

Auckland's water is one of its most valuable natural assets. The water Auckland needs for people, farms, businesses and industry is taken from the surface (rivers, lakes and dams) and from underground aquifers where it is naturally stored in rocks and called groundwater.

This is how we use water:

- Almost all of Auckland's water supply comes from the surface water stored in nine dams in the Hunua and Waitakere ranges, some also comes from the Waikato River.
- Across the region in 2008, daily water demand averaged 300 litres per person per day for household and industrial use, including leakages. That is 180 litres a day for purely domestic use.

- Aside from domestic water use, areas north and south of central Auckland use most water for horticulture and dairying, with smaller amounts used for golf courses, quarries, and some industry. In comparison, in central Auckland areas most is used for industry followed by pastoral farming and horticulture.
- There have been more applications to take bore water (groundwater) for household use and stock in recent years. This is because more land is being subdivided for residential use in rural areas without central water supplies.
- Figure 4 shows that between 2007-2008 those with consents to take bore water used 111 million m³ of water, around the same as the previous two years, and less than they were allocated in total. In wetter years, consent holders use less water than they are allocated.



Fig.4 Amount of water allocated compared to usage showing that overall, consent holders do not take more than they are allowed. 2002/03 to 2007/08 (Source: ARC)

What does freshwater use mean for the environment?

When water is taken out of a stream or aquifer the flow is reduced. Lower water levels can in turn lead to:

- A build up of sediment, risking flooding during high rainfall.
- Disturbing the migratory patterns of river and lake life, especially in dams that form barriers.
- A reduction in a river's ability to dilute and absorb contaminants washing off surrounding land.
- A loss of habitat for important stream life such as invertebrates and micro organisms.
- Lowering of groundwater levels to the point that wetlands and springs are no longer fed, and seawater seeps into the aquifer, contaminating future supplies.

Each person uses around 180 litres of water per day

That's about a bath full. This is less than people use in Hamilton, Palmerston North and Wellington, well below the USA or Australia, and about same as people use in Europe.



The Upper Mangatawhiri Dam in the Hunua Ranges is one of nine serving the Auckland region.

Unless we become more efficient at energy production, transfer and use, the region will need 65 per cent more energy by 2031.

Energy

We use energy for transport, industrial processes, light, heat and appliances. The more energy we use, the more pressure is placed on the environment.

Here's how we use energy:

- About 56% of all energy used in Auckland goes into transport. Figure 5 shows you where it all goes.



- Of non-transport energy, 70 per cent goes towards industry and commerce, with the remaining 30 per cent used by households. Figure 6 shows the fuels that make up non-transport energy use.
- Many homes are heated by wood and LPG.
- Weather affects how much energy is used – in hot summers and cold winters we use more energy for heating and cooling our surroundings.
- Although petrol use increased slightly over the three years to 2008, use increased at a lower rate than population growth.

What does energy use mean for the environment?

- Coal and oil powered generation plants, and home wood and coal burners release carbon dioxide, a greenhouse gas, into the air, as well as particles that are dangerous to human health.
- Nearly all of the energy used in Auckland comes from outside the region. Changing energy from one form to another, and then supplying it to consumers takes energy. For instance, geothermal steam turned into electricity is transmitted through lines. An estimated one third of energy is lost during this process. Maintaining and upgrading the transfer of energy to Auckland including pipelines, fuel storage and transmission lines is not only costly, but impacts on environments beyond the region.

Fig.5 Auckland's transport-related energy use by mode of transport, 2008. (Source: ARC)

Electricity 51%
Coal 22%
Gas 19%
Biomass 5%
LPG 3%
Diesel <1%

Fig.6 Non-transport energy use, 2008. (Source: ARC)

Solid waste

Solid waste is made up of household rubbish as well as industrial, commercial, construction and demolition waste and tailings from mines and quarries. Most is taken to landfills.

- The amount of rubbish we create is increasing (see Table 1). From 2003 to 2008, waste from the region sent to landfill grew by 23 per cent, an increase of 320,000 tonnes. Although the population grew in this time, we know the rate still increased from 0.81 tonnes to 0.98 tonnes per person in this time.
- Over half of all waste going to landfill is food, garden, construction and demolition waste.
- Aucklanders are recycling more than ever before (see Table 2). From 2004 to 2008, 11 to 60 per cent more waste by volume went into recycling bins, with variation across areas. A total of 8.6 per cent of the region's solid waste by volume was recycled in 2008. About half of Auckland's recycling material is cardboard and paper, although more glass and other materials are being recycled.

Year	Waste from the Auckland region sent to landfill (tonnes)	Waste from the Auckland region sent to landfills (tonnes/person)
1998/99	969,331	0.83
1999/00	911,414	0.77
2000/01	915,290	0.76
2001/02	881,221	0.72
2002/03	1,002,121	0.80
2003/04	1,049,776	0.81
2004/05	1,189,720	0.90
2005/06	1,215,369	0.90
2006/07	1,440,217	1.05
2007/08	1,370,044	0.98

Tab.1 Solid waste sent to landfill, 1998/98 to 2007/08 showing a gradual increase. (Source: ARC)

Year	Rodney District	North Shore City	Waitakere City	Auckland City	Manukau City	Papakura District	Franklin District
2004	65	*	85	89	51	62	*
2005	76	100	68	93	56	65	*
2006	95	103	84	95	58	71	*
2007	97	112	86	94	58	78	*
2008	93	109	89	97	59	79	*

*No data available

Tab.2 Recycled waste per kg/person by local council, 2004-08. (Source: Territorial authorities' recycling records)

Solid waste

What does solid waste do to the environment?

- Landfills can pose risks to human and ecological health and take up valuable space. They can devalue surrounding land.
- Historical landfills may harbour hazardous material. Poor containment of the waste can contaminate soil and water over time, preventing use of the land in the future and polluting local water supplies.



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Three main types of liquid waste affect the quality of our freshwater and marine environments.

Wastewater poses a public health risk as it comprises both sewage and grey water (such as the water from showers and laundries). It is treated and released to the sea.

Stormwater is rainfall that runs off hard impervious surfaces such as roads and roofs and can pick up and transport sediment and chemical contaminants as it flows down stormwater drains. Stormwater is not treated and enters streams and the sea.

Rural discharges include water from agricultural production and rainfall. These enter streams and subsequently the sea.

- 133 million m³ of wastewater is treated each year at the Mangere and Rosedale Wastewater Treatment Plants. Mangere processes 330,000 m³ per day, Rosedale, 54,000 m³. The quality of water discharged from plants has improved considerably in recent years.
- Once wastewater has been treated, it is discharged to the sea. Between 2004-2008 there were 232 'dry weather overflows' of sewage into the sea due to blockages and pump station failures. Also, during heavy storms, the wastewater transport network can sometimes overflow delivering untreated sewage directly to the sea. In 2008 there were 2,479 recorded wet weather sewage overflows, most in old systems combining sewage and stormwater run off.
- Rural discharges from agricultural and horticultural production can contain sediment, nutrients, for example, nitrogen from fertilizers and dairy, piggery and poultry waste. Herbicides and pesticides can leach from soil into waterways and the sea, harming aquatic and streamside life. Use of nitrogen-based fertilizer and effluent spraying of pasture has increased in the Auckland region.
- Spillages of oil and fuel pollute the region's marine areas. In 2008, four commercial oil spills in the port area brought the total number of spills to 22, and total volume to 3616 litres for that year. This was more than double the number and volume of spills of each previous year.

What does liquid waste mean for the environment?

- In 2010 substantial quantities of sediment are predicted to enter the Waitemata and Manukau harbours from soil exposed during urban development. This is affecting marine health.
- Stormwater run off from hard surfaces like roads, roofs and pavements carries many contaminants including zinc, copper and faecal matter. This polluted water flows to the sea where it accumulates in marine environments, potentially causing serious health issues to humans and other animals. Although industrial areas supply more of these contaminants than residential areas, there is more residential land in total (see Table 3).
- In some areas, untreated wastewater overflows from combined sewer and stormwater pipe networks and flows into the sea during heavy rainfall. This can make local beaches temporarily unsafe for bathing.
- Untreated waste water from livestock, for instance, dairy, piggery and poultry waste, increases nutrient levels, polluting freshwater. Elevated nutrient levels use up available oxygen in water and encourage the growth of algae and weed species. This harms or destroys aquatic life.

- Herbicides and pesticides leaching from horticultural soils can be washed into the waterways and the sea, harming marine life.
- Marine spills are difficult to contain and clean up, causing immediate and long term damage to the marine environment.

Tab. 3 Estimated stormwater contaminants and sediment yields from residential and business land. (Source: ARC)

	Residential land	Business land
Total suspended sediment (kg per hectare per year)	595	642
Total zinc (kg per hectare per year)	0.68	6.56
Total copper (kg per hectare per year)	0.08	0.28
Enterococci bacteria (number per hectare per year)	2.96 x 10 ⁹	1.06 x 10 ¹²

The main causes of air pollution in the region are transport, home heating and industrial processes. These emissions are mainly from the burning of fuels such as diesel, petrol, wood, gas and oil.

- The urban area makes up only 10 per cent of the total land in the Auckland region but contributes most of the region's total emissions for each air pollutant.
- Although Auckland has air pollution issues and from time to time exceeds standards and guidelines, the air is usually good compared to many cities in the world.
- Transport is the greatest contributor to most pollutants of the air in Auckland. Levels of carbon monoxide and nitrogen dioxide in the air increase during rush hours. The use of cars, trucks and buses causes the greatest share of transport related emissions. Vehicle use is increasing in Auckland – the volume of petrol sold in 2008 was 2.5 times greater than that sold in 1990, while 4 times as much diesel was sold in that time. Diesel vehicles produce more nitrogen oxides and particulates than petrol, and diesel vehicle use is rising. Petrol vehicles produce more carbon monoxide than diesel vehicles.
- Many households burn wood and coal for home heating, creating high particulate levels especially over winter (see Figure 7), although use of this form of heating seems to be declining.

What air pollution means for Auckland's environment

- By far the major issue with Auckland's air pollution is health. Auckland's main air pollutants include fine particles (we refer to PM₁₀ and PM_{2.5} in this document), oxides of nitrogen, carbon monoxide, volatile organic compounds (VOCs) and sulphur dioxide. Many of these, when produced in sufficient quantities or concentrations, are potentially harmful to human, plant and animal health. One in six adult New Zealanders and 27 per cent of six and seven year olds suffer from asthma, and fine particles worsen symptoms for asthmatics. The lungs of children under six years old are more vulnerable to air pollution than adults. An estimated 600 premature deaths in Auckland each year are related to high levels of particulates in the air. Annual health costs due to air pollution in Auckland are estimated at \$547 million.
- Although better fuels and vehicle technologies have improved vehicle emissions, there are now more vehicles on Auckland roads, and population growth is likely to continue this increase in vehicle numbers.
- Air pollution can also lead to hazy days, Auckland has around 30 days of 'brown haze' per year. The frequency of these brown hazes depends on pollutant sources and weather conditions.

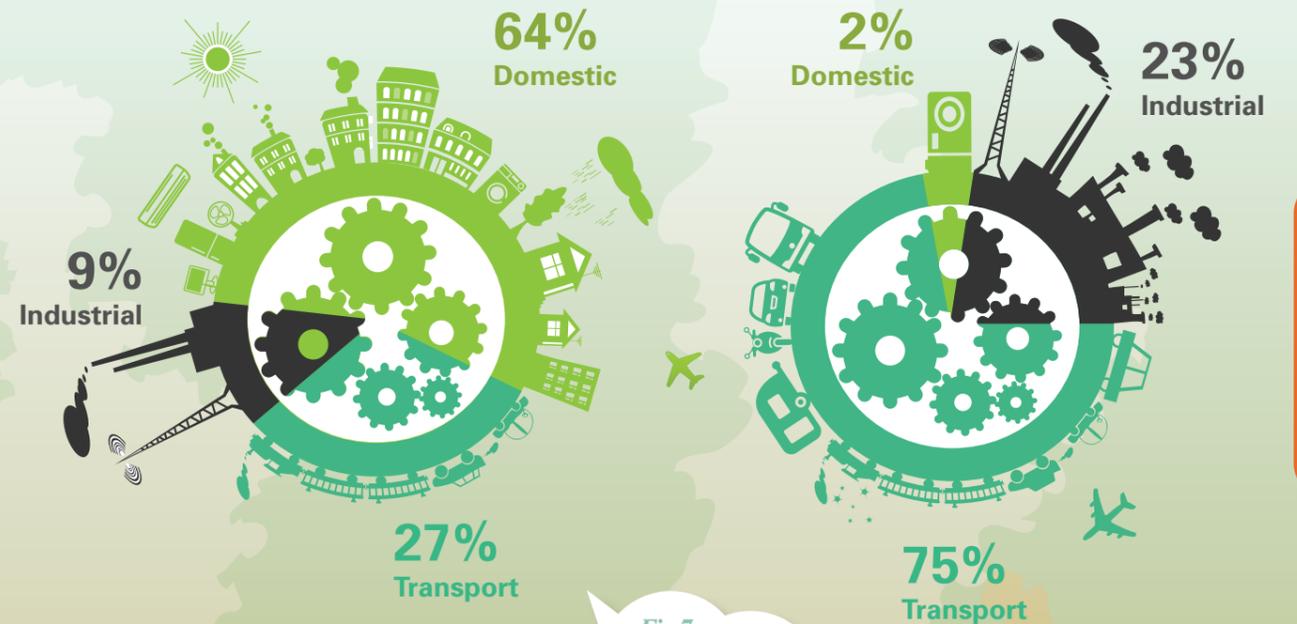


Fig.7
Sources of PM₁₀ (a particle pollutant) in the Auckland region showing significant seasonal differences, 2004. (Source: ARC)

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A prosperous economy requires goods and people to move efficiently between locations. People also want to be able to travel safely and quickly from place to place. This need and desire for mobility places further pressures on our environment.

- The number of road vehicles owned is increasing nationally (see Table 5) and people are choosing vehicles with larger engines. Around half of the cars on Auckland's roads are over 12 years old, with less efficient fuel and emission ratings than newer cars.
- Congestion in Auckland shows considerable variability. Travel times in the evening peak have improved slightly recently. It is not yet known if this is a long-term trend.
- We measure Vehicle Kilometres Travelled (VKT) as an indicator of how many kilometres people are travelling and from this we can calculate road transport pressure. Between 2004 and 2008, VKT increased by 9 per cent (see Table 4).
- Public transport use increased from 33.3 million to 54.7 million passenger boardings between 1994 and 2008. This is an increase of 64 per cent. Rail travel has shown the greatest increase and over the last five years, train patronage has grown 97 per cent to 7.6 million passenger trips per year.

- Population growth in the region is expected to put more demand on the existing transport networks. Although the use of public transport is increasing, so too is private vehicle use.
- Although vehicle use may increase in the future, emissions are predicted to remain at current levels due to advances in engine and fuel technologies.
- Aucklanders do cycle and walk, but these do not seem to be replacing other means of transport.

Tab.4 Vehicle Kilometres Travelled (VKT) in the Auckland region, 2001-08. (Source: ARC)

Year	Total vehicle distances travelled (millions km)	Average vehicle km travelled per person per year
2000-01	10,098	8460
2001-02	10,340	8497
2002-03	10,797	8611
2003-04	11,077	8582
2004-05	11,401	8659
2005-06	11,734	8776
2006-07	11,853	8727
2007-08	12,047	8734

What transport does to Auckland's environment

- Increasing numbers of vehicles burning fossil fuels create more greenhouse gases and increase air and water pollution in Auckland (see Table 5). However, new technology such as more efficient engines and cleaner fuel will offset the overall impact of more vehicles.
- Road transport affects water quality when rain washes pollutants into waterways. Pollutants come from fuel emissions, oil, brake linings and tyres.
- Rail and road transport can cause noise and vibration nuisance.
- Construction of transport networks uses land, fuel and materials, and can fragment or destroy natural areas, landscapes and communities.
- When more people use public transport, there are less private vehicles on the road and there is less pollution.

The Auckland region gets 35 new vehicles every day.

Tab.5 Vehicle ownership in New Zealand, 2001-07 (Source: Ministry of Transport).



Light vehicles
(at year end Dec 31st)



Light vehicle ownership
(per 1000 people)

2001	2,486,230	641
2002	2,557,144	649
2003	2,658,215	663
2004	2,757,280	679
2005	2,849,825	695
2006	2,897,832	692
2007	2,951,878	698

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