

Air pollution

Particulate matter (PM_{2.5})

Particles, also known as 'particulate matter' or PM, contribute a great deal to air pollution. Particle pollution is a complex combination of extremely small particles and liquid droplets, and includes nitrates, sulfates, organic chemicals, metals, and soil or dust particles. Some particles are emitted directly from their source while others are formed in the atmosphere through chemical reactions. For example, some gases emitted from power plants, industries and motor vehicles form particles through chemical reactions.

Sources of particle pollution include motor vehicles, power plants, residential wood heaters, bushfires, agricultural burning, and some industrial processes.

Exposure to particles is a health concern because they can pass through the throat and nose and enter the lungs, where they can cause respiratory and circulation problems, particularly in elderly people, children and people with existing health conditions.

About PM_{2.5} pollution

PM_{2.5} pollution comprises tiny particles of less than 2.5 micrometres (μm) in diameter. As an indicator of how small these particles are, a human hair is around 70 micrometres in diameter (see Figure 1). PM_{2.5} pollution is made up of diverse liquid and solid substances from different sources and processes, which include sea salt spray, atmospheric chemical reactions and combustion.

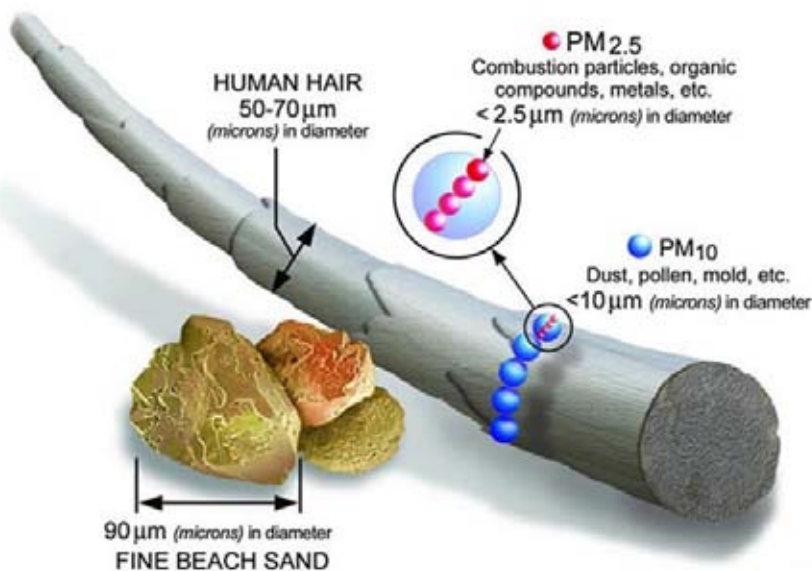


Figure 1: Particulate matter (reproduced with permission from the US EPA, Office of Research and Development)

In winter, domestic wood heaters, which create smoke from solid fuel combustion, are the most significant source of PM_{2.5}, according to the NSW Air Emissions Inventory for the Greater Metropolitan Region which generally includes the greater Sydney, Newcastle and Wollongong regions.

About PM₁₀ pollution

PM₁₀ pollution is made up of particles less than 10 µm in diameter and thus includes PM_{2.5} pollution. Particles from vehicles on dirt roads and dusty industries such as mining, crushing and grinding, which are generally larger than 2.5 µm in diameter are also included in PM₁₀ pollution.

Measurement and monitoring

Australian ambient air quality standards and advisory reporting standards are set by the National Environment Protection Council (NEPC) under the National Environment Protection Measure for Ambient Air Quality (AAQ NEPM). Air pollution levels are regularly monitored, and those events rising above acceptable levels – known as exceedences - are reported on.

There is a national ambient air quality standard for PM₁₀ which was set in 1998. It is 50 µg/m³ averaged over one day. This level may be exceeded on a maximum of five days each year to account for extreme weather, such as dust storms which temporarily raise levels of PM₁₀ pollution.

There is currently no national ambient air quality standard for the continuous monitoring of PM_{2.5} and existing methods can produce differing results. The national advisory reporting standard for PM_{2.5}, introduced in 2003, is 25 micrograms per cubic metre (µg/m³) averaged over one calendar day and 8 µg/m³ averaged over one calendar year.

In NSW, PM₁₀ data has been measured and reported on since 1992 using methods approved by the NEPC. PM_{2.5} data has been monitored in NSW since 1997 using various methods.

In NSW, PM_{2.5} is monitored in Sydney, Singleton, Muswellbrook, Wollongong and Newcastle. Real-time monitoring data is available at: www.environment.nsw.gov.au/aqms/hourlydata.htm.

Exceedences of PM_{2.5} pollution levels

In the thirteen years from 1997 to 2009, one or more sites in the Sydney region reported a PM_{2.5} concentration greater than the calendar day national advisory reporting standard on 75 days. Natural events were noted on more than half of these days, bushfires on 34 days and dust storms on 5 days. The number of days exceeding the advisory standard varied greatly in these years. For example, no days were reported as exceeding the standard in 2007 while 25 days exceeded the standard in 2002.

Sites in the lower Hunter region recorded 42 days exceeding the advisory reporting standard in these thirteen years. There were bushfires on 18 of the 42 days and dust storms on 8 days. No exceedences were reported in 1999, 2005, 2007 or 2008.

Sites in the Illawarra region recorded 29 days exceeding the advisory reporting standard in these years. There were bushfires on 14 of the 29 exceedence days and dust storms on 5 days. The standard was met in 1999, 2004, 2005, 2007 and 2008.

Exceedences occurred mainly in the warmer months from October to January – as follows:

- in Sydney, on 50 of the 75 days
- in the lower Hunter, on 34 of the 42 days, and
- in the Illawarra, on 23 of the 29 days.

From 1997 to 2009, the annual national advisory reporting standard was exceeded in the following regions in the following years:

- in Sydney, in 2001–2006 and 2009
- in the lower Hunter, in 2002 and 2009, and
- in the Illawarra, in 2002–2004.

Combating PM_{2.5} particle pollution

Reducing particle pollution is identified as a priority in the NSW 25 year air quality management plan, *Action for Air*. Levels of PM_{2.5} are managed by regulating emissions:

- from combustion sources, and
- of the chemicals that react to form PM_{2.5}, such as sulfates, nitrates and organic compounds.

Industry: In NSW, particle pollution from major industries is regulated by emission limits, licences and economic incentives. The main regulatory tool is the NSW Protection of the Environment Operations (Clean Air) Regulation 2010, which limits emissions from industry, motor vehicles, fuels and petrol stations. The Regulation is regularly reviewed so limits for new industrial premises reflect contemporary technology. Current maximum particle emission limits for major industry reduced PM₁₀ by 736 tonnes per year in 2010, and will reduce PM₁₀ by an estimated 1669 tonnes a year by 2029.

Vehicle Standards and Improved Fuel Quality:

In Australia, emissions from new vehicles and fuels are regulated nationally. Australia has adopted ultra low sulphur diesel and Euro 5 standards for diesel vehicle emissions. In NSW, to reduce these emissions, diesel maintenance programs and an exhaust retrofit program have been introduced. Over 500 vehicles had been retrofitted by the end of 2010.



Port Kembla heavy industrial area
(Judy Greenwood, OEH)



Peak hour traffic in Sydney, NSW
(Bob Peters, OEH)

To reduce particle emissions from diesel engines used in non-road equipment, the NSW Clean Machine Program was introduced in 2010. It involves Government and private organisations working together to reduce exhaust emissions from diesel engines used in construction and industrial activities or ports by:

- improving procurement policies (e.g. implementing policies for purchase and hire of cleaner equipment and encouraging cleaner contractors' equipment)
- retrofitting subsidised exhaust treatment devices
- adopting improved work site practices.

The program includes \$500,000 to fund retrofitting high polluting diesel engines with particle traps.

Woodsmoke: The NSW Government is tackling particles from wood heaters by prohibiting the sale of wood heaters in NSW that do not meet the current standards set by Standards Australia. It is estimated that this will prevent between 67 and 153 tonnes of particle emissions annually, saving approximately \$4–36 million in avoided health costs per year. The Government has also introduced schemes to replace old wood heaters and educate local communities about woodsmoke pollution.

Regulatory controls on backyard burning have reduced emissions of particles in Sydney by 99 per cent over the past three decades, with 121 out of 152 NSW councils adopting these controls.

More information on programs to reduce particles can be found in *Action for Air*, most recently updated in 2009. A public Clean Air Forum is regularly held to review progress and identify emerging issues for air quality. The last forum was held in 2010. For more information visit www.environment.nsw.gov.au/air/actionforair/index.htm.

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