



Australian Government

Department of the Environment  
and Water Resources

# Particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>)

PM<sub>10</sub> ranked 7 of 90 substances. PM<sub>2.5</sub> is unranked

The National Pollutant Inventory (NPI) provides information on the types and quantities of substances being emitted into the Australian environment, and holds data on reported sources of particulate matter (PM) emissions in Australia.

This fact sheet provides information about PM. It describes how you might be exposed to these substances, how exposure might affect you and the environment, common uses, and physical and chemical properties.

For more information on the terms used in this fact sheet, see the glossary on the NPI web site:

[http://www.npi.gov.au/epg/npi/contextual\\_info/glossary.html](http://www.npi.gov.au/epg/npi/contextual_info/glossary.html)

## What are PM<sub>10</sub> and PM<sub>2.5</sub>?

PM<sub>10</sub> is particulate matter 10 micrometers or less in diameter, PM<sub>2.5</sub> is particulate matter 2.5 micrometers or less in diameter. PM<sub>2.5</sub> is generally described as fine particles. By way of comparison, a human hair is about 100 micrometres, so roughly 40 fine particles could be placed on its width.

## Health effects

### What effect might PM<sub>10</sub> and PM<sub>2.5</sub> have on my health?

Recent epidemiological research suggests that there is no threshold at which health effects do not occur. The health effects include:

- toxic effects by absorption of the toxic material into the blood (e.g. lead, cadmium, zinc)
- allergic or hypersensitivity effects (e.g. some woods, flour grains, chemicals)
- bacterial and fungal infections (from live organisms)
- fibrosis (e.g. asbestos, quartz)
- cancer (e.g. asbestos, chromates)
- irritation of mucous membranes (e.g. acid and alkalis)
- increased respiratory symptoms, aggravation of asthma and premature death. The risks are highest for sensitive groups such as the elderly and children.

The factors that may influence the health effects related to exposure to particles include:

- the chemical composition and physical properties of the particles
- the mass concentration of the airborne particles
- the size of the particles (smaller particles may be associated with more adverse effects because they can be inhaled more deeply into the lungs)
- the duration of exposure (short and long term, possibly in years).

### How might particulate matter enter my body?

Particles in the PM<sub>10</sub> size range are commonly present in air and may be drawn into the body with every breath. In the lungs particles can have a direct physical effect and/or be absorbed into the blood. Airborne particles, not only the PM<sub>10</sub> fraction, may also be deposited in the mouth, throat or nose and be ingested.

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[www.npi.gov.au](http://www.npi.gov.au)



## Particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>)

### How might I be exposed to PM<sub>10</sub> and PM<sub>2.5</sub>?

All people are continuously exposed to some extent except in special filtered environments. Exposure may be higher in urban and industrial areas due to an increase in the number of sources, however high levels may also occur in natural environments.

### What are the PM health guidelines?

#### National Ambient Air Quality Standards:

Under the National Environment Protection Measure for Ambient Air Quality, Australian governments have set a national ambient air quality standard for PM<sub>10</sub> of 50 micrograms per cubic metre (50 µg/m<sup>3</sup>) in outdoor air averaged over a 24-hour period. The goal, to be met by 2008, is for the standard to be exceeded no more than five days a calendar year.

The Measure was varied in 2003 to include advisory reporting standards for PM<sub>2.5</sub>. These are: 25 µg/m<sup>3</sup> averaged over 24 hours; and 8 µg/m<sup>3</sup> averaged over one year. The goal of the variation is to collect sufficient PM<sub>2.5</sub> monitoring data to allow the development of air quality standards.

#### Workplace exposure:

Currently, the eight-hour time weighted average (TWA) exposure limits are 10 milligrams of inspirable dust per cubic metre of air. Consult with your state or territory workplace safety authority to confirm current guidelines for particulate matter.

### Environmental effects

#### What effect might PM<sub>10</sub> and PM<sub>2.5</sub> have on the environment?

PM<sub>10</sub> may affect animals in the same way as it affects humans. Particles in general, not specifically PM<sub>10</sub> or PM<sub>2.5</sub>, affect the aesthetics and utility of areas through visibility reduction and may affect buildings and vegetation. The specific effect of particles depends on their composition, concentration and the presence of other pollutants such as acid forming gases.

#### How might PM<sub>10</sub> and PM<sub>2.5</sub> enter the environment?

Particles in the air affect both the quality of the air and visibility. Once in the air particulate matter generally takes a long time to settle. The particulates may be washed from the air by rain or snow. When they settle on land they may settle permanently or be re-entrained. In water particulates may settle, dissolve or both.

#### Where in the environment do PM<sub>10</sub> and PM<sub>2.5</sub> end up?

PM<sub>10</sub> and PM<sub>2.5</sub> are very fine and light and are therefore easily entrained into the air by wind or disturbances. Chemical changes may occur, as may reactions with other substances, depending on the composition of the particles. Particles may stick together or break apart, changing the size distribution over time.



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### Common uses

PM<sub>10</sub> and PM<sub>2.5</sub> are not used for any application.

### Sources

Some particles are emitted directly into the air from a variety of sources that are either natural or related to human activity. Those related to human activity include motor vehicle emissions, industrial processes (eg electricity generation, incinerators and stone crushing), unpaved roads and wood heaters. Fine secondary aerosols generated as a result of condensation or photochemical reactions of gaseous air pollutants also contribute to PM<sub>10</sub> or PM<sub>2.5</sub> levels.

#### Industry sources

PM<sub>10</sub> and PM<sub>2.5</sub> are produced from a wide range of industrial processes through bulk material handling, combustion and minerals processing. The industries using these processes include brickworks, refineries, cement works, iron and steel making, quarrying, and fossil fuel power plants.

#### Diffuse sources

Particulates are released from a wide range of diffuse sources. Examples include lawn mowing, wood stoves, fires, and wind generated dust, though this tends to be coarser.

#### Transport sources

Vehicles will generate particulates either from direct emissions from the burning of fuels (especially diesel powered vehicles) or from wear of tyres or vehicle-generated air turbulence on roadways. Particles may also be generated from the action of wind on the dusty material that the vehicle may be carrying.

#### Natural sources

Natural sources of PM<sub>10</sub> and PM<sub>2.5</sub> include bushfires, dust storms, pollens and sea spray.

### Consumer products that contain PM

Particulates are not generally included intentionally in any product but may be present as part of the product, for example as part of talc or other powder products.

### Comparison to other substances

#### NPI rank

Currently 93 substances are required to be reported to the NPI. A panel of technical experts, the Technical Advisory Panel (TAP), was formed to recommend inclusion of substances on the NPI. The TAP assessed the hazards and risks associated with particulate matter, but did not provide overall health or environmental hazard scores, or an overall rank for PM<sub>2.5</sub>. However, the TAP determined that inclusion of PM<sub>2.5</sub> on the reporting list would not, in any serious way, go against its advice.

PM<sub>10</sub> was ranked 7 of the 90 substances (rank 1 being the worst). The total hazard score taking into account both human health and environmental criteria is 2.5 (on a scale of 0-6).

Substances with a high hazard score but low likelihood of exposure to Australia's population or environment may have a lower risk rating (hence lower NPI rank) than substances with a lower hazard score but higher chance of exposure.





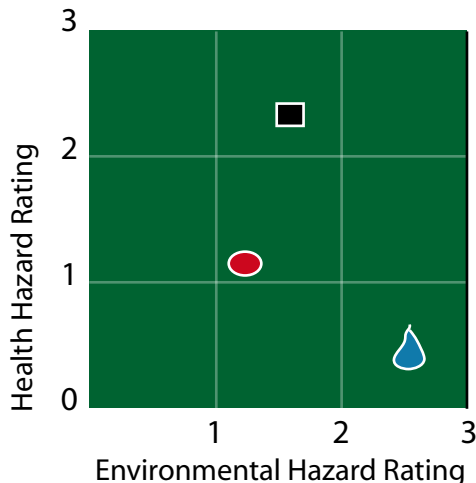
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For further information about the role of the TAP and the ranking process, please see our Technical Advisory Panel report:

[www.npi.gov.au/publications/tap/pubs/npi-tap-report.pdf](http://www.npi.gov.au/publications/tap/pubs/npi-tap-report.pdf)

On a health hazard rating of 0 - 3, PM<sub>10</sub> registers 1.2. On an environmental rating of 0 - 3, PM<sub>10</sub> registers 1.3.

- PM<sub>10</sub>** ● Total hazard score: 2.5  
NPI Rank: 7
- Arsenic and compounds** ■ Total hazard score: 4.0  
NPI Rank: 10
- Total phosphorus (in solution)** ● Total hazard score: 3.0  
NPI Rank: 27



## Physical and chemical properties

**Substance name** Particulate matter (less than 10 micrometers in diameter or less than 2.5 micrometres in diameter)

**Synonyms** dust, particulate matter, inhalable particles, respirable particles, smoke, mist

### Physical properties

Particles of any substances that are less than 10 or 2.5 micrometres diameter. Particles in this size range make up a large proportion of dust that can be drawn deep into the lungs. Larger particles tend to be trapped in the nose, mouth or throat.

### Chemical properties

The chemical properties vary depending on sources of particles. It is important to note that particulates are not one particular chemical substance but a classification of particles by size rather than chemical properties.

## Sources used in preparing this fact sheet

- National Health and Medical Research Council (NHMRC) and the National Resource Management Ministerial Council (NRMMC) (2004), Australian Drinking Water Guidelines 6, accessed July 2007.
- National Pollutant Inventory (1999), Contextual Information.
- Office of the Australian Safety and Compensation Council, Exposure Standards, accessed July 2007.
- Technical Advisory Panel 1999, Final Report to the National Environment Protection Council.
- Technical Advisory Panel 2006, Final Report to the National Environment Protection Council

Other information that may be useful in understanding some of the issues surrounding the NPI can be found on our web site: [www.npi.gov.au/database/substance-info/sources.html](http://www.npi.gov.au/database/substance-info/sources.html)

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