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.[87] 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.

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 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 average annual PM_{10} levels in selected sites above 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.

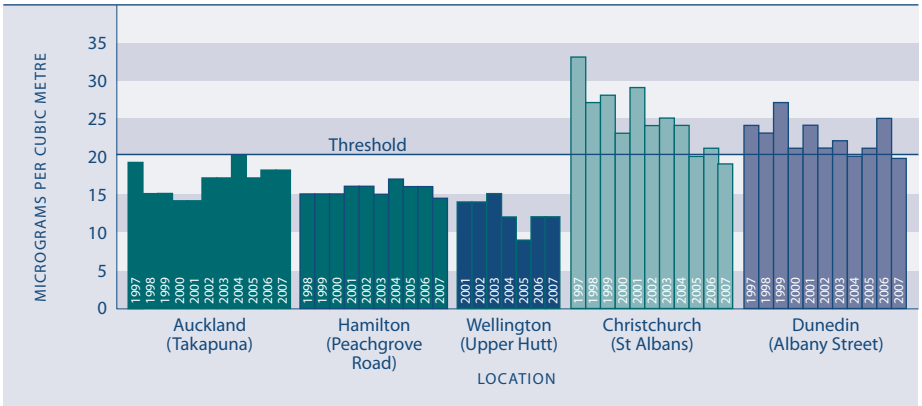
RELEVANCE

Good air quality is an important component in maintaining our quality of life and 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.[88] 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

Figure EN1.1 shows the average annual PM_{10} levels in the air at selected monitoring sites in the five major cities. In 2007, all five sites averaged PM_{10} levels that were below the annual guideline. The Christchurch and Dunedin results were only just below the annual guideline in 2007. Both sites have been above the guideline for most of the years between 1997 and 2006. Christchurch has had improving annual results, while Dunedin's results have fluctuated. The Auckland site has averaged PM_{10} levels at or below the annual guideline since 1997. Although Auckland's results have deteriorated since 1998, they have still met the guideline each year. The recorded average annual PM_{10} levels at the Hamilton and Wellington sites have been consistently below the New Zealand annual guideline.

Figure EN1.1 **Average annual PM_{10} levels, at selected sites, 1997–2007**



Source: Ministry for the Environment, unpublished data
Notes: (1) 2007 data for Auckland is provisional (2) The 2007 Dunedin average is based on an incomplete year of data. Data was not collected from 1 January 2007 until 23 March 2007 due to maintenance issues with the instrument (3) Data is unavailable for Wellington before 2001 and Hamilton before 1998

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 must be met every day of the year, but one. 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 69 airsheds within New Zealand that meet these criteria. Compliance with the daily PM_{10} standard is discussed below.

In 2007, the Christchurch airshed exceeded the average daily PM_{10} concentration on 14 days, the Auckland urban airshed exceeded on seven days and the Dunedin airshed (which includes central and north Dunedin, but not south Dunedin), exceeded the daily average on two days. Between 2006 and 2007, the Christchurch and Dunedin airsheds significantly reduced the number of days they exceeded the daily PM_{10} standard, from 27 days and 7 days respectively. Auckland exceeded the daily guidelines in 2006 on six days, a similar number of days to that recorded in 2007. The Wellington and Hamilton City airsheds did not exceed the daily standard on any day in 2007.

Some smaller locations outside the main cities have issues with air quality. In 2005, Alexandra, Nelson, Richmond, Timaru and Tokoroa each exceeded the daily standard on over 30 days of the year.[89]

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 the natural sources of small particles, dust pollens and sea spray. 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 2006, the average annual levels of PM_{10} were similar between the five main centre New Zealand sites and the 20 sites in the Australian regions of Sydney and Port Phillip (which includes Melbourne). The New Zealand sites had average annual levels of PM_{10} ranging from 12–25µg/m^3, while the sites in the two Australian regions had average annual PM_{10} levels ranging from 14–26µg/m^3.[90] In 2006, 62 urban sites in the United Kingdom compared poorly to the five New Zealand sites. Three of New Zealand's main centre sites (Wellington, Auckland and Hamilton) had annual PM_{10} levels below or equal to the lowest annual PM_{10} levels for the United Kingdom sites. Over half of the 62 United Kingdom urban sites had annual levels at or above 24µg/m^3, with the highest being 40µg/m^3.[91] In 2006, only one of the five New Zealand sites (Dunedin) had an annual level at or above 24µg/m^3.

Drinking water quality

DEFINITION

The percentage 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

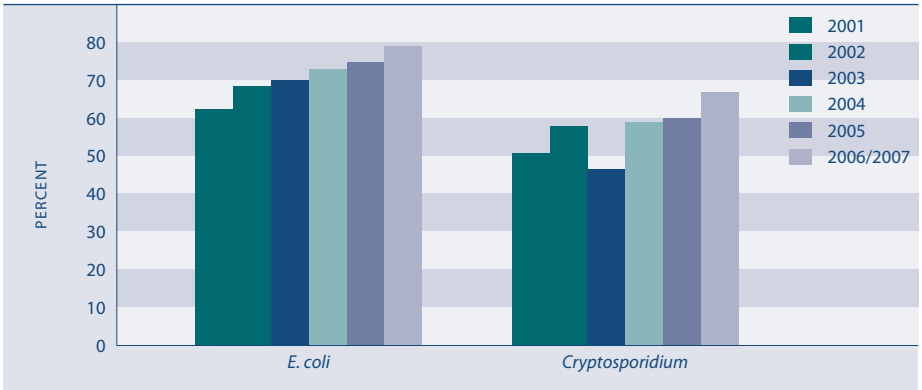
Good quality drinking water is critical for people's health and their quality of life. The health risk to consumers from water-borne diseases in drinking water supplies comes from three main types of microorganisms: bacteria (such as *Campylobacter* and pathogenic *E. coli*), parasites (such as *Giardia* 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.

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 2006/2007, the proportion of the total population whose drinking water, measured at the tap, complied with the Drinking Water Standards for *E. coli* was 79 percent. This was an increase from 75 percent in 2005 and a considerable improvement from 62 percent in 2001. Most water supplies serving large population areas are fully compliant with the Drinking Water Standards. A significant 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 2006/2007, the *Cryptosporidium* compliance rate was 67 percent. This was an improvement on the 2005 rate of 60 percent, and on the 2001 rate of 51 percent. Compliance rates for *Cryptosporidium* dropped in 2003 to 47 percent, but recovered to 59 percent 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, 2001–2006/2007**



Source: ESR (Environmental Science and Research), customised data
Notes: (1) The measurement of compliance has moved from a calendar year to the fiscal year (2) These compliance rates may differ when compared to Ministry of Health publications 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 percent 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 significantly increased to 75 percent. The West Coast region had low compliance rates with *E. coli* standards in 2004 (34 percent) and 2005 (33 percent), and did not improve in 2006/2007 (35 percent). Compliance was highest in the Nelson (93 percent), and Auckland and Canterbury (both 91 percent) regions.

In 2006/2007, 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 2001. In 2006/2007, less than 1 percent of the population in the West Coast region and less than 5 percent of the population in the Tasman region were supplied with fully-compliant drinking water. Compliance with *Cryptosporidium* standards was highest in the Nelson (97 percent), Auckland (88 percent) and Wellington (84 percent) 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 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.[92] The contribution of contaminated drinking water to the incidence of giardiasis is not known.