

## Waste Management

Key Information	Why is this Useful?	What is Happening?
Quantity of waste disposed of in landfills.	Waste in landfills often contains valuable resources that could be reused or recycled. Landfills can also have significant impacts on the environment.	↓ Waste to the landfill decreased by around 3,200 tonnes per year between 1994 and 1999.
Quantity of landfilled waste per capita.	This takes into account any influence population growth has on the amount of waste generated. It also provides a measure of changes to residential waste disposal behaviour.	↓ Per capita waste decreased from 810kg per person to 700kg per person between 1994 and 1999.
Amount of green waste composted by Christchurch City Council.	Composting provides a method of reducing green waste being landfilled and produces a valuable resource in return.	↑ The amount of green waste being composted has increased to around 30,000 tonnes per year between 1997 and 1999.
Amount of waste recycled or reused.	Recycling not only reduces the amount of waste going to the landfill, it also reduces the need to extract and use new raw materials.	● Kerbside recycling collected 11,647 tonnes of waste in the year to June 1999.
Biological Oxygen Demand (BOD) discharged from wastewater treatment plant to the Avon-Heathcote Estuary.	This measures the pressure effluent places on the water environment. When BOD levels are high, more dissolved oxygen in the water is required to break down this material.	~ BOD levels averaged 31 g/m <sup>3</sup> for the period between 1989 and 1999.
Requests for disposal of hazardous waste.	Hazardous wastes have the greatest potential to cause environmental damage. They need to be disposed of in a way which mitigates any environmental impact.	↑ Requests for disposal of hazardous waste increased from 241 in 1993 to 521 in 1999.

**Other Related Sections:** Population Growth, Land Use, Groundwater, Surface Water, The Coastal Environment, The Built Environment, Urban Amenity, Part 3: The City's Economy.

### Solid Waste

The production of solid waste (including household rubbish, commercial and industrial waste, and garden waste) is an inevitable consequence of most human activity. However, reduced waste production will lead to more efficient resource use and a reduction of environmental impacts from landfills and the extraction of non-renewable resources.

To effectively reduce waste, a good understanding of waste volumes, sources and composition in Christchurch is necessary. Each of the City's transfer stations and the landfill site are equipped with weighbridges to enable accurate monitoring of waste quantities. The composition of various waste streams is determined by sampling the refuse at source or at the transfer station and landfill site.

During the year to June 1999 the City produced 228,295 tonnes of solid waste (excluding hardfill) that were dumped at Burwood Landfill. It also took 10,694 tonnes of waste from Waimakariri and 1,120 tonnes from Selwyn District Councils. In addition, 31,535 tonnes of green waste were composted at the City's Bromley composting plant (Figure 2.46). Almost 17,000 tonnes of inert hardfill and rubble were also disposed of in 1999.

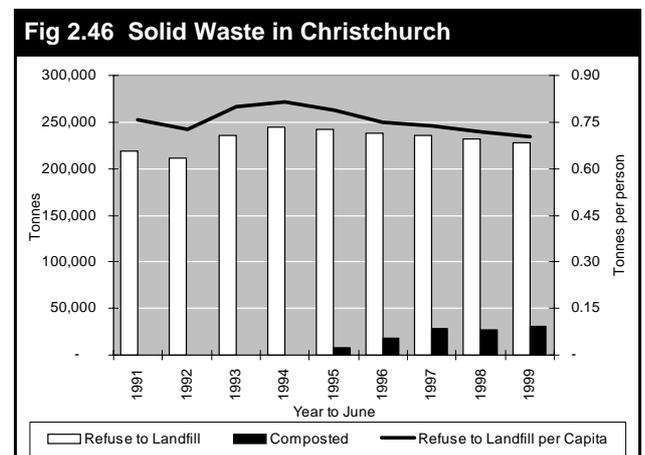
The total amount of waste going to the landfill has been decreasing steadily since 1994. This can be attributed in part to the separation of 'clean green waste' (including grass clippings, hedge and tree prunings, leaves and plants) for the Council's

composting plant and, more recently, to the start of kerbside recycling in May 1998.

Total waste has been declining at a rate of 3,200 tonnes per year since 1994. At this rate it is estimated that the City will no longer need to landfill waste by the year 2070.

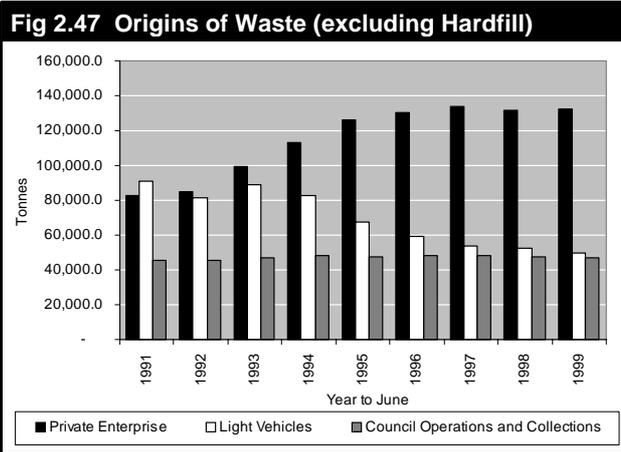
The amount of waste generated per capita takes into account the impact of population changes on waste production. It provides a measure of how individuals are changing their waste disposal behaviour and reducing domestic waste. In 1996 it was estimated that residential waste contributed around half the total waste in Christchurch City.

Figure 2.46 shows that per capita waste decreased



Source: Christchurch City Council.

## PART 2. THE CITY'S NATURAL AND PHYSICAL ENVIRONMENTS



Source: Christchurch City Council.

from 810 kilograms per person in the year to June 1994, to 700 kilograms per person for the year to June 1999. This was an average decrease of 20 kilograms per person per year. At this rate the Council's goal of zero waste<sup>48</sup> to the landfill per person will occur in 35 years, 15 years after the year 2020 target. However, the initial goal of reducing waste by 14 per cent per capita ( 697 kilograms per person) of the 1994 level by the year 2000 looks like it will be achieved.

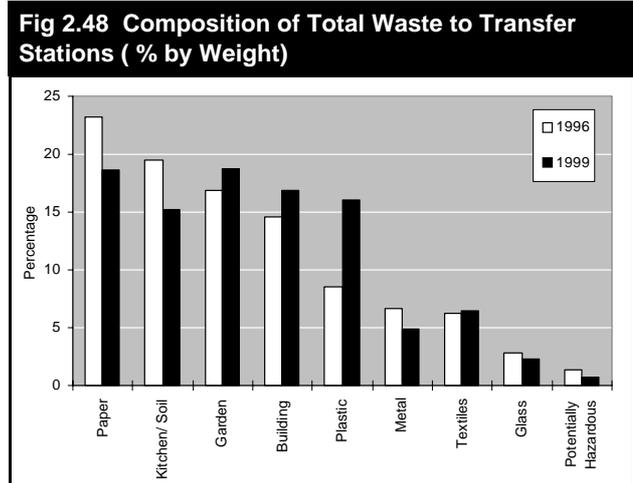
The amount of waste per capita is decreasing at a more rapid rate than total waste due to the impact of increased population growth in the mid-1990s. In fact, 55 per cent of the decline in waste per capita would have occurred solely as a result of increased population and no change in total waste. The rate of population growth declined considerably between 1997 and 1999. If this continues, the rate of decreasing per capita waste will slow down unless other waste initiatives increase the rate of reduction in total waste.

Figure 2.47 shows the origins of waste in the City. Until 1993 both light vehicles and commercial non-Council vehicles were responsible for delivering most of the waste. The Council's operations and refuse collection contributed the remaining 45,000 tonnes per year. Since then, waste from private vehicles decreased by 45 per cent to be just under 50,000 tonnes in the year to June 1999. Conversely, the amount of waste from private enterprise increased from around 100,000 tonnes in 1993 to around 130,000 tonnes per year between 1995 and 1999.

### Composition of Solid Waste

Waste audits were carried out in 1993, 1994, 1996 and 1999. Figure 2.48 shows the comparison between the proportion of each type of waste that went to the landfill in 1996 and 1999. Although paper was the greatest source of waste in 1996 and 1999, the proportion of total waste decreased between surveys. The proportion of total waste from garden material, building material and especially plastics increased between the 1996 and 1999 surveys.

<sup>48</sup> Christchurch City Council Waste Management Strategy for Solid and Hazardous Waste 1998, <http://www.ccc.govt.nz/waste/ManagementPlan/index.asp>

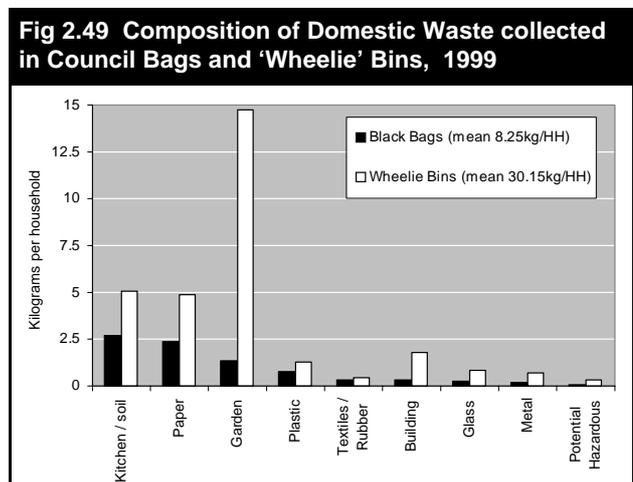


Source: Christchurch City Council.

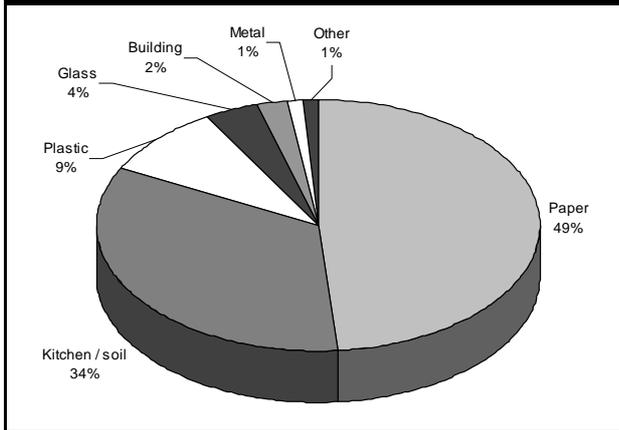
The 1999 audit also sampled the composition of residential black rubbish bags and "wheelie" bins. Generally, more waste was collected from households with bins than those that used bags. The mean weekly household waste disposed of in black rubbish bags was 8.25 kilograms per household, whereas the mean household waste in "wheelie" bins was 30.15 kilograms per household.

Figure 2.49 shows the breakdown of waste per household for both black rubbish bags and bins. Paper, kitchen and garden material made up the greatest proportion of waste in both bins and bags. Bins contained a greater proportion of green material, kitchen waste, paper and building material than bags. A large amount of green material which went into bins should, ideally, have been composted.

The use of bins in Christchurch increased significantly in the five years to 1999. It is difficult to know whether using a bin increased the amount of waste being disposed of, or whether households producing a large amount of waste were more likely to change to using bins due to the increased convenience. However, it is apparent that a greater amount of green waste was disposed of by households using bins compared with households using bags.



Source: Christchurch City Council.

**Fig 2.50 Composition of CBD Waste in Black Rubbish Bags, 1999**

Source: Christchurch City Council.

The composition of commercial and business waste was also estimated in the waste audit. Black rubbish bags from the central business district (CBD) were sampled. Unfortunately it was impossible to distinguish between Central City residential waste and waste from commercial premises. However, there was a distinct difference in the proportions of waste in these bags compared with residential bags and bins. Figure 2.50 shows the majority of waste in the commercial business district was paper (49 per cent) and kitchen waste (34 per cent). As expected, there was very little garden waste.

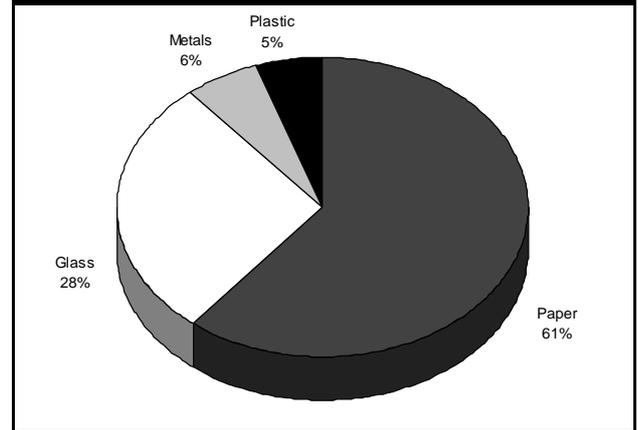
The composition of business waste was dominated by paper, wood, rubble and plastic. Combined, these made up approximately 75 per cent of business waste. Garden and kitchen waste combined contributed less than 15 per cent of total business waste.

### Composting Green Waste

Composting not only reduces the amount of landfilled waste, it also lessens greenhouse gas emissions. The aerobic composting process produces carbon dioxide, rather than methane, which results if the material decomposes without oxygen (as occurs in landfills).

Council composting started in the year to June 1995 and rapidly increased to around 30,000 tonnes by the year to June 1997 (Figure 2.46). Since then green waste appears to have stabilised at around 30,000 tonnes per year. If this green waste was not composted, it would have added an additional 13 per cent more waste to the landfill, based on figures for the year to June 1999.

In addition to the Council-operated compost plant, many residents also compost their own green waste for reuse in their gardens. The Annual Survey of Residents found that 57 per cent of residents in 1999 composted some of their garden and food waste. The survey also asked residents whether they took green waste to the transfer station. Sixty seven per cent of respondents had taken green waste to the transfer

**Fig 2.51 Proportion of Materials Collected from Kerbside Recycling**

Source: Recovered Materials Foundation.

station in the previous 12 months.

### Kerbside Recycling

Recycling and reuse of materials such as glass, paper, wood, oil, plastic and metals is another way of reducing the amount of waste being disposed in landfills. Reuse is the repeated or continued use of a product in its original form. Recycling involves the breakdown of products into their constituent materials either by melting (in the case of metal, glass or plastic) or maceration (in the case of paper), followed by the reformation of the material into new products.

In May 1998 the Christchurch City Council started a kerbside recycling programme that enabled glass, newspaper, some plastics, cardboard, and aluminium and steel cans to be collected. Previously, newspaper was the only material collected at the kerbside, while other materials could be recycled at the transfer stations and drop off points throughout the City.

In the year to June 1999, 11,647 tonnes of material were collected from kerbside recycling. This removed 5 per cent of the waste that would otherwise have gone to the landfill. The greatest proportion by weight of material collected as part of kerbside recycling was paper and cardboard (61 per cent), then glass (28 per cent), with plastic and metal each contributing around 5 per cent to the total (Figure 2.51).

Ninety per cent of residents questioned in the Annual Survey of Residents thought the Council's kerbside recycling programme was good or very good. While this is encouraging it is interesting to note that when this question was asked in 1997, when only newspapers were being collected, 88 per cent of residents thought the kerbside recycling was either good or very good. This probably measures the quality of service rather than satisfaction with the range of materials that can be recycled.

Before 1999 the Annual Survey of Residents asked a question on recycling habits. In 1998, 61 per cent of residents recycled glass, 78 per cent newspapers, 40

## PART 2. THE CITY'S NATURAL AND PHYSICAL ENVIRONMENTS

per cent aluminium cans and 37 per cent plastic. These percentages remained reasonably stable between 1991 and 1998, and showed that many residents were already accustomed to recycling before kerbside recycling commenced.

### Target Zero<sup>49</sup> – Cleaner Production Principles

Between mid-1997 and June 1999 a trial programme to develop cleaner production methods in 12 Christchurch companies was carried out. The Target Zero programme was funded by the Christchurch City Council, the Ministry for the Environment, and the Electricity Corporation of New Zealand. As a result of the trial the following savings were achieved:

#### Inputs:

- 94,200m<sup>3</sup> of water
- 17,740 GJ of fossil fuels
- 535 MWh of electricity
- \$489,440 of materials

#### Outputs:

- 123,990m<sup>3</sup> of trade waste
- 890 tonnes of solid waste
- \$684,160 of product
- 1,850 tonnes of CO<sub>2</sub> emissions.

Although the initial trial has finished, the Target Zero programme is still continuing locally with manufacturers. It has also expanded to include a green retailers programme, focusing on commercial waste from retailing.

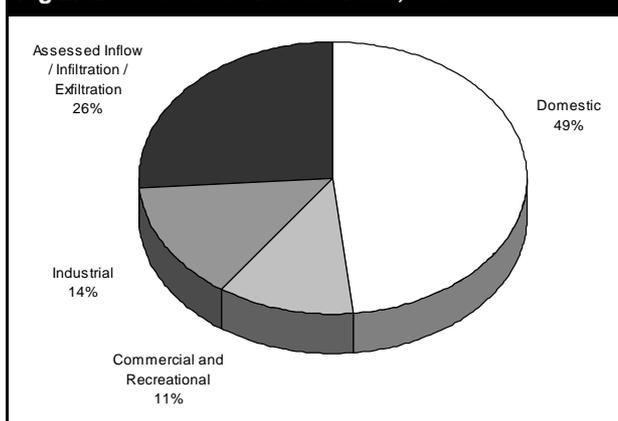
## Liquid Waste

Waste water treatment is an extremely large, complex and expensive operation that is vital for the health and well-being of the community. Waste water, which is almost all used water, is carried through a network of underground pipes to the treatment plant. The aim of waste water treatment is to remove all pollutants and produce an effluent that is as near as possible to fresh water, which can then be safely reused or returned to the environment.

In the year to June 1999 the City's waste water treatment system processed approximately 48,659 mega litres<sup>50</sup> of waste through the City's three waste water treatment plants. Almost all of this was processed at the Bromley treatment plant (98.3 per cent), with the Belfast and Templeton plants processing the remaining 1.0 and 0.7 per cent of the total waste water respectively.

Approximately half of the waste water originated from domestic sources (49 per cent). Industrial sources contributed 14 per cent, and commercial and recreational sources 11 per cent of the liquid waste.

Fig 2.52 Sources of Waste Water, 1999



Source: Christchurch City Council.

The remaining 26 per cent was from the infiltration and inflow of groundwater and stormwater (Figure 2.52).

Domestic effluent flow has increased at a rate consistent with population growth, although the total annual flow fluctuates from wet year to dry year due to the infiltration and inflow of ground water and stormwater into the system.

All three treatment plants carry out primary and secondary treatment. Liquid effluent is discharged from the Bromley treatment plant into the Avon-Heathcote Estuary twice daily, a few hours after high tide. This ensures that most of the discharge moves straight out to sea with the falling tide. Before being discharged in the Estuary, effluent flows through 230 hectares of oxidation ponds. These are also an important habitat for a variety of bird species at the Te Huinga Manu Wildlife Refuge. Liquid effluent from the Belfast treatment plant is discharged into the south branch of the Waimakariri River, and effluent from the Templeton treatment plant is discharged directly on to pasture.

Effluent discharged into the Avon-Heathcote Estuary has 90 per cent of the biological oxygen demand (BOD) removed. The average amount of BOD in the effluent discharged into the Estuary was 25 micrograms per litre during the year to June 1999. In the period from July 1989 to June 1999, BOD concentrations averaged 31 grams per cubic metre. The treatment plant also removed 99.91 per cent of the faecal coliforms from the liquid waste. The median number of faecal coliforms discharged in the Estuary in the year to June 1999 was 5,600 per 100 millilitres. Micro-organisms remaining in the effluent are a mixture of those that survive the pond system and those contributed by resident bird life. They do not normally have an adverse effect on the Estuary except in a small area adjacent to the outfalls.

Other outputs for the year to June 1999 from the waste treatment plant included: 4,496 tonnes of solid waste, (which was sent to the Burwood Landfill), and 4.7 million cubic metres of methane. The methane is used

<sup>49</sup> For more information on Target Zero see: <http://www.ccc.govt.nz/TargetZero/>

<sup>50</sup> One mega litre = 1,000,000 litres or one million litres

to run the Bromley treatment plant, which is 100 per cent self-sufficient in energy. Surplus electricity goes to the national grid.

### Hazardous Waste

Hazardous wastes are solid or liquid wastes which have properties that could pose dangers to human health, property or the environment if they are not properly treated, stored, transported, disposed of or otherwise managed. Waste is considered hazardous if it is ignitable, corrosive, reactive or toxic.

Hazardous waste, while not produced in large quantities in Christchurch, is the category of waste with the greatest potential to harm the environment if not properly managed. The 1999 waste audit estimated potentially hazardous waste made up 0.7 per cent of the total waste. Hazardous wastes are produced by industry and business and also, in smaller quantities, by households (Table 2.29).

The Christchurch City Council receives requests for the disposal of hazardous waste from industry and business. Between June 1994 and June 1997 the annual number of applications received more than doubled. Between 1997 and 1999 there was an average of 525 applications each year. This increase in applications is believed to reflect general public concern about the safe disposal of hazardous waste.

Table 2.30 shows that the City Council received 521 applications to dispose or recycle 8,281 tonnes of solid and 4,229 litres of liquid hazardous waste in the year to June 1999. There was a marked reduction in liquid waste compared with the year to June 1998, due to one operator now being able to discharge directly into the sewerage system after meeting trade waste standards.

Seventy two per cent of requests for disposal of hazardous waste were for industrial waste, with domestic and agricultural waste accounting for 23 and 5 per cent of requests respectively. The quantity of waste from industrial sources made up 99.7 per cent of the total solid and 57 per cent of the total liquid hazardous waste.

Recycling and reuse continue to play a significant part

Priority Waste Streams	Industry Groups
Cyanide Wastes	electroplaters, laboratories, pest control.
Chlorinated solvents and sludges	Drycleaners, aircraft maintenance, paint strippers, laboratories, engine repairs.
Agrichemical wastes	Agrichemical spray contractors, pest control.
Timber treatment sludges	Timber treatment plants and chemical suppliers
Waste Oil	Engine repairs, service stations, aircraft maintenance, electricity generation.
Metal processing wastes	Electroplaters and galvanisers, aircraft maintenance, tanning.
Household hazardous waste	Includes: garden sprays, poisons and pesticides, medicines, dietary supplements and animal remedies, small batteries, automobile batteries, mineral oils, paints and related products, aerosols etc.

Source: CRC Summary Report: Hazardous Waste Management Options for Canterbury Region.

in the disposal request process with 17 per cent of requests leading to products being recycled. In the year to June 1999, less than 1 per cent of solid hazardous waste was recycled or reused while 62 per cent of liquid hazardous waste was recycled or reused.

There is no clear trend in the quantities of hazardous waste. Both increases and decreases can potentially have beneficial environmental results. Increasing waste volumes can reflect greater awareness of hazardous wastes, while decreasing trends in hazardous waste can reflect the impact of cleaner production practices.

Year to June	Recycled			Disposed			Total		
	Requests	Solid (tonnes)	Liquid (litres)	Requests	Solid (tonnes)	Liquid (litres)	Requests	Solid (tonnes)	Liquid (litres)
1994	55	34	65,717	186	4,049	38,022	241	4,083	103,739
1995	70	3,258	17,765	302	2,908	48,191	372	6,166	65,956
1996	63	2	7,050	407	2,669	606,316	470	2,671	613,366
1997	83	43	9,204	458	4,001	114,314	541	4,044	123,518
1998	91	21	30,601	427	3,296	958,959	518	3,318	989,560
1999	91	9	2,633	430	8,272	1,596	521	8,281	4,229

Source: Christchurch City Council.