMPROVEMENT

The *Protection of the Environment Operations Act 1997* sets an objective of reducing risks to human health by reducing emissions to harmless levels. The EPA recognises that even small reductions in particle concentrations and population exposure will continue to deliver health gains and should be pursued as long as they deliver a net benefit to the community. The EPA through its licensing system and support tools, such as Pollution Reduction Programs, actively encourages industry to continuously improve its performance.

4. ENSURE INDUSTRY MINIMISES EMISSIONS WHERE FEASIBLE AND COST EFFECTIVE

The EPA requires use of reasonable and practicable measures to minimise emissions and promotes industry adoption of international best management practice. The EPA backs up regulatory requirements with a strong compliance program that includes prosecuting offenders where warranted. Government requires industry to inform and consult with the community and to fund new monitoring networks where they are needed due to industry activities. The EPA is working closely with the coal industry to drive best practice and reduce particle emissions across NSW.

5. SUPPORT LOCAL COUNCILS IN IMPROVING AIR QUALITY

The EPA collaborates with and supports councils in meeting their responsibilities for air quality management through providing information at a local government scale, improving statewide frameworks for managing local air issues (such as wood smoke and open burning) and providing funding support for local initiatives.

6. IMPROVE THE EVIDENCE BASE ON IMPACTS AND CONTROLS

To help improve knowledge and understanding of particles in the atmosphere and ensure a rigorous evidence base for future programs, the NSW Government maintains and updates its air quality monitoring network and air emissions inventory and is improving particle modelling capabilities by conducting research into particle formation and composition.

New measures to improve air quality are identified, developed and implemented using the air quality management cycle, as summarised below:

- Ambient air monitoring determines NSW's compliance with Air NEPM goals and highlights areas where action is needed.
- The air emissions inventory is used to identify priority sources of key air pollutants.
- Modelling is used to estimate the amount of air pollutant reductions required to achieve compliance with air quality goals.
- Specific sectors generating emissions are investigated and analysed in order to develop cost effective emissions reduction strategies.
- This process includes stakeholder consultation and thorough economic analysis of the costs of measures and their benefits, primarily in terms of improved public health.

INDUSTRY FRAMEWORK

The *Protection of the Environment Operations Act 1997* is the key piece of environment protection legislation administered by the EPA.

The POEO Act establishes a system of environment protection licensing for 'scheduled' activities with the potential to have a significant impact on the environment. Schedule 1 of the Act lists these activities, which are licensed by the EPA. Most 'non-scheduled' activities are regulated by local councils and other local authorities.

Part 5.4 (sections 124-135) of the POEO Act deals specifically with air pollution. This includes the general obligation that the occupiers of non-residential premises do not cause air pollution by failing to operate or maintain plant, carry out work or deal with materials in a proper and efficient manner (sections 124-126).

Section 128 of the POEO Act requires occupiers of non-residential premises to comply with any air emission standards prescribed by regulations. These standards are contained in Part 5 of the Clean Air Regulation. Even where the Regulation does not prescribe standards for a particular air impurity, occupiers must still take all practicable means to prevent or minimise air pollution.

Site-specific features that will impact on the setting of emission limits are accounted for in an air quality impact assessment. The purpose of such assessment is to demonstrate acceptable impacts at any sensitive receptors surrounding the premises. Approved methods for the modelling and assessment of air pollutants in NSW specifies the methods required by statute to be used to model and assess emissions of air pollutants from stationary sources in NSW.

The methods required by statute to be used to measure emissions of air pollutants from stationary sources in NSW, to determine compliance with emissions limits, are specified in Approved methods for the sampling and analysis of air pollutants in NSW.

Tighter standards for industry emissions of particles, oxides of nitrogen (NO_x) and VOCs were introduced when the Clean Air Regulation was reviewed in 2005, along with a framework for the upgrade of old plant and equipment. The initial stage helped achieve compliance by older industrial premises, including some of the oldest and largest industrial facilities such as refineries and steel mills.

The Regulation was remade in 2010 and the second stage of the program to upgrade old industrial plant and equipment as required by regulation was implemented on 1 January 2012. It requires premises to upgrade old plant and equipment over a six-year lead-in period and further reduce emissions of particles and additional pollutants.

INDUSTRY INITIATIVES, FOCUSSING ON HUNTER COAL MINING

DUST STOP PROGRAM

As indicated above, coal mining contributes 58.4% of the PM_{10} emissions and 27.7% of $PM_{2.5}$ emissions from human activities in the NSW GMR. In response to these findings and community concerns about dust from coal mines in the Upper Hunter Region, the Government has initiated the Dust Stop Program.

In 2011-12 the EPA began implementing the recommendations of a study of international best practice in the management of dust and particle emissions from coal mines. As a result, all working NSW coal mines have been required, through Pollution Reduction Programs attached to their Environment Protection Licences, to assess operations against international best practice dust management, identify feasible improvements and report back to the EPA. The EPA is now working with industry to implement specific PRPs to manage dust from haul roads. PRPs relating

to operational practices in adverse weather, managing stockpiles and monitoring dust are being scoped.

In consultation with industry and the Department of Planning and Infrastructure, the EPA has also developed and distributed to all working NSW mines a “glove-box” size pictorial handbook as a tool for both the mining industry and Government regulatory staff. The handbook is designed to assist operators of mining machinery assess and reduce dust emissions from haul roads and drilling rigs.

The EPA also carries out unannounced inspections and surveillance of open cut coal mine operations and issues penalty notices or initiates legal action where warranted.

Best Practice Diesel Emissions Management Strategy at Mine Sites

Non-road diesel vehicles and equipment from coal mines account for a significant proportion of man-made particulate matter in both the Upper Hunter and the total GMR. Approximately 14% of $PM_{2.5}$ emissions in the Upper Hunter and over 5% of $PM_{2.5}$ in the total GMR comes from equipment used in coal mines in the Upper Hunter.

Similar to the Dust Stop program, the EPA is initiating a study to identify international best practice to reduce emissions from non-road vehicles and equipment at coal mines and to assess the extent to which the equipment in NSW mines meets best practice standards or can be retrofitted with pollution control devices. If warranted, it is proposed that coal mines will be required, via PRPs attached to their environment protection licences, to take feasible measures to reduce diesel emissions.

Dust from coal trains

In response to community concerns in the Newcastle area, the EPA commenced a study into dust from coal trains. The community was particularly concerned in view of potential doubling of coal train movements from the coal fields to the port of Newcastle.

To ascertain levels of dust generated by coal train movements, the EPA issued the Australian Rail Track Corporation (ARTC) with a PRP requiring it to install dust monitoring stations along the Hunter Valley rail corridor and conduct pilot monitoring of dust generated by different train movements.

ARTC completed the pilot and reported findings on its website in September 2012. The report indicated no appreciable difference between the dust levels measured during the movement of loaded or unloaded coal trains and other types of freight trains.

The EPA has required the ARTC, by way of a second PRP, to undertake further monitoring to test the results and report back to the EPA and public. The outcomes will inform Government consideration of whether action is required to control coal dust emissions along the Hunter rail corridor.

It is noted that the local community has also undertaken its own study into train generated dust along the Hunter rail corridor.

Upper Hunter stakeholder engagement

The Government has held community forums to discuss air quality concerns and potential solutions in the Hunter, sought industry's input via the licensing process on better managing mining emissions and engaged local councils in air quality workshops and programs.

During development of the Upper Hunter Monitoring Network, the Government established the Upper Hunter Air Quality Monitoring Network Advisory Committee. The community includes community, local government and industry representatives. The Government consulted with the Committee on all stages of the development of the network. Information on the monitoring network and committee is available at: http://www.environment.nsw.gov.au/aqms/upperhunter.htm.

Industry levy for air quality monitoring

To ensure ongoing funding for monitoring where it is needed due to a concentration of industry rather than network requirements under the Air NEPM, coal mines and electricity generators in the Upper Hunter are required under regulation to pay a levy towards ongoing operation of the network. The levy is calculated on the amount of emissions from the premises and for coal mines, also on the amount of material moved.

Upper Hunter fine particle characterisation study

To improve understanding of fine particles in the Upper Hunter, OEH and NSW Health funded CSIRO and the Australian Nuclear Science and Technology Organisation to undertake the *Upper Hunter Particle Characterisation Study*. The study commenced in 2012 and involves sampling and analysis of $PM_{2.5}$ particles to determine their composition and identify key sources. The results of the study will be publicly released following completion of the study and peer review of the results. Further detail is available at: http://www.environment.nsw.gov.au/aqms/uhaqmnfpcs.htm.

$PM_{2.5}$ model for the Upper Hunter airshed

The EPA is developing a model of the sources and transport of primary emissions of $PM_{2.5}$. The model will quantify major contributors to annual average $PM_{2.5}$ concentrations in Singleton and Muswellbrook for a base year and estimate emissions for projected years, taking into account projected future growth in coal mining and potential emission abatement scenarios. This will inform measures to improve air quality in these population centres in the long term.

NEWCASTLE MONITORING AND CONSULTATIVE COMMITTEE

At the Minister's direction, the EPA is investigating additional air quality monitoring for the heavy industrial precinct around the port of Newcastle. To provide community input, the Minister established the Newcastle Consultative Committee on the Environment. The membership of the committee includes community, local government and industry representatives. The role of the committee is to advise the Minister of environmental issues of concern. At present, its primary focus is on delivery of the additional monitoring stations. Following consideration of funding options and agreement with industry, sites are proposed to be commissioned by early 2014. See: http://www.environment.nsw.gov.au/NewcastleCttee/index.htm.

Pending installation of the new sites, Orica, with EPA and OEH technical input, has provided an ambient air quality monitoring station at Stockton to provide live data to the community on its website.

RUTHERFORD ODOUR

Following review of existing data and an initial investigation by independent experts, the EPA will commission odour sampling and modelling of the Rutherford Industrial Estate. This action has been endorsed by the Rutherford Air Quality Liaison Committee, which the Minister established to consult on issues of local industrial odours and their management. The sampling information will be fed into an odour modelling program, to identify any potential movement of odours and possible effects on nearby communities.

MANAGING PARTICLES IN OTHER REGIONAL AREAS

Various NSW Government programs by a range of agencies are underway to help minimise exposure to particle emissions in regional NSW. The EPA and the EH Graham Centre have worked together with local government and local communities to establish why seasonally high levels of air pollution have been recorded at Wagga Wagga and to develop and deliver coordinated actions addressing the multiple particle sources. Information on the sources and responses is available at: http://www.environment.nsw.gov.au/aqms/minimisepmreg.htm.

Commercial and Domestic Sources

As indicated earlier, products and equipment used in the commercial and domestic sectors and that are largely unregulated have become increasingly important as emitters of primary particles and of ozone and particle precursors. The regulatory powers that are available to manage emissions from these sectors are generally vested in local councils. There is an important role for councils in reducing emissions from these sectors, both to protect local air quality and improve outcomes for regional air quality.

Local government's role in managing air quality is defined through the *Protection of the Environment Operations Act 1997*, the *Environmental Planning and Assessment Act 1979* and the *Local Government Act 1993*.

Under the POEO Act, councils are the appropriate regulatory authority for air quality in relation to activities that are not scheduled under the Act. These activities generally include:

- medium-to-small industries
- commercial activities
- domestic premises and activities
- rural and agricultural activities.

Under the POEO Act councils have the power where they are the appropriate regulatory authority to issue prevention notices to prevent pollution and specific powers to issue prevention notices and smoke abatement notices against people creating excessive smoke from wood heaters. Councils also have specific powers in relation to open burning under the Clean Air Regulation.

Commercial and domestic source Initiatives

Local government toolkit and training

The EPA has developed a comprehensive "local government air quality toolkit" for councils to provide council officers with a resource for their role in protecting and improving air quality across NSW. Periodic training, in the form of highly interactive workshops, is held to support local councils in applying the toolkit. The toolkit is available on the EPA website at: http://www.environment.nsw.gov.au/air/aqt.htm

Wood smoke Program

Wood smoke is a major source of winter particle pollution in Sydney and some regional NSW towns. On a winter weekend day in Sydney, the contribution of wood heaters to PM_{10} and $PM_{2.5}$ particle pollution can be as high as 48% and 60%, respectively. Figures for colder climates, such as Armidale, are higher. An AECOM

economic analysis for the EPA in 2011 indicated wood smoke could add $8 billion to NSW health costs by 2030. See: http://www.environment.nsw.gov.au/resources/air/WoodsmokeControlReport.pdf.

The EPA has provided councils with training and resources to help them meet their wood smoke management responsibilities. Currently the Government is reviewing NSW's wood smoke management framework. The EPA has undertaken research and economic analysis, surveyed councils and consulted publicly on a discussion paper. The framework proposed in the paper, if adopted, would allow councils to consider a range of options and choose the most suitable for local conditions, taking into account housing density, weather conditions and the number of wood heaters already in use. Alternatively, councils could choose to take no action.

In late 2012 the Minister for the Environment announced over $1 million in grants available to NSW councils for wood smoke reduction programs in the winters of 2013 and 2014. Eligible programs include education initiatives, local enforcement programs or targeted rebates to remove old heaters. Up to $60,000 per council is available per year.

For more detail, go to: http://www.environment.nsw.gov.au/woodsmoke/index.htm.

Vehicles, Engines and Fuels

While vehicle and fuel standards have been effective in improving air quality in urban NSW, there are still significant public health gains available from reducing emissions in this sector, including from older, more polluting diesel vehicles and non-road engines. Reducing evaporative emissions addresses ozone exceedences in Sydney, while also reducing air toxics and precursors for secondary particles.

Emissions from motor vehicles and motor vehicle fuels are covered by Part 4 of the Clean Air Regulation. The Regulation deals with:

- emission of air impurities, including excessive smoke from motor vehicles;
- the compulsory fitting and maintenance of anti-pollution devices, and exemptions from these requirements;
- the method of transfer of petrol into a vehicle's fuel tank;
- the volatility of petrol; and
- vapour recovery at petrol service stations.

Vehicle, engine and fuel initiatives

Smoky vehicles

The smoky vehicle enforcement program aims to reduce vehicle emissions to air by ensuring owners properly maintain their vehicles. A smoky vehicle is any motor

vehicle that emits visible smoke continuously for over 10 seconds. More detailed information is available on the smoky vehicles webpages at: http://www.environment.nsw.gov.au/esdsmoky/index.htm.

The Government is taking specific action in the M5 tunnel in relation to diesel trucks using the tunnel to travel to and from Port Botany, in order to reduce exposure to harmful emissions in and around the tunnel. Fines for smoky vehicles have been increased to $2,000 for the first two offences with a third offence attracting a $2,000 fine and an automatic three month suspension of vehicle registration. At the same time, Government is encouraging truck owners with older vehicles and who regularly use the M5 Tunnel to have their vehicles assessed, repaired and fitted with a particle trap on a 50:50 shared cost basis.

Petrol volatility

During the summer period – 15 November to 15 March – the volatility of petrol supplied in Sydney is limited to 62 kilopascals as a means of reducing summertime ozone events in Sydney and improving compliance with the Air NEPM. Petrol refiners, importers and blenders must test and report to the EPA on batch volatility.

Vapour recovery

Stage 1 vapour recovery (VR1): Capturing VOC emissions from underground storage tanks as they are filled by road tankers has been in place in most parts of Sydney for some time. The regulatory requirement for VR1 has been extended to all parts of Sydney, as well as the Wollongong, Newcastle and Central Coast metropolitan areas, with installation to be completed by the end of 2013.

Stage 2 vapour recovery (VR2): This involves capturing VOC emissions from vehicle petrol tanks during refuelling at petrol bowsers. VR2 has been introduced under the Clean Air Regulation, with vapour recovery equipment to be installed at the largest service stations in Sydney, Newcastle, Wollongong and the Central Coast by 2014 and at all but the smallest service stations in Sydney by 2017. Vapour recovery technology will reduce refuelling emissions by over 85% and its implementation will cut VOC emissions in the Greater Metropolitan Area (GMA) by 5000 tonnes per year by 2020 (about 1–2% of total VOC emissions in the GMA).

Diesel Retrofit Program

Retrofitting existing diesel vehicles with exhaust treatment devices is a cost-effective strategy to reduce air pollutant emissions. This program involved the EPA and Roads and Maritime Services working in partnership with local councils and private enterprise to retrofit fleet vehicles. At completion of the program in June 2011, over 520 vehicles from 71 fleets had been retrofitted. This delivered particle emission reductions of 4.7 tonnes per annum and will avoid approximately $1.05 million in health costs each year.

CLEAN MACHINE PROGRAM

The EPA's Clean Machine Program aims to reduce diesel exhaust emissions from non-road diesel machinery through development of better worksite practices, encouraging the procurement of cleaner machines and subsidising the retrofit of diesel particle filters to machinery. Under the program, the EPA and Roads and Maritime Services partner with local government and industry organisations and subsidise the retrofitting of particle filters to machines such as tractors, loaders, cranes and gantries. The EPA has invited councils and industry other than coal mines in the Upper Hunter to participate and take advantage of the available subsidy. A specific program for non-road diesel machinery is being implemented for coal mines (see above).

Air Quality Management at National Level & National Plan for Clean Air

National framework and National Plan for Clean Air

As stated in the *Public Statement on the Development of the National Plan for Clean Air*, released by the COAG Standing Council on Environment and Water (SCEW) in May 2012, in 2011 the Council of Australian Governments (COAG) identified air quality as a *Priority Issue of National Significance* and agreed that the COAG Standing Council on Environment and Water would develop a National Plan for Clean Air by the end of 2014. The Plan will integrate modernised air pollution standards with actions to reduce pollution and exposure to pollution.

In the first stage of the development of the National Plan for Clean Air, the focus is on particles, because of:

- the size of the health benefits to be gained;
- current population exposure and levels of particles in the atmosphere; and
- the range of cost-effective actions available to address particles.

NSW is chairing the Air Thematic Oversight Group (ATOG), which reports progress on developing the National Plan for Clean Air to the Senior Officials Committee for the SCEW.

National Emission Reduction Actions:
national product and equipment standards

Under the National Plan for Clean Air, NSW and other jurisdictions are working with the Commonwealth to introduce Australian emission standards for products and equipment. The target sectors are non-road diesel engines, as used in mines, ports and construction projects, small spark ignition engines (particularly two stroke engines), as used in gardening equipment and recreational boats, and wood heaters. Collectively these are significant emitters of Australian cities, especially of particulate matter and of VOCs which are precursors of both secondary particles and ozone.

Jurisdictions have introduced available measures to control point sources of pollution through state-based regulation and NSW has introduced extensive programs to reduce emissions from, for example, wood heaters and non-road diesel engines. However states are approaching the limits of major emissions gains from these measures and can have those gains eroded by national laws allowing lower performance products in terms of emissions to be imported and sold in Australia. Mutual recognition requirements constrain states in their attempts to require improved emissions performance from new products sold.

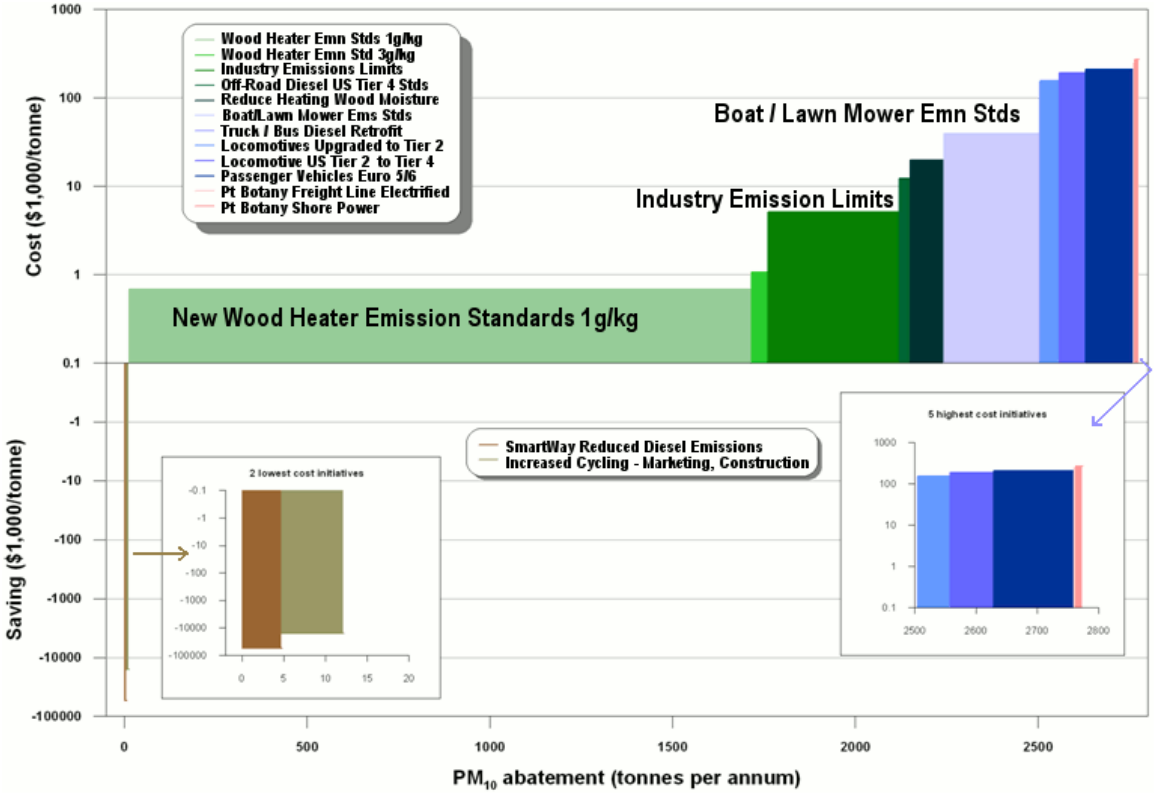
Australian vehicle emission and fuel quality standards have successfully reduced emissions from on-road motor vehicles and further gains are expected. With vehicle emissions decreasing due to tighter national standards, while population and the economy continue to grow, the product and equipment sectors have become a more significant contributor to air pollution in Australian cities and an important target for

new measures. Australia's approach on harmonisation of vehicle standards provides a model for adopting international emission standards for products and equipment.

In response to growing understanding of the health impacts and the associated tightening of air quality standards, Europe, North America, China, Japan and India have introduced or tightened emission standards for a range of products and equipment. With no mandated national standards for these emission sources, Australia, along with many developing countries, lags the US, EU and international best practice.

The NSW EPA has conducted research using costs curves to rank cost effective emission reduction actions. This shows that national actions addressing sources such as wood heaters, non-road engines and small petrol engines, are priorities for any package of feasible, cost-effective actions to bring NSW into compliance with air quality goals for ozone and particles (see Figure 19). The report, *Cost abatement curves for air emission reduction actions*, can be found at: http://www.environment.nsw.gov.au/air/costcurves.htm

Figure 19: Cost Curve for Sydney PM_{10} abatement actions



NATIONAL STANDARDS FOR SMALL PETROL ENGINES

Non-road petrol driven equipment, particularly two stroke engines used in gardening equipment (e.g. lawn mowers and outdoor handheld equipment) and boats, are very

high polluters relative to their size and usage. A cost benefit analysis undertaken for development of small engine measures in Australia has determined that setting national emission standards for these could lead to around $3.4 billion in saved health costs over 10 years. (See consultation regulatory impact statement at: http://www.scew.gov.au/archive/air/pubs/aq_ris_non_road_spark_ignition_engines_consultation_250510.pdf)

National Standards for Woodheaters

Wood heater emissions impact health in population centres of multiple states and territories across urban and regional Australia. Wood heater particle emissions impose health costs estimated at $190 million per annum. [2] The NSW EPA cost curves study found that national standards for wood heaters would bring about the largest emission reductions for PM_{10} in Sydney at the least cost.

Individual states and territories have regulatory requirements and programs to manage wood heaters but limitations include limited enforcement of jurisdictional wood heater regulations and inconsistencies in jurisdictional implementation of the wood heater standard. A national approach would be most efficient in overcoming current management constraints and delivering improved environmental and health outcomes for all jurisdictions dealing with wood smoke.

2 BDA Group, *Consultation regulatory impact statement for reducing emissions from woodheaters* (2010), Table 3.1, p24