

Exceedance of National Environmental Standards for Air Quality

BACKGROUND

The indicator examines exceedance of National Environmental Standards for Air Quality, for four air pollutants: particulate matter with a diameter of less than 10 micrometres (PM10), carbon monoxide (CO), nitrogen dioxide (NO₂) and sulfur dioxide (SO₂). The national environmental standards for these pollutants are consistent with the 2005 WHO global guidelines, which are based on robust epidemiological research in order to protect human health (WHO 2006a). PM10 can penetrate far into the human lung. Most poor air quality in New Zealand is caused by high winter levels of PM10 from coal and wood used in home heating (Ministry for the Environment 2010a). Auckland also experiences high levels of PM10 from road transport (Ministry for the Environment 2007). Particulates are also produced from atmospheric reactions of SO₂, NO₂ and organic compounds (Cromar et al 2004), and natural sources such as dust, pollen, ash, sea salt and soil particles (Fisher et al 2007).

Short-term and long-term exposures to PM10 have predominantly been associated with the exacerbation of respiratory and cardiovascular conditions (WHO 2006a). In New Zealand, a 10µg/m³ increase in daily PM10 levels, after a one-day lag, was associated with a 1% increase in all-cause mortality and a 4% increase in respiratory mortality among people aged over 30 years (Hales et al 2000). Furthermore, each 10µg/m³ increase in annual average PM10 concentration was associated with a 4.3% increase in annual mortality for people aged over 30 years (Kunzli et al 2000; Fisher et al 2002). Population groups most affected by PM10 include children with asthma and elderly people with respiratory and cardiovascular disease (Fisher et al 2007).

The New Zealand National Environmental Standards for Air Quality set a maximum 24-hour PM10 threshold concentration of 50 µg/m³, while the national guideline sets a guideline annual average value of 20 µg/m³ for PM10. These concentrations are consistent with WHO guidelines. However, health effects have been shown at low concentrations only just above background (natural sources) levels (WHO 2003b, 2006a). In addition, other air pollutants such as NO₂, SO₂ and CO may contribute to poor air quality. Sources of NO₂ that are related to human activities include the combustion of fossil fuels (coal, oil and gas) and commercial manufacturing.

NO₂ is often found with a number of other air pollutants. Studies have suggested that NO₂ is a toxic gas with health effects at a concentration of 200µg/m³ or greater (WHO 2006a). For this reason, the WHO guideline (and New Zealand national environmental standard for NO₂) has been set at a one-hour maximum concentration of 200 µg/m³. Short-term exposure to high concentrations of SO₂ has been shown to have health effects such as respiratory symptoms, particularly for asthmatics. The National Environmental Standards for Air Quality have set a maximum concentration of 350 µg/m³ for SO₂. CO is also associated with health effects ranging from respiratory, neurobehavioral effects at low concentration (10 ppm) to unconsciousness and death after prolonged or acute exposure to high concentration of CO (> 500 ppm). It has a maximum concentration of 10 mg/m³ per eight hours according to the National Environmental Standards for Air Quality.

References

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