

## DESIRED OUTCOMES

The natural and built environment in which people live is clean, healthy and beautiful. Everybody is able to access natural areas and public spaces.

# Physical Environment

## INTRODUCTION

The physical environment includes land, air, water, plants and animals, buildings and other infrastructure, and all of the natural resources that provide our basic needs and opportunities for social and economic development.

A clean, healthy environment is important for people's physical and emotional wellbeing. At a fundamental level, elements such as clean air and good quality drinking water are vital for people's physical health. Other environmental factors such as noise pollution can cause both physical harm and psychological stress.

The cleanliness and beauty of the environment is also important for people's sense of wellbeing. For many people, access to an attractive physical environment contributes to their contentedness with life. A healthy environment provides recreational opportunities, allowing people to take part in activities they value. For New Zealanders, the "clean, green" environment is an integral part of their national identity. They see guardianship of the land and other aspects of the physical environment as an important part of social wellbeing.<sup>79</sup> This image is also vital for the health of New Zealand's economy. It is a key contributor in attracting tourists and it underpins the nation's success as an exporter of primary products.

Harm to the environment can reduce the quality of life not only for people alive today but also for those born many years in the future. The concept of sustainability is an important aspect of social wellbeing. It acknowledges that social and economic developments need to take place in ways that do not harm present and future wellbeing by damaging the natural environment, and do not harm future wellbeing by using natural resources in unsustainable ways.

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## INDICATORS

Two indicators are used in this chapter: air quality and drinking water quality. Both measure important aspects of the environment that have a direct impact on individual wellbeing. Because of a lack of adequate data, there is no direct measure of people's access to natural areas and public spaces.

The two indicators provide an insight into current and future wellbeing. They relate to the health, cleanliness and beauty of the environment. Pollution in the air or water can have significant adverse effects on people's health, as well as being detrimental to the beauty of the environment.

The first indicator measures the levels of fine particles in the air at certain sites. Fine particles are known to have a harmful effect on people's health. Prolonged exposure to elevated levels has been linked with the aggravation of existing respiratory and cardiovascular diseases and premature death.

The second indicator measures the percentage of the population receiving drinking water that complies with the 2000 Drinking Water Standards. Poor-quality drinking water can create health risks from water-borne diseases and contaminants. It is also likely to be associated with poor-quality sewerage infrastructure and electricity supply.

# Air quality

## DEFINITION

The average annual PM<sub>10</sub> levels in selected sites above the ambient PM<sub>10</sub> guidelines.

PM<sub>10</sub> is particulate matter that is less than 10 microns in diameter. The New Zealand ambient air quality guideline for PM<sub>10</sub> is 20 micrograms per cubic metre (20µg/m<sup>3</sup>), averaged annually.

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## RELEVANCE

Good air quality is an important component in maintaining our quality of life, the appeal of New Zealand as a tourist destination, and the health of our people, plants and animals. PM<sub>10</sub> is the primary contaminant of concern in New Zealand and it is known to adversely affect the health of many people. Health effects associated with this contaminant include increased premature mortality, the aggravation of existing respiratory and cardiovascular diseases, hospital admissions and emergency department visits, school absences, lost work days and restricted activity days.

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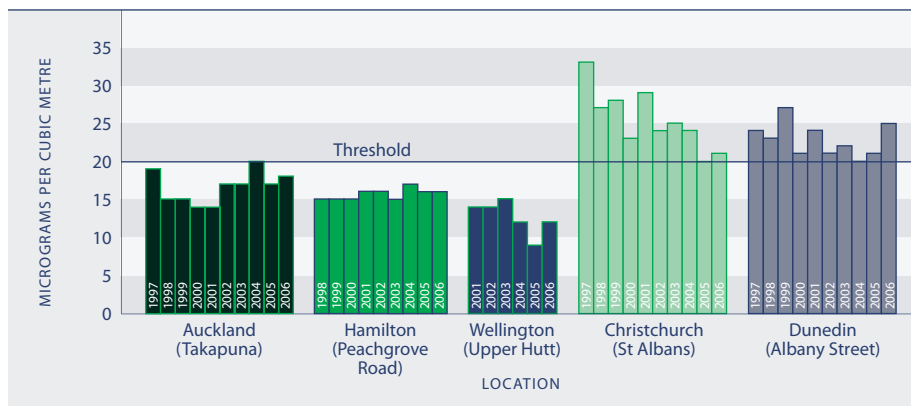
## CURRENT LEVEL AND TRENDS

Figure EN1.1 shows the average annual PM<sub>10</sub> levels in the air at selected monitoring sites in the five major cities. At the Christchurch and Dunedin sites, average annual PM<sub>10</sub> levels were above the ambient guideline for all years we have data except in 2005 in Christchurch and 2004 in Dunedin when the guideline was met. The Auckland site was at or below the guideline in all years for which we have data. Recorded PM<sub>10</sub> levels at the Hamilton and Wellington sites were consistently below the New Zealand annual guideline.

Poor air quality in New Zealand is typically associated with urban areas and is a product of domestic home heating (nationally) and vehicle emissions (Auckland). Lesser sources of PM<sub>10</sub> are industrial and agricultural emissions and the natural sources of small particles, dust pollens and sea spray.

The annual data presented here should not be confused with daily average PM<sub>10</sub> concentrations. In September 2005, new air quality standards were introduced based on daily average PM<sub>10</sub> concentrations. To date regional and unitary authorities have declared 69 "airsheds" where air quality may, or is known to, exceed the standards for PM<sub>10</sub> or may require management in the future. When sufficient data is available, we will report against these standards.

Figure EN1.1 **PM<sub>10</sub> concentration in selected sites, 1997–2006**



Source: Collated from regional council publications by the Ministry for the Environment up to 2005  
 Notes: (1) 2006 data is provisional (2) Data unavailable for Wellington before 2001 and Hamilton before 1998

## INTERNATIONAL COMPARISON

Ambient air quality is entirely location-specific and it is not possible to compare countries. For example, it is possible to compare annual PM<sub>10</sub> in Auckland with annual PM<sub>10</sub> in Los Angeles, but a comparison between New Zealand and the United States or other OECD countries cannot be calculated. New Zealand’s urban air quality is, however, broadly comparable with or better than the air quality in a number of urban areas in OECD countries.

# Drinking water quality

## DEFINITION

The proportion of the total population whose drinking water complies with the 2000 Drinking Water Standards of New Zealand relating to *E. coli* and *Cryptosporidium*.

## RELEVANCE

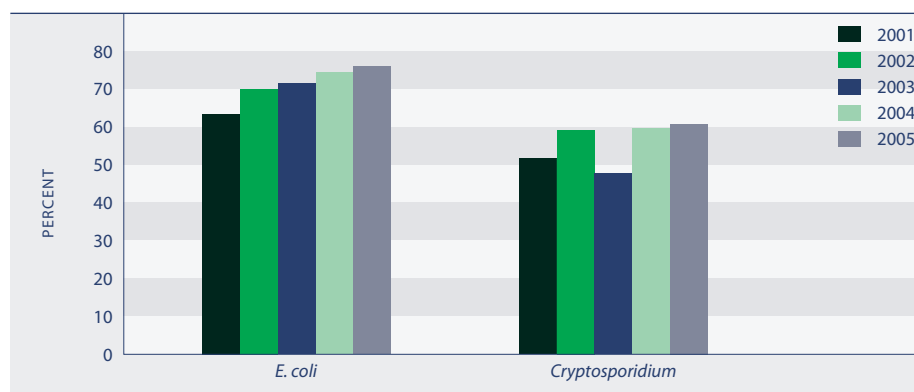
Maintaining good drinking water quality is critical for human health and quality of life outcomes. The health risk to consumers from water-borne diseases in drinking water supplies comes from three main types of microorganisms: bacteria (such as *Campylobacter* and pathogenic *E. coli*), parasites (such as *Giardia* and *Cryptosporidium*) and viruses such as the Norovirus. Improvements in this indicator suggest less of the population is at risk of water-borne diseases and other microbiological contaminants.

## CURRENT LEVEL AND TRENDS

Most New Zealanders are supplied with drinking water that complies with the microbiological standards. However, many smaller communities are supplied with microbiologically non-compliant drinking water. In 2005, the proportion of the total population whose drinking water, measured at the tap, complied with the 2000 Drinking Water Standards for *E. coli* was 76 percent. This was an increase from 74 percent in 2004 and a considerable improvement from 63 percent in 2001. Most water supplies serving large population areas are fully compliant with the 2000 standards. A significant reason for non-compliance is inadequate monitoring rather than proven contamination of drinking water.

Compliance with the 2000 Drinking Water Standards for *Cryptosporidium* is assessed at the water treatment plant rather than at the tap. In 2005, the *Cryptosporidium* compliance rate was 61 percent.<sup>80</sup> This was slightly up on the 2004 rate of 60 percent and an improvement on the 2001 rate of 52 percent. Compliance rates fluctuated between 48 percent and 61 percent over the 2001–2005 period. The drop in the compliance rate from 2002 to 2003 was largely due to non-compliance at the Waitakere plant, which has since been resolved.

Figure EN2.1 **Proportion of the total population served with water that meets the 2000 Drinking Water Standards, 2001–2005**



Source: Water Information New Zealand Database, March 2007

**REGIONAL DIFFERENCES** Groundwater sources supply drinking water for approximately 40 percent of the New Zealand population; about 60 percent of people are supplied from surface water. Most water in catchment headwaters is of good quality. Lower down the catchment, where farming and intensive land use occurs (eg intensive livestock farming), water quality deteriorates. Problems with the quality of some groundwater sources have also been identified.

There is considerable regional variation in the population served with drinking water that is fully compliant with the 2000 Drinking Water Standards for *E. coli* and *Cryptosporidium*. In 2005, only 5 percent of the population in the Marlborough region was served with drinking water that fully complied with the 2000 Drinking Water Standards for *E. coli*. The Northland and the West Coast regions also had low compliance rates, with 28 percent and 35 percent of the population respectively supplied with drinking water that was fully compliant. Compliance was highest in the Nelson region (92 percent), followed by the Auckland region (91 percent) and the Wellington region (85 percent).

In 2004, none of the population in the Marlborough region was supplied with drinking water that fully met the 2000 Drinking Water Standards for *Cryptosporidium*. Less than 1 percent of the population both in the West Coast and Gisborne regions were supplied with fully-compliant water. Compliance was highest in the Nelson region (92 percent), followed by the Auckland region (88 percent) and the Hawke's Bay region (82 percent).

Where drinking water quality is affected, the agricultural sector is seen as the most significant source of contamination.<sup>81</sup>

## INTERNATIONAL COMPARISON

Overall, the quality of New Zealand's water is comparable with other developed countries. New Zealand's water supplies are free of many of the pathogens that result in sickness and death in other countries. However, the incidence of *Giardia* infection in New Zealand is 85 per 100,000 people, which is considered high compared to the reported rates for other western countries.<sup>82</sup> The contribution of contaminated drinking water to the incidence of giardiasis is not known.