Ministry for the Environment
Manatū Mō Te Taiao

AIR QUALITY (PARTICULATE MATTER – PM_{10})

Environmental Report Card
February 2009

At a glance

Poor outdoor air quality is a significant issue in some locations in New Zealand. About two-thirds of New Zealanders live in areas that can experience air pollution. Each year, about 1100 people die prematurely from air pollution in urban areas. Most poor air quality in New Zealand is caused by high winter levels of particulate matter (known as PM_{10}) from wood and coal used for home heating. Auckland, where about a third of New Zealand's population lives, also experiences high levels of PM_{10} from road transport.

By tracking air quality against a national standard, which sets an acceptable daily level for PM_{10}, and the New Zealand guideline, which sets an acceptable annual level, we can understand more about our changing air quality and how this might affect our health. Regional councils currently monitor 40 areas where air quality is likely to or known to breach the PM_{10} standard – these areas are known as airsheds. In most cases, airsheds are single towns or cities, though some group a number of towns together.

NATIONAL ENVIRONMENTAL STANDARD FOR PM_{10}

☹ **Compliance with the standard**: In 2007, 42 per cent of New Zealand's monitored airsheds complied with the national standard for PM_{10}.

Getting better — While there has been some fluctuation, compliance with the national standard has increased from 31 per cent in 2005. However, 18 of the 20 non-complying airsheds in 2005 have continued to breach the PM_{10} standard.

Getting worse — **Annual exceedences of the standard**: In 2007, the Otago 1, Timaru and Rotorua airsheds breached the PM_{10} standard most often. The highest number of exceedences in an airshed increased from 51 in 2005 to 55 in 2007.

NEW ZEALAND ANNUAL GUIDELINE FOR PM_{10}

☹ In 2007, 81 per cent of the 37 airsheds for which data was reported met the New Zealand annual guideline for PM_{10}. The seven airsheds which did not meet the guideline were Nelson B, Timaru, Kaiapoi, Nelson A, Reefton, Rotorua and Richmond.

Getting better — In the decade to 2007, indicator sites in Auckland, Hamilton and Wellington consistently met the New Zealand annual guideline, while Christchurch and Dunedin sites commonly exceeded it. For the first time since reporting began, indicator sites in all five main centres met the guideline in 2007.

INTERNATIONAL COMPARISON: In 2006, annual levels of PM_{10} at indicator sites in New Zealand's five main centres were comparable to levels at similar sites in Sydney and Melbourne.

FUTURE WATCH: Regional councils are required to bring PM_{10} levels in their airsheds to within the national standard by 2013. Regional councils will not be able to grant resource consent applications for discharges to air in airsheds that fail to comply with the PM_{10} standard after 2013.

To date, there has been fluctuation in compliance with the national environmental standard. This is because weather is an important influence on air quality. Yearly weather patterns will continue to be reflected in the PM_{10} levels, and therefore we can expect to see further fluctuation in compliance in the future.

Introduction

Clean air contributes to New Zealand's quality of life – not only people's health, but also the beauty of the natural and physical environment (Ministry for the Environment, 2007).

New Zealand has good air quality in most locations for most of the time (Ministry for the Environment, 2007). However, solid fuel (wood and coal) used for home heating and exhaust emissions from transport can affect air quality in about 30 locations, particularly during winter (Ministry for the Environment, unpublished a). Each year, about 1100 New Zealanders die prematurely from air pollution in urban areas (Fisher et al, 2007). Air pollution from households is a significant factor, with more than half of all bronchitis cases, and acute respiratory and cardiac hospitalisations in 2001 associated with the use of wood and coal for home heating (Fisher et al, 2007).

A number of air pollutants can affect the quality of air we breathe. Particulate matter is a collective term used to describe very small solid or liquid particles in the air, such as dust, smoke or fog. A pollutant of particular concern in New Zealand is PM_{10} (see text box 1).

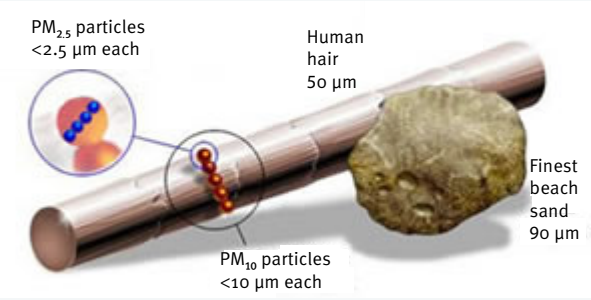
Most PM_{10} in New Zealand comes from burning solid fuels for home heating. This, along with the more frequent settled weather conditions during winter, is why most peak PM_{10} levels occur during this time of year. Exhaust emissions from vehicles are another significant source of PM_{10} in cities like Auckland. It is estimated that the number of New Zealanders that die prematurely from traffic-related air pollution is similar to the number killed in road traffic accidents (Fisher et al, 2002). Industry, as well as natural sources such as pollen, mineral dust and sea salt, can also contribute to PM_{10} levels.

Text box 1: Particulate matter

PM_{10} is an air pollutant of particular concern because it regularly occurs at high levels in urban areas, and is linked to harmful health effects. As shown in figure 1, a PM_{10} particle is less than 10 microns in diameter, or one-fifth of the diameter of human hair. These are easily inhaled and can be readily absorbed into the lungs. As a result, PM_{10} can cause significant health effects, particularly for the elderly and infants, people with asthma and other respiratory diseases, and sufferers of other chronic diseases, such as heart disease.

PM_{10} pollution includes particles referred to as 'coarse' (between 2.5 and 10 microns) and 'fine' (less than 2.5 microns, also known as $PM_{2.5}$) (Ministry for the Environment, 2003).

+ FIGURE 1
PARTICLE SIZES



Source: Ministry for the Environment, 2008.

National air quality standards and guidelines

In 2004, national environmental standards (NES) for air quality were introduced in New Zealand to provide a guaranteed level of protection for the health of New Zealanders (Ministry for the Environment, 2005a). The daily level set for PM_{10} is 50 micrograms per cubic metre ($\mu g/m^3$) as a 24-hour average (midnight to midnight). To comply with the standard, this level can not be exceeded more than one day each year.

A national air quality guideline was put in place in 2002 to set an acceptable annual average level of PM_{10} (20 $\mu g/m^3$). The guideline represents the minimum standard that outdoor air quality should meet in order to protect human health and the environment (Ministry for the Environment, 2002).

Managed airsheds

Following the introduction of the national environmental standard, 68 areas were identified in New Zealand where air quality is likely or known to breach the PM_{10} standard – these areas are known as airsheds. Some airsheds are also identified based on factors such as: the number of people living in the airshed, its unique weather patterns and geography, or because local air emissions (eg, local industrial activity) need to be managed separately. In most cases, airsheds are towns

or cities, though in some areas they may include a number of towns – for example, the Otago 1 airshed combines both Alexandra and Arrowtown. As of 2007, 40 of New Zealand's 68 airsheds are being monitored. Not all airsheds are monitored: if exploratory tests show that PM_{10} levels are above the standard or a high number of people are affected, then ongoing monitoring is required.

To date, approximately 1.5 per cent of New Zealand's total land area has been gazetted as an airshed. This equates to an area in which an estimated two-thirds of New Zealand's population live (Ministry for the Environment, unpublished b). Areas outside airsheds are generally sparsely populated, and, as a result, little PM_{10} monitoring occurs in the rural environment and areas free from emissions caused by human activity (Ministry for the Environment, 2007).

Text box 2: What are environmental report cards?

Environment New Zealand 2007, the country's second national state of the environment report, provided information on around 115 national-scale environmental data sets. Its primary focus was to report on the 66 national data sets that constitute New Zealand's core set of environmental indicators. A key focus of the Ministry for the Environment's national environmental reporting programme is to produce a series of 'report cards' to provide updated information on the indicators reported in *Environment New Zealand 2007*. This is one such report card.

About this report card

This environmental report card discusses peak PM_{10} levels and annual levels for PM_{10} in monitored airsheds in New Zealand. It compares these with the national standard for PM_{10} and the New Zealand air quality guideline. The report card also reviews the number of times the standard is exceeded.

This report card looks at:

- national environmental standard for PM_{10} – peak daily levels
- national environmental standard for PM_{10} – number of times it is exceeded
- New Zealand annual guideline for PM_{10}.

Key findings

In 2007, 42 per cent of New Zealand's monitored airsheds complied with the national standard for PM_{10}.

National environmental standard for PM_{10} – peak daily levels

This section reports the daily levels of PM_{10} in the 40 monitored airsheds in New Zealand against the national environmental standard, which sets an acceptable daily level for PM_{10}. Reporting peak daily levels of PM_{10} provides an important short-term snapshot of air quality in an airshed. It allows us to understand the intensity of air pollution to which people are being exposed.

Current situation

The national environmental standard sets an acceptable daily level for PM_{10}, and requires continuous monitoring throughout the year in areas where PM_{10} is likely to breach the standard. Forty airsheds were monitored in New Zealand in 2007. Of these, 17 airsheds (42 per cent) complied with the PM_{10} standard.

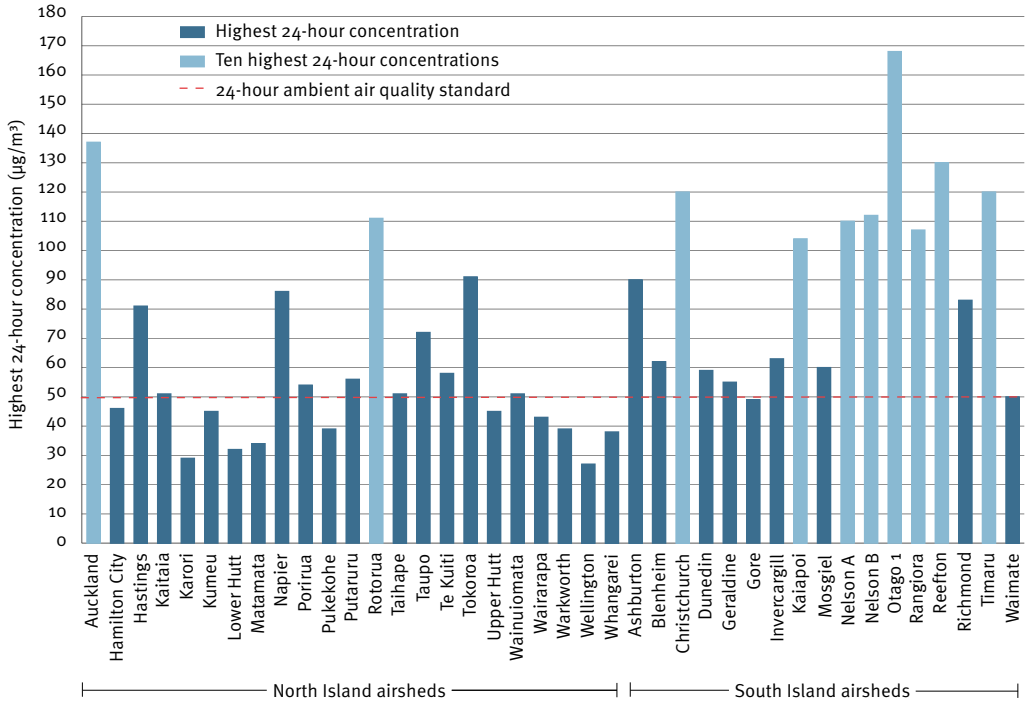
Figure 2 shows that 13 of the 40 monitored airsheds (32 per cent) had a peak daily level below the standard of 50 µg/m³. Each airshed is allowed to exceed the standard once a year (see text box 3), which is why four airsheds with peak daily levels greater than 50 µg/m³ still complied with the standard. In 2007, on average, South Island peak daily levels, shown on the right hand side of figure 2, were higher than North Island levels. Eight of the 10 airsheds that recorded the highest daily PM_{10} levels in New Zealand are located in the South Island. Levels ranged from 104 to 168 µg/m³, with the three highest levels recorded in the Otago 1, Auckland and Reefton airsheds.

Text box 3: Exceeding and breaching the PM_{10} standard

The PM_{10} standard is exceeded whenever a PM_{10} result in an airshed is above the PM_{10} national standard of 50 µg/m³. A breach occurs when the PM_{10} standard is exceeded more than once in a year. Airsheds that exceed the standard zero or once a year comply with the PM_{10} standard.

+ FIGURE 2

HIGHEST 24-HOUR PM_{10} CONCENTRATION IN NEW ZEALAND AIRSHEDS, 2007



Notes: (1) From 2006, Otago 1 monitoring results are the combination of Alexandra and Arrowtown results.
(2) See below for data sources.

Trend

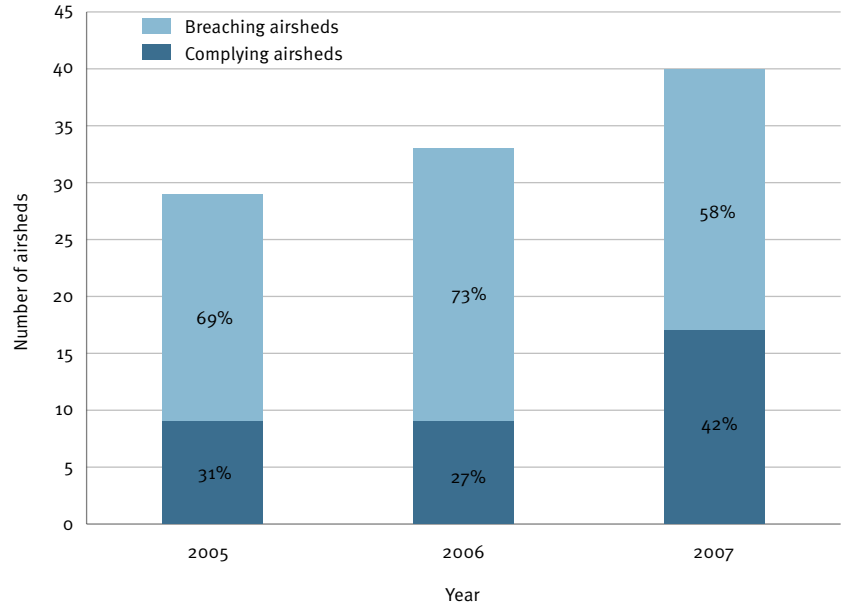
Since we last reported on PM_{10} in *Environment New Zealand 2007*, there has been an increase in the number of monitored airsheds in New Zealand. Figure 3 shows an annual summary of compliance with the PM_{10} standard. The proportion of complying airsheds decreased in 2006, with half of the newly monitored airsheds breaching the standard, as shown in table 1. After complying in 2005, the Hamilton, Otago 3 (Dunedin) and Wairarapa airsheds breached the standard in 2006.

Getting better

Since 2005, the proportion of airsheds complying with the PM_{10} standard has increased.

+ FIGURE 3

SUMMARY OF COMPLIANCE WITH THE PM_{10} STANDARD IN NEW ZEALAND



Data sources for figures 2 and 3: Auckland Regional Council, unpublished; Environment Bay of Plenty, unpublished; Environment Canterbury, unpublished; Environment Southland, unpublished; Environment Waikato, unpublished; Greater Wellington Regional Council, unpublished; Hawke's Bay Regional Council, unpublished; Horizons Regional Council, unpublished; Marlborough District Council, unpublished; Nelson City Council, unpublished; Northland Regional Council, unpublished; Otago Regional Council, unpublished; Tasman District Council, unpublished; West Coast Regional Council, unpublished.

The following year, five of the seven newly monitored airsheds complied with the standard. This, together with the Gore, Hamilton, Waimate and Wairarapa airsheds, contributed to the increased proportion of complying airsheds in 2007.

Seventeen of the 40 monitored airsheds (42 per cent) complied with the PM_{10} standard in 2007. The highest recorded daily PM_{10} level also showed an improving trend by dropping from 198 µg/m^3 (Invercargill) in 2005, to 168 µg/m^3 (Otago 1) in 2007.

+TABLE 1

BREACHING AND COMPLYING AIRSHEDS IN NEW ZEALAND, 2005–2007

BREACHING AIRSHEDS			COMPLYING AIRSHEDS		
2005	2006	2007	2005	2006	2007
Auckland	Auckland	Auckland			
	Hamilton		Hamilton		Hamilton
Hastings	Hastings	Hastings			
			Kaitaia	Kaitaia	Kaitaia
					Karori
					Kumeu
			Lower Hutt	Lower Hutt	Lower Hutt
				Matamata	Matamata
Napier	Napier	Napier			
					Porirua
					Pukekohe
		Putaruru			
Rotorua	Rotorua	Rotorua			
				Taihape	Taihape
Taupo	Taupo	Taupo			
Te Kuiti	Te Kuiti	Te Kuiti			
Tokoroa	Tokoroa	Tokoroa			
			Upper Hutt	Upper Hutt	Upper Hutt
			Wainuiomata	Wainuiomata	Wainuiomata
	Wairarapa		Wairarapa		Wairarapa
					Warkworth
			Wellington	Wellington	Wellington
			Whangarei	Whangarei	Whangarei
Ashburton	Ashburton	Ashburton			
Blenheim	Blenheim	Blenheim			
Christchurch	Christchurch	Christchurch			
		Geraldine			
Gore	Gore				Gore
Invercargill		Invercargill		Invercargill	
Kaiapoi	Kaiapoi	Kaiapoi			
Nelson A	Nelson A	Nelson A			
Nelson B	Nelson B	Nelson B			
Otago 1 (Alexandra)	Otago 1	Otago 1			
Otago 2 (Mosgiel)	Otago 2 (Mosgiel)	Otago 2 (Mosgiel)			
	Otago 3 (Dunedin)	Otago 3 (Dunedin)	Otago 3 (Dunedin)		
Rangiora	Rangiora	Rangiora			
	Reefton	Reefton			
Richmond	Richmond	Richmond			
Timaru	Timaru	Timaru			
	Waimate				Waimate

Note: From 2006, Otago 1 monitoring results are the combination of Alexandra and Arrowtown results. In 2006, four additional airsheds were monitored, and in 2007, seven additional airsheds were monitored.

However, 18 of the 20 breaching airsheds in 2005 have continued to breach the PM_{10} standard (see table 1). Six of these airsheds – Christchurch, Kaiapoi, Nelson A, Otago 1, Rangiora and Timaru – are among the 10 airsheds recording the highest daily PM_{10} levels from 2005 to 2007 (see table 2). These airsheds are expected to have difficulty in complying with the PM_{10} standard by 2013 (see the Future watch section on page 11). Only six airsheds have consistently complied with the PM_{10} standard between 2005 and 2007 – Kaitaia, Lower Hutt, Upper Hutt, Wainuiomata, Wellington and Whangarei.

+ TABLE 2

AIRSHEDS WITH THE 10 HIGHEST 24-HOUR AVERAGE PM_{10} LEVELS, 2005–2007

RANK	2005	2006	2007
1	Invercargill	Timaru	Otago 1
2	Kaiapoi	Christchurch	Auckland
3	Christchurch	Kaiapoi	Reefton
4	Hastings	Otago 1	Christchurch
5	Timaru	Rangiora	Timaru
6	Otago 1	Ashburton	Nelson B
7	Gore	Richmond	Rotorua
8	Rangiora	Hastings	Nelson A
9	Otago 2	Rotorua	Rangiora
10	Nelson A	Nelson A	Kaiapoi

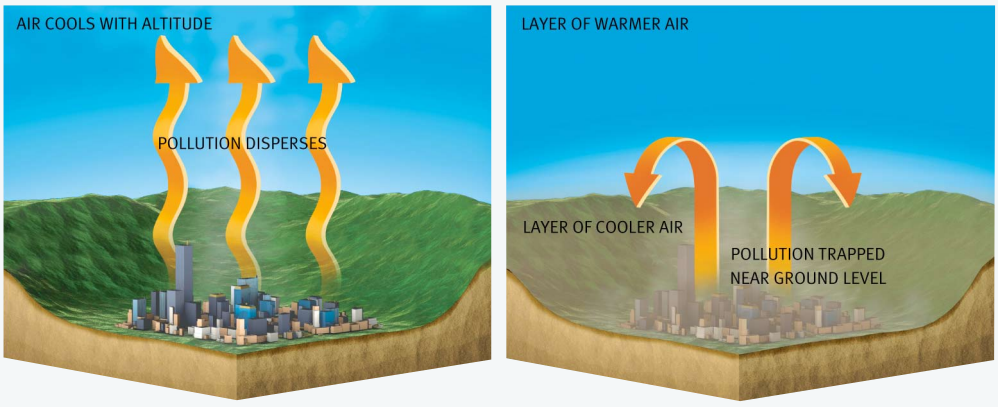
Note: From 2006, Otago 1 monitoring results are the combination of Alexandra and Arrowtown results.

Text box 4: Temperature inversions

A temperature inversion occurs when a layer of warm air sits on top of a layer of cooler air near the ground. Because cool air is heavier than warm air, the cool air often remains trapped close to the ground (Ministry for the Environment, 2007). Figure 4 shows how air pollution also gets trapped in this cool layer, leading to higher air pollution levels.

+ FIGURE 4

HOW TEMPERATURE INVERSIONS TRAP POLLUTION



Source: Ministry for the Environment, 2007.

Key findings

National environmental standard for PM_{10} – number of times it is exceeded

This section reports on how many times the national standard for PM_{10} is exceeded over a year in the 40 monitored airsheds in New Zealand. Monitoring this allows us to understand how frequently people are being exposed to poor air quality.

Current situation

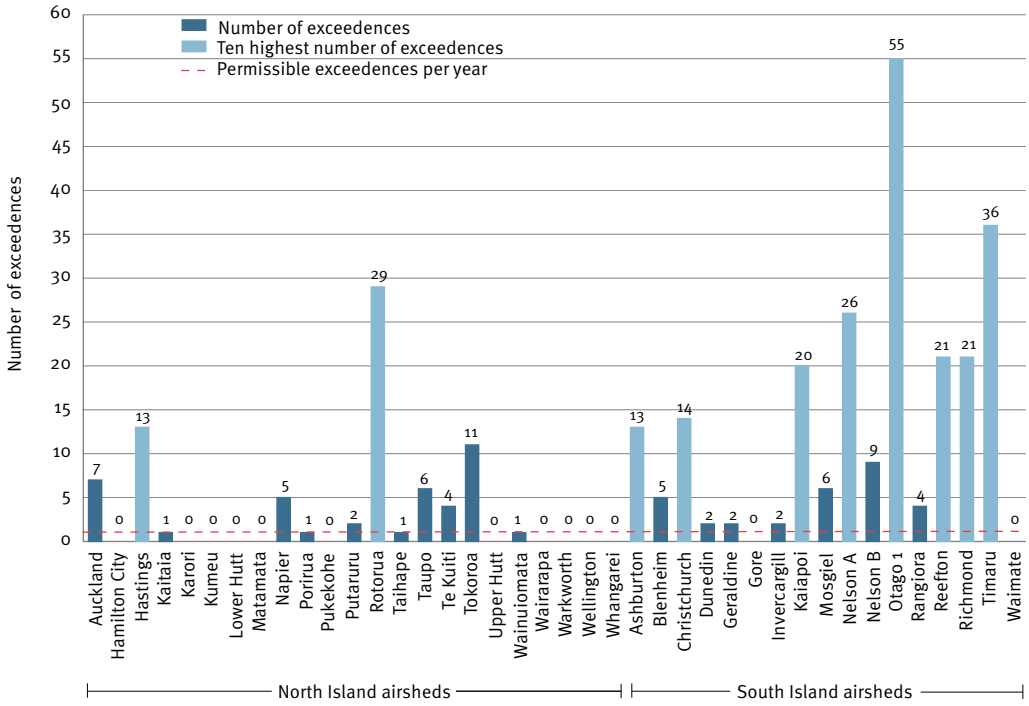
In 2007, Otago 1, Timaru and Rotorua airsheds exceeded the national standard for PM_{10} most often.

In 2007, 13 airsheds (32 per cent) did not exceed the national standard at all. Eleven of these are in the North Island, as shown in the left hand side of figure 5. The airsheds that exceeded the standard most often in 2007 include the Otago 1 airshed (55 instances), followed by Timaru (36) and Rotorua (29). Each instance represents a day when PM_{10} levels are above the standard. The greater the number, the more days that PM_{10} levels are at a level that could affect people's health.

In New Zealand, the PM_{10} standard and peak levels are more often exceeded during the winter months when burning solid fuels for home heating is at its peak and winter inversions are most common (see text box 4).

+ FIGURE 5

NUMBER OF TIMES NEW ZEALAND AIRSHEDS EXCEEDED THE PM_{10} STANDARD, 2007



Data sources: Auckland Regional Council, unpublished; Environment Bay of Plenty, unpublished; Environment Canterbury, unpublished; Environment Southland, unpublished; Environment Waikato, unpublished; Greater Wellington Regional Council, unpublished; Hawke's Bay Regional Council, unpublished; Horizons Regional Council, unpublished; Marlborough District Council, unpublished; Nelson City Council, unpublished; Northland Regional Council, unpublished; Otago Regional Council, unpublished; Tasman District Council, unpublished; West Coast Regional Council, unpublished.

Trend

Getting worse

In 2007, the highest number of exceedences increased to 55.

The highest number of times a single airshed exceeded the national standard increased to 55 in 2007, up from 51 in 2005 and 2006. As shown in table 3, the highest number was recorded in the Otago 1 airshed in 2007, which reports monitoring results from both Alexandra and Arrowtown.

The airsheds recording the highest number of instances from 2005 to 2007 remained fairly consistent. Eight airsheds – Ashburton, Christchurch, Hastings, Kaiapoi, Nelson A, Otago 1, Richmond and Timaru – consistently appeared in the top 10 list from 2005 to 2007.

Of these eight airsheds, seven are in the South Island. A recent study of home heating fuels used in 29 New Zealand towns showed the rate of household coal use in 20 South Island towns was more than double the national average (Ministry for the Environment, 2005b). Coal fires emit 58–75 per cent more PM_{10} pollution than even the least efficient wood burner (Ministry for the Environment, 2005c). This, together with the occurrence of temperature inversions (see figure 4) and generally lower winter temperatures in the South Island, may contribute to higher PM_{10} levels and number of times South Island airsheds exceed the standard.

+ TABLE 3

TOP 10 AIRSHEDS EXCEEDING THE STANDARD, 2005–2007

RANK	2005	2006	2007
1	Nelson A	Nelson A	Otago 1
2	Timaru	Otago 1	Timaru
3	Otago 1	Richmond	Rotorua
4	Richmond	Timaru	Nelson A
5	Tokoroa	Kaiapoi	Reefton
6	Christchurch	Christchurch	Richmond
7	Ashburton	Ashburton	Kaiapoi
8	Hastings	Nelson B	Christchurch
9	Nelson B	Rotorua	Ashburton
10	Kaiapoi	Hastings	Hastings

Note: From 2006, Otago 1 monitoring results are the combination of Alexandra and Arrowtown results.

Text box 5: Link between peak daily PM_{10} levels and number of times the standard is exceeded

There is no clear-cut relationship between the peak daily level of PM_{10} and the number of times the standard is exceeded. Figure 2 shows that while an airshed may have a comparatively high recorded peak PM_{10} level (for example, Auckland), it may exceed the standard fewer times in the year (see figure 5) than an airshed which has lower peak PM_{10} levels (for example, Hastings). In the South Island, Timaru and Christchurch airsheds both had the same peak PM_{10} level of 120µg/m³, but Timaru exceeded the standard more than twice the times Christchurch did (see figure 5). Such examples illustrate the major role that other factors can play in affecting air quality – such as weather (eg, wind), geography and the number and type of sources of air pollution – for example, households, vehicle exhausts, industry and agricultural activities.

Key findings

New Zealand annual guideline for PM_{10}

This section reports on the average annual level of PM_{10} compared to the New Zealand guideline, a health-based guideline which sets an acceptable annual level for PM_{10}. Annual averages take into account both peak and low pollution periods in an airshed, giving an important long-term picture of air quality.

Current situation

In 2007, 81 per cent of airsheds for which data was reported met the air quality guideline.

In 2007, 37 of the 40 monitored airsheds were able to report an annual average for PM_{10}. A minimum of 75 per cent data capture rate is recommended for an airshed to be able to report an annual average, and three airsheds were not able to achieve this. Thirty of the 37 airsheds (81 per cent) met the New Zealand annual air quality guideline for PM_{10} (20 µg/m³). The seven airsheds that did not meet the guideline were Nelson B, Timaru (23 µg/m³); Kaiapoi, Nelson A, Reefton, Rotorua (22 µg/m³); and Richmond (21 µg/m³).

Some airsheds can significantly breach the national standard for PM_{10}, while the annual average in that airshed meets the guideline. To illustrate this, while Otago 1 airshed had the highest daily PM_{10} level and exceeded the standard the most times in 2007, the annual average in the airshed still met the annual guideline that year. This would suggest that PM_{10} levels in the Otago 1 airshed are generally low outside the peak winter pollution period.

Getting better

In 2007, indicator sites in the five main centres all met the annual guideline of 20 µg/m³.

Long-term trend

In the decade to 2007, PM_{10} levels at one indicator site in Auckland, Hamilton and Wellington consistently met the annual guideline (see figure 6). While the levels at the Christchurch and Dunedin sites commonly exceeded the guideline over this period, for the first time since monitoring began, in 2007 each indicator site in the five main centres met the annual guideline.

Short-term trend

Annual average PM_{10} levels have fluctuated since we last reported them in *Environment New Zealand 2007*. In 2006, there was an increase in annual average PM_{10} levels at all the indicator sites in the five main centres except Hamilton. However, in 2007 there was a drop in PM_{10} levels in Hamilton, Christchurch and Dunedin. Levels in Auckland remained the same. Annual average data for 2006 and 2007 is shown in figure 6.

+ FIGURE 6

ANNUAL AVERAGE PM_{10} LEVELS AT INDICATOR SITES IN THE FIVE MAIN CENTRES OF POPULATION

Note: *Data capture for these years is less than 50 per cent.

Data sources: Auckland Regional Council, unpublished; Environment Canterbury, unpublished; Environment Waikato, unpublished; Greater Wellington Regional Council, unpublished; Otago Regional Council, unpublished.

In 2006, annual levels of PM_{10} at New Zealand indicator sites were comparable to levels at similar sites in Sydney and Melbourne.

International comparison

Outdoor air quality is very site-specific. It is therefore reasonable to compare air quality at particular sites in different countries, but not to compare country averages (Ministry of Social Development, 2008).

In 2006, the average annual levels of PM_{10} at indicator sites in each of the five main New Zealand centres – Auckland, Hamilton, Wellington, Christchurch and Dunedin – were similar to levels at 20 similar 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 12–25 µg/m^3, while the sites in the two Australian regions had average annual PM_{10} levels ranging from 14–26 µg/m^3 (Department of Environment and Climate Change, New South Wales Government, 2008; Environment Protection Authority Victoria, 2008).

TEMPERATURE INVERSION TRAPPING AIR POLLUTION FROM WINTER HOME HEATING, CROMWELL

Source: Otago Regional Council.

Case study

Health and air pollution in New Zealand

Human exposure to air pollution can create health risks that may lead or contribute to various health conditions. The *Health and Air Pollution in New Zealand* (HAPiNZ) report discusses these effects in detail and provides information on air pollution in 67 areas around New Zealand (Fisher et al, 2007).

Sources of air pollution identified in the report are:

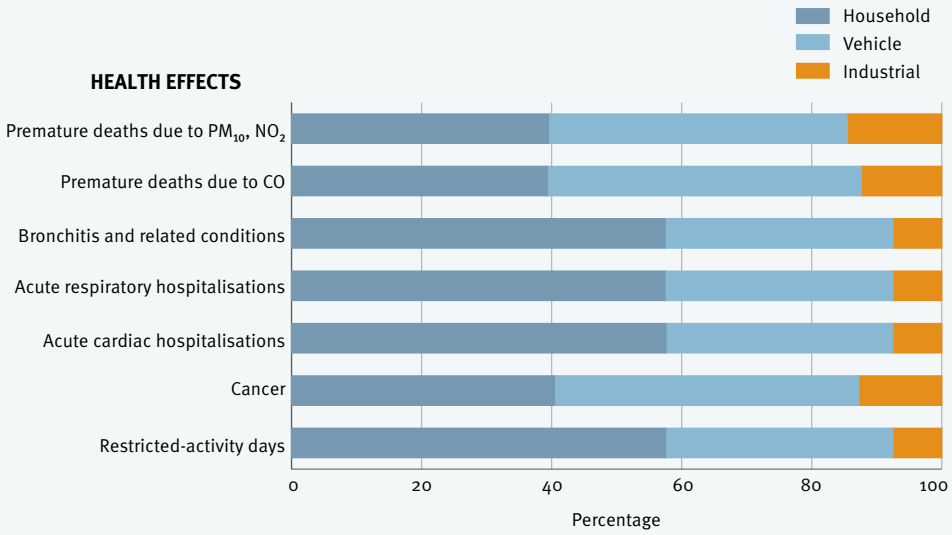
- households – emissions from the use of wood and coal for home heating
- vehicles – emissions from motorised vehicles on New Zealand roads, which use petrol and diesel as fuel
- industrial – emissions from all major industries, as well as some smaller commercial activities.

As shown in figure 7, the report identified households as the major source of air pollution that harmed human health in New Zealand in 2001. Air pollution from households was associated with nearly 60 per cent of bronchitis cases, acute respiratory hospitalisations, and acute cardiac hospitalisations. It was also the main source of air pollution associated with restricted-activity days – days on which people cannot do the things they might otherwise have done if air pollution was not present (Fisher et al, 2007).

Air pollution from vehicles was associated with nearly half of the total cases of premature deaths due to carbon monoxide (CO), PM_{10} and nitrogen dioxide (NO_2) poisoning in New Zealand in 2001, as well the largest cause of cancer related to air pollution.

+ FIGURE 7

HEALTH EFFECTS OF AIR POLLUTION IN NEW ZEALAND, BY SOURCE AND EFFECT, 2001 (PROPORTION OF CASES IN THE POPULATION OVER 30 YEARS OF AGE)



Data source: Fisher et al, 2007.

Rates of death from air pollution vary in the report from a low of 0.18 per 1000 people each year in New Plymouth, to a high of 0.74 in central Christchurch (Fisher et al, 2007). This difference may be attributed to the number and type of air pollution sources in each area, the topography and local weather patterns.

The report also discussed the link between exposure and levels of air pollution with the resulting changes in death rates. Exposure to air pollution may be categorised into short exposure (eg, daily) and long-term (eg, annual) exposure. The report found that long-term exposure to increased levels of particulates in the air has a greater effect on premature death rates than short-term exposure (Fisher et al, 2007). This emphasises the need for continuous monitoring of PM_{10} to obtain both short- and long-term data sets to support evidence-based policy-making.

Future watch

Under the national environmental standard, by September 2013 regional councils are required to bring the PM_{10} levels of their airsheds within the PM_{10} standard of 50 µg/m^3. Councils cannot grant resource consent applications for discharges to air in airsheds that fail to comply with the PM_{10} standard after that date.

Between 2005 and 2007, the number of complying airsheds has fluctuated. We can expect to see further fluctuation in compliance over the next five years to September 2013. This is because weather is an important influence on air quality and expected fluctuations in yearly weather patterns will most likely be reflected in the PM_{10} levels.

Another aspect to compliance involves costs associated with replacing old, non-compliant wood burners with burners that comply with the national environment standard, or other cleaner home heating options. This is a major part of regional council action plans to reduce PM_{10} levels in an airshed. Funding programmes are in place in some regions, but in most, homeowners will still need to cover at least part of the cost of improving air quality in their airsheds. As New Zealand heads into recession, it is not clear whether homeowners will continue to prioritise spending money on a shift to cleaner heating. This increases the risk that some airsheds may not comply with the PM_{10} standard by September 2013.

The Vehicle Exhaust Emissions Rule, which took effect at the beginning of 2008, is one initiative expected to improve the harmful exhaust emissions of used imported vehicles. As a result, this rule is also expected to help reduce the health-related effects of vehicle exhaust emissions, particularly in cities such as Auckland.

Further information

The implementation of the national environmental standards for air quality is a major step in addressing air pollution in New Zealand. Information about it can be found on the Ministry for the Environment's website at: www.mfe.govt.nz/laws/standards/air-quality-standards.html and www.mfe.govt.nz/publications/rma/user-guide-draft-oct05/index.html

More information on New Zealand's air quality can be found in the Air chapter of *Environment New Zealand 2007* at: www.mfe.govt.nz/publications/ser/enz07-dec07/chapter-7.pdf

Home heating is the most common source of PM_{10} air pollution in New Zealand. Switching to cleaner, more efficient wood burners can significantly reduce pollution levels. A well-insulated house needs less heating, so having proper insulation in your home is another important element of reducing air pollution. For further information on changing your existing wood burner, installing a new one, or adding insulation to your home, visit the following websites:

- www.eeca.govt.nz
- www.energywise.govt.nz
- www.cleanheat.org.nz
- www.mfe.govt.nz/laws/standards/woodburners/authorised-woodburners.html

Car owners can obtain more information on how to reduce vehicle exhaust emissions at: www.transport.govt.nz/choke-the-smoke-index

Technical notes

Limitations of this indicator

Health impacts of air quality

The national environmental indicator discussed in this report card is primarily focused on tracking air quality against the national environmental standard for PM_{10}. Although localised studies on air quality are able to provide more detailed information on the human health effects of air pollution, this indicator does not report on or quantify the specific human health effects of poor air quality at the national scale.

Furthermore, the indicator does not show the effects from exposure to two or more air pollutants in the environment. This is relevant because most combustion processes give rise to several pollutants simultaneously (Ministry for the Environment, 2007).

Variations in weather and climate

The indicator reports on the state of air quality over time, but does not allow for the influence of variations in weather and climate from year to year. This makes it difficult to assess whether changes in air quality are caused by changing environmental pressures – for example, a reduction in the emission of air pollutants – or meteorological variations, such as changes in wind patterns (Ministry for the Environment, 2007).

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