

AIR QUALITY AND POLLUTION

What is this?

Air pollution is the introduction of chemicals or biological materials into the atmosphere that cause discomfort, disease, or death to living organisms or damage the natural environment.

Why is it important?

High levels of air pollution are associated with adverse effects on human health. Documented effects of exposure to small sub-10 micron-sized particles (known as PM₁₀) include increased mortality, hospital admissions, and emergency department visits, as well as increases in respiratory and cardiovascular symptoms and medication use. Other components of air pollution also have respiratory and cardiac effects. In addition, air pollution can cause drowsiness and may lead to learning difficulties.¹

As well as particulate matter, other contaminants in the air include carbon monoxide, nitrogen dioxide, sulphur dioxide ozone, and benzene. There is also a range of other toxic compounds, including complex organic chemicals and heavy metals, and the health effects of these are not well known.

The health effects of air pollution are cumulative, with the greatest effect shown for long term exposure to relatively low level pollutants. As well as the direct health effects, there is an effect on health services and society from restricted activity days, when people are not well enough to participate in planned activities or attend work or school.²

An area of increasing concern internationally is the effects of sub-2.5 micron particles or PM_{2.5}, because the small particle size allows them to travel deeply into the respiratory tract. Continuing research since 2002 has confirmed that PM_{2.5} levels may in fact give a better indication of the likelihood of adverse health effects resulting from exposure to respirable particulate.

Other noted effects of poor air quality are poor visibility and odours which impact wellbeing.

Data

The highest concentrations of air pollutants usually occur during winter. In Christchurch 80% of the PM₁₀ comes from home heating, while 20% comes from industrial, commercial, vehicle and other emissions during winter. The combination of increased emissions during winter with cold and stable weather conditions means air pollution can become a problem. On clear sunny days, there is little wind after sunset and any air pollution does not get blown away. These calm conditions lead to the development of an inversion layer with the ground cooling more rapidly than the air above it. This effectively traps any pollutants at low altitude above the city.

The Ministry for the Environment has set a National Environmental Standard for concentrations of PM₁₀ emissions at 50 micrograms/m³ over a 24 hour period.



¹ <http://www.mfe.govt.nz/issues/air/>

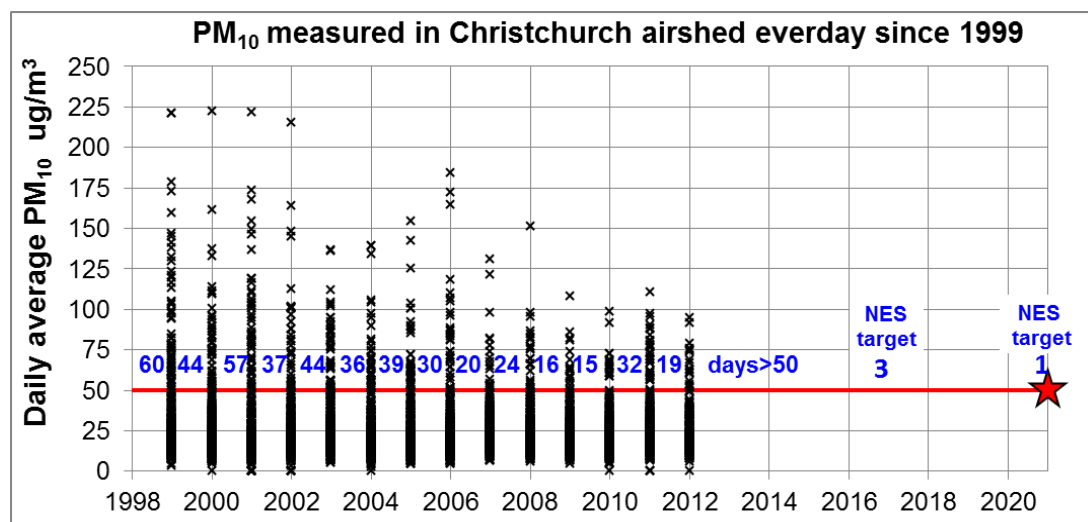
² Ministry for the Environment. 2004. *National Environmental Standards for Air Quality*. Wellington: Ministry for the Environment. <http://www.mfe.govt.nz/laws/standards/air-quality-standards.html> Accessed 12.10.10.

Christchurch must lower emissions to achieve the 2016 target of a maximum of three breaches per year of the PM₁₀ threshold.³

Air quality has been improving in Christchurch with the number of high pollution nights falling from 50 in 1999 to 19 in 2012.⁴ The earthquakes have had an impact on air quality as discussed further below.

Figure 1 below shows the daily concentrations of PM₁₀ in Christchurch each year and the number of days the guideline was breached in the Christchurch airshed.

Figure 1 PM₁₀ concentrations and National Environmental Standard breaches in the Christchurch airshed, 1999-2012



Impact on inequalities

The most sensitive sections of the population to air pollution are people aged over 65 years; infants, particularly those under one year; preschool children; people with asthma, bronchitis, and other respiratory problems; and people with other chronic diseases such as heart disease⁵.

People on lower incomes often live in cold damp houses and have poorer health and are susceptible to respiratory disease which is exacerbated by poor air quality. Lower socioeconomic groups are more at risk from exposure to air pollution including traffic pollution. A study in Christchurch found that more socially deprived neighbourhoods and areas with a greater proportion of low income households had significantly higher levels of traffic-related pollution than high income areas.⁶ These areas have greater proportions of Maori, Pacific peoples and other migrant groups.

³ Ministry for the Environment. 2011. *Revised national environmental standards for air quality*. Wellington: Ministry for the Environment. <http://www.mfe.govt.nz/laws/standards/air-quality/review/index.html> Accessed 19.06.11.

⁴ <http://ecan.govt.nz/services/online-services/monitoring/air-pollution/Pages/data-from-past-years.aspx>

⁵ <http://www.mfe.govt.nz/environmental-reporting/air/air-quality/pm10/>

⁶ Kingham, S., Pearce, J., Zawar-Reza, P. 2007. Driven to injustice? Environmental justice and vehicle pollution in Christchurch, New Zealand. *Transportation Research Part D: Transport and Environment*, 12, 254-263.

Solutions

A range of tools are currently utilised to improve air quality in Christchurch. These include:

- regulation
- incentive programmes such as subsidies to support the installation of insulation and approved alternative heating sources
- education programmes

The priority for Environment Canterbury over the last two winters has been to ensure people in damaged properties stayed warm and this priority will continue for winter 2013. This coming winter Environment Canterbury will be working closely with territorial authorities and key partners such as the Canterbury District Health Board to examine policy options comprising a mix of regulation, financial incentives, education and awareness to continue to reduce concentrations of PM₁₀. There is also financial assistance available through EECA to install clean and efficient home heating.

Connections with other issues

Asthma, Chronic Obstructive Pulmonary Disease, Housing, Income, Fuel Poverty.

Impact of the earthquakes

As time passes and these papers are updated the initial sections on the impact of the earthquake are going to be kept as an archive of what we thought the situation was at the time. Updates where possible are provided.

As at December 2012

Following a downward trend in the number of high pollution nights (exceedances of the PM₁₀ standard) in Christchurch in recent years, there was an increase in exceedances in 2011 associated with both earthquake and snow events. In 2012 the number of exceedances started to drop again.

As population, housing and land use change is on-going as a result of the earthquakes the exact number of burners remaining in Christchurch, and their effect on PM₁₀ concentrations, will become clearer in subsequent years.

However overall PM₁₀ emissions still need to be reduced which will involve either removing more burners or reducing emissions from burners including by operating them better and improved fuel quality.

The regulation relaxing the use of wood burners and open fires remains in place for earthquake damaged homes.

As at November 2011

The earthquakes have damaged many houses' primary and secondary heat sources: log burners and heat pumps. Through the Winter Heat programme, householders have the option of replacing open fires and older wood burners with heat pumps or other approved clean heat systems, including more efficient wood burners.

The replacement of older heating sources should reduce particulate air pollution over time. In the short term, however, the need for emergency repairs to heating systems has meant that legislation to prosecute those using polluting older wood burners and open fires has been temporarily relaxed for earthquake damaged homes for the winter of 2011.⁷

Prepared by Environment Canterbury and Community and Public Health.

⁷ <http://ecan.govt.nz/advice/your-home/home-heating/Pages/earthquake-damage.aspx>