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. 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.[92] 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.

INDICATORS

Two indicators are used in this chapter: air quality and drinking water quality. 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 either the 2000 Drinking-water Standards or the 2005 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 annual average PM_{10} levels at selected monitoring sites that meet the ambient air quality guideline for PM_{10}.

PM_{10} is airborne particulate matter that is smaller than 10 microns in diameter. It is produced by the combustion of wood and fossil fuels (such as petrol), and from some natural sources (such as pollen). The ambient air quality guideline for PM_{10} is 20 micrograms per cubic metre (20µg/m^3), averaged annually.

RELEVANCE

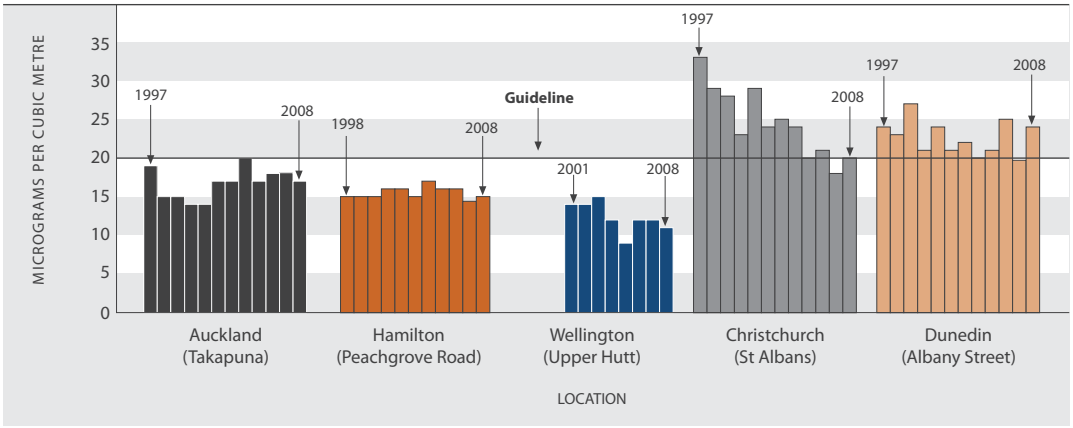
Good air quality is an important component in maintaining the health of our people, plants and animals. Clean air also contributes to the attraction of New Zealand's natural environment to tourists and immigrants. PM_{10} is the primary contaminant of concern in New Zealand. Poor air quality is known to adversely affect the health of many people, particularly older people, infants, people with respiratory problems and people with chronic diseases such as heart disease.[93] The 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.

CURRENT LEVEL AND TRENDS

Five monitoring sites, one from each of the main centres, have been selected to monitor compliance with the ambient air quality guideline for PM_{10}. In 2008, annual average PM_{10} levels at four of the five selected monitoring sites met the annual air quality guideline, being at or below 20µg/m^3. At the Dunedin site, PM_{10} levels were above the annual guideline in 2008. In 2007, all five sites met the annual guideline.

Since 1997, the Dunedin and Christchurch sites have exceeded the annual average guideline in most years, although Christchurch has had improving annual results, while Dunedin's annual results have fluctuated. Since 1997, the Auckland site has met the guideline in all years, although in 2004 the PM_{10} level was at the annual guideline. The annual average PM_{10} levels recorded at the Hamilton and Wellington sites have been consistently below the annual guideline since monitoring started at these sites, in 1998 and 2001 respectively.

Figure EN1.1 **Annual average PM_{10} levels, at selected sites, compared to the New Zealand ambient air quality guideline, 1997–2008**



Source: Ministry for the Environment

Notes: (1) 2008 data for Auckland and Wellington is provisional (2) Data is unavailable for Wellington before 2001 and for Hamilton before 1998 (3) Since 2006, the Upper Hutt monitoring method and location differs from that used between 2001–2005

In September 2005, the Ministry for the Environment introduced a new air quality standard that uses a daily measure rather than the annual measure reported above. The national environmental standard for PM_{10} is 50 micrograms per cubic metre (50µg/m^3), averaged daily over 24 hours. The standard can be exceeded on only one day per year. When sufficient time series data is available for this measure, we will expand the reporting against this standard. The standard is monitored by regional councils in "airsheds", areas within the region where air quality may, or is known to, exceed the standard or may require management in the future. To date, regional and unitary authorities have declared 68 airsheds within New Zealand.

In 2008, the Christchurch airshed exceeded the average daily PM_{10} concentration on 18 days, the Dunedin central airshed exceeded it on nine days and the Auckland urban airshed exceeded it on six days. The Wellington and Hamilton City airsheds did not exceed the daily standard on any day in either 2007 or 2008. The number of days the Christchurch airshed exceeded the average daily PM_{10} concentration has improved from 27 days in 2006 and 32 days in 2005, despite increasing slightly from 14 days to 18 days between 2007 and 2008. The number of days the Dunedin airshed exceeded the daily guidelines increased from two days in 2007 to nine days in 2008, but this was similar to seven days in 2006. Auckland exceeded the daily guidelines on a similar number of days between 2005 and 2008 (between four days and seven days).

In 2007, out of the 40 monitored airsheds throughout New Zealand, 42 per cent did not exceed the daily standard on more than one day a year. This was an increase from around 30 per cent in 2005 and 2006. The total number of monitored airsheds has also increased from 30 since 2005. Some smaller locations outside the main centres have difficulty meeting the air quality standards for PM_{10}. In 2007, Alexandra/Arrowtown, Timaru, Rotorua, Nelson south, Richmond, Reefton and Kaiapoi each exceeded the daily standard on 20 days or more within the year.[94]

In New Zealand, poor air quality resulting from PM_{10} emissions is typically associated with urban areas and is a product of domestic home heating (nationally) and vehicle emissions (Auckland). Lesser sources of PM_{10} are industrial and agricultural emissions and natural sources of small particles that include dust, pollens and sea salt. Weather conditions and geography also influence air quality. Wind can disperse pollution, temperature inversions (where a layer of warm air stops cold air close to the ground from rising) can trap pollution and the topography of valleys can encourage air pollution to build up.

INTERNATIONAL COMPARISON

Ambient air quality is particular to one location. It is reasonable to compare particular sites between countries but not to compare countries.

In 2007, the annual average levels of PM_{10} were similar between the five main centre New Zealand sites and the 21 sites in the Australian regions of Sydney and Port Phillip (which includes Melbourne). The New Zealand sites had annual average levels of PM_{10} ranging from 12–20µg/m^3, while the sites in the two Australian regions had annual average PM_{10} levels ranging from 13–22µg/m^3.[95]

Drinking water quality

DEFINITION

The proportion of the estimated resident population who receive their water from community water supplies whose drinking water complies with either the 2000 or 2005 Drinking-water Standards of New Zealand relating to *E. coli* and *Cryptosporidium*.

RELEVANCE

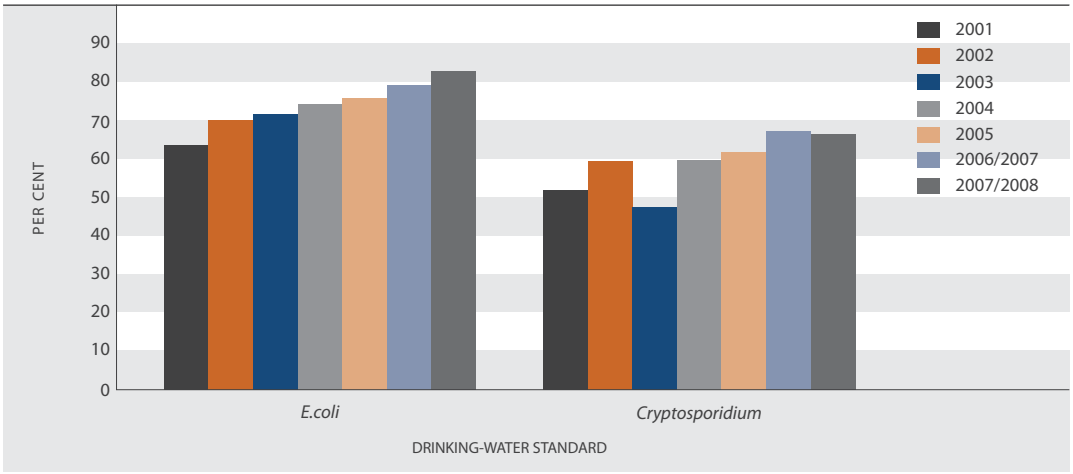
Good quality drinking water is critical for people's health and their quality of life. The health risk to consumers from water-borne diseases in drinking water supplies comes from three main types of microorganisms: bacteria (such as *Campylobacter* and pathogenic *E. coli*), parasites (such as *Giardia* and *Cryptosporidium*) and viruses such as Norovirus. Improvements in this indicator suggest less of the population is at risk of water-borne diseases and other microbiological contaminants. In 2006/2007 there were 27 water-borne disease outbreaks, with untreated or contaminated supplies identified as a contributing factor in most of them.[96]

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 2007/2008, the proportion of the total population whose drinking water, measured at the tap, complied with the Drinking-water Standards for *E. coli* was 83 per cent. This was an increase from 79 per cent in 2006/2007 and a considerable improvement from 63 per cent in 2001. Most water supplies serving large population areas are fully compliant with the Drinking-water Standards. A common reason for non-compliance is inadequate monitoring rather than proven contamination of drinking water.

Compliance with the Drinking-water Standards for *Cryptosporidium* is assessed at the water treatment plant rather than at the tap. In 2007/2008, the *Cryptosporidium* compliance rate was 66 per cent. This was similar to the 2006/2007 rate of 67 per cent, but an improvement on the 2001 rate of 52 per cent. Compliance rates for *Cryptosporidium* dropped in 2003 to 47 per cent, but recovered to 59 per cent in 2004. The drop in the compliance rate in 2003 was largely due to non-compliance at the Waitakere plant, which has since been resolved.

Figure EN2.1 **Proportion of the population served with water that meets the relevant Drinking-water Standards, 2001–2007/2008**



Source: Environmental Science and Research, customised data

Notes: (1) The measurement of compliance moved from a calendar year to a fiscal year in 2006 (2) These compliance rates may differ from those published by the Ministry of Health due to methodological differences explained in Appendix 2

REGIONAL DIFFERENCES

The current transition between the 2000 and 2005 Drinking-water Standards is scheduled to take several years to complete, with drinking water suppliers choosing which of these standards to operate under in the meantime. Therefore, some regions will have moved to the 2005 standards while others will still be using the 2000 standards.

There is considerable regional variation in the population served with drinking water that is fully compliant with the 2000 or 2005 Drinking-water Standards for *E. coli* and *Cryptosporidium*. Between 2002 and 2005, less than 5 per cent of the population in the Marlborough region was served with drinking water that fully complied with the Drinking-water Standards for *E. coli*. In 2006/2007 this increased significantly to 75 per cent and remained at that level in 2007/2008. The West Coast and Tasman regions have had compliance rates with *E. coli* standards below 50 per cent since 2004. Compliance was highest in the Nelson (97 per cent), Canterbury (91 per cent) and Auckland (90 per cent) regions.

In 2007/2008, none of the population in the Marlborough and Gisborne regions was supplied with drinking water that fully complied with the Drinking-water Standards for *Cryptosporidium*. None of the population in Marlborough has had drinking water that complied with the standards for *Cryptosporidium* since the data series started in 2001. In 2007/2008, 1 per cent of the population in the West Coast region and 4 per cent of the population in the Tasman region were supplied with fully-compliant drinking water. Compliance with *Cryptosporidium* standards was highest in the Nelson (96 per cent), Auckland (87 per cent) and Wellington (83 per cent) regions.

INTERNATIONAL COMPARISON

Overall, the quality of New Zealand's drinking 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 some parts of the world. However, the annual average incidence of notified cases of *Giardia* infection in New Zealand between 1997 and 2006 was 44.1 cases per 100,000 people, considerably higher than reported rates for other western countries, such as the United Kingdom, with 5.5 cases per 100,000 in 2005.[97] The incidence of notified cryptosporidiosis between 1997 and 2006 was also higher in New Zealand (22.0 cases per 100,000) than in some other western countries, such as Australia (15.8 cases per 100,000 in 2005) and the United Kingdom (8.5 cases per 100,000 in 2005).[98] The contribution of contaminated drinking water to the incidence of giardiasis and cryptosporidiosis is not accurately known.