Item 2: Collaboration in Waste

SESSION TYPE: Briefing

PURPOSE/DESIRED OUTCOME:

Working as a region to minimise and manage waste can reduce costs and increase the range of possible solutions for Council and the community. Previous work undertaken by the Otago Mayoral Forum led to a better understanding of the opportunities to improve waste minimisation and management as a region and respond to stronger central government policy requirements.

A cross-cutting theme for Otago is the way the region splits into two parts: a coastal zone consisting of Waitaki, Dunedin and Clutha, and an inland zone with Central Otago and Queenstown Lakes. The synergies that exist are mainly within these zones. Queenstown Lakes, Central Otago and Clutha also have more natural transport connections with Southland than with Dunedin and Waitaki. These are important considerations for the movement of recyclable and organic materials when considering appropriate recovery facilities, re-processing infrastructure and end markets.

Some of these opportunities are described in the attached 'Otago Region Waste Assessment 2024' and 'Waste and Recycling in Otago 2022'. Some are currently being explored and will be considered during the development of the new QLDC Waste Management and Minimisation Plan.

The focus on regional opportunities has also led to strengthened relationships across Otago's council waste teams and the employment of a new role, the Otago Regional Waste Officer. Regional opportunities require detailed consideration of how they can be delivered, and it is expected that this will be explored and supported by the new role.

The purpose of this briefing is to provide Council with an opportunity to meet with the newly appointed Otago Regional Waste Officer and discuss progress on various regional waste minimisation opportunities with QLDC staff including:

- Southland Otago Waste Network Meeting (3 September 2024)
- Regional Material Recovery Facility (MRF) options assessment
- CODC Organics Processing Facility

DATE/TIME:

Tuesday, 17 September 2024 at 10:30am

TIME BREAKDOWN:

Presentation: 20 minutes
Questions: 10 minutes

Prepared by:

Name: Sophie Mander
Title: Senior Waste Minimsation Planner

Date: 2 September 2024

Reviewed and Authorised by:

Name: Tony Avery
Title: Property & Infrastructure General Manager

Date: 2 September 2024

ATTACHMENTS:

A	Collaboration in Waste Presentation | To be presented on the day
B	Otago Region Waste Assessment 2024
C	Waste and Recycling in Otago 2022

Otago Region Waste Assessment

Covering Queenstown Lakes, Central Otago, Clutha and Waitaki Districts; and Dunedin City

AUGUST 2023

eunomia

QUEENSTOWN LAKES DISTRICT COUNCIL

Approved by

Duncan Wilson

(Project Director)

Eunomia Research & Consulting Ltd
PO Box 78 313
Grey Lynn
Auckland 1245

New Zealand

Tel: +64 9 376 1909

Web: www.eunomia.co.nz

Acknowledgements

Disclaimer

Report Summary

This Waste Assessment (WA) has been prepared for the councils of the Otago region (Queenstown Lakes, Central Otago, Clutha and Waitaki Districts; and Dunedin City) – known here as 'the Councils' - by Eunomia Research & Consulting; in accordance with the requirements of the Waste Minimisation Act 2008 (WMA). This document provides background information and data to support the Councils' waste management and minimisation planning process.

The document is broken down into sections:

1) Introduction – the purpose and scope of the WA and the practical, legislative and strategic context
2) A description and assessment of waste infrastructure available to the region
3) A description and assessment of the waste services in the region, both council and non-council
4) Presentation and analysis of available waste data
5) Performance measurement and benchmarking
6) A review of the current Council WMMPs, as required by the WMA
7) A forecast of future demand and identification/analysis of gaps and key issues
8) Proposals to meet the gaps and address key issues, including an outline of the Circular Resource Network concept
9) Statement of Councils' intended roles
10) Appendices including the statement from the Medical Officer of Health

Introduction

This WA has been prepared in compliance with sections 50 and 51 of the WMA. It also reflects the national strategic environment, Te rautaki para | New Zealand Waste Strategy (TRP) and provides a foundation to enable the Councils to review and update/amend (as necessary) their WMMPs in an informed and effective manner; in doing so, it considers all waste in the region and not just that controlled by the Councils.

The WA touches only lightly on solid wastes that emerge from waste water management; as this is currently subject to significant national reform.

Beyond TRP, other key strategic and legislative context includes:

- public health protection;
- the waste hierarchy;
- Emissions Reduction Plan and emissions trading scheme;
- Waste Minimisation Act (2008);
- the waste disposal levy and information reporting requirements;
- other relevant central government initiatives such as a possible container return scheme, kerbside standardisation requirements, performance reporting for

territorial authorities (TAs), priority products, product bans, the infrastructure and investment strategy and data/monitoring requirements;
- the Resource Management Act review; and
- international commitments.

The local and regional planning context is summarised in section 1.6, including TA plans, strategies, and regulation along with long term plans; and relevant regional plan provisions. Current services and regional/local characteristics are also described.

Waste Infrastructure

The section outlines the waste management and minimisation infrastructure across the Otago region, and further abroad where applicable. The facilities available in the Otago region are a combination of those owned, operated and/or managed by Councils, and those that are owned and/or operated by commercial entities or community enterprise.

Disposal Facilities

These are categorised according to the MfE regulations adopted in 2021. There are four Class 1 (municipal) landfills in the region: Green Island in Dunedin, Mt Cooee near Balclutha, Victoria Flats near Queenstown, and Palmerston landfill. Waste from the region is also disposed of at AB Lime's facility in the Southland region.

Waste is also disposed of to a range of Class 2-5 fills and on-property in rural areas. The recent extension of the landfill levy and government requirements for data reporting has anecdotally resulted in some Class 2 landfills closing.

Transfer Stations, Resource Recovery Parks, Recycling Drop-off Points

There are a number of these facilities across the region; which provide for those that can't or prefer not to take waste directly to a landfill or have materials that are able to be diverted through recycling or recovery.

Error! Reference source not found. in the report lists the known facilities across the region and, where available, the materials and quantities handled.

The closed landfills in the region that the Councils have responsibility for are listed; and hazardous waste and waste water treatment systems are described in sections 2.2 and 2.3.

Recovering and Reprocessing

There are a number of recycling, recovery or reprocessing facilities used within the region and nationally, with some materials exported for reprocessing.

The key facilities within the region include:

- Queenstown Lakes District Council's material recovery facility (MRF) at Frankton, operated by Waste Management NZ Ltd;
- OJI's MRF at Green Island, which accepts recyclables from Clutha district;
- Waitaki Resource Recovery Trust's (WRRT) MRF in Oamaru, mainly handling recyclables collected from commercial customers;
- EnviroNZ Ltd's MRF at Timaru, which processes recyclables from Dunedin;
- Dunedin City Council's composting facility at Green Island;
- AllWaste's construction and demolition recycling facility in Queenstown;
- Cargill Enterprise's e-waste dismantling and sorting site in Dunedin;
- Nash & Ross aggregate recycling in Dunedin;
- Keep It Clean rendering plans in Abbottsford and Mosgiel;
- Central Wormworx vermicomposting in Cromwell;
- Hall Bros aggregate recycling in various Dunedin locations;
- Central Otago District Council's glass crusher;
- Clutha District Council's greenwaste shredder at Mt Cooee; and
- WRRT's greenwaste shredder in Oamaru

Key facilities used outside the region are:

- Visy Glass, Auckland (most areas);
- Envirowaste's composting facility at Redruth (organic waste from Central Otago district);
- Tyrewise, Agrecovery agricultural plastics, Plasback agricultural film, Expol polystyrene, Terracycle for various materials - through national product stewardship programmes (some materials from all areas);
- OJI Fibre Solutions, Auckland (some paper and carboard from across the region);
- scrap metal yards – numerous locations;
- ITRecycla and Remarkit Solutions, Wellington and E-Cycle, Christchurch (some e-waste from most of the region);
- Comspec, Christchurch (some pre-consumer plastics from across the region);
- Flight Plastics, Wellington (PET #1 plastic from across the region);
- Astron, Auckland (some pre-consumer plastics from across the region);
- Future Post producing fence posts from specific waste plastics, Blenheim (some soft plastics and Anchor milk bottles from across the region);
- Canterbury Landscaping Supplies take plasterboard offcuts to incorporate into various product streams (small quantities from across the region); and
- 5R in Christchurch accepts window glass (small quantities from across the region).

In addition, there are a large number of charity shops, secondhand stores, and smaller scrap metal recyclers that have a role in diverting material from landfill disposal.

While most material types are transported out of the region for recycling and reprocessing, this is not an unusual situation in New Zealand and particularly in the lower South Island.

Assessment

Current landfill disposal infrastructure appears adequate for the needs of the region, for some time to come; although one of the key facilities (AB Lime) is based outside the Otago region. Two other disposal facilities, Green Island and Mt Cooee, are coming to the end of current consents; although plans are underway to extend/expand the consents for each. DCC also has consents for a new disposal facility, Smooth Hill.

Once both Smooth Hill and the extension to Mt Cooee are operating (assuming this is the outcome) there will be two Class 1 disposal facilities within around 70km of each other, which is a relatively high level of provision given the costs involved in consenting Class 1 landfills and engineering new cells.

There is very little reprocessing infrastructure of scale in the region, and what is in place is focused on bulk low value materials such as recovered aggregate. This means that most recovered materials need to be transported significant distances, as far away as Auckland, or exported. This makes the cost-benefit consideration of recycling (whether through kerbside services or collection points) some common items very marginal, which can be a challenging issue to explain to the public – some materials, such as glass, can incur significant net cost when collected and transported for reprocessing. For some materials, such as fibre (paper/cardboard), the New Zealand-based reprocessors are at capacity and prefer to purchase pre-consumer feedstock, which tends to be more consistent in material type and higher quality due to the use of single-stream material collection systems.

The recovery infrastructure, significantly the MRFs in Dunedin and Queenstown Lakes, are both dated and are currently struggling to cope from both a quantity and quality perspective; both QLDC and DCC have plans underway for new MRF infrastructure. Recyclables from Dunedin are currently sent out of the region to Timaru, with a new MRF planned to be in place locally in 2025.

There are gaps in reprocessing for organics and C&D waste, both large waste streams and making up a significant proportion of what is currently going to landfill. These material streams are dense, and it is rarely economical to transport these long distances for reprocessing. Several of these gaps are being closed; with work progressing on organics processing across the region, and most of the councils underway with plans for resource recovery centres (with a range of recovery options) at varying sizes and extent. DCC is also progressing a C&D waste facility to be part of the Green Island Resource Recovery Park, alongside a new MRF (March 2025) and green waste processing. CDC are investigating the feasibility of C&D waste diversion as part of the Mt Cooee RTS design.

Services

Council-Provided Services

A range of services are provided by councils to residents and businesses in the district.

Details on current council-provided kerbside collections in the Otago region are summarised below.

	Dunedin	Waitaki	Queenstown Lakes	Central Otago	Clutha
Glass	Fortnightly crate	No council collection	Fortnightly 140L wheeled bin	8-weekly 240L wheeled bin	No council collection
Other dry recyclables	Fortnightly 240L wheeled bin	No council collection	Fortnightly 240L wheeled bin	Fortnightly 240L wheeled bin	Fortnightly 240L wheeled bin
Residual rubbish	Weekly bag collection Nightly bag collection CBD	No council collection	Weekly 140L wheeled bin	Fortnightly 240L wheeled bin	Fortnightly 240L wheeled bin
Organics				Weekly FOGO 240L wheeled bin	

A number of the Councils are currently in the process of planning or researching potential changes to their kerbside services:

- Dunedin will be introducing a **4-bin kerbside** (plus one optional garden waste bin) collection system from 1 July 2024;
- Queenstown Lakes, Clutha, and Waitaki are all considering various options for extended or new services.

A key drive is the need to comply with government's standardised kerbside service.

The implications for each council of the kerbside standardisation requirements are summarised below.

Service Component	QLDC	CODC	DCC	WDC	CDC
Materials in kerbside recycling (excluding glass)	Need to include all #1 plastic containers	Need to include all #1 plastic containers	Will be compliant with new service	Council kerbside service required by 1 January 2027	Compliant

Kerbside glass recycling collections	Compliant	Compliant	Will be compliant with new service	Council kerbside glass service required by 1 January 2027	Council kerbside glass service required by 1 January 2027
Foil not included in kerbside recycling	Compliant	Compliant	Will need to remove foil from accepted items by 1 February 2024	NA	Compliant
Food scraps collections	Council collection required by 1 January 2030	Compliant	Council collection required by 1 January 2030 – will be compliant with new service	Council collection required by 1 January 2027	Council collection required by 1 January 2030

Councils also deliver a wide range of waste management and minimisation programmes.

Non-Council Services

A wide variety of non-council services are provided across the region. These are summarised in the table below.

	QLD	COD	DC	WD	CD
Commercial rubbish collection	✓	✓	✓	✓	✓
Commercial recycling collection – paper/cardboard	✓	✓	✓	✓	✓
- **Plastics**	✓	✓	✓	✓	
- **Glass bottles/jars**	✓	✓	✓	✓	
- **Tins/cans**	✓	✓	✓	✓	
- **Polystyrene**	✓	✓	✓	✓	

- **Plastic film**	✓	✓		✓	
- **E-waste**	✓	✓	✓	✓	
Building waste	✓		✓		✓
Residential rubbish collections	✓	✓	✓	✓	✓
Rural rubbish collections	✓	✓	✓	✓	✓
Residential recycling collections				✓	
Residential greenwaste	✓		✓	✓	✓

Assessment

As would be expected in a region that includes dense cities through to isolated rural areas, there is a variety of service levels provided – this applies to both council-provided services and private sector. Both residential and commercial customers have access to a range of services, with some council collections also available to commercial customers (such as some Clutha businesses, and businesses in the Dunedin CBD).

However, there are some key areas where the disparity in services may cause issues with respect to waste management and minimisation:

1) The variety in materials collected and services provided makes it more difficult to collaborate on education about kerbside services – which is one of the drivers behind the MfE's kerbside standardisation requirements.
2) While leaving the provision of kerbside services to the private sector does provide the community with full choice over which service provider they use, and which type of service; data from elsewhere in New Zealand does suggest that this can reduce the effectiveness of waste minimisation and diversion efforts particularly where large (240L) wheeled bins are provided for rubbish collections. This can also be an issue where customers choose to use private services instead of the council collection.
3) Where private sector services have a large part of the market, it can be more difficult to plan for waste management and minimisation due to lack of data and detailed understanding of how private sector services are performing, and also to encourage the use of preferable alternatives.

Many of the issues relating to variable service provision and alignment to kerbside standardisation will soon be resolved, or are being explored further – such as the new services to be provided in Dunedin city and now provided in Central Otago district, and the intention to explore the implications of offering council-controlled kerbside services in Waitaki and Central Otago districts. However, increased capture of recyclables and food scraps across the region will only further exacerbate the current issues with poor reprocessing infrastructure provision.

Situation Review

Waste to Class 1 (Municipal) Landfills

The table below provides an estimate of the total annual tonnage of waste originating from the Otago region that is disposed of to Class 1 landfills in the region and to Class 1 landfills outside the region. For clarity, the estimate does not include waste that originates from outside the region (if any).

Overall waste to Class 1 landfills - 2020	% of total weight	Tonnes per annum
Disposal outside of Region		
General + kerbside rubbish	6.1%	8,700
Special wastes	2.9%	4,200
Subtotal	**9.0%**	**12,900**
Disposal in Region		
Kerbside rubbish	35.5%	50,946
General waste	52.7%	75,623
Special wastes	2.9%	4,095
Subtotal	**91.0%**	**130,664**
TOTAL	**100.0%**	**143,564**

An estimated 143,564 tonnes of waste from the Otago region were disposed of in 2020 to Class 1 landfills. The Class 1 landfills within the Otago region receive 90% of this waste. The other 10% is disposed of outside the region.

There is also a large, but unmeasured, quantity of waste being disposed of to Class 2-5 fills and on-property (burning or burying).

Composition

The table below shows the composition of waste to landfill for each disposal facility, compared to the regional and national average (calculated in 2020).

Material type	National average	Regional average	Green Island	Victoria Flats	Mt Cooee	Oamaru RTS
	All in percentage of total					
Paper	5.9	8.6	7.3	10.7	7.8	8.2
Plastics	8.3	10.2	9.1	10.7	12.5	13.1

Organic	14.8	29.7	31.5	25.6	30.0	36.5
Ferrous metals	2.7	3.2	3.7	2.5	3.0	3.3
Non-ferrous metals	0.8	0.6	0.6	0.7	0.7	0.6
Glass	1.8	2.9	2.8	1.6	8.3	3.5
Textiles	5.0	4.5	3.9	5.1	4.7	5.5
Sanitary paper	2.3	4.5	4.5	3.7	5.5	6.2
Rubble	20.1	7.2	3.3	13	9.7	4.4
Timber	12.6	16.1	12.8	24.3	7.5	10.7
Rubber	2.1	1.5	1.0	0.8	2.8	7.2
Potentially hazardous	23.5	10.9	19.4	1.5	7.4	0.8

This analysis shows that the proportions vary significantly across the region. The material type that varies the most is 'potentially hazardous' (largely sewage sludges and biosolids), with significant quantities of this present at Green Island and very little at the other locations. This reflects the disposal practices of the different councils; with QLDC and CODC sending this waste to AB Lime, and Clutha sending what is not suitable for disposal at Mt Cooee Landfill to Green Island landfill for disposal.

Kerbside-collected waste has also been analysed; and the composition of all kerbside rubbish collected in the Otago region is shown below.

Primary composition of kerbside rubbish - 2020	% of total	Tonnes per annum
Paper	8.6%	4,411
Plastics	9.5%	4,878
Organic	55.3%	28,243
Ferrous metals	1.9%	987
Non-ferrous metals	0.8%	427
Glass	4.6%	2,327
Textiles	3.9%	2,002
Sanitary paper	8.5%	4,339
Rubble & concrete	3.6%	1,819
Timber	1.9%	966

Rubber	0.3%	156
Potentially hazardous	1.1%	556
TOTAL	**100.0%**	**51,112**

Based on the results of the three sort-and-weigh audits, organics was the largest primary classification of kerbside rubbish, comprising 55.3% of the total weight. Kitchen waste comprised 60% of the organic material. Plastic was the second largest primary classification, comprising 9.5% by weight, and paper the third largest, at 8.6%.

Diversion Potential

The table below shows the proportion of the waste stream to landfill that could have been diverted through existing recycling collections, and straightforward composting. As above, this is split by disposal point – with CODC sending residual waste to Victoria Flats. Oamaru RTS represents the majority of waste going to Class 1 landfill (AB Lime) from the Waitaki district; although a small proportion goes to Palmerston landfill. These figures also represent the 'general' waste stream (i.e. excluding potentially hazardous).

Material type	Green Island	Victoria Flats	Oamaru RTS	Mt Cooee
	As percentages of the overall waste stream (excluding potentially hazardous)			
Paper - recyclable	5.3	5.0	5.1	3.0
Paper - cardboard	2.4	4.7	2.3	3.6
Plastic - recyclable	1.8	1.3	1.6	1.2
Ferrous metals	4.6	2.5	3.3	3.0
Non-ferrous metals	0.8	0.7	0.6	0.6
Glass - recyclable	2.0	0.9	2.7	7.8
Textiles - clothing	2.1	1.9	1.8	1.8
Rubble - cleanfill	1.0	1.9	0.7	4.8
Timber - reusable	3.5	2.1	0.8	0.0
Organics - food scraps	19.2	14.2	20.7	12.7
Organics - greenwaste	11.5	7.6	10.2	15.1

Rubble - new plasterboard	0.2	4.4	0.4	6.0
Timber – unpainted, untreated	3.5	3.9	3.0	1.2

These comparisons show some high consistency, but also some notable differences. These include:

- slightly lower proportion of recyclable paper going to Mt Cooee;
- more cardboard going to Victoria Flats – perhaps due to the very active retail and construction sectors;
- more glass going to Mt Cooee – reflecting the lack of recycling options;
- more rubble and other cleanfill materials going to Mt Cooee – reflecting the closure of the only nearby cleanfill facility in the district;
- slightly more reusable timber going to Green Island – probably just related to higher levels in general of construction activity;
- the proportion of food scraps and green waste are quite variable; and
- new plasterboard going to landfill at Victoria Flats and Mt Cooee – probably reflecting the active construction sector and lack of local cleanfill options respectively.

In considering the options to capture the potentially divertable material, it is important to understand how and from what source these materials are reaching landfill. While there are some variations across the region, the primary pathways are consistent:

- food scraps overwhelmingly reaches landfill through household kerbside rubbish collections;
- compostable greenwaste reaches landfill through two main pathways: household kerbside rubbish collections (particularly in urban areas where households use large wheeled bins for rubbish collections) and from general residential, C&D, and ICI waste going straight to transfer stations and landfills (note: not through landscaping);
- recyclable paper and cardboard through household kerbside rubbish collections (particularly from large wheeled bins) and then through residential and ICI to transfer stations and landfills;
- recyclable plastic and glass – through household kerbside and ICI;
- textiles – mainly household kerbside rubbish and also ICI to transfer stations and landfills; and
- new plasterboard, timber types, ferrous metals, and rubble arrive directly to transfer stations (partially) and landfill (mainly) from the C&D sector.

A similar analysis has also been carried out for kerbside waste, shown below by TA.

Diversion Potential of Kerbside Rubbish (%)	Central Otago (based on 2020 SWAP)	Clutha (2022 SWAP)	Dunedin (assumed)	Queenstown Lakes (2019 SWAP)	Waitaki (assumed)
Recyclable paper	5.8	2.9	8.4	5.9	8.9
Recyclable plastic	0.9	1.4	2.5	1.7	2.8
Steel cans	0.6	0.7	0.8	0.5	0.9
Aluminium cans	0.3	0.3	0.4	0.2	0.4
Glass bottles/jars	5.2	13.1[1]	3.5	1.9	4.5
Food scraps	23.7	21.2	35.3	33.9	35.1
Garden waste	20.3	29.9	18.7	18.2	17.0
Total	**56.9**	**69.6**	**69.6**	**62.2**	**69.7**

Approximately 18.3% of kerbside rubbish overall from the Otago region could have been readily diverted through kerbside recycling collections or at drop-off facilities. Recyclable paper was the largest single recyclable component, comprising 7.1% of the total weight of kerbside rubbish regionally.

Organic materials that could have been composted comprised between 44% and 52% of kerbside rubbish; of this kitchen waste comprised 21% to 35%of kerbside rubbish (16,987 tonnes per annum regionally), and greenwaste 17% to 30% (10,031 tonnes per annum regionally)[2]. In total across the region, 70.5% of kerbside rubbish, 36,499 tonnes per annum, could have been diverted from landfill disposal by residents.

Performance Measurement

This section provides comparisons of several waste metrics between the Otago region and other territorial authorities. The data from the other districts has been taken from a variety of research projects undertaken by Waste Not and Eunomia.

Per Capita Waste to Class 1 Landfills

By combining Statistics NZ population estimates and the Class 1 landfill waste data in section 4.1.1, the per capita per annum waste to landfill in 2020 from the Otago region can be calculated as 608 kgs per capita. The estimate includes special wastes but excludes non-levied cleanfill materials.

[1] Note that there is no kerbside glass recycling collection in Clutha, although these items have still been designatd as potentially divertible

[2] Note that a small percentage of greenwaste in kerbside rubbish is not compostable

Calculation of per capita waste to Class 1 landfills for Otago	
Population (2020)	236,200
Total waste to Class 1 landfill	143,564
Tonnes/capita/annum of waste to Class 1 landfills 2022	0.608

This figure varies significantly throughout New Zealand. The table below compares the 2020 figure for the Otago region with other local authorities.

Overall waste to Class 1 landfills including special wastes	Kgs per capita per annum
Gisborne 2017	283
Waimakariri 2017	325
Ashburton 2015	366
Waitaki 2022	466
Clutha 2022	505
Central Otago 2021	527
Invercargill 2018	528
Bay of Plenty 2017	529
Palmerston North 2017	545
Kapiti Coast 2017	546
Waikato 2017	552
Dunedin 2018	554
Tauranga and WBoP 2020	556
Napier/Hastings 2022	595
Wellington 2016	608
Otago region	***608***
New Zealand 2021	685
Taupo 2022	716
Hamilton 2017	718
Queenstown Lakes 2020	833
Hutt Valley 2022	899
Auckland 2016	1053

Areas with lower per capita waste generation tend to be rural areas, or urban areas with relatively low levels of manufacturing activity. The areas with the highest per capita waste generation are those with significant primary manufacturing activity, and/or with large numbers of tourists, with the latter applying to a great extent to the Queenstown Lakes district.

Per Capita Kerbside Rubbish

It is also possible to calculate the amount of rubbish collected at the kerbside. This figure is particularly influenced by the method of kerbside collections, and how easy these are to use. If a kerbside rubbish collection service is convenient to use and has capacity (such as a large container, or frequent collections) then it is more likely to be well used – of course, the converse also applies.

District/city and year of data	Kilos kerbside rubbish collected per capita per year	Commentary
Christchurch 2011	110	rates-funded fortnightly 140L wheelie bins (with weekly organic)
Gisborne 2017	122	rates-funded bags with stickers
Ashburton 2021	144	rates-funded weekly 80L wheelie bins, private wheelie bins
Whangarei 2017	153	user-pays rubbish bags and private wheelie bins
Auckland 2016	156	user-pays rubbish bags, rates-funded wheelie bins, and private wheelie bins
Waikato region 2017	156	Various
Bay of Plenty region 2020	160	user-pays rubbish bags, rates-funded wheelie bins, and private wheelie bins
Central Otago	168	Rates-funded fortnightly 240L wheelie bins
Taupo 2022	183	user-pays rubbish bags and private wheelie bins
Dunedin 2018	187	user-pays rubbish bags and private wheelie bins
Tauranga and WBoP 2019	192	user-pays rubbish bags and private wheelie bins
Queenstown 2020	195	rates-funded weekly 140L wheelie bin
Hastings/Napier 2022	197	rates-funded 120L wheelie bins and private wheelie bins
Hamilton 2017	197	rates-funded bags (two per hh max)
Wellington region 2014/15	206	user-pays rubbish bags and private wheelie bins

Clutha 2022	209	rates-funded fortnightly 240L wheelie bins
Palmerston North 2022	215	user-pays rubbish bags and private wheelie bins
Waitaki 2022	223	private wheelie bins

Waitaki and Clutha districts have higher quantities of rubbish collected at kerbside; however, these districts also have the lowest overall quantity of waste going to landfill. This suggests that householders and businesses are more likely to use kerbside collections to dispose of rubbish rather than transporting this to a transfer station or landfill.

Review of Current Waste Management and Minimisation Plans

As required by the Act, the WA includes a review of each Council's current WMMP, found in section 6.

The overall conclusion from this review was that, while the current WMMPs varied widely in strategic direction, action plans, and targets; the very significant central government work programme over the last five years, and the recent release of TRP, leads to the conclusion that the Otago region WMMPs should be revoked and replaced by new Plans[3].

Future Demand and Gap Analysis

There are a wide range of factors that are likely to affect future demand for waste management and minimisation. The extent to which these influence demand could vary over time and in different localities. This means that predicting future demand has inherent uncertainties. Key factors are likely to include the following:

- overall population growth;
- economic activity;
- changes in lifestyle and consumption; and
- changes in waste management approaches.

[3] The only exception to this is Dunedin City Council's current WMMP, which already includes a reference to the Circular Economy and therefore is more closely aligned with the strategic direction of TRP. However, as the majority of the actions have been completed and a significant rewrite would be required, it is felt that a new Plan is still the best option.

In general, the factors that have the greatest influence on potential demand for waste and resource recovery services are population and household growth, construction and demolition activity, economic growth, and changes in the collection service or recovery of materials.

A detailed analysis is provided of these factors in section 7.1. The analysis of factors driving demand for waste services in the future suggests that demand will increase over time as a result largely of population growth and economic activity. It is likely that some new waste management approaches will be introduced as a result of the central government work programme, which could create demand in specific areas. Initial indications are that, for Otago, this new demand is likely to be largely related to efforts to divert organic waste materials from landfill, including possible business food scraps diversion and recovery of construction wastes. There is also likely to be an increasing focus and demand in other waste activities and types, including:

1) Disaster waste – recent events have highlighted the need for proactive disaster waste management plans, particularly with respect to local resilience where there is reliance on waste infrastructure located elsewhere in the region, or outside the region.
2) Equity of service provision, particularly relating to the impact of user-pays rubbish collections on lower socio-economic communities, particularly considering the low benefit seen in increased waste diversion that might be assumed to result from a 'pay as you throw' approach.
3) Smaller but difficult waste streams such as soft plastics, packaging that isn't accepted in kerbside recycling collections, compostable packaging as replacements for what will become banned packaging items, farm wastes.
4) The impact of a possible future container return scheme.

Gap Analysis

The aim of waste planning at a territorial authority level is to achieve effective and efficient waste management and minimisation. The following high level key issues or gaps in meeting forecast demand have been identified, grouped into topic areas. These are discussed in more detail in sections 7.3 through 7.7.

Infrastructure

- The region has relatively low access to waste infrastructure, particularly material reprocessing;
- the performance of the MRFs in the region currently is an issue both in terms of material quality (Frankton and Dunedin) and capacity;
- Dunedin and Clutha's access to convenient landfill disposal in the medium- to long-term depends on consenting a new facility;
- planned landfill provision in the coastal area could be more efficient; and
- Class 2-5 landfill provision in the region is variable.

Data and monitoring

- As is found in other areas, there is a significant data gap relating to private waste collections, Class 2-5 fills, and farm waste management practices.

Services

- Council service levels in some districts are lower – particularly Waitaki and, to a lesser extent, Clutha districts;
- variability in service provision generally reduces the opportunities for collaboration (regionally or nationally) on activities such as education, awareness raising, and behaviour change;
- contamination in household kerbside recycling collections is high; and
- the market share of household kerbside services held by councils is low in some areas. This may indicate that the services being provided by the councils is not considered fit for purpose by their residents (e.g. a wheeled bin rather than a bag-based collection).

Specific materials

- A number of waste materials could be managed more in accordance with the waste hierarchy; particularly biosolids/sludges, C&D waste, non-household recyclables, agricultural wastes, glass, organic waste generally, and textiles; and
- many of the key issues described above relate to waste streams that originate in the commercial, industrial, institutional and construction sectors; which are very difficult for councils to influence alone

Leadership and Collaboration

- Relatively less resources and budget spent (by councils or other agencies) on waste prevention, reduction and reuse activities; compared to lower levels of the waste hierarchy such as recycling and reprocessing;
- contract timeframes across the region are variable, reducing the ability to collaborate and partner on procurement and service provision;
- there is no formal mechanism to jointly fund and collaborate on regional or sub-regional waste-related projects;
- the entire sector is currently struggling to recruit staff, and the operational sector is also experiencing significant delays with new vehicles and driver shortages;
- TAs will need to contribute to planning for disaster waste management; and
- there is variability in strategic direction for waste across the region, particularly in relation to the council's role in providing waste management and minimisation services.

Proposals

This section sets out the range of options available to the councils to address the key issues that have been identified in the previous section of this Waste Assessment. Options presented in this section would need to be fully researched, considered specific

to each district, and the cost implications understood, before being implemented through each council's WMMP action plans and respective LTP/Annual Plan. Addressing these issues will ensure that the Otago councils meet their statutory obligations, and improve waste management and minimisation in the Otago region.

The proposals incorporate the concept of a Circular Resource Network, which is a concept first developed in work carried out by Eunomia for the Ministry for Environment in 2021, and is included in the recently released 'National Resource Recovery – Infrastructure and Services Stocktake and Gap Analysis'[4]. This concept is a way of implementing Circular Economy principles, which are a key part of Te rautaki para, in a practical resource recovery network infrastructure approach. The Circular Resource Network concept is summarised in section 8.1 and explained in detail in appendix A.5.0.

A range of proposals are put forward under the following option headings:

1) Regulation
2) Measuring/Monitoring
3) Education and Engagement
4) Collection and Services
5) Infrastructure
6) Leadership and Management

The proposals are set out in detail in sections 8.2.1 through 8.2.6; but can form an almost infinite number of combinations. High level scenarios with logical combinations of the above options are laid out in the table below. These scenarios are for illustration only and can be fine-tuned and amended for each councils draft WMMP action plans.

[4] www.environment.govt.nz/assets/publications/Waste/Waste-and-resource-recovery-infrastructure-and-services-stocktake-Project-summary-report.pdf

Scenario Name	Regulation	Measuring & Monitoring	Education & Engagement	Collections & Services	Infrastructure	Leadership & Management
Business as Usual (compliance with regulation and kerbside standardisation)	Each council makes its own decision on whether to have a solid waste bylaw, and these are implemented independently	Current levels of measuring and monitoring are continued	Each council continues their current education and engagement programmes, with the addition of communicating service changes	WDC introduce kerbside recycling and food scraps to Oamaru only CDC introduce glass collections only to Balclutha and Milton QLDC introduce food scraps collections to required areas CODC and DCC make minor amendments to comply with kerbside standardisation	Councils work independently to develop infrastructure required to accommodate new services, and continue existing collaborative projects	Councils continue to meet as a SOWN network, and continue discussions on potential collaborative initiatives as a region Councils largely engage with central government and national bodies individually on a reactive basis
First steps towards a Circular Economy	As above	Current levels of measuring and monitoring are continued, along with increased monitoring of participation/set out rates and contamination	Each council extends current education and engagement programmes to include targeted campaigns to increase participation and reduce	Each council extends access to kerbside collections to businesses, on a user-pays basis Each council supports virtual material trading systems locally	Each council considers sources of waste materials in the area other than kerbside collections (such as organics, recyclables) when planning and developing infrastructure	Each council proactively engages with national government and bodies Councils commit to ongoing meetings as an Otago network and discussions of

Scenario Name	Regulation	Measuring & Monitoring	Education & Engagement	Collections & Services	Infrastructure	Leadership & Management
		Increased monitoring and analysis of non-household waste streams and Councils' data	contamination in kerbside services Each council engages more with other sectors e.g. C&D, health, retail, industry		The Circular Resource Network approach is incorporated where possible	collaborative opportunities
Moderate collaboration, Circular Economy	Each council makes its own decision on whether to have a solid waste bylaw, but this is based on a standard template and some common areas are implemented collaboratively (such as guidance for events waste management)	As above, with Councils collaborating on monitoring and analysis of non-=household waste streams where appropriate	Rather than individual councils engaging with other sectors, this is done at a regional level, perhaps with each TA taking responsibility for a sector Branding and content of communications materials is consistent as far as possible Education and engagement on common issues are coordinated regionally	Details of services are aligned where possible to enable collaboration Collections are provided to areas other than 'small urban', where this can be done efficiently Additional collection services are offered other than those required, e.g. garden waste collections (user pays) and kerbside refuse (Waitaki) Councils collaborate to support virtual	Councils collaborate when developing infrastructure and identify opportunities to share facilities where appropriate The Circular Resource Network approach is used as a template and infrastructure projects are proactively designed to align with this Smaller and community-led infrastructure is supported and integrated where possible	Otago Councils collaborate on national engagement, e.g. responding to submissions, engaging in technical advisory groups Otago Councils have a formal collaborative working arrangement and identify priority projects to deliver through this group

Scenario Name	Regulation	Measuring & Monitoring	Education & Engagement	Collections & Services	Infrastructure	Leadership & Management
				material trading systems		
High collaboration, Full Circular Economy	Councils agree to adopt a consistent solid waste bylaw, enabling regional implementation (such as waste operator licensing and data collection)	Councils work jointly collecting data from waste operators, and identifying issues and options from this information Councils jointly lobby for access to centrally-held data (e.g. levy and information reporting)	There is a shared regional resource that engages with these sectors, with regular proactive discussion on waste management and minimisation opportunities Councils consistently and proactively engage with target communities to minimise contamination	Household kerbside refuse collections are consistently and largely rates-funded across the region to maximise participation in council diversion services Virtual material trading systems are supported by a regional resource	A Circular Resource Network is proactively designed for the region, and any infrastructure projects are designed to fit with this Network. This extends to all levels of scale, with smaller and community-led infrastructure actively encouraged and prioritised over larger commercial infrastructure, where appropriate	The Councils share a joint resource to coordinate regional collaboration, and commit a portion of funding to deliver priority collaborative projects. The Councils engage at a national level in a collaborative way, with individual TA officers able to represent a considered regional view

The options identified and the Councils' possible role in meeting forecast demand comprise a range of proposals. The specific actions and timeframes for delivery will be identified through the development of each Councils' draft Waste Management and Minimisation Plans, and will be dependent on the strategic direction preferred by each TA; the extent of collaboration that is desirable and possible; and the resources available to each TA.

It is expected that the implementation of the preferred options from these proposals, as will be set out in the Councils' draft WMMPs, will meet forecast demand as well as support the Councils' goals and objectives for waste management and minimisation, and support the phase 1, 2 and 3 goals of TRP. These goals and objectives will be confirmed as part of the development and adoption of the draft WMMPs.

The WA also includes a statement as to the extent to which the proposals will (i) ensure that public health is adequately protected, and (ii) promote effective and efficient waste management and minimisation.

It is considered that the proposals would adequately protect public health. This is supported by the statement received from the Medical Officer of Health following review of the draft WA.

The Waste Assessment has investigated current and future quantities of waste and diverted material, and outlines the Councils' potential roles in meeting the forecast demand for services. It is considered that the process of forecasting has been robust, and that the Councils' intended role in meeting these demands is appropriate in the context of the overall statutory planning framework for the Councils. Therefore, it is considered that the proposals would promote effective and efficient waste management and minimisation.

Contents

1 Introduction

This Waste Assessment has been prepared for the councils of the Otago region (Queenstown Lakes, Central Otago, Clutha and Waitaki Districts; and Dunedin City) – known here as 'the Councils' - by Eunomia Research & Consulting in accordance with the requirements of the Waste Minimisation Act 2008 (WMA). This document provides background information and data to support the Councils' waste management and minimisation planning process.

1.1 Structure of this Document

This document is arranged into a number of sections designed to help construct a picture of waste management in the Otago region. The key sections are outlined below.

Introduction

The introduction covers a number of topics that set the scene. This includes clarifying the purpose of this Waste Assessment, its scope, the legislative context, and key documents that have informed the assessment.

Otago Region

This section presents a brief overview of key aspects of the region's geography, economy, and demographics that influence the quantities and types of waste generated and potential opportunities. It also provides an overview of regional waste facilities, and initiatives that may be of relevance to how we manage our waste.

The Districts/City

This section presents a brief overview of key aspects of each area's geography, economy, and demographics that influence the quantities and types of waste generated and potential opportunities.

Waste Infrastructure, Services, Data and Performance Measurement

These sections examine how waste is currently managed, where waste comes from, how much there is, its composition, and where it goes.

Gap Analysis and Future Demand

This section provides an analysis of what is likely to influence demand for waste and recovery services in the region and identifies key gaps in current and future service provision, and in the Councils' ability to promote effective and efficient waste management and minimisation.

Statement of Options & Councils' Proposed Role

These sections develop options available for meeting the forecast future demand and identify the Councils' proposed role in ensuring that future demand is met, and that each Council is able to meet its statutory obligations.

Statement of Proposals

The statement of proposals sets out what options are available to meet the project demand or address the key issues. The proposals will be assessed against the strategic direction for each of the Councils, and preferred options will be carried forward into the Waste Management and Minimisation Plans (WMMPs).

Appendices

The appendices include the consultation response from the Medical Officer of Health as well as additional detail on national context, legislation, and background principles.

1.2 Purpose of this Waste Assessment

This Waste Assessment is intended to provide an initial step towards the development of WMMPs by each of the Councils and sets out the information necessary to identify the key issues and options, that will then be prioritised and included in draft WMMPs.

Section 51 of the WMA outlines the requirements of a waste assessment for a territorial authority (TA), which must include:

- a description of the collection, recycling, recovery, treatment, and disposal services provided within the TA's area;
- a forecast of future demands;
- a statement of options available to meet the forecast demands with an assessment of the suitability of each option;
- a statement of the TA's intended role in meeting the forecast demands;
- a statement of the TA's proposals for meeting the forecast demands; and
- a statement about the extent to which the proposals will protect public health, and promote effective and efficient waste management and minimisation.

1.3 Legislative Context

The principal solid waste legislation in New Zealand is the Waste Minimisation Act 2008 (WMA). The stated purpose of the WMA is to:

> "encourage waste minimisation and a decrease in waste disposal in order to
>
> (a) protect the environment from harm; and
>
> (b) provide environmental, social, economic, and cultural benefits.

To further its aims, the WMA requires TAs to promote effective and efficient waste management and minimisation within their district. To achieve this, all TAs are required by the legislation to adopt a WMMP.

The WMA requires every TA to complete a formal review of its existing waste management and minimisation plan at least every six years. The review must be consistent with WMA sections 50 and 51. Section 50 of the WMA also requires all TAs to prepare a 'waste assessment' prior to reviewing its existing plan. This document has been prepared in fulfilment of that requirement.

Further detail on key waste-related legislation is contained in Appendix A.4.0.

1.4 Scope

1.4.1 General

As well as fulfilling the statutory requirements of the WMA, this Waste Assessment will build a foundation that will enable the Councils to review and update/amend (as necessary[5]) their WMMPs in an informed and effective manner. In preparing this document, reference has been made to the Ministry for the Environment's 'Waste Management and Minimisation Planning: Guidance for Territorial Authorities'[6], while noting that this guidance dates back to 2015 and has, to an extent, been superseded through practice.

A key issue for this Waste Assessment will be forming a clear picture of waste flows and management options in the region. The WMA requires that a waste assessment must contain:

"A description of the collection, recycling, recovery, treatment, and disposal services provided within the territorial authority's district (whether by the territorial authority or otherwise)".

This means that this Waste Assessment must take into consideration all waste and recycling services carried out by private waste operators as well as the Councils' own services. While the Councils have reliable data on the waste flows that they control, data on those services provided by private industry is limited. Reliable, regular data on waste flows is important if a TA chooses to include waste reduction targets in their WMMP. Without data, targets cannot be readily measured.

The New Zealand Waste Strategy 2023 also repeatedly refers to central and local councils as being the key agencies by which many goals could be achieved.

Although the WMA is currently subject to review (as discussed further below in section 1.5.3, there has not been any indication that the requirements for local waste planning will be reduced.

1.4.2 Period of Waste Assessment

The WMA requires WMMPs to be reviewed at least every six years, but it is considered prudent to take a longer-term view. The horizon for the WMMP is not fixed but is assumed to be centred on a 10-year timeframe, in line with council long term plans (LTPs). For some assets and services, it is necessary to consider a longer timeframe and this is taken into account where appropriate. Therefore, the period of the Waste

[5] Noting that, depending on the scope/scale of the amendments and reviews, the special consultation process set out in section 83 of the Local Government Act (2002)

[6] Ministry for the Environment (2015), Waste Management and Minimisation Planning: Guidance for Territorial Authorities

Assessment looks forward over at least the next ten years, and sometimes longer (in the case of infrastructure/facilities, e.g. landfill consenting).

1.4.3 Consideration of Solid, Liquid and Gaseous Wastes

The guidance provided by the Ministry for the Environment on preparing Waste Management and Minimisation Plans states that:

"Councils need to determine the scope of their WMMP in terms of which wastes and diverted materials are to be considered within the plan".

The guidance further suggests that liquid or gaseous wastes that are directly managed by a TA, or are disposed of to landfill, should be seriously considered for inclusion in a WMMP.

Other wastes that could potentially be within the scope of the WMMP include gas from landfills and the management of biosolids from wastewater treatment plant (WWTP) processes.

In line with the Councils' previous WMMPs, this Waste Assessment is focused on solid waste that is disposed of to land or diverted from land disposal, including solid waste collected and disposed of by commercial enterprise as well as waste collected by the councils.

However, given the current work on restructuring water services (including waste water), this WA and any resulting WMMPs will not include management of solid wastes resulting from these activities.

1.4.4 Public Health Issues

Protecting public health is one of the original reasons for local authority involvement in waste management. Te rautaki para, the new Waste Strategy, refers to protection of human health as one of the outcomes from successful recovery of resources (page 6).

Protection of public health is currently addressed by a number of pieces of legislation, most significantly the Health Act (1956), the Hazardous Substances and New Organisms Act (1996) and the Health and Safety at Work Act (2015). Discussion of the implications of the legislation is contained in Appendix A.4.0.

1.4.4.1 Key Waste Management Public Health Issues

Key issues that are likely to be of concern in terms of public health include the following:

- population health profile and characteristics;
- implications of pandemic management, e.g. increases in some waste materials;
- meeting the requirements of the Health Act 1956;
- management of putrescible wastes;
- management of nappy and sanitary wastes;
- potential for dog/seagull/vermin strike;
- timely collection of material;
- locations of waste activities;

- management of spillage;
- litter and illegal dumping;
- medical waste from households and healthcare operators;
- storage of wastes;
- management of biosolids/sludges from WWTP;
- management of hazardous wastes (including asbestos, e-waste, etc.);
- private on-site management of wastes (i.e. burning, burying);
- closed landfill management including air and water discharges, odours and vermin; and
- health and safety considerations relating to collection and handling.

1.4.4.2 Management of Public Health Issues

From a strategic perspective, the public health issues listed above are likely to apply to a greater or lesser extent to virtually all options under consideration. For example, illegal dumping tends to take place ubiquitously, irrespective of the waste collection and transfer station systems in place. Some systems may possibly exacerbate the problem (infrequent collection, user-charges, inconveniently located facilities etc.) but, by the same token, the issues can be reduced and managed through methods such as enforcement, education and by providing convenient facilities. It is also known that illegal dumping continues to be a problem even in areas where disposal is free of charge.

In most cases, public health issues can be addressed through setting appropriate performance standards for waste services. It is also important to ensure performance is monitored and reported on and that there are appropriate structures within the contracts for addressing public health issues that arise. There is now increased emphasis on workplace health and safety under the Health and Safety at Work Act 2015. This legislation can impact on the choice of collection methodologies and working practices and the design of waste facilities, for example.

In addition, public health impacts will be able to be managed through consideration of potential effects of planning decisions, especially vulnerable groups such as Māori and lower socioeconomic communities. That is, potential issues will be identified prior to implementation so they can be mitigated for.

1.5 Strategic Context

1.5.1 New Zealand Waste Strategy

The 2023 New Zealand Waste Strategy is the first time New Zealand's national strategic direction for waste has been reviewed since 2002, and unsurprisingly takes quite a different approach to the previous Strategy.

The vision of the 2023 New Zealand Waste Strategy, Te rautaki para, is:

> *"By 2050, Aotearoa New Zealand is a low-emissions, low-waste society, built upon a circular economy.*

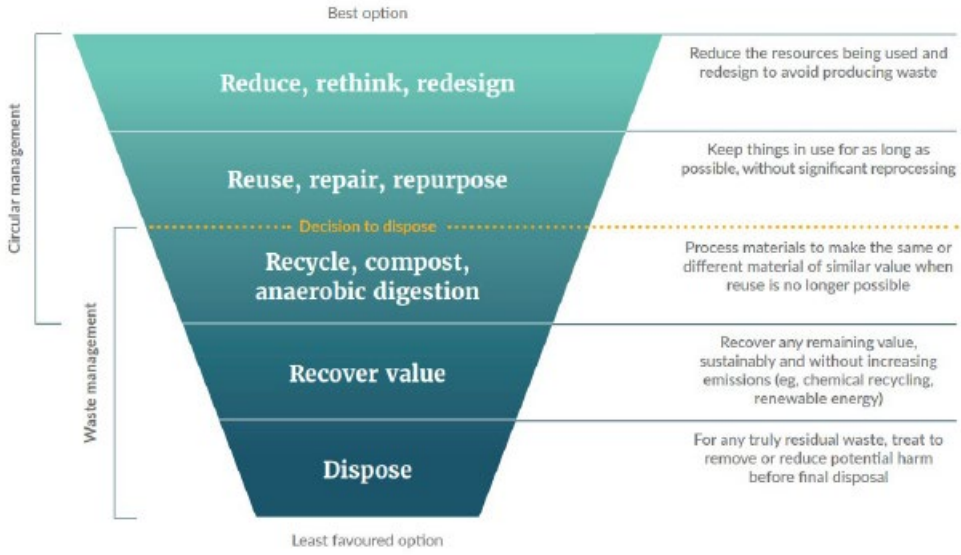
We cherish our inseparable connection with the natural environment and look after the planet's finite resources with care and responsibility"

This vision is supported by six guiding principles:

1) Take responsibility for how we make, use, manage and dispose of things
2) Apply the waste hierarchy preferences to how we manage materials
3) Protect and regenerate the natural environment and its systems
4) Deliver equitable and inclusive outcomes
5) Ensure our systems for using, managing and disposing of materials are financially sustainable
6) Think across systems, places and generations

A revised waste hierarchy is set out (shown below), intended to illustrate which options are the best, and which are least favoured. While many versions of the waste hierarchy exist, the one in the strategy is intended to be simple and easy to understand.

Figure 1: Revised Waste Hierarchy



Source: Te rautaki para | Waste Strategy (page 14), Ministry for the Environment 2023

The strategy has three phases:

1) Embedding circular thinking into systems (by 2030)
2) Expanding to make circular normal (to 2040)
3) Helping others do the same (by 2050)

Each of the three phases has associated goals, some of which are particularly relevant to the Waste Assessment and WMMP process; others more relevant to central government, the wider public, the community/private sector, or other local government roles such as contaminated land management.

The key role for local government is described in the Strategy as:

- getting involved in implementing the strategy and the process of developing the action and investment plan – using the strategy as a starting point for WMMPs;
- looking for opportunities to work with other councils, particularly on facilities and services that support a 'national circular resource management network';
- supporting local community groups and non-governmental organisations with waste reduction initiatives;
- incorporating national behaviour change programmes in local activity;
- ensuring planning and consenting processes consider the need for waste management infrastructure and services; and
- planning and resourcing contaminated land management including vulnerable landfills

The Strategy has three targets to be achieved by 2030:

1) Reduce waste generation by 10% per person
2) Reduce waste disposal by 30% per person
3) Reduce biogenic methane emissions from waste by at least 30%

However, at this point no baseline has been set.

Further detail on the implications of the Waste Strategy are set out in Appendix A.4.1.

Section 44 of the WMA requires councils to have regard to the NZWS when preparing their WMMP.

For the purpose of this Waste Assessment, we have given regard to the NZWS and the current WMMPs of the Otago councils; the options presented in section 8 are aligned with the guiding principles of Te rautaki para and would fulfil the key roles described for councils in this strategy.

These sections are discussed in more detail in Appendix A.4.0.

1.5.2 Emissions Reduction Plan

The Climate Change Commission (CCC) was established to provide impartial expert evidence to government to support initiatives that would reduce greenhouse gas emissions and address climate change mitigation and adaptation, contributing towards the goals set out in the Climate Change Response Act 2002. The CCC reviewed the waste sector as part of its work during 2020 and 2021 and has provided its final advice to government with respect to this sector, amongst others, in the Emissions Reduction Plan (May 2022)[7].

The advice of the CCC is that unless waste management practices and policy settings in New Zealand change significantly, we will not meet the targets set in the 2002 Act – "*current policies will not deliver the emissions reductions we must achieve.*"

[7] https://environment.govt.nz/assets/publications/Aotearoa-New-Zealands-first-emissions-reduction-plan.pdf

Comprehensive action is required to reduce waste overall, divert waste from landfill disposal, and improve/extend landfill gas capture systems.

The main source of biogenic methane emissions from the waste sector is the anaerobic decomposition of organic wastes in landfill (94% in 2019).

The key actions for the waste sector are:

- enable households and businesses to reduce organic waste (reduction of food scraps at home and in businesses, and participation in improved kerbside collections);
- divert more organic waste from landfill (improve household kerbside collections of food and garden waste, invest in processing and recovery infrastructure for organics, require organic waste to be separated);
- reduce and divert construction and demolition waste (minimisation, sorting and processing infrastructure, separation of material);
- bans or limits for organic waste to landfill – potentially by 2030;
- increase gas capture from Class 1 landfills (regulations requiring gas capture, investigate additional gas capture); and
- improve waste data including a national operator licensing scheme (which will improve information on greenhouse gas emissions).

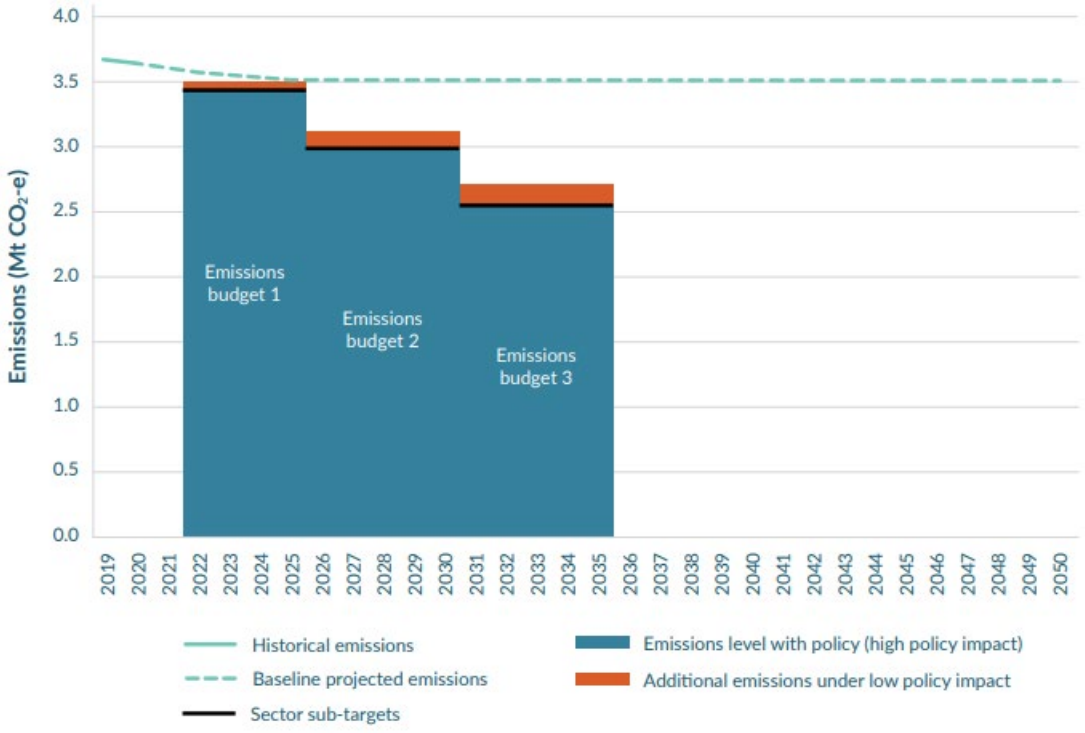
The Plan includes a 'waste pathway to 2035' which is highly consistent with the New Zealand Waste Strategy. Key actions over the next ten years include:

- 2023: organic waste prevention programmes and increased investment in resource recovery;
- 2024: new waste legislation, national waste reporting, wider coverage of kerbside organics collections, more organics recovery/processing;
- 2025: new regulations to drive emissions reduction, national waste licensing, all Class 1 landfills capturing gas;
- To 2030: possibly organic waste landfill limits or bans; and
- To 2035: target of 40% reduction in biogenic methane (from 2017 levels).

New Zealand has a long-term target of net zero greenhouse gases by 2050, and a specific target for biogenic methane of 24 – 47% reduction by 2050 under the Climate Change Response Act (2002 Act).

It is worth noting that even with all of the actions proposed this would still fall short of achieving the first sub-target for the waste sector (2022 – 2025) but will come very close to the target in the period 2026 – 2035, as shown in the chart below:

Figure 2: Total projected methane emissions from waste showing the impact of proposed combined waste policy options



Source: Ministry for the Environment. 2022. *Te hau mārohi ki anamata | Towards a productive, sustainable, and inclusive economy.* Wellington: Ministry for the Environment. This assumes 40% of food waste diverted to composting and 60% to anaerobic digestion and 100% of green waste to composting.

1.5.3 Waste Minimisation Act 2008

As signalled during consultation for and in the recently-released Te rautaki para/New Zealand Waste Strategy, MfE is also currently working on a review of the WMA to improve or amend provisions and consider new provisions. The provisions for use of landfill levy funds and the administrative and decision-making processes around this use will also be reviewed and improved. This review will also consider whether, and how, the Litter Act (1979) could be reviewed to better integrate with and support the WMA.

The WMA has been amended by the 2021 waste disposal levy regulations[8], which set out the progressive increase and expansion of the landfill levy starting 1 July 2021; and supplemented by regulations banning specific items, including microbeads[9] (2017),

[8] https://www.legislation.govt.nz/regulation/public/2021/0068/latest/LMS474556.html#LMS474591

[9].https://www.legislation.govt.nz/regulation/public/2017/0291/latest/DLM7490715.html?search=ts_act%40bill%40regulation%40deemedreg_microbeads_resel_25_a&p=1

plastic shopping bags[10] (2018), and numerous tranches of plastics packaging during 2022 and 2023, as described in section 1.5.6.5.

Currently, the WMA provides for half of the revenue from the waste levy to be distributed to TAs. These funds are provided pro rata, based on population, and must be spent on waste minimisation and in accordance with each TA's WMMP. MfE have recently signalled that they intend to make specific provision for auditing and enforcement of correct service provision to be funded by waste levy funds.

The waste disposal levy is outlined further in the following subsection.

1.5.4 Waste Disposal Levy and Information Reporting

In April 2021 the government introduced regulation to expand the scope of the levy from Class 1 landfills to also include classes 2-4,[11] and to require operators of industrial monofills, Class 5 fills and refuse transfer stations (RTS) to report data on the quantity of waste received. Section 2.1 defines the different types and classes of fills.

The table below shows the timetable and rates for the new levy regime:

Table 1: Levy Rates by Disposal Facility Type and Year (per Tonne)

DISPOSAL FACILITY CLASS	1-Jul-21	1-Jul-22	1-Jul-23	1-Jul-24
Municipal landfill (class 1)	$20	$30	$50	$60
Construction and demolition fill (class 2)		$20	$20	$30
Managed fill (class 3)			$10	$10
Controlled fill (class 4)			$10	$10

https://www.mfe.govt.nz/waste/waste-and-government

As the landfill levy is expanded and raised, there will be an impact on the quantity of material going to the different destinations; however, the extent to which this occurs, and for which materials, depends on a number of other factors. The potential impacts are explored further in appendix A.4.0.

The requirement for all fills and RTS to at least report data on the quantity of waste received will provide much greater understanding of the role that all types of facilities play in waste management.

Anecdotally, there is evidence that some facilities in the Otago region are choosing to close rather than comply with the requirements to register and pay the levy and/or

[10] https://www.legislation.govt.nz/regulation/public/2018/0270/6.0/whole.html
[11] https://www.legislation.govt.nz/regulation/public/2021/0069/latest/whole.html

report waste quantities. This is known to have occurred in the Queenstown Lakes district, and in Clutha district.

1.5.5 Emissions Trading Scheme (ETS)

Since 2013, Class 1 landfill owners have been required by the Climate Change (Emissions Trading) Amendment Act 2008 to surrender emission units to cover methane emissions. If any solid waste incineration plants are constructed (without energy recovery), this act would also require emission units to be surrendered to cover greenhouse gas emissions from the incineration of household wastes.

The number of emission units that needs to be surrendered is based on a calculation of how much methane is generated from a tonne of waste. As a starting point, landfills use a default emissions factor for waste (DEF). This is the methane assumed to be generated by each tonne of waste and is currently set at 0.91 tonnes of CO_2-e (CO2 equivalent) per tonne of waste.

However, landfill operators can reduce their liabilities under the ETS through use of a unique emissions factor (UEF). The UEF is a calculation of actual methane released by the specific landfill. This can be done by either capturing the methane that is generated or showing (based on the type of waste going into the landfill) that the landfill generates a different amount of methane to the default.

1.5.5.1 Carbon Price

The other component of the calculation of a landfill's liability under the ETS is the price of carbon. New Zealand units (NZU)[12] currently change hands for between $70 and $85, with prices at $77.50 at the time of writing[13].

The cost of NZUs has been increasing steadily for the last couple of years, due largely to changes made to the types of offsets that are eligible under the ETS. Class 2-5 landfills and closed landfills (along with certain other excluded landfills) are not currently covered by the ETS.

The implications of the ETS and carbon prices are explored further in appendix A.4.8.

1.5.6 Other Relevant Initiatives

1.5.6.1 Container Return Scheme

Container return schemes (CRS) place a deposit on all containers when sold. This deposit can then be redeemed by consumers when they return the containers. These schemes are in wide use worldwide including Australia and are designed to promote higher rates of recovery of containers and reduce littering by providing an incentive to consumers.

[12] NZUs are carbon credits that are officially accepted to offset liabilities under the NZETS
[13] Accessed from https://www.carbonnews.co.nz/tag.asp?tag=Carbon+prices

In 2019, a WMF-funded project led by Auckland Council and Marlborough District Council embarked on the research and design of a potential container return scheme for New Zealand. The outcomes from this project were reported to MfE, who have analysed the information and produced advice for ministers.

MfE consulted on a detailed implementation proposal for a container return scheme in New Zealand. This was included in the 'Transforming Recycling' consultation document.

The consultation document proposed a deposit of 20c per container for a wide range of beverage containers, excluding 'fresh milk' (the logic being that this product is rarely consumed outside the home). Depending on the details of the eventual CRS, and the extent to which containers may be captured in the scheme, two key effects on household kerbside recycling collections are likely:

- the quantity of containers collected in a kerbside collection would reduce; and
- the value of containers that are part of the CRS, but are still collected in a kerbside collection, will likely result in income for the 'owner' of the items. Usually, the owner is either the Council and/or its contractor.

Possible implications for Councils include the potential to reduce the frequency of recycling collections due to lower volumes of material, and an increased focus on how income from collected recyclables is shared between council and contractor (assuming that the CRS deposit can be claimed on kerbside-collected material).

In early 2023, government announced that the CRS development would be put on hold. This position has since been softened to a 'delay' but it remains unclear when, or how, a CRS would be introduced for New Zealand.

1.5.6.2 Kerbside Standardisation

In 2019, WasteMINZ was commissioned by MfE to complete a national review of kerbside collections and make recommendations as to how to achieve consistency across the country. The report was completed in 2020[14], and MfE then considered implementing the three main recommendations:

1. A standard set of items accepted in kerbside recycling collections
2. Glass collected separately to other material streams
3. A weekly kerbside food scraps collection service for households.

MfE consulted on a detailed implementation proposal for kerbside standardisation in New Zealand. This was included in the 'Transforming Recycling' consultation document[15].

[14] https://www.wasteminz.org.nz/wp-content/uploads/2020/08/Final-1.0-Standardising-Kerbside-Collections-in-Aotearoa.pdf
[15] https://environment.govt.nz/assets/publications/Transforming-recycling-consultation-document.pdf

The proposals included, alongside the points above from the original review, options to achieve the diversion of food scraps from businesses. The three possible options set out in the consultation document are:

- phasing in source-separation of food scraps only from businesses that produce or sell food;
- phasing in source-separation of food scraps from all businesses; or
- prohibiting the disposal of food scraps to landfill entirely (which would also preclude disposal of food scraps from household sources).

In March 2023, MfE announced its decisions regarding kerbside standardisation alongside the release of Te rautaki para /New Zealand Waste Strategy. The key aspects are:

- standardising materials in existing council kerbside recycling collections by 1 February 2024 to: glass bottles and jars, paper and cardboard (including pizza boxes), plastic bottles and containers grades #1, #2, and #5, and aluminium/steel tins and cans[16];
- requiring council kerbside recycling to be provided to households in urban areas (defined as those with more than 1000 people[17]) by 1 January 2027; and
- Council food scraps collections to be provided to households in urban areas (defined as above) by 1 January 2030, or by 1 January 2027 if a nearby processing option is available[18].

MfE advise it will also be working on business food scrap diversion by 2030.

Kerbside standardisation excludes tetrapak and other gabletop/liquid paperboard containers, foil, aerosols, soft plastics, polystyrene, and plastic bottles and containers other than those mentioned above. Councils will have the discretion to choose whether or not to include compostable bin liners in organics collections, and can also choose whether to collect glass separately or comingled with other materials.

Councils for which the earlier food scraps collection deadline (2027) applies includes Waitaki District. Clutha District is one of the three councils that have until 1 January 2027 to add a household kerbside glass recycling collection.

Kerbside standardisation will only apply to council-provided services (either in-house or via a contractor) for now, with the hope that the private and community sector will choose to align their kerbside services with these requirements. However, MfE have

[16] The information sheet "Improving household recycling and food scraps collections' clarifies that the three councils nationwide that do not currently collect glass at the kerbside will have until 1 January 2027 to start this service

[17] As defined by StatsNZ as 'small urban areas', and shown on the StatsNZ Arc GIS system based on 2022 data.

[18] Defined as within 150km of a 'main centre'.

indicated that they intend to provide for kerbside standardisation to be regulated more widely through the new version of the WMA.

The kerbside standardisation changes also include performance standards for household waste kerbside diversion, and reporting requirements for private waste companies.

The performance standards relate to kerbside recycling and food waste, and set an increasing proportion of kerbside waste diverted from landfill:

- 30% by July 2026
- 40% by July 2028
- 50% by July 2030

Councils that do not comply with the requirements to collect a standard set of kerbside recycling materials, and/or meet the minimum diversion requirements, can have all or part of their waste levy allocation withheld. Once withheld, this is not available at a later date (i.e. even if the council becomes compliant shortly after the due date, the levy funds will not then be released).

Councils that do not comply with the requirement to provide a kerbside recycling and food scraps collection service to householders in applicable urban areas will not, at this point, have waste levy funds withheld; however, it is likely that there will be regulatory requirements introduced for these aspects at a later date, and it would be very difficult for a council to achieve the minimum diversion requirements without having these services in place.

The performance requirements will be enacted by a gazette notice under the WMA, and the two household kerbside collection provisions will be enacted by a regulation issued by the Governor-General.

MfE have also clarified that 'provision' of services will require a TA to provide these either through in-house services or a contract. While it is technically possible for the Minister to allow exceptions for all four requirements, it has been made clear that this will be very rare and the onus will be on the TA to present the case for exceptions to be made.

1.5.6.3 TA Performance Reporting

In addition to the proposals for a container return scheme and the standardisation of kerbside recycling, the MfE's consultation also covered a number of related issues.

One of these was the requirement for TAs to report to MfE on a number of performance standards/targets; including a minimum 50% diversion standard for dry recyclables and food scraps in kerbside collections. This was supported by a 70% high performance 'stretch target' which would be non-enforceable, but was intended to further encourage and motivate TAs[19].

[19] Proposal 4, page 87 – 'A minimum performance standard' and 'A high-performance target' sections

The proposal was that the minimum standard would need to be achieved by 2030, to align with timeframes proposed in the draft New Zealand Waste Strategy and the ERP.

Some TA performance targets have now been confirmed in the outcomes from the kerbside standardisation, as discussed in the section above. It may be that additional performance targets will follow over time.

1.5.6.4 Priority Products

The WMA enables a product to be named as a 'priority product'. Once a product has been named such, an extended producer responsibility approach must be taken and a regulated product stewardship scheme development.

The first six priority products were named under the WMA in 2020 (shown below) and subsequently single-use packaging has been added. The first seven priority products named are:

1. Plastic packaging
2. Tyres
3. Electrical and electronic products (e-waste including large batteries)
4. Agrichemicals and their containers
5. Refrigerants
6. Farm plastics
7. Single-use plastic packaging

MfE has taken a 'co-design' approach, which involves industry developing and operating product stewardship schemes with central government oversight. Progress on the schemes, and parties involved, are summarised below.

Table 2: Product Stewardship Programmes

Priority product	Progress made	Lead agency/ies
Tyres	Consultation on proposed regulations late 2021 Scheme accredited October 2020 Regulation in effect from late 2023	Tyrewise
Large batteries	Consultation on proposed regulations late 2021 Accreditation expected late 2023 Regulation in effect from 2024	Battery Industry Group
Refrigerants (and other synthetic greenhouse gases)	Consultation on regulations in late 2022 Scheme accreditation mid 2023 Regulation in effect from 2024	Synthetic Refrigerant Stewardship group

Farm plastics, agrichemicals and containers (farm waste)	Consultation on regulations planned late 2023	The Agrecovery Foundation
Electrical and electronic products (e-waste)	Scheme design in 2023 Consultation on regulations in 2024	TechCollect
Plastic packaging	Co-design underway	Packaging Forum and Food & Grocery Council

1.5.6.5 Product Bans

In April 2022, MfE announced that regulations had been passed to enable the implementation of the first tranche of bans for problematic plastic items. These regulations include:

- plastic cotton buds;
- plastic drink stirrers;
- oxo- and photo-degradable plastic products;
- certain PVC food trays and containers (pre-formed and rigid);
- polystyrene takeaway packaging; and
- expanded polystyrene food and beverage packaging.

The bans will take effect from 1 October 2022, and MfE is releasing further information such as scope and guidance on alternatives as required

Two more 'tranches' of bans are planned. From 1 July 2023 the following will be banned:

- plastic produce bags;
- plastic tableware;
- plastic straws; and
- non-compostable plastic produce labels.

From mid-2025, all other PVC and polystyrene food and beverage packaging will also be banned.

1.5.6.6 Infrastructure Investment Strategy

With the increased and expanded landfill levy comes an increased pool of funds that can be invested in waste management and minimisation initiatives.

MfE is developing a proactive strategic investment plan for waste infrastructure, supported by a detailed stocktake of current infrastructure and prioritisation of possible new infrastructure. The goal of this work is to give a national view of the waste investment New Zealand needs over the next 15 years. The outcomes will be

incorporated in to the action and investment plan that will supplement Te rautaki para, and will be released in the first half of 2024.

In April 2023, MfE released a summary report of the infrastructure assessment carried out by Eunomia in 2021[20].

1.5.6.7 Data and Monitoring

As described in section 1.5.4, MfE has developed protocols to collect data from the additional facilities that will now be paying the landfill levy, and has adopted regulations that enable the collection of some data from Class 5 fills and transfer stations[21], and has introduced an approach for performance reporting by TAs alongside Te rautaki para. These protocols will be included in the revised National Waste Data Framework, which will be completed in mid-2023.

MfE has also indicated that it is likely the new Waste Minimisation Act will also include requirements for waste operators to be licensed by a central agency, and to report data on the quantities of waste handled; and that requirements for construction site waste management plans (SWMP) will be included in a revision of the Building Act. It is not clear what the timeframes or specific requirements will be; however, it does seem clear that building consents will not be contingent on a compliant SWMP being submitted.

1.5.7 Resource Management Act Review

Government has resolved to replace the Resource Management Act (RMA) with two new Acts; the Spatial Planning Act, and the Natural and Built Environment Act. These are currently making their way through Parliament as Bills.

The increased abilities and requirements for spatial planning will have a positive impact on waste management; in particular infrastructure, as demand and supply of waste infrastructure will be an essential consideration under a spatial planning approach.

However, there is no specific reference to waste in the Bills, and so the extent to which waste planning will be undertaken successfully for the Otago region (by the applicable Regional Planning Committee) will depend on local implementation of the provisions.

The Bills both propose a more significant role for iwi in regional-scale planning, which could result in an approach that is more aligned with te ao Māori principles and a circular economy approach to waste management and minimisation.

1.5.8 International Commitments

New Zealand is party to the following key international agreements:

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[20] Eunomia (2023) "Waste and Resource Recovery Infrastructure and Services Stocktake Summary Report", available at www.mfe.govt.nz

[21] https://www.legislation.govt.nz/regulation/public/2021/0069/latest/whole.html

1) Montreal Protocol – to protect the ozone layer by phasing out the production of numerous substances
2) Basel Convention – to reduce the movement of hazardous wastes between nations
3) Stockholm Convention – to eliminate or restrict the production and use of persistent organic pollutants
4) Waigani Convention – bans export of hazardous or radioactive waste to Pacific Islands Forum countries

These agreements are explained in more detail in appendix A.4.0.

1.6 Local and Regional Planning Context

This Waste Assessment and the resulting WMMPs will have been prepared within a local and regional planning context whereby the actions and objectives identified in the Waste Assessment and WMMPs reflect, intersect with, and are expressed through other planning documents. Key planning documents and waste-related goals and objectives are noted in this section.

1.6.1 Local Strategic Context

Each of the five councils has a long term plan (LTP) adopted in 2021 and a current WMMP. Some also have other strategies or plans that should be considered, particularly those relating to climate. The local strategic context for each council is summarised below.

1.6.1.1 Queenstown Lakes

QLDC last reviewed its WMMP (the Plan) and associated Waste Assessment in 2018.

While the QLDC WMMP doesn't strictly include a list of 'key issues', the Plan highlighted that large quantities of organic, glass, and construction and demolition (C&D) wastes were going to landfill.

QLDC used a 'programme business case' approach to identify the preferred approach for the six-year term of the Plan. From the seven programmes outlined, ranging from do minimum (programme 1) to aspirational (programme 7), programme 6 was chosen which had a focus on glass and organics. This decision meant that any significant action on C&D waste would largely be deferred for the course of the 2018 Plan.

The planned programme of work was forecast to achieve a 19% decrease in waste to landfill during the term of the WMMP.

Since the adoption of the WMMP, two additional key issues have arisen:

1) The Whakatipu materials recovery facility (MRF) is beyond its anticipated functional life and following the Covid-19 lockdowns of 2020-21 has struggled with both processing capacity and staff retention; as a result it is struggling to cope with the volume of incoming recyclables from the QLDC area. Until 2022, CODC also relied on the Whakatipu MRF for processing of recyclables, and

frequently had to stockpile recyclables or transport them to Southland Disability Enterprises (SDE) for processing. CODC is no longer dependent on the Whakatipu MRF but would consider use of a future facility if available.

2) The inland sub-region (Queenstown/Central Otago) lacks a full facility resource recovery park with large capacity. Wānaka benefits from the present of Wānaka Wastebusters, a social enterprise operating on Council land, but this operation does not have the space or resources to serve the wider sub-region, and is roughly one hour from Queenstown and 45 minutes from Cromwell.

QLDC is in the process of identifying a potential new site that could accommodate a new MRF and full resource recovery park.

The QLDC 2021 long term plan (LTP) confirms funding for two key work areas:

1) Funding to research and trial methods to divert organic waste from landfills, with a reference to possible MfE diversion targets (although no capital funding for implementing solutions has been allocated);
2) Funding for the proposed new Whakatipu MRF/transfer station to form the beginning of a more extensive resource recovery centre and allow the current MRF in Frankton to be decommissioned.

Infrastructure projects are influenced by the QLDC 30 year infrastructure strategy, and are required to align with the strategic outcomes from this strategy:

1) All people can live healthy lives (services protect people from harm, create opportunities for increased activity, recreation and social connection)
2) The economy is stable and our people prosper (respond to service demand providing quality and affordability, sustain affordability, sustain annual market spend and build diversity and capability in business)
3) Communities are resilient to sudden natural events (ensure continuity of service, optimise recovery of services)
4) The natural environment's mauri is respected and protected (prevent contaminants from entering natural environment, reduce impact on global emissions and resource extraction, support environmental regeneration)

Paraphrased from the Queenstown Lakes District Council 30-year Infrastructure Management Strategy[22]

QLDC has a Climate and Biodiversity Plan 2022-25 (CBP) adopted in 2022. There are six outcomes identified in the CBP to reach the goals including reduction of greenhouse gas emissions by 44% by 2030 and net-zero greenhouse gas emissions by 2050. The CBP addresses the challenge of minimising waste, diverting organic waste out of landfill and managing a transition to a circular economy. The CBP states that QLDC's main areas of focus are to reduce reliance on the landfill and divert waste that releases emissions, such as food waste, which can be composted.

[22] https://www.qldc.govt.nz/media/40mhqoxm/iams-28jun18-adopted2.pdf

The CBP includes the following waste relevant outcomes:

Outcome 1 - Leadership

We enable and accelerate community behaviour change

We are committed to zero waste

Action: Divert organic material from landfill.

Outcome 4 - Our communities are low-emission and resilient

We grow a resilient and low carbon local food system

Action: Support composting, gardening skills, food growing hubs and the development of community composting.

Outcome 5 - Low-emission businesses thrive

We support businesses to transition to a low emission future

Action: Amplify and support programmes to assist businesses to be energy efficient, reduce greenhouse gas emissions, waste, and water use.

1.6.1.2 Central Otago

Central Otago District Council's WMMP, and supporting Waste Assessment, were adopted in 2018 and 2017 respectively.

Key issues identified in the WMMP include:

- an increasing percentage of kerbside refuse going to landfill;
- capacity of kerbside collection containers and frequency of service;
- fees and charges for waste services;
- needs of urban vs rural householders;
- biosolids management;
- hazardous waste disposal;
- large quantities of construction and demolition waste going to landfill; and
- public place waste management.

The issues relating to kerbside containers and servicing frequencies have partially been resolved following changes made to council's services. These changes have also slightly decreased the percentage of kerbside refuse going to landfill, although not significantly.

While biosolids management is identified as a key issue, management of organic waste overall was not, and this has since been noted as an area needing addressing.

Central Otago had been sending mixed recyclables collected at the kerbside to QLDC's Whakatipu MRF in Frankton. As mentioned above, this facility is beyond its anticipated functional life and is struggling with capacity and staff retention. The limited capacity has meant that recyclables have had to be stockpiled in Central Otago, and other facilities used as needed. Since October 2022, all mixed recyclables from Central Otago have successfully been processed at the Redruth MRF in Timaru.

CODC has experienced ongoing difficulties in recycling bottle glass collected at kerbside as they are unable to meet the logistics operator 5R's contamination requirements. It has concluded that the best option is to crush the glass and send it for different end uses (such as roading and footpath base course) and has purchased a crusher to enable this to occur.

Other waste management issues in the Central Otago district that are not directly highlighted in the Council's WMMP include:

- management of agricultural, viticultural and horticultural organic wastes: the majority of these currently appear to be managed on-property. A small amount of fruit processing waste reaches the vermicomposting facility in Cromwell; however, this is only a very small proportion of the expected overall volume. Local waste operators report that they do service these properties but only to move the wastes from one part of the site to another. While no water quality issues have been identified in the sub-region (in comparison to Marlborough, where viticulture waste was causing significant and noticeable issues with water quality), this is a potentially large waste stream and management of this could be better understood;
- organic waste management generally, with kerbside audits showing around 24% is food scraps and 20% greenwaste; and
- better management of rural waste generally.

The CODC 2021 LTP indicates that council would work on a plan for green waste for implementation through the 2024 LTP, with a possible district-wide green waste collection and processing system. No significant changes were made with respect to waste management and minimisation planning, with the focus for the next three years on reviewing existing waste services and re-tendering contracts for these; alongside investigation of improvements to the Cromwell transfer station and green waste processing.

As part of this service review and procurement process, CODC carried out a community consultation exercise in 2021 and reflected these outcomes in new services to be introduced from 1 July 2023. The new services will involve four collections streams – a weekly collection of food scraps and garden waste (known as FOGO, food and garden organics) from a 240L wheeled bin, a fortnightly collection of comingled recycling (from a 240L wheeled bin) and residual rubbish (from a 140L wheeled bin) and a four-weekly collection of glass from a 240L wheeled bin.

While CODC doesn't have a specific climate strategy or plan, it does have a Sustainability Strategy adopted in 2019. This strategy mentions various undesirable activities, including 'waste or biomass burning' (due to air quality impacts). Waste-related actions include:

- waste audit for council facilities;
- aligning community education provision with waste management and minimisation plan objectives;
- measuring progress using waste per capita to landfill; and

- reporting through a six-monthly review with the Waste and Property Committee.

1.6.1.3 Clutha District Council

Clutha DC's current WMMP was adopted in 2018. Key action areas from this Plan include:

- evaluating options for beneficial use of glass;
- investigating and evaluating benefits of landfill gas capture/flaring at Mt Cooee; and
- Investigating and evaluating the best way to reduce organic waste to landfill.

The management of biosolids was not identified or considered as part of this work, however castings from Council's treatment plants and sludge has been sent to Mt Cooee on a number of occasions.

Clutha District Council owns and operates Mt Cooee, a small, unlined landfill at Balclutha. Mt Cooee is 78km from Dunedin, 142km from Alexandra and 126km from the main centre of Southland, Invercargill. The resource consent for this expires in October 2023 (although, as noted below, an extension is being sought).

All kerbside recyclables from the Clutha district are transported to OJI's MRF in Dunedin, which does not accept glass. Glass can be taken to Mt Cooee, where it is used in landfill engineering.

As part of the 2018 WMMP Council considered the following options but chose not to implement:

- a kerbside organics collection and subsequent composting;
- the extension of kerbside collection services, particularly recycling, to suburban and some rural areas; and
- kerbside collection of glass for recycling.

However, under the recently announced kerbside standardisation requirements, household kerbside glass recycling and food scraps collections must be provided to the communities of Balclutha and Milton, by 1 January 2027 and 1 January 2030 respectively. CDC has noted this as an issue that needs addressing.

The demand for access to recycling in Clydevale resulted in a trial extension of the kerbside collection service to this area. The continuation of service to Clydevale and possible extension to other areas will also now be considered as part of CDC's 2024 LTP

While C&D waste is highlighted as a key source of landfill waste, the 2021 LTP provides no budget to directly address this issue. Waste composition audits have shown that there is a significant amount of C&D waste, including cleanfill, coming into Mt Cooee. CDC intends to look into options for reprocessing or separate disposal of these wastes.

CDC's contract for solid waste services is due to end in October 2023. The decision was recently made to extend the current contract for a period of at least 3 years due to the uncertainty around legislation changes and the landfill consent process.

One of the priority renewals projects in CDC's 2021 LTP was the intention to secure a long-term consent extension for Mt Cooee landfill to 2053, rather than a short-term extension to 2028 or sending waste to a landfill outside the district; alongside the development of a resource recovery park on the site. A key goal was to increase diversion from landfill beyond the current 9%, and a longer-term management option would also involve the introduction of liners for new landfill cells which will enable better management of landfill gases.

As Council's preferred option, it is now working on two key infrastructure projects to achieve this:

1. The application for a new resource consent of a new lined landfill cell at Mt Cooee with a life expectancy of 35 years 3; and
2. the development of a waste transfer station and resource recovery park at the Mt Cooee site, to be co-located with the landfill.

CDC are also aware that DCC are currently developing a new landfill site and that this could potentially be an alternative disposal avenue for Clutha District's waste if the consent application is unsuccessful. CDC also has a standing agreement with the AB Lime landfill that could be considered.

CDC are planning a review of its Solid Waste Bylaw (2019), Wheelie Bin Policy, Activity Management Plan and the operation of CDC's transfer stations in addition to a likely WMMP review. These will be completed as part of the 2024 LTP. In 2020, Clutha DC commissioned a report on the impacts and implications of climate change for the Clutha District. This report is focused on the outcomes of climate change, rather than mitigation or adaptation.

1.6.1.4 Dunedin

Key local drivers in relation to waste for Dunedin include the following:

- a number of strategic initiatives that are intended to guide action in the waste sector. These include:
  - The Waste Management and Minimisation Plan (2020)[23] which embodies a zero waste and circular economy approach;
  - The Waste Futures project which is an overarching programme of work for waste services and infrastructure taking a whole of systems approach and based on a Better Business Case methodology; and
  - the adoption of a target of net zero carbon emissions from waste by 2030;
- Green Island Landfill consent expires in 2023, although DCC is now seeking an extension of this resource consent to 2028 or 2029;

[23] https://www.dunedin.govt.nz/__data/assets/pdf_file/0020/342902/WMMP-Waste-Minimisation-and-Management-Plan-Updated-May-2021-WEB.pdf

- as part of the 'Waste Futures' project, DCC has confirmed the need to develop a new landfill to replace Green Island. A resource consent has been granted for the development and operation of a new landfill at Smooth Hill; however, development of the new landfill is expected to take until at least 2027. While Smooth Hill is under development, DCC intend to continue to use Green Island for waste disposal; and
- Dunedin is the largest population centre in the region and can achieve sufficient economies of scale for most types of facility on its own.

During consultation on its 2021 LTP, DCC sought the community's views specifically on options for kerbside collections. The two proposed options were:

1) Four bins for glass, other recyclables, food scraps and residual waste (plus an optional green waste bin) for $270 - $310 per year; or
2) Three bins – excluding the food scraps collection - costing $260 - $300 per year.

Following consultation, DCC confirmed the preferred option is option 1, and aims to implement this from mid-2024 as part of the wider Waste Futures project (which has a total budget of $29M). In addition to a food scraps collection option, residents will also have the ability to choose a 140L wheeled bin which can be used for food scraps and garden waste.

1.6.1.5 Waitaki

Waitaki's WMMP and supporting Waste Assessment were adopted in 2018 and 2017 respectively.

Key issues identified in the Waste Assessment were:

1) WDC resource recovery parks (transfer stations) – Omarama, Otematata, Kurow and Hampden;
2) green waste management at resource recovery parks (transfer stations) – Omarama, Otematata, Kurow and Hampden;
3) Palmerston Landfill and Hampden closed landfill;
4) waste minimisation education and initiatives;
5) support to Waitaki Resource Recovery Trust;
6) support to community providers;
7) rural recycling drop-off centres and street-side recycling;
8) collaboration with community providers, private enterprise and other local authorities;
9) waste Minimisation Levy funding expenditure;
10) kerbside collection services; and
11) the Solid Waste Bylaw

Key local drivers in relation to waste for Waitaki include the following:

- waste is almost entirely controlled by the private sector. WDC provides no kerbside collections or recycling services and does not own a transfer station in Oamaru (the largest centre). It owns four rural recovery parks (transfer stations) located at Otematata, Omarama, Kurow and Hampden, and a landfill in

Palmerston which is presently just used by the local community (it accepts 250 tonnes per annum), and recycling drop-off facilities in Papakaio, Enfield and Herbert;

- in 2017 WDC signed a memorandum of understanding (MOU) with Waste Management (WAM) and the Waitaki Resource Recovery Trust (WRRT) to facilitate the ongoing provision of waste and recycling services to the community. Under the agreement WAM will provide a transfer station for the public and the WRRT will receive all recycling. The MOU states that the parties will endeavour to ensure that all waste they control is processed through the WAM RTS and the recycling through the WRRT resource recovery facility. It puts certain obligations on the parties to provide fair access, including operating hours, and provide waste diversion options. It also provides for the provision of data and reporting;
- WDC financially supports the WRRT to deliver waste minimisation outcomes;
- there is no local processing infrastructure, no organic waste facility, no large-scale MRF (there is a small manual sorting line operated by WRRT), no C&D sorting and recovery. It would be good to understand the potential in these areas; and
- rural waste receives little attention, and there is no information on what actually happens with it.

The LTP addresses the Palmerston landfill, and outlines plans to make best use of the remaining life and closure. A landfill remediation project to rehabilitate Hampden closed landfill, along with two fly-tipping sites, to Palmerston Landfill before it's closure, and develop a closure plan commenced in 2022.

The LTP also proposes that Council work more closely with the Waitaki Resource Recovery Trust and other providers on education and waste minimisation, and review the 2010 solid waste bylaw. A full-time Waste Minimisation Officer has recently been employed.

1.6.2 Solid Waste Bylaws

Two of the five TAs in the Otago region have current solid waste bylaws (Clutha and Central Otago districts, 2019 and 2021 respectively). Key issues covered in these bylaws include provisions relating to waste management and disposal methods, responsibilities, specific waste materials, and penalties/charges; with CODC also covering off multi-unit development (MUD) and event waste management.

These bylaws do not provide for waste operator licensing. This is a key aspect as, like many other regions, much of the waste in the Otago region is managed by the private sector. Being able to access data relating to the quantities, types, and management pathway of these wastes is crucial in being able to complete a detailed waste assessment and develop a comprehensive WMMP.

1.6.3 Otago Regional Council

The Otago Regional Council has a statutory duty to adopt a plan to manage and mitigate the environmental impacts on air, land, and water. In the Otago region, this is currently

directed by three separate plans; although Council is currently working on development of a new Land and Water Plan.

There is also a regional 'waste plan', Waste for Otago (1997). This is optional under the Resource Management Act, and ORC chose to prepare one to "provide an integrated approach to waste issues together with the aim of reducing the adverse effects associate with Otago's waste stream" and to address the identification of waste as a regionally significant issue under the Regional Policy Statement. In 2020/21, the ORC undertook a review of the Waste Plan as part of the development of its new Land and Water Plan. Several key issues were identified during this review.

The regional council now intends to rescind the Regional Plan: Waste for Otago 1997 and include environmental regulation of waste activities in the new Land and Water Regional Plan.

It is not yet clear what the implications will be for waste management and minimisation.

1.7 Our Region

This section presents a brief overview of key aspects of the regional and local geography, economy, and demographics. These key aspects influence the quantities and types of waste generated and potential opportunities for the Councils to manage and minimise these wastes in an effective and efficient manner.

This is New Zealand's geographically second largest region, made up of five local authorities. It covers an area of approximately 32,000 km^2, of which approximately 68% is used for farming activities.

As of 2020, the population of Otago is estimated at 245,300. There are fourteen urban areas in the region with the largest, Dunedin, housing 43.3% of the region's population. The second largest urban area is Queenstown with 6.5% of Otago's overall population, and which is significantly impacted by one of New Zealand's highest tourism rates.

The Otago region has a mean per-capita GDP of $56,667, compared to a national average of $58,778[24]. The main primary industries include construction, forestry, fishing, mining, manufacturing, and agriculture. The services sector's main contributors to the economy are rental and property-related services, tourism, education and training, healthcare, and social assistance.

The climate of Otago is diverse. Annual precipitation in Otago decreases with increasing distance from the western ranges and the east coast. Dry spells of more than two weeks occur in Central Otago, but less so elsewhere. Temperatures are, on average, lower than over the rest of the country with frosts and snowfalls occurring relatively frequently each year. However, daily maximum temperatures in summer can exceed 30°C, especially

[24] StatsNZ data, accessed September 2021 at www.stats.govt.nz

about inland areas of Otago. On average, coastal Otago receives less sunshine than many other parts of New Zealand.

The region is home to three Ngāi Tahu Rūnanga (tribal councils), all with coastal marae at Ōtākou, Moeraki and Karitane. The coastal councils liaise with iwi through Aukaha, while part of the Queenstown Lakes and Central Otago district areas fall into the rohe of Te Ao Marama (Te Ao Marama Inc, or TAMI) and so liaise with both Aukaha and TAMI.

Further detail for each district or city is provided below.

1.7.1 Central Otago

Central Otago has a population of 23,900 and the three major towns (Cromwell, Alexandra, and Clyde) house more than half of the district's population. This district covers 9,968 km^2 and is the driest region of New Zealand, receiving less than 400 mm of rainfall annually.

The largest employers in the Central Otago district are wine growers, and the largest number of businesses are non-residential property operators. Other large employers are house construction, apple and pear growing, and education and healthcare services. Within the Otago region, Central Otago has about average population growth and GDP per capita, but is below average household income for the region.

1.7.2 Clutha

Clutha has a population of 18,300 and the major towns include Balclutha and Milton. This district covers 6,363 km^2 and is also known as South Otago. The Clutha River (Mata-Au) is the second largest river New Zealand and originates in the Southern Alps. The Clutha district has the third largest roading network in the country, providing for the significant travelling distances between small towns.

The largest employer in the Clutha district is the primary education sector, and the largest number of businesses are beef cattle farming. Other large employers are road freight transport, aged care services and logging. Within the Otago region, Clutha district has about average population growth and GDP per capita, but is below average household income for the region.

1.7.3 Dunedin

Dunedin is a coastal city with the most densely populated area in Otago, with a total of 134,100 residents. The city covers 328,626 km^2 and is home to a port, hospital, sports stadium, and university.

The largest employers in Dunedin are in the health care and social assistance sectors, and the largest number of businesses are landscape, construction, and accommodation and food services. Other large employers are house construction, apple and pear growing, and education and healthcare services. Within the Otago region, Dunedin has lower than average population, GDP growth and household income.

1.7.4 Queenstown Lakes

Queenstown Lakes district has 49,500 residents and is considered to be a high growth district within New Zealand. The district covers 8,719 km^2. The district includes multiple distinct urban areas including Wānaka, Albert Town, Lake Hawea, Frankton, Lower Shotover/Lake Hayes, Jacks Point/Hanleys Farm, Arthurs Point and Arrowtown. The rural townships include Makarora, Luggate, Gibbston, Glenorchy, Kingston, Cardrona and Hawea Flat. The wider region is sometimes referred to as the Southern Lakes.

The largest employers in Queenstown Lakes district are in the food and labour supply, and accommodation services; the largest number of businesses are engineering design and consulting services. Within the Otago region, Queenstown has above average population, GDP growth, household income, and visitor numbers. Peak day population (including residents and visitors) can reach nearly 100,000.

1.7.5 Waitaki

The Waitaki district has 23,500 residents and covers 7,148 km^2. Oamaru is the district administrative centre. Waitaki district is split between the Canterbury and Otago region, with most of its population (90.1%) living in the Otago region.

The largest employers in Waitaki district are in health care/social assistance and accommodation; and food services, particularly meat processing. The largest number of businesses are in beef and sheep-beef cattle farming. Within the Otago region, Waitaki has a lower-than-average population density, and average GDP growth and household income.

The following table summarises the demographics of each district/city along with key information on waste services and infrastructure.

Table 3: Summary of District/City Context

District	Population, Economy	Key Services	Recovery Infrastructure	Disposal Infrastructure
Queenstown Lakes	49,500 Food, labour, accommodation, engineering, consulting, tourism Above average population growth, GDP, household income, visitor numbers	Council kerbside recycling – glass (fortnightly 140L wheeled bin), mixed recycling (fortnightly 240L wheeled bin) Council kerbside rubbish (weekly 140L wheeled bin) Numerous community- and council-operated green waste drop-off points	MRF – beyond expected lifespan Reuse/recovery centre in Wānaka (community enterprise) RTS – Frankton and Wānaka small scale C&D recovery (private company), Queenstown	Privately-owned and operated Victoria Flats landfill (under BOOT contract with QLDC) Small quantities to AB Lime
Central Otago	23,900 Viticulture, orchards, construction Average population growth, GDP Below average household income	Council kerbside recycling – glass (8-weekly wheeled bin), mixed recycling (fortnightly wheeled bin) Council kerbside rubbish Numerous rural drop-off points	Sends kerbside recycling to Redruth MRF in Timaru Rural drop-off point recycling processed by Alexandra Wastebusters until 30 June 2023, then EnviroNZ Glass crusher RTS in Roxburgh, Ranfurly, Cromwell, Alexandra Central Wormworx vermicomposting – Cromwell	Sends residual waste to Victoria Flats landfill Small quantities to AB Lime

Clutha	18,300 Education, beef farming, transport, forestry Average population growth, GDP Below average household income	Council kerbside recycling – mixed recycling (no glass, fortnightly 240L wheeled bin) Council kerbside rubbish (fortnightly 240L wheeled bin) Eight drop-off points	Green waste shredding at Mt Cooee landfill site Resource Recovery Park (RRP) at Mt Cooee landfill site for scrap metal, batteries, waste oil & paint, LPG cylinders Recyclables sent to Green Island MRF	Council-owned Mt Cooee Landfill (consent expires 2023 but extension underway application for new consent for 35 years also underway)
Dunedin	134,100 Health, construction, accommodation, education, orchards Below average population growth, GDP, household income	Council kerbside recycling – glass (fortnightly crate), mixed recycling (fortnightly wheeled bin) Introducing a food scraps collection and optional green waste from mid 2024 Council inner-city cardboard collection for businesses, inner-city recycling hubs Numerous drop-off centres	Council RTS and green waste composting – Green Island EnviroNZ MRF - Timaru Waste Management RTS – Wickliffe Street Burnside Green Waste Hall Bros C&D aggregate processing	Council-owned Green Island landfill (consent expires 2023 but extension underway) Nash & Ross (Class 2) landfill accepting construction and demolition waste (C&D waste), contaminated soils, cleanfill, etc – no household waste, green waste, hazardous waste.
Waitaki	23,500 Health, beef/sheep farming, food services Below average population growth Average GDP, household income	No Council kerbside services Various private providers Waitaki Resource Recovery Trust collects and sorts recyclables Recycling/reuse centre – Palmerston Numerous drop-off centres	Waste Management RTS – Oamaru Waitaki Resource Recovery Trust Resource Recovery Centre	Council-owned landfill at Palmerston (used for local waste only) Waste from Oamaru RTS is sent to AB Lime

2 Waste Infrastructure

This section outlines existing waste management and minimisation infrastructure across the Otago region, and further abroad where applicable. The facilities available in the Otago region are a combination of those owned, operated and/or managed by Councils, and those that are owned and/or operated by commercial entities or community enterprise.

This inventory is not to be considered exhaustive, particularly with respect to the commercial waste industry as these services are subject to change. It is also recognised that there are many small private operators (including scrap metal yards) and second-hand goods dealers that are not specifically listed. However, the data is considered accurate enough for the purposes of determining future strategy and to meet the requirements of the WMA.

2.1 Disposal Facilities

In 2021, MfE adopted regulations to extend the landfill levy and apply information requirements to facilities that were not already subject to the levy and reporting requirements. These regulations also established legal definitions for disposal facilities and other fills. Previously, disposal facilities had been categorised according to the 2016 Waste Management Institute of New Zealand (WasteMINZ) Technical Guidelines for Disposal to Land.[25] As there are differences, albeit slight, between the two; the legal definitions take precedence[26]. This is explored in more detail in appendix A.3.0.

The definitions of the six classes of facilities in the regulations are summarised below.

Class 1 - Municipal Disposal Facility

Accept any of the following:

- household waste;
- waste from commercial or industrial sources;
- waste from institutional sources;
- green waste; and
- waste that is not accepted at Class 2-5 disposal facilities.

Class 2 – Construction and Demolition Disposal Facility

Accepts waste from construction and demolition activities. Does not accept Class 1 waste.

Classes 3 and 4 – Managed or Controlled Fill Disposal Facility

Accepts any of the following:

- inert waste material from construction and demolition activities; and

[25] www.wasteminz.org.nz/pubs/technical-guidelines-for-disposal-to-land-april-2016/

[26] Two regulations: "Waste Minimisation (Calculation and Payment of Waste Disposal Levy) Amendment Regulations 2021" and "Waste Minimisation (Information Requirements) Regulations 2021" both found at www.legislation.govt.nz

- inert waste material from earthworks or site remediation

Does not accept Class 2 waste.

Class 5 – Cleanfill

Accepts only virgin excavated natural material (such as clay, soil, or rock) for disposal – but is not a 'disposal facility'.

Industrial Monofill

A facility that accepts disposal waste that:

- discharges or could discharge contaminants or emissions; or
- is generated from a single industrial process (e.g. steel or aluminium making, or pulp and paper making) carried out in one or more locations.

The actual wording used in the regulations and examples of types of waste accepted at each facility is provided in appendix A.3.0.

The regulations also define a transfer station as a facility that receives waste and where waste is then transferred to a final disposal site or for further processing. Significantly, if a site does not accept waste that is then transferred to a final disposal site (i.e. residual waste), it is not a transfer station (but is instead a recycling drop-off site or similar) and isn't required to report data.

2.1.1 Class 1 Disposal Facilities

There are four Class 1 disposal facilities within the region.

Residual waste from Dunedin city is disposed of at Green Island landfill, which is owned by Dunedin City Council and operated on their behalf by Waste Management NZ Ltd (WMNZL). This facility accepts around 85,000 tonnes per annum. DCC has applied for a consent extension while it finalises plans for a new Class 1 landfill to the south of the city.

Residual waste from Clutha district is disposed of at Mt Cooee landfill, which is owned and operated by CDC. This landfill only accepts waste from within the Clutha district; just under 10,000 tonnes per annum. The consent for this facility expires in 2023. CDC is currently seeking an extension of this consent until 2028 and new consent for a Class 1 disposal facility. Waste generated in the Clutha District that does not meet disposal conditions at Mt Cooee landfill is taken to Burnside or Green Island Landfills in Dunedin or AB Lime's landfill in Winton.

Queenstown Lakes and Central Otago districts dispose of residual waste (nearly 55,000 tonnes per annum) at Scope Resources Class 1 landfill, Victoria Flats, at Gibbston. This is operated by Scope Resources under a build, own, operate, transfer (BOOT) contract with QLDC, with ownership transferring to QLDC on 30 June 2034. Scope Resources recently invested significantly in gas capture infrastructure and is recovering the cost through operating fees.

WDC own a consented landfill near Palmerston, although the facility only accepts a small amount of waste from local sources. Waste from the district that is collected at the RTS is also disposed of to AB Lime's landfill in Southland. WasteCo collect some waste at their private transfer station in Oamaru and this goes to Kate Valley in Canterbury.

Residual waste from Waitaki district, along with some waste such as screenings and/or biosolids from Queenstown Lakes and Central Otago and commercial waste from Dunedin, is disposed of at AB Lime landfill with a total of around 23,000 tonnes per annum. AB Lime recently received a resource consent to accept unlimited tonnage into its facility (although the facility footprint won't change).

2.1.2 Emissions from Waste to Class 1 Landfills

When waste is landfilled, it breaks down in the anaerobic (lacking oxygen) environment of the landfill and instead of producing carbon dioxide or CO2, as would be the case in an oxygenated environment), produces methane or CH4. Methane is a far more potent greenhouse gas than carbon dioxide, with an immediate (less than 20 years) global warming impact 80 times higher.

The New Zealand ETS requires Class 1 landfill operators to surrender carbon credits, based on the amount of greenhouse gases released. This in turn is calculated using the quantity of waste received by the landfill, and the composition of that waste – as different material types contain differing levels of carbon, and break down at different rates (for example food scraps breaks down very quickly, while timber breaks down extremely slowly).

Large Class 1 landfills (over 1 million tonnes total capacity) are required to operate landfill gas capture systems, where the methane is captured before escaping to the atmosphere and can be burned to create energy or to convert to the less harmful CO2. However, landfill gas capture and recovery systems do not capture all the methane gas that is produced, and so a proportion still escapes to the atmosphere. The Emission Reduction Plan highlights increased gas capture at Class 1 landfills as a key action for the waste sector.

2.1.3 Class 2-5 Landfills

Research estimates that waste disposed of to land other than in Class 1 landfills accounts for approximately 70% of all waste disposed of[27]. Other disposal sites include Class 2-5 fills and farm dumps.

Class 2-5 fills can be an issue for effective and efficient waste management as, for some materials, these disposal sites are competing directly with other options such as composting sites and Class 1 landfills; while Class 2-5 landfills are much less costly than Class 1 landfills to establish and require much lower levels of engineering investment to prevent discharges into the environment. Class 2-5 landfills also have much lower compliance costs than Class 1 landfills and have not previously been required to pay the waste levy. Because of these differing cost structures, Class 2 landfills generally charge markedly less for disposal than Class 1 landfills.

Following the recent expansion of the landfill levy, and information reporting requirements, MfE will now hold data on the quantities of waste disposed of at these sites and are in the process of developing a database of Class 2-5 facilities around the country. Because of the

[27] Ministry for the Environment (2014) Review of the Effectiveness of the Waste Disposal Levy. The report estimates 56% of material disposed to land goes to non-levied facilities, 15% to farm dumps and 29% to levied facilities.

varying dates that the requirements become effective, the data currently available from MfE only includes Class 2-4 landfills; it may also not reflect closures since mid-2022.

The table below shows the number of known Class 2-4 landfills in each district or city. Further detail on each site is provided in section 4.1.2.

Table 4: Class 2-4 Landfills

Site Type	Queenstown Lakes	Central Otago	Clutha	Dunedin	Waitaki	TOTAL
Industrial monofil	1	1	0	0	1	**3**
Class 2 C&D landfill	0	0	0	2	0	**2**
Class 3/4 managed or controlled landfill	15	2	2	17	2	**38**
Unknown[28]	1	0	0	3	0	**4**
TOTAL	**17**	**3**	**2**	**22**	**3**	**47**

2.1.4 Transfer Stations, Resource Recovery Parks, and Recycling Drop-off Points

Refuse transfer stations (RTS) or resource recovery parks (RRPs) and recycling drop-off points (RDOPs) provide for those that can't or choose not to make the journey to a disposal facility. Waste can be dropped off at these sites by the public and commercial collectors after paying a gate fee, and, in most cases, the waste is compacted before transport to a Class 1 disposal facility.

The terms 'RTS' and 'RRP' are frequently used interchangeably; however, RTS were traditionally, and primarily, established as a point to dispose of residual waste and where this waste could be bulked and prepared for transport to a disposal site. 'RRPs' are usually expected to have a focus on waste diversion, and include a wide variety of waste diversion opportunities – such as green waste, scrap metal, cleanfill, hazardous wastes, recyclables, batteries, etc. The most well developed RRPs would include additional aspects such as a reuse store and/or an education facility, support product stewardship schemes, and divert more difficult material streams. Appendix A.5.2.3 discusses the various forms that an RRP

[28] Classification not known at April 2022

(or RRC, resource recovery centre) can take and how they can significantly contribute to a circular economy.

RDOPs can be defined by size and location; in that the sites are usually intended primarily as a site for recyclables, with perhaps a few other materials; but very seldom providing for the disposal of residual waste. Some RDOPs are technically considered RTS under the MfE regulation if residual waste is accepted, although this isn't the primary role of the site and they tend to be smaller and with less (or no) staffing and charging systems in place.

The table below shows these facilities located in the region.

Table 5: Transfer Stations & Resource Recovery Centres, RDOPs

Facility	Detail	Annual Tonnage
Green Island RTS, Dunedin	Owned by DCC, disposes of waste from Dunedin. Operated by WAM The RTS separates out material on the current Green Island Landfill site. Site is due for redevelopment into an RRP over the next couple of years, with resource consent application to be lodged July 2023, with separate consent for organic waste processing.	Recycling: 1260 t Greenwaste: 500 t Batteries: 3.66t Gas Bottles: 7.81 Clothing: 25.32 Oil: 1.66 Special / Hazardous: 3
Inner-city cardboard collection, Dunedin	Cardboard from businesses. Provided by DCC	169
Inner city recycling hubs, Dunedin	Comingled recycling including cardboard. Provided by DCC.	Glass: 123 Comingled: 60
Rural resource recovery (inc Green Island, Pop ups & BP stations)	Provide rural drop off sites: Waikouaiti and Middlemarch Transfer Stations. Rural recycling Hoopers inlet, Lee Stream. Rural skip days 3x year in Sawyers Bay, Warrington, Long Beach, Aramoana, Outram, Allanton, Portobello, and Henley/Berwick	113
RTS, Wickliffe St Dunedin	Owned and operated by Waste Management Ltd.	Not available

Facility	Detail	Annual Tonnage
Rural Recycling and RTS, Dunedin	Provide rural drop off sites Waikouaiti and Middlemarch Transfer Stations. Rural recycling Hoopers inlet, Lee Stream. Rural skip days 3x year in Sawyers Bay, Warrington, Long Beach, Aramoana, Outram, Allanton, Portobello, and Henley/Berwick	
RTS, Oamaru	Owned and operated by Waste Management Ltd.	10,000 (estimate)
RTS, Oamaru	Owned and operated by WasteCo and only used for its waste	2,400 (some C&D waste is further sorted in Dunedin)
WRRP, Waitaki	Waitaki Resource Recovery Park, owned by Waitaki Resource Recovery Trust and supported by Waitaki DC.	2,500 tonnes (2,000 tonnes recyclables, 500 tonnes reuse)
Waihemo Wastebusters, Waitaki	Collect recycling and reuse from Palmerston. operated by Waihemo Wastebusters. It is open for 9 hours a week and has a re-use shop. Recovered materials are transported to the Waitaki RRP	Total tonnage: 95 81.5 recycling 13 reuse store 0.5 other reuse
Rural recycling centres, Waitaki	Waitaki District Council owns 4 rural transfer stations located at Hampden, Omarama, Kurow & Otematata. These sites are managed under contract. There are 3 unstaffed recycling drop off centres in Enfield, Papakaio and Herbert.	400 tonnes (to WRRT's WRRP)
Mt Cooee landfill, Clutha	The transfer station at the landfill also accepts cleanfill, other recyclables, greenwaste, scrap metal, ewaste	
Rural RTS, Clutha	Eight rural drop-off/transfer stations operated under contract to WasteCo; Clinton, Lawrence, Maclennan, Milton, Owaka, and Tapanui accept waste and recycling and are open at least weekly. unstaffed recycling drop-off at Taieri Mouth Key operated waste drop-off at Beaumont	>50 tonnes residual <50 tonnes recycling

Facility	Detail	Annual Tonnage
Roxburgh, Ranfurly, Cromwell, Alexandra RTS	Provided by CODC under contract to EnviroNZ Ltd (from 1 July 2023, previously AllWaste	
Recycling drop-off centres (Central Otago)	Alexandra, Cromwell, Omakau, Oturehau, Patearoa, Poolburn, Ranfurly, Roxburgh, and Tarras (Patearoa and Tarras also have provision for drop-off of rubbish in pre-pay bags. Provided by CODC under contract to EnviroNZ Ltd (from 1 July 2023, previously AllWaste and Wānaka Wastebusters)	
Central Otago Wastebusters, Alexandra	Operated by Wānaka Wastebusters until 1 July 2023 – then closed	
Frankton RTS, Queenstown	Acceptance of general waste, green waste, used tyres, domestic quantities of hazardous wastes, whiteware and scrap metal, e-waste, clean fill, child restraints, gas bottles	
Wānaka Wastebusters, Wānaka	Sited on Council land, but operated as an independent community enterprise by Wānaka Wastebusters. Wastebusters' core services include business and events recycling, drop-off recycling, reuse shop, education for sustainability, advocacy and support of waste minimisation in the community and in wider NZ	
RTS, Wānaka	QLDC site, accepts of general waste, green waste, used tyres, domestic quantities of hazardous wastes, whiteware and scrap metal, e- waste, child restraints, gas bottles	
Rural greenwaste drop off points, Queenstown Lakes	Glenorchy, Kingston, Luggate, Hawea and Makarora managed by a mix of QLDC and community associations involvement and situated on a variety of QLDC, Department of Conservation (DoC) and Land Information New Zealand (LINZ) land.)	

Facility	Detail	Annual Tonnage
Whakatipu Recycling Centre	QLDC site, accepts domestic recycling, batteries, used engine oil, light bulbs	

2.1.5 Closed Landfills

There are a number of closed landfills that councils have responsibility for through the region, shown below.

Table 6: Closed Landfills Managed by Councils

District/City	Number of closed landfills	Location
QLDC	11	Consented: Tucker Beach, Wānaka, Glenorchy, Hawea, Makarora, Luggate Unconsented: Kingston, Albert Town, Warren Park, Fernhill, Arrowtown
CODC	15	Alexandra, Cromwell, Tarras, Roxburgh (2), Ettrick, Millers Flat, Ranfurly, Ophir, Lauder, Becks, Oturehua, Naseby, St Bathans, Patearoa.
DCC	5	Forrester Park, Middlemarch landfill, North Taieri landfill, Sawyers Bay landfill, Waikouaiti landfill
CDC	19	Beaumont, Clinton, Clydevale, Edievale, Heriot, Kaitangata, Kaka Point, Lawrence, Maclennan, Milton, Owaka, Tahakopa, Taieri Mouth, Tapanui, Tuapeka, Waihola, Waipahi, Waitahuna, Waiwera South
WDC	14	

2.2 Hazardous Waste Facilities and Services

The hazardous waste market comprises both liquid and solid wastes that, in general, require further treatment before conventional disposal methods can be used. The most common types of hazardous waste include:

- organic liquids, such as those removed from septic tanks and industrial cesspits;
- solvents and oils, particularly those containing volatile organic compounds;
- hydrocarbon-containing wastes, such as inks, glues and greases;
- contaminated soils (lightly contaminated soils may not require treatment prior to landfill disposal);
- chemical wastes, such as pesticides and agricultural chemicals;
- medical and quarantine wastes;

- wastes containing heavy metals, such as timber preservatives; and
- contaminated packaging associated with these wastes.

A range of treatment processes are used before hazardous wastes can be safely disposed.

Most disposal is either to Class 1 landfills or through the trade waste system. Some of these treatments result in trans-media effects, with liquid wastes being disposed of as solids after treatment. A very small proportion of hazardous wastes are 'intractable', and require exporting for treatment.

These include polychlorinated biphenyls, pesticides, and persistent organic pollutants.

There are four participants in the local hazardous waste market; EnviroNZ Technical Services, Waste Management Technical Services, Wastech Services, and Waste Away South. Agrecovery provides hazardous waste management services for agricultural chemicals.

Household hazardous waste can be taken to many of the RTSs in the region.

2.3 Wastewater Treatment

As outlined earlier in this report, wastewater treatment is considered where it results in waste being managed through solid waste systems.

The five councils of the Otago region take varying approaches to wastewater management; but all management practices result in solid residual (sludges or biosolids) that are then disposed of to landfill, along with screenings from wastewater systems.

From QLDC and CODC, this material goes to AB Lime (rather than to Victoria Flats). DCC and CDC dispose of this waste at Green Island landfill (as shown in later sections, this results in Green Island accepting a disproportionate quantity of waste categorised as 'potentially hazardous').

The future of wastewater management in the district, as across New Zealand, is currently somewhat uncertain depending on the implementation of the national three waters management proposals.

2.4 Recycling and Reprocessing Facilities

There are a number of processing/reprocessing facilities. These are shown in the table below.

Table 7: Processing/Reprocessing within the Region

Facility	Detail	Annual Tonnage
Processing		
Frankton MRF	Owned by QLDC and operated under contract with Waste Management NZ Ltd on a site owned by QLDC. Acceptance, sorting and storage of recyclable materials for commercial resale. Consolidation of separated recyclables and transport to processing facilities within NZ and overseas. Operation of drop off point for domestic recyclables and items like batteries, lightbulbs and used engine oil.	7,000
Green Island MRF	Owned/operated by OJI, handles kerbside-collected material from Clutha.	6,500
Waitaki MRF	Operated by WRRT, handles recyclables from council sites in Waitaki district and material delivered to site by customers	2,000
Green Island RTS/composting	Windrow composting of greenwaste dropped off at Green Island.	500
AllWaste C&D sorting facility, Queenstown	AllWaste are doing a small amount of C&D sorting They send scrap metal to Otago metals in Cromwell, gib board to Christchurch, light plastics to Future Post in Blenheim, polystyrene to Expol, pallets to Christchurch, window glass to 5R solutions.	Not available
Cargill Enterprises	Accept e-waste, dismantled and/or sent elsewhere for recycling	Not available
Reprocessing		
Nash & Ross	Recover 10,000 tonnes of aggregate and about 500 tonnes of steel.	10,500
Keep it Clean	Rendering plants in Abbottsford and Mosgiel.	Not available

Facility	Detail	Annual Tonnage
Processing		
Central Wormworx, Cromwell	Takes range of putrescible materials, e.g. fruit waste, dairy shed waste, pelts, biosolids.	1,500
Hall Bros, Dunedin	Has a number of sites, mostly with mobile equipment. Grinds asphalt (6,000t), concrete (30,000t), some wood, pulls out metal, recovers bark from port. Uses materials back in own construction operations.	37,000
CODC Glass crusher	Owned by CODC. Currently being commissioned.	Up to 10,000 tonnes capacity
Mt Cooee greenwaste shredding CDC	Shredding of greenwaste dropped at Mt Cooee – given away to public	600
WRRT greenwaste shredding, Oamaru	Shredding of greenwaste at WRRT site in Oamaru – available to public	Not available
Future Post	Blenheim facility which receives waste plastic and recycles it into fence post products	unknown
E-Cycle	Christchurch facility receives e-waste and batteries via national sites	unknown
Canterbury Landscaping Supplies	Canterbury facility receives GIB board offcuts for grinding and re-screening and addition to fertilizer	unknown
5R	Window glass is received and goes off-shore	unknown

In addition, there are a number of key processing facilities that are located out of the Otago region, but accept material from the region. These are shown below in **Error! Reference source not found.**.

Table 8: Processing/Reprocessing Infrastructure Outside the Region

Facility	Detail	Annual Tonnage
Visy Glass	Beneficiation and reprocessing, Onehunga, Auckland. Receives glass from much of the region via 5R.	9,849 (to beneficiation site)

Facility	Detail	Annual Tonnage
Redruth Composting Facility Envirowaste	Green waste and food scraps composting facility, Timaru	CODC material from 1 July 2023
EnviroNZ MRF	Located at Redruth, Timaru	DCC material from 1 July 2023 to (approximately) March 2025
Tyres	Multiple sites, via the Tyrewise product stewardship programme.	3,988
OJI Fibre Solutions	Fibre reprocessing, Penrose, Auckland	3,000
Scrap metal yards	Numerous sites, industry estimate	28,530
ItRecycla, Remarkit Solutions	e-waste reprocessing, Wellington	53
Plasback	Nationwide product stewardship scheme for a variety of agricultural plastics	470
Agrecovery	Nationwide product stewardship scheme for unwanted agrichemicals, and the recycling or recovery of empty containers, drums and IBCs	25
Comspec	Pre-consumer plastic reprocessed to manufacturing feedstock (flake, pellet), Christchurch	375
Flight Plastics	PET reprocessing, Wellington	195
Astron	Plastics reprocessing, Auckland (two sites)	425
Expol	Numerous sites, product stewardship programme for rigid, extruded polystyrene foam	21
Terracycle	Numerous sites, product stewardship programme for recycling solutions for typically hard-to-recycle waste streams	1

In addition, there are a large number of charity shops, secondhand stores, and smaller scrap metal recyclers that have a role in diverting material from landfill disposal.

While most material types are transported out of the region for recycling and reprocessing, this is not an unusual situation in New Zealand and particularly in the lower South Island.

2.5 Summary and Assessment

Current landfill disposal infrastructure appears adequate for the needs of the region, for some time to come; although one of the key facilities (AB Lime) is based outside the Otago region. Two other disposal facilities, Green Island and Mt Cooee, are coming to the end of current consents; although plans are underway to extend/expand the consents for each. DCC also has consents for a new disposal facility, Smooth Hill.

Once both Smooth Hill and the extension to Mt Cooee are operating (assuming this is the outcome) there will be two Class 1 disposal facilities within around 70km of each other, which is a relatively high level of provision given the costs involved in consenting Class 1 landfills and engineering new cells.

There is very little reprocessing infrastructure of scale in the region, and what is in place is focused on bulk low value materials such as recovered aggregate. This means that most recovered materials need to be transported significant distances, as far away as Auckland, or exported. This makes the cost-benefit consideration of recycling (whether through kerbside services or collection points) some common items very marginal, which can be a challenging issue to explain to the public – some materials, such as glass, can incur significant net cost when collected and transported for reprocessing. For some materials, such as fibre (paper/cardboard), the New Zealand-based reprocessors are at capacity and prefer to purchase pre-consumer feedstock, which tends to be more consistent in material type and higher quality due to the use of single-stream material collection systems.

The recovery infrastructure, significantly the MRFs in Dunedin and Queenstown Lakes, are both dated and are currently struggling to cope from both a quantity and quality perspective (which has further impacts on the ability of operators to recruit staff in an already challenging market). Both QLDC and DCC has plans underway for new MRF infrastructure. For an interim period, DCC will be sending kerbside-collected recyclables out of the region for processing while its contractor develops a replacement facility (intended completion March 2025).

There are gaps in reprocessing for organics and C&D waste, both large waste streams and making up a significant proportion of what is currently going to landfill. These material streams are dense, and it is rarely economical to transport these long distances for reprocessing. Several of these gaps are being closed; with work progressing on organics processing across the region, and most of the councils underway with plans for resource recovery centres (with a range of recovery options) at varying sizes and extent. DCC is also progressing a C&D waste facility to be part of the Green Island Resource Recovery Park, alongside a new MRF (March 2025) and green waste processing. CDC are investigating the feasibility of C&D waste diversion as part of the Mt Cooee RTS design.

3 Waste Services

3.1 Council-provided Waste Services

A range of services are provided by councils to residents and businesses in the district.

3.1.1 Current Collection Services

Apart from WDC, all councils provide fortnightly kerbside collection services for recycling in 240L wheeled bins, albeit all through different service providers. Where glass is collected, it is collected separately from other recycling in either crates or wheelie bins.

Since 1 July 2023 CODC has been offering a kerbside FOGO (food scraps and garden waste) collection; but this is the only current kerbside food scraps or garden waste collection offered by councils in the Otago region.

Details on current council-provided kerbside collections in the Otago region are summarised in Table 9.

Table 9: Council-Provided Kerbside Collections Per TA

	Dunedin	Waitaki	Queenstown Lakes	Central Otago	Clutha
Glass	Fortnightly crate	No council collection	Fortnightly 140L wheeled bin	8-weekly 240L wheeled bin	No council collection
Other dry recyclables	Fortnightly 240L wheeled bin	No council collection	Fortnightly 240L wheeled bin	Fortnightly 240L wheeled bin	Fortnightly 240L wheeled bin
Plastics Accepted	#1, #2, #5	No council collection	#1 (clear only), #2, #5	#1 (clear only), #2, #5	#1, #2, #5
Foil, aerosols	Both	No council collection	Not accepted	Not accepted	Not accepted
Residual rubbish	Weekly bag collection Nightly bag collection CBD	No council collection	Weekly 140L wheeled bin	Fortnightly 240L wheeled bin	Fortnightly 240L wheeled bin
Organics				Weekly FOGO 240L wheeled bin	

As mentioned earlier in section 1.5.6.2, MfE has recently released the details of a standardised kerbside service.

The implications for each council of the kerbside standardisation requirements are summarised below.

Table 10: Kerbside Standardisation Implications

Service Component	QLDC	CODC	DCC	WDC	CDC
Materials in kerbside recycling (excluding glass)	Need to include all #1 plastic containers and pizza boxese	Need to include all #1 plastic containers	Will be compliant with new service	Council kerbside service required by 1 January 2027	Compliant
Kerbside glass recycling collections	Compliant	Compliant	Will be compliant with new service	Council kerbside glass service required by 1 January 2027	Council kerbside glass service required by 1 January 2027
Foil not included in kerbside recycling	Compliant	Compliant	Will need to remove foil from accepted items by 1 February 2024	NA	Compliant
Food scraps collections	Council collection required by 1 January 2030	Compliant	Council collection required by 1 January 2030 – will be compliant with new service	Council collection required by 1 January 2027	Council collection required by 1 January 2030

3.1.2 Planned Collection Service Changes

Dunedin is in the process of making significant changes to its kerbside services, with the implementation of a **4-bin kerbside** (plus one optional garden waste bin) collection system with the goal of increasing the amounts of recyclable materials collected, including glass. These new services will be available from 1 July 2024.

Central Otago, at this stage, has indicated that collection of green waste is a higher priority and is introducing a FOGO (food and greenwaste) kerbside collection from 1 July 2023. At the same time, changes will be made to other collection services – with rubbish being

collected fortnightly from a smaller 140L bin, and the glass bin collection frequency increasing to once every four weeks, with mixed recycling collected every two weeks. It is also in the process of developing a supporting green waste and food scraps processing site within the district, that could accommodate up to 16,000 tonnes per annum.

Queenstown Lakes is also considering kerbside organics collections.

These additional services will require necessary investment in collection and processing infrastructure - which could potentially be supported by other TAs across the region; Clutha has indicated previously that a kerbside organics collection may be considered if efficiencies could be achieved by working alongside other councils. Clutha and Waitaki are also exploring the options available to align with the requirements of kerbside standardisation, with the aim of identifying the most appropriate option/s for their districts. Although kerbside standardisation only requires services to be provided to Oamaru (Waitaki district) and Balcultha and Milton (Clutha district), these councils will investigate options to extend services beyond these urban areas.

Once all the new confirmed collection arrangements are in place, collections in the region could look like the following:

Table 11: Future Council-Provided Kerbside Collections Per TA

	Dunedin	Waitaki	Queenstown Lakes	Central Otago	Clutha
Glass	Fortnightly crate	Not yet determined	Fortnightly 140L wheeled bin	4-weekly 240L wheeled bin	Not determined yet
Other dry recyclables	Fortnightly 80L/240L wheeled bin	Not yet determined	Fortnightly 240L wheeled bin	Fortnightly 240L wheeled bin	Fortnightly 240L wheeled bin
Residual rubbish	Fortnightly 80L/140L wheeled bin	Not yet determined	Weekly 140L wheeled bin	Fortnightly 140L wheeled bin	Fortnightly 240L wheeled bin
Organics	Weekly 23L food scraps bin OR Weekly 140L FOGO bin	Not yet determined	Undecided	Weekly FOGO 240L wheeled bin	Not determined yet
Additional services	Fortnightly 240L green waste bin, additional charge	Not yet determined			

3.1.3 Council Contracts

The table below summarises the contracts held by each council for kerbside services.

Table 12: Council-Provided Service Contracts

	Dunedin	Waitaki	Queenstown Lakes	Central Otago	Clutha
Kerbside recycling	Envirowaste to 30 June 2023, then new contract starts 1 July 2023 with extended service starting 1 July 2024 Twice-weekly cardboard collection CBD	No council collection	Waste Management, till 30 June 2034	All Waste till 30 June 2023, Envirowaste 1 July 2023 onwards	WasteCo, till October 2023 – Looking to extend to 2028 in alignment with landfill consent extension
Kerbside rubbish	Envirowaste to 30 June 2023, then new contract starts 1 July 2023 with extended service starting 1 July 2024		Waste Management, till 30 June 2034	All Waste till 30 June 2023, Envirowaste 1 July 2023 onwards	
Recycling drop-off points	Envirowaste		Waste Management, till 30 June 2034	Wastebusters till 30 June 2023, Envirowaste 1 July 2023 onwards	

Transfer Stations	Rural Transfer Stations – Envirowaste. Green Island Transfer Station - Waste Management until approx. 2025		s Waste Management, till 30 June 2034, Wānaka and Whakatipu	All Waste till 1 July 2023, Envirowaste 1 July 2023 onwards	
Landfill	Waste Management to October 2025		Scope Resources, till 30 June 2034	NA	

3.1.4 Other Council Services

3.1.5 Waste Education and Minimisation Programmes

There are a wide range of education and waste minimisation programmes or initiatives funded or delivered across the region. These are summarised in the table below.

Table 13: Council Funded or Provided Waste Education and Minimisation Programmes

	QLDC	CODC	DCC	WDC	CDC
General service promotion	✓	✓	✓	✓	✓
Organics reprocessing – home composting, bokashi, mulching and community provision	✓	✓	✓	✓	✓
Para Kore/Te Ao Maori-based			✓		
Food rescue	✓		✓		
Enviroschools	✓	✓	✓	✓	✓
Paper 4 Trees	✓				
Zero waste schools education	✓				✓
Contestable community funding	✓		✓	✓	
Events waste reduction (regulation and/or guidelines)	✓		✓	✓	✓

Business waste reduction	✓		✓	✓	
Bulky waste reuse collections	✓				
C&D waste reduction	✓		✓		
Support wider campaigns – Love food hate waste, plastic-free July, single-use cup-free, green drinks, RefillNZ, Keep NZ Beautiful	✓	✓	✓	✓	✓
Community waste reduction campaigns	✓				
Waste-free parenting	✓	✓		✓	✓
Zero Waste workshops (e.g. Mainstream Green, Kate Meads, etc)	✓	✓	✓		✓
Product stewardship – Seatsmart, Agrecovery, polystyrene etc	✓	✓	✓	✓	✓

3.2 Non-Council Services

A wide variety of non-council services are provided across the region. These are summarised in the table below.

Table 14: Non-Council Waste Services

	QLD	COD	DC	WD	CD
Commercial rubbish collection	✓	✓	✓	✓	✓
Commercial recycling collection – paper/cardboard	✓	✓	✓	✓	✓
- **Plastics**	✓	✓	✓	✓	
- **Glass bottles/jars**	✓	✓	✓	✓	
- **Tins/cans**	✓	✓	✓	✓	
- **Polystyrene**	✓	✓	✓	✓	
- **Plastic film**	✓	✓		✓	
- **E-waste**	✓	✓	✓	✓	
Building waste	✓		✓		✓
Residential rubbish collections	✓	✓	✓	✓	✓

Rural rubbish collections	✓	✓	✓	✓	✓
Residential recycling collections	✓			✓	
Residential greenwaste	✓		✓	✓	✓

3.3 Summary and Assessment

As would be expected in a region that includes dense cities through to isolated rural areas, there is a variety of service levels provided – this applies to both council-provided services and private sector. Both residential and commercial customers have access to a range of services, with some council collections also available to commercial customers (such as some CDC businesses, and businesses in the Dunedin CBD).

However, there are some key areas where the disparity in services may cause issues with respect to waste management and minimisation:

1) The variety in materials collected and services provided makes it more difficult to collaborate on education about kerbside services – which is one of the drivers behind the MfE's kerbside standardisation requirements.
2) While leaving the provision of kerbside services to the private sector does provide the community with full choice over which service provider they use, and which type of service; data from elsewhere in New Zealand does suggest that this can reduce the effectiveness of waste minimisation and diversion efforts particularly where large (240L) wheeled bins are provided for rubbish collections. This can also be an issue where customers choose to use private services instead of the council collection.
3) Where private sector services have a large part of the market, it can be more difficult to plan for waste management and minimisation due to lack of data and detailed understanding of how private sector services are performing, and also to encourage the use of preferable alternatives.

Many of the issues relating to variable service provision and alignment to kerbside standardisation will soon be resolved, or are being explored further – such as the new services to be provided in Dunedin city and Central Otago district, and the intention to explore the implications of offering council-controlled kerbside services in Waitaki and Central Otago districts. However, increased capture of recyclables and food scraps across the region will only further exacerbate the current issues with poor reprocessing infrastructure provision.

4 Situation Review

4.1 Waste to Class 1-5 Disposal

The terminology that is used in this section to distinguish sites where waste is disposed of to land are taken from the relevant MfE regulations, as discussed earlier in section 2.1.

4.1.1 Waste to Class 1 Disposal

Table 15 provides an estimate of the total annual tonnage of waste originating from the Otago region that is disposed of to Class 1 landfills in the region and to Class 1 landfills outside the region. For clarity, the estimate does not include waste that originates from outside the region (if any).

Disposal in the region includes Green Island landfill, in Dunedin, Mt Cooee landfill in Balclutha, Victoria Flats landfill, in Gibbston, and Palmerston landfill.

Disposal outside of the region occurs at AB Lime landfill, near Winton, Southland, and Redruth landfill, in Timaru.

The data used to calculate the estimate has primarily been drawn from surveys undertaken by Waste Not Consulting at transfer stations and Class 1 landfills in the region and data provided by councils.

As the data used for the analysis relates to different years, the tonnages are not representative of a specific year. For simplicity's sake, throughout this section the data is identified as being '2020'. In those instances where tonnage data has not been located or is considered unreliable, surrogate data based on other sources has been substituted.

It is noted that not all waste streams have been included in this total as no accurate tonnage data has been located or made available. For instance, contaminated soil from Central Otago District is reportedly being disposed of at AB Lime, but no tonnage data is available.[29]

Table 15: Waste to Class 1 Landfills from Otago Region - 2020

Overall waste to Class 1 landfills - 2020	% of total weight	Tonnes per annum
Disposal outside of Region		
General + kerbside rubbish	6.1%	8,700
Special wastes	2.9%	4,200
Subtotal	**9.0%**	**12,900**
Disposal in Region		
Kerbside rubbish	35.5%	50,946

[29] https://www.odt.co.nz/regions/southland/hearing-begins-bid-remove-landfill-cap

General waste	52.7%	75,623
Special wastes	2.9%	4,095
Subtotal	**91.0%**	**130,664**
TOTAL	**100.0%**	**143,564**

An estimated 143,564 tonnes of waste from the Otago region were disposed of in 2020 to Class 1 landfills. The Class 1 landfills within the Otago region receive 90% of this waste. The other 10% is disposed of outside the region.

Most of the waste disposed of outside the Otago region was from Waitaki District, with the remainder being biosolids from Queenstown Lakes and screenings from Central Otago. There is also anecdotal evidence that construction and demolition waste, and some contaminated soils, move from Clutha district to AB Lime. Biosolids are classified as special wastes.

4.1.2 Waste to Class 2-5 Disposal

There are several industrial monofills and Class 2 landfills, and many Class 3/4 landfills, in the region; as set out in section 2.1.2. There are also several (although of unknown number) Class 5 facilities although many of them don't accept waste from others – e.g. multiple Fulton Hogan sites that are predominantly used to dispose of cleanfill from earthworks and roading projects.

As discussed earlier in this report, at present there is very little information available regarding most cleanfilled waste, both composition and quantities; although data on quantities will be provided by these facilities to MfE from the beginning of this year.

A 2011 MfE report on non-levied disposal facilities stated:[30]

> *No information about cleanfill quantities was compiled for this report because the few sites with available data are unlikely to be indicative of what is happening around the country.*

Several other studies have attempted to quantify the disposal of waste to Class 2-5 landfills, often on a per capita basis, with widely-varying results. In practical terms, the lack of precise data about disposal of waste to Class 2-5 fills makes it impossible to reliably monitor any changes over time in the disposal of major waste streams, such as construction and demolition waste.

4.2 Composition of Waste

As a region, the availability of data relating to waste is variable, depending on the extent to which councils have access to the waste stream and therefore have been able to include in solid waste analysis protocol (SWAP) audits.

[30] Ministry for the Environment (2011) *Consented Non-levied Cleanfills and Landfills in New Zealand: Project Report*. Wellington: Ministry for the Environment

The following recent SWAP data is available for the region:

1) Dunedin: kerbside audit 2018, Green Island Landfill audit 2022
2) Waitaki: Oamaru refuse transfer station 2022
3) Clutha: Mt Cooee and kerbside audits 2022
4) Central Otago: kerbside audit 2018
5) Queenstown: solid waste audit 2020, and kerbside audit 2019

All audits were carried out by Waste Not Consulting Ltd and the reports from these audits have been referred to for the data in this section. Given the varying availability of data, not all of the sections below cover off every council area.

4.2.1 Composition to Class 1 Disposal

The table below shows the composition of waste to landfill for each disposal facility, compared to the regional and national average (calculated in 2020).

Table 16: Composition of Waste to Class Landfills

Material type	National average	Regional average	Green Island	Victoria Flats	Mt Cooee	Oamaru RTS
	All in percentage of total					
Paper	5.9	8.6	7.3	10.7	7.8	8.2
Plastics	8.3	10.2	9.1	10.7	12.5	13.1
Organic	14.8	29.7	31.5	25.6	30.0	36.5
Ferrous metals	2.7	3.2	3.7	2.5	3.0	3.3
Non-ferrous metals	0.8	0.6	0.6	0.7	0.7	0.6
Glass	1.8	2.9	2.8	1.6	8.3	3.5
Textiles	5.0	4.5	3.9	5.1	4.7	5.5
Sanitary paper	2.3	4.5	4.5	3.7	5.5	6.2
Rubble	20.1	7.2	3.3	13	9.7	4.4
Timber	12.6	16.1	12.8	24.3	7.5	10.7
Rubber	2.1	1.5	1.0	0.8	2.8	7.2
Potentially hazardous	23.5	10.9	19.4	1.5	7.4	0.8

This analysis shows that the proportions vary significantly across the region. The material type that varies the most is 'potentially hazardous' (largely sewage sludges and biosolids), with significant quantities of this present at Green Island and very little at the other locations. This reflects the disposal practices of the different councils; with QLDC and CODC

sending this waste to AB Lime, and Clutha sending what is not suitable for disposal at Mt Cooee Landfill to Green Island landfill for disposal.

This means that when it comes to calculating the 'potentially divertible' portion of this waste stream, it is very difficult to make comparisons due to the highly variable 'potentially hazardous' stream. For subsequent calculations relating to diversion potential and benchmarking, this material has been excluded.

General waste can be broken down into four the activity sources - C&D waste, industrial/commercial/institutional waste, residential waste (which excludes kerbside rubbish), and landscaping waste. In Table 17, the primary composition of each of the four activity sources is shown.

Table 17: Primary compositions of Waste - By Activity Source - 2020

Primary compositions of waste to Class 1 landfills - - 2020	Construction & demolition	Industrial/ commercial/ institutional	Landscaping	Residential
Paper	2.6%	18.2%	0.3%	8.4%
Plastics	2.6%	24.6%	0.7%	7.7%
Organic	1.0%	15.0%	80.2%	12.4%
Ferrous metals	2.2%	2.9%	0.0%	11.2%
Non-ferrous metals	0.1%	0.6%	0.0%	0.8%
Glass	0.4%	2.5%	0.0%	2.1%
Textiles	2.3%	7.8%	0.2%	17.0%
Sanitary paper	0.0%	4.3%	0.0%	0.7%
Rubble & concrete	35.4%	6.0%	17.3%	2.9%
Timber	51.7%	14.5%	1.3%	35.7%
Rubber	1.0%	2.1%	0.0%	0.6%
Potentially hazardous	0.7%	1.6%	0.0%	0.4%
TOTAL	**100.0%**	**100.0%**	**100.0%**	**100.0%**

The majority of construction and demolition waste was timber (51.7%) and rubble (35.4%). Industrial/commercial/institutional waste was more heterogeneous, with plastics comprising the largest proportion (24.6%) and paper comprising 18.2% of the total weight. Landscaping waste was 80.2% organics, primarily greenwaste.

Residential waste often includes waste from several activities, including landscaping and construction. The largest component of residential waste was timber, comprising 35.7% of

the total, which included both furniture and wood from construction and demolition. Textiles was the second largest component, comprising 17.0% of the total weight. Carpet, soft furnishings, and clothing were the major components of textile waste.

4.3 Diversion Potential

4.3.1 Waste to Class 1 Landfill

The table below shows the proportion of the waste stream to landfill that could have been diverted through existing recycling collections, and straightforward composting. As above, this is split by disposal point – with CODC sending residual waste to Victoria Flats. Oamaru RTS represents the majority of waste going to Class 1 landfill (AB Lime) from the Waitaki district; although a small proportion goes to Palmerston landfill. These figures also represent the 'general' waste stream (i.e. excluding potentially hazardous).

Table 18: Diversion Potential in Landfill Waste

Material type	Green Island	Victoria Flats	Oamaru RTS	Mt Cooee
	As percentages of the overall waste stream (excluding potentially hazardous)			
Paper - recyclable	5.3	5.0	5.1	3.0
Paper - cardboard	2.4	4.7	2.3	3.6
Plastic - recyclable	1.8	1.3	1.6	1.2
Ferrous metals	4.6	2.5	3.3	3.0
Non-ferrous metals	0.8	0.7	0.6	0.6
Glass - recyclable	2.0	0.9	2.7	7.8
Textiles - clothing	2.1	1.9	1.8	1.8
Rubble - cleanfill	1.0	1.9	0.7	4.8
Timber - reusable	3.5	2.1	0.8	0.0
Organics - food scraps	19.2	14.2	20.7	12.7
Organics - greenwaste	11.5	7.6	10.2	15.1
Rubble - new plasterboard	0.2	4.4	0.4	6.0
Timber – unpainted, untreated	3.5	3.9	3.0	1.2

These comparisons show some high consistency, but also some notable differences. These include:

- slightly lower proportion of recyclable paper going to Mt Cooee;
- more cardboard going to Victoria Flats – perhaps due to the very active retail and construction sectors;
- more glass going to Mt Cooee – reflecting the lack of recycling options;
- more rubble and other cleanfill materials going to Mt Cooee – reflecting the closure of the only nearby cleanfill facility in the district;
- slightly more reusable timber going to Green Island – probably just related to higher levels in general of construction activity;
- the proportion of food scraps and green waste are quite variable; and
- new plasterboard going to landfill at Victoria Flats and Mt Cooee – probably reflecting the active construction sector and lack of local cleanfill options respectively.

In considering the options to capture the potentially divertable material, it is important to understand how and from what source these materials are reaching landfill. While there are some variations across the region, the primary pathways are consistent:

- food scraps overwhelmingly reach landfill through household kerbside rubbish collections;
- compostable greenwaste reaches landfill through two main pathways: household kerbside rubbish collections (particularly in urban areas where households use large wheeled bins for rubbish collections) and from general residential, C&D, and ICI waste going straight to transfer stations and landfills (note: not through landscaping);
- recyclable paper and cardboard through household kerbside rubbish collections (particularly from large wheeled bins) and then through residential and ICI to transfer stations and landfills;
- recyclable plastic and glass – through household kerbside and ICI;
- textiles – mainly household kerbside rubbish and also ICI to transfer stations and landfills; and
- new plasterboard, timber types, ferrous metals, and rubble arrive directly to transfer stations (partially) and landfill (mainly) from the C&D sector.

4.3.2 Kerbside-Collected Rubbish

Since 2017, sort-and-weigh audits of kerbside rubbish have been undertaken by Waste Not Consulting for QLDC, CODC and CDC. Kerbside rubbish disposed of by these three territorial authorities represents 43% of all kerbside rubbish from the region. Based on these audits, the primary composition of all kerbside rubbish collected in the Otago region is presented in Table 19.

Table 19: Composition of Kerbside Rubbish Otago Region - 2020

Primary composition of kerbside rubbish - 2020	% of total	Tonnes per annum
Paper	8.6%	4,411

Plastics	9.5%	4,878
Organic	55.3%	28,243
Ferrous metals	1.9%	987
Non-ferrous metals	0.8%	427
Glass	4.6%	2,327
Textiles	3.9%	2,002
Sanitary paper	8.5%	4,339
Rubble & concrete	3.6%	1,819
Timber	1.9%	966
Rubber	0.3%	156
Potentially hazardous	1.1%	556
TOTAL	**100.0%**	**51,112**

Based on the results of the three sort-and-weigh audits, organics was the largest primary classification of kerbside rubbish, comprising 55.3% of the total weight. Kitchen waste comprised 60% of the organic material. Plastic was the second largest primary classification, comprising 9.5% by weight, and paper the third largest, at 8.6%.

4.3.2.1 Diversion Potential of Kerbside Rubbish

In the sort-and-weigh audits used to calculate the composition of kerbside rubbish, secondary categories were used to differentiate between recoverable and non-recoverable materials (e.g. recyclable paper vs. non-recyclable paper). In this context, 'recoverable' is taken to mean materials which can be readily diverted by residents, through kerbside recycling and organic collections, drop-off facilities, or through home-composting.

Using the results of the three SWAP audits of kerbside rubbish conducted in the Otago region since 2017, and assumed compositions for Dunedin and Waitaki, the diversion potential of kerbside rubbish has been calculated to be as shown in Table 20 (for the region) and Table 21 (for individual TAs).

Table 20: Diversion Potential of Kerbside Rubbish - 2020

Diversion potential of kerbside rubbish – 2022	% of total (%)	Tonnes per annum
RECYCLABLE MATERIALS		
Paper recyclable	7.1	3,699
Plastic - #1-7 containers	2.1	1,068
Steel cans	0.7	370
Other ferrous	1.2	630
Aluminium cans	0.3	164

Other non-ferrous	0.5	269
Glass bottles & jars	4.0	2,071
Clothing/textiles	2.3	1,190
Subtotal	**18.3**	**9,481**
COMPOSTABLE		
Food scraps	32.8	16,987
Garden waste	19.4	10,031
Subtotal	**52.2**	**27,018**
TOTAL DIVERTABLE	**70.5**	**36,499**
Non-divertable	**29.5**	**15,254**
TOTAL KERBSIDE RUBBISH	**100.0%**	**51,753**

Approximately 18.3% of kerbside rubbish from the Otago region could have been readily diverted through kerbside recycling collections or at drop-off facilities. Recyclable paper was the largest single recyclable component, comprising 7.1% of the total weight of kerbside rubbish.

Organic materials that could have been composted comprised 52.2% of kerbside rubbish; of this kitchen waste comprised 32.9% of kerbside rubbish (16,987 tonnes per annum), and greenwaste 19.4% (10,031 tonnes per annum). (It is noted that a small percentage of greenwaste in kerbside rubbish is not compostable.) In total, 70.5% of kerbside rubbish, 36,499 tonnes per annum, could have been diverted from landfill disposal by residents.

Table 21: Diversion Potential of Kerbside Rubbish – by TA (based on data 2019 – 2022)

Diversion Potential of Kerbside Rubbish (%)	Central Otago (based on 2020 SWAP)	Clutha (2022 SWAP)	Dunedin (assumed)	Queenstown Lakes (2019 SWAP)	Waitaki (assumed)
Recyclable paper	5.8	2.9	8.4	5.9	8.9
Recyclable plastic	0.9	1.4	2.5	1.7	2.8
Steel cans	0.6	0.7	0.8	0.5	0.9
Aluminium cans	0.3	0.3	0.4	0.2	0.4
Glass bottles/jars	5.2	13.1[31]	3.5	1.9	4.5
Food scraps	23.7	21.2	35.3	33.9	35.1

[31] Note that there is no kerbside glass recycling collection in Clutha, although these items have still been designatd as potentially divertible

Garden waste	20.3	29.9	18.7	18.2	17.0
Total	**56.9**	**69.6**	**69.6**	**62.2**	**69.7**

4.4 Other Waste Disposed of to Land

4.4.1 Farm Waste

In 2013, a study of farm waste management practices in Canterbury region provided data that enables estimates to be made of the quantity of non-natural wastes disposed of on rural properties.[32]

The Canterbury study found that 92% of farms use one of the 'three B' methods of waste management – bury, burn, or bulk storage on property. The Canterbury study calculated average annual tonnages of waste for four different types of farm. As farm waste from a specific type of farm is likely to be similar throughout the country, the data is considered to be suitable for application to other regions, by applying the waste data per farm to the number of farms of each type in a region. Data on numbers of farm types in each region in 2020 is available from Stats NZ.

Based on the data contained in the 2013 Canterbury study, an estimate of the quantity of waste disposed of in Otago Region is presented in Table 22. The categories are those presented in the study. 'Non-natural rural waste' includes materials such as scrap metal, treated timber, fence posts, plastic wraps and ties, crop netting, glass, batteries, and construction and demolition wastes. 'Organic waste' is not well-defined in the study and is only reported in the study as including 'crop residues'.

Table 22: Estimate of On-Farm Disposal of Waste - Reported Classifications

Farm wastes in Otago Region - 2020 Tonnes/year	Dairy	Livestock	Grape growers	Other arable	TOTAL
Number of farms	**612**	**252**	**36**	**2,391**	**3,291**
Non-natural waste	3,435	2,063	182	7,993	13,673
Domestic waste	338	19	0	2,410	2,767
Animal carcasses	5,416	4,895	0	3,269	13,580
Organic waste	6,510	28	331	1,587	8,456
TOTAL	**15,698**	**7,005**	**513**	**15,260**	**38,476**
Average per farm	**25.7**	**27.8**	**14.3**	**6.4**	**11.7**

[32] GHD (2013), *Non-natural rural wastes - Site survey data analysis*, Environment Canterbury Report No.R13/52

The 3,291 farms in the Otago region[33] are estimated to dispose, on-farm, of an average 11.7 tonnes of waste per farm per annum. In total, 38,476 tonnes of waste per annum are estimated to be disposed of in this manner across the region.

Using the raw data from the 2013 Canterbury study, the composition of farm waste in Otago Region in 2020, expressed in the standard SWAP classifications, has been calculated as shown in Table 23.

Table 23: Estimate of On-Farm Disposal of Waste - SWAP Classifications

Farm wastes in Otago Region - 2020	% of total weight	Tonnes per year
Paper	0.5%	210
Plastics	8.0%	3,096
Food and other putrescibles	*27.7%*	*10,658*
Garden and other carbon sources	*48.0%*	*18,488*
Putrescibles - subtotal	**75.8%**	**29,146**
Ferrous metals	2.4%	916
Non-ferrous metals	0.0%	4
Glass	1.9%	733
Textiles	0.1%	23
Nappies and sanitary	0.1%	42
Rubble	0.2%	71
Timber	10.5%	4,032
Rubber	0.0%	4
Potentially hazardous	0.5%	198
TOTAL	**100.0%**	**38,476**

Putrescible materials, which includes 'organic' waste and animal carcasses as per the 2013 Canterbury study, tree trimmings, wood chip animal bedding, and food waste in domestic rubbish, was the largest classification of farm waste, comprising 75.8% of the total weight. Timber was the second largest classification, comprising 10.5%. The timber classification incudes both treated and untreated processed timber.

4.4.2 Waste to Class 2-5 Fills

Section 2.1 describes the different types of facilities, as regulated by MfE.

[33] Stats NZ business demography for ANZSIC06 for 2020

As part of the process of extending the levy, MfE is currently identifying and cataloguing all landfills and cleanfills in New Zealand. While there are numerous Class 2-5 fills in the Otago region, the precise number has yet to be determined by MfE.

For this project, an Official Information Act request was made to MfE for the available information on Class 2-5 fills in the Otago region.

The Class 2-5 landfill sites identified by MfE in the Otago region are listed in Table 24. The table includes the address of each site as well as the materials that are accepted, based on either the resource consents for the site or on information gathered for this project.

Table 24: Class 2-5 Landfills in Otago Region

Territorial authority	Address	Accepted materials
Central Otago	Parkburn Quarry Site beside Lake Dunstan, near Cromwell	Cleanfill, up to 5% vegetation
Clutha	Kai Point Coal Mine, Kaitangata	Boiler ash, mine overburden
Dunedin	712 Kaikorai Valley Road, Dunedin	C&D waste, contaminated soil, other non-putrescible waste
Dunedin	13 Matanaka Drive, Waikouaiti	Eggshells, boiler ash
Dunedin	20 McLeods Rd, Dunedin	Greenwaste
Queenstown Lakes	Shotover Delta Rd, Queenstown	Cleanfill
Waitaki	Works Rd, Pukeuri	Cleanfill, boiler ash
Waitaki	Awamoa Road and Beach Road, Oamaru	Offal
Waitaki	McEneany and Steward Roads, Pukeuri	Soil, cleanfill

While most of the Class 2-4 sites, which includes C&D landfills and industrial disposal sites, are likely to have been identified by MfE through their resource consents; there may be Class 5 cleanfill sites that have not. Operation of a cleanfill site or greenwaste disposal site is a permitted activity under Otago Regional Council so often remains undocumented.

While the landfill sites identified by MfE include cleanfill sites in proximity to three of the major towns, there are also likely to be a number of unofficial cleanfill operations on farmland and in other isolated locations that serve the other towns.

Few Class 2-5 fills record the quantity of material they receive. Based on the information provided by MfE, only three of the resource consents for the sites listed in **Error! Reference source not found.** include conditions limiting the amount of material that can be accepted each year.

A small number of the sites have provided MfE and/or the project team with information on the quantity of material accepted. On the basis of this information, it is estimated that

approximately 100-200,000 tonnes of material are disposed of annually in Class 2-5 fill sites in the Otago region. A very high proportion of this material is inert, excavated soils and other natural materials. This figure does not include the overburden from Kai Point coal mine.

4.5 Diverted Materials

The data in Table 25, which was provided by diverted material reprocessors, only represents material from the Otago region that is managed within New Zealand and excludes exported material. This presents a particular gap for some diverted materials, such as plastic and fibre.

Table 25: Diverted Materials Reported by Reprocessors 2020

Reprocessed material	TOTAL (material in tonnes per annum)
Glass	
Bottles/jars	9,849
Organics	
Putrescibles (wet organics)	1,260
Greenwaste, wood waste, manure	2,520
Tyres	3,988
Fibre (paper, card)	
Mixed paper	450
Old corrugated cardboard	3,000
Construction & Demolition	
Aggregate	46,000
C&D	1,300
Scrap metal	10,000
Electrical and Electronic	133
Farm Plastics	470
Plastics (various grades)	642
TOTAL	**79,612**

The above table shows that an estimated 80,000 tonnes of material is recovered and processed from the Otago region annually within New Zealand, with over half of this accounted for by aggregates. An additional, unknown, quantity of material is exported for reprocessing.

Table 26: Waste to Disposal and Recovery (Excluding Exported Material)

Destination	Tonnage	Percent
Tonnes to Class 1 landfills	143,564	35%
Tonnes to Class 2-5 (est)	150,000	36%
Tonnes to rural disposal	38,476	9%
Recovery (excl. rural recovery)	79,612	19%
TOTAL	**411,652**	**100%**

The above data suggests that Otago recovers approximately 20% of the waste material generated with approximately equal quantities of material going to Class 1 and Class 2-5 disposal; not accounting for exported recovered materials.

5 Performance Measurement

5.1 Current Performance Measurement

This section provides comparisons of several waste metrics between the Otago region and other territorial authorities. The data from the other districts has been taken from a variety of research projects undertaken by Waste Not and Eunomia.

5.1.1 Per Capita Waste to Class 1 Landfills

The total quantity of waste disposed of at Class 1 landfills in a given area is related to a number of factors, including:

- the size and levels of affluence of the population;
- the extent and nature of waste collection and disposal activities and services;
- the extent and nature of resource recovery activities and services;
- the level and types of economic activity;
- the relationship between the costs of landfill disposal and the value of recovered materials;
- the availability and cost of disposal alternatives, such as Class 2-5 landfills/fills; and
- seasonal fluctuations in population (including tourism).

By combining Statistics NZ population estimates and the Class 1 landfill waste data in section 4.1.1, the per capita per annum waste to landfill in 2020 from the Otago region can be calculated as in Table 27 below. The estimate includes special wastes but excludes non-levied cleanfill materials.

Table 27: Waste Disposal per Capita

Calculation of per capita waste to Class 1 landfills	
Population (2020)	236,200
Total waste to Class 1 landfill	143,564
Tonnes/capita/annum of waste to Class 1 landfills 2022	0.608

This figure varies significantly throughout New Zealand. The table below compares the 2020 figure for the Otago region with other local authorities.

Table 28: Comparative Per Capita Disposal Rates

Overall waste to Class 1 landfills including special wastes	Tonnes per capita per annum
Gisborne 2017	0.283
Waimakariri 2017	0.325

Ashburton 2015	0.366
Waitaki 2022	0.466
Clutha 2022	0.505
Central Otago 2021	0.527
Invercargill 2018	0.528
Bay of Plenty 2017	0.529
Palmerston North 2017	0.545
Kapiti Coast 2017	0.546
Waikato 2017	0.552
Dunedin 2018	0.554
Tauranga and WBoP 2020	0.56
Napier/Hastings 2022	0.595
Wellington 2016	0.608
Otago region	***0.608***
New Zealand 2021	0.685
Taupo 2022	0.716
Hamilton 2017	0.718
Queenstown Lakes 2020	0.833
Hutt Valley 2022	0.899
Auckland 2016	1.053

Areas with lower per capita waste generation tend to be rural areas, or urban areas with relatively low levels of manufacturing activity. The areas with the highest per capita waste generation are those with significant primary manufacturing activity, and/or with large numbers of tourists, with the latter applying to a great extent to the Queenstown Lakes district.

5.1.2 Per Capita Kerbside Rubbish

It is also possible to calculate the amount of rubbish collected at the kerbside. This figure is particularly influenced by the method of kerbside collections, and how easy these are to use. If a kerbside rubbish collection service is convenient to use and has capacity (such as a large container, or frequent collections) then it is more likely to be well used – of course, the converse also applies.

Table 29: Kerbside-Collected Rubbish per capita

District/city and year of data	Kilos kerbside rubbish collected per capita per year	Commentary

Christchurch 2011	110	rates-funded fortnightly 140L wheelie bins (with weekly organic)
Gisborne 2017	122	rates-funded bags with stickers
Ashburton 2021	144	rates-funded weekly 80L wheelie bins, private wheelie bins
Whangarei 2017	153	user-pays rubbish bags and private wheelie bins
Auckland 2016	156	user-pays rubbish bags, rates-funded wheelie bins, and private wheelie bins
Waikato region 2017	156	Various
Bay of Plenty region 2020	160	user-pays rubbish bags, rates-funded wheelie bins, and private wheelie bins
Central Otago	168	Rates-funded fortnightly 240L wheelie bins
Taupo 2022	183	user-pays rubbish bags and private wheelie bins
Dunedin 2018	187	user-pays rubbish bags and private wheelie bins
Tauranga and WBoP 2019	192	user-pays rubbish bags and private wheelie bins
Queenstown 2020	195	rates-funded weekly 140L wheelie bin
Hastings/Napier 2022	197	rates-funded 120L wheelie bins and private wheelie bins
Hamilton 2017	197	rates-funded bags (two per hh max)
Wellington region 2014/15	206	user-pays rubbish bags and private wheelie bins
Clutha 2022	209	rates-funded fortnightly 240L wheelie bins
Palmerston North 2022	215	user-pays rubbish bags and private wheelie bins
Waitaki 2022	223	private wheelie bins

5.1.3 Summary

Waitaki and Clutha districts have higher quantities of rubbish collected at kerbside; however, these districts also have the lowest overall quantity of waste going to landfill. This suggests that householders and businesses are more likely to use kerbside collections to dispose of rubbish rather than transporting this to a transfer station or landfill.

6 Review of Waste Management and Minimisation Plans

As part of this Waste Assessment, a review has been carried out of all current WMMPs.

This has included a review of the vision, any supporting goals and objectives, targets, and action plans. The timeframes by which each WMMP needs to be reviewed (and when this Waste Assessment needs to be adopted) are:

Table 30: Review Dates for WMMPs

Council	Last Waste Assessment adopted	WMMP Review required by
QLDC	June 2018	June 2024
CODC	June 2018	June 2024
DCC	November 2018	November 2024
WDC	December 2017	December 2023
CDC	2017	June 2024

The table below summarises the visions, supporting goals/objectives, and targets of the five current WMMPs.

The action plans have also been reviewed but are included in appendices xxx to xxx for each individual council.

Table 31: Summary of Strategic Direction and Targets

	QLDC	CODC	DCC	WDC	CDC
Vision	(moving/working) Towards zero waste and a sustainable district	(moving/working) Towards zero waste and a sustainable Central Otago	that Dunedin "is actively committed to zero waste, inclusive of a circular economy, to enhance the health of our environment and people by 2040"	people in Waitaki choose to minimise and divert their waste to the greatest extent possible"	a district where the amount of waste created is minimised and the waste we do create is managed in a way which reduces harm and maximises benefits, which reflects Councils aspirational goal of zero waste
Goals (and supporting objectives)	G1 Improving the efficiency of resource use O1 Provide opportunities to minimise waste through reduction, reuse, recycling and recovery (in priority order) O2: Educate and support generators (residents, visitors, and businesses) with options and responsibilities	G1 Improving the efficiency of resource use O1 Provide opportunities to minimise waste through reduction, reuse, recycling and recovery (in priority order) O2: Educative producers and consumers about options and responsibilities	G1: Advocate, educate and enable waste minimisation, recycling and resource recovery O1: advocate for a holistic approach to waste minimisation and management which embraces the principles of kaitiakitaka (including the ethics of stewardship) and ki uta, ki tai. O2: Promote circular economies to maximise the use of products and resources. O3: Promote the stewardship of resources and the diversion of waste from landfill (reduce,	G1: To keep Waitaki people safe and healthy, and minimise waste O1: Ensuring appropriate and accessible waste management and minimisation services, facilities and education programmes are provided O2. Maintaining a user-pays approach to waste so that the majority of costs lie with the waste generator, and so that households and businesses can reduce their costs through increasing their waste minimisation and diversion O3. Considering the long-term costs and benefits	This vision was supported by two objectives, which are the same as the New Zealand Waste Strategy: 1. To reduce the harmful effects to the environment and public health from the generation and disposal of waste, and 2. To increase economic benefit by encouraging efficient resource use.

	QLDC	CODC	DCC	WDC	CDC
			reuse, repurpose) to protect the natural environment for future generations	(including social, cultural, economic and environmental) in all decision-making related to waste management and minimisation O4. Monitoring waste management and minimisation outcomes within the district and taking action where appropriate to meet our goals	
	G2: Reducing the harmful effects of waste O3: Avoid or mitigate any adverse effects on public health or the environment O4: Provide effective and efficient waste minimisation and management services supported by the right funding mechanisms	G2: Reducing the harmful effects of waste O3: Avoid or mitigate any adverse effects on public health or the environment O4: Provide cost-effective and safe waste services O5: Engage with the community on Council's progress	G2: Encourage social enterprise and commercial development O4: Build on initiatives to support circular economies O5: Reduce reliance on external markets for recyclable material O6: Facilitate regional and national market development	G2: To protect Waitaki's environment from harm O5. Managing incidents of littering and illegal dumping through education, monitoring and enforcement O6. Meeting health and environmental legislative requirements and consent conditions	
			G3: Collect information to enable informed decision-making	G3: To keep rates affordable O7. Maintaining or increasing levels of waste minimisation and diversion through ensuring	

	QLDC	CODC	DCC	WDC	CDC
			O7: Support and promote the National Waste Data Framework	households and businesses have access to effective information, services and facilities O8. Leaving provision of waste services to the private market, wherever practicable	
			G4: Minimise the harmful effects of waste O8: Protect both public health and the environment from the adverse effects of waste through regulation and upholding best practice standards	G4: To enable households and businesses to manage their waste costs O9: Collaborating with community providers, private businesses and other local authorities in order to ensure services, facilities and programmes are provided in the most cost-effective ways	
			G5: Provide infrastructure to meet goals and objectives		
Targets	Total waste to landfill (tonnes per year) Total waste diverted (tonnes per year) –	Total quantity of waste to landfill – incremental year on year reduction from 9,700 tonnes per year (not including biosolids)	Reduce municipal solid waste generation per capita by at least 15% by 2030 compared to 2015. Reduce the amount of municipal solid waste		Tonnes of residual waste collected via Council's kerbside collection service per year

	QLDC	CODC	DCC	WDC	CDC
	Consent compliance (%) Customer satisfaction (%) –	Total amount recycled – incremental year on year increase in tonnes per year from 2,000 tonnes per year Percentage of residents that are satisfied with the execution of the waste management and minimisation services – improve customer satisfaction with Council waste management and minimisation services to 90% (as measured by the annual residents' opinion survey)	disposed to landfill and incineration by at least 50% by 2030 compared to 2015. Increase the diversion rate away from landfill and incineration to at least 70% by 2030		Number of customers using transfer stations Average per customer kg bin weight of residual waste collected Tonnes of recyclables collected via kerbside collection service per year Number of annual contamination strikes Number of customers using recycling drop off facilities annually Tonnes of waste disposed of at Mt Cooee landfill per year Number of customers using Mt Cooee Number of students receiving waste minimisation education

	QLDC	CODC	DCC	WDC	CDC
					Number of electronic interactions per month with waste minimisation information provided by council Free Event recycling bin utilisation Attendance at Waste Minimisation events Compliance with resource consents for closed landfills
Key issues	The programmes of work considered were: 1. Status quo 2. Do minimum: provide minimum level of service to minimum legal requirements 3. More influencing: continue with current refuse and recycling collections and waste facilities	• Increasing percentage of kerbside refuse is being disposed of to landfill • Capacity of wheelie bins and frequency of kerbside collection services • Fees and charges for waste services • Meeting differing needs	The WMMP does include a summary of proposals described for a variety of services or facilities, including: • Kerbside collection services – noting demand to introduce an organic waste collection service • Landfill facilities – with ongoing demand for a facility that	1. Cost recovery at Council resource recovery parks (transfer stations) and Palmerston Landfill 2. Green waste management at RRPs and Palmerston Landfill 3. Planning for the future of Palmerston Landfill & Hampden landfills 4. Developing targeted waste	

	QLDC	CODC	DCC	WDC	CDC
	but increase education and regulation 4. More services: Provide more waste minimisation services and facilities and retain current education and engagement 5. Full council service: More waste minimisation services, facilities, education and regulation, with council providing full service supported by education and regulation 6. Focus on organics and glass: Provide more waste minimisation services and facilities that target organics	of rural and urban households and businesses • Biosolids disposal • Hazardous waste disposal • Construction and demolition waste going to landfill • Public place waste management	accepts municipal solid waste • Transfer station facilities – possible need for additional transfer stations to meet demand • Resource Recovery Centre – possible need to extend/additional RRCs to meet demand	minimisation/illegal dumping education 5. Ongoing support to the Waitaki Resource Recovery Trust 6. Ongoing support to community providers 7. Maximising rural township and urban recycling bins 8. Collaborating with other providers and local authorities 9. Maximising expenditure of Waste Minimisation Levy funding 10. Reviewing use of kerbside collection services 11. Reviewing and updating the Solid Waste Bylaw	

	QLDC	CODC	DCC	WDC	CDC
	and glass; and retain current education and regulation 7. Focus on C&D and glass: Provide more waste minimisation services and facilities that target C&D and glass; and retain current education and regulation				

6.1 Recommendation to Retain or Review WMMPs

With the recent release of Te rautaki para (the New Zealand Waste Strategy) and decisions relating to kerbside standardisation, along with the implications of other less significant central government work programmes, it is recommended that all councils of the Otago region revise their current WMMPs and consult with their communities on new proposed Plans.

7 Future Demand and Gap Analysis

7.1 Future Demand

There are a wide range of factors that are likely to affect future demand for waste management and minimisation. The extent to which these influence demand could vary over time and in different localities. This means that predicting future demand has inherent uncertainties. Key factors are likely to include the following:

- overall population growth;
- economic activity;
- changes in lifestyle and consumption; and
- changes in waste management approaches

In general, the factors that have the greatest influence on potential demand for waste and resource recovery services are population and household growth, construction and demolition activity, economic growth, and changes in the collection service or recovery of materials.

7.1.1 Resident Population

Population projections are shown in the following table:

Table 32: Resident Population Projections to 2048

Projection	2023	2028	2033	2038	2043	2048	Change 2023 – 2048: number	Change 2023 – 2048: average annual percent
Region	257,400	272,700	287,300	300,900	313,800	325,800	53,100	0.7%
QLDC[34]	51,800	57,700	63,400	68,900	74,200	79,400	21,700	1.5%
CODC	25,400	27,700	29,900	31,900	33,900	35,800	8,100	1.2%
CDC	18,950	19,650	20,300	20,900	21,400	21,700	2,050	0.4%
DCC	138,800	144,200	149,400	154,100	158,400	162,200	18,000	0.5%
WDC	24,400	25,500	26,400	27,300	28,100	28,900	3,400	0.5%

Resident population growth through to 2048 is expected to be primarily around the central plateau, with Queenstown Lakes and Central Otago districts both experiencing strong ongoing growth. Population around the coastal areas (Waitaki and Clutha districts, and

[34]

Dunedin city) is expected to increase in the short term, but then stabilise during the period 2028 – 2048.

The demographics of the region are expected to change as the impacts of an ageing population and the impacts of immigration are felt. With the elderly more likely to live alone, and the region's trend towards smaller households, the average household size is likely to reduce. This may be balanced to an extent by increasing medical waste associated with aged care.

7.1.2 Economic Activity

The Otago region has contributed around 4 to 4.3% of the national GDP over the last ten years. The economy relies heavily on two key sectors – primary production and associated manufacturing industries, and tourism. In the years to 2020, tourism growth contributed greatly to this, particularly through Queenstown airport to surrounding areas. The impact of COVID-19 pandemic management had a significant impact on this over the 2021 and 2022 years, with numbers now starting to pick up again in 2023.

The region has the 'Otago Regional Economic Development Framework', known as the ORED, which was developed collaboratively through an advisory group and completed in 2019[35].

The table below shows historical GDP for the Otago region.

Table 33: Historical Otago Region GDP

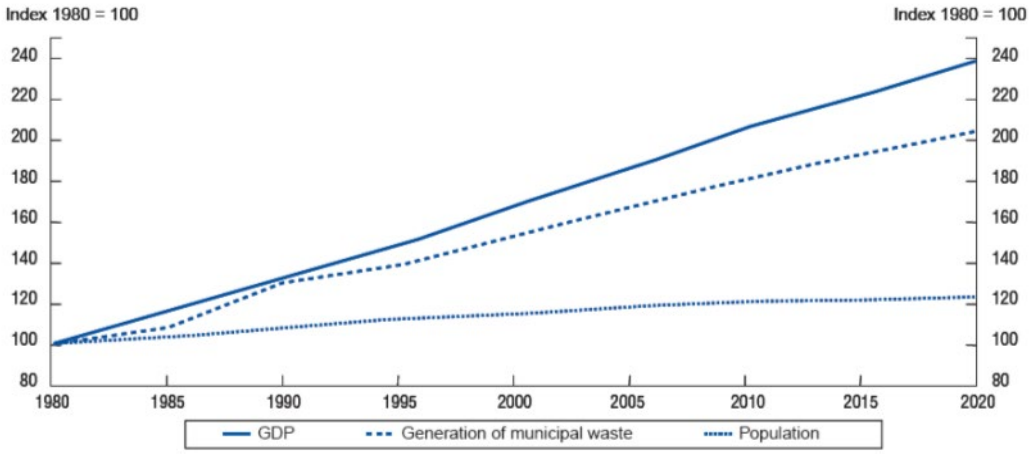
Year	2014	2//015	2016	2017	2018	2019	2020	2021	2022
GDP ($M)	10,015	10,243	10,944	11,835	12,802	13,566	14,298	13,922	15,336

GDP and waste production has been shown to have a strong relationship.

For reference, **Error! Reference source not found.** below shows the growth in municipal waste in the OECD plotted against GDP and population.

[35] https://www.qldc.govt.nz/media/oqxbrkp5/3b-final-ored-framework-30-july-2019-c.pdf

Figure 3: Municipal Waste Generation, GDP and Population in OECD 1980 - 2020



Source: OECD 2001.

Research from the UK[36] and USA[37] suggests that underlying the longer-term pattern of household waste growth is an increase in the quantity of materials consumed by the average household and that this in turn is driven by rising levels of household expenditure.

The relationship between population, GDP, and waste seems intuitively sound, as an increased number of people will generate increased quantities of waste and greater economic activity is linked to the production and consumption of goods which, in turn, generates waste.

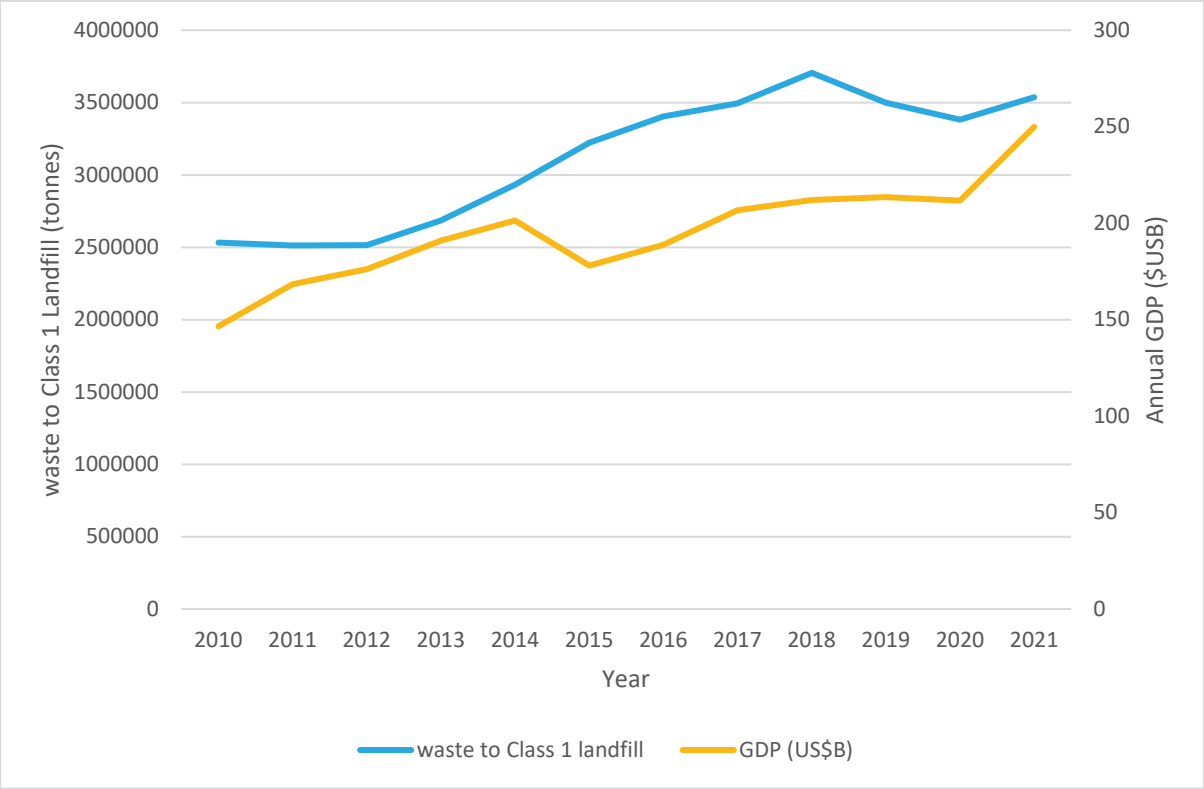
Total GDP is also a useful measure as it takes account of the effects of population growth as well as changes in economic activity. The chart suggests that municipal solid waste growth tracks above population growth but below GDP. The exact relationship between GDP, population, and waste growth will vary according to local economic, demographic, and social factors.

Figure 4 below shows the annual tonnes sent to Class 1 landfill disposal, against the annual GDP of New Zealand (in billions of US$). This relationship is not a complete picture, as Class 1 landfills tonnes are a subset of all waste disposed of in New Zealand, and this further does not represent waste produced, but only waste disposed of to Class 1 landfills. This data also can only be shown from 2010, as this was the first time that waste to Class 1 landfill disposal was measured accurately.

[36] Eunomia (2007), *Household Waste Prevention Policy Side Research Programme*, Final Report for Defra, London, England

[37] EPA, 1999. National Source Reduction Characterisation Report For Municipal Solid Waste in the United States

Figure 4: Waste to Class 1 Disposal and GDP (2010 - 2021)



As the Otago region's population is anticipated to experience steady growth, alongside economic growth, it is likely that the region will experience an approximately similar increase in waste generated assuming no change to waste behaviour or resource recovery rates.

7.1.3 Changes in Lifestyle and Consumption

Consumption habits affect the waste and recyclables generation rates. For example, there has been a national trend related to the decline in newsprint. In New Zealand, the production of newsprint has been in decline since 2005, when it hit a peak of 377,000 tonnes, falling to 276,000 tonnes in 2011.[38] Anecdotally, this has been accompanied by an increase in the use of printed direct mail ('junk mail') both in real terms and proportionally. This presents challenges for fibre recycling as this is a less desirable recycling commodity.

The ongoing growth in electronic devices will ensure that e-waste continues to be a growing waste stream, with (for example) data showing that households now tend to access the internet through multiple devices within the home and out, rather than a single home computer[39].

[38] http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10833117

[39] Data from www.stats.govt.nz 'Household Use of Information and Communication Technology' accessed September 2018

7.1.4 Changes in Waste Management Approaches

There are a range of drivers that mean methods and priorities for waste management are likely to continue to evolve, with an increasing emphasis on diversion of waste from landfill and recovery of material value. These drivers include:

- Te rautaki para / New Zealand Waste Strategy – with a strong focus on reducing emissions and waste, to achieve a more circular economy;
- New Zealand's first Emissions Reduction Plan with a number of actions for the waste sector including reducing the amount of organic going to landfill, including C&D, and a potential ban or limits on organic waste to landfill; along with improving waste data and landfill gas capture;
- infrastructure investment - an increased landfill levy and other funding sources will drive increased investment in waste infrastructure. MfE are currently working a long-term strategic waste infrastructure investment plan;
- increased cost of landfill - landfill costs have risen in the past due to higher environmental standards under the RMA, introduction of the Waste Disposal Levy (currently $30 per tonne for Class 1 disposal facilities) and the New Zealand Emissions Trading Scheme. The current price for carbon credits, and the ongoing increases in the landfill levy, will make disposal prices a more significant consideration in waste management practices;
- kerbside standardisation now requires that a standard list of materials is collected in kerbside recycling (including glass) and that kerbside food scraps collections are introduced, with associated performance standards for TAs based on kerbside diversion; this will increase existing community demand for kerbside services where they don't already exist;
- waste industry capabilities - as the nature of the waste sector continues to evolve, the waste industry is changing to reflect a greater emphasis on recovery and is developing models and ways of working that will help enable effective waste minimisation in cost-effective ways. COVID-19 pandemic management presents ongoing challenges in resourcing, both staff and vehicles;
- local policy drivers, including actions and targets in the WMMP, bylaws, and licensing; and
- recycling and recovered materials markets - recovery of materials from the waste stream for recycling and reuse is heavily dependent on the recovered materials having an economic value. This particularly holds true for recovery of materials by the private sector. Markets for recycled commodities are influenced by prevailing economic conditions, by commodity prices for the equivalent virgin materials, and by market controls in key destinations such as China. The risk is linked to the wider global economy through international markets, and the impact of the China National Sword policies has demonstrated this.

7.1.5 Summary of Demand Factors

The analysis of factors driving demand for waste services in the future suggests that demand will increase over time as a result largely of population growth and economic activity. It is likely that some new waste management approaches will be introduced as a result of the central government work programme, which could create demand in specific areas. Initial indications are that, for Otago, this new demand is likely to be largely related to efforts to

divert organic waste materials from landfill, including possible business food scraps diversion and recovery of construction wastes. There is also likely to be an increasing focus and demand in other waste activities and types, including:

- disaster waste – recent events have highlighted the need for proactive disaster waste management plans, particularly with respect to local resilience where there is reliance on waste infrastructure located elsewhere in the region, or outside the region;
- equity of service provision, particularly relating to the impact of user-pays rubbish collections on lower socio-economic communities, particularly considering the low benefit seen in increased waste diversion that might be assumed to result from a 'pay as you throw' approach;
- smaller but difficult waste streams such as soft plastics, packaging that isn't accepted in kerbside recycling collections, compostable packaging as replacements for what will become banned packaging items, farm wastes; and
- the impact of a possible future container return scheme.

7.2 Future Demand – Gap Analysis

The aim of waste planning at a territorial authority level is to achieve effective and efficient waste management and minimisation. The following high level key issues or gaps in meeting forecast demand have been identified, grouped into topic areas. These are discussed in more detail in the following sections.

Infrastructure

- The region has relatively low access to waste infrastructure, particularly material reprocessing;
- the performance of the MRFs in the region currently is an issue both in terms of material quality (Frankton and Dunedin) and capacity;
- Dunedin and Clutha's access to convenient landfill disposal in the medium- to long-term depends on consenting a new facility;
- planned landfill provision in the coastal area could be more efficient; and
- Class 2-5 landfill provision in the region is variable

Data and monitoring

- As is found in other areas, there is a significant data gap relating to private waste collections, Class 2-5 fills, and farm waste management practices.

Services

- Council service levels in some districts are lower – particularly Waitaki and, to a lesser extent, Clutha districts;
- variability in service provision generally reduces the opportunities for collaboration (regionally or nationally) on activities such as education, awareness raising, and behaviour change;
- contamination in household kerbside recycling collections is high; and
- the market share of household kerbside services held by councils is low in some areas. This may indicate that the services being provided by the councils is not

considered fit for purpose by their residents (e.g. a wheeled bin rather than a bag-based collection).

Specific materials

- A number of waste materials could be managed more in accordance with the waste hierarchy; particularly biosolids/sludges, C&D waste, non-household recyclables, agricultural wastes, glass, organic waste generally, and textiles; and
- many of the key issues described above relate to waste streams that originate in the commercial, industrial, institutional and construction sectors; which are very difficult for councils to influence alone

Leadership and Collaboration

- Relatively less resources and budget spent (by councils or other agencies) on waste prevention, reduction and reuse activities; compared to lower levels of the waste hierarchy such as recycling and reprocessing;
- contract timeframes across the region are variable, reducing the ability to collaborate and partner on procurement and service provision;
- there is no formal mechanism to jointly fund and collaborate on regional or sub-regional waste-related projects;
- the entire sector is currently struggling to recruit staff, and the operational sector is also experiencing significant delays with new vehicles and driver shortages;
- councils will need to contribute to planning for disaster waste management; and
- there is variability in strategic direction for waste across the region, particularly in relation to the council's role in providing waste management and minimisation services.

7.3 Infrastructure

7.3.1 Reprocessing Infrastructure

Several previous sections have highlighted the sheer distance from the Otago region to several key domestic reprocessing facilities; for example, fibre, glass, and soft plastics reprocessing options are almost completely located in Auckland. Other key reprocessing facilities are located in other parts of the North Island, such as PET and PP recycling in Wellington and the Hawkes Bay. While these materials are often transported a long distance for reprocessing, the Otago region is one of the furthest from these facilities (along with Westland and Southland).

The cost of transport, and the scale of reprocessing capacity domestically, also make it necessary to export some materials for reprocessing.

There is almost a complete lack of reprocessing facilities for organic waste and C&D waste – these are waste streams that do not lend themselves to being transported long distances.

The nearest shredders for metal recovery, and the only ones located in the South Island, are in Christchurch (although there is a logistics hub in Dunedin associated with one of those shredders).

If infrastructure can be located in the Otago region, there is potential for other regions that suffer from the same geographical issues as the Otago councils to become customers.

Future Post, for example, is very keen to establish other processing sites, in particular in the lower South Island (although they are also currently looking at a Christchurch location). The large viticulture and horticulture industry in central Otago could make this a very attractive proposition for them, and contribute to the sustainability goals of the industries involved.

Distance to reprocessing could make reusables schemes more feasible, as the cost of reusable systems in comparison to reprocessing is often stated as a key barrier. Active viticulture and brewing industries (in central Otago and Dunedin respectively) may be interested in the benefits of a refillable approach for local customers.

7.3.2 Recovery Infrastructure

Recycling processing infrastructure in Otago is currently problematic with the two main MRFs in the region (Frankton and Dunedin) overdue for replacement, while the MRF at WRRT in Oamaru is designed to handle only small quantities of material at a time (as most recyclables are hand sorted at site by customers).

There may be potential to explore consistent provision of MRF infrastructure across the region (although this would have to be in the context of existing contract arrangements). This could take the form of a single provider, or greater alignment in terms of standards, material acceptance, access, and markets. DCC is already planning an upgraded MRF for Dunedin at Green Island, to form part of the planned Green Island RRP; and QLDC is considering options for an upgrade of the Frankton MRF. If the WRRT site in Oamaru is ever required to handle large quantities of unsorted recyclables onsite, the MRF system will need significant upgrading.

7.3.3 Landfills

The landfill market is an important aspect of the picture. AB Lime recently received consent for receiving unlimited tonnage into its facility (although the facility footprint won't change); DCC is proceeding with plans to develop a landfill at Smooth Hill as a replacement for the Green Island landfill and also extending the consent for Green Island; CDC has applied to extend the current consent through to 2028 and is pursuing a 35 year resource consent for a new landfill at Mt Cooee; WDC is looking at options for Palmerston landfill, with a potential view to utilising more of the airspace at the facility before the consents expire. In addition, private operators are likely to consider options for disposal and send tonnages where it is going to be most cost effective. With the increase in the waste disposal levy and the increasing cost of carbon emissions through the ETS this is likely to change the current dynamic of which waste is sent where for disposal.

7.3.4 Resource Recovery Parks

Most of the TAs of the Otago region expressed an intent to develop some form of resource recovery park. QLDC is in the process of identifying a site that could potentially accommodate a full resource recovery park, transfer station and new MRF. Dunedin is looking to expand the operations at Green Island to become a resource recovery park, including construction and demolition waste sorting; CDC are looking to develop a RRP on its Mt Cooee Landfill site; and WDC has noted the lack of local C&D sorting, composting and high-volume MRF infrastructure (although there is a RRP in place collecting a very wide range of materials - over 40). There is an opportunity to coordinate and align RRP service provision to develop a high level of consistent service.

Done well, developing a coordinated network of regional resource recovery parks has the potential to catalyse a range of resource recovery activity. It can enable a range of product stewardship schemes to function effectively and efficiently, ensure consistency of service provision and messaging, which will help increase engagement and recovery rates, and potentially lower costs for recovery of a wider range of materials. It may also be possible to access central government funding to assist in the development of facilities.

The principles of a 'network' are discussed in detail in appendix A.5.0.

7.3.5 Sub-Regional Areas

The region can be split into two parts – a coastal zone consisting of Waitaki, Dunedin and Clutha, and an inland zone with Central Otago and Queenstown Lakes. The synergies that exist are mainly within these zones. QLDC, CODC and CDC also have more natural transport connections with Southland than with Dunedin/Waitaki. The potential for collaboration with Southland region should be taken into account.

In terms of processing infrastructure for a range of materials, there is potential to scale solutions for sub-regional approaches, while also if possible, seeking alignment in terms of standards, material acceptance, access, and markets.

7.4 Data and Monitoring

As with much of the country, there is a lack of data relating particularly to private sector operations, Class 2-5 landfills, and rural waste management in the Otago region. While two of the five councils have a solid waste bylaw in place, there is no provision for waste operator licensing and data collection.

7.5 Services

Council kerbside service levels vary – with WDC not providing any council kerbside services, and CDC not collecting glass. While this doesn't necessarily result in lower performance in waste diversion as other avenues are used (such as the WRRT in Oamaru) it means these councils are not currently aligned with the requirements for kerbside standardisation. Only CODC is compliant with the forthcoming requirements for food scraps collections, although Dunedin has new services planned and the other three councils are exploring options.

Variability in service provision, with different containers, materials, and frequencies, makes collaboration on regionally-consistent education and engagement campaigns on (for example) kerbside recycling contamination and organics diversion more difficult.

Market share held by councils in some areas is very low, or zero. This may indicate that the services provided by councils are not considered fit for purpose by their residents (e.g. a preference for a wheeled bin to a bag-based collection), and they instead choose to use a private sector collection service. This can pose a significant barrier to encouraging more desirable behaviour, as the private collections may not include a recycling service and the use of large (240L) wheeled bins reduces the household's diversion of recyclables and garden waste from landfill.

7.6 Specific Materials

7.6.1 Organics

Organic waste was the predominant waste stream to emerge from the analysis to date in terms of both current tonnage to disposal, and in terms of a focus for action. Kerbside food scraps is the largest single source of organic waste to landfill and has been targeted for action by Dunedin, Central Otago, and Queenstown Lakes councils. Organic waste from commercial and industrial sources was found to be relatively well managed in comparison, within the limited opportunities available, but there are some exceptions such as animal skins and ash.

There are a number of companies investigating the potential to establish operations in (or servicing) the region, and it may be possible to leverage these opportunities to achieve outcomes that align with the needs of the councils of the Otago region and beyond.

7.6.2 Construction and Demolition Waste

C&D waste is particularly an issue in Queenstown Lakes, Central Otago and Dunedin, and an increasing issue for Clutha district. While some recovery is occurring, the majority of C&D waste appears to be sent to some form of landfill disposal. There are likely to be opportunities to divert significant quantities of material.

Dunedin is planning to take measures to develop C&D waste sorting and diversion, and CDC is investigating the feasibility for C&D waste diversion as part of the Mt Cooee RTS design (to then feed into another facility for further processing/reprocessing). However, there are no significant planned activities in Queenstown Lakes and Central Otago. There may be opportunities to develop a consistent approach to C&D sorting and diversion in the region. While sub-regional facilities may be most sensible there is potential to align standards, material acceptance, access, and markets. It may also be possible to access central government funding to assist in the development of facilities.

7.6.3 Rural Waste

Nationally, rural wastes are estimated to account for up to 12% of waste disposed of.[40] There is very little information available regarding rural wastes and, unsurprisingly, little specific action targeting rural waste in current WMMPs. Rural waste is highlighted as it is an area that has not to date received the attention it most likely needs. Rural wastes are most commonly managed on-farm with material stockpiled, burned, and/or buried. There are very few controls over waste disposal on farm sites, and much of the material which is currently managed casually could be recycled or recovered, or properly disposed of. TA waste officers have highlighted to the regional council that management of waste 'on-farm' should be a key issue to consider and address through the development of the new Land and Water Plan.

[40]Ministry for the Environment. 2019. *Reducing waste: a more effective landfill levy – consultation document*. Wellington: Ministry for the Environment.

Further to this, the information from the Ernst & Young[41] study on regional carbon emissions suggests that rural wastes may be a substantial source of emissions from the waste sector (although Eunomia advises this requires further investigation and that the emissions are much lower than suggested).

The key issue is that current management methods are essentially no-cost and relatively convenient for farmers, as little or no sorting is required. Services that collect non-natural materials for recovery or proper disposal are likely to be costly due to the distances involved and remoteness from processing and consolidation points, and require farmers to sort different materials into a number of different containers for collection.

Current product stewardship programmes such as Agrecovery and Plasback apply charges to farmers that participate in the schemes.

There have been a number of trials of farm waste collection services nationally, and limited collection services occur in some areas (including Clutha and Queenstown Lakes district). In addition, there are steps being taken to develop regulated product stewardship schemes for farm plastics and agricultural chemicals and their containers, which will provide a more comprehensive approach with (potentially) no direct charges to the end-user at end of life. There is an opportunity to leverage these initiatives to support on-farm collection services for non-natural rural wastes that offers a high-quality collection service at below cost.

7.6.4 Textiles

Textiles are a material stream that has historically had a very low profile nationally. The recent focus on carbon reduction through waste management has increased this profile as textiles can contribute significantly to carbon impact assessments. Various national programmes exist to divert specific textile types (such as socks and cotton clothing) but these are capturing very small quantities and are unlikely to have the ability to cope with large quantities.

7.7 Leadership and Collaboration

Previous regional projects have highlighted the lack of structures and arrangements to progress collaboration projects. Several barriers are in place that make this difficult to improve, such as variable contract arrangements, expiry dates, and strategic approaches to waste.

As is commonly found nationally, collaborative actions tend to focus on the lower levels of the waste hierarchy, particularly recycling and reprocessing. The impact of (and therefore funding for) actions higher up the hierarchy such as prevention, reduction, and reuse initiatives is harder to define and measure/monitor.

Disaster waste is increasingly becoming an issue, as climate change drives more extreme weather events such as flooding and slips, along with other natural disasters (such as earthquakes). A regional approach to this might strengthen a response to events that are likely to have regional scale impact.

[41] https://www.orc.govt.nz/media/10129/otago-region-ghg-profile-report_v4.pdf

The waste sector is experiencing a range of resourcing issues for staff, affecting both TAs and the private/community waste sectors. TAs can support sector groups such as WasteMINZ and the Zero Waste Network in addressing barriers to new recruits joining the waste sector, and in making submissions to (in particular) vocational training organisations.

8 Statement of Options and Proposals

This section sets out the range of options available to the councils to address the key issues that have been identified in the previous section of this Waste Assessment. Options presented in this section would need to be fully researched, considered specific to each district, and the cost implications understood, before being implemented through each council's WMMP action plans and respective LTP/Annual Plan. Addressing these issues will ensure that the councils is meeting their statutory obligations, and improving waste management and minimisation in the Otago region.

8.1 Circular Resource Networks

A core principle incorporated in the options table following is that of the 'circular resource network'. This is a concept first developed in work carried out by Eunomia for the Ministry for Environment in 2021, and is included in the recently released 'National Resource Recovery – Infrastructure and Services Stocktake and Gap Analysis' referenced previously.

This concept is a way of implementing Circular Economy principles, which are a key part of Te rautaki para, in a practical resource recovery network infrastructure approach.

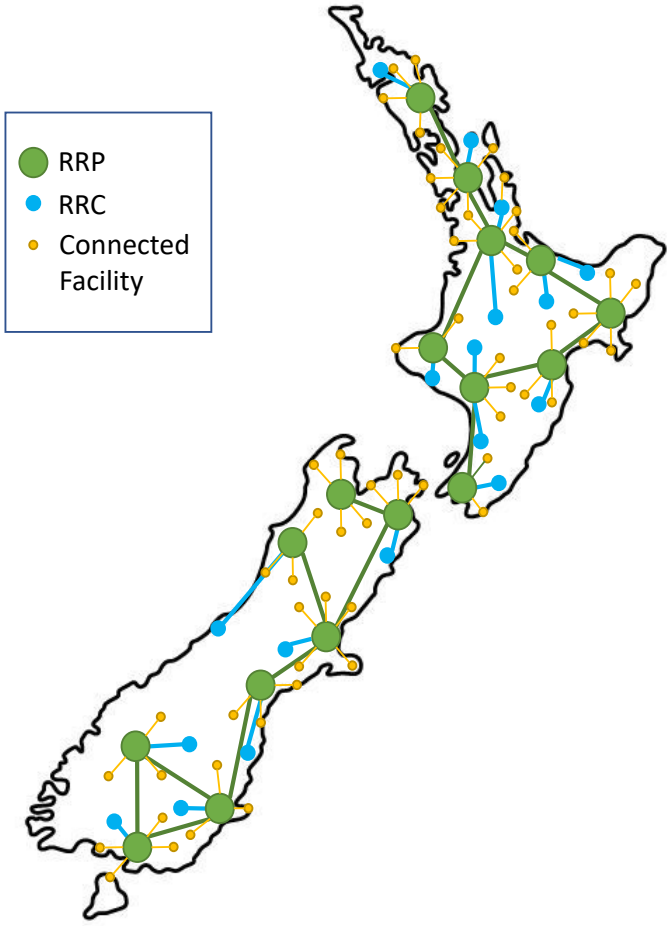
While the Circular Resource Network concept is explained in detail in appendix A.5.0, the key components of the system are explained here. Figure 13 below shows a high-level visual representation of a national resource recovery network.

The large green dots represent regional RR Parks that consolidate and process material at a regional level. Depending on the material stream, materials could also be transported between the regional hubs (for example glass being consolidated in Christchurch for shipping to Auckland for manufacture). Regional hubs could also specialise in processing certain materials and swap materials accordingly.

The mid-sized blue dots represent local RR Centres that accept a full range of materials and send to the regional RR Parks for bulking (or to Connected Facilities for local processing). Not shown are smaller drop off sites.

The small yellow dots represent the potentially hundreds of facilities that are not co-located at an RR Park or RR Centre but are linked and operate to the standards of the network. These facilities could accept materials from the RR Park or RR Centres for processing, or supply materials to these sites.

Figure 5: Concept Map of Circular Resource Network



The key roles and components of the system are:

RR Parks – Regional Hubs: The heart of each regional network consists of one or two large RR Parks, where a range of key functions are co-located. The purpose of the RR Park is to provide a 'hub' for the efficient regional consolidation of a wide range of materials collected at the RR Centre and Connected Facilities, as well as those that may be collected at the RR Park itself.

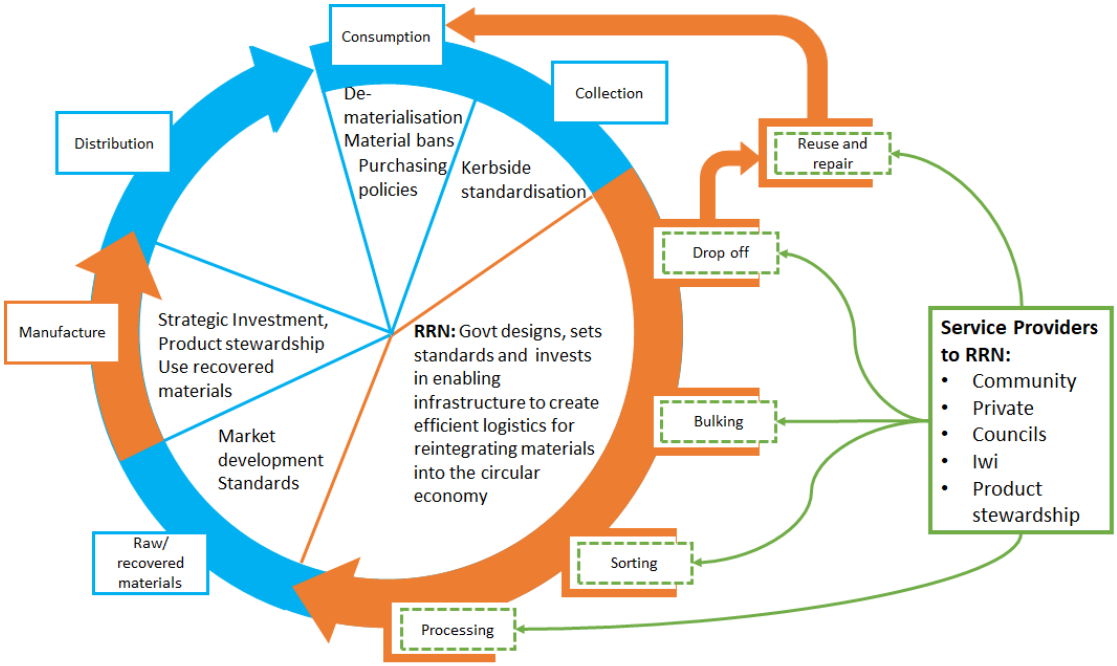
Local RR Centres: While the RR Parks are the hub of the regional networks, the RR Centre form the primary nodes, where the majority of material is dropped off and consolidated locally. Many RR Centres will start off as local transfer station sites that are upgraded and re-purposed to have a predominant focus on resource recovery.

Connected Facilities: While the heart of the circular resource network is the RR Park and RR Centre, a key feature of the circular resource network concept is the connection of potentially all resource recovery operations to the network. A range of resource recovery businesses that are not/do not need to be co-located at a network site are connected virtually. The facilities could be owned or operated by regional or national agencies, TAs, private sector, iwi, or community sector or through partnerships. As noted earlier, these

facilities would operate to the same standards as co-located facilities and could participate in the logistics and virtual network arrangements.

The figure below illustrates how the roles and functions of a national resource recovery network could integrate to provide key reverse logistics functions in the circular economy. The orange elements of the circle are the parts that form the circular resource network.

Figure 6: Roles and Functions of a Circular Recovery Network in the Circular Economy



In the above chart material flows around in a clockwise direction. The arrows represent the material flows. The boxes indicate the key steps within the value chain. The graphic shows how different providers to the can deliver all of the key functions, but within an overall connected framework (that is established and overseen by central/regional/local government).

8.2 Options Categorised by Work Area

These sections present the high-level options to address the key issues described above, broken down into the categories of regulation, measuring/monitoring, education/engagement, collections/services, infrastructure, and leadership/management. Options are presented this way as the role of TAs is likely to be fairly consistent within each of these categories and one option may address a number of key issues; also this enables the options to show a progression of options in one category with (for example) an increasing level of circular economy alignment.

The Councils' roles can be:

Strategic: Simply identify the need at a strategic level, with other sectors able to respond to the need as they wish

Facilitation/Leadership: Take a facilitation and leadership role in addressing the need, such as by creating working groups focusing on a particular material e.g. construction waste

Regulator: Use regulatory tools available to councils to create an environment that encourages solutions, such as requiring construction site waste management plans, banning certain materials from landfill, etc.

Funder: Influence the way gaps addressed by others by making funding available for specific initiatives that address the need in some way

Provider: Take direct action by providing services or facilities that address the need.

For each option, the following table identifies the key issue being addressed, the extent (to which the issue will be addressed), how the future demand will be met, and what Councils' role may be.

An example of how an option is described and how it links to the key issues is shown below:

Ref	Option	Issues Addressed	Impact on Current/Future Demand Alignment with Te rautaki para	Council's role
Reference number for when the detailed actions and options are considered for inclusion in the draft WMMP For example: Regulation 1 = R1.	High level description of an option that **addresses a key issue.** For example: Adopt consistent solid waste bylaws and implement provisions.	Detail of **how the option addresses a key issue.** For example: A bylaw will enable data collection from private waste operators, or, bylaws can restrict the use of 240L wheeled bins for private rubbish collections.	**Alignment with Te rautaki para** Statement of how this option would **address current and/or future demand.** For example: Gives access to better data, and encourages/enables better management of some waste streams. Statement of how this option is aligned with the Te rautaki para Phase 1 priorities.	as per the list above, with additional detail where applicable. For example, when setting local bylaws, Council is the ***Regulator.***

8.2.1 Regulation

Ref	Option	Issues Addressed	Impact on Current/Future Demand Alignment with Te rautaki para	Councils' Role
R1	Adopt consistent solid waste bylaws and implement provisions	Data collection by licensing waste operators and requiring reporting C&D waste management through construction site waste management plans Restrict use of 240L wheeled bins for private rubbish collections through licensing conditions (regulations can also relate to MUDs, event waste management, etc)	Having access to better data enables better management of waste streams and future identification of issues Te rautaki para goal 1 priority 1.1	Regulator

8.2.2 Measuring and Monitoring

Ref	Option	Issues Addressed	Impact on Current/Future Demand Alignment with Te rautaki para	Councils' Role
M1	Increase monitoring to provide data on participation and set out rates for all services, and monitor both organics and recycling collection for contamination, by locality	Improves understanding of the community's use of council services, particularly participation in the organic waste collections and types/causes of contamination in kerbside recycling	Will enable Councils to identify localities where there is low participation in services, or high contamination, and target education and engagement accordingly Te rautaki para goal 1, priority 1.3	Provider
M2	Increase monitoring where necessary to provide more information on commercial and industrial waste streams, and changes in Councils' data over time	Better quality data on wider range of waste types	Addresses some current gaps in understanding on certain waste streams. Better data could enable Council to improve and target services more appropriately Te rautaki para goal 1, priority 1.3	Regulator, Provider

8.2.3 Education and Engagement

Ref	Option	Issues Addressed	Impact on Current/Future Demand Alignment with Te rautaki para	Councils' Role
EE1	Identify opportunities for consistent, targeted, direct engagement that can be delivered where there is low participation in recycling and/or organic waste services, and/or high contamination	Reduce contamination in kerbside recycling (and therefore at MRFs) through education and engagement (E&E) Encourage participation in services such as kerbside recycling and organic waste collections	Need for education/ engagement (i.e. demand) is proactively identified and addressed Te rautaki para goal 3, priorities 3.1 and 3.2	Provider – deliver locally and/or employ a shared resource of 'waste educators' or similar to undertake direct targeted engagement across the region.

		E&E can be targeted in areas where it is needed, and where possible a region-wide campaign would be more effective and efficient		
EE2	Initiate wider engagement with industry, community, and other agencies through regional waste action groups (e.g. C&D, health, retail, industry) Where appropriate, a single nominated TA officer could become a topic specialist for the region	Improve the management of specific materials, moving up the hierarchy, by engaging with the sources – C&D waste, non-household recyclables, agricultural wastes, etc. Collaborate with the community and industry would improve their engagement, understanding, and awareness of waste issues, and enable closer relationships with other agencies such as Te Whatu Ora	Improved understanding of needs in the region and service gaps, and who is best to address them. Increased responsibility taken by various sectors for waste management within the community. Better understanding across the board of non-household waste management and opportunities to move up the hierarchy Te rautaki para goal 1, priority 1.5; goal 2, priority 2.4	Facilitation/Leadership, Funder, Provider Councils could initiate groups and facilitate, possibly with low-level funding for project work Councils could provide options that support these other sectors in moving up the hierarchy Interaction through a single TA officer for the region would be more effective than all individual TAs engaging with every sector
EE3	Work closely with mana whenua, community groups, social enterprise, non-government organisations etc to develop and enable locally-led waste minimisation engagement and education, and support existing initiatives locally such as Sharewaste and Foodprint	Reduce contamination in kerbside recycling (and therefore at MRFs) through education and engagement Encourage participation in services such as kerbside recycling and organic waste collections E&E can be targeted in areas where it is needed and delivered locally Improve the management of specific materials, moving up the hierarchy, by engaging with the sources – C&D waste, non-household recyclables,	Need for education/ engagement (i.e. demand) is proactively identified and addressed Increased responsibility taken by various sectors for waste management within the community. Better understanding across the board of non-household waste management and opportunities to move up the hierarchy Te rautaki para goal 1 priority 1.5; goal 3 priority 3.1 and 3.2	Facilitation/Leadership, Funder, Provider Councils should identify and facilitate collaboration with and between local groups to enable waste minimisation education and engagement.

		agricultural wastes, etc. and reducing environmental harm Collaborate with the community and industry would improve their engagement, understanding, and awareness of waste issues		

8.2.4 Collection & Services

Ref	Option	Issues Addressed	Impact on Current/Future Demand Alignment with Te rautaki para	Councils' Role
CS1	New council-contracted services are introduced to achieve a more consistent level of service across the region – mainly impacting on Waitaki and, to a lesser extent, Clutha (Dunedin have plans in place for new services, Central Otago began new services 1 July 2023)	Variation in service levels across the region – reducing the ability to collaborate in a number of areas	Service provision would be more closely aligned to demand. Demand would increase for suburban infrastructure, i.e. transfer stations and recycling centres Te rautaki para goal 2, priority 2.1; goal 5 priorities 5.2 and 5.3	Facilitation/leadership, Provider: Liaise with contractor to redefine service areas. Ensure transferred demand is met at recycling centres and transfer stations.
CS2	Ensure that the requirements of kerbside standardisation and performance standards are met – mainly impacting on Waitaki and, to a lesser extent, Clutha. Some small adjustments required for Dunedin and Central Otago; Queenstown Lakes requires food scraps collections	Variation in service levels across the region – resulting in variable levels of alignment with the requirements of kerbside standardisation	Kerbside services would be aligned with central government's kerbside standardisation requirements Demand from some householders in the region for extended kerbside services would be met Te rautaki para goal 2, priority 2.1; goal 5 priorities 5.2 and 5.3	Provider

CS3	Introduce a user-pays garden waste collection to urban areas where this is not already collected or plans are in place to do so (Queenstown, Waitaki, Clutha)	May encourage further diversion of green waste from landfill and reduce need for recycling centres and transfer stations	Demand appears to be moderate for this service, given the small quantities of garden waste that are present in rubbish bins Te rautaki para goal 7, priority 7.2	Liaise with contractors to facilitate provision of user-pays service
CS4	Where council-provided rubbish collections are provided, these should be funded through rates with restrictions on capacity and/or frequency	Contamination in kerbside collections is not reduced by user-pays rubbish collections Kerbside services are as consistent as possible	Encourages best use of existing diversion options such as kerbside recycling, home composting and organic waste collections (where available) Te rautaki para goal 5, priority 5.2	Provider - implement preferred collection methodology where possible – e.g. new or amended contracts
CS5	Provide access to kerbside services to the commercial sector on a user-pays basis	Will meet improve recycling diversion from the commercial sector by providing commercial premises that only need a household-type service with an easy option	Some increased diversion of commercial recycling and food waste services for those it is appropriate for. Te rautaki para goal 5 priority 5.2, 5.3; goal 7 priority 7.2	Provider - negotiate with contractor to provide service and administer customers
CS6	Support/introduce virtual trading marketplaces e.g. freecycle pages, Civilshare	Increase reuse of materials and diversion of target materials e.g. C&D waste	Meets demand for materials, and demand for increased reuse Te rautaki para goal 1, priority 1.5; goal 2, priority 2.4; goal 3 priority 3.2, goal 4 priority 4.1 and 4.3	Facilitate/leadership, and/or provision

8.2.5 Infrastructure

Infrastructure options have been categorised into infrastructure that addresses a specific material (such as C&D, or organic waste) and then into progressively increasing levels of alignment with circular economy principles and achieving a Circular Resource Network.

Ref	Option	Issues Addressed	Impact on Current/Future Demand Alignment with Te rautaki para	Councils' Role
		Infrastructure for specific materials		
IN1	Processing for C&D waste and provision for C&D deconstruction	Increased diversion of C&D waste	Meet demand for C&D waste diversion Te rautaki para goal 2, priority 2.3, 2.4; goal 4 priority 4.1; goal 5 priority 5.3; goal 6 priority 6.1; goal 7 priority 7.2 (where C&D waste is organic in nature)	Strategic and/or facilitation/leadership and/or funder and/or provider
IN2	Processing for organic wastes	Organic waste	Meet demand for organic waste diversion Te rautaki para goal 2, priority 2.3 and 2.4; goal 4 priority 4.1; goal 5 priority 5.3; goal 6 priority 6.1 (if anaerobic digestion was introduced for organic wastes); goal 7 priority 7.2	Facilitation/leadership and/or funder and/or provider
IN3	Processing for difficult materials e.g. soft plastics	Difficult material streams	Meet demand for regional processing of difficult materials Te rautaki para goal 2, priority 2.3 and 2.4; goal 4 priority 4.1; goal 5 priority 5.3	Strategic and/or facilitation/leadership and/or funder and/or provider
IN4	Take a regional approach to Class 1 landfill provision	Efficient Class 1 landfill provision	Ensure that landfill access for coastal TAs is efficient Te rautaki para goal 1 priority 1.5; goal 2 priority 2.4	Facilitation/leadership and provide required disposal facilities

Ref	Option	Issues Addressed	Impact on Current/Future Demand Alignment with Te rautaki para	Councils' Role
		Circular Resource Network – First steps		
		Te rautaki para goal 1 priority 1.5; goal 2 priorities 2.1, 2.3, 2.4; goal 4 priorities 4.1 and 4.3; goal 5 priority 5.3; goal 7 priority 7.2		
IN5	Provide for reuse stores, repair sites, community workshops, demonstrations and courses at key network sites	Access to infrastructure, consistent service levels, manage a wide variety of waste materials more in accordance with the waste hierarchy, facilitate collaboration	There will be better access to infrastructure across the region, with consistent provision of the various facilities, materials accepted, and education/engagement undertaken	Collaborate and/or facilitate/leadership and/or provision
IN6	Standardised signs and branding, material acceptance and quality standards, customer service	Supports many other initiatives	Supports actions to meet many key issues	Facilitate/leadership – direct provision
IN7	Provide space for product stewardship schemes collection points at network sites	Supports and enables diversion of several difficult materials Could support focus on higher levels of waste hierarchy (depending on PS system)	Enables better management of many difficult materials	Facilitate/leadership – direct provision
IN8	Provide for container reuse at network sites (eg collection space)	Supports focus on higher levels of waste hierarchy Supports better management of some difficult materials	Increases reuse of materials	Facilitate/leadership – direct provision
		Circular Resource Network – Extended		
		Te rautaki para (in addition to above) goal 2 priorities 2.2 (and more strongly supports 2.1, 2.3 and 2.4 than above); goal 4 priorities 4.2 (more strongly supports 4.1 and 4.3 than above); goal 5 priorities 5.2 and 5.4		
IN9	Establish regional hubs	Supports wider RR network, enables better material diversion	Provides an infrastructure hub/s for the efficient regional consolidation of	Facilitate/leadership – direct provision

Ref	Option	Issues Addressed	Impact on Current/Future Demand Alignment with Te rautaki para	Councils' Role
			a wide range of materials such as soft plastics, plastics excluded from kerbside recycling, bulky and reusable items, soft plastics, e-waste	
IN10	Provide for product stewardship programmes within network sites for bulking and processing	Supports and enables diversion of several difficult materials Could support focus on higher levels of waste hierarchy (depending on PS system)	Provides for better management of many difficult materials	Facilitate/leadership – direct provision
IN11	Use standard containers and logistics across all network sites	Supports and enables a number of other options by making capturing and diverting materials more straightforward and effective	Makes it easier for customers to use sites and increases the efficiency of capturing materials for recovery and transferring them between different parts of the Circular Resource Network	Facilitate/leadership – direct provision
IN12	Provide for container reuse at network sites (e.g. washing facilities)	Supports focus on higher levels of waste hierarchy Supports better management of some difficult materials	Increases reuse of materials	Facilitate/leadership – direct provision
		Circular Resource Network – Full **Te rautaki para – all of above, to a greater extent**		
IN13	Centralised coordination of network	Maximises efficiencies and consistency, supporting better management of a wide range of materials	TAs actively work towards having a comprehensive network of facilities supporting the collection and circular management of products and	Facilitate/leadership – direct provision

Ref	Option	Issues Addressed	Impact on Current/Future Demand Alignment with Te rautaki para	Councils' Role
			materials that supports a national network	
IN14	Collaboration on inter-regional logistics	Maximises efficiencies and consistency, supporting better management of a wide range of materials	Provides for better management of many materials	Facilitate/leadership – direct provision
IN15	Identify off-site re-processors and manufacturers and ensure that these parties are fully integrated and considered in the network design	Maximises efficiencies and consistency, supporting better management of a wide range of materials	Maximise the material types and quantities that can be diverted by ensuring that re-processors and manufacturers are fully considered in network design	Facilitate/leadership – direct provision
IN16	Extend the Circular Resource Network to include industrial symbiosis parks	Maximises efficiencies and consistency, supporting better management of a wide range of materials	Provides for better management of more materials by facilitating the co-location and development of more waste management options, particularly those further up the waste hierarchy	Facilitate/leadership – direct provision
IN17	Work with manufacturers & institutions to develop circular material models (e.g. product design, leasing systems etc.)	Maximises efficiencies and consistency, supporting better management of a wide range of materials	Supports the development and implementation of circular resource networks; locally, across the region, and supporting national work; moves up the waste hierarchy by supporting prevention and reduction of waste at source	Facilitate/leadership – direct provision

8.2.6 Leadership and Management

Ref	Option	Issues Addressed	Impact on Current/Future Demand Alignment with Te rautaki para	Councils' Role
LM1	Advocate to central government for extended producer responsibility	Implementation of product stewardship addresses problem waste streams at the source	Using the provisions in the WMA will help to ensure that the true cost of waste management of a product is reflected in its price. Product stewardship schemes for difficult waste streams such as e-waste and tyres will help Council provide management options for these waste streams. Te rautaki para goal 1 priority 1.1; goal 4 priorities 4.1, 4.2 and 4.3; goal 5 priorities 5.1 and 5.3; goal 7 priority 7.1	Facilitate/leadership - advocate to central government for stronger regulation and extended producer responsibility. Work with other councils and agencies to support similar lobbying efforts.
LM2	Respond to central government consultations, engagements, technical advisory groups, and information sharing opportunities	Otago-specific issues are considered and reflected in national strategies, plans, regulation, and actions	Ensures that central government work supports local/regional work, and that local/regional issues are recognised. Te rautaki para goal 1; goal 2 priorities 2.1 and 2.4	Facilitate/leadership - advocate to central government
LM3	Work closely with mana whenua, community groups, and the private sector to progress opportunities for increased waste reduction and diversion	TAs, mana whenua, community groups and the private sector working together will increase waste reduction and diversion	Encourage the community to be more involved in waste minimisation, and potentially reduce waste and increase waste diversion. Te rautaki para goal 1 priority 1.5; goal 2 priority 2.4; goal 4; goal 5 priorities 5.2, 5.3 and 5.4; goal 7 priority 7.1	Facilitate/leadership, funder: coordinate and support initiatives.

LM4	Continue to develop collaborative projects and work towards increasingly formal collaborative arrangements	Addresses the current lack of formal collaborative arrangements	Puts in place collaboration arrangements that are appropriate to the collaborative work agreed Te rautaki para goal 1 priority 1.5	Facilitate/leadership - negotiate and agree collaborative working arrangements
LM5	Support regional and national initiatives and organisations campaigning for better waste management and minimisation such as WasteMINZ sector groups and the TAO Waste Manifesto	Otago-specific issues are considered and reflected in industry work programmes and Otago councils are aware and informed of work at the national scale	Ensures that national scale work supports local/regional work, and that Otago councils are well positioned to make the most of opportunities from these national initiatives and organisations Te rautaki para goal 1 priorities 1.1 and 1.5; goal 2 priorities 2.1, 2.2 and 2.3; goal 4 priorities 4.1, 4.2 and 4.3; goal 5 priorities 5.1 and 5.3; goal 7 priority 7.1	Facilitate/leadership: be involved, coordinate and support initiatives.
LM6	Support regional and national projects improving waste management planning in disaster situations	Proactive planning in place for disaster waste	Proactive planning in place for disaster waste Te rautaki para goal 1 priority 1.5	Facilitate/leadership - provide information as requested, and any other input required.
LM7	Support national sector organisations in lobbying for better vocational training and to encourage new recruits to the sector	Otago-specific issues relating to staff and vehicle resources are incorporated in national-level work and addressed at a national level	Ensures that Otago-focused issues are incorporated in national-level work on these issues Te rautaki para goal 1 priority 1.5; goal 2 priority 2.1; goal 5 priority 5.2	Facilitate/leadership – provide support and information to national sector organisations.

8.3 Summary Table of Potential Scenarios

The above options can form an almost infinite number of combinations. To simplify consideration of the options, high level scenarios with logical combinations of the above options are laid out in the table below. These scenarios are for illustration only and can be fine-tuned and amended for draft WMMP action plans.

Scenario Name	Regulation	Measuring & Monitoring	Education & Engagement	Collections & Services	Infrastructure	Leadership & Management
Business as Usual (compliance with regulation and kerbside standardisation)	Each council makes its own decision on whether to have a solid waste bylaw, and these are implemented independently	Current levels of measuring and monitoring are continued	Each council continues their current education and engagement programmes, with the addition of communicating service changes	WDC introduce kerbside recycling and food scraps to Oamaru only CDC introduce glass collections only to Balclutha and Milton QLDC introduce food scraps collections to required areas CODC and DCC make minor amendments to comply with kerbside standardisation	Councils work independently to develop infrastructure required to accommodate new services, and continue existing collaborative projects	Councils continue to meet as a SOWN network, and continue discussions on potential collaborative initiatives as a region Councils largely engage with central government and national bodies individually on a reactive basis
First steps towards a Circular Economy	As above	Current levels of measuring and monitoring are continued, along with increased monitoring of participation/set out rates and contamination	Each council extends current education and engagement programmes to include targeted campaigns to increase participation and reduce	Each council extends access to kerbside collections to businesses, on a user-pays basis Each council supports virtual material	Each council considers sources of waste materials in the area other than kerbside collections (such as organics, recyclables) when planning and	Each council proactively engages with national government and bodies Councils commit to ongoing meetings as an Otago network

Scenario Name	Regulation	Measuring & Monitoring	Education & Engagement	Collections & Services	Infrastructure	Leadership & Management
		Increased monitoring and analysis of non-household waste streams and Councils' data	contamination in kerbside services Each council engages more with other sectors e.g. C&D, health, retail, industry	trading systems locally	developing infrastructure The Circular Resource Network approach is incorporated where possible	and discussions of collaborative opportunities
Moderate collaboration, Circular Economy	Each council makes its own decision on whether to have a solid waste bylaw, but this is based on a standard template and some common areas are implemented collaboratively (such as guidance for events waste management)	As above, with Councils collaborating on monitoring and analysis of non-=household waste streams where appropriate	Rather than individual councils engaging with other sectors, this is done at a regional level, perhaps with each TA taking responsibility for a sector Branding and content of communications materials is consistent as far as possible Education and engagement on common issues are coordinated regionally	Details of services are aligned where possible to enable collaboration Collections are provided to areas other than 'small urban', where this can be done efficiently Additional collection services are offered other than those required, e.g. garden waste collections (user pays) and kerbside refuse (Waitaki) Councils collaborate to support virtual material trading systems	Councils collaborate when developing infrastructure and identify opportunities to share facilities where appropriate The Circular Resource Network approach is used as a template and infrastructure projects are proactively designed to align with this Smaller and community-led infrastructure is supported and integrated where possible	Otago Councils collaborate on national engagement, e.g. responding to submissions, engaging in technical advisory groups Otago Councils have a formal collaborative working arrangement and identify priority projects to deliver through this group

Scenario Name	Regulation	Measuring & Monitoring	Education & Engagement	Collections & Services	Infrastructure	Leadership & Management
High collaboration, Full Circular Economy	Councils agree to adopt a consistent solid waste bylaw, enabling regional implementation (such as waste operator licensing and data collection)	Councils work jointly collecting data from waste operators, and identifying issues and options from this information Councils jointly lobby for access to centrally-held data (e.g. levy and information reporting)	There is a shared regional resource that engages with these sectors, with regular proactive discussion on waste management and minimisation opportunities Councils consistently and proactively engage with target communities to minimise contamination	Household kerbside refuse collections are consistently and largely rates-funded across the region to maximise participation in council diversion services Virtual material trading systems are supported by a regional resource	A Circular Resource Network is proactively designed for the region, and any infrastructure projects are designed to fit with this Network. This extends to all levels of scale, with smaller and community-led infrastructure actively encouraged and prioritised over larger commercial infrastructure, where appropriate	The Councils share a joint resource to coordinate regional collaboration, and commit a portion of funding to deliver priority collaborative projects. The Councils engage at a national level in a collaborative way, with individual TA officers able to represent a considered regional view

The options identified and the Councils' possible role in meeting forecast demand comprise a range of proposals. The specific actions and timeframes for delivery will be identified through the development of draft Waste Management and Minimisation Plans, and will be dependent on the strategic direction preferred by each TA; the extent of collaboration that is desirable and possible; and the resources available to each TA.

It is expected that the implementation of the preferred options from these proposals, as will be set out in the Councils' draft WMMPs, will meet forecast demand as well as support the Councils' goals and objectives for waste management and minimisation and support the phase 1, 2 and 3 goals of Te rautaki para. These goals and objectives will be confirmed as part of the development and adoption of the draft WMMPs.

8.4 Statement of Extent

In accordance with section 51 (f), a Waste Assessment must include a statement about the extent to which the proposals will (i) ensure that public health is adequately protected, (ii) promote effective and efficient waste management and minimisation.

8.4.1 Protection of Public Health

The Health Act 1956 requires councils to ensure the provision of waste services adequately protects public health. The Waste Assessment has identified potential public health issues, and appropriate mechanisms to manage these risks would be a part of any implementation programme.

In respect of Council-provided waste and recycling services, public health issues are and will continue to be addressed through setting appropriate performance standards for waste service contracts and ensuring performance is monitored and reported on, and that there are appropriate structures within the contracts for addressing issues that arise.

Privately-provided services can be regulated through local bylaws where necessary.

Uncontrolled disposal of waste, for example in rural areas and in cleanfills, can be regulated at a local, regional and central government level. Recent regulation adopted by government has extended both levy requirements and information reporting requirements to a wider range of facilities, and TAs will work with the regional council to ensure that waste issues are reflected appropriately in the developing regional plan/s.

It is considered that, subject to any further issues identified by the Medical Officer of Health, the proposals would adequately protect public health.

8.4.2 Effective and Efficient Waste Management and Minimisation

The Waste Assessment has investigated current and future quantities of waste and diverted material, and outlines the Councils' potential roles in meeting the forecast demand for services.'

It is considered that the process of forecasting has been robust, and that the Councils' intended role in meeting these demands is appropriate in the context of the overall statutory planning framework for the Councils.

Therefore, it is considered that the proposals would promote effective and efficient waste management and minimisation.

9 Statement of Councils' Intended Role

9.1 Statutory Obligations and Powers

Councils have a number of statutory obligations and powers in respect of the planning and provision of waste services. These include the following:

- under the WMA each Council "must promote effective and efficient waste management and minimisation within its district" (s 42). The WMA requires TAs to develop and adopt a Waste Management and Minimisation Plan (WMMP);[42]
- the WMA also requires TAs to have regard to the New Zealand Waste Strategy, Te rautaki para;
- under Section 17A of the Local Government Act 2002 (LGA) local authorities must review the provision of services and must consider options for the governance, funding and delivery of infrastructure, local public services and local regulation. There is substantial cross over between the section 17A requirements and those of the WMMP process in particular in relation to local authority service provision;
- under the Local Government Act 2002 (LGA) Councils must consult the public about their plans for managing waste;
- under the Resource Management Act 1991 (RMA), TA responsibility includes controlling the effects of land-use activities that have the potential to create adverse effects on the natural and physical resources of their district. Facilities involved in the disposal, treatment or use of waste or recoverable materials may carry this potential. Permitted, controlled, discretionary, non-complying and prohibited activities and their controls are specified within district planning documents, thereby defining further land-use-related resource consent requirements for waste-related facilities;
- under the Litter Act 1979 TAs have powers to make bylaws, issue infringement notices, and require the clean-up of litter from land;
- the Health Act 1956 provisions for the removal of refuse by local authorities have been repealed by local government legislation. The Public Health Bill is currently progressing through Parliament. It is a major legislative reform reviewing and updating the Health Act 1956, but it contains similar provisions for sanitary services to those currently contained in the Health Act 1956;
- the Hazardous Substances and New Organisms Act 1996 (the HSNO Act) provides minimum national standards that may apply to the disposal of a hazardous substance. However, under the RMA a regional council or TA may set more stringent controls relating to the use of land for storing, using, disposing of or transporting hazardous substances; and

[42] The development of a WMMP in the WMA is a requirement modified from Part 31 of the LGA 1974, but with even greater emphasis on waste minimisation.

- under current legislation and the Health and Safety at Work Act the Councils have a duty to ensure that its contractors are operating in a safe manner.

The Councils, in determining their role, need to ensure that their statutory obligations, including those noted above, are met.

9.2 Overall Strategic Direction and Role

The role taken by Councils in implementing the options described in the previous section can vary significantly, for example Councils can:

- simply identify the need at a strategic level, with other sectors able to respond to the need as they wish;
- take a facilitation and leadership role in addressing the need, such as by creating working groups focusing on a particular material e.g. construction waste;
- regulator - use regulatory tools available to Councils to create an environment that encourages solutions, such as requiring construction site waste management plans, banning certain materials from landfill, etc;
- influence the way gaps are addressed by others by making funding available for specific initiatives that address the need in some way; and/or
- take direct action by providing services or facilities that address the need.

The overall strategic direction and role is presented in the Waste Management and Minimisation Plans.

Appendices

A.1.0 Medical Officer of Health Statement

4 July 2023

Te Whatu Ora
Health New Zealand

Lisa Eve
Eunomia Research & Consulting Ltd
PO Box 78 313
Grey Lynn
Auckland 1245

Tena koe Lisa

Medical Officer of Health Review of Otago Region Waste Assessment 2023
The Waste Minimisation Act 2008 requires that each Territorial Authority (TA) must review its Waste Management and Minimisation Plan (WMMP) at intervals of not more than six years after the last review (s50(1)). In doing so, it must make a waste assessment before conducting the review (s50 (2)). In making a waste assessment the TA must consult the Medical Officer of Health (s51(5)(b)).
A waste assessment must contain, amongst other things (sl(f)(i)), a statement about the extent to which the proposals contained in it will ensure that public health is adequately protected.

The following feedback is provided on the Draft Waste Assessment prepared for the Otago region (covering Queenstown Lakes, Central Otago, Clutha and Waitaki Districts, and Dunedin City) by Eunomia Research & Consulting Ltd.

1.0 General Comments

The Medical Officer of Health (MOoH) is supportive of the collaborative approach taken by TAs in the Otago region. However, the MOoH also recognises that individual TAs may have specific requirements depending on population demographics and waste streams and this will need to be taken into consideration.

It is also noted that consultation with Aukaha and Te Ao Marama has not yet occurred, and this will be important to fully inform this assessment.

The Waste Assessment is comprehensive and will be a valuable tool in the development of an Otago Waste Management and Minimisation Plan. From a public health perspective, the sanitary collection, disposal and ongoing review of waste streams is crucial for the following reasons:

- Disease prevention and control (i.e., pathogenic wastes, and reducing attraction to and containment of human disease vectors e.g., rats and mosquitoes).
- The control of leachate that may have an impact on the environment and public health.
- Prevention and control of nuisances created from dust, odour, and insects (e.g., wasps, flies, cockroaches) and inappropriate disposal of waste (i.e., illegal dumping, hoarding and burning).
- Public safety in terms of access in thoroughfares and exposure to physical solid waste.
- Direct health risks from hazardous materials (e.g., asbestos, heavy metals).
- Sustainability — best use of waste for the right purpose (e.g., economic benefits contributing to a healthy economy).
- Equity considerations (i.e., accessibility for all residents/ratepayers to an available and reliable waste disposal service).
- Future population demands and consumption rates on the current system and mitigation strategies.
- Climate change and impact on health - the contribution of effective waste management and minimisation in reducing greenhouse gas emissions (as well as reducing landfill size).
- Disaster waste management plans to support and enhance local resilience.

It is noted that the assessment has given regard to the Aotearoa New Zealand Waste Strategy 2023 and the guiding principles of Te rautaki para I Waste strategy.

Comments by chapter

2.0 1. Introduction

This provides a comprehensive overview of the current waste management system in Otago and will serve as a useful reference for the future.

3.0 2. Waste Infrastructure

It is clear from this assessment that Councils use different processes and end receiving points for waste across Otago and this includes disposal out of the region, in some instances. Recycling and recovery are carried out in various ways and to various degrees, by individual TAs and some thought is required to provide consistency in process, treatment and possibly end points across the region (standardisation). In this way synergies can be created and processes that are more efficient (and have a recycling component and or reuse) can be utilised. The goal is to build a Circular Waste Economy across the region and meet both the current legislative requirements under the Waste Minimisation Act 2008 and the goals of the Ministry for the Environment alongside the Aotearoa NZ Waste Strategy 2023.

With new and reconsented landfills in the region meeting current controlled landfill standards, Otago is in a good position to consolidate disposal options and alleviate the requirement for Councils to run smaller less controlled landfills across the region. This will in turn ensure that economies of scale in waste recovery are utilised. We note that AB Lime has a landfill that has no limit on consent volumes and can receive waste not otherwise able to be disposed of within some Otago Councils own facilities (e.g., Clutha District Council, Waitaki District Council). Similarly, AB Lime could be considered by Clutha if their own landfill at Mt Cooee fails to obtain consent.

It is noted there is currently only limited plastics recycling with biosolids going to landfill, as well as gaps in reprocessing for organics and construction and demolition waste. Most material types are transported out of the region for recycling/reprocessing which in turn may make cost-benefit consideration of recycling marginal. However, this should be continually reviewed in the event of new technologies, or other options becoming available.

4.0 3. Waste Services

Currently, there is no kerbside collection for food scraps or garden waste. Although it is noted that this commenced on 1 July 2023 in Central Otago District Council with waste being sent to Redruth Recovery Park Timaru; Dunedin's new kerbside collection services are scheduled to start 1 July 2024.

The segregation and removal of organic (food) wastes using a multi bin system is a huge change for the areas having this implemented (such as Dunedin/Central Otago) but it will be necessary under the Aotearoa New Zealand Waste Strategy 2023 to divert as much organic material from the landfill as possible and reduce the production of biogenic methane. This new service will require a supporting community education programme.

It is noted that Green Island landfill consent expired in October 2023 with an extension being sort for 2029/30 to allow for the development of the future Dunedin Landfill (Smooth Hill). Smooth Hill Landfill is consented but won't be operational until around 2029, and it will be important to have appropriate measures in place to manage the risk of bird strike at Dunedin Airport.

Rural landfills/farm waste and private waste contractors can be controlled through the creation of Bylaws and the new Regional Land and Water Plan for Otago. In this way the future of waste disposal in Otago that meets current legislative needs and goals and protects Public Health, is well assured.

There appears to be good uptake of waste education and minimisation programmes, however, these will need continued support and delivery.

5.0 4. Situation Review

It will be important to have ongoing measurement of waste streams i.e., what quantity of what stream is going where, what needs to be recycled and what needs to be monitored? An ongoing audit will need to be considered.

Little consideration has been given to the potential reuse of wastewater sludges, and potential application of biosolids to land.

5. Performance Measurement

It is noted that Queenstown Lakes District Council (QLDC) have higher per capita disposal rates (0.833 compared to NZ 2021 0.685 and Otago 0.608). In the case of QLDC this likely relates to large numbers of tourists and construction and demolition waste. We understand that QLDC is looking at establishing targets in relation to their very high tourist numbers, which will be benchmarked against other areas in New Zealand with high tourist numbers. In view of this, QLDC may need to look at further specific strategies to address their unique waste situation.

The carbon footprint of waste management related operations may be difficult to quantify, given the current and future transboundary movement across TAs and regions. Consideration will have to be given as to how best to measure this. Consideration will also need to be given as to whether this may represent a false economy ie shifting the issue of waste disposal to another jurisdiction, outside of the region, to effectively manage.

6.0 6. Future Demand and Gap Analysis

The MOoH supports the recommendation for all TAs to revise current WMMPs and consult with communities (including iwi) on their new proposed plans. This needs to include medical waste which may have health and safety concerns for collecting and processing staff and may need further definition by TAs.

The importance of TAs investing in their waste workforce is also noted. This will be important in achieving desired outcomes.

7.0 7. Review of Waste Management and Minimisation Plans

Previous individual TA WMMPs have varying degrees of recognition of the importance of Public Health Protection and the involvement of the Medical Officer of Health. We expect a clear statement re public health protection in the finalised WMMP, and acknowledgement of the involvement of the MOoH as required under the Waste Minimisation Act 2008.

TA Long Term Plans should support the resultant WMMP and demonstrate adequate funding and progress against set milestones.

8. Statement of Options and Proposals

The MOoH encourages TAs to consider the options in 8.2 and 8.3, which provide a number of strategies for consideration and work towards a circular economy. It is anticipated that they will all have a positive impact on Public Health.

10 For information

Note that the Code of Practice for Unsealed Radioactive Material has recently been updated (31 July 2020) and replaces CSP 1 (use of unsealed radioactive material). An important consideration of this type of radioactive material is disposal, and the IAEA International Basic Safety Standards requires regulatory bodies to set out acceptable values for disposal. Therefore, this code imposes clear disposal obligations in Appendix 3: Waste Disposal of this code. This may not impact on TAs, as most of the radioactive waste generated by hospitals/medical facilities have a short half-life (measured in hours and days) and is stored until it decays, so that at the time of disposal it is not radioactive — but is provided here for completeness. Refer: Code of Practice for Unsealed Radioactive Material I Ministry of Health NZ

Recommendations

The Medical Officer of Health recommends that all TAs:

1. continuously review reprocessing collection and infrastructure of plastics/other recyclables as technology and economics allow. This includes ongoing audits to inform current practice.

2. engage more closely with private operators to obtain better information on waste quantities generated.

3. review potential opportunities for the use of biosolids on an ongoing basis.

4. communicate and engage with their communities (including iwi) on any changes to existing services, waste streams and recycling kerbside collections. This includes the ongoing review and development of waste education and minimisation programmes that engage with businesses and schools.

5. review workforce planning in relation to delivering waste management programmes.

6. work towards standardisation of waste management practices across Otago. This will help realise economies of scale that may be possible — particularly in relation to recyclables.

Conclusion

The Medical Officer of Health — Southern supports this Otago Waste Management Assessment and compliments Eunomia Research & Consulting Ltd for the thoroughness of their assessment.

The WMMP will need to show a clear direction/change in practice that demonstrates a more efficient use of resources and waste diversion.

We hope these comments assist with the development of the WMMP and look forward to seeing the Plan(s) finalised, resulting in further improvements in waste management across the region.

Ngä mihi

Dr Michael Butchard
Äpiha o te Hauora I Medical Officer of Health
Southern I Te Waipounamu I National Public Health Service

Te Whatu Ora - Southern
Private Bag 1921, Dunedin 9054
Waea: 03 476 9800

Te Whatu Ora - Southern
PO Box 1610, Invercargill 9840
Waea: 03 211 8500

Te Whatu Ora - Southern
PO Box 2180, Whakatipu, Queenstown 9349
Waea: 03 450 9156

A.2.0 Glossary of Terms

Class 1-5 facilities	Classification system for facilities where disposal to land takes place. The classification system is provided in appendix A.3.0 below for reference.
Cleanfill	A cleanfill (properly referred to as a Class 5 fill) is any disposal facility that accepts only cleanfill material. This is defined as material that, when buried, will have no adverse environmental effect on people or the environment.
C&D Waste	Waste generated from the construction or demolition of a building including the preparation and/or clearance of the property or site. This excludes materials such as clay, soil and rock when those materials are associated with infrastructure such as road construction and maintenance, but includes building-related infrastructure.
Diverted Material	Anything that is no longer required for its original purpose and, but for commercial or other waste minimisation activities, would be disposed of or discarded.
Domestic Waste	Waste from domestic activity in households.
ETS	Emissions Trading Scheme
ICI	Industrial, commercial, institutional
Landfill	A type of disposal facility as defined in S.7 of the Waste Minimisation Act 2008, excluding incineration. Includes, by definition in the WMA, only those facilities that accept 'household waste'. Also referred to as a Class 1 landfill.
LGA	Local Government Act 2002
Managed Fill	A Class 3 disposal site requiring a resource consent to accept well-defined types of non-household waste, e.g. low-level contaminated soils or industrial by-products, such as sewage by-products.
MfE	Ministry for the Environment

MRF	Materials recovery facility
NZ	New Zealand
Putrescible, garden, greenwaste	Plant based material and other bio-degradable material that can be recovered through composting, digestion or other similar processes.
RRP	Resource recovery park
RTS	Refuse transfer station
Service Delivery Review	As defined by s17A of the LGA 2002. Councils are required to review the cost-effectiveness of current arrangements for meeting the needs of communities within its district or region for good-quality local infrastructure, local public services, and performance of regulatory functions. A review under subsection (1) must consider options for the governance, funding, and delivery of infrastructure, services, and regulatory functions.
TA	Territorial authority (a city or district council)
TRP	Te rautaki para | New Zealand Waste Strategy
Waste	Means, according to the WMA: a) Anything disposed of or discarded, and b) Includes a type of waste that is defined by its composition or source (for example, organic waste, electronic waste, or construction and demolition waste); and c) To avoid doubt, includes any component or element of diverted material, if the component or element is disposed or or discarded.
WA	Waste Assessment as defined by s51 of the Waste Minimisation Act 2008. A Waste Assessment must be completed whenever a WMMP is reviewed
WMA	Waste Minimisation Act 2008
WMMP	A Waste Management and Minimisation Plan as defined by s43 of the Waste Minimisation Act 2008

WWTP	Wastewater treatment plant

A.3.0 Classifications for Disposal to Land

MfE have classified disposal and other waste facilities under two regulations, which enable the application of the disposal levy and the collection of data. Facilities had also previously been categorised according to the WasteMINZ 'Technical Guidelines for the Disposal of Waste to Land', and there are some slight variations between the two.

A.3.1 Technical Guidelines Definitions

Class 1 - Landfill

A Class 1 landfill is a site that accepts municipal solid waste. A Class 1 landfill generally also accepts C&D waste, some industrial wastes and contaminated soils. Class 1 landfills often use managed fill and clean fill materials they accept, as daily cover.

Class 1 landfills require:

- a rigorous assessment of siting constraints, considering all factors, but with achieving a high level of containment as a key aim;
- engineered environmental protection by way of a liner and leachate collection system, and an appropriate cap, all with appropriate redundancy; and
- landfill gas management.

A rigorous monitoring and reporting regime is required, along with stringent operational controls. Monitoring of accepted waste materials is required, as is monitoring of sediment runoff, surface water and groundwater quality, leachate quality and quantity, and landfill gas.

Waste acceptance criteria (WAC) comprises:

- municipal solid waste; and
- for potentially hazardous leachable contaminants, maximum chemical contaminant leachability limits (TCLP) from Module 2 Hazardous Waste Guidelines – Class A4.

WAC for potentially hazardous wastes and treated hazardous wastes are based on leachability criteria to ensure that leachate does not differ from that expected from non-hazardous municipal solid waste.

For Class 1 landfills, leachability testing should be completed to provide assurance that waste materials meet the WAC.

Class 2 Landfill

A Class 2 landfill is a site that accepts non-putrescible wastes including C&D wastes, inert industrial wastes, managed fill material and clean fill material. C&D waste can contain biodegradable and leachable components which can result in the production of leachate – thereby necessitating an increased level of environmental protection. Although not as strong as Class 1 landfill leachate, Class 2 landfill leachate is typically characterised by mildly acidic pH, and the presence of ammoniacal nitrogen and soluble metals, including heavy metals. Similarly, industrial wastes from some activities may generate leachates with chemical characteristics that are not necessarily organic.

Class 2 landfills should be sited in areas of appropriate geology, hydrogeology and surface hydrology. A site environmental assessment is required, as are an engineered liner, a leachate collection system, and groundwater and surface water monitoring. Additional engineered features such as leachate treatment may also be required.

Depending on the types and proportions of C&D wastes accepted, Class 2 landfills may generate minor to significant volumes of landfill gas and/or hydrogen sulphide. The necessity for a landfill gas collection system should be assessed.

Operational controls are required, as are monitoring of accepted waste materials, monitoring of sediment runoff, surface water and groundwater quality, and monitoring of leachate quality and quantity.

Waste acceptance criteria comprises:

- a list of acceptable materials; and
- • maximum ancillary biodegradable materials (e.g. vegetation) to be no more than 5% by volume per load; and
- • maximum chemical contaminant leachability limits (TCLP) for potentially hazardous leachable contaminants.

Class 3 Landfill – Managed/Controlled Fill

A Class 3 landfill accepts managed fill materials. These comprise predominantly clean fill materials, but may also include other inert materials and soils with chemical contaminants at concentrations greater than local natural background concentrations, but with specified maximum total concentrations.

Site ownership, location and transport distance are likely to be the predominant siting criteria. However, as contaminated materials (in accordance with specified limits) may be accepted, an environmental site assessment is required in respect of geology, stability, surface hydrology and topography.

Monitoring of accepted material is required, as are operational controls, and monitoring of sediment runoff and groundwater.

Waste acceptance criteria comprises:

- a list of acceptable solid materials; and
- maximum incidental or attached biodegradable materials (e.g. vegetation) to be no more than 2% by volume per load; and

- maximum chemical contaminant limits.

A Class 3 landfill does not include any form of engineered containment. Due to the nature of material received it has the potential to receive wastes that are above soil background levels. The WAC criteria for a Class 3 landfill are therefore the main means of controlling potential adverse effects.

For Class 3 landfills, total analyte concentrations should be determined to provide assurance that waste materials meet the WAC.

Class 4 Landfill – Controlled Fill

A Class 4 landfill accepts controlled fill materials. These comprise predominantly clean fill materials, but may also include other inert materials and soils with chemical contaminants at concentrations greater than local natural background concentrations, but with specified maximum total concentrations.

Site ownership, location and transport distance are likely to be the predominant siting criteria. However, as contaminated materials (in accordance with specified limits) may be accepted, an environmental site assessment is required in respect of geology, stability, surface hydrology and topography.

Monitoring of accepted material is required, as are operational controls, and monitoring of sediment runoff and groundwater.

Waste acceptance criteria comprises:

- a list of acceptable solid materials; and
- maximum incidental or attached biodegradable materials (e.g. vegetation) to be no more than 2% by volume per load; and
- maximum chemical contaminant limits.

A Class 4 landfill does not include any form of engineered containment. Due to the nature of material received it has the potential to receive wastes that are above soil background levels. The WAC criteria for a Class 4 landfill are therefore the main means of controlling potential adverse effects.

Class 5 – Landfill

A Class 5 landfill accepts only clean fill material. The principal control on contaminant discharges to the environment from Class 5 landfills is the waste acceptance criteria.

Stringent siting requirements to protect groundwater and surface water receptors are not required. Practical and commercial considerations such as site ownership, location and transport distance are likely to be the predominant siting criteria, rather than technical criteria.

Clean filling can generally take place on the existing natural or altered land without engineered environmental protection or the development of significant site infrastructure. However, surface water controls may be required to manage sediment runoff.

Extensive characterisation of local geology and hydrogeology is not usually required.

Monitoring of both accepted material and sediment runoff is required, along with operational controls.

Waste acceptance criteria:

- virgin excavated natural materials (VENM), including soil, clay, gravel and rock; and
- maximum incidental inert manufactured materials (e.g. concrete, brick, tiles) to be no more than 5% by volume per load; and
- maximum incidental5 or attached biodegradable materials (e.g. vegetation) to be no more than 2% by volume per load; and
- maximum chemical contaminant limits are local natural background soil concentrations.

Materials disposed to a Class 5 landfill should pose no significant immediate or future risk to human health or the environment.

The WAC for a Class 5 landfill should render the site suitable for unencumbered potential future land use, i.e. future residential development or agricultural land use.

The WAC for a Class 5 landfill are based on the local background concentrations for inorganic elements, and provide for trace concentrations of a limited range of organic compounds.

Note: The Guidelines should be referred to directly for the full criteria and definitions.

A.3.2 Ministry for the Environment Classifications

The Ministry for the Environment have recently extended the payment of the landfill levy to a wider range of disposal facilities, and have also required reporting of data from 'cleanfills' and transfer stations. This has entailed two regulations – the first to extend the levy to other facilities[43] and the second to require data reporting from 'cleanfills' and transfer stations[44].

These regulations establish definitions for a range of disposal and other waste facilities beyond the Class 1 landfills that were captured by the landfill levy when it was first introduced.

These are summarised in the table below:

[43] https://www.legislation.govt.nz/regulation/public/2021/0068/latest/LMS474556.html
[44] https://www.legislation.govt.nz/regulation/public/2021/0069/latest/whole.html

Disposal facility class	Description	Types of waste not accepted	Examples of types of waste accepted
1 Municipal Disposal Facility	A facility, including a landfill: • where waste is disposed of • that operates, at least in part, as a business to dispose of waste • accepts waste that is or includes any one or more of the following: household waste waste from commercial or industrial sources waste from institutional sources (eg, hospitals, educational facilities and aged-care facilities) green waste (eg, degradable plant materials such as tree branches, leaves, grass, and other vegetation matter) waste that is not accepted at other disposal facilities in the WMA. It is not a: • class 2: construction and demolition disposal facility • class 3 and 4 managed or controlled fill disposal facility • an industrial monofill facility • a cleanfill facility.		Types of waste may include (but not limited to): • mixed municipal waste from residential, commercial and industrial sources • construction and demolition waste • contaminated soils • rocks, gravel, sand, clay • sludges • slurries • putrescible waste • green waste • biosolids • clinical waste • treated hazardous waste • incidental hazardous waste.
2 C&D Disposal	Accepts waste from construction and demolition activity It is not a: • class 3 and 4 managed or controlled fill disposal facility • an industrial monofil facility • a cleanfill facility.	Does not accept any of the following for disposal: • household waste • waste from commercial or industrial sources • waste from institutional sources (eg, hospitals, educational facilities, and aged-care facilities) • waste generated from a single industrial	Mixed construction and demolition waste including: • rubble, plasterboard, treated and untreated timber • wood products,including softboard, hardboard, particle board, plywood, MDF, customwood, shingles, sawdust

		process (eg, steel or aluminium-making, or pulp and paper-making) carried out in one or more locations • Is not a class 3 and 4 managed or controlled fill facility	• concrete, including reinforced or crushed concrete blocks • clay products including pipes, tiles • asphalt (all types), and roading materials, including road sub-base • plasterboard and Gibraltar board • masonry, including bricks, pavers • metal, or products containing metals, including corrugated iron, steel, steel-coated tiles, wire, wire rope, wire netting, aluminium fittings • plastic products, including plastic bags, pipes, guttering, building wrap • insulation products • laminate products, including Formica • flooring products, including carpet and underlay, vinyl/linoleum, cork tiles • paper and cardboard products, including wallpaper, lining paper, building paper • site clearance and excavation materials including soils, clays, rocks, gravel, tree stumps
3/4 Managed or Controlled Fill Disposal	Accepts any one of the following for disposal: • inert waste material from construction and demolition activities	Does not accept: • household waste • waste from commercial or industrial sources	Types of waste may include (but not limited to): • lightly contaminated soil below applicable consent limits and inert

	• inert waste material from earthworks or site remediation	• waste from institutional sources (eg, hospitals, educational facilities, and aged-care facilities • waste generated from a single industrial process (eg, steel or aluminium-making, or pulp and paper-making) carried out in one or more locations • waste material from construction and demolition activity (except for inert waste material).	construction and demolition materials, including: site facilities clearance and excavation materials including soils, clays, rocks, gravel, tree stumps masonry, including bricks and pavers clay products, including pipes, tiles concrete, including crushed concrete and blocks (for reinforced concrete, exposed reinforcing must be removed) asphalt (bitumen-based only) road sub-base.
5 **Cleanfill**	A facility that accepts only virgin excavated natural material (such as clay, soil, or rock) for disposal	Any materials other than virgin excavated natural materials (VENM)	VENM such as clay, soil and rock
Industrial monofill	A facility that accepts for disposal waste that: • discharges or could discharge contaminants or emissions • is generated from a single industrial process (eg, steel or aluminium-making, or pulp and paper-making) carried out in one or more locations.	• household waste • waste from commercial or institutional sources (eg, hospitals, educational facilities, and aged-care facilities) • waste not generated by a single industrial process.	Waste generated by industrial processes such as: • steel-making • aluminium-making • pulp and paper • oil exploration and extraction
Transfer station	A facility: • that contains a designated receiving area where waste is received; and • from which waste or any material derived from that waste is: transferred to a final disposal site transferred elsewhere for further processing that does not itself provide	N/A (no disposal of waste occurs)	N/A

	long-term storage for waste or material derived from that waste.		

A.4.0 National Legislative and Policy Context

A.4.1 The New Zealand Waste Strategy 2023

The New Zealand Waste Strategy 2023 provides the Government's strategic direction for waste management and minimisation in New Zealand. This strategy was released in 2023 and replaced the 2010 Waste Strategy.

The strategy aims to provide direction to central and local government, businesses (including the waste industry), and communities on where to focus their efforts to manage waste. It will be supported by an action and investment plan (AIP) which will be developed in consultation with local authories, the waste management sector, and others; and will set out priority actions required over the next five years. The 2023 strategy has a focus on achieving a more 'circular economy' for waste and sets out a multi-decade pathway towards this.

Under section 44 of the Waste Management Act 2008, in preparing their waste management and minimisation plan (WMMP) councils must have regard to the New Zealand Waste Strategy, or any government policy on waste management and minimisation that replaces the strategy. Guidance on how councils may achieve this is provided in section 4.4.3.

A copy of the current New Zealand Waste Strategy is available on the Ministry's website.

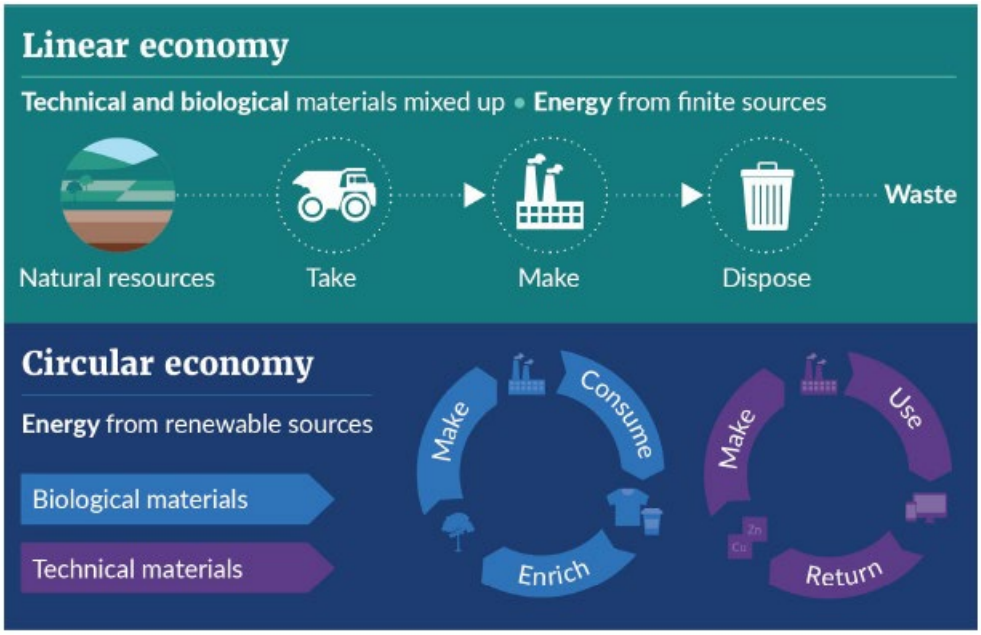
Sections of the new strategy are discussed here in more detail.

A.4.1.1 Circular Economy principles

The strategy includes some background on circular economy, including some summary figures that compare a linear economy to a circular economy, and a revised waste hierarchy. It also emphasises the role of te ao Māori in considering waste appraoches.

The figures mentioned above are shown here (with permission from MfE):

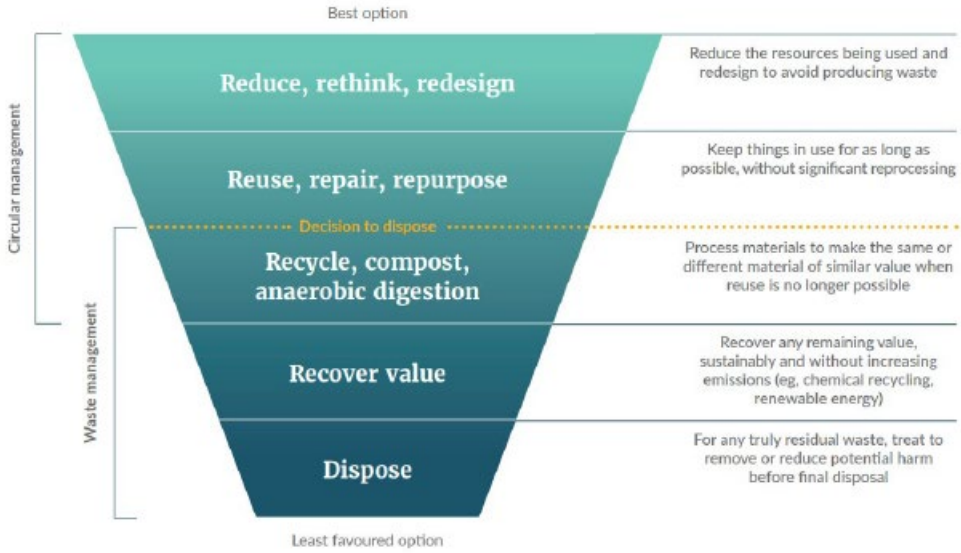
Figure 7: Characteristics of Linear and Circular Economies



Source: Te rautaki para | Waste Strategy (page 14), Ministry for the Environment 2023

The waste hierarchy is still a core principle guiding waste management and minimisation in New Zealand, but has been refined to more closely support and align with a circular economy approach.

Figure 8: Revised Waste Hierarchy



Source: Te rautaki para | Waste Strategy (page 14), Ministry for the Environment 2023

The strategy highlights several key facts that demonstrate New Zealand's relatively poor performance in waste management and minimisation:

- Emissions from waste produce 9% of New Zealand's biogenic methane emissions, and 4% of our total greenhouse gas emissions, with organic waste decomposing in landfills contributing 94% of these emissions.
- On average, nearly 700 kg of waste per capita goes to municipal landfills[45] annually – compared to the OECD average of 538 kg; and trends are for this to increase
- Domestic recovery infrastructure is limited, and exporting challenging due to our relative geographic isolation and distance from markets
- Lack of data relating to waste practices, significantly non-municipal landfills and diverted materials
- Historical management has been poor, with numerous legacy disposal sites around the country causing local environmental harm.

A.4.1.2 The Strategy

The direction of the strategy is important in many, very practical, ways; it provides a clear vision through to 2050, principles that support this vision, a phased approach with three clear stages, and targets to measure progress and encourage ambitious action.

Three key strategic issues are core to the strategy – domestic resource recovery and recycling, the role of waste to energy, and net zero emissions by 2050.

The vision is:

> *"By 2050, Aotearoa New Zealand is a low-emissions, low-waste society, built upon a circular economy.*
>
> *We cherish our inseparable connection with the natural environment and look after the planet's finite resources with care and responsibility."*

Six guiding principles are included.

A.4.1.3 A staged process

While the strategy has a view out to 2050, the work required to get there has been divided into three high level work stages:

1. 2022 – 30: embedding circular thinking into systems
2. 2030 – 40: expanding to make circular normal
3. 2040 – 50: Helping others do the same

Each stage has a number of goals, some of which are more relevant to TAs than others – Phase 1 is shown in the table below and has been addressed in the options list.

[45] 'municipal landfill', 'municipal solid waste landfill' 'sanitary landfill' and 'Class 1 landfill' are all terms that essentially refer to the same type of facility.

Phase 1 Goals – By 2030, our enabling systems are working well and behaviour is changing	
The building blocks are in place to enable change	
Strategic planning, regulatory, investment and engagement systems are in place and operating to drive and support change	TAs have a role in strategic planning at a local level (through WMMPs), which will both inform and be informed by the AIP TAs also have a role, albeit limited compared to the national role, to contribute through local bylaws and any local funding pools that are available TAs carry out local engagement and can support national campaigns
We have a comprehensive national network of facilities supporting the collection and circular management of products and materials	TAs will be well placed to understand what this means at a local level, and be able to drive and coordinate the development of a network approach
We all take responsibility for how we produce, manage, and dispose of things, and are accountable for our actions and their consequences	This is likely to be aimed mainly at personal responsibility – although TAs can encourage this attitude locally
Specific Priorities:	• Support the creation of national planning, regulatory and investment systems. • Consider how the timing and interactions of central government and local government waste planning could best be integrated, and communicate to MfE • Consider how to use waste levy funding to support the overall strategic framework of funding and investment, given the AIP context, direction and priorities – collaborate with other councils and with central government to a greater extent • Support the development of simple ways for central and local government to collaborate and work in partnership

	• Work with central government, the waste sector, and others to develop a shared view of what a 'comprehensive national network of facilities' looks like • Align overall direction and approach with this • The network needs to have nationwide coverage (significant for the Otago region), include a range of products and materials, and focus on circular management options where possible • Prioritise reducing greenhouse gas emissions • Ensure planning and consenting teams require new builds to have appropriate space for waste management, there is space for community facilities, and feed in to regional plans to ensure they provide for a 'coherent network' • Identify and work with community partners to extend services into hard-to-reach areas • Promote waste minimisation using long-term, evidence-based hehaviour change programmes • Provide timely, accurate and clear information when creating additional obligations through bylaws or introducing new services
More activity is circular and we produce less waste	
We use fewer products and materials, and using (sic) them for longer, by making them more durable, and repairing, reusing, sharing and repurposing them	As above, TAs have a detailed understanding of what is required to enable repair, reuse, sharing and repurposing at the local level
Resource recovery systems are operating effectively for core materials and across all regions	TAs will have a key role in developing and maintaining resource recovery systems at the local level. Regional and cross-regional collaboration will be needed to ensure these form part of a cohesive network.
We look for ways to recover any remaining value from residual waste, sustainably and without increasing emissions, before final disposal	TAs will need to consider any potential role for energy-from-waste technologies at the local and/or regional level – particularly those that operate landfills

Specific Priorities	• Support repair initiatives by, for example, making space in resource recovery centres or other community facilities • Think about how to cater for future reuse systems when developing infrastructure to support collection and processing of products and materials • Take responsibility for kerbside collection of household recycling and general waste • Find solutions to provide services to small towns and rural areas • Implement kerbside standardisation locally • Recover value from 'truly residual waste' without harming the environment • Consider the purpose, feedstock, processing and potential energy production of any 'waste to energy' methodology
Emissions and other environmental indicators are improving	
Emissions from waste are reducing in line with our domestic and international commitments	TAs will need to model and monitor emissions from their local activities – waste emissions are being considered at a regional level for the Otago region
Contaminated land is sustainably managed and remediated, to reduce waste and emissions and enhance the environment	TAs are responsible for the management of their closed landfills.
Specific Priorities	• Maximise the amount of organic waste being recycled into beneficial uses (composting and anerobic digestion are options) • Implement standardised kerbside collections locally for organic wastes (with support and education) • Fund and invest in infrastructure to collect, process, manage and recycle organic waste (food, garden and C&D organics) • Landfill gas capture at Class 1 facilities by the end of 2026 or cease accepting organic waste • Potentially implement landfill organics ban by 2030 at all Class 1 facilities

- Address the management of ‘vulnerable landfills’ if any are identified that are council’s responsibility that are not already included in a closed landfill management plan.

A.4.1.4 Targets

The strategy includes targets; although it is acknowledged that there currently isn't enough (or reliable enough) data to set an accurate baseline or monitor these fully.

TAs should consider these, however, when setting targets in their WMMPs as it would make sense for these metrics to be reflected in local target setting and monitoring. This will also provide more support to the process of monitoring these targets at a national level.

A.4.1.5 Strategic Planning Cycle

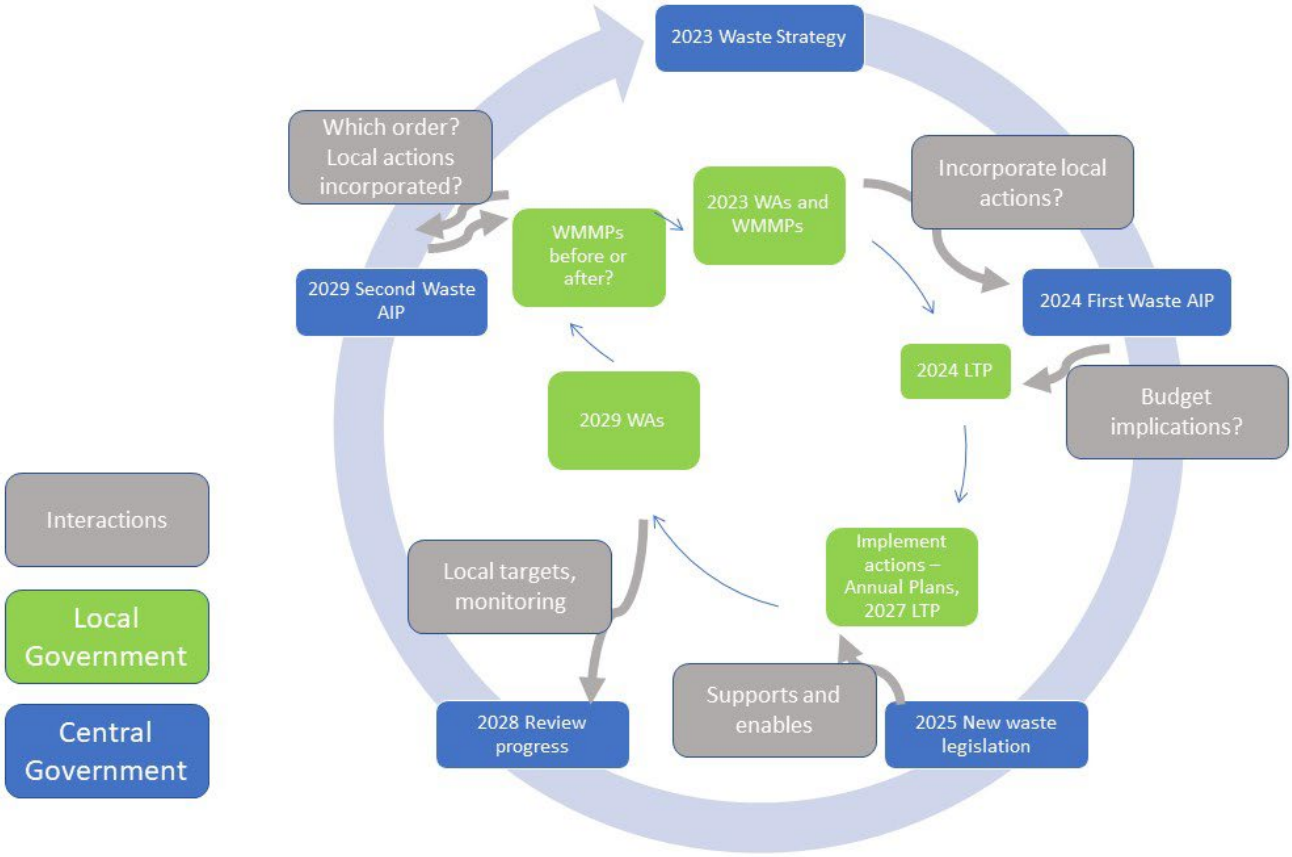
Many TAs are currently in the process of completing a Waste Assessment with a view to reviewing their WMMPs (if necessary) during the second half of 2023 so actions can be budgeted and included in 2024 LTPs. The current proposal is for the first of the MfE AIP to be out in 2024, and then a five year cycle to occur from there – so the second AIP will be due in 2029. This doesn't fit neatly with the local government planning cycle, particularly for the Otago region TAs which are all completing a Waste Assessment during 2023 (and therefore would need to repeat this process no later than 2029) .

It is not yet clear the extent to which local planning (through WMMPs) will be used to build, and be incorporated in, the AIPs. It is also not clear what the impact would be if the AIP included actions or investments that would require implementation at a local level, as is likely – and therefore may need to be included in WMMPs. Significant amendments to WMMPs do, of course, require that the full special consultative process is completed again.

The question then arises as to how TAs handle the situation where they are required, through regulation or through implementation of national AIPs and to take advantage of specific focuses for funding opportunities, to implement actions that their local communities have not had the opportunity to comment on fully through consultation.

The figure below attempts to align and show the interactions between the central and local government waste planning cycles.

Figure 9: Central and Local Government Waste Planning



A.4.1.6 Summary

The direction of the New Zealand Waste Strategy, the supporting goals, and the proposed targets all have clear implications for the future direction of waste disposal facilities in this country.

- The overall direction of the Waste Strategy is towards a circular economy, which is not supported by a landfill disposal-based linear system;
- there are specific actions relating to reducing a wide range of waste streams, and specifically and particularly organic waste – in concert with work to reduce emissions. This could extend to a ban on organic waste going to landfill; and
- the targets focus on reducing waste generation and waste disposal by 2030 – by quite significant proportions.

The overall tone of the strategic direction is not in support of continued or extended disposal of waste; and particularly not organic wastes.

A.4.2 Waste Minimisation Act 2008

The purpose of the Waste Minimisation Act 2008 (WMA) is to encourage waste minimisation and a decrease in waste disposal to protect the environment from harm and obtain environmental, economic, social and cultural benefits.

The WMA introduced tools, including:

- waste management and minimisation plan obligations for territorial authorities
- a waste disposal levy to fund waste minimisation initiatives at local and central government levels
- product stewardship provisions.

Part 4 of the WMA is dedicated to the responsibilities of a council, in that it "must promote effective and efficient waste management and minimisation within its district" (section 42).

To meet this requirement, councils are required to develop and adopt a WMMP. The development of a WMMP in the WMA is a requirement modified from Part 31 of the Local Government Act 1974, but with even greater emphasis on waste minimisation.

To support the implementation of a WMMP, section 56 of the WMA also provides councils the ability to:

- develop bylaws
- regulate the deposit, collection and transportation of wastes
- prescribe charges for waste facilities
- control access to waste facilities
- prohibit the removal of waste intended for recycling.

A number of specific clauses in Part 4 relate to the WMMP process. It is essential that those involved in developing a WMMP read and are familiar with the WMA and Part 4 in particular.

The Waste Minimisation Act 2008 (WMA) provides a regulatory framework for waste minimisation that had previously been based on largely voluntary initiatives and the involvement of territorial authorities under previous legislation, including Local Government Act 1974, Local Government Amendment Act (No 4) 1996, and Local Government Act 2002. The purpose of the WMA is to encourage a reduction in the amount of waste disposed of in New Zealand.

In summary, the WMA:

- Clarifies the roles and responsibilities of territorial authorities with respect to waste minimisation e.g. updating Waste Management and Minimisation Plans (WMMPs) and collecting/administering levy funding for waste minimisation projects.

- Requires that a Territorial Authority promote effective and efficient waste management and minimisation within its district (Section 42).
- Requires that when preparing a WMMP a Territorial Authority must consider the following methods of waste management and minimisation in the following order of importance:
    - Reduction
    - Reuse
    - Recycling
    - Recovery
    - Treatment
    - Disposal
    - Put a levy on all waste disposed of in a landfill.
    - Allows for mandatory and accredited voluntary product stewardship schemes.
    - Allows for regulations to be made making it mandatory for certain groups (for example, landfill operators) to report on waste to improve information on waste minimisation.
    - Establishes the Waste Advisory Board to give independent advice to the Minister for the Environment on waste minimisation issues.

Various other aspects of the Waste Minimisation Act are discussed in more detail below.

A.4.3 Waste Levy

The waste levy originally came in to effect from 1st July 2009, adding $10 per tonne to the cost of landfill disposal at sites which accept household solid waste (essentially Class 1 disposal facilities). The levy has two purposes, which are set out in the Act:

- to raise revenue for promoting and achieving waste minimisation
- to increase the cost of waste disposal to recognise that disposal imposes costs on the environment, society and the economy.

This levy is collected and managed by the Ministry for the Environment (MfE) who distribute half of the revenue collected to territorial authorities (TA) on a population basis to be spent on promoting or achieving waste minimisation as set out in their WMMPs. The other half is retained by the MfE and managed by them as a central contestable fund for waste minimisation initiatives (the Waste Minimisation Fund).

In April 2021, the government introduced regulation to expand the scope of the levy from Class 1 landfills to also include classes 2-4.[46]

The table below shows the timetable and rates for the new levy regime:

Figure 10: Levy Rates by Fill Type and Year

LANDFILL CLASS	1-Jul-21	1-Jul-22	1-Jul-23	1-Jul-24
Municipal landfill (class 1)	$20	$30	$50	$60
Construction and demolition fill (class 2)		$20	$20	$30
Managed fill (class 3)			$10	$10
Controlled fill (class 4)			$10	$10

https://www.mfe.govt.nz/waste/waste-and-government

As the landfill levy is expanded and raised, there will be an impact on the quantity of material going to the different destinations; however, the extent to which this occurs, and for which materials, depends on a number of other factors.

One impact that has been noted in some areas of New Zealand, for example, is operators choosing to close rather than add the landfill levy to their gate fee, and undertake the administrative task of monitoring waste quantities to the extent required by the online waste levy system (OWLS). Some of these facilities don't have weighbridges in place and instead base their charges on volume estimates. To report to the OWLS, these facilities then need to translate volumes to weights, and it is on this basis that their landfill levy obligations are calculated. Therefore, any variances in conversion rates between volume and weight could result in an over- or under-calculation of the required landfill levy at the gate.

A.4.4 Product Stewardship

Under the Waste Minimisation Act 2008, if the Minister for the Environment declares a product to be a priority product, a product stewardship scheme must be developed and accredited to ensure effective reduction, reuse, recycling or recovery of the product and to manage any environmental harm arising from the product when it becomes waste.[47]

[46] https://www.legislation.govt.nz/regulation/public/2021/0069/latest/whole.html
[47] Waste Management Act 2008 2(8)

The following voluntary product stewardship schemes have been accredited by the Minister for the Environment:[48]

- Agrecovery rural recycling programme
- Envirocon product stewardship
- Fonterra Milk for Schools Recycling Programme
- Fuji Xerox Zero Landfill Scheme
- Holcim Geocycle Used Oil Recovery Programme (no longer operating)
- Interface ReEntry Programme
- Kimberly Clark NZ's Envirocomp Product Stewardship Scheme for Sanitary Hygiene Products
- Plasback
- Public Place Recycling Scheme
- Recovering of Oil Saves the Environment (R.O.S.E. NZ)
- Refrigerant recovery scheme
- RE:MOBILE
- Resene PaintWise
- The Glass Packaging Forum

Further details on each of the above schemes are available on: http://www.mfe.govt.nz/waste/product-stewardship/accredited-voluntary-schemes

The first six priority products were named under the WMA in 2020 (shown below) and subsequently single-use packaging has been added. The first seven priority products named are:

1. Plastic packaging
2. Tyres
3. Electrical and electronic products (e-waste including large batteries)
4. Agrichemicals and their containers
5. Refrigerants
6. Farm plastics
7. Single-use plastic packaging
8. MfE has taken a 'co-design' approach, which involves industry developing and operating product stewardship schemes with central government oversight. Progress on the schemes, and parties involved, are summarised below.

[48] http://www.mfe.govt.nz/waste/product-stewardship/accredited-voluntary-schemes

Priority product	Progress made	Lead agency/ies
Tyres	Consultation on proposed regulations late 2021 Scheme accredited October 2022 Regulation in effect from late 2023	Tyrewise
Large batteries	Consultation on proposed regulations late 2021 Accreditation expected late 2023 Regulation in effect from 2024	Battery Industry Group
Refrigerants (and other synthetic greenhouse gases)	Consultation on regulations in late 2022 Scheme accreditation mid 2023 Regulation in effect from 2024	Synthetic Refrigerant Stewardship group
Farm plastics, agrichemicals and containers (farm waste)	Consultation on regulations planned late 2023	The Agrecovery Foundation
Electrical and electronic products (e-waste)	Scheme design in 2023 Consultation on regulations in 2024	TechCollect
Plastic packaging	Co-design underway	Packaging Forum and Food & Grocery Council

A.4.5 Waste Minimisation Fund

The Waste Minimisation Fund has been set up by the Ministry for the Environment to help fund waste minimisation projects and to improve New Zealand's waste minimisation performance through:

- Investment in infrastructure;
- Investment in waste minimisation systems and
- Increasing educational and promotional capacity.

Criteria for the Waste Minimisation Fund have been published:

1. Only waste minimisation projects are eligible for funding. Projects must promote or achieve waste minimisation. Waste minimisation covers the reduction of waste and the

reuse, recycling and recovery of waste and diverted material. The scope of the fund includes educational projects that promote waste minimisation activity.

2. Projects must result in new waste minimisation activity, either by implementing new initiatives or a significant expansion in the scope or coverage of existing activities.

3. Funding is not for the ongoing financial support of existing activities, nor is it for the running costs of the existing activities of organisations, individuals, councils or firms.

4. Projects should be for a discrete timeframe of up to three years, after which the project objectives will have been achieved and, where appropriate, the initiative will become self-funding.

5. Funding can be for operational or capital expenditure required to undertake a project.

6. For projects where alternative, more suitable, Government funding streams are available (such as the Sustainable Management Fund, the Contaminated Sites Remediation Fund, or research funding from the Foundation for Research, Science and Technology), applicants should apply to these funding sources before applying to the Waste Minimisation Fund.

7. The applicant must be a legal entity.

8. The fund will not cover the entire cost of the project. Applicants will need part funding from other sources.

9. The minimum grant for feasibility studies will be $10,000.00. The minimum grant for other projects will be $50,000.00.

Application assessment criteria have also been published by the Ministry.

The current funding round opened in October 2022 and will consider applications as they are received, and will agree to fund successful applications until funds are exhausted.

A.4.6 Local Government Act 2002

The Local Government Act 2002 (LGA) provides the general framework and powers under which New Zealand's democratically elected and accountable local authorities operate.

The LGA contains various provisions that may apply to councils when preparing their WMMPs, including consultation and bylaw provisions. For example, Part 6 of the LGA refers to planning and decision-making requirements to promote accountability between local authorities and their communities, and a long-term focus for the decisions and activities of the local authority. This part includes requirements for information to be included in the long-term plan (LTP), including summary information about the WMMP.

More information on the LGA can be found at ww.dia.govt.nz/better-local-government.

A.4.6.1 Section 17A Review

Local authorities are now under an obligation to review the cost-effectiveness of current arrangements for meeting community needs for good quality infrastructure, local public services and local regulation. Where a review is undertaken local authorities must consider options for the governance, funding and delivery of infrastructure, local public services and local regulation that include, but are not limited to:

a) in-house delivery
b) delivery by a CCO, whether wholly owned by the local authority, or a CCO where the local authority is a part owner
c) another local authority
d) another person or agency (for example central government, a private sector organisation or a community group).

Local authorities had three years from 8 August 2014 to complete the first review of each service i.e. they must have completed a first review of all their services by 7 August 2017 (unless something happened to trigger a review before then).

Other than completion by the above deadline, there are two statutory triggers for a section 17A review:

- The first occurs when a local authority is considering a significant change to a level of service
- The second occurs where a contract or other binding agreement is within two years of expiration.

Once conducted, a section 17A review has a statutory life of up to six years. Each service must be reviewed at least once every six years unless one of the other events that trigger a review comes into effect.

While the WMMP process is wider in scope – considering all waste service provision in the local authority area – and generally taking a longer term, more strategic approach, there is substantial crossover between the section 17A requirements and those of the WMMP process, in particular in relation to local authority service provision. The S17A review may however take a deeper approach go into more detail in consideration of how services are to be delivered, looking particularly at financial aspects to a level that are not required under the WMMP process.

Because of the level of crossover however it makes sense to undertake the S17A review and the WMMP process in an iterative manner. The WMMP process should set the strategic direction and gather detailed information that can inform both processes. Conversely the consideration of options under the s17A process can inform the content of the WMMP – in particular what is contained in the action plans.

A.4.7 Resource Management Act 1991

The Resource Management Act 1991 (RMA) promotes sustainable management of natural and physical resources. Although it does not specifically define 'waste', the RMA addresses waste management and minimisation activity through controls on the environmental effects of waste management and minimisation activities and facilities through national, regional and local policy, standards, plans and consent procedures. In this role, the RMA exercises considerable influence over facilities for waste disposal and recycling, recovery, treatment and others in terms of the potential impacts of these facilities on the environment.

Under section 30 of the RMA, regional councils are responsible for controlling the discharge of contaminants into or on to land, air or water. These responsibilities are addressed through regional planning and discharge consent requirements. Other regional council responsibilities that may be relevant to waste and recoverable materials facilities include:

- managing the adverse effects of storing, using, disposing of and transporting hazardous wastes
- the dumping of wastes from ships, aircraft and offshore installations into the coastal marine area
- the allocation and use of water.

Under section 31 of the RMA, council responsibility includes controlling the effects of land-use activities that have the potential to create adverse effects on the natural and physical resources of their district. Facilities involved in the disposal, treatment or use of waste or recoverable materials may carry this potential. Permitted, controlled, discretionary, noncomplying and prohibited activities, and their controls, are specified in district planning documents, thereby defining further land-use-related resource consent requirements for waste-related facilities.

In addition, the RMA provides for the development of national policy statements and for the setting of national environmental standards (NES). There are currently two enacted NESs that directly influence the management of waste in New Zealand:

6) The Resource Management (National Environmental Standards for Air Quality) Regulations 2004; this NES requires certain landfills (e.g., those with a capacity of more than 1 million tonnes of waste) to collect landfill gases and either flare them or use them as fuel for generating electricity. Unless exemption criteria are met, the NES for Air Quality also prohibits the lighting of fires and burning of wastes at landfills, the burning of tyres, bitumen burning for road maintenance, burning coated wire or oil, and operating high-temperature hazardous waste incinerators. These prohibitions aim to protect air quality.
7) The Resource Management (National Environmental Standards for Storing Tyres Outdoors) Regulations 2021; this NES provides nationally consistent rules for the responsible storage of tyres.

The implementation of the National Policy Statement for Freshwater Management[49] may reduce the application rates of some organic wastes to land, which is currently a low cost management option for wastes such as effluent. This may increase the quantities of these organic materials that will be available for processing, which would then impact on the types of materials requiring processing, the technologies best suited to these material mixes, and the markets for the end product.

The RMA is currently subject to extensive reform, which will entail repealing the RMA and replacing it with three separate pieces of legislation:

8) National and Built Environments Act;
9) Spatial Planning Act; and
10) Climate Adaptation Act.

It is likely that this reform process will be completed before the end of 2023.

A.4.8 New Zealand Emissions Trading Scheme

The Climate Change Response Act 2002 and associated regulations is currently the Government's principal response to manage climate change. A key mechanism for this is the New Zealand Emissions Trading Scheme (NZ ETS). The NZ ETS puts a price on greenhouse gas emissions, providing an incentive for people to reduce emissions and plant forests to absorb carbon dioxide. Certain sectors are required to acquire and surrender emission units to account for their direct greenhouse gas emissions or the emissions associated with their products. Landfills that are subject to the waste disposal levy are required to surrender emission units to cover methane emissions generated from landfill. These disposal facilities are required to report the tonnages landfilled annually to calculate emissions (this is separately to the tonnages required to be reported for the landfill levy, through the OWLS).

The NZ ETS was introduced in 2010 and, from 2013, landfills have been required to surrender 'New Zealand emissions units' or NZUs for each tonne of CO_2 (equivalent) that they produce. Until around 2017, however, the impact of the NZETS on disposal prices was limited. There were a number of reasons for this:

- The global price of carbon crashed during the GFC in 2007-8 and was slow to recover in the following years. Prior to the crash it was trading at around $20 per tonne. The price had been as low as $2, although in June 2015, the Government moved to no longer accept international units in NZETS and the NZU price increased markedly. NZUs[50] currently change hands for between $70 and $85, with prices at $74.40 at the time of writing[51].

[49] https://environment.govt.nz/publications/national-policy-statement-for-freshwater-management-2020/
[50] NZUs are carbon credits that are officially accepted to offset liabilities under the NZETS
[51] According to carbon prices on www.carbonforestservices.co.nz and https://www.carbonmatch.co.nz/

- The transitional provisions of the Climate Change Response Act, which were extended in 2013 but have now been reviewed, meant that landfills only had to surrender half the number of units they would be required to otherwise. These transitional provisions were removed in January 2017, effectively and immediately doubling the price per tonne impact of the ETS.
- Landfills are allowed to apply for 'a methane capture and destruction unique emissions factor (UEF)'. This means that if landfills have a gas collection system in place and flare or otherwise use the gas (and turn it from methane, CH_4 into carbon dioxide, CO_2) they can reduce their liabilities in proportion to how much gas they capture. Up to 90% capture and destruction is allowed to be claimed under the regulations, with large facilities applying for UEF's at the upper end of the range.

Taken together (a low price of carbon, only two-for-one surrender required, and methane destruction of 80-90%) the actual cost of compliance with the NZETS had been small for most landfills – particularly those that were able to claim high rates of gas capture. Disposal facilities typically imposed charges (in the order of $5 per tonne) to their customers, but these charges mostly reflected the costs of scheme administration, compliance, and hedging against risk rather than the actual cost of carbon.

The way the scheme has been structured has also resulted in some inconsistencies in the way it is applied – for example class 2-5 landfills and closed landfills do not have any liabilities under the scheme. Further, the default waste composition (rather than a SWAP) can be used to calculate the theoretical gas production, which means landfill owners have an incentive to import biodegradable waste, which then increases gas production and which can then be captured and offset against ETS liabilities.

Recently, however the scheme has had a greater impact on the cost of landfilling, and this is expected to continue in the medium term. Many small landfills which do not capture and destroy methane are now beginning to pay a more substantial cost of compliance. The ability of landfills with high rates of gas capture and destruction to buffer the impact of the ETS will mean a widening cost advantage for them relative to those without such ability. This appears to be putting further pressure on small (predominantly Council-owned) facilities and will drive further tonnage towards the large regional facilities (predominantly privately owned).

For example, with a price of carbon at $75 per tonne, the liability for a landfill without gas capture will be $68.25 (based on a DEF of 0.91 tonnes of CO_2e per tonne of waste), whereas for a landfill claiming 90% gas capture (the maximum allowed under the scheme), the liability will be only $6.83. This type of price differential will mean it will become increasingly cost competitive to transport waste larger distances to the large regional landfills.

More information is available at www.climatechange.govt.nz/emissions-trading-scheme.

A.4.9 Litter Act 1979

Under the Litter Act[52] it is an offence for any person or body corporate to deposit or leave litter:

- in or on any public place; or
- in or on any private land without the consent of its occupier.

The Act enables Council to appoint Litter Officers with powers to enforce the provisions of the legislation.

The legislative definition of the term "litter" is wide and includes 'refuse, rubbish, animal remains, glass, metal, garbage, debris, dirt, filth, rubble, ballast, stones, earth, waste matter or other thing of a like nature'.

Any person who commits an offence under the Act is liable to:

- An instant fine of $400 imposed by the issue of an infringement notice; or a fine not exceeding $5,000 in the case of an individual or $20,000 for a body corporate upon conviction in a District Court.
- A term of imprisonment where the litter is of a nature that it may endanger, cause physical injury, disease or infection to any person coming into contact with it.

Under the Litter Act 1979 it is an offence for any person to deposit litter of any kind in a public place, or onto private land without the approval of the owner.

The Litter Act is enforced by territorial authorities, who have the responsibility to monitor litter dumping, act on complaints, and deal with those responsible for litter dumping. Councils reserve the right to prosecute offenders via fines and infringement notices administered by a litter control warden or officer. The maximum fines for littering are $5,000 for a person and $20,000 for a corporation.

Council powers under the Litter Act could be used to address illegal dumping issues that may be included in the scope of a council's waste management and minimisation plan.

The Litter Act may be reviewed alongside the review of the Waste Minimisation Act.

A.4.10 Health Act 1956

The Health Act 1956 places obligations on TAs to provide sanitary works for the collection and disposal of refuse, for the purpose of public health protection (Part 2 – powers and duties of local authorities, section 25). Where the Ministry of Health

[52] https://www.legislation.govt.nz/act/public/1979/0041/latest/DLM33082.html

considers that a local authority is not taking the necessary action to meet these obligations and protect public health, it can require a local authority to do so.

It specifically identifies certain waste management practices as nuisances (S 29) and offensive trades (Third Schedule) and section 23 directs every local authority to improve, promote, and protect public health by inspecting its district regularly to identify any nuisance or condition likely to be offensive or harm human health. If any issues are noted, the local authority should take steps to rectify the situation. Improperly managed waste would be considered a nuisance. Section 34 enables councils to abate nuisances without notice and recover costs.

Section 54 places restrictions on carrying out an offensive trade and requires that the local authority and medical officer of health must give written consent and can impose conditions on the operation. The local authority's responsibilities under section 54 only applies where resource consent has not been granted under the RMA (i.e., no need to give written consent twice). Local authorities should seek to coordinate with their local public health unit where offensive trades are being established, such as refuse collection and other waste treatment practices.

The Health Act enables TAs to raise loans for certain sanitary works and/or to receive government grants and subsidies, where available.[53] It also means that where TAs incur costs in meeting their responsibilities to abate nuisances by (for example) removing refuse that is likely to harm public health, the TA can seek payment of these costs.

Health Act provisions to remove refuse by local authorities have been repealed.

A.4.11 Hazardous Substances and New Organisms Act 1996 (HSNO Act)

The HSNO Act addresses the management of substances (including their disposal) that pose a significant risk to the environment and/or human health. The Act relates to waste management primarily through controls on the import or manufacture of new hazardous materials and the handling and disposal of hazardous substances.

Depending on the amount of a hazardous substance on site, the HSNO Act sets out requirements for material storage, staff training and certification. These requirements would need to be addressed within operational and health and safety plans for waste facilities. Hazardous substances commonly managed by TAs include used oil, household chemicals, asbestos, agrichemicals, LPG and batteries.

The HSNO Act provides minimum national standards that may apply to the disposal of a hazardous substance. However, under the RMA a regional council or TA may set more

[53] From: MfE 2009: Waste Management and Minimisation Planning, Guidance for Territorial Authorities.

stringent controls relating to the use of land for storing, using, disposing of or transporting hazardous substances.[54]

A.4.12 Health and Safety at Work Act 201555

The new Health and Safety at Work Act, passed in September 2015 replaces the Health and Safety in Employment Act 1992. The bulk of the Act came into force from 4 April 2016.

The Health and Safety at Work Act introduces the concept of a Person Conducting a Business or Undertaking, known as a PCBU. The Council will have a role to play as a PCBU for waste services and facilities.

The primary duty of care requires all PCBUs to ensure, so far as is reasonably practicable:

11) the health and safety of workers employed or engaged or caused to be employed or engaged, by the PCBU or those workers who are influenced or directed by the PCBU (for example workers and contractors)
12) that the health and safety of other people is not put at risk from work carried out as part of the conduct of the business or undertaking (for example visitors and customers).

The PCBU's specific obligations, so far as is reasonably practicable:

- providing and maintaining a work environment, plant and systems of work that are without risks to health and safety
- ensuring the safe use, handling and storage of plant, structures and substances
- providing adequate facilities at work for the welfare of workers, including ensuring access to those facilities
- providing information, training, instruction or supervision necessary to protect workers and others from risks to their health and safety
- monitoring the health of workers and the conditions at the workplace for the purpose of preventing illness or injury.

A key feature of the new legislation is that cost should no longer be a major consideration in determining the safest course of action that must be taken.

WorkSafe NZ is New Zealand's workplace health and safety regulator. WorkSafe NZ will provide further guidance on the new Act after it is passed.

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[54] From: MfE 2009: Waste Management and Minimisation Planning, Guidance for Territorial Authorities.
[55] http://www.legislation.govt.nz/act/public/2015/0070/latest/DLM5976660.html#DLM6564701

A.4.13 Other legislation

Other legislation that relates to waste management and/or reduction of harm, or improved resource efficiency from waste products includes:

- Biosecurity Act 1993
- Radiation Protection Act 1965
- Ozone Layer Protection Act 1996
- Agricultural Chemicals and Veterinary Medicines Act 1997.

For full text copies of the legislation listed above see www.legislation.govt.nz.

A.4.14 International commitments

New Zealand is party to international agreements that have an influence on the requirements of our domestic legislation for waste minimisation and disposal. Some key agreements are the:

- Montreal Protocol
- Basel Convention
- Stockholm Convention
- Waigani Convention
- Minamata Convention.

More information on these international agreements can be found on the Ministry's website at www.mfe.govt.nz/more/international-environmental-agreements.

A.5.0 A Circular Resource Recovery Network

Historically, our economic system has operated primarily on the basis of linear processes. This system involves extraction, processing, manufacturing, consumption and disposal (end-of-life). This system is not sustainable as it involves systematically using up non-renewable raw materials (such as minerals and fossil fuels) and degrading the natural environment, which is necessary to support life, through unsustainable agricultural and extractive activities (such as logging of native forests), and the creation of waste and pollution. To address this, a paradigm shift is needed. This requires a change in how the economic system produces, assembles, sells and uses products in order to minimise waste and maximise the value of materials in use. The circular economy is a model that enables resources to be kept in use for as long as possible, extract maximum value from them, and then recover and regenerate materials at end-of-life.

Within the context of enabling a circular economy, it is proposed to re-organise how the recovery of materials in the economy occurs by establish a **'circular resource network'**.

The key organising principle behind the concept of a circular resource network is that the resource recovery system should be consciously designed to facilitate the circular flow of materials through the economy, by 'completing the circle'. To date, the 'reverse logistics' aspect of the economy that is responsible for collecting widely dispersed and mixed materials has been a poor relation to the 'logistics' part of the economy that is responsible for the dispersion.

The following subsections expand on what a circular resource network concept that is designed for the circular economy could entail. The circular resource network concept borrows from and builds on the existing concept of a resource recovery network (RRN).

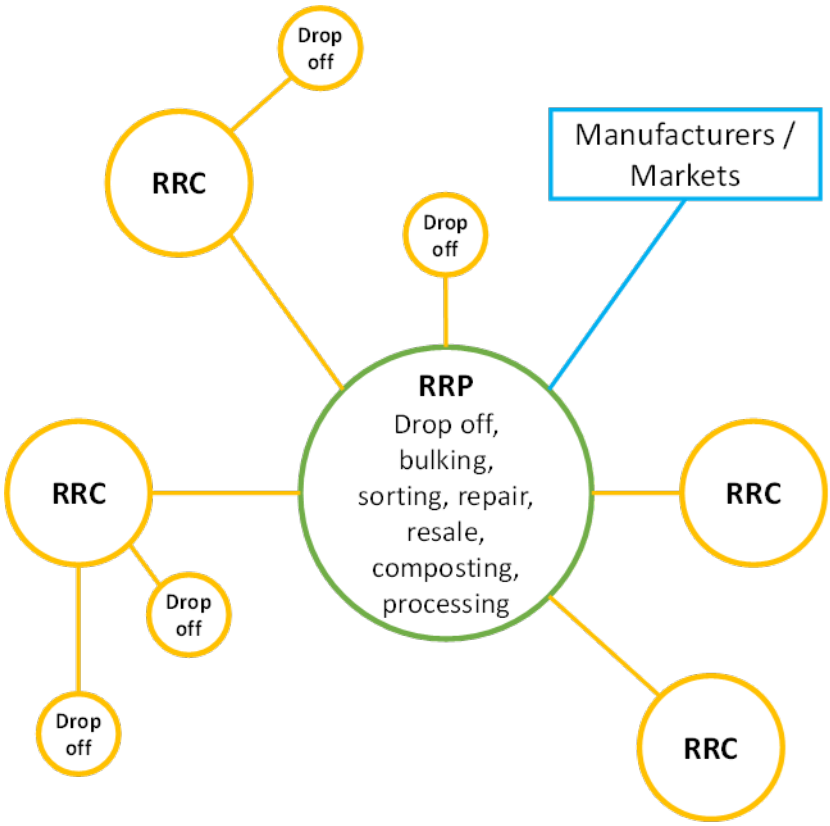
A.5.1 Conventional Resource Recovery Network (RRN)

The concept of a RRN is a longstanding one with various examples including Auckland Council working to develop a network of community run facilities in partnership with the Zero Waste Network[56], the development of a Māori and Pasifika Eco Park, in South Auckland[57], and Selwyn District Council recently announcing their resource recovery park concept[58].

[56] https://www.makethemostofwaste.co.nz/resource-recovery-network/
[57] https://www.stuff.co.nz/business/126810349/the-1-billion-plan-to-lift-mori-and-pasifika-prosperity-in-aucklands-south-and-west
[58] https://www.selwyn.govt.nz/services/rubbish,-recycling-And-organics/recovery-park/reconnect-project

These examples (which have different approaches) can be expanded into a nationwide state of the art network of resource recovery parks (RRPs) which consist of linked (sub) regional hubs, with smaller satellite facilities (resource recovery centres or RRCs) feeding recovered materials into the hub for processing and sale. These potentially can be further supplemented by local drop off sites that feed the satellite facilities. This concept is illustrated in the figure below.

Figure 11: Network of Resource Recovery Centres Linked to Resource Recovery Parks



The functions that are performed by the RRP consolidate a range of resource recovery functions into a single site. The intent is both to provide a 'one stop shop', but also to take advantage of economies of scale and sharing of infrastructure, services, and overheads, and optimising transport of materials to reduce costs. Furthermore, by co-locating functions there can arise the possibility of synergies between the different functions. For example, reclaimed timber and building materials can provide materials for a 'Community Shed' type operation[59], or items salvaged from the waste stream can be sold at low cost to the public. The proposed form of a resource recovery network is

[59] https://menzshed.org.nz/about-us/what-is-a-shed/

to have a series of sites with physically co-located functions, and for these to be operated by or overseen by a single entity.

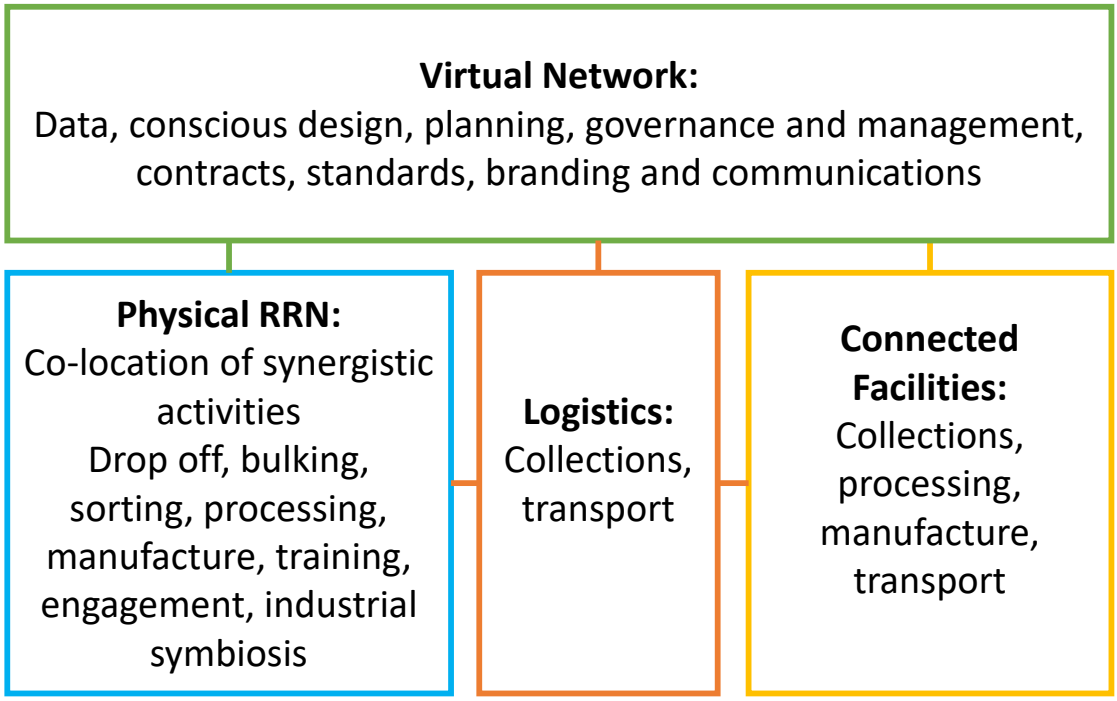
A.5.2 Expanding the Resource Recovery Network

While the conventional concept of a resource recovery network has much to recommend it, in our view there is potential to evolve it further to create the core functionality needed to enable the circular economy.

It is proposed to evolve the concept of physical co-location of synergistic activities to encompass a virtual and holistic network of sites, some co-located (where this provides efficiency gains, and is practical), but also including other sites that may be physically stand-alone sites, but which are connected to the circular resource network. The method of connection would be through supplying and receiving material, utilising network transport arrangements, operating to agreed performance standards, utilising standardised signage and specifications, providing and receiving data, and being linked through virtual directories.

A physical network of sites and logistic can be replicated virtually in an information management system. A nation-wide virtual circular resource network could, eventually, track and/or manage the flow or materials through the entire resource recovery sector in Aotearoa, and enable the optimisation of infrastructure, logistics, and services. Underpinning the virtual network is a physical network of sites and facilities that operate to agreed standards (akin to the traditional RRN concept), supplemented by standalone sites that are connected to the network. Connecting the physical network and standalone sites is a highly efficient, flexible, and low-carbon logistics network. The high-level structure of the network is illustrated in the figure below:

Figure 12: Circular Recovery Aotearoa High-Level Structure



A.5.2.1 Spatial Representation

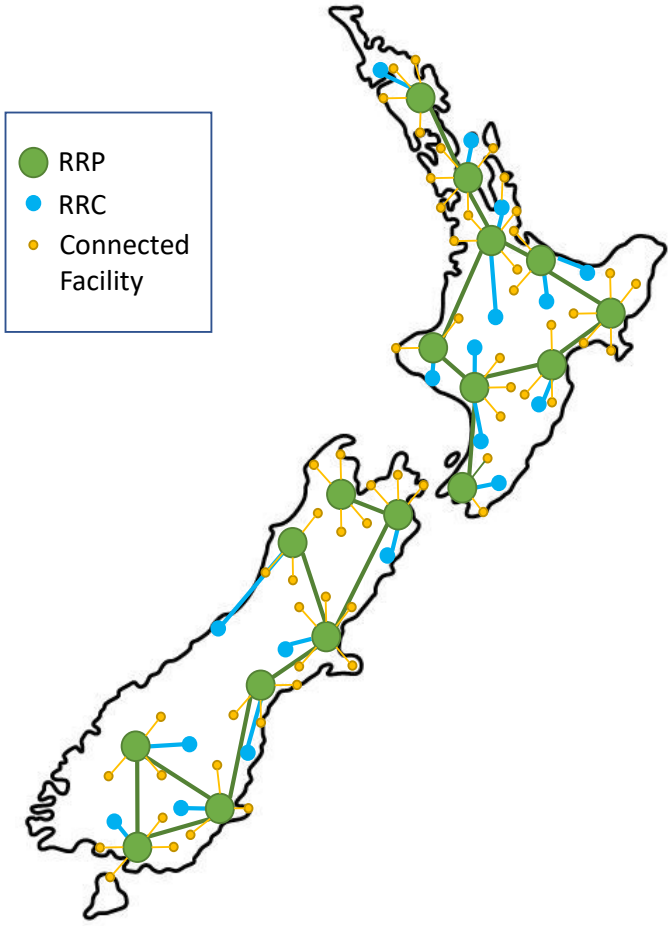
Figure 13 below shows a high-level visual representation of a national resource recovery network.

The large green dots represent regional RRPs that consolidate and process material at a regional level. Depending on the material stream, materials could also be transported between the regional hubs (for example glass being consolidated in Christchurch for shipping to Auckland for manufacture). Regional hubs could also specialise in processing certain materials and swap materials accordingly.

The mid-sized blue dots represent local RRCs that accept a full range of materials and send to the regional RRPs for bulking (or to 'connected facilities' for local processing). Not shown are smaller drop-off sites.

The small yellow dots represent the potentially hundreds of facilities that are not co-located at an RRP or RRC but are linked and operate to the standards of the network. These facilities could accept materials from the RRP or RRC for processing, or supply materials to these sites.

Figure 13: Concept Map of Circular Resource Network

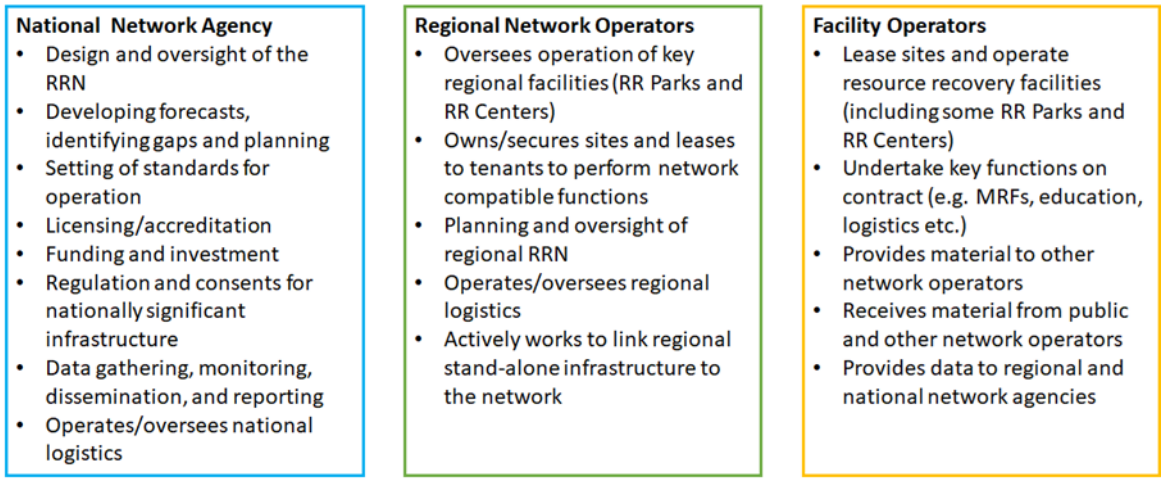


A.5.2.2 Virtual Network

The core of the concept is that the reverse logistics system is actively planned and optimised to 'close the circle' and enable a circular economy. This requires planning, analysis, and data gathering and analysis functions, alongside the active ongoing management of material flows. This is what is covered by the 'virtual network' element.

The roles of the key organisations involved in the circular resource network are shown in the figure below:

Figure 14: Key Agents and Roles in the Resource Recovery Network



A digital model could be developed of the key material flows within the resource recovery sector (ideally this would ultimately encompass a mass balance of materials through the economy, although this is likely to be more difficult to achieve and therefore a more long-term aspiration).

By digitally mapping material flows nationally, across both core facilities and connected facilities, potential gaps and issues could be quickly identified and planning undertaken to ensure the system remains optimised and is resilient and adaptive in the face of change.

The digital model would include current material flows and allow for projections and modelling of new facilities, changes to material types and quantities, logistics etc. This would enable the potential impact of new facilities and options to be investigated before implementation.

The core of the circular resource network is the establishment of a set of standards of operation that all facilities that form part of the circular resource network operate to. These standards would apply to both operations co-located at an RRP or RRC, as well as connected facilities. In this regard what is proposed is similar to a franchise model: as well as designing the overall system the government (or its agents) set the basis by which the circular resource network would function.

A.5.2.3 Physical RRN – Structure

The 'Physical RRN' is the aspect of the system that is most recognisable interface of the network. A national network could be made up of regional nodes (circular resource networks) that are linked but that can operate as independent regional entities.[60] This

[60] For the purposes of this exercise, it should be assumed that 'regional' broadly corresponds to current regional council and unitary council boundaries.

would enable planning with a national perspective (as noted above) but empower the governance and management at a regional level to enable agile response to regional and local requirements. It should be noted, however, that there could be a number of different models.

The role at a regional level is primarily:

- Site ownership, management, development, and leasing.
- Operating region-wide logistics to consolidate materials from RRCs and Connected Facilities at the regional RRP for bulking, sorting, processing and bulk transport or local manufacture.
- Overseeing and applying the operating standards for the network
- Advocating for the development of the network and working with operators and stakeholders to facilitate its continued development.
- Promotion and communication with users.

Regional networks would operate to national standards that include the following (as noted above):

- Branding and communications
- Core materials accepted and material acceptance criteria
- Output material quality standards and contamination levels (referencing existing market specifications or official standards where appropriate)
- Customer service levels
- Appropriate employment conditions
- Standard contracts and agreements for supply of services, provision or sale of materials, leases etc.
- Access to and participation in online marketplaces for recovered materials generated by network participants.

The regional network operators in turn would be responsible for applying and enforcing these standards for local and connected facilities.

A.5.2.4 RRPs – Regional Hubs

The heart of a regional network consists of one or two large RRPs, where a range of key functions are co-located. The purpose of the RRP is to provide a 'hub' for the efficient regional consolidation of a wide range of materials collected at the RRC and Connected Facilities, as well as those that may be collected at the RRP itself.

The core of the concept is to have regional consolidation of materials and provide a hub for the regional network. In addition, these sites could provide a 'flagship' centre with a full range of services for drop-off and community engagement etc.

The RRP all can have different mixes of facilities depending on local requirements. The logistics and flagship public facing operations could be co-located or at different sites depending on local situations.

Typical facilities may include:

- Material recovery facilities for sorting of collected comingled materials.
- Anaerobic digestion facilities to process putrescible wastes and generate biogas that is used to fuel the regional logistics collection fleet.
- Logistics sorting centre for managing the inputs and outputs of a range of facilities.
- Construction and demolition waste sorting facility
- Wash plants and fleet management facilities for reusable containers
- Regional consolidation and logistics for a range of product stewardship schemes such as:
    - E-waste dismantling and processing operations.
    - Used large battery (EV and stationary storage) assessment and consolidation centres.
    - Farm plastics and agrichemical containers
    - Tyres
    - Mattresses
- Education centre
- Reuse stores/mall
- Food rescue
- Repair hubs
- Manufacturing businesses utilising recovered materials. In some instances, these businesses are co-located to utilise others' discarded materials and surplus process heat, with ongoing work to develop industrial symbiosis models.
- Research on material reuse/recovery
- Drop off facilities for a full range of materials.

A.5.2.5 Local RR Centres

While the RRPs are the hub of the regional networks, the RRC form the primary nodes where the majority of material is dropped off and consolidated locally. Many RRCs will start off as local transfer station sites that are upgraded and re-purposed to have a predominant focus on resource recovery. The RRCs are the local centre for community activity, with many run by community enterprises or iwi, and serve to engage, educate and empower the local communities to not only recover materials but extract and apply the value of those materials for community benefit.

There are a range of different services and facilities at each site, but a set of core facilities could include the following:

- Drop off facilities for a standard range of materials (nominally as follows):
    - Cardboard
    - Metals
    - Paper
    - Glass
    - Plastics 1,2,5
    - Shrink-wrap
    - Garden waste
    - DIY construction and demolition waste
- Dropoff/consolidation sites for current and future product stewardship schemes, for example:
    - Reusable containers
    - Single use containers
    - E-waste and batteries
    - Farm plastics and chemical containers
    - Tyres
    - Mattresses
    - Textiles
    - Paint and household chemicals
- Reuse drop off, refurbishment and resale (furniture, household items, furnishings and clothing, toys, books, tools).

Optional services and facilities could include:

- Café
- Construction and bulky materials sales yard
- Education, training
- Workshops/refurbishment
- Food rescue
- Cooking oil – biodiesel/soap manufacture
- Reusable nappies
- Mattress recycling
- Business incubator space.

A.5.2.6 Logistics

A core feature of the concept is the establishment of an efficient logistics network that is able to consolidate and transport materials as efficiently as possible, including utilising

back-loading, bulk transport, and using flexible methodologies to facilitate bulk transport of smaller volume materials (for example, modular bins transported on side loaders).

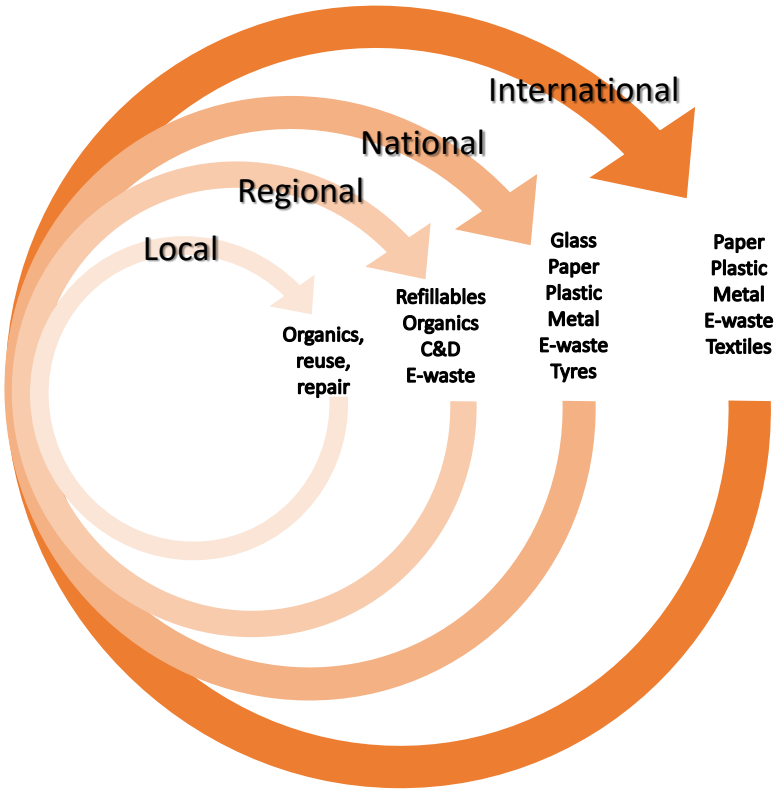
Vehicles utilised by the network could take advantage of low-carbon and waste-based technologies to minimise the carbon footprint of materials managed by the network. For example:

- Vehicles could be powered by gas/energy generated from anaerobic digestion of organic waste.
- Battery electric vehicles could utilise second-life batteries or charging infrastructure built using second life batteries.
- Bulk transport using rail (ideally electrified).

Materials are dealt with in the most appropriate manner through the network with some materials manged locally or regionally, and other materials utilising the logistics capabilities of the network to be delivered to national end uses at low cost.

The figure below illustrates how certain materials are likely to be managed locally, regionally, nationally, or internationally.

Figure 15:Geographical Circulation of Material Types



In the above indicative representation, organics (such as garden waste), reusables, and repairable items are likely to be utilised in local communities; refillables, organics that require more capital intensive processes (such as food waste or sludges), construction and demolition waste, and e-waste dismantling are likely to be undertaken on a regional level; processing and manufacture of products from glass, paper, plastic, metal, e-waste,

and tyres are likely to be processed at national or sub-national scale facilities. Finally, there will be a range of materials that are sold into international commodity markets. These are likely to include paper, plastics, metals, e-waste, and textiles.

The above is intended purely for the purposes of illustration – as markets, material types, and processing technologies evolve these circles of re-integration into the economy are likely to change. The key point is that the network will involve a redistribution of different products and materials to different points and designing this redistribution to be as efficient and effective as possible will be critical to the functioning of the circular economy.

Local Logistics

A key part of the concept is to facilitate the ability to capture the widest possible range of materials by taking advantage of economies of scale to capture economic quantities. This can be achieved through a standardised modular approach to material separation and collection. An example of this is the system deployed in Upper Austria, which utilised 1 cubic metre stackable bins that can be moved using forklifts and transported on curtainsider trucks (see **Error! Reference source not found.**).

Figure 16: Standardised Bins Being Loaded onto Curtainsider Truck

The system collects 80 different types of separated material. The possible downside of it taking time to gather economic quantities of less common material types is minimised as

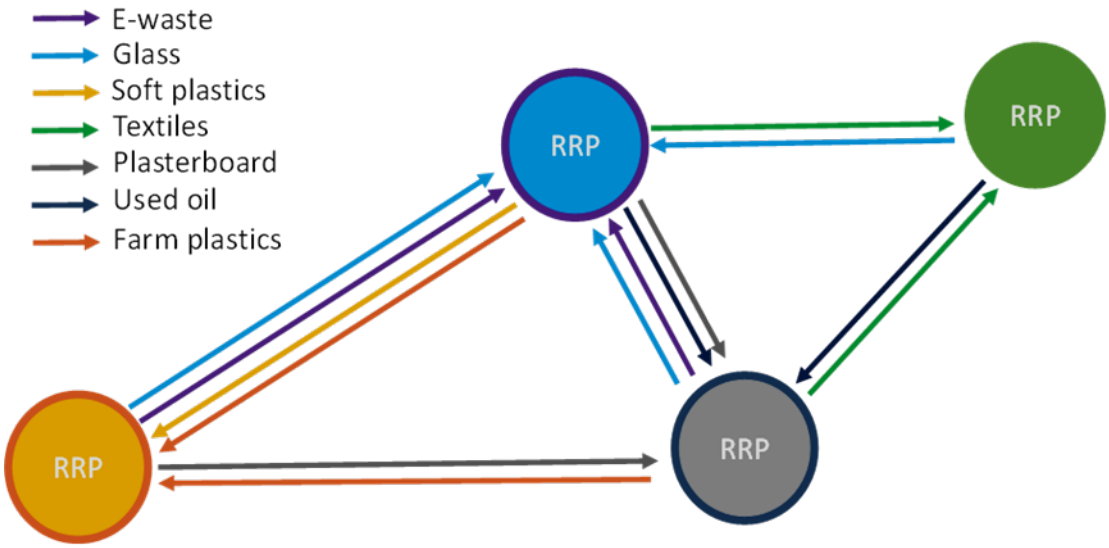
economic quantities can be achieved across the whole region, and the systems components are low cost and have proven efficiency.

The use of the same bins the same types of materials and common signage provides standardisation across the network, despite a wide range of operators being responsible for the individual resource recovery sites.

Inter-Regional Logistics

There is also potential to optimise the flows of materials between regional/sub regional hubs. For example, each regional hub could specialise in processing of one or more material types, with flows of materials then able to be balanced between sites, optimising logistics through backloading, as well as creating economies of scale. A hypothetical illustration is provided in the figure below.

Figure 17: Inter-Regional Logistics Model

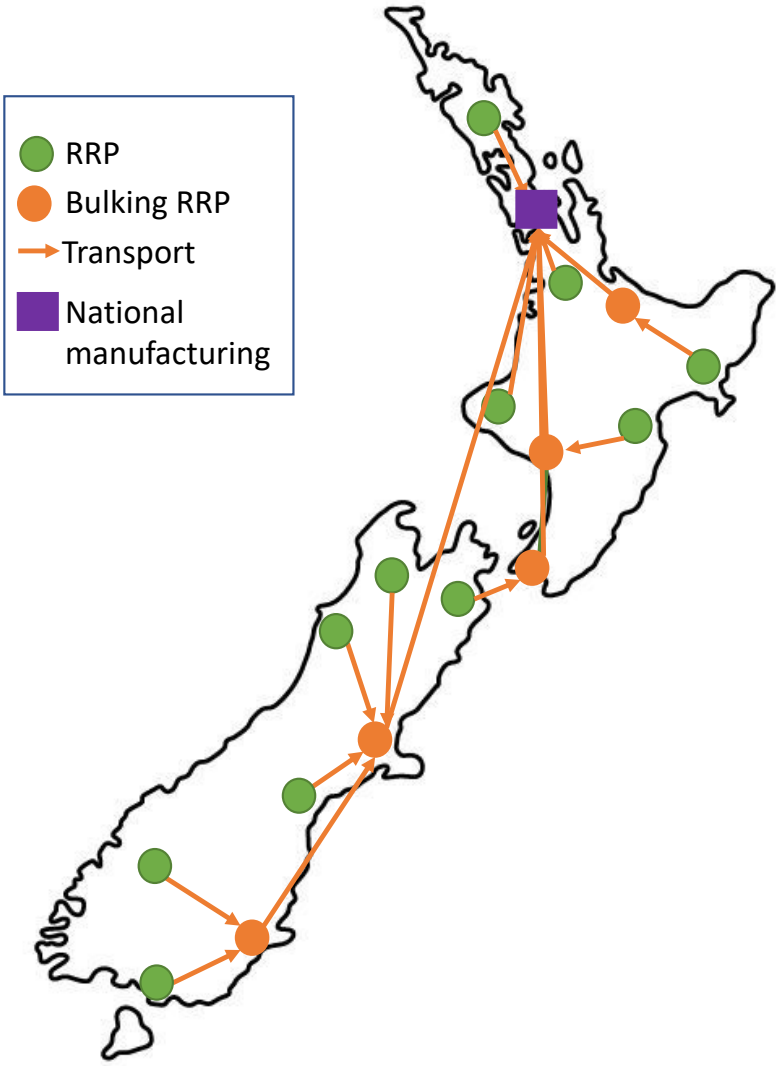


In the above hypothetical illustration, the blue RRP processes e-waste and glass from other proximate RRPs, while sending other materials such as soft plastics, farm plastics, textiles, plasterboard and used oil to other proximate RRPs. This is repeated across the RRPs, so that the quantities and movements of material are approximately balanced. The location of specialised processing and balancing of logistics would be part of the design and planning role of the national level 'virtual network'.

National Logistics

In addition to the local and inter-regional flows of materials, a range of materials handled by the network would need to go to national scale processing/manufacturing facilities (e.g. glass, paper, plastics). Logistics across the network could be optimised to take advantage of bulk transport through strategic bulking points, and there is even the possibility of constructing new national scale facilities in locations to balance national materials flows. The figure below illustrates how materials could be consolidated through regional networks to key bulking points for long-haul transport.

Figure 18: National Logistics Illustration



A.5.2.7 The Role of Local/Regional Government

Local government has historically had a major role in waste management planning and service delivery, and this is likely and desirable to continue. Local government own a significant proportion of the existing transfer station sites, and well as processing infrastructure sites and are familiar with local circumstances. Many councils are already in the process of developing resource recovery parks or local networks. These existing and planned sites could form a starting point for the physical circular resource network. It would primarily be a matter of collaborating to establish consistency and linkages across the existing and planned sites as well as promoting the development of new sites by local government.

In addition, there may be a vital role for regional entities. One of the key issues identified in the stocktake work was a lack of appropriate delivery structures for regional level infrastructure. Some facilities require a regional level approach to achieve appropriate economies of scale (for example processing of food waste, MRFs, regional bulking for key materials such as glass etc.). The proposed circular resource network concept is centred around a regional approach, with one or two regional scale RRPs that form the core hubs for collecting and consolidating material from the RRC sites, and undertaking processing and, potentially, manufacture. Key aspects of the roles for regional and local government could include:

- Service operation/contracting
- Local and regional expertise and coordination
- Local infrastructure investment and operation
- Identification and provision of appropriate sites
- Local consents monitoring, and enforcement
- Gathering and analysis of data

A.5.2.8 The Role of Iwi

Iwi also have an important role to play in the co-development of the circular resource network. The concept of resource recovery is aligned with the te ao Māori principle of kaitiakitanga, and the Para Kore programme is already in place in 476 marae across the country[61]. In addition to performing a similar role to the private and community sectors in service delivery, iwi have a role as kaitiaki of the land and people, and where resources are available, iwi can contribute financial investment and sites to the network and provide leadership in the development of the network. Key aspects of the roles for iwi could include:

[61] https://www.parakore.maori.nz/our-story/

- Service operations
- Infrastructure investment and operation
- Guardians / developers of RR Park and RR Centre sites
- Recovering value from materials
- Ownership and sale of recovered materials
- Utilising recovered value to leverage other community outcomes (e.g. employment, training, rehabilitation)

A.5.2.9 The Role of Private Sector Operators

Private sector operators currently manage the vast majority of waste materials recovered and disposed of in NZ, whether via private commercial arrangements or under contract to the public sector, and this would be expected to continue under the proposed model. The expectation is that, for the operation of the physical circular resource network, the public sector would generally own the land and generic infrastructure (such as buildings or, concrete pads, roading etc.) but would lease the sites or contract out for the delivery and operation of the circular resource network sites (such as separation of materials, composting, processing, manufacture). Sites could have a range of private and community sector operators involved (see below). Key aspects of the roles for private sector operators could include:

- Service operations
- Infrastructure investment and operation (either privately or under contract)
- Recovering value from materials (including repair and reuse)
- Ownership and sale of recovered materials

A.5.2.10 The Role of the Community Sector

Although the community sector is a minor player in terms of the total quantity of waste materials managed in New Zealand, they have had a significant role in the industry in terms of community engagement, innovating around recovery, and extracting value from waste materials to apply to social and community outcomes. The community sector role can potentially be further embedded and given added importance in the delivery of the circular resource network concept. Community groups could not only provide services such as reuse and repair across multiple sites but could also be empowered to deliver all services on sites (as has been demonstrated in Auckland). Key aspects of the roles for community sector operators could include:

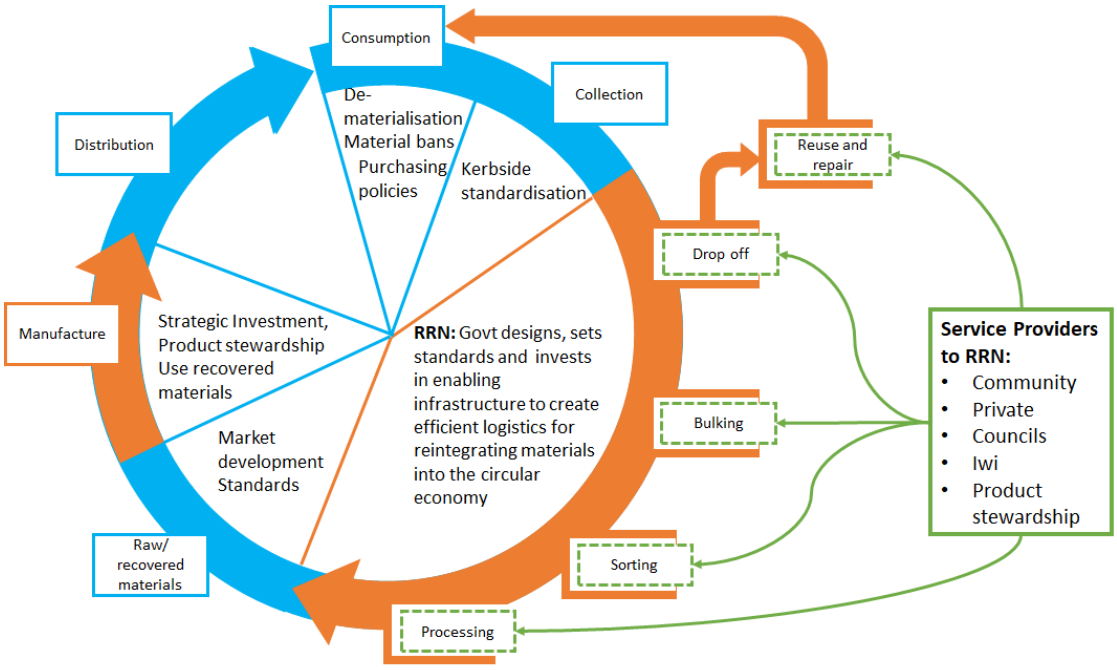
- Service operations
- Infrastructure operation
- Recovering value from materials (including repair and reuse)

- Ownership and sale of recovered materials
- Utilising recovered value to leverage other community outcomes (e.g. employment, training, rehabilitation)

A.5.2.11 Summary

The figure below illustrates how the roles and functions of a national resource recovery network could integrate to provide key reverse logistics functions in the circular economy. The orange elements of the circle are the parts that form the circular resource network.

Figure 19: Roles and Functions of a Circular Recovery Network in the Circular Economy



In the above chart material flows around in a clockwise direction. The arrows represent the material flows. The boxes indicate the key steps within the value chain. The graphic shows how different providers to the can deliver all of the key functions, but within an overall connected framework (that is established and overseen by central/regional/local government).

A.5.3 Benefits of Circular Resource Network Approach

A Circular Resource Network approach would have a range of benefits. These include:

- **Consistent with the Waste Strategy.** At its core the approach is about enabling the circular economy by building out the infrastructure required for the circular flow of materials in the economy. The circular resource network concept synthesises this into a practical approach with wide ranging applications.
- **A practical, easily articulated, investment strategy**. Because the core component of the circular resource network concept is an arrangement of physical infrastructure it is intuitively easy to communicate the intent.
- **Improved efficiency and value.** By focusing on how value can be preserved and enhanced through the resource recovery value chain rather than purely on environmental and social outcomes, it is possible to unlock the potential value of recovered materials and unleash the innovative power of the sector to achieve environmental and social outcomes.
- **Future flexibility.** Flows of materials will change over time. By government investing in the skeleton structures that enable functions, then investment is not locked into a time-limited solution. As materials, markets and processes change over time existing

infrastructure and governance can be efficiently and nationally adapted for the new functions.

- **Data harvesting.** The development of the digital model circular resource network will enable an unprecedented level of insight into recovered material flows and enable effective and intelligent planning and nimble responses by the sector to evolving situations.
- **Baskets of materials.** By co-locating and handling of a range of material and product types at single locations this enables efficiencies through the sharing of support structures and cross subsidisation, and hence the viable recovery of a wider range of materials.
- **Builds on existing infrastructure.** As noted, existing infrastructure (such as existing and planned RR Parks, and transfer stations) would form the foundation of the circular resource network, and these could be progressively integrated.
- **Provides valuable roles for all stakeholders.** The circular resource network will be significant in scale and scope, and it will require the input, collaboration, innovation, and power of all parts of the sector to fully realise its' potential.
- **'No regrets' approach.** The circular resource network concept proposed here is potentially far reaching in its scope and what it could eventually encompass. However, whatever level the concept is implemented to, it will still have multiple benefits. At a minimum it would result in the creation of a number of RR Parks or regional circular resource networks, which will still be positive outcomes.
- **Scalability.** The network can be "right"-sized in a flexible manner with the ability to effectively respond to changing circumstances.

A.6.0 Issues, Evidence, Options

Key Issue Summary	Data and Evidence	Options
The region has relatively low access to material reprocessing infrastructure; ie most recovered materials have to be transported out of the region and, in some cases, long distances to be reprocessed (such as glass, transported to Auckland to be reprocessed into new glass bottles). This impacts on the economics of recovering materials and has a strong influence on which materials can be recovered, and to what extent.	• Infrastructure assessment section 2 • Otago Infrastructure Review and Options report	• All infrastructure options • Advocate to central government for extended producer responsibility • Work closely with mana whenua, community groups, and the private sector to progress opportunities for increased waste diversion • Continue to develop collaborative projects and work towards increasingly formal collaborative arrangements
The performance of the two MRFs in the region currently is an issue both in terms of material quality and sheer capacity. Both Queenstown Lakes and Dunedin (which operate the existing MRFs) have intentions to address this issue, but it is considered appropriate to still highlight this as a key issue	• Infrastructure assessment section 2 • Feedback from councils on the current operation of MRFs section 2.1.4 • Feedback from councils and operators that recovered material quality could be higher with a higher quality MRF section 2 and also Otago Infrastructure Review and Options report • Incidents of diverted material not being recovered successfully due to operational MRF issues section 2 and also Otago Infrastructure Review and Options report	• Identify opportunities for consistent, targeted, direct engagement that can be delivered where there is low participation in recycling and/or organic waste services, and/or high contamination, delivered regionally where possible • Introduce new council-contracted services to increase consistency and enable more regional education and behaviour change • Ensure that the requirements of kerbside standardisation and performance standards are met (once available) • Status quo - new MRFs • Supported by - Standardised signs and branding, material acceptance and quality standards, customer service • Establish regional hubs as described in section A.5.0, particularly A.5.2.4 • Use standard containers and logistics across all network sites as described in section A.5.0, particularly A.5.2.6 • Centralised coordination of network • Collaboration on inter-regional logistics

Key Issue Summary	Data and Evidence	Options
		• Link off-site re-processors and manufacturers to network • Advocate to central government for extended producer responsibility • Work closely with mana whenua, community groups, and the private sector to progress opportunities for increased waste diversion • Continue to develop collaborative projects and work towards increasingly formal collaborative arrangements
Landfill provision in the coastal area of the region presents a number of challenges – Dunedin's access to a local landfill in the medium-long term requires completing consenting for a new facility; Clutha District Council is currently reconsenting Mt Cooee as a Class 1 – which will mean there are two Class 1 landfills within roughly 50 minutes' drive; and Waitaki District currently transports all residual waste to AB Lime in Southland	• Infrastructure assessment section 2, specifically section 2.1.1 • Otago Infrastructure Review and Options report	• Take a regional approach to Class 1 landfill provision • Continue to develop collaborative projects and work towards increasingly formal collaborative arrangements
Class 2-5 landfill provision around the region is variable. Where access is poor, this could lead to residual waste being managed through informal (and potentially illegal) means such as farm dumping	• Infrastructure review section 2.1.3 • Otago Infrastructure Review and Options report	• No direct actions – better information on number and location, and data on quantities, will enable a better assessment here for future work
As is found in other parts of the country, there is a significant data gap relating to private waste collections, Class 2-5 fills, and farm waste management practices. This lack of information makes it difficult to identify gaps and issues, and therefore to effectively manage/minimise this waste.	• Infrastructure review section 2 • Services review (data gaps noted in each section)	• Increased data collection and monitoring should be undertaken (through regulation or national requirement); this would enable councils to better understand what private waste services are in use, why customers choose to use these in preference to council services, and whether these services are supporting strategic goals and targets • Council services could be introduced and/or amended to provide a better fit for purpose

Key Issue Summary	Data and Evidence	Options
		overall; demonstrated through a higher market share for councils • All infrastructure options • Continue to develop collaborative projects (ie regulation) and work towards increasingly formal collaborative arrangements • Collection better data on use of Class 2-5 fills to enable councils to better understand current management options - composition of this waste would still be unknown however (possible future opportunity?) • increased data collection and monitoring for agricultural and non-household waste streams could be achieved through regulation, resulting in increased understanding of, and influence over, private sector service and infrastructure provision
Variation in service levels across the region, and specifically in council-provided service levels (both existing and planned). This means that the extent to which the region is compliant with kerbside standardisation proposals is variable, and the ability to collaborate regionally or nationally on education, behaviour change, and awareness raising is reduced	• Kerbside standardisation section 1.5.6.2 • Services review e.g. sections 3.1.1 and 3.1.2	• Introduce regulation to manage and increase consistency in services provided by the private sector • Introduce new council-contracted services to achieve a more consistent level of service across the region – mainly impacting on Waitaki and, to a lesser extent, Clutha (Dunedin and Queenstown already have plans in place for new services) • Ensure that the requirements of kerbside standardisation and performance standards are met (once available) • Introduce a user-pays garden waste collection to urban areas where this is not already collected or plans are in place to do so (Queenstown, Waitaki, Clutha) • Fund council-provided rubbish collections through rates with restrictions on capacity and/or frequency • Provide access to kerbside services to the commercial sector on a user-pays basis • Support/introduce virtual trading marketplaces e.g. freecycle pages, Civilshare

Key Issue Summary	Data and Evidence	Options
		• Continue to develop collaborative projects and work towards increasingly formal collaborative arrangements • Implement consistent regulation across the region to support more consistent education and engagement • Provide for reuse stores, repair sites, community workshops, demonstrations and courses at key network sites • Standardise signs and branding, material acceptance and quality standards, customer service • Use standard containers and logistics across all network sites • Centralise coordination of network
As is the case in many other parts of the country, contamination in household kerbside recycling collections is high (in the order of 20 – 25%) at the MRFs in Queenstown and Dunedin	• Infrastructure assessment section 2 • Feedback from councils on the current operation of MRFs section 2.1.4 • Feedback from councils and operators that recovered material quality could be higher with a better quality MRF (section 2) and also Otago Infrastructure Review and Options report • Incidents of diverted material not being recovered successfully due to operational MRF issues section 2 and also Otago Infrastructure Review and Options report	• Identify opportunities for consistent, targeted, direct engagement that can be delivered where there is low participation in recycling and/or organic waste services, and/or high contamination • Advocate to central government for extended producer responsibility • Work closely with mana whenua, community groups, and the private sector to progress opportunities for increased waste diversion • Continue to develop collaborative projects and work towards increasingly formal collaborative arrangements • Introduce new council-contracted services to achieve a more consistent level of service is provided across the region – mainly impacting on Waitaki and, to a lesser extent, Clutha (Dunedin and Queenstown already have plans in place for new services) • Ensure that the requirements of kerbside standardisation and performance standards are met (once available)
The market share of household kerbside services held by councils is low in	• Services review section 3.1 (supported by	• Identify opportunities for consistent, targeted, direct engagement that can be delivered where there is low participation in

Key Issue Summary	Data and Evidence	Options
some areas. This may indicate that the services being provided by the councils is not considered fit for purpose by their residents. While this issue is being addressed by several councils, such as Central Otago and Dunedin, it is considered appropriate to still highlight this as a key issue. Private rubbish collections are frequently provided using large (240L) wheeled bins. This has been shown elsewhere to have a significant negative impact on the diversion of recyclables and organic waste.	previous studies e.g. Dunedin Waste Futures), note that Waitaki is an outlier as no council services • Services review – provision of collection services by the private sector section 3.2	recycling and/or organic waste services, and/or high contamination, delivered regionally where possible • Council services could be introduced and/or amended to provide a better fit for purpose overall; demonstrated through a higher market share for councils • Regional regulation to better manage private sector service provision
A number of waste materials could be managed more in accordance with the waste hierarchy to improve diversion from landfill; particularly biosolids/sludges, C&D waste, non-household recyclables, agricultural wastes, glass, organic waste generally, and textiles. These materials appear in relatively high quantities in landfill waste analyses. Many of the materials are non-household waste streams, which are very difficult for councils to influence alone.	• Waste situational analysis section 4.3 including SWAP data from landfills (Green Island, Victoria Flats and Mt Cooee) and transfer stations (WAM in Oamaru) • Infrastructure review section 2.1.4- known facilities and quantities of material diverted at these facilities for these types of waste, also lack of (for e.g.) large scale C&D waste diversion facilities in the district	• Collection services for organic wastes – food scraps and garden waste collections • Improve infrastructure provision for organic wastes, C&D waste, soft plastics, textiles, non-household recyclables, agricultural waste, hazardous waste, glass • Provide infrastructure that encourages deconstruction rather than C&D • Provide for reuse stores, repair sites, cafes/playgrounds, community workshops, demonstrations and courses at key network sites • Standardised signs and branding, material acceptance and quality standards, customer service • Provide space for product stewardship schemes at network sites • Establish regional hubs as defined in section A.5.2.4 • Provide for product stewardship programmes within network sites for bulking and processing • Use standard containers and logistics across all network sites • Centralised coordination of network

Key Issue Summary	Data and Evidence	Options
		• Collaboration on inter-regional logistics • Link off-site re-processors and manufacturers to network • Extend network to include industrial symbiosis parks • Work with manufacturers & institutions to develop circular material models (e.g. product design, leasing systems etc.)
As in most parts of the country, relatively less resources and budget spent (by councils or other agencies) on waste prevention, reduction and reuse activities; compared to lower levels of the waste hierarchy such as recycling and reprocessing.	• Infrastructure assessment section 2 • Services assessment section 0 • To a lesser extent, WMMP reviews section 6	• Identify opportunities for consistent, targeted, direct engagement • Provide for reuse stores, repair sites, community workshops, demonstrations and courses at key network sites • Provide space for product stewardship schemes at network sites • Provide for container reuse at network sites (eg collection space) • Provide for product stewardship programmes within network sites for bulking and processing (depending on type of system) • Provide for container reuse at network sites (eg washing facilities) • Collaboration on inter-regional logistics (depending on type of system) • Extend network to include industrial symbiosis parks • Work with manufacturers & institutions to develop circular material models (e.g. product design, leasing systems etc.)
Council contract timeframes across the region are variable, reducing the ability to collaborate and partner on procurement and service provision	• Infrastructure assessment section 2 • Services assessment section 0	• Addressed by a number of collection-related actions listed above • Continue to develop collaborative projects and work towards increasingly formal collaborative arrangements
There is no formal mechanism to jointly fund and collaborate on regional	• Infrastructure assessment section 2	• Continue to develop collaborative projects and work towards increasingly formal collaborative arrangements

Key Issue Summary	Data and Evidence	Options
or sub-regional waste-related projects, which makes it more difficult to leverage on opportunities and funding sources	• Services assessment section 0 To a lesser extent, WMMP reviews section 6	
There is variability in strategic direction for waste across the region, particularly in relation to the council's role in providing waste management and minimisation services (e.g. direct service provision compared to influence through partnerships and regulation). This makes it more difficult for the councils to collaborate and to access funding that prioritises collaboration.	• Infrastructure assessment section 2 • Services assessment section 0	• Continue to develop collaborative projects and work towards increasingly formal collaborative arrangements, including development of a shared strategic direction
As is the case nationally, some services and infrastructure are affected by a lack of trained resource. The waste sector as a whole does not have a comprehensive or consistently available vocational training programme	• National context section 1.5 • Infrastructure assessment section 2 • Services assessment section 0	• Advocate to central government agencies for a more comprehensive vocational training programme, delivered consistently • Work closely with mana whenua, community groups, and the private sector to progress opportunities for increased waste diversion
Proactive plans to manage disaster waste, such as that caused by severe weather events and other natural disasters, are required	• Identified as a future demand, section 7.1	• Develop local disaster waste management plans based on national disaster waste management research

A.7.0 Queenstown Lakes District Council

This section covers issues that are specific to the Queenstown Lakes district, including a detailed review of the current WMMP, additional specific benchmarking, a consideration of the implications of kerbside standardisation, and specific comments on the options list.

A.7.1 Review of the 2018 Waste Management and Minimisation Plan (WMMP)

QLDC's previous Waste Assessment was adopted as complete in March 2018 followed by the adoption of a WMMP in June 2018. QLDC has now carried out a review of its WMMP 2018 and as required by the WMA this Waste Assessment (containing a review of the WMMP 2018), must be completed and adopted by Council no later than June 2024.

The QLDC WMMP 2018 had a vision for the future of (moving/working) "towards zero waste and a sustainable district" and was supported by two goals and four objectives. The goals were directly taken from the New Zealand Waste Strategy 2002.

Goal	Objective
G1: Improving the Efficiency of Resource Use	O1: Provide opportunities to minimise waste through reduction, reuse, recycling and recovery (in priority order) O2: Educate and support generators (residents, visitors, and businesses) with options and responsibilities
G2: Reducing the Harmful Effects of Waste	O3: Avoid or mitigate any adverse effects on public health or the environment O4: Provide effective and efficient waste minimisation and management services supported by the right funding mechanisms

The metrics and targets in the WMMP 2018 included:

- Total waste to landfill (tonnes per year)
- Total waste diverted (tonnes per year)
- Consent compliance (%)
- Customer satisfaction (%)

These metrics and targets were subsequently modified for both the 2018 and 2021 Ten Year Plan and are tracked as follows:

Key Performance Indicator	Emissions (CO2e) from waste to landfill (kerbside and transfer station material only)	Percentage of Materials Recovery Facility (MRF) recycling contaminated	Total waste diverted from landfill (tonnes)	Total waste sent to landfill (tonnes)
Baseline Performance (30 June 2020)	New measure	28%	7,736t	43,700t
Target 2020/21	Annual reduction of 4.2%	<20%	>7,800t	<42,000t
Actual 2020/21	N/A	N/A	7,386t	41,486t
Target 2021/22	Annual reduction of 4.2%	<20%	> 8,000t	<44,000t
Actual 2021/22	4%	15.94%	7,237t	40,448t
Target 2022/23	Annual reduction of 4.2%	<20%	> 8,200t	<46,000t
Actual 2022/23	29%	15%	7,688t	45,515t
Target 2029/30	Annual reduction of 4.2%	<20%	>23,000t	<59,000t

The QLDC WMMP 2018 doesn't include a section that specifically outlines the key issues to be addressed through the Plan. Alternatively, it describes the outcomes of a 'programme business case' (PBC) approach where seven programmes of work to improve waste management and minimisation were addressed during the Waste Assessment process. This process was described in detail in an appendix to the Waste Assessment. The seven different programmes of work considered were:

1. Status quo
2. Do minimum: provide minimum level of service to minimum legal requirements
3. More influencing: continue with current refuse and recycling collections and waste facilities but increase education and regulation
4. More services: Provide more waste minimisation services and facilities and retain current education and engagement
5. Full council service: More waste minimisation services, facilities, education, and regulation, with council providing full service supported by education and regulation
6. Focus on organics and glass: Provide more waste minimisation services and facilities that target organics and glass; and retain current education and regulation
7. Focus on C&D and glass: Provide more waste minimisation services and facilities that target C&D and glass; and retain current education and regulation

Through a structured assessment and scoring process, a group of stakeholders ranked the seven programme options. Option 6 was ranked first, with the commentary "more achievable, earlier implementation, cost effective, aligns with other strategies e.g. sludge disposal, aligns with stakeholder delivery vision, delivers reduction to landfill, lower operational costs." The programme was carried forward to the WMMP 2018 Action Plan.

The table below comments on the vision, goals, objectives, and target of the WMMP 2018:

WMMP 2018	Commentary
Vision	The vision was focused on a zero waste philosophy. This is considered to have been quite appropriate, as 'zero waste' was the dominant waste minimisation philosophy at the time. The zero waste concept is well understood and supported in the district. Recent years have seen a global focus on the concept of a 'circular economy' which incorporates many zero waste principles and raises the importance of 'circularity' in waste systems. There is also a growing awareness of the environmental impacts (especially GHG emissions) of waste management practices. The recently released Ministry for the Environment 'Te Rautaki Para, New Zealand Waste Strategy', has focussed on a circular economy-based vision. The existing vision could reflect global and national focus on reduction of emissions and the circular economy approach. For these reasons, it is proposed that the 2018 vision be reviewed for the Queenstown Lakes next WMMP.

Goals	The goals in the WMMP 2018 are heavily reflective of the previous New Zealand Waste Strategy 2002. The 2018 goals don't fully reflect the strategic priorities for the district. This can make aligning proposals for new action difficult and impair the ability to fully assess the costs and benefits of proposals. The 2018 goals would benefit from revision to better reflect the strategic approach and direction of the district. Depending on the scope of the revisions, this alone may not require the full consultation process.
Objectives	Similarly, the 2018 objectives need reviewing alongside the goals, particularly in the context of Te Rautaki Para. Additional objectives could be included to reflect the wider circular economy approach, the focus on emissions and be more aligned with the strategic direction of Te Rautaki Para.
Target	The 2018 first target was based on overall waste to landfill. This could still be used, but amended to reflect a 'per person' (including visitor numbers) figure to ensure that even with increasing population and visitor numbers, proportional waste reduction can be measured. A similar recommendation applies to the recycling/diverted material-related target. Targets should also incorporate the planned performance targets set by central government.

10.1 Actions

The current WMMP 2018 includes a number of actions with associated timeframes. These are set out below with brief commentary on progress.

Table 34: Review of the Previous WMMP 2018 Action Plan (actions with contribution towards targets)

Action in the QLDC WMMP 2018	Planned timeframe	Commentary	Progress
Waste Reduction			
Work with community groups, residents, business and visitors to encourage and promote waste minimisation and optimal resource use	2018 – ongoing	Several community outreach initiatives are funded and delivered under the 'QLDC Zero Waste District Programme' including the 'Resourceful Communities' programme delivered by Wanaka Wastebusters and Sustainable Queenstown. QLDC also provides grant funding to: - KiwiHarvest a food rescue charity redirecting good-to-eat food from landfill and delivering it to community groups providing food support. - Wanaka Community Workshop an inclusive community resource hub where people can access the tools, materials, learning and physical space necessary for building and repair projects and learn and share skills. - Lightfoot One Bike, an organisation that rescues unwanted bikes, fixes them and donates them to new owners. Numerous community outreach campaigns and pop up events are also supported including: Wanaka A&P Show, Queenstown Homeshow, Responsible Camping initiative and visitor/tourism targeted campaigns.	Ongoing

Support development, implementation and promotion of local, regional and national initiatives that drive waste minimisation	2018 – ongoing	QLDC promote, fund and support the following local and national campaigns and events. Many are repeated across a number of years (e.g. annual campaigns). Initiatives include: ◦ Love Food Hate Waste ◦ Plastic Free July ◦ SUCfree Wanaka and Whakatipu https://www.plasticfreewanaka.co.nz/initiatives/single-use-cup-free/ ◦ Repair Cafes https://www.wastebusters.co.nz/2020/11/16/join-the-repair-revolution-with-wastebusters/ ◦ Slow Fashion and the Six Items Challenge https://www.wastebusters.co.nz/2021/02/19/fight-fashion-waste-with-the-six-items-challenge/ ◦ Sustainable Queenstown's Green Drinks https://www.facebook.com/sustainableQueenstown/ ◦ The annual WAO Summit and a number of its' working groups: https://www.wao.co.nz/ ◦ The Better Building Working Group https://www.wao.co.nz/better-building ◦ RefillNZ, including all QLDC water fountains signed up as refill stations https://refillnz.org.nz/ ◦ Keep New Zealand Beautiful. QLDC supports NZ Clean Up Week through promotion and free litter disposal at transfer stations during the event.	Ongoing

Provide waste minimisation programmes and workshops for residents, visitors, business and schools e.g. Enviroschools, Environmental Education for Resource Sustainability, Dr Compost, Waste Free Parenting, Love Food Hate Waste	2018 – ongoing	Various national programmes and workshops are delivered in partnership with local service providers. Initiatives include: Schools – Funding for delivery of Enviroschools, Paper for Trees and Zero Waste in-class education for state owned and state integrated primary and secondary schools. The programme covers 13 primary schools and two high schools. Waste free period education is delivered by Waste Free with Kate at the high schools. Business - Regular, on request, presentations and MRF tours provided to businesses on the topic of waste minimisation and recycling. Waste audits, case studies and demand surveys delivered through the Resourceful Communities programme in conjunction with the local Chambers of Commerce. Waste minimisation support is provided to businesses under the education component of the Solid Waste Services Contract. Residents – Funding of Dr Compost to offer free advice and resources at events, workshops, by email and on Facebook. Waste Free Parenting workshops delivered by Waste Free with Kate. Numerous workshops delivered via the Resourceful Communities programme including Low Waste Living, Repair Cafes. Visitors – SUC Free, RefillNZ, Responsible Camping and Tiaki Promise programmes are supported. Low waste tourism advice, tips and promotional material is shared via Lake Wanaka Tourism and Destination Queenstown channels.	Ongoing

Use lobbying power to support the priorities in the Local Government New Zealand's 'Waste Manifesto'	2018 – ongoing	Supported the development of the Local Government Waste Manifesto 2020 and its implementation through submissions, media enquiries and letters to the Minister. Currently supporting the development of the revised Waste Manifesto 2023. Continued staff involvement on WasteMinz Sector Groups and relevant MfE Technical Advisory Groups.	Ongoing
Support the development of a revised NZ Waste Strategy to create a strategic framework, give certainty and guide decision making	2018 – ongoing	Supported the development of the new Waste Strategy Te Rautaki Para through various submissions and involvement on Technical Advisory Groups (TAGs). The Waste Strategy Te Rautaki Para was released in March 2023. Continued staff involvement on TAGs, steering committees and submissions to consultations associated with targeted aspects of the new strategy and its implementation.	Complete
Support the development of an effective container deposit scheme	2018 – ongoing	Supported through submissions and involvement on Local Government TAGs during the development of the preferred scheme. The container return scheme has been deferred by Government but its implementation continues to be supported through the Local Government Waste Manifesto.	Ongoing
Support the extension and increase of the NZ Landfill Waste Levy	2018 – ongoing	Supported through submissions, the Local Government Waste Manifesto and involvement on MfE TAGs. The increased scope and value of the levy has been adopted by Government.	Complete
Support the implementation of the National Waste Data Framework to secure better data for decision making	2018 – ongoing	Supported through submissions and involvement on MfE TAGs. The National Waste Data Framework (and associated regulations) have been drafted and is expected to be included in amended WMA regulation.	Ongoing

Support the development and implementation of mandatory product stewardship schemes for tyres, e-waste, agricultural chemicals and plastics, and other products that need priority attention	2018 – ongoing	Supported through various submissions to the MfE and industry sector.	Ongoing
Provide information on the available waste minimisation and management services to business, visitors and residents	2018 – ongoing	Provided through various targeted communication campaigns, web update and comprehensive communications planning with stakeholders (Wastebusters and Waste Management) and delivery through Zero Waste District programme.	Ongoing
Regularly update waste minimisation and management information available on the Council website	2018 – ongoing	Website overhaul and regular improvements undertaken.	Ongoing
Provide targeted communication and engagement campaigns that raise awareness and provide information on waste minimisation for visitors, residents and businesses	2018 – ongoing	Wide range of material provided through targeted communication campaigns, web updates and comprehensive communications planning with stakeholders (Wastebusters and Waste Management) and delivery through Zero Waste District programme.	Ongoing
Use multiple languages to aid communication of waste minimisation and management information	2018 – ongoing	Key initiative occurred through the upgrade of the public space bins with multiple-language signage included.	Complete

Develop baseline and reporting measures on waste minimisation and diversion on QLDC operational activities	2018 – ongoing	Targeted initiatives only including no print/no paper campaigns, food scrap bins in some QLDC kitchen/office spaces, event and sport centre facilities audits, baseline and interventions. Progress made with limited targeted QLDC operations only.	Not complete
Support local, regional and national level initiatives that drive waste reduction e.g. Plastic Free July, Love Food Hate Waste	2018 – ongoing	As noted previously, support is provided as part of the Zero Waste District programme and through the education component of the Solid Waste Services Contract.	Ongoing
Promote sustainable building practice that minimises waste and reduces resource use	2018 – ongoing	Supported the development of various initiatives; Better Building Group Wanaka, various presentations to sector stakeholders, tradie breakfasts, promotion of CivilShare app through launch events and ongoing coms, submissions to relevant central government consultations to develop policy changes that support (e.g. 'Building for climate change'), relevant key performance indicators on a couple of key council infrastructure projects/panels.	Ongoing
Install drinking water fountains to encourage refilling of drinking vessels	2018 – ongoing	Parks and trails team deliver where possible although challenges exist due to risk of water freezing during the winter period. Progress also demonstrated through the purchase of a mobile drinking water station available for public events and support for RefillNZ to include all QLDC water fountains identified online as refill stations https://refillnz.org.nz/. Provided project support to enable sign up to RefillNZ by local cafes.	Complete

Enforce waste minimisation regulatory provisions at events	2018 – ongoing	Developed 'Top tips on how to reduce waste at events' digital resource https://www.qldc.govt.nz/services/rubbish-recycling/zero-waste-events Currently developing an extensive event waste minimisation guide. Includes multiple stakeholder workshops to help develop support guidelines (and regulatory response), case studies and advisory services. The project will identify the triggers and process required to apply a regulatory approach.	Not complete
Establish a community contestable fund for initiatives that minimise waste and maximise resource recovery	2018 – ongoing	The fund was established in 2019 and up to $60,000 is now available annually. This includes initiatives that complement and enhance existing programmes, address gaps, create new opportunities, and encourage community participation in waste minimisation. Recipients and more details here Waste Minimisation Community Fund (qldc.govt.nz).	Complete
Resource Recovery			
Provide resource recovery (and waste disposal) facilities that optimise separation of divertible material in Wanaka and Whakatipu	2018 – ongoing	A review of the districts two transfer stations and MRF was undertaken with ongoing work looking at providing a new combined MRF and Transfer Station site with additional resource recovery capacity for the Whakatipu and an improved layout at the Wanaka transfer station facility.	Ongoing
Provide recycling collection services for eligible schools	2018 – ongoing	Recycling collection is funded across all state owned and state integrated primary and secondary schools in the district e.g. 13 primary schools and two high schools.	Ongoing

Use procurement processes to align and invest in services and facilities that drive reduction, resource recovery and support national product take back schemes	2018 – ongoing	A major procurement review and contract development process was undertaken prior to the waste services contract review in 2019. The new contract is now in place for a ten-year period. Limited product take back schemes are included in the contracted services.	Ongoing
Provide promotional support for commercial waste minimisation programmes e.g. agricultural chemical containers and bale wrap recovery	2018 – ongoing	Local opportunities where available are identified on the website.	Ongoing
Provide recycling collection services for urban households	2018 – ongoing	A new contract was awarded to Waste Management Ltd (WMNZ) in 2019 for kerbside collection services starting July 2019. For eligible properties, the recycling collection is provided via kerbside collection where possible, or via a collection area on the nearest road where a collection is provided. Residents outside the collection boundaries can bring their bins to the collection area for collection. Extensions to the collection boundaries are considered as areas develop and more properties become eligible for collection. The service provision includes fortnightly mixed recycling and separated glass bins on alternating weeks.	Complete
Implement a change to the glass recycling that improves quality, quantity and yield and is consistent across the district	2018 - 2020	A new kerbside glass-only fortnightly 140L wheelie bin collection was implemented with the new WMNZ kerbside service contract in July 2019. Glass bottles and jars collected are sent to Auckland to be recycled into new containers onshore. Recent audit analysis showed well below 1% contamination.	Complete

Provide organic waste drop off facilities and mulching of material for beneficial use	2018 – ongoing	Services at Council's two main facilities include organic waste drop off for hedge trimmings and tree branches up to 400mm in diameter and small tree stumps. This organic material is then chipped and reused in the district on QLDC managed parks and reserves. Material excess is occasionally offered to the wider community for use in home and community based projects. Council also supports community-run greenwaste facilities in the rural communities including; Glenorchy, Kingston, Lake Hawea, Luggate and Makarora.	Ongoing
Introduce organic waste kerbside collection service for urban households	2022 - 2024	QLDC is undertaking a detailed business case to consider the options available for the collection and processing of food scraps and/or green waste to avoid material being sent to landfill and to reduce the associated emissions.	Underway
Provide an organic waste processing facility	2022 - 2024	The Organics detailed business case is considering options available for the processing of collected food scraps and/or green waste both within the district or outside of the district.	Underway
Review and provide upgrades to the layout and operation of resource recovery and waste disposal facilities to optimise resource recovery and improve capacity	2018 - 2020	The implementation of the Queenstown and Wanaka Transfer Stations Waste Management contract included improvements to sorting and storage of divertible materials, such as green waste, tyres, scrap metal, cleanfill, gas bottles, child car seats and limited volumes of hazardous waste.	Ongoing

Install public place recycling bins co-located with litter bins where practicable and cost effective	2018 - 2020	QLDC rationalised and replaced existing bins with four way bins (two rubbish, one glass and one can) in the CBDs in 2020. This was updated following an independent 'sort-and-weigh' audit to capture data on the quality, composition, and volume of recyclable content collected. The audit showed that single stream collection of glass recycling in public bins is working well and a change to a single stream collection for aluminium cans would have a positive recycling outcome because cans are clean enough to be recycled. All existing 2-way bins (currently made up of one mixed recycling and one rubbish bin) were changed to rubbish only. Existing 2-way bins at Queenstown Gardens (currently made up of one mixed recycling and one rubbish bin) will change to rubbish and glass recycling. All existing 4-way bins (currently made up of one mixed recycling, one glass and two rubbish bins) will change to one glass, one aluminium cans only and 2 rubbish bins. New 4-way bins installed in Hawea and Kingston to ensure these communities have consistent access to public place recycling with the rest of the district.	Complete
Provide learning opportunities and incentives to compost at home	2018 – ongoing	QLDC provides the Dr Compost programme to educate how to compost food and garden waste at home, how to garden and grow food to close the loop; this programme includes multiple workshops and events. QLDC also subsidises the purchase of Bokashi bins and composting worms. Excess mulch from transfer station facilities is returned to the community by Council via Mulch Grab events. These events also allow for engaging with the community on topical waste issues.	Ongoing

Support and enable the development of construction and demolition material recovery where practicable	2018 – ongoing	Targeted success with behaviour change and specific initiatives only, including the establishment of the sector-led 'Better Building Working Group' which has developed research and case studies on construction waste minimisation. QLDC supports various sector initiatives and community led workshops, tradie breakfasts and presentations. QLDC developed project specific key performance indicators for a major QLDC de-construction/demolition capital works project and eco-build initiative https://www.qldc.govt.nz/services/rubbish-recycling/other-waste/construction-demolition-waste	Ongoing
Implement enhancements to end-use of biosolids	2018 - 2022	Considered as part of the organics preliminary programme business case. Detailed investigation is being deferred due to the Three Waters Reform.	Not complete
Promote recycling opportunities and schemes e.g. Love NZ soft plastic scheme	2018 – ongoing	Soft plastics recycling scheme services are not available in the district. Alternative solutions are promoted. Promotion of industry led, and national recycling schemes are supported through social media, web and regular communications. Initiatives include batteries, car seats and electronic waste.	Ongoing

Waste Disposal			
Provide waste disposal facilities in Wanaka and Whakatipu	2018 – ongoing	Waste disposal services are provided through the 2019 WMNZ contract at the Wanaka and Whakatipu Transfer Stations. Both facilities are operating beyond their intended design life. They are requiring significant ongoing maintenance to enable their continued operation ahead of various upgrades identified in the Long Term Plan. Various upgrades have already been completed to keep plant operational but a new transfer station facility at a new site to service the Whakatipu area is programmed. Detailed planning is currently underway.	Ongoing
Provide promotional support for community led litter clean up events	2018 – ongoing	Promotional support of events and free disposal of litter collected during the annual Keep New Zealand Beautiful Clean Up Week is provided at the districts transfer stations. Loanable Litter Kits are available at the Queenstown, Frankton and Wānaka Libraries and can be checked out by library card holders for a loan period of one week. Each litter kit contains a pickup tool, high visibility vest, a pair cut resistant gloves and a reusable bag.	Ongoing
Respond to illegal dumping complaints	2018 – ongoing	The QLDC Customer Services and Regulatory Teams manage initial customer contact. The WMNZ contract covers provision of the clean up response to illegal dumping.	Ongoing
Provide household hazardous waste disposal services	2018 – ongoing	The WMNZ contract covers provision of household hazardous waste disposal services. Services are provided at the Wanaka and Whakatipu Transfer Stations.	Ongoing

Comply with obligations under the Emissions Trading Scheme including reporting of methane emissions from the Victoria Flats landfill.	2018 – ongoing	Council purchases carbon emission units (NZUs) under the New Zealand Emissions Trading Scheme for the Victoria Flats Landfill. Costs are passed on through gate fees for the landfill and fees and charges at the transfer stations. The impact of carbon credits in accordance with the Emissions Trading Scheme is reviewed on an annual basis to ensure pricing of waste services is amended in-line with forecast prices for carbon credits. A Landfill Gas (LFG) collection and destruction system was commissioned in 2021. An application for a Unique Emissions Factor (UEF) was successful for the 2022 calendar year. The new UEF is two-thirds lower than the previous Default Emissions Factor. An emissions reduction target will be set once QLDC have reviewed and updated the QLD Emissions Reduction Roadmap and developed the Operational Emissions Reduction Plan (Actions 1.1 and 1.14 of the Climate and Biodiversity Plan).	Ongoing
Monitor the types and quantities of construction and demolition waste disposal	2018 – ongoing	Three yearly SWAP composition analysis is undertaken as part of the WMNZ contract at kerbside, transfer station and landfill. The data is integrated into QLDC demand management and waste projections.	Ongoing
Monitor, maintain and report on consent compliance for waste facilities and closed landfills	2018 – ongoing	QLDC monitors six closed landfills and reports to the Otago Regional Council against the consent relating to discharge to land and air. QLDC has ongoing costs associated with the management of closed landfills and is in the process of assessing the environmental and public health risk associated with these landfills. The outcome of the assessment may lead to additional capital work required to manage risk from extreme weather events. This is particularly relevant to closed landfills near waterways.	Ongoing

Monitor the future capacity of the landfill and search for alternative disposal options should capacity decrease below a future proof disposal level	2018 – ongoing	Analysis and monitoring of landfill capacity is ongoing. Current capacity is estimated for 2068 under current projections with no further diversion/recovery activities. The Victoria Flats landfill is consented to 2032 and QLDC are currently investigating consent renewal options.	Ongoing
Provide facilities for household hazardous waste disposal including; ewaste, oil and batteries where affordable and where complement national schemes	2018 – ongoing	The WMNZ 2019 contract covers provision of drop-off services for household hazardous waste disposal. Hazardous waste is accepted at Wanaka and Whakatipu Transfer Stations by prior arrangement to ensure an approved handler is available to safely deal with the waste. Electronic waste can be recycled at the Wanaka and the Whakatipu Transfer Stations Used engine oil, batteries, lightbulbs can also be recycled via the Whakatipu Recycling Centre.	Ongoing
Provide facilities for agrichemical and agrichemical container recycling/disposal through nationally supported schemes	2018 – ongoing	Agrecovery Container Collection Sites are not available in the district but are provided in neighbouring CODC. Agricultural chemical collection events are scheduled in conjunction with Otago TAs, Otago Regional Council and Agrecovery and are advertised locally.	Not complete
Investigate tools that support safe disposal of health care waste	2018 – 2020	Limited work has been progressed to investigate tools or methods to support this initiative.	Not complete

Provide rubbish collection services for urban households	2018 – ongoing	New contract awarded to Waste Management Ltd (WMNZ) in 2019 for kerbside collection service provision from July 2019. For eligible properties, waste collection is provided via kerbside collection where possible, or via a collection area on the nearest road where a collection is provided. Residents outside the collection boundaries can bring their bins to the collection area for collection. Extensions to the collection boundaries are considered as areas develop and more properties become eligible for collection. Kerbside refuse is collected weekly in 140l wheelie bins.	Ongoing
Review methodology of kerbside rubbish collection including receptacles, frequency and funding mechanisms	2018 - 2020	Council streamlined the service delivery framework in 2019 and implemented improvements with the new WMNZ contract.	Complete
Review methodology and provision of CBD rubbish collection services including receptacles, frequency and funding mechanisms	2018 – ongoing	Considering solutions for commercial waste storage to alleviate collection challenges in the CBD where traditional service lanes have been taken over by businesses operating under licences to occupy. Initial investigation underway including regulatory approach to use of existing facilities and placement of bins.	Underway

Provide public place litter bins. Review bin type and servicing frequency	2018 – ongoing	(See previous comments). During busy summer months, the CBD and waterfront bins are monitored by an e-bike rider who is responsible for: ○ reporting back to collection truck drivers bins that need emptying ○ protecting waterways and water bodies by keeping designated public bins tidy and minimising litter ○ educating the public about how to use the public bins correctly, and helping them to recycle right	Ongoing
Review the need for a waste bylaw	2018 – ongoing	A significant bylaw review was undertaken in conjunction with CODC and draft provisions were developed. Due to potential new provisions in the WMA this work has been stalled.	Ongoing
Investigate differential pricing tools to increase diversion at both the landfill and transfer station facilities	2018 – ongoing	Pricing reviews are undertaken annually as part of setting the fees and charges process and were completed as part of the new WMNZ contract 2019.	Ongoing

Review and provide upgrades to the layout and operation of the waste disposal facilities to optimise resource recovery and improve capacity	2018 - 2020	Significant investment is required to keep the district facilities operational. Assets at both Wanaka and Whakatipu facilities are in critical/poor condition with limited space onsite to expand for wider waste diversion/resource recovery opportunities and meet increasing demand in our growth region. As such, Council is proposing to develop a new resource recovery and waste transfer facility in the Whakatipu and a rearrangement/realignment and upgrades of the existing transfer station site in Wānaka. Various improvements have been carried out at both facilities to maintain and enhance service provision however significant upgrades are still required. Provisional funding is in the LTP but the new Whakatipu facility will likely require extra funding to provide the full extent of services and maximise resource recovery. Securing a site and detailed planning for the Whakatipu facility is progressing. The new Whakatipu facility will be developed in two stages, with the first stage involving the construction of a Waste Transfer Station and Materials Recovery Facility (MRF) for receiving and processing recyclable material. Stage two will involve the establishment of a community Resource Recovery Park. The focus will be on the recovery of additional materials, along with development of a reuse store, a repair hub, and a community learning centre. Once completed, the Whakatipu facilities will work together to focus on reduction of waste and recovery of materials from the waste stream. In turn, this will help demonstrate real opportunities for community members to make our vision of a zero waste and sustainable district a reality.	Underway
Provide waste disposal services at the Victoria Flats landfill	2018 – ongoing	The Victoria Flats Landfill is owned and managed by Scope Resources until June 2034 (at the earliest) under agreement between QLDC and Scope Resources Ltd. A review of the agreement was undertaken to align with other service contracts for waste collection.	Ongoing

Design and construct landfill gas capture and destruction at Victoria Flats landfill	2019 - 2022	The Landfill Gas (LFG) collection and destruction system was commissioned in 2021. An application for a Unique Emissions Factor (UEF) was successful for the 2022 calendar year. The new UEF is two-thirds lower than the previous Default Emissions Factor.	Complete

Council has completed most of the planned actions and significant progress has been made on others. In a very few cases, action is no longer appropriate or necessary due to changing circumstances.

Strategically, the WMMP 2018 is reflective of the strategic environment in which it was written; i.e. the previous New Zealand Waste Strategy, it also had a strong zero waste focus which is embedded throughout a number of programmes and initiatives.

The recent release of Te Rautaki Para creates a new strategic environment nationally, with a circular economy focus.

Although the circular economy principles are closely aligned to zero waste, the overlap is not complete and therefore by moving to a fully circular economy-focused strategic direction, some of the legacy value of the zero waste-focused work in the district would be lost.

Therefore, considering the circular economy direction of Te Rautaki Para, and the requirements of confirmed national policy, regulations and work programmes; it is recommended that Council adopt a new WMMP that:

- incorporates both zero waste and circular economy principles
- updates goals, objectives and targets that reflect those in Te Rautaki Para
- includes the performance targets for TAs, (including the specific impacts of high visitor numbers on the district).

A.7.2 Benchmarking

Additional benchmarking was carried out for the Queenstown Lakes district, as the very high visitor numbers result in higher figures for overall waste to landfill than would be expected given the strong waste minimisation work programme. The very active construction sector in the district is likely to contribute to this.

As Queenstown Lakes district has high visitor numbers, basing a target on a 'per capita' measure is not considered appropriate. Future targets based on a 'per person' metric will need to account for visitor numbers. Population data inclusive of resident and visitor numbers is available for the district.

Waste to landfill figures have been sourced from a number of districts that also have high visitor numbers (using the regional tourism organisation figures that correspond to the district area).

Table 35: Specific Benchmarking for Queenstown Lakes District

Council	Population (2018)	Visitor numbers	Landfill kg/capita/annum
Queenstown Lakes District* ***Lake Wanaka Tourism and Destination Queenstown***	47,400	261,908	0.833
Rotorua Lakes District	77,300	307,958	0.212
Thames-Coromandel District	31,500	471,674	0.383

A.7.3 Kerbside Standardisation Alignment

Queenstown Lakes district is impacted by new government requirements for a council-run food scraps service as part of the kerbside standardisation requirements. Councils with main centres within 150 kilometres of an existing organics processing facility will need to collect food scraps by 2027. Urban areas where no organic processing facilities exist the date is extended to 2030. The requirements will apply to households of 1,000 people or more defined by thresholds in the Stats NZ Geographic Boundary Viewer (for the 2022 year). The definitions include the following urban areas, Arrowtown, Lake Hayes, Arthurs Point, Queenstown, Lake Hawea and Wanaka. Rural settlements are not considered part of the new requirements and include Hawea Flat, Luggate, Kingston, Jacks Point and Glenorchy.

Under the new requirements if QLDC kerbside services are non-compliant at 1 January 2030, MfE will have the right to withhold council's waste levy funds. Retrospective payments would not be available once services are compliant.

QLDC is currently working through the business case for organic waste collection and processing, including household food scraps, so it is considered likely that the kerbside service requirements will be compliant earlier than 1 January 2030.

A.7.4 Proposed Options

The range of options available as described in this Waste Assessment will need to be considered specific to QLDC, and, their potential cost implications understood before inclusion in the draft QLDC WMMP action plan for consultation.

Attachment C: Waste and Recycling in Otago 2022

Waste and Recycling in Otago

eunomia

OTAGO MAYORAL FORUM

Report for the Otago Mayoral Forum

Prepared by:
Duncan Wilson, Lisa Eve, Bruce Middleton,
Niki Bould, and Ella van Gool.

Approved by

……

Duncan Wilson

(Project Director)

Eunomia Research & Consulting Ltd
PO Box 78 313
Grey Lynn
Auckland 1245

New Zealand

Tel: +64 9 376 1909

Web: www.eunomia.co.nz

Acknowledgements

Disclaimer

Contents

Glossary

C&D	Construction and demolition waste
CAP	Climate Action Plan
CCC	Climate Change Commission
CH4	Methane
Clutha DC	Clutha District Council
CO2	Carbon dioxide
CODC	Central Otago District Council
DCC	Dunedin City Council
DEF	Default emissions factor
ELTs	End of life tyres
ETS	Emissions Trading Scheme
GHG	Greenhouse gas
HDPE	High-density polyethylene, plastic type 2
HSNO	Hazardous Substances and New Organisms Act
LGA	Local Government Act
LTP	Long term plan
LULUCF	Land use, land use change and forestry
MDF	Medium-density fibreboard
MfE	Ministry for the Environment
MOU	Memorandum of understanding
MRF	materials recovery facility
NBA	Natural and Built Environments Act
NES	National environmental standard
NWDF	National waste data framework
NZU	New Zealand units
NZWS	New Zealand Waste Strategy
ORC	Otago Regional Council
PET	Polyethylene teraphthalate, plastic type 1
PP	Polypropylene, plastic type 5
QLDC	Queenstown Lakes District Council
RMA	Resource Management Act
RTS	Refuse transfer station
SdE	Southland disAbility Enterprises
SDHB	Southern District Health Board
SFF	Silver Fern Farms
SWAP	Solid waste analysis protocol
TA	Territorial authority
TDF	Tyre-derived fuel
TDM	Tyre-derived medium
UEF	Unique emissions factor
WAM	Waste Management NZ Ltd

WasteMINZ	Waste Management Institute of New Zealand
WDC	Waitaki District Council
WMA	Waste Minimisation Act
WMF	Waste Minimisation Fund
WMMP	Waste Management and Minimisation Plan
WRRP	Waitaki Resource Recovery Park
WRRT	Waitaki Resource Recovery Trust
WWTP	Waste water treatment plant

Foreword from the Otago Mayoral Forum

When the Otago Mayoral Forum met for the first time following the 2019 local elections, members put waste and recycling at the top of our shared agenda.

The Otago Mayoral Forum is comprised of Otago's five Mayors, the Chair of the Otago Regional Council, and the territorial authorities' Chief Executives. The Forum's role is to enable communication and coordination across the region, paving the way for councils to work together on issues of shared importance. We can't direct our councils to collaborate, but we can investigate issues and options at a regional scale and offer new perspectives.

Thinking regionally to address waste makes a lot of sense. Otago's five district and city councils manage waste and recycling responsibilities individually on behalf of residents, and mostly independently of each other. But working together could provide the scale and shared resources we need to do things better.

Though many New Zealanders are doing the right thing - reducing waste, reusing and recycling - huge amounts of materials still go to landfill. Volumes are increasing[1] and space is limited. Climate change is another incentive, as organic materials sent to landfill create methane, a greenhouse gas.

For Otago, waste and recycling challenges are magnified by our large area, small population and large distances between populations centres and to national waste facilities. If we are to better manage our own waste, we need to work harder than most.
To understand the very specific waste and recycling challenges that we face in Otago, the Forum commissioned this report from environmental consultancy Eunomia.

In this report, Eunomia documents waste and recycling infrastructure, volumes and activity throughout Otago. It also provides a national, regional and local overview of waste planning, responsibilities, challenges and opportunities.

The report includes examples of large organisations in the region and how they are tackling waste, including the Southern District Health Board, University of Otago and Harraways Oats. We'd like to thank all of these organisations for giving us access to important information.

This information is a resource for councils, waste industry organisations and the community to better understand our waste activity and how to improve it. While councils are responsible for managing waste, we all play a part.

We trust you will find useful information in this report, and encourage you to have conversations with your council, within organisations and with each other about how we can collectively improve Otago's waste management. We look forward to supporting those conversations through the Forum.

Mayor Tim Cadogan
Chair, Otago Mayoral Forum
Mayor of Central Otago

Foreword from Ngai Tahu Rūnaka ki Otago

Kāi Tahu are encouraged by and support the Otago Mayoral Forum initiative to have this report on 'Waste and Recycling in Otago' prepared. The report helpfully summarises the national context and range of initiatives designed to improve waste infrastructure and management at the local and regional level.

The report usefully describes the current waste infrastructure in Otago and its adequacy, the nature and source of waste while also identifying issues and opportunities.

As mana whenua of the region, Kāi Tahu have long expressed the view that poorly sited and dysfunctional waste management systems pose a serious threat to the cultural values of whānau, hapū and iwi. A values system is required that recognises an interconnection between land, water, sea and air, and the ongoing welfare of people.

It is in this context that mana whenua have long been engaged during the era of the RMA with regional and local government in Otago on waste management policy and plan initiatives to achieve sustainable and positive outcomes for waste management.

This report is a positive contribution to informing not only councils and waste industry, but importantly community understanding of our waste activity. We join with the Mayoral Forum in encouraging the interest and engagement of all communities in finding better solutions to waste management in the region.

Edward Ellison
Upoko Rūnaka
Te Rūnaka o Ōtākou

Overview

This report is organised into five parts as follows:

National, regional and local context (p. 1) provides a summary of national policy, legislation, investment and other government initiatives, all in one place with weblinks where possible. The regional context includes plans and policies, and outlines connections with Southland. The section on local context looks especially at each district's Waste Minimisation and Management Plan.

Key infrastructure (p. 18) documents Otago's waste infrastructure, from large class 1 landfills to small-scale rural transfer stations and reprocessing facilities, and comments on their adequacy.

Waste flows (p. 32) presents volumes of landfill and kerbside waste, focusing on waste types that can be diverted with the right alternative solutions. It also covers what is known about farm waste.

Waste sources (p. 52) discusses individual waste sources: household recycling, tertiary institutions, hospitals, food processors, horticulture, boiler ash, construction and more, all at a regional scale.

Issues and opportunities (p. 75) presents the authors' assessment of key issues and opportunities for working together to address waste in Otago.

Waste and Recycling in Otago has been shared with everyone who contributed to its preparation.

Further electronic copies can be obtained by emailing secretariat@otagomayors.org.nz

1.0

National, Regional and Local Context

1.0 National, Regional and Local Context

1.1 National Context

The last four years has seen an increased focus on waste management and minimisation from central government and a correspondingly widened work programme. This ranges across policy, legislation, investment, and specific projects such as extended producer responsibility and material bans with the express intent of "accelerating New Zealand's transition towards a circular economy."

In this section, we look at how national policy and legislation is paving the way toward this important transition. In August 2021, the Ministry for the Environment (MfE) released its Waste Reduction Work Programme, which describes the various projects to be completed during the remainder of the political term (roughly to mid-2023) and beyond, and how these all interact and link.

The work programme sets out five objectives, and the relevant key workstreams are listed under these five headings. The key workstreams and objectives for this project include:

- a long-term waste infrastructure plan, to be published in 2022 to support the objective of 'building the foundations for a transformed waste system';
- establishing the Plastics Innovation Fund to support the objective 'expanding investment in the sector'
- revising and expanding the Waste Minimisation Fund, also in support of also 'expanding investment'
- several materials-focused projects as part of the 'individual material streams and products' objective – plastics, tyres, organics/food waste, construction and demolition materials, hazardous substances; all supported by regulated product stewardship.

In addition, there are several relevant over-arching workstreams that are described in following sections.

1.1.1 National Policy

The current New Zealand Waste Strategy (NZWS) was released in October 2010.

MfE has released a draft revised New Zealand Waste Strategy, which was open for consultation until late 2021. The proposed Strategy has a focus on achieving a more 'circular economy' for waste, and sets out a multi-decade pathway towards this. MfE is currently considering submissions on the draft document.

1.1.2 National Legislation

There are five important pieces of legislation that impact on the management of waste in New Zealand. These are discussed briefly below.

1.1.2.1 The Waste Minimisation Act 2008

The Waste Minimisation Act 2008 (WMA) provides a regulatory framework for waste minimisation and aims to encourage a reduction in the amount of waste disposed of in New Zealand.

Alongside the development of a revised NZWS, MfE is also currently working on a review of the WMA to improve or amend provisions and consider new provisions. The provisions for use of landfill levy funds and the administrative and decision-making processes around this use will also be reviewed and improved. As for the NZWS, consultation on possible changes took place during November/December 2021. This review will also consider whether, and how, the Litter Act (1979) could be reviewed to better integrate with and support the WMA.

The WMA has been amended by the 2021 waste disposal levy regulations, which set out the progressive increase and expansion of the landfill levy starting 1 July 2021; and supplemented by regulations banning specific items, including microbeads (2017) and plastic shopping bags (2018).

Currently, the WMA provides for half of the revenue from the waste levy to be distributed to territorial authorities (TAs). These funds are provided pro rata, based on population, and must be spent on waste minimisation and in accordance with each authority's Waste Minimisation and Management Plan (WMMP).

1.1.2.2 Emissions Trading Scheme (ETS)

Since 2013, Class 1 landfill owners have been required by the Climate Change (Emissions Trading) Amendment Act 2008 to surrender emission units to cover methane emissions. If any solid waste incineration plants are constructed, this act would also require emission units to be surrendered to cover greenhouse gas emissions from the incineration of household wastes.

Some landfill operators have reduced their liabilities under the ETS through use of a unique emissions factor (UEF). UEFs rely either on a landfill having methane capture technology or limiting biodegradable waste.

Other landfills use a default emissions factor for waste (DEF). This is the methane assumed to be generated by each tonne of waste and is currently 1.19 tonnes of CO_2-e (CO_2 equivalent). However, during May 2021 MfE consulted on some possible changes to the ETS including:

- special treatment for waste removed from a closed landfill (not currently falling under the ETS) and re-disposed of at another landfill (that does fall under the ETS)
- decreasing the DEF from 1.19 to 0.91 to reflect the most recent composition estimate for waste going to Class 1 landfills

In early 2022, New Zealand units (NZU) were selling for around $85. Based on an NZU figure of $80 and a DEF of 1.19 the ETS adds $87.60 to the cost of disposing of a tonne of waste. However, the application of a UEF could lower this cost substantially.

Class 2-5 landfills and closed landfills (along with certain other excluded landfills) are not currently covered by the ETS.

1.1.2.3 Local Government Act 2002

The Local Government Act (LGA) sets out the decision-making and consultation processes TAs must follow to prepare or review a WMMP.

The LGA was amended in 2012 by the Local Government Act 2002 Amendment Act 2012 (the LGA Amendment Act), with the aim of encouraging local authorities to focus more on cost-effective service provision.

The LGA was further amended in 2014, with these amendments encouraging collaboration and shared services, more flexible consultation requirements, provision for new significance and engagement policies, and new requirements for asset management planning and infrastructure strategies.

The 2014 amendments also included requirements for carrying out regular service delivery reviews. In 2017, the councils of the Otago region undertook a region-wide, high level, section 17A assessment for solid waste services.

1.1.2.4 The Resource Management Act 1991

The Resource Management Act 1991 (RMA) also has significant implications for waste management and minimisation activity by placing controls on the environmental effects of activities and facilities through national, regional, and local policy, standards, plans, and consent procedures. Government has considered the recommendations of the Resource Management Review Panel and will, during this current term, repeal the RMA and replace it with three new acts:

1. Natural and Built Environments Act
2. Strategic Planning Act
3. Climate Change Adaptation Act

The Natural and Built Environments Act (NBA) is likely to be the key replacement legislation. While not yet clear what all the ramifications will be for waste management and minimisation, one likely outcome is that various regional rules will be aligned and consolidated in a shorter list of national environmental standards.

1.1.2.5 Hazardous Substances and New Organisms Act (HSNO)

This Act, along with the 2015 Amendment Act, addresses the management (including disposal) of substances that pose a significant risk to the environment and/or human health. The Act relates to waste management primarily through controls on the import or manufacture of new hazardous materials and the handling and disposal of hazardous substances.

Depending on the amount of a hazardous substance on site, HSNO sets out requirements for material storage, staff training and certification. These requirements need to be addressed within operational and health and safety plans for waste facilities.

Hazardous substances commonly managed include used oil, household chemicals, asbestos, agrichemicals, LPG and batteries.

HSNO provides minimum national standards that may apply to the disposal of a hazardous substance. However, under the RMA a regional council or TA may set more stringent controls relating to the use of land for storing, using, disposing of, or transporting hazardous substances.[1]

1.1.3 Investment

1.1.3.1 Waste Minimisation Fund

The Waste Minimisation Fund (WMF) is a key source of funding for waste minimisation projects. The purpose and operation of the WMF is described on MfE's website.

While only a few projects across the Otago region have benefited from funding through the WMF, some national-scale projects have included the region. Examples of Otago projects funded through the WMF include:

- 'Agriwaste to wealth', University of Otago (completed in 2012)
- 'ResOURceful Communities', Wanaka Wastebusters (2018 – 2021)
- 'Otago Polytechnic Resource Recovery Hub', Otago Polytechnic (in progress since 2019)

The most recent 2021 funding round had a focus on organic waste, and construction and demolition waste.

1.1.3.2 InfraCom

Te Waihanga, the Infrastructure Commission was established in 2019 with the goal of making infrastructure investment in New Zealand more purposeful and strategic, including investment in waste infrastructure. Te Waihanga released its findings in the 'Infrastructure for a Better Future' consultation document in May 2021.

1.1.3.3 COVID-19 Response and Recovery Fund

A proportion of this fund was invested in waste management and minimisation infrastructure. While no investment was made into the Otago region specifically, some funding was provided to national projects, such as Plasback, with a baler funded for several locations including Waimate.

1.1.3.4 Other Funds

There are a number of funding streams that are focused on specific waste material types:

[1] From: MfE 2009: Waste Management and Minimisation Planning, Guidance for Territorial Authorities.

- Plastics Innovation Fund: As of 1 November 2021, any legal entity can submit an expression of interest for funding from the $50 million fund that supports the reimagination of how plastics are made, used and disposed of. Funding is available for, amongst others, designing out waste, new products, improved recycling and new technologies; and
- Glass Forum: a proportion of the levies paid by Glass Packaging Forum members provide a contestable fund for initiatives that "improve outcomes for glass" such as infrastructure, equipment, or funding for research.

1.1.4 Other Relevant Initiatives

1.1.4.1 Emissions Reduction Plan

The Climate Change Commission (CCC) was established to provide impartial expert evidence to government to support initiatives that would reduce greenhouse gas emissions and address climate change mitigation and adaptation, contributing towards the goals set out in the Climate Change Response Act 2002. The CCC reviewed the waste sector as part of its work during 2020 and 2021 and has provided its final advice to government with respect to this sector, amongst others.

The recommendations for the waste sector included an increase in waste minimisation infrastructure investments to decrease methane emissions from waste by at least 40% by 2035 from 2017 levels. New Zealand has a long-term target of net zero greenhouse gases by 2050, and a specific target for biogenic methane of 24 – 47% reduction by 2050 under the Climate Change Response Act (2002 Act).

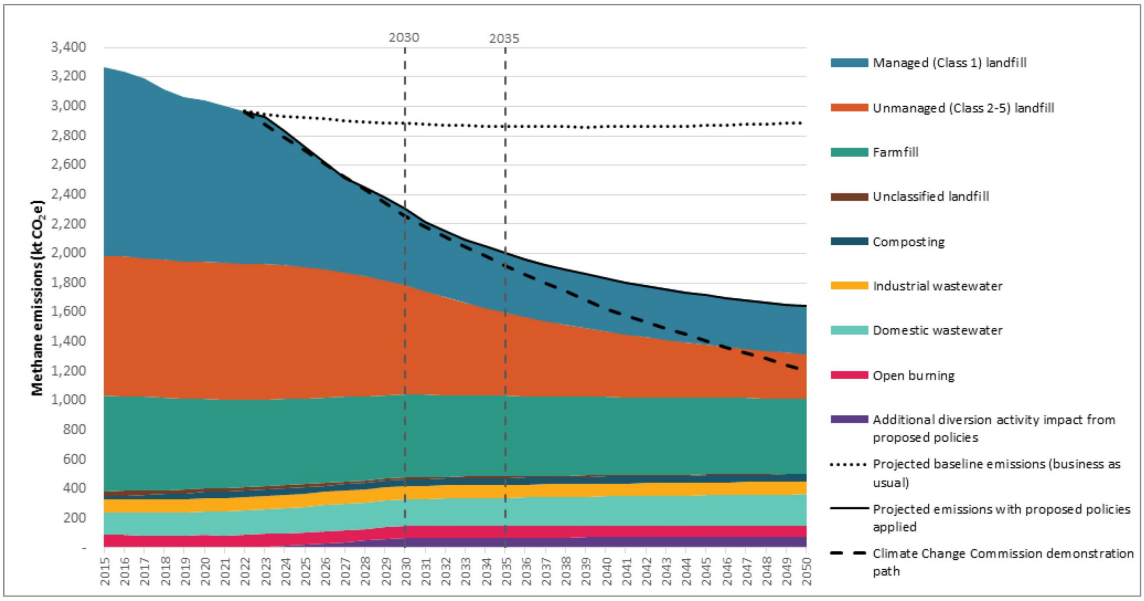
The advice of the CCC is that unless waste management practices and policy settings in New Zealand change significantly, we will not meet the targets set in the 2002 Act. Comprehensive action is required to reduce waste overall, divert waste from landfill disposal, and improve/extend landfill gas capture systems.

The main source of biogenic methane emissions from the waste sector is the anaerobic decomposition of organic wastes in landfill (81%). As one possible way to significantly reduce this, the emissions reduction plan proposes "key organic materials such as food, green, and paper waste could also be banned from Class 1 landfills by 2030" with a note that this could also be extended to wood waste. Further possible methods to reduce organic waste going to disposal include food and green waste collections, services to enable commercial premises to divert food and green waste, better paper and cardboard recycling, and improvements to infrastructure such as transfer stations and material recovery facilities (MRFs).

Other relevant proposals relate to reducing the generation of food waste, construction and demolition waste, and options to divert treated timber from disposal.

It is worth noting that even with all of the initiatives proposed this would still fall short of achieving the CCC's proposed target for waste emissions, as shown in Figure 3.

Figure 1: Total projected methane emissions from waste showing the impact of proposed combined waste policy options



Source: Ministry for the Environment. 2021. *Te hau mārohi ki anamata | Transitioning to a low-emissions and climate-resilient future: Have your say and shape the emissions reduction plan.* Wellington: Ministry for the Environment.

1.1.4.2 Container Return Scheme

Container return schemes (CRS) place a deposit on all containers when sold. This deposit can then be redeemed by consumers when they return the containers. These schemes are in wide use worldwide including Australia and are designed to promote higher rates of recovery of containers and reduce littering by providing an incentive to consumers.

In 2019, a WMF-funded project led by Auckland Council and Marlborough District Council embarked on the research and design of a potential container return scheme for New Zealand. The outcomes from this project were reported to MfE, who have analysed the information and produced advice for ministers.

MfE is now seeking feedback on a detailed implementation proposal for a container return scheme in New Zealand. This is included in the 'Transforming Recycling' consultation document, and consultation closes on 8 May 2022.

1.1.4.3 Kerbside Standardisation

WasteMINZ was commissioned by MfE to complete a national review of kerbside collections and make recommendations as to how to achieve consistency across the country. The report was completed in 2020, and MfE is currently considering implementing the three main recommendations:

1. A standard set of items accepted in kerbside recycling collections
2. Glass collected separately to other material streams
3. A weekly kerbside food waste collection service for households.

MfE is now seeking feedback on a detailed implementation proposal for kerbside standardisation in New Zealand. This is included in the 'Transforming Recycling' consultation document, and consultation closes on 8 May 2022.

The proposals include, alongside the points above from the original review, options to achieve the diversion of food waste from businesses. The three possible options set out in the consultation document are:

- Phasing in source-separation of food waste only from businesses that produce or sell food;
- Phasing in source-separation of food waste from all businesses; or
- Prohibiting the disposal of food waste to landfill entirely (which would also preclude disposal of food waste from household sources).

1.1.4.4 TA Performance Reporting

In addition to the proposals for a container return scheme and the standardisation of kerbside recycling, the MfE's current consultation also covers a number of related issues.

One of these is the requirement for TAs to report to MfE on a number of performance standards/targets; including a minimum 50% diversion standard for dry recyclables and food waste in kerbside collections. This is supported by a 70% high performance 'stretch target' which would be non-enforceable, but is intended to further encourage and motivate TAs.

The proposal is that the minimum standard would need to be achieved by 2030, to align with timeframes proposed in the draft New Zealand Waste Strategy and the ERP.

1.1.4.5 Priority Products

Until July 2020, the ability under the WMA to name a product as a 'priority product' had not been used. Once a product has been named such, an extended producer responsibility approach must be taken and a regulated product stewardship scheme developed. The first six priority products named were:

1. Plastic packaging
2. Tyres
3. Electrical and electronic products (e-waste including large batteries)
4. Agrichemicals and their containers
5. Refrigerants
6. Farm plastics

Working with industry, MfE has developed product stewardship schemes for tyres, large batteries, refrigerants, and agrichemicals. Consultation has commenced for tyres and large batteries, and due to take place in the second half of 2022 for refrigerants and farm plastics.

1.1.4.6 Infrastructure Investment Strategy

With the increased and expanded landfill levy comes an increased pool of funds that can be invested in waste management and minimisation initiatives.

MfE is developing a proactive strategic investment plan for waste infrastructure, supported by a detailed stocktake of current infrastructure and prioritisation of possible new infrastructure. The goal of this work is to give a national view of the waste investment New Zealand needs over the next 15 years. It is due for completion in mid-2022.

1.2 Regional Context

In this section, we consider the responsibility of territorial authorities, the regional council and mana whenua on waste minimisation in what is New Zealand's second largest region in terms of land mass.

In Otago, distances between the major centres of the regions are significant, as are the distances within the Otago region – Queenstown is a 3 ½ hour/280km journey from Dunedin. This is significant in terms of accessing waste facilities.

Geographically, the administrative centres of the five TAs within the Otago region fall into three groups:

1. Coastal Otago – Dunedin and Waitaki represented by the Dunedin City Council (DCC) and Waitaki District Council (Waitaki DC)
2. Central Otago – Queenstown Lakes and Central Otago represented by Queenstown Lakes District Council (QLDC) and Central Otago District Council (CODC)
3. Clutha District Council (Clutha DC), which is roughly equidistant from Invercargill and Dunedin

The three southern Otago TAs (QLDC, CODC, Clutha DC) are geographically closer to the Southland TAs than they are to Dunedin, with Invercargill a 2 ½ hour/188 km journey from Queenstown.

1.2.1 The Regional Council

The Otago Regional Council (ORC) has adopted plans and policies that guide environmental management, iwi engagement, and waste management across the region. The statutory role of regional councils such as the ORC in waste management and minimisation generally relates to managing the potential environmental impacts (on air, land and water) of how waste is managed or minimised. Regional plans dictate whether specific types of activities are permitted activities that don't require a consent; or if a consent is required, what needs to be considered.

In the Otago region, there are currently three separate plans pertaining to Air, Coast, and Water. There is also a specific Waste Plan.

The Regional Council is currently reviewing its Water and Waste Plans toward producing a new Land and Water Plan that will incorporate waste provisions.

1.2.1.1 Kāi Tahu strategies and policies

As tangata whenua of the South Island, Kāi Tahu has produced strategies and policies that have implications for solid waste management:

- Natural Resource Management Plan (2005) – key issues are:
  - Preventing human waste discharge to water and food production land
  - Contaminated land from landfills, industrial sites and waste disposal sites – requiring site remediation plans
  - Waste discharges from mining
  - Impact on waterways from waste activities including disposal, biosolids management, coastal littering, tourism-associated waste
  - Investigating the location of informal dumps particularly from the mid-20th century
- Te Tangi a Tauira (the Cry of the People), Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan (2008) – key issues are:
  - Ensure waste disposal does not adversely affect tangata whenua values with high standards for waste disposal consents
  - Contribute to central government waste reduction initiatives
  - Reducing waste generation, maximising re-use, recycling and recovery
  - Zero waste at marae
  - Supporting community-based recycling schemes
  - High environmental standards for waste facilities
  - Promoting community awareness, zero waste, and economic incentives and communication between communities
  - Clear responsibility for legacy, closed, or unused landfill sites

Te Tangi a Tauiri is formally recognised by Queenstown Lakes District Council – the Murihiku Runānga Rohe extends into the Queenstown Lakes District.

1.2.1.2 Otago's Emissions Project

A report by Ernst & Young in May 2021 developed a greenhouse gas emissions profile for the Otago region. The report considered emissions across stationary storage, transportation, agriculture, waste, and industrial processes and product use, as well as offsets from the 'land use, land use change and forestry' (LULUCF) sector. It also provided a breakdown of the results by TA.

Overall, the report found that Otago's largest source of emissions is agriculture (65%), with waste accounting for 6% of gross emissions. The proportion of emissions from waste would appear to be slightly higher than, but still broadly consistent with, the National Greenhouse Gas Inventory , which estimates emissions from waste at about 4% of gross emissions nationally.

Table 1 shows the emissions from waste split by sub-classification and district.

Table 1: Summary of Carbon Emissions from Waste

	Central Otago	Clutha	Dunedin	Queens-town	Waitaki	TOTAL	%
Active Landfills	0	6,947	49,005	26,684	117	**82,753**	28%
Closed Landfills	396	0	3,116	120	0	**3,632**	1%
Wastewater treatment and discharge	1,084	3,386	13,852	5,005	11,766	**35,093**	12%
Farm fills and rural waste	47,525	78,221	38,020	12,191	1,156	**177,113**	59%
TOTAL	**49,005**	**88,554**	**103,993**	**44,000**	**13,039**	**298,591**	**100%**
Percent	16%	30%	35%	15%	4%	**100%**	

There are a couple of points to note on the above data: the report did not account for waste generated in a district but disposed of out of the district; and farm fills and rural waste are likely to be overstated due to the methodology selected.

We have provided feedback to the ORC on each of these points to inform future iterations of the Otago emissions inventory. Until such time, the 2021 report is the best available information.

1.2.2 Southland Connection

Geographically, facilities in Southland are as accessible as facilities in other parts of Otago; Queenstown, for example, is 100km closer to Invercargill than to Dunedin.

The central Otago councils including QLDC, CODC and CDC report that they have a significant ongoing working relationship with WasteNet Southland, which manages solid waste issues on behalf of the Invercargill, Gore and Southland councils.

The three districts also make use of significant waste facilities in Southland, such as the AB Lime landfill near Winton and aggregating/processing of farm waste, for example silage wrap.

These TAs have also been watching progress on various possible organic waste processing facilities, which could be located within reach of both Southland and the three southern Otago councils, while having the benefit of being in a rural area.

Invercargill City Council had previously indicated plans to progress an organic-waste focused project over the three years from July 2021, but it has now revised these plans

and instead intends to undertake a wider review of waste activities in the Invercargill area, with the intention of delivering a business case towards the end of 2022. This review will look at what materials are collected for recycling or other processing in Invercargill, what processing options exist, and what end markets are available.

1.3 Local Context

All councils in New Zealand are required, under the WMA, to adopt a Waste Minimisation and Management Plan (WMMP). These plans must be reviewed at least every six years, or sooner, and should set out how waste in the district or city is to be 'managed or minimised'. While the Plans are developed and adopted by councils, they need to consider all waste not just council-controlled waste such as household kerbside collections.

WMMPs are supported by Waste Assessments, which are technical documents intended to pull together the relevant information and data relating to waste in the city and district, providing the context for the WMMP by identifying the key waste management and minimisation issues.

1.3.1 Queenstown Lakes District Council

QLDC last reviewed its WMMP in 2018 and completed a Waste Assessment in 2019.

While the QLDC WMMP doesn't strictly include a list of 'key issues', the Plan highlighted that large quantities of organic, glass, and construction and demolition waste were going to landfill.

QLDC used a 'programme business case' approach to identify the preferred approach for the six-year term of the Plan. From the seven programmes outlined, ranging from do minimum (programme 1) to aspirational (programme 7), programme 6 was chosen which had a focus on glass and organics. This decision meant that any significant action on construction and demolition waste would largely be deferred for the course of this Plan.

The planned programme of work was forecast to achieve a 19% decrease in waste to landfill during the term of the WMMP.

It should be noted that Council is also working on biosolids, which would continue to be implemented alongside the WMMP.

Since the adoption of the WMMP, two additional key issues have arisen:

1. The Queenstown materials recovery facility (MRF) is beyond its anticipated life and is currently struggling to cope with incoming recyclables from the QLDC area. CODC also currently relies on the Queenstown MRF for processing of recyclables, and frequently has to stockpile recyclables or transport them to Southland disAbility Enterprises (SdE) for processing.
2. The sub-region lacks a full facility resource recovery park with large capacity. Wanaka benefits from Wanaka Wastebusters, a social enterprise operating on Council land, but this operation does not have the space or resources to serve

the wider sub-region, and is roughly one hour from Queenstown and 45 minutes from Cromwell.

QLDC has identified a site near Queenstown that could potentially accommodate a new MRF and full resource recovery hub. It is currently exploring the consenting and site requirements.

The QLDC 2021 long term plan (LTP) confirms funding for two key work areas:

1. $519k over three years to research and trial methods to divert organic waste from landfills, with a reference to possible MfE diversion targets (although no capital funding for implementing solutions has been allocated);
2. Funding for the proposed Wakatipu MRF/transfer station to form the beginning of a more extensive resource recovery centre is brought forward to start in year 6, allowing the current MRF in Frankton to be decommissioned.

QLDC has a Climate Action Plan (CAP), adopted in 2019 and with a further revision due shortly. The CAP identifies greenhouse gas emissions from landfills as an example of emissions that need to be reduced. The 'keystone action' of Outcome 5 (our economy and natural environment thrive together) is to *"work with the tourism system to become a net zero carbon and zero waste destination…"*

The CAP also notes that a circular economy contributes to climate benefits, compared to a traditional linear economy.

1.3.2 Central Otago District Council

Central Otago District Council's WMMP, and supporting Waste Assessment, were adopted in 2018 and 2017 respectively.

Key issues identified in the WMMP include:

- An increasing percentage of kerbside refuse going to landfill
- Capacity of kerbside collection containers and frequency of service
- Fees and charges for waste services
- Needs of urban vs rural householders
- Biosolids management
- Hazardous waste disposal
- Large quantities of construction and demolition waste going to landfill
- Public place waste management

The issues relating to kerbside containers and servicing frequencies have partially been resolved following changes made to council's services. These changes have also slightly decreased the percentage of kerbside refuse going to landfill, although not significantly.

While biosolids management is identified as a key issue, management of organic waste overall was not, and this has since been noted as an area needing addressing.

Central Otago currently rely on using QLDC's MRF. This facility is beyond its anticipated functional life and is struggling to cope with the recycling material collected within QLDC's area. If the operator doesn't have capacity to take CODC's material, it needs to

be stockpiled until they do or sent elsewhere. This raises cost, through double-handling, and reduces the quality of the material.

With CODC also using the Victoria Flats landfill (although they do use AB Lime for small quantities), it is largely reliant on QLDC for significant waste infrastructure.

CODC is also experiencing ongoing difficulties in recycling bottle glass as they are unable to meet the logistics operator 5R's contamination requirements. It has concluded that the best option is to crush the glass and send it for different end uses (such as roading and footpath base course) rather than attempting to meet the contamination requirements which would enable the glass to be sent to Auckland for reprocessing into new bottles. CODC has purchased a crusher to enable this to occur.

Other waste management issues in the Central Otago district that are not directly highlighted in the Council's WMMP include:

- Management of agricultural, viticultural and horticultural organic wastes:
    - the majority of these currently appear to be managed on-property. A small amount of fruit processing waste reaches the vermicomposting facility at Cromwell; however, this is only a very small proportion of the expected overall volume. Local waste operators report that they do service these properties but only to move the wastes from one part of the site to another. While no water quality issues have been identified in the sub-region (in comparison to Marlborough, where viticulture waste was causing significant and noticeable issues with water quality), this is a potentially large waste stream and management of this could be better understood.
- Organic waste management generally, with audits at Victoria Flats showing that household rubbish is roughly one third food waste.
- Better management of rural non-household waste generally.

CODC's 2021 LTP indicates that council would work on a plan for greenwaste for implementation through the 2024 LTP, with a possible district-wide greenwaste collection and processing system. No significant changes were made with respect to waste management and minimisation planning, with the focus for the next three years on reviewing existing waste services and re-tendering contracts for these; alongside investigation of improvements to the Cromwell transfer station and greenwaste processing.

In September 2021 CODC consulted with their community regarding waste collections and facilities, with a focus on the renewal of its rubbish and recycling services contract by 1 July 2023. Two of the new collection service packages include a four-weekly greenwaste collection from a 240L wheeled bin, while the third incorporates a weekly collection of mixed food and greenwaste from a smaller bin. The community feedback and the subsequently released central Government consultation on a new waste strategy, "Taking Responsibility for our Waste" have informed the structure of the contract that was put out for tender in January 2022. A decision on the new contract award is expected July 2022.

CODC has a Sustainability Strategy, adopted in 2019. This strategy mentions various undesirable activities, including 'waste or biomass burning' (due to air quality impacts). Waste-related actions include:

- Waste audit for council facilities
- Aligning community education provision with waste management and minimisation plan objectives
- Measuring progress using waste per capita to landfill
- Reporting through a six-monthly review with the Waste and Property Committee

1.3.3 Clutha District Council

Clutha DC's administrative centre, Balclutha, is roughly equidistant from Dunedin and the main centre of Southland, Invercargill. The council maintains strong links with Southland, and in this way is strategically aligned with the Central Otago councils; but also has strong links with Dunedin.

Clutha DC owns and operates a small, unlined landfill at Mt Cooee. All kerbside recyclables from the Clutha district are transported to Dunedin's MRF, which does not accept glass. Glass can be taken to Mt Cooee, where it is used in landfill engineering.

Clutha DC's current WMMP was adopted in 2018. Key action areas from this Plan include:

- Evaluating options for beneficial use of glass
- Investigating and evaluating benefits of landfill gas capture/flaring at Mt Cooee
- Investigating and evaluating the best way to reduce organic waste to landfill

In addition, Council is working on two key infrastructure projects:

1. The possible extension/renewal of the resource consent for a landfill at Mt Cooee, with the existing consent due to expire during 2023
2. The development of a resource recovery park at the Mt Cooee site, to be co-located with the landfill

Clutha DC are also aware that DCC are currently progressing a new landfill site and, if this is located towards the south of the DCC area, this could potentially be an alternative disposal avenue for Clutha District's waste.

Clutha DC's WMMP describes a kerbside organics collection and subsequent composting as being financially out of reach; although this could change should a regional or sub-regional collaborative project address this waste stream.

The extension of kerbside collection services, particularly recycling, to suburban and some rural areas is also explored; but ruled out as too costly. These areas will continue to be supported through drop-off and rural transfer station sites.

In its 2021 LTP, Clutha DC make it clear that it plans to invest in a long-term consent extension for Mt Cooee landfill to 2053, alongside development of a resource recovery park on the site; at a total estimated cost of $3.4M for consenting and associated work. Increasing diversion from landfill beyond the current 9% is a key goal, and the

introduction of liners for new landfill cells could enable better management of landfill gases.

While construction and demolition waste is highlighted as a key source of landfill waste, the LTP provides no budget to directly address this issue; although it is noted that data will be collected to feed into the 2022/23 waste assessment process.

1.3.4 Dunedin City Council

DCC has several strategic initiatives that are intended to guide action in the waste sector. These include:

- A WMMP (2020)[2] which embodies a zero waste and circular economy approach
- The Waste Futures project which an overarching programme of work for waste services and infrastructure taking a whole of systems approach and based on a Better Business Case methodology
- A target of net zero carbon emissions from waste by 2030

The Green Island Landfill is due to close in 2023. Work is ongoing to develop a new landfill at Smooth Hill, just south of the city. At this stage it is anticipated construction on the new landfill could start in 2024/5. The latest plans announced suggest that the new landfill may be smaller than originally intended, in order to meet local environmental concerns.[3]

In the intervening period between Green Island closing and Smooth Hill opening it is likely that waste will have to be transported out of the region for disposal – most likely to AB Lime in Southland.

While Dunedin is the largest population centre in the region and can achieve sufficient economies of scale for most types of facility on its own, it is geographically distant from much of the rest of the region, with only Waitaki and Clutha in relatively close proximity from a transport and material flow perspective.

During consultation on its 2021 LTP, DCC sought the community's views specifically on options for kerbside collections. The two proposed options were:

1. Four bins for glass, other recyclables, food waste and residual waste (plus an optional greenwaste bin) for $270 - $310 per year
2. Three bins – excluding the food waste collection - costing $260 - $300 per year.

Following consultation, DCC confirmed the preferred option is option 1, and aims to implement this from mid-2023 as part of the wider Waste Futures project.

[2] https://www.dunedin.govt.nz/__data/assets/pdf_file/0020/342902/WMMP-Waste-Minimisation-and-Management-Plan-Updated-May-2021-WEB.pdf
[3] https://www.odt.co.nz/news/dunedin/smaller-smooth-hill-landfill-proposed

1.3.5 Waitaki District Council

In 2017, Waitaki DC signed a memorandum of understanding (MOU) with Waste Management (WAM) and The Waitaki Resource Recovery Trust (WRRT) to facilitate the ongoing provision of waste and recycling services to the community. Under the agreement WAM will provide a transfer station for the public and the WRRT will receive all recycling. The MOU states that the parties will endeavour to ensure that all waste they control is processed through the WAM RTS and the recycling through the WRRT resource recovery facility. It puts certain obligations on the parties to provide fair access, including operating hours, and provide waste diversion options. It also provides for the provision of data and reporting. The Council financially supports the WRRT to deliver waste minimisation outcomes.

In Waitaki, waste is almost entirely controlled by the private sector. The Council provides no kerbside collections or recycling services and does not own a transfer station in Ōamaru (the largest centre). It owns four rural recovery parks (transfer stations) located at Ōtemātātā, Ōmārama, Kurow and Hampden, and a landfill in Palmerston which is used by the local community (it accepts 250tpa), and recycling drop-off facilities in Papakaio, Enfield and Herbert;

Waitaki DC's 2021 LTP addresses the Palmerston landfill, and outlines plans to make best use of the remaining life and closure. The LTP also proposes that Council work more closely with the Waitaki Resource Recovery Trust and other providers on education and waste minimisation, and review the 2010 solid waste bylaw.

A full-time Waste Minimisation Officer has recently been employed.

1.3.6 Solid Waste Bylaws

Three of the five TAs in the Otago region have current solid waste bylaws.

These bylaws vary in detail and scope, and only support waste operator licensing and limited data collection. This is a key aspect as, like many other regions, much of the waste in the Otago region is managed by the private sector. Being able to access data relating to the quantities, types, and management pathway of these wastes is crucial in being able to complete a detailed waste assessment and develop a comprehensive WMMP.

2.0

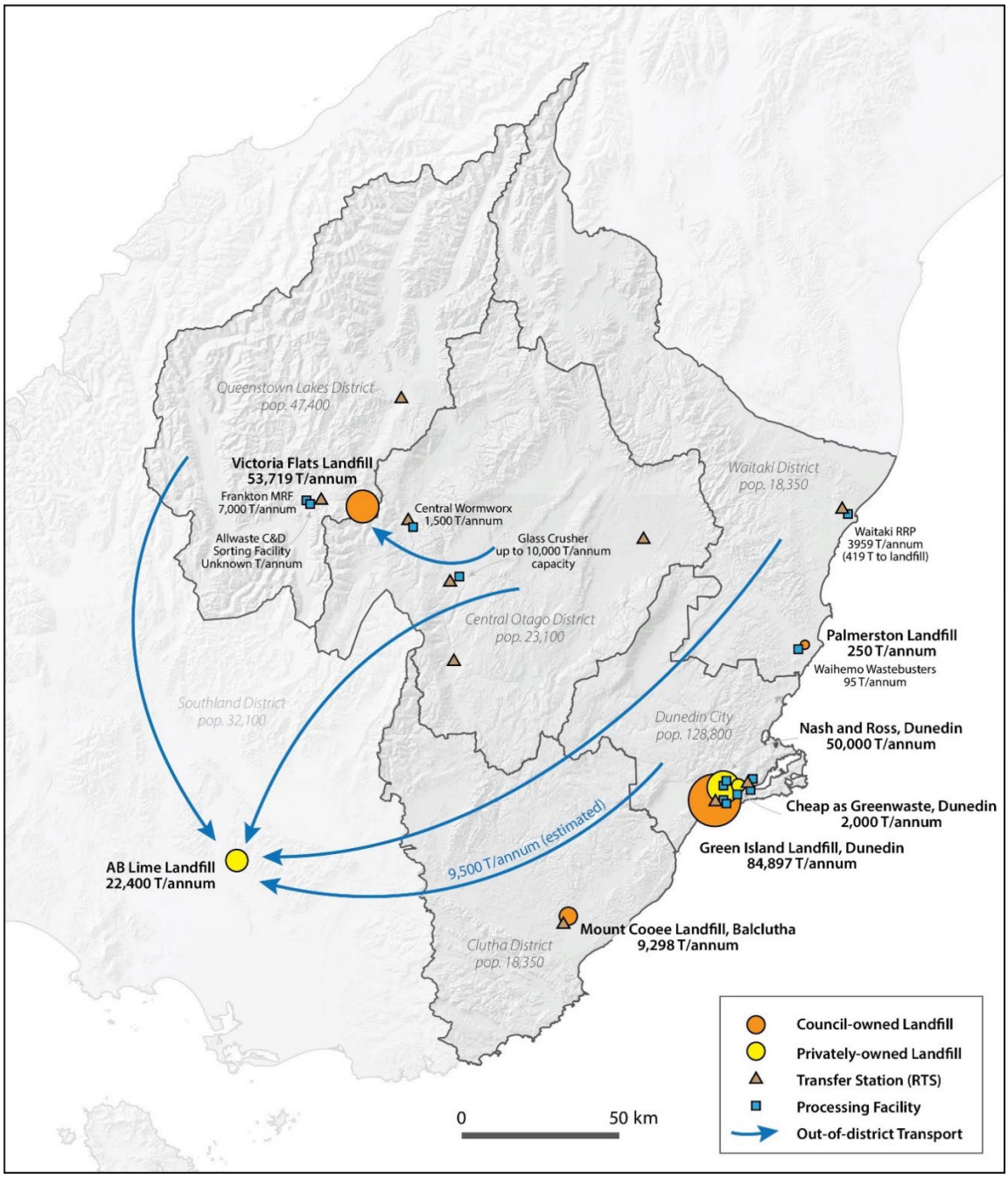
Key Infrastructure

2.0 Key Infrastructure

This section describes the existing waste management and minimisation infrastructure across the Otago region, and further afield where applicable – for example, the main glass recycling facility in New Zealand is in Auckland.

The map below shows the key infrastructure of the Otago region and nearby. It also shows (where known) annual tonnages and movements between council areas and into the Southland region.

Figure 2: Significant Waste and Recovery Infrastructure



Facilities have been split into categories depending on their role – landfills, transfer stations/recycling centres (these are often co-located), and infrastructure that accepts collected recycling for reprocessing.

2.1 Disposal Infrastructure (Landfills)

Landfills in New Zealand are generally identified as one of five 'classes', according to the WasteMINZ' 'Technical Guidelines for Disposal to Land'. The five classes of landfills are summarised below.

Class of landfill	Description
Class 1 - Municipal Landfill	A Class 1 landfill accepts municipal solid waste. It generally also accepts construction and demolition waste, some industrial wastes and contaminated soils. Functionally the equivalent of a "disposal facility" as defined in the WMA.
Class 2 - Construction and demolition / Industrial Landfill	A Class 2 landfill accepts non-organic wastes including construction and demolition wastes, inert industrial wastes, managed fill material, and clean fill material.
Class 3 - Managed Fill	A Class 3 landfill accepts materials comprising predominantly clean fill materials, but also includes other inert materials and soils with chemical contaminants.
Class 4 - Controlled Fill	A Class 4 landfill accepts predominantly controlled fill and cleanfill materials but may also include soils with chemical contaminants;
Class 5 - Cleanfill	A Class 5 cleanfill accepts only clean excavated natural materials.

Until 1 July 2021, only Class 1 landfills paid the landfill levy. The landfill levy has now been extended to Class 2-4 landfills, and is also now scheduled to increase annually as described in section 1.1.2.1.

The table below lists key disposal facilities, including all known landfills that accept waste produced within the Otago region.

Table 2: Disposal Facilities

Facility	Detail	Annual Tonnage
Green Island Class 1 landfill, Dunedin	Owned by DCC, disposes of waste from Dunedin. Operated by Waste Management NZ. Consent expires 2023. DCC are currently developing plans for a new landfill which will be located towards the south near Henley (Smooth Hill specifically).	84,897
Mt Cooee Class 1 landfill, Clutha	Owned/operated by Clutha District Council, disposes of waste from Clutha District (has in the past accepted waste from out of district). Consent expires 2023, but Council has resolved to seek a new consent to 2053.	9,298
Victoria Flats Class 1 landfill, Frankton	The Victoria Flats Landfill is owned and managed by Scope Resources. The land is owned by QLDC, and the landfill operates under a BOOT (Build Own Operate Transfer) contract, which expires at the end of June 2034. The landfill consent expires in 2032. Waste from CODC is also received at the Victoria Flats Landfill through this arrangement (until 2029), with QLDC administering this contract with Scope Resources on behalf of CODC. Scope Resources recently invested significantly in gas capture and flare infrastructure to reduce emissions and is recovering the cost through operating fees.	53,719
Palmerston Class 1 landfill, Waitaki	Owned by Waitaki District Council. Currently operates to accept only local waste, but has no annual tonnage limit.	250

Facility	Detail	Annual Tonnage
AB Lime Class 1 landfill, Southland	Owned by AB Lime. Accepts waste from Oamaru and Dunedin, and some waste (screenings and/or biosolids) from Central Otago and Queenstown Lakes. AB Lime recently received consent for receiving unlimited tonnage into its facility (although the facility footprint won't change).	22,400
Nash & Ross Class 2 landfill, Dunedin	Class 2 landfill taking construction and demolition waste and contaminated soils. Accepts everything except household waste, greenwaste, and hazardous waste. Can take asbestos. Consented to 2036 but enough airspace for 80 years at current rates of fill.	50,000
Cheap As Greenwaste, Kaikorai Valley, Dunedin	Accepts domestic and landscape greenwaste. Mulches material and uses on site.	2,000[4]
Parkburn Quarry Class 4 landfill, CODC	Owned and operated by Fulton Hogan.	Not available
Various Class 4/5 Cleanfills	In Queenstown, Scope Resources and Wilsons Contractors on Kingston Rd and Fulton Hogan on Shotover Delta Rd. A cleanfill facility in Clutha district recently closed due to increasing regulation and landfill levy requirements.	

[4] No weights available. Estimates are based on information supplies of 60m3 per day at a bulk density of approximately 91kg/m3 (1,971 tonnes per annum)

2.2 Transfer Stations and Recycling Centres

Transfer stations are sites where a wide range of materials are accepted, including recyclables, and can be open to the public or only available for use by waste companies. Resource recovery centres or recycling centres are usually sites that focus on accepting material that can be reused, recovered, and reprocessed – although they may sometimes accept small quantities of landfill rubbish.

Table 3: Transfer Stations & Resource Recovery Centres

Facility	Detail	Annual Tonnage (where known)
Green Island RTS, Dunedin	Owned by DCC, disposes of waste from Dunedin. Operated by WAM. The RTS separates out material on the current Green Island Landfill site. Site is due for redevelopment into an RRP when the new contract commences and the landfill closes.	Mixed recyclables (glass, fibre, plastic, metal): 1260 Greenwaste: 500 Batteries: 3.7 Gas Bottles: 7.8 Clothing: 25.3 Oil: 1.7 Special / Hazardous: 3
Dunedin Inner-City Cardboard Collection	Cardboard from businesses. Provided by DCC.	Cardboard: 169
Inner city recycling hubs (PLUS - Glass from bottle banks AND Public Places Recycling), Dunedin	Comingled recycling including cardboard. Provided by DCC.	Glass: 123 Comingled: 60
Rural resource recovery (incl Green Island, Pop ups & BP stations), Dunedin	Provide rural drop off sites: Waikouaiti and Middlemarch Transfer Stations. Rural recycling Hoopers inlet, Lee Stream. Rural skip days 3x year in Sawyers Bay, Warrington, Long Beach, Aramoana, Outram, Allanton, Portobello, and Henley/Berwick	113

Facility	Detail	Annual Tonnage (where known)
Wickliffe St RTS, Dunedin	Owned and operated by Waste Management Ltd.	Not available
Rural Recycling and RTS, Dunedin	Provide rural drop off sites Waikouaiti and Middlemarch Transfer Stations. Rural recycling Hoopers inlet, Lee Stream. Rural skip days 3x year in Sawyers Bay, Warrington, Long Beach, Aramoana, Outram, Allanton, Portobello, and Henley/Berwick	
Oamaru RTS (Waitaki)	Owned and operated by Waste Management Ltd; not open to the public. Waste goes to AB Lime in Southland.	10,000 (estimate)
Waitaki Resource Recovery Park, Waitaki	Waitaki Resource Recovery Park (WRRP), owned by Waitaki Resource Recovery Trust and supported by Waitaki District Council, handles all recycling from Waitaki district.	Card 550 E-waste: 181 Glass: 615 Metal 85 Paper 300 Plastic 157 Reuse: 641 Total: 3,959 (including landfill and organics)
Waihemo Wastebusters, Waitaki	Collect recycling and reuse from Palmerston; operated by Waihemo Wastebusters. It is open for nine hours a week and has a re-use shop. Recovered materials are transported to the WRRP.	Mixed recyclables: 81.5 Reuse store: 13 Other reuse: 0.5 Total: 95
Rural Recycling Centres, Waitaki	Waitaki District Council owns 4 rural transfer stations located at Hampden, Ōmārama, Kurow & Ōtemātātā. These sites are managed under contract. There are three unstaffed recycling drop off centres in Enfield, Papakaio and Herbert.	These sites supply an estimated 2,000 tonnes of the 4,000 tonnes processed by WRRT annually

Facility	Detail	Annual Tonnage (where known)
Mt Cooee landfill, Clutha	The transfer station at the landfill also accepts cleanfill, other recyclables, greenwaste, scrap metal, e-waste.	
Rural RTS, Clutha	Ten rural drop-off/mini transfer stations, five of these accept recyclables/ Council provides waste transfer stations at Beaumont, Clinton, Clydevale, Lawrence, Maclennan, Milton, Owaka, Papatowai, Tapanui and Taieri Mouth. These facilities open at least monthly for residents to dispose of their waste which is then transferred to and landfilled at Mt Cooee.	120 (residual)
Roxburgh RTS, Central Otago	Provided by Council under contract to AllWaste and Wanaka Wastebusters.	
Ranfurly RTS, Central Otago	Provided by Council under contract to AllWaste and Wanaka Wastebusters.	
Cromwell RTS, Central Otago	Provided by Council under contract to AllWaste and Wanaka Wastebusters.	
Alexandra RTS, Central Otago	Provided by Council under contract to AllWaste and Wanaka Wastebusters.	
Recycling Drop-off Centres, Central Otago	Alexandra, Cromwell, Omakau, Oturehau, Patearoa, Poolburn, Ranfurly, Roxburgh, and Tarras. Provided by Council under contract to AllWaste and Wanaka Wastebusters.	
Central Otago Wastebusters, Alexandra, Central Otago	Operated by Wanaka Wastebusters.	
Frankton Transfer Station, Queenstown Lakes	Acceptance of general waste, greenwaste, used tyres, car seats, domestic quantities of hazardous wastes, whiteware and scrap metal, e-waste, clean fill.	

Facility	Detail	Annual Tonnage (where known)
Wanaka Wastebusters, Wanaka, Queenstown Lakes	Sited on Council land, but operated as an independent community enterprise by Wanaka Wastebusters.	
Wanaka Transfer Station, Wanaka, Queenstown Lakes	Acceptance of general waste, greenwaste, used tyres, car seats, domestic quantities of hazardous wastes, whiteware and scrap metal, e- waste.	
Rural greenwaste drop off points, Queenstown Lakes	Glenorchy, Kingston, Luggate, Hawea and Makarora managed by a mix of QLDC and community associations involvement and sitting situated on a variety of QLDC, Department of Conservation (DoC) and Land Information New Zealand (LINZ) land.)	

2.3 Resource Recovery Infrastructure

Resource recovery infrastructure accepts material that has been collected through kerbside collections, at RTS, or at recycling centres and prepares it for export, such as sorting recyclables at a MRF, or reprocesses the material. Facilities are shown below, grouped into those located within the Otago region and those in other parts of the country.

Table 4: Resource Recovery Infrastructure in the Otago Region

Facility	Detail	Annual Tonnage (T)
Frankton MRF, Queenstown Lakes	Owned by QLDC and operated under contract with Waste Management NZ Ltd on a site owned by Council. Acceptance, sorting and storage of recyclable materials for commercial resale from Queenstown Lakes and Central Otago. Consolidation of separated recyclables and transport to processing facilities within NZ and overseas. There is a drop-off point and a resale shop for unwanted, reusable goods operated by the Salvation Army.	7,000
Green Island MRF, Dunedin	Operated by OJI, handles kerbside-collected material from Dunedin and Clutha.	6,500
Nash & Ross, Dunedin	Recover 10,000 tonnes of aggregate and about 500 tonnes of steel.	10,500
Keep it Clean, Dunedin	Rendering plants in Abbottsford and Mosgiel.	Not available
Central Wormworx, Cromwell	Accepts a range of putrescible materials, e.g. fruit waste, dairy shed waste, pelts, biosolids, and produces vermicast.	300
Hall Bros, Dunedin	Has a number of sites, mostly with mobile equipment. Grinds asphalt (6,000T), concrete (30,000T), some wood, pulls out metal, recovers bark from port. Uses materials back in own construction operations.	37,000
Green Island Composting, Dunedin	Windrow composting of greenwaste dropped off at Green Island (co-located with Green Island RTS).	500
Doubt not Compost, Dunedin	Commercial scale compost of organic waste for businesses in Dunedin.	180

Facility	Detail	Annual Tonnage (T)
AllWaste C&D Sorting Facility, Queenstown Lakes	AllWaste are doing a small amount of construction and demolition sorting – mostly a single client. They send scrap metal to Otago metals in Cromwell, gib board to Christchurch.	Not available
Glass Crusher, **Central Otago**	Owned by CODC. Currently being commissioned.	Up to 10,000 tonnes capacity

In addition, there are a number of key processing facilities that are located out of the Otago region, but which accept material from the region. These are shown below in Table 5.

Table 5: Processing Infrastructure Outside the Region

Facility	Detail	Annual Tonnage
Visy Glass, Auckland	Beneficiation and reprocessing, Onehunga, Auckland. Accepts glass from the region (excluding Clutha and Central Otago) via 5R.	9,849 (to beneficiation site)
Tyres	Multiple sites, via the Tyrewise product stewardship programme.	3,988
OJI Fibre Solutions, Auckland	Fibre reprocessing, Penrose, Auckland.	3,000
Scrap metal yards	Numerous sites, industry estimate.	28,530
ITRecycla, Remarkit Solutions, Wellington	e-waste reprocessing, Wellington.	53
Plasback	Nationwide product stewardship scheme for waste plastic on farms.	470
Agrecovery	Nationwide product stewardship scheme for agrichemicals and their containers.	25

Facility	Detail	Annual Tonnage
Comspec, Christchurch	Pre-consumer plastic reprocessed to manufacturing feedstock (flake, pellet), Christchurch.	375
Flight Plastics, Wellington	PET reprocessing, Wellington.	195
Astron, Auckland	Plastics reprocessing, Auckland (two sites).	425
Expol	Numerous sites, product stewardship programme for polystyrene.	21
Terracycle	Numerous sites, product stewardship programme for specified food, cosmetic and other consumer packaging.	1

2.4 Summary

2.4.1 Disposal (Landfill) Infrastructure

In general, landfill disposal infrastructure at a cross-regional level appears to be adequate for the needs of the region for some time to come, particularly considering the capacity of AB Lime (as shown in Table 2). However, there may be issues with respect to how efficiently this infrastructure is being provided.

DCC and Clutha DC are both currently undertaking consenting processes for new disposal facilities; DCC for a new landfill that is likely to be located at Smooth Hill and Clutha DC for an extension of their existing landfill at Mt Cooee – the two locations are estimated to be around 40 minutes travel time apart.

This is discussed in more detail in section 5.8.

2.4.2 Recycling, Recovery, and Reprocessing Infrastructure – local and national opportunities

While landfill disposal infrastructure appears adequate for the needs of the region for some time to come; the same cannot be said of recycling, recovery, and reprocessing infrastructure. There is very little reprocessing infrastructure in the region, and existing infrastructure is dated.

The extent to which this type of infrastructure could or should be provided locally is largely dependent on the material type/s targeted.

2.4.2.1 Organic waste

Organic waste infrastructure is usually very local to the source of the waste. It is highly scalable and it is not very desirable to transport organic waste long distances due to the speed at which odour and leachate become an issue.

There is a general lack of organic waste processing infrastructure across the region, with a few exceptions:

- Green Island composting facility in Dunedin (which only accepts greenwaste);
- Doubt Not in Dunedin which processes commercial organic wastes; and
- Central Wormworx in Cromwell which processes a variety of commercial putrescible (wet) organic wastes.

Organic waste is a large waste stream which makes up a significant proportion of what is currently going to Class 1 landfill, particularly from households.

2.4.2.2 Construction and demolition waste

Recovery infrastructure, such as construction and demolition waste facilities and MRFs, are usually able to be provided at a relatively local level. There is a compromise to be found between achieving an effective quantity of material for the facility and the distance that the material needs to be transported.

The two MRFs in the region, located in Dunedin and Queenstown, are both dated and are currently struggling to cope from both a quantity and quality perspective. The presence of SdE in Invercargill alleviates this issue somewhat for the central TAs and Clutha.

Construction and demolition waste is a very large waste stream and makes up a significant proportion of waste to all kinds of landfills, particularly cleanfills.

2.4.2.3 Reprocessing facilities

Large reprocessing facilities, such as those for fibre and glass, are so capital intensive that in New Zealand there is essentially only one key provider for each of these material streams, and both are in Auckland. There is one small fibre reprocessing facility located in the Hawkes Bay.

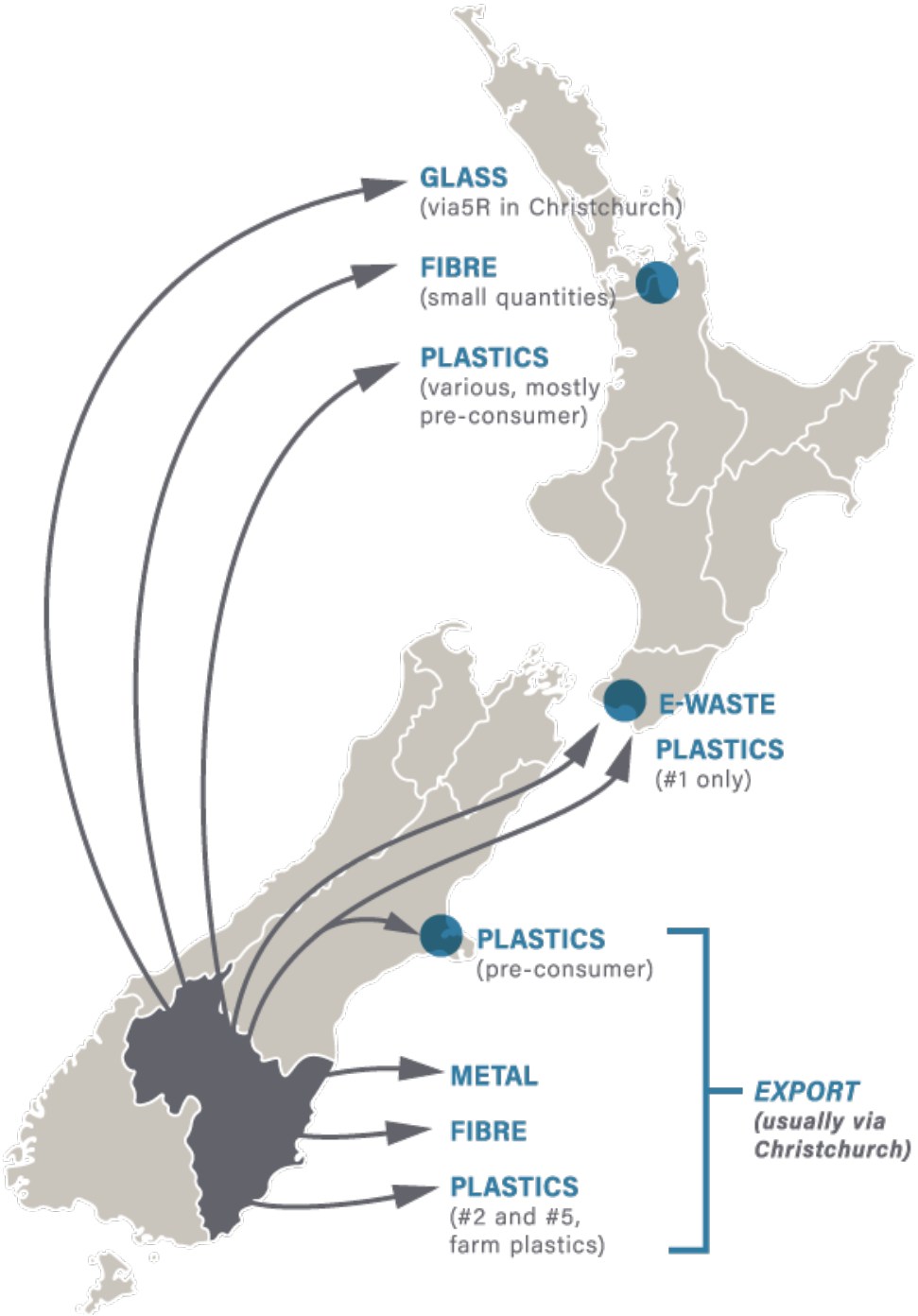
Located in the south of the South Island, the Otago region is almost as far away from key facilities as it is possible to get, which makes the cost-benefit consideration of recycling very marginal. This can be a challenging issue to communicate to the public.

For fibre, there is a viable alternative option of exporting for reprocessing, which only requires transport to the nearest port. Contamination and quality of the fibre stream is a key consideration for the export market.

Glass, however, is not generally exported and the only alternative for the Otago region is to put this material to alternative use such as roading base course, or crushing for use as filter media.

Fixing the gaps in Otago's recycling, recovery and reprocessing infrastructure will require a mix of local and regional investment. It will also require solutions that improve access to infrastructure further afield.

Figure 3: Key movements of recovered recyclables out of Otago



3.0

Current Waste Flows

3.0 Current Waste Flows

This section presents and analyses the available data relating to waste in the Otago region; both waste to landfill and then recovered materials.

Section 4.0 then presents and analyses the sources of this material.

3.1 Waste to Landfills

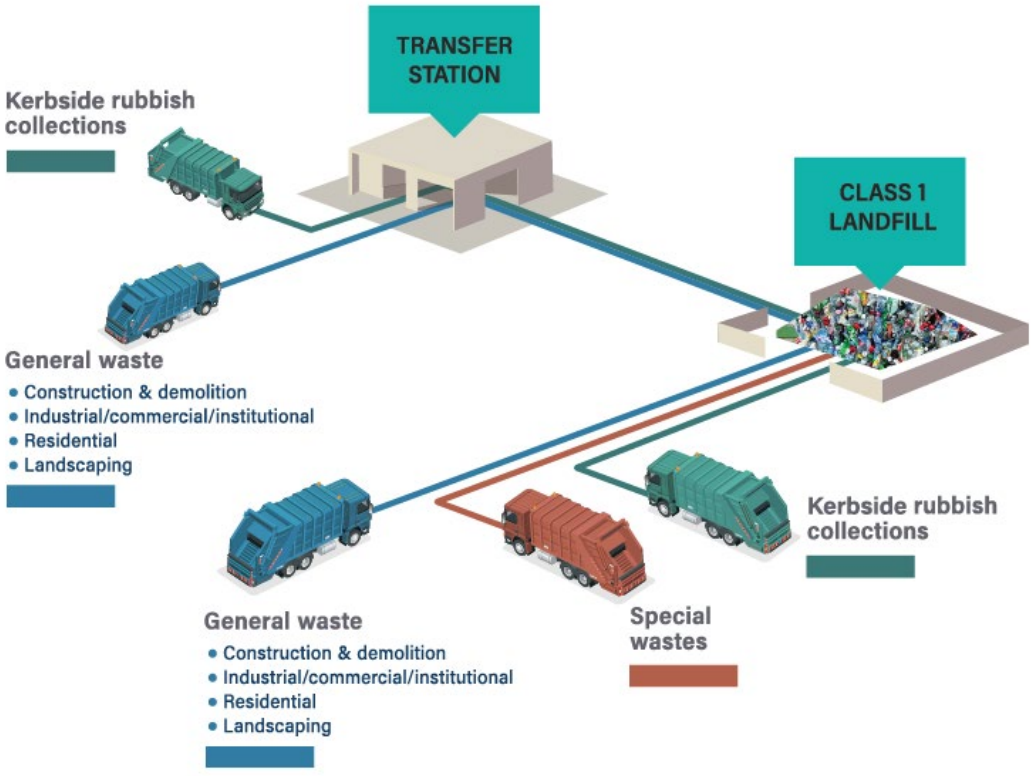
3.1.1 Classification of Waste Streams

As different waste streams require different management strategies, a standardised system for classifying waste streams was developed for the National Waste Data Framework. This system is used for the presentation of the data in the following sections.

'Overall waste', in this report, refers to all waste that is disposed of at a Class 1 landfill and is subject to the waste levy. 'Diverted materials', such as waste used for cover material or other engineering purposes, is not included. The waste levy is not paid on diverted materials.

'Overall waste' is broken down, in this report, into three waste streams - general waste, kerbside rubbish, and special wastes (such as biosolids and contaminated soils). 'General waste' is further broken down into four 'activity sources' – construction and demolition, industrial/commercial/ institutional, landscaping, and residential. These activity sources are defined in appendix A.6.0.

The following is a generic waste flow diagram that illustrates this system for classifying waste streams.



3.1.2 Tonnage of Waste to Class 1 Landfills

Table 6 provides an estimate of the total annual tonnage of waste originating from the Otago region that is disposed of to Class 1 landfills in the region and to Class 1 landfills outside the region. The estimate does not include waste that originates from outside the region.

Disposal in the region includes Green Island landfill, in Dunedin, Mt Cooee landfill in Balclutha, Victoria Flats landfill, in Gibbston, and Palmerston landfill.

Disposal outside of the region occurs at AB Lime landfill, near Winton, Southland, and Redruth landfill in Timaru.

The data used to calculate the estimate has primarily been drawn from surveys undertaken by Waste Not Consulting at transfer stations and Class 1 landfills in the region. Data has also been taken from waste assessments, WMMPs, and council meeting agendas and reports.

As the data used for the analysis is the most recent available but relates to different years, the tonnages are not representative of a specific year. For simplicity's sake, throughout this section the data is identified as being '2020'. In those instances where tonnage data has not been located or is considered unreliable, surrogate data based on other sources has been substituted.

It is noted that not all waste streams have been included in this total as no accurate tonnage data has been located or made available. For instance, contaminated soil from CODC is reportedly being disposed of at AB Lime, but no tonnage data is available.

Table 6: Waste to Class 1 Landfills from Otago Region - 2020

Overall waste to Class 1 landfills - 2020	% of total weight	Tonnes per annum
Disposal outside of Region		
General + kerbside rubbish	6.1%	8,700
Special wastes	2.9%	4,200
Subtotal	**9.0%**	**12,900**
Disposal in Region		
Kerbside rubbish	35.5%	50,946
General waste	52.7%	75,623
Special wastes	2.9%	4,095
Subtotal	**91.0%**	**130,664**
TOTAL	**100.0%**	**143,564**

An estimated 143,564 tonnes of waste from the Otago region were disposed of in 2020 to Class 1 landfills. The Class 1 landfills within the Otago region receive 90% of this waste. The other 10% is disposed of outside the region.

Most of the waste disposed of outside the Otago region was from Waitaki, with the remainder being biosolids from Queenstown Lakes and screenings from Central Otago. Biosolids are classified as special wastes.

3.1.3 Activity sources of Waste to Class 1 Landfills

The overall tonnage of waste to landfill has been divided into three waste streams in Table 6: kerbside rubbish, general waste, and special wastes. 'Kerbside rubbish' includes all rubbish collected from both residential and commercial properties by both council and private kerbside waste collections. 'Special' wastes include biosolids and road sweepings from council sources and potentially hazardous materials, such as asbestos-contaminated soil, from other sources.

In Table 7, 'general' waste is all waste to Class 1 landfills that is neither kerbside rubbish nor a special waste and is broken down into four activity sources. These activity sources align with those in the National Waste Data Framework and are shown as subsets of the General waste category. All waste from the Otago region, including that disposed of outside of the region, have been included.

Table 7 - Activity Sources of Waste to Class 1 Landfills - 2020

Activity sources of waste to Class 1 landfills from the Otago region – 2020	% of waste by weight	Tonnes per annum
Construction & demolition	18%	26,056
Industrial/commercial/institutional	27%	39,082
Landscaping	2%	2,569
Residential	5%	7,478
Subtotal - General waste	**52%**	**75,185**
Kerbside rubbish	36%	51,112
Special waste	12%	17,267
TOTAL	**100%**	**143,564**

It is estimated that a total of 143,564 tonnes of waste were disposed of to Class 1 landfills in 2020 from the Otago region. Of the total quantity disposed of to landfill, 36% was kerbside rubbish and 27% was industrial/commercial/institutional waste. Construction and demolition waste made up 18%, residential waste (which excludes kerbside rubbish) 5%, and landscaping waste 2%. A further 12% was special waste, which is primarily biosolids.

3.1.4 Per-capita Disposal of Waste to Class 1 Landfills

Using population figures from Stats NZ 2018-2048 subnational population estimates, per capita disposal rates of waste to Class 1 landfills has been calculated. The results are shown in Table 8.

Table 8 - Per Capita Disposal of Waste to Class 1 Landfills

Waste to Class 1 landfills from Otago Region - Per capita disposal rates	
Population	244,875
Tonnes per annum of kerbside rubbish	51,112
Tonnes/capita/annum of kerbside rubbish	0.209
Tonnes per annum of overall waste - including special waste	143,564
Tonnes/capita/annum of overall waste- including special waste	0.586

When special wastes are included, approximately 0.586 tonnes of waste per year are disposed of to a Class 1 landfill for every resident of the Otago region. Approximately 0.209 tonnes of kerbside rubbish are disposed of for every resident.

3.1.5 Comparison of Per-capita Disposal Rate to Other Councils

Waste Not Consulting has undertaken studies of waste disposal in several local authority areas, generating per capita disposal rates for the overall waste stream to landfill. In Table 9, disposal rates for the overall waste stream from a number of local authorities are compared to those from the Otago region. These figures include special wastes.

Table 9: Per Capita Disposal of Waste to Class 1 Landfills - Comparison to Other Areas

Comparison of per capita disposal rates of waste to Class 1 landfills	Tonnes per capita per annum
Gisborne District 2017	0.296
Waimakariri District 2017	0.325
Invercargill City 2018	0.528
Bay of Plenty Region 2017	0.529
Palmerston North 2017	0.545
Waikato Region 2017	0.552
Dunedin City 2018	0.554

Otago Region 2020	**0.586**
Wellington region 2016	0.608
Napier/Hastings 2019	0.630
New Zealand (to Sept. 2020)	0.663
Taupō District 2017	0.673
Hamilton City 2017	0.718
Queenstown Lakes District 2020	0.833
Auckland region 2016	1.053

The per-capita disposal rate for the Otago region is similar to many of the other areas that have been analysed. Differences in the disposal rates are associated with differences in the level and type of economic activity in an area. For example, agricultural activity generates less waste to Class 1 landfills than manufacturing. High levels of tourism activity, such as in Taupō and Queenstown Lakes Districts, result in higher per-capita disposal rates.

3.1.6 Composition of Waste to Class 1 Landfills

The compositions of the general and overall waste streams disposed of to landfill from the Otago region have been calculated using the results of Solid Waste Analysis Protocol (SWAP) audits undertaken since 2017 in four of the five territorial authority areas[5]. These SWAP audits represent 89% of the 143,564 tonnes (including special waste) disposed of annually to landfill.

The primary compositions of general waste and overall waste to Class 1 landfills are presented in Table 10. 'General waste' excludes kerbside rubbish and special waste. 'Overall waste' includes general waste, kerbside rubbish, and special wastes. The secondary compositions, which include all 25 classifications, are provided in appendix A.1.0.

Table 10: Primary compositions of Waste to Class 1 Landfills - 2020

Primary compositions of waste to Class 1 landfills - 2020	**General waste - excludes kerbside rubbish and special wastes**	**Overall waste - includes general waste, kerbside rubbish, and special wastes**

[5] The classification system for waste streams is described in Section **Error! Reference source not found.**

	% of total	Tonnes per annum	% of total	Tonnes per annum
Paper	11.2%	8,436	8.9%	12,847
Plastics	14.5%	10,877	11.0%	15,754
Organics	12.1%	9,106	26.0%	37,349
Ferrous metals	3.4%	2,558	2.5%	3,545
Non-ferrous metals	0.5%	345	0.5%	773
Glass	1.7%	1,241	2.5%	3,568
Textiles	6.5%	4,916	4.8%	6,917
Sanitary paper	2.3%	1,736	4.2%	6,075
Rubble & concrete	16.3%	12,221	9.8%	14,040
Timber	29.0%	21,820	15.9%	22,786
Rubber	1.5%	1,111	0.9%	1,267
Potentially hazardous	1.1%	820	13.0%	18,642
TOTAL	**100.0%**	**75,185**	**100.0%**	**143,564**

Timber (29.0%) and rubble (16.3%) were the two largest components of general waste to Class 1 landfills. Plastics (14.5%) was the third largest component.

The largest component of overall waste (which includes general waste, kerbside rubbish, and special wastes) was organic waste, which comprised 26.0% of the total weight. Nearly 70% of the tonnage of organic material in overall waste is kitchen waste from kerbside rubbish collections. Timber was the second largest components of overall waste to landfill, comprising 15.9% of waste. Potentially hazardous materials (13.0%) were the third largest. All special wastes have been classified as potentially hazardous.

3.1.6.1 Composition of Waste to Class 1 Landfills - By Activity Source

In Table 11, general waste is broken down into four the activity sources - construction and demolition waste, industrial/commercial/institutional waste, residential waste (which excludes kerbside rubbish), and landscaping waste. The primary composition of each of the four activity sources is shown. The secondary compositions, in terms of both percentage and tonnes per annum, are presented in appendices A.3.0 and A.4.0.

Table 11: Primary compositions of Waste - By Activity Source - 2020

Primary compositions of waste to Class 1 landfills - - 2020	Construction & demolition	Industrial/ commercial/ institutional	Landscaping	Residential
Paper	2.6%	18.2%	0.3%	8.4%
Plastics	2.6%	24.6%	0.7%	7.7%
Organic	1.0%	15.0%	80.2%	12.4%
Ferrous metals	2.2%	2.9%	0.0%	11.2%
Non-ferrous metals	0.1%	0.6%	0.0%	0.8%
Glass	0.4%	2.5%	0.0%	2.1%
Textiles	2.3%	7.8%	0.2%	17.0%
Sanitary paper	0.0%	4.3%	0.0%	0.7%
Rubble & concrete	35.4%	6.0%	17.3%	2.9%
Timber	51.7%	14.5%	1.3%	35.7%
Rubber	1.0%	2.1%	0.0%	0.6%
Potentially hazardous	0.7%	1.6%	0.0%	0.4%
TOTAL	**100.0%**	**100.0%**	**100.0%**	**100.0%**

The majority of construction and demolition waste was timber (51.4%) and rubble (35.4%). Industrial/commercial/institutional waste was more diverse, with plastics comprising the largest proportion (24.6%) and paper comprising 18.2% of the total weight. Landscaping waste was 80.2% organics, primarily greenwaste.

Residential waste often includes waste from several activities, including landscaping and construction. The largest component of residential waste was timber, comprising 35.7% of the total, which included both furniture and wood from construction and demolition. Textiles was the second largest component, comprising 17.0% of the total weight. Carpet, soft furnishings, and clothing were the major components of textile waste.

3.1.7 Diversion Potential of Waste to Class 1 Landfills

Of the 25 secondary classifications of the composition, nine are commonly recycled or recovered in New Zealand. A further four materials are compostable. There are currently diversion options available in Otago region for most of these 13 materials.

Based on these 13 materials, Table 12 shows the proportions of kerbside rubbish (see section 3.2), general waste, and overall waste that could potentially be diverted from landfill disposal. The percentages and tonnages of general waste and overall waste have been taken from appendix A.1.0. The data on kerbside rubbish is from appendix A.5.0.

Table 12: Diversion Potential of Waste to Class 1 Landfills – 2020

Diversion potential of waste to Class 1 landfills - 2020	Kerbside rubbish		General waste - excludes kerbside rubbish and special wastes		Overall waste - includes kerbside rubbish, general, and special wastes	
	% of total	Tonnes per annum	% of total	Tonnes per annum	% of total	Tonnes per annum
Recyclable and recoverable materials						
Paper - Recyclable	6.6%	3,349	4.1%	3,114	4.5%	6,463
Paper - Cardboard	0.7%	372	5.8%	4,355	3.3%	4,727
Plastic - Recyclable	2.2%	1,108	0.7%	558	1.2%	1,666
Ferrous metals	1.9%	987	3.4%	2,558	2.5%	3,545
Non-ferrous metals	0.8%	427	0.5%	345	0.5%	773
Glass - Recyclable	3.9%	2,009	0.7%	523	1.8%	2,532
Textiles - Clothing	2.4%	1,208	1.9%	1,434	1.8%	2,642
Rubble - Cleanfill	0.0%	0	4.4%	3,299	2.3%	3,299
Timber - Reusable	0.0%	0	1.7%	1,265	0.9%	1,265
Subtotal	**18.5%**	**9,460**	**23.2%**	**17,451**	**18.7%**	**26,911**
Compostable materials						
Kitchen waste	32.9%	16,827	3.4%	2,586	13.5%	19,413
Compostable greenwaste	17.0%	8,684	3.9%	2,944	8.1%	11,628
New plasterboard	0.0%	0	3.0%	2,256	1.6%	2,256
Untreated/unpainted timber	0.0%	0	4.0%	3,033	2.1%	3,033
Subtotal	**49.9%**	**25,511**	**14.4%**	**10,820**	**25.3%**	**36,332**
TOTAL - Potentially divertible	**68.4%**	**34,971**	**37.6%**	**28,271**	**44.1%**	**63,242**

Recyclable/recoverable materials accounted for 18.7% of overall waste and compostable materials 25.3%. Approximately 44.1% of the overall waste stream disposed of at Class 1 landfills could be readily diverted either by either by recycling/recovering or by composting.

3.1.8 Activity Source of Potentially Recoverable Waste Materials

Table 13 focuses on the 'potentially recoverable' materials that are currently going to landfill; with the depth of colour highlighting the largest material quantities by volume.

Table 13 - Activity sources of potentially recoverable materials - 2020

Activity Source of potentially recoverable waste materials	Construction & demolition	Industrial/ Commercial/ Institu	Landscaping & earthworks	Residential	Kerbside rubbish
	Tonnes per Annum to Class 1 landfill				
Recyclable Paper	32	2,891	1	190	3,349
Recyclable Cardboard	560	3,374	6	415	372
Recyclable Plastics	23	477	0	58	1,108
Food waste	0	2,418	3	164	16,827
Compostable green waste	213	866	1,193	672	8,684
Other organics	17	2,298	0	7	1,767
Primarily ferrous	484	456	0	240	373
Steel, other ferrous	96	681	0	600	614
Non-ferrous	37	248	0	60	427
Recyclable glass	3	491	0	29	2,009
Cleanfill	2,685	128	443	44	0
New plasterboard	2,244	0	0	13	0
Other' rubble	4,289	2,211	2	164	1,819
Reusable Timber	1,025	170	3	66	0
Unpainted & untreated timber	1,817	984	4	228	0
TOTAL	**13,527**	**17,694**	**1,657**	**2,949**	**37,349**

Looking at the food waste example, it's clear that changing householders' behaviour through appropriate kerbside collections is a priority. When it comes to cleanfill, plasterboard, rubbish and timber in comparison, action for change should be focussed on the construction and demolition sector. To reduce recyclable paper to landfill, both households and the commercial, industrial and institutional sectors should be targeted.

3.1.9 Carbon Emissions from Waste to Class 1 Landfills

When waste is landfilled, it decomposes anaerobically and methane (CH_4) is produced. Methane is one of the six greenhouse gases (GHG) recognised in the international climate change agreement, the Kyoto Protocol. For GHG accounting purposes, all six greenhouse gases are measured and expressed in terms of carbon dioxide equivalent units, in tonnes ($tCO2_{-e}$ unit). The ETS requires all Class 1 landfills to surrender carbon credits, based on the quantity of waste the landfill receives.

Large Class 1 landfills (over 1 million tonnes total capacity) in New Zealand are required to operate landfill gas capture systems, which reduce the amount of methane gas emitted to the atmosphere. A landfill gas recovery scheme does not, however, capture all the methane gas that a landfill generates and a proportion is still released. Green Island Landfill and Victoria Flats Landfill, the large Class 1 landfills servicing Dunedin and Queenstown respectively, have landfill gas capture systems, as does AB Lime Landfill, in Southland.

The Climate Change (Unique Emissions Factors) Regulations 2009 provides a process through which a Class 1 landfill may apply for a unique emissions factor (UEF), based on the proportion of landfill gas that is captured (see 0).

UEFs are published annually in the New Zealand Gazette. Using the published UEFs for 2020 for Green Island and AB Lime landfills, and applying them to the tonnage of waste disposed of at each facility, it is estimated that the landfill gas capture systems reduce the quantity of methane released to the atmosphere waste generated in Otago Region that is disposed of at Class 1 landfills by 16%. As Victoria Flats landfill has not had gas capture in place for a year and therefore cannot yet apply for an applicable UEF, it has been assumed to have the same gas capture rate as AB Lime landfill.

Landfill methane emissions are calculated based on the composition of waste, with a different emissions factor being applied to each type of material with methane-generating potential. Table 12lists the materials that could potentially be diverted from Class 1 landfill disposal. Many of these materials are organic in nature, so diverting them from landfill will not only reduce the tonnage of waste to landfill but will change the methane-generating potential of the materials that remain. Table 14 presents:

- The carbon emissions potential of all waste disposed of to Class 1 landfills from Otago Region, before and after landfill gas is captured.
- The carbon emissions potential from the same waste after all divertible materials have been removed, before and after landfill gas is captured.

Table 14: Carbon Emissions from Waste to Class 1 Landfills

Carbon emissions from Otago Region waste to Class 1 landfills	All waste	Waste after removal of divertible materials	Change
Tonnes to Class 1 landfills	143,564	80,322	-44%
Calculated emissions factor in tCO2-e per tonne of waste	1.295	1.177	-9%
Emissions potential, based on calculated emissions factor, in tCO2-e	185,974	94,504	-49%
Actual emissions, with landfill gas capture, in tCO2-e	156,297	79,424	76,873

The 143,564 tonnes of waste currently disposed of to Class 1 landfills from the Otago region has the potential to emit 185,974 tonnes of carbon. Landfill gas capture systems reduce this potential to 156,297 tonnes of carbon.

Removal of all possible divertible materials (as per Table 12 reduces the tonnage of waste by 44% (to 80,322 tonnes) and the emissions factor of the waste by 9%. Potential emissions are reduced by 49% to 94,504 tonnes. Landfill gas capture systems currently in place in the Class 1 landfills reduce this potential to 79,424 tonnes.

3.2 Kerbside Rubbish

An estimated 51,112 tonnes of rubbish are collected from Otago's kerbsides by councils and private waste collectors. Although a high proportion of the kerbside rubbish is from residential properties, a proportion from commercial properties is also included in the total.

3.2.1 Composition of Kerbside Rubbish

Since 2018, Waste Not Consulting has undertaken sort-and-weigh audits of kerbside rubbish for three of the five territorial authorities in the Otago region. Kerbside rubbish disposed of by these three territorial authorities represents 43% of all kerbside rubbish from the region. Based on these audits, the primary composition of all kerbside rubbish collected in the Otago region is presented in Table 15. The secondary composition, which includes all 23 classifications used for the audits, is provided in appendix A.5.0.

Table 15 Composition of Kerbside Rubbish Otago Region - 2020

Primary composition of kerbside rubbish - 2020	% of total	Tonnes per annum
Paper	8.6%	4,411
Plastics	9.5%	4,878
Organic	55.3%	28,243
Ferrous metals	1.9%	987
Non-ferrous metals	0.8%	427
Glass	4.6%	2,327
Textiles	3.9%	2,002
Sanitary paper	8.5%	4,339
Rubble & concrete	3.6%	1,819
Timber	1.9%	966
Rubber	0.3%	156
Potentially hazardous	1.1%	556
TOTAL	**100.0%**	**51,112**

Based on the results of the three sort-and-weigh audits, organics was the largest primary classification of kerbside rubbish, comprising 55.3% of the total weight. Kitchen waste comprised 60% of the organic material. Plastic was the second largest primary classification, comprising 9.5% by weight, and paper the third largest, at 8.6%.

3.2.2 Diversion Potential of Kerbside Rubbish

In the sort-and-weigh audits used to calculate the composition of kerbside rubbish, secondary categories were used to differentiate between recoverable and non-recoverable materials (e.g. recyclable paper vs. non-recyclable paper). In this context, 'recoverable' is taken to mean materials which can be readily diverted by residents, through kerbside recycling and organic collections, drop-off facilities, or through home-composting.

Using the results of the three SWAP audits of kerbside rubbish conducted in the Otago region since 2017, the diversion potential of kerbside rubbish has been calculated to be as shown in Table 16.

Table 16: Diversion Potential of Kerbside Rubbish - 2020

Diversion potential of kerbside rubbish - 2020	% of total	Tonnes per annum
RECYCLABLE MATERIALS		
Paper recyclable	7.3%	3,721
Plastic - #1, #2 and #5 containers	2.2%	1,108
Steel cans	0.7%	373
Aluminium cans	0.3%	165
Glass bottles & jars	3.9%	2,009
Subtotal	**14.4%**	**7,376**
COMPOSTABLE		
Kitchen waste	32.9%	16,827
Greenwaste	18.9%	9,649
Subtotal	**51.8%**	**26,476**
TOTAL DIVERTIBLE	**66.2%**	**33,853**
Non-divertible	**33.8%**	**17,260**
TOTAL KERBSIDE RUBBISH	**100.0%**	**51,112**

Approximately 14.4% of kerbside rubbish from the Otago region could have been readily diverted through kerbside recycling collections or at drop-off facilities. Recyclable paper

was the largest single recyclable component, comprising 7.3% of the total weight of kerbside rubbish.

Organic materials that could have been composted comprised 51.8% of kerbside rubbish. Kitchen waste comprised 32.9% of kerbside rubbish (16,827 tonnes per annum), and greenwaste 18.9% (9,649 tonnes per annum). In total, 66.2% of kerbside rubbish, 33,853 tonnes per annum, could have been diverted from landfill disposal by residents.

3.2.3 Per Capita Disposal of Kerbside Rubbish

Using population figures from Stats NZ 2018-2048 sub-national population estimates, a per capita disposal rate of kerbside rubbish has been calculated. The results of the calculations are shown in Table 17

Table 17: Per Capita Disposal of Kerbside Rubbish - 2020

Waste to Class 1 landfills - Per capita disposal rates - 2020	
Population	244,875
Tonnes per annum of kerbside rubbish	51,112
Kg/capita/annum of kerbside rubbish	209

Approximately 209 kilograms of kerbside rubbish are disposed of per year for every resident of the Otago region.

3.2.3.1 Comparison of Per Capita Disposal Rates to Other Councils

Waste Not Consulting has undertaken studies of waste disposal in several local authority areas that have generated per capita disposal rates for kerbside rubbish. In Table 18, disposal rates for kerbside rubbish from a number of local authorities are compared to those in the Otago region. These figures, in most instances, include kerbside rubbish collected from commercial properties.

The per capita disposal rate of kerbside rubbish from the Otago region is higher than from most other areas. In general terms, a range of factors affect the disposal rate, including the recycling options available to residents, the volume of waste receptacles for rates-funded services, the proportion of properties that are used for holiday homes or short-term rentals, and the proportion of commercial properties that use kerbside services for rubbish disposal.

However, the primary reason for the relatively high per capita disposal rate from the Otago region is the very high disposal rate from Queenstown Lakes district. Disposal rates here are high due to the large number of visitors (who are not classified as ‘usually resident’ by the census) and a higher than average proportion of businesses that use kerbside rubbish collections for commercial waste disposal.

Table 18: Per Capita Disposal of Kerbside Rubbish - Comparison to Other Areas - 2020

Comparison of per capita disposal rates of kerbside rubbish - 2020	Kilograms per capita per annum	Principal kerbside rubbish collection services
Christchurch City 2011	110	Rates-funded fortnightly 140-litre wheelie bins (with weekly organic)
Gisborne District 2017	122	Rates-funded rubbish bag stickers
Whangarei District 2017	153	User-pays rubbish bags + private wheelie bins
Waikato Region 2017	156	Various
Auckland Council 2016	156	User-pays rubbish bags + rates-funded wheelie bin + private wheelie bins
Dunedin City 2018	187	User-pays rubbish bags + private wheelie bins
Tauranga and WBOP District 2019	192	User-pays rubbish bags + private wheelie bins
Hamilton City 2017	197	Rates-funded bags (2 per h/h max)
Bay of Plenty Region 2017	201	Various
Palmerston North 2017	201	User-pays rubbish bags + private wheelie bins
Wellington Region 2014/15	206	User-pays rubbish bags + private wheelie bins
Otago Region 2020	**209**	**Various**
Hastings District/Napier City 2019	221	Rates-funded bags (2 bags h/h max) + User-pays rubbish bags + private MGBs

3.3 Other Waste Disposed of to Land

3.3.1 Farm Waste

In 2013, a study of farm waste management practices in Canterbury region provided data that enables estimates to be made of the quantity of non-natural wastes disposed of on rural properties.[6]

The Canterbury study found that 92% of farms use one of the 'three B' methods of waste management – bury, burn, or bulk storage on property. The Canterbury study calculated average annual tonnages of waste for four different types of farm. As farm waste from a specific type of farm is likely to be similar throughout the country, the data is considered to be suitable for application to other regions, by applying the waste data per farm to the number of farms of each type in a region. Data on numbers of farm types in each region in 2020 is available from Stats NZ.

Based on the data contained in the 2013 Canterbury study, an estimate of the quantity of waste disposed of in Otago Region is presented in Table 19. The categories are those presented in the study. 'Non-natural rural waste' includes materials such as scrap metal, treated timber, fence posts, plastic wraps and ties, crop netting, glass, batteries, and construction and demolition wastes. 'Organic waste' is not well-defined in the study and is only reported in the study as including 'crop residues'.

Table 19: Estimate of On-Farm Disposal of Waste - Reported Classifications

Farm wastes in Otago Region - 2020 Tonnes/year	Dairy	Livestock	Grape growers	Other arable	TOTAL
Number of farms	**612**	**252**	**36**	**2,391**	**3,291**
Non-natural waste	3,435	2,063	182	7,993	13,673
Domestic waste	338	19	0	2,410	2,767
Animal carcasses	5,416	4,895	0	3,269	13,580
Organic waste	6,510	28	331	1,587	8,456
TOTAL	**15,698**	**7,005**	**513**	**15,260**	**38,476**
Average per farm	**25.7**	**27.8**	**14.3**	**6.4**	**11.7**

[6] GHD (2013), *Non-natural rural wastes - Site survey data analysis*, Environment Canterbury Report No.R13/52

The 3,291 farms in the Otago region[7] are estimated to dispose, on-farm, of an average 11.7 tonnes of waste per farm per annum. In total, 38,476 tonnes of waste per annum are estimated to be disposed of in this manner across the region.

Using the raw data from the 2013 Canterbury study, the composition of farm waste in Otago Region in 2020, expressed in the standard SWAP classifications, has been calculated as shown in Table 20.

Table 20: Estimate of On-Farm Disposal of Waste - SWAP Classifications

Farm wastes in Otago Region - 2020	% of total weight	Tonnes per year
Paper	0.5%	210
Plastics	8.0%	3,096
Food and other putrescibles	*27.7%*	*10,658*
Garden and other carbon sources	*48.0%*	*18,488*
Putrescibles - subtotal	**75.8%**	**29,146**
Ferrous metals	2.4%	916
Non-ferrous metals	0.0%	4
Glass	1.9%	733
Textiles	0.1%	23
Nappies and sanitary	0.1%	42
Rubble	0.2%	71
Timber	10.5%	4,032
Rubber	0.0%	4
Potentially hazardous	0.5%	198
TOTAL	**100.0%**	**38,476**

Putrescible materials, which includes 'organic' waste and animal carcasses as per the 2013 Canterbury study, tree trimmings, wood chip animal bedding, and food waste in domestic rubbish, was the largest classification of farm waste, comprising 75.8% of the total weight. Timber was the second largest classification, comprising 10.5%. The timber classification incudes both treated and untreated processed timber.

[7] Stats NZ business demography for ANZSIC06 for 2020

3.3.2 Waste to Class 2-5 Landfills

For this project, an Official Information Act request was made to MfE for the available information on Class 2-5 landfills in the Otago region.

The Class 2-5 landfill sites identified by MfE in the Otago region are listed in Table 21. The table includes the address of each site as well as the materials that are accepted, based on either the resource consents for the site or on information gathered for this project.

Table 21: Class 2-5 Landfills in Otago Region

Territorial authority	Address	Accepted materials
Central Otago	Parkburn Quarry Site beside Lake Dunstan, near Cromwell	Cleanfill, up to 5% vegetation
Clutha	Kai Point Coal Mine, Kaitangata	Boiler ash, mine overburden
Dunedin	712 Kaikorai Valley Road, Dunedin	Construction and demolition waste, contaminated soil, other non-putrescible waste
Dunedin	13 Matanaka Drive, Waikouaiti	Eggshells, boiler ash
Dunedin	20 McLeods Rd, Dunedin	Greenwaste
Queenstown Lakes	Ballantyne Rd, Wanaka	Cleanfill (possibly closed)
Queenstown Lakes	2 sites on Kingston Rd, Queenstown	Cleanfill
Queenstown Lakes	Shotover Delta Rd, Queenstown	Cleanfill
Waitaki	Works Rd, Pukeuri	Cleanfill, boiler ash
Waitaki	Awamoa Road and Beach Road, Oamaru	Offal
Waitaki	McEneany and Steward Roads, Pukeuri	Soil, cleanfill

While most of the Class 2-4 sites, which includes construction and demolition landfills and industrial disposal sites, are likely to have been identified by MfE through their resource consents, there may be Class 5 cleanfill sites that have not. Operation of a cleanfill site or greenwaste disposal site is a permitted activity so often remains undocumented.

While the landfill sites identified by MfE include cleanfill sites in proximity to several of the major towns, there are also likely to be a number of unofficial cleanfill operations on farmland and in other isolated locations that serve the other towns.

Few Class 2-5 landfills record the quantity of material they receive. Based on the information provided by MfE, only three of the resource consents for the sites listed in Table 21 include conditions limiting the amount of material that can be accepted each year.

A small number of the sites have provided MfE and/or the project team with information on the quantity of material accepted. Based on this information, it is estimated that approximately 100-200,000 tonnes of material are disposed of annually in Class 2-5 landfill sites in the Otago region. A very high proportion of this material is inert, excavated soils and other natural materials. This figure does not include the overburden from Kai Point coal mine.

3.4 Recovered Material Data

The data in Table 22 was provided by diverted material reprocessors and covers material from the Otago region that are managed within New Zealand. Excluding exports creates a gap for plastic and fibre in particular.

Table 22: Diverted Materials Reported by Reprocessors 2020

Reprocessed material	TOTAL (material in tonnes per annum)
Glass	
Bottles/jars	9,849
Organics	
Putrescibles (wet organics)	1,260
Greenwaste, wood waste, manure	2,520
Tyres	3,988
Fibre (paper, card)	
Mixed paper	450
Old corrugated cardboard	3,000
Construction & Demolition	
Aggregate	46,000
Construction and demolition	1,300

Reprocessed material	TOTAL (material in tonnes per annum)
Scrap metal	10,000
Electrical and Electronic	133
Farm Plastics	470
Plastics (various grades)	642
TOTAL	**79,612**

Table 22 shows that an estimated 80,000 tonnes of material is recovered and processed from the Otago region annually, with over half of this accounted for by aggregates.

Table 23 puts the above data in a broader context, presenting the diverted data alongside (and as a proportion of) total waste to disposal and recovery.

Table 23: Waste to Disposal and Recovery

Destination	Tonnage	Percent
Tonnes to Class 1 landfills	143,564	35%
Tonnes to Class 2 5 (est)	150,000	36%
Tonnes to rural disposal	38,476	9%
Recovery (excl. rural recovery)	79,612	19%
TOTAL	**411,652**	**100%**

The above data suggests that Otago recovers approximately 20% of the waste material generated with approximately equal quantities of material going to Class 1 and Class 2-5 disposal.

4.0

Key Waste Sources

4.0 Key Waste Sources

This section explores the key sources of waste and recovered materials. These waste sources do not cover all waste generation in the region but highlight key areas.

4.1 Household Recycling – Kerbside Collections

4.1.1 Collection Services

Apart from Waitaki, all councils provide fortnightly kerbside collection services for recycling in 240L wheeled bins, albeit through different service providers. Where glass is collected, it is collected separately from other recycling in either crates or wheelie bins.

There are currently no kerbside food waste or greenwaste collections offered through the councils in the Otago region. Dunedin intends to offer kerbside food waste and optional greenwaste collections when it awards a new waste management contract - expected to commence in mid-2023. CODC is currently consulting on three possible new service configurations; two of which include a four-weekly greenwaste collection from a 240L bin, with the third offering a weekly mixed food and greenwaste collection from a smaller bin.

Details on council-provided kerbside recycling collections in the Otago region are summarised in Table 24.

Table 24 Council-Provided Kerbside Recycling Collections Per TA

	Dunedin	Waitaki	Queenstown Lakes	Central Otago	Clutha
Glass	Fortnightly crate	No council collection	Fortnightly 140L wheeled bin	8-weekly 240L wheeled bin	No council collection
Other dry recyclables	Fortnightly 240L wheeled bin	No council collection	Fortnightly 240L wheeled bin	Fortnightly 240L wheeled bin	Fortnightly 240L wheeled bin
Plastics Accepted	#1, #2, #5	No council collection	#1 (clear bottles only), #2, #5	#1 (clear only), #2, #5	#1, #2, #5
Foil, aerosols	Foil only	No council collection	Not accepted	Not accepted	Not accepted
Annual Tonnages	Glass: 3,093 Other: 4,322	Unknown	Glass: 2,853 Other: 2,381	All: 1,538	Unknown

4.1.2 Consistency across districts

In 2020, WasteMINZ completed a review for MfE on kerbside collections and made recommendations as to how better consistency in collection systems could be achieved across the country[8]. Implementation of national harmonisation can have far reaching effects on the types, quantity and quality of material collected as well as the collection methods. MfE has commissioned a follow-up project to support the implementation of kerbside standardisation, and intends to consult on these proposals in late 2021.

It is worth pointing out where the Otago region kerbside services diverge from these recommendations (and from each other):

- consistency in the materials accepted in kerbside recycling and how they are presented (which includes containers used, and frequency):
    - collection frequency varies
    - glass included or not
    - #1 plastic containers (CODC and QLDC restricted to clear bottles only)
- food waste collections, with Dunedin proposing a weekly kerbside food waste collection but CODC proposing a greenwaste collection, or food waste co-collected with greenwaste (kerbside standardisation proposes a food waste-only collection); and
- Collection containers, with a standardised approach currently proposing a three crate-based system.

4.1.3 Signalled changes to services

Dunedin is in the process of making significant changes to its kerbside services, with the implementation of a 4 + 1 kerbside collection system with the goal of increasing the amounts of recyclable materials collected, including glass.

The two largest councils (in terms of population and together covering about 50% of all the region's households), Dunedin and Queenstown Lakes, are considering or are introducing kerbside food waste collection service. These additional services would require necessary investment in collection and processing infrastructure - which might potentially be supported by other TAs across the region. Clutha has indicated an interest in working with other councils for kerbside organics collection.

Central Otago, at this stage, has indicated that collection of greenwaste is a higher priority and is currently consulting on proposed service changes that would collect greenwaste at the kerbside, with one of the three proposed options including food waste with the greenwaste.

[8] https://www.wasteminz.org.nz/wp-content/uploads/2020/08/Final-1.0-Standardising-Kerbside-Collections-in-Aotearoa.pdf

4.1.4 Recovery and Processing

In addition, there is variability in how recovered materials are managed. Glass that is collected is not necessarily being recycled back into glass, but instead is being downgraded for other uses, such as roading and landfill cover. This is a particular issue for Central Otago, where the glass currently being collected is not meeting the quality standards set by glass recovery company 5R. Queenstown Lakes has historically had similar issues, but is currently able to direct recovered glass through 5R.

As a result of the recent international and national legislative changes regarding the import, manufacturing, sales, distribution, and export of (waste) plastics, most councils now only collect plastics 1, 2 and 5. Clutha has indicated in its LTP that they do not believe there are markets for grade 5 plastics, which is not experienced nationally. This requires further discussion.

Both MRFs in Dunedin and Queenstown Lakes are not fit for purpose, as they are dated and cannot meet the qualitative and quantitative demands of local recycling streams. Specifically, the Dunedin MRF cannot process glass, nor separate plastics by polymers, resulting in reduced diversion and quality of materials. The MRF in Queenstown Lakes regularly struggles with capacity, leading to delays or non-acceptance of recycling from Central Otago. In turn, this causes either extended transport (to Southland), double handling and storage (resulting in reduced quality), and/or the mismanagement of waste in the sense that otherwise recyclable materials will go to landfill.

4.2 Institutional Waste

Otago is home to large institutional and commercial waste generators, providers of health care, higher education and transport. Some of the larger generators are discussed in the following sections.

4.2.1 Southern District Health Board – Dunedin and Wakari Hospitals

Southern District Health Board (SDHB) is responsible for planning, funding and providing all publicly funded health care services for the Southern District. SDHB operates hospitals in Dunedin, Wakari (Dunedin), Invercargill and Queenstown and also contracts health services from rural hospitals, WellSouth (Primary Health Organisation), pharmacies, aged residential care facilities and more.

Dunedin Hospital is the main public hospital in Dunedin. It serves as the major base hospital for the Otago and Southland regions. Wakari Hospital in Dunedin comprises Mental Health facilities, administration and other SDHB support services.

Broadly speaking, there are two types of waste generated from Dunedin and Wakari Hospitals. Hazardous, or clinical, waste includes needles, blood-soaked dressings, chemotherapy chemicals, and infectious waste. Non-hazardous wastes include paper (including confidential documents, treated separately), packaging, general waste, organic waste, and recyclables.

SDHB's core function is healthcare and the use of consumables is largely driven by clinical need. That said, SDHB works to reduce waste wherever possible. Initiatives either planned or taken to date include:

- substituting medical gas (Nitrous Oxide) use where clinically appropriate due to the presence of Desflurane, a potent greenhouse gas. (Other anaesthetic gases contain Sevoflurane, a much less potent greenhouse gas)
- electrifying 50% of the SDHB's 290 fleet vehicles by 2030
- recycling pens, PVC drip lines and post-surgical cuffs
- recycling single use metal instruments, and
- improving recycling in the cafeterias for milk bottles and tins.

Throughout Dunedin and Wakari Hospitals, staff are encouraged to ensure that paper and cardboard, glass, plastics and aluminium is separated and PVC recycling options for clinical products are utilised. Provision for recycling of batteries is also accommodated.

Construction on a New Dunedin Hospital (NDH) will begin shortly. An Outpatients' Building will open in 2025, followed by an Inpatients' Building that will open in 2028. The NDH is seeking accreditation to become a five-Star, "Green Star" accredited building. Practically speaking, the NDH is being designed to mitigate carbon emissions, be resilient to our changing environment and create a modern healthcare facility to promote health and wellbeing for staff and patients.

Specific sustainability initiatives being woven into NDH's planning, design and ultimately construction are grouped around:

- water efficiency
- promoting the natural environment (including co-design with Mana Whenua)
- waste reduction, and
- use of sustainable materials wherever possible.

Additional work around sustainable transport and travel and innovation is also being undertaken.

Two "Operational Waste Management Plans" will be completed to support the NDH – one each for the Outpatients' and Inpatients' Buildings. These plans will describe how waste is collected, moves around and ultimately leaves each building. We will also include some waste target metrics and a view about how to work with staff to encourage positive waste management behaviour change.

4.2.2 University of Otago

The University of Otago is a collegiate university based in Dunedin. The university provides accommodation through 12 halls of residence with 3,000 bed spaces, student flats (a combination of university-owned flat accommodation and leased buildings), and the executive residence building that operates like a hotel for visiting academics. It owns teaching and research facilities (3,500 offices, lecture theatres, workspaces and labs across health science, humanities, science, and commerce). The university owns multiple

large building such as libraries, stores, museums, gyms, a composting facility, and a salmon hatchery. The university staff also host and run national and international conferences.

As well as Dunedin, the university operates in Wellington, Christchurch, Invercargill and Auckland. Annually, it hosts around 21,000 students and 4,000 full-time equivalent staff offering 200 undergraduate and postgraduate degree, diploma, and certificate courses across its campuses.

In 2017, the university set a waste target of halving the waste disposed of to landfill in 2012 by 2021 but achieved that goal two years early (waste dropped by 62% in 2019). Now it is working towards halving the 2018 waste total through a partnership with Waste Management NZ Ltd and has already reduced waste further in 2020, resulting in a drop of 43% since 2018.

The university replaced a multi-million-dollar waste contract held with four companies into a single contract with Waste Management NZ Ltd in March 2019. The financial arrangement is not based on number of bins emptied; rather, it is a fixed fee. This action created a unique collaborative venture that is incentivising continued and aggressive waste reduction changes.

4.2.3 Otago Polytechnic

Otago Polytechnic is a publicly-owned New Zealand tertiary education institute, centred in Dunedin with additional campuses in Cromwell and Auckland. The polytechnic provides career-focused education and training, offering a range of New Zealand accredited postgraduate qualifications, degrees, diplomas and certificates at levels 2–10.

The polytechnic owns 15 teaching buildings and a residential village accommodating 231 students, around 8,000 students, and 650 staff.

The polytechnic has a Living Campus where staff and students grow and harvest food onsite. The campus generates garden waste pruned by students from around the campus which is chipped and composted. Food scraps from the catering facilities go to an onsite worm farm. The polytechnic has a dedicated staff member who manages the compost and worm farm.

EnviroWaste, the polytechnic's main waste contractor, collects general waste, and various materials for recovery including co-mingled glass, green waste, mixed recycling, cardboard, and wood ash. Spotless Cleaning company holds the cleaning contract for the whole campus and also collects general waste from 37 locations.

The polytechnic has a 2019 waste reduction plan agreed upon by the leadership team. The midterm goal was a 20% reduction on 2017 waste generated by 2020. The long-term goal is an 80% reduction by 2021. It has a midterm recycling goal of 40% improvement from 2017 recycling amounts by 2022.

Educating students and staff as to what can and can't be recycled remains a problem. The polytechnic would like to see a regional education campaign to reinforce the

recycling habits started at home, which would require recycling to be standardised across councils to work. Polytechnic staff we interviewed felt the current situation creates a lack of trust in recycling when students and staff don't know what happens to the materials that they have separated, especially when media stories can contradict what they have been told.

4.2.4 Port Otago

Port Otago Limited is a full-service port located in Port Chalmers, Dunedin. As well as port facilities, there are container servicing and storage facilities. The storage facilities are primarily used for milk powder, fish and timber prior to export.

The company has six main locations:

1. Main port in Port Chalmers
2. Sawyers Bay warehouse
3. Cold storage at Dunedin Bulk Port
4. Dunedin depot container storage
5. Container storage operation in Mosgiel
6. Marine plant at Birch St

Various general waste types are sent to landfill from nine different facilities.

Port Otago is committed to reducing its waste through recycling, repurposing or reusing items. The majority of recycled items are packaging and scrap metal items, and clothing is repurposed and provided to Cargill Enterprises for use. There is ongoing work into removing items from the organisation to eliminate the requirement for recycling or landfill.

4.2.5 Trends and opportunities – institutional and large commercial waste

All of the large institutional and commercial waste generators studied for this project have implemented recycling into their waste collection services. They have all identified their main waste materials and looked for ways to reduce their disposal to landfill.

Polytechnic staff we interviewed felt there needed to be consistency across the country for plastic recycling.

An opportunity lies in promoting the introduction of standardised kerbside collection services across the region to begin with and providing clear concise guidance as to what can and can't be recycled nationally and within the Otago region. This would help everyone in Otago understand the impact they can make from home or work.

By better understanding what is in their waste and how different materials can be identified and managed, waste producers like the ones identified in this report will be able to manage their waste more efficiently. The SDHB's New Dunedin Hospital, for example, has a unique opportunity to change the way it manages and thinks about waste as it plans the design of the new hospital.

4.3 Pre-Consumer Food Waste

This section looks at ten Otago-based food producers and their waste programmes.

Pre-consumer food waste refers to organic waste materials resulting from the processing of food products.

4.3.1 Harraways Oats

Harraways has been processing oats in Dunedin since 1867.

Harraways processes up to 12,000 tonnes per annum of oats, wheat, barley, rye, and other specialist grains. Up to 8,000 tonnes per annum of finished product are sold into the New Zealand retail and commercial sectors and into export markets.

Based on processing 12,000 tonnes of oats, Harraways generates approximately 3,800 tonnes of organic waste materials per year.

Prior to 2018, Harraways' by-product was sold as stock food. However, during exceptionally good grass-growing years, stock producers would not purchase additional feed. In these years, 87% of this organic waste would go to landfill as neither Harraways nor the stock food manufacturer had space to store the excess product.

In conjunction with large stock food suppliers, Harraways are now able to supply approximately 90% of the oat by-product to stock food manufacturers, compost operators, re-generative farmers, and directly to the public as stock food. For the remaining 10%, since 2010, Harraways has converted its process boilers to use oat by-product as a fuel. Harraways now uses approximately 7.5% of its oat by-product as a biofuel, with the ash being used as fertiliser by local vineyards.

The remaining by-product consists of damaged grain or spillages of between 0.5% -2.5% and is either sold to specific buyers or sent to landfill.

With a high proportion of its organic waste products now being diverted from landfill disposal, Harraways' major waste material is cardboard, paper and soft plastic wrap which is all recycled, and general waste including polypropylene bulk tote bags, and other types of plastic packaging going to landfill.

4.3.2 Kraft Heinz – Cerebos Gregg's Coffee

Kraft Heinz is the third largest food company in North America and the fifth largest in the world. Kraft Heinz purchased Kiwi company Cerebos Gregg's in 2017.

Cerebos Gregg's began operations in 1861, making it one of New Zealand's oldest food companies. The Dunedin North factory has operated on the same site since 1925.

Gregg's in Dunedin North processes green coffee beans into instant coffee powder, resulting in a by-product of wet spent grounds that are transported to a composting facility in Christchurch.

Less simple to divert from landfill is the grit from Gregg's coal boiler. Grit that is not transported to the composting facility in Christchurch is disposed of to landfill in Dunedin.

Another problematic waste material generated by Gregg's is the aluminium foil used in the packaging of the coffee powder. The company is currently seeking an alternative material.

4.3.3 Lion – Speight's Brewery and Emerson's Brewery

Speight's brewery in Dunedin was established in 1876. The brewery is operated by Lion Pty Ltd, an Australasian company owned by Japanese food, beverage and healthcare company Kirin Holdings Co. Ltd.

Speights recycles cardboard and plastic. It also generates general waste which includes malt sacs and the foil bags in which hops are transported; no additional information was provided regarding the material of the malt sacs.

The Emerson's Brewery Company, also owned by Lion, is a craft brewery located in Dunedin. The brewery recycles glass and plastics as well as generating general waste. Emerson's was not able to provide a breakdown of the composition of general waste, nor whether any organic material was included in that figure.

4.3.4 Alliance Group – Pukeuri

The Alliance Group is a farmer co-operative exporting lamb, beef and venison products to more than 65 countries. It operates freezing works at eight sites in New Zealand; one of them, Pukeuri (north of Oamaru), is within the Otago region.

Alliance Group - Pukeuri employs 1,000 staff at peak season and processed 1.1 million lambs, 184,000 sheep, and 71,000 cattle in 2020-2021.

Alliance Group - Pukeuri has introduced several initiatives to minimise the organic waste generated by processing animals for meat. There is an onsite facility for composting faecal material and paunch (stomach contents). Locally sourced bark is used in the composting process.

Due to a slump in the market, one of the largest amounts of organic waste materials was disposed of to landfill in recent years including animal hides, primarily cattle hides. Due to the increasing cost of landfill disposal, Alliance Group - Pukeuri invested in a shredding machine, and shredded hides are now transported to Wormworx in Cromwell.

Alliance Group - Pukeuri has not rendered on site since 2019. Currently, sheep waste is diverted for cat food and beef waste for dog food. Other organic processing wastes are used as fish food by an Indonesian client.

Alliance Group - Pukeuri has a consented cleanfill for the disposal of boiler ash as well as inert materials, such as bricks and concrete.

4.3.5 BX Foods – Oamaru Meats (Previously Lean Meats)

Oamaru Meats is a small-scale abattoir that process sheep (including lamb and goats) and cattle.

Due to the current slump in the hide market, Oamaru Meats was sending skins to landfill. However, the increasing costs of landfill disposal is encouraging it to develop alternative management options.

The abattoir also sends general waste to landfill, including plastic film.

4.3.6 Silver Fern Farms Finegand Plant

Silver Fern Farms Limited (SFF) is owned in equal partnership by Chinese food manufacturing company Shanghai Maling and by Silver Fern Farms Co-op Ltd, a cooperative of New Zealand sheep, cattle and deer farmers.

SFF is New Zealand's largest processor, marketer and exporter of lamb, beef, venison and associated products. The company operates 14 plants in New Zealand and processes 30% of all New Zealand lamb, beef and venison production. The Finegand plant, outside Balclutha, is in the Otago region.

The plant generates general waste including both soft and hard plastics. Plastic waste includes aprons, masks, visitor clothing kits, Weasand clips, animal ear tags, plastic bin/carton liners, scrubber pads, plastic pipe centres, plastic gloves, plastic bags, plastic packaging, and shrink wrap. The weekly amount of general waste increases over summer and decreases over winter, dictated by processing peaks and stock throughput.

In terms of organic waste, market volatility has resulted in some hide and skin by products being disposed of to landfill. SFF reports that alternative options for landfill diversion are being actively investigated, along with management options. Any additional non-edible material from animals is either used for pet food or rendered.

Ash from coal boilers at Finegand is shipped back to the coal mine for disposal (at a significant cost to Finegand). The plant is moving away from coal over the next two years and is investigating technical feasibility for the use of paunch grass (stomach contents) and other organic material as mixed into other biomass fuel sources for additional energy generation.

SFF has adopted a sustainability action plan which includes the following:

- A target of 90% reduction in organic material to landfill by 2024
- A Waste reduction fund to accelerate alternative uses for organic waste in order to avoid landfill
- An across the board 10% reduction in inorganic waste to landfill by 2024
- Additional transparency and baseline measures in place to measure waste to landfill and progress against the target
- Participation in a circularity event and associated actions with x labs in 2022
- Active sustainable procurement and vendor partnerships to support goals for reducing plastic use, innovation in packaging and circularity

4.3.7 Southern Clams

Since 1982 Southern Clams, based in Dunedin, has harvested littleneck clams from the waters of Otago Coast.

The company claims minimal waste is generated through its food processing. All of the clam shells are returned to the harbours or bays where they were harvested. The fish waste generated from emptying freezers once a year is given away as fish bait. This material is landfilled if there is not sufficient demand.

Southern Clams uses a skip for a weekly collection of its general waste, which consists primarily of soft plastics such as gloves, packaging, shrink wrap and Netlon (netting used to hold clams together) as well as general office waste.

4.3.8 Danone Nutricia - Clydevale

Danone Group is a multinational food products corporation founded in Spain and based in Paris. Danone sells products in 120 markets and approximately 50% of sales is from dairy and plant-based products.

All members of the Danone Group must adhere to strict sustainability policies. For example, at least 75% of the milk supply is to comply with its sustainable agricultural practices by 2020. Other policies include reducing packaging at source, turning waste into a resource, and using packaging materials made only from sustainable resources.

Danone Nutricia manufacture infant formula in New Zealand at two locations, Auckland and Clydevale, Otago.

The factory at Clydevale processes milk, all collected from within 130 km of the plant, into powdered infant base formula. The base formula is sent to Auckland to create different infant formula products.

Danone Nutricia reports having no waste materials from its Clydevale plant that are not compostable, recyclable or reusable. Organic waste material is used for stock food. All plastics are separated into plastic type, baled and transported to SdE in Invercargill for recycling. All transport costs are covered by Danone. Other material sent for recycling include polypropylene bulk tote bags per year and aluminium nutrient containers.

Danone Nutricia generates liquid waste that is sent to the onsite wastewater treatment plant (WWTP).

4.3.9 Fonterra - Stirling

Fonterra Co-operative Group Limited is a multinational publicly traded dairy co-operative owned by approximately 10,500 New Zealand farmers. Fonterra has 96 processing plants on 30 manufacturing sites in New Zealand, including Stirling, which is southeast of Balclutha in Otago.

The Stirling plant processes milk to cheese; the cheese is packaged into 20 kg boxes and sent to Dunedin for export.

Whey is separated and delivered to Clandeboye or Edendale as a liquid for further processing into a final product. A portion is also dried for milk powder export.

During the production season, the Stirling plan produces general waste to landfill which includes soft plastic, dirty cheese bags (soft plastic), polystyrene, harder plastics such as sampling containers, label backing, strapping, salt fines, stock food cheese, cardboard, petri dishes, batteries, paper and domestic recycling. There is a target to reduce this figure annually by 30%.

4.3.10 Trends and opportunities – pre-consumer food waste

Across all of the processing operations studied, soft plastics is a key problematic waste material, with the majority of processors sending it to landfill. Small hard plastics, foil packaging materials and contaminated cardboard were also identified as materials of concern.

SdE in Invercargill is currently (December 2021) fundraising to purchase a machine to wash, dry, and shred bale wrap[9]. Once the machine is purchased, SdE will export the shredded plastic to overseas markets. Feedstock for the process will depend on bale wrap and commercial soft plastics from Southland farmers and commercial producers. SdE also takes the polypropylene bulk tote bags.

It is currently not commercially viable for SdE to transport plastics from Otago to its Invercargill plant for processing. Potentially, commercial soft plastics from Otago could be back-loaded to Invercargill, which would reduce the cost of transport.

Some bale wrap, but not commercial soft plastics, is currently collected in Otago by Plasback. Plasback produces a range of plastics products for on-farm use. An opportunity exists to expand Plasback's operations through the collection of commercial soft plastics.

In the North Island, Future Post has developed a process for manufacturing fencing products from domestic and commercial plastic waste. The fence posts are approved for use on organic farms (BioGro certified) and can be re-processed when required. Future Post has spoken publicly about being keen to expand to the South Island but has not received funds applied for through the WMF. An opportunity exists to bring this proven technology to the South Island.

4.4 Horticultural Industry Waste

The Otago region, in particular central Otago, has a strong horticultural and viticultural sector. These sectors might be expected to produce large quantities of wastes, both organic waste and packaging. However, data from landfills in the area do not suggest that large quantities of waste fruit are being sent to landfill.

Several industry organisations were spoken to during this project, including Central Otago Winemakers' Association and the Otago Fruit Growers' Association. Various waste

[9] www.sde.org.nz/page14.html#timeline2-9u

operators also provide some information on management of horticultural/viticultural wastes.

4.4.1 Grape marc

Experiences in other regions had suggested that grape marc (the skins left over after pressing for juice to make wine) may be a potential issue. However, the Regional Council has not noted water quality issues in the region, which would be expected were grape marc being managed poorly.

Anecdotally, waste companies suggest that the vast majority of this material is managed on-property and, while the waste company may provide a service, this is limited to moving the waste material from one part of the site to another.

Viticulture also uses quantities of agricultural chemicals (to a varying degree depending on a growers' particular approach). Enquiries by the Central Otago Winemakers' Association have suggested that most vineyards, and certainly the larger and high-profile ones, make use of services such as Agrecovery to dispose of their agricultural chemical containers.

When it comes to bottling, given the high number of vineyards around the central Otago region, the lack of a recycling pathway for post-consumer glass bottles is of concern, including for the industry from a reputational perspective.

4.4.2 Stone fruit

In the first half of 2021, there were frequent media reports about large quantities of waste fruit resulting from a lack of seasonal workers to pick the fruit when needed. A recent report commissioned by CODC estimated that approximately 15 percent of fruit grown in the region does not make it to market.

The available waste data does not suggest that large quantities of spoiled fruit are being sent to landfill, yet this material also does not appear to be going to off-property processing such as commercial composting or vermicomposting. Anecdotal reports from a number of fruit growers suggests that this waste material is simply being managed on-property.

Once again, there are packaging issues associated with fruit. Firstly, with agrichemical containers and secondly the containers and wrap used to sell fruit, including local sale through orchard shops and roadside stalls. Wherever possible, orchardists should be encouraged to use #1 plastic containers and minimise plastic wrap to ensure the waste impact from this sector is minimised.

4.5 Boiler ash

Within Otago there are a wide variety of boilers, sizes and use. They range from biomass, coal, wood, wood pellet, LPG and one sulphur boiler.

Typically, 0.5% of the wood that goes into wood boilers turns into ash. Wood ash is completely safe for composting or putting directly onto the land.

Approximately 6% of the coal that goes into coal boilers turns into ash. Coal ash can contain contaminants such as mercury, cadmium and arsenic and it is not recommended that coal ash goes directly onto the land or is used in composts that will feed food producing gardens. Often, large operators return their coal ash to the mine (as part of the mine's consent conditions). Our data shows approximately 4,200 tonnes of coal ash per year is returned to the mine as cleanfill (interestingly, four large operators produce 3,957 tonnes per year between them).

However, for smaller operators this is not always feasible to return the coal ash to the mine. Instead, it goes to landfill. At the Balclutha Swimming Pool, one swimming pool boiler produces approximately 55 tonnes of ash per year that is sent to landfill.

Some Otago schools are burning coal and some of them are burying ash on the school grounds to get rid of it. However, this practice will be phased out as the Ministry of Education prioritises 90 schools for replacement of their coal boilers to alternative boiler technologies such as pellet boilers, or other forms of heating.

4.6 Construction and Demolition Waste

Construction and demolition waste includes a wide range of material streams, with the most common waste types being concrete and rubble, timber (treated and untreated), plasterboard and mixed waste.

Construction and demolition is generally defined best by activity source rather than material type. Quantity estimates are presented in Table 13.

There are very few large-scale construction and demolition waste operators in the Otago region. All are located in Dunedin, and focus on aggregate recovery. There are a number of very small-scale recovery operations, particularly in central Otago, but these focus on individual projects and are very much the exception rather than the rule. The decision to make a particular effort to recover construction or demolition waste is usually made due to client needs, such as meeting the criteria for standards such as Green Star, rather than any financial consideration.

There are quite different dynamics in the construction and demolition waste recovery sector for demolition/aggregate waste, and mixed construction waste. Demolition and aggregate waste operators tend to handle high volumes of waste, and outputs are low value per unit but similarly produced in volume. Construction waste operators tend to handle much lower volumes, and the outputs from this sector are more likely to be high quality, high value items such as native timber, joinery and household fittings. It is also common for scrap metal and fibre (paper/cardboard) to be recovered.

An increase in the landfill levy for Class 1 landfills, and the expansion of the landfill levy to Class 2-5 landfills, may make diversion of construction and demolition waste more common as it becomes economically viable. Over 80% of construction companies reported that they expect the costs of waste minimisation and increasing landfill levies to have a negative or neutral impact on their operations over the next three years, while

also rating 'waste minimisation and recycling' as the top priority action to help their operations become more environmentally sustainable[10].

The general feeling of those involved in the construction waste diversion industry is that until disposal costs (to landfill) are higher, the choice to sort at source or to use a construction waste service that incorporates a sorting stage will be purely environmental and the market will be limited.

4.7 Biofuel Feedstock

Organic wastes can be used as feedstocks to generate energy. Feedstocks can come from a wide range of sources including organic waste, plastics, fibre and tyres, as well as construction and demolition wood waste. The largest potential however is from organic wastes generated through forestry, agriculture and horticulture.

Pre- and post-consumer food waste, horticultural waste and construction and demolition wastes are covered in other sections. This section therefore focuses primarily on forestry and crop residues.

4.7.1 Generation

Otago has approximately 104,000 hectares in plantation forestry which represents approximately 5.8% of New Zealand's total exotic forest.

Waste woody biomass which can potentially be used as an energy feedstock comes primarily from:

- Forestry residue - slash, tops and unmerchantable stemwood from trees harvested for saw or pulp logs. Forest residue may include the cutover (those left at the stump) depending on location of harvest, or material brought to the landing during the harvest operations.
- Wood processing residues - bark, sawdust, shavings, offcuts, etc. from processed wood for pulp, panel board, construction timber, furniture, etc. and black liquor from pulp plant residues.
- Straw and stover – the woody stalks and stems from grass and grain crops. While approximately half of this material needs to be left in situ to preserve soil nutrition and health, there is potential for some to be utilised in energy recovery.
- Orchard residues - stumps and old vines. Turnover rates in orchards range from 4% to 12% per annum depending on the crop[11].

[10] Teletrac Navman and Civil Contractors New Zealand (2020) "Construction Industry Survey" available at www.civilcontractors.co.nz

[11] Saggar S., Giltrap D., Forgie V. and Renquist R. (2007). *Bioenergy Options report: Review of Agricultural resources*. Landcare Research Contract Report; LC0708/016

Scion (2017) calculated the potential of biomass feedstocks for energy generation on a regional basis in NZ.[12] The outcomes of its calculations for the Otago region are shown in the table below. The quantities of material shown exclude material that is currently recovered.

Table 25: Estimated Tonnages of Woody Wastes Generated

	In Forest	Orchard	Straw & Stover	Wood Processing	Total
2017 (actual)	233,680	14,748	28,527	23,228	300,183
2022	392,462	15,043	29,098	23,228	459,831
2027	457,848	15,344	29,679	23,228	526,099
2032	271,753	15,651	30,273	23,228	340,905

Source: Scion

In addition, Scion also calculated the quantities of material that could practically be recovered from each of the sources examined. The calculations allow for the need to leave some material in-situ and the difficulty of accessing material. Scion's estimates are shown in the table below:

Table 26: Estimated Tonnages of Woody Wastes Recoverable (low estimate)

	In Forest	Orchard	Straw & Stover	Wood processing	TOTAL	%
2017 (actual)	98,971	9,586	17,116	20,905	146,578	49%
2022	173,466	9,778	17,459	20,905	221,608	48%
2027	195,547	9,973	17,808	20,905	244,233	46%
2032	120,849	10,173	18,164	20,905	170,091	50%

Source: Scion

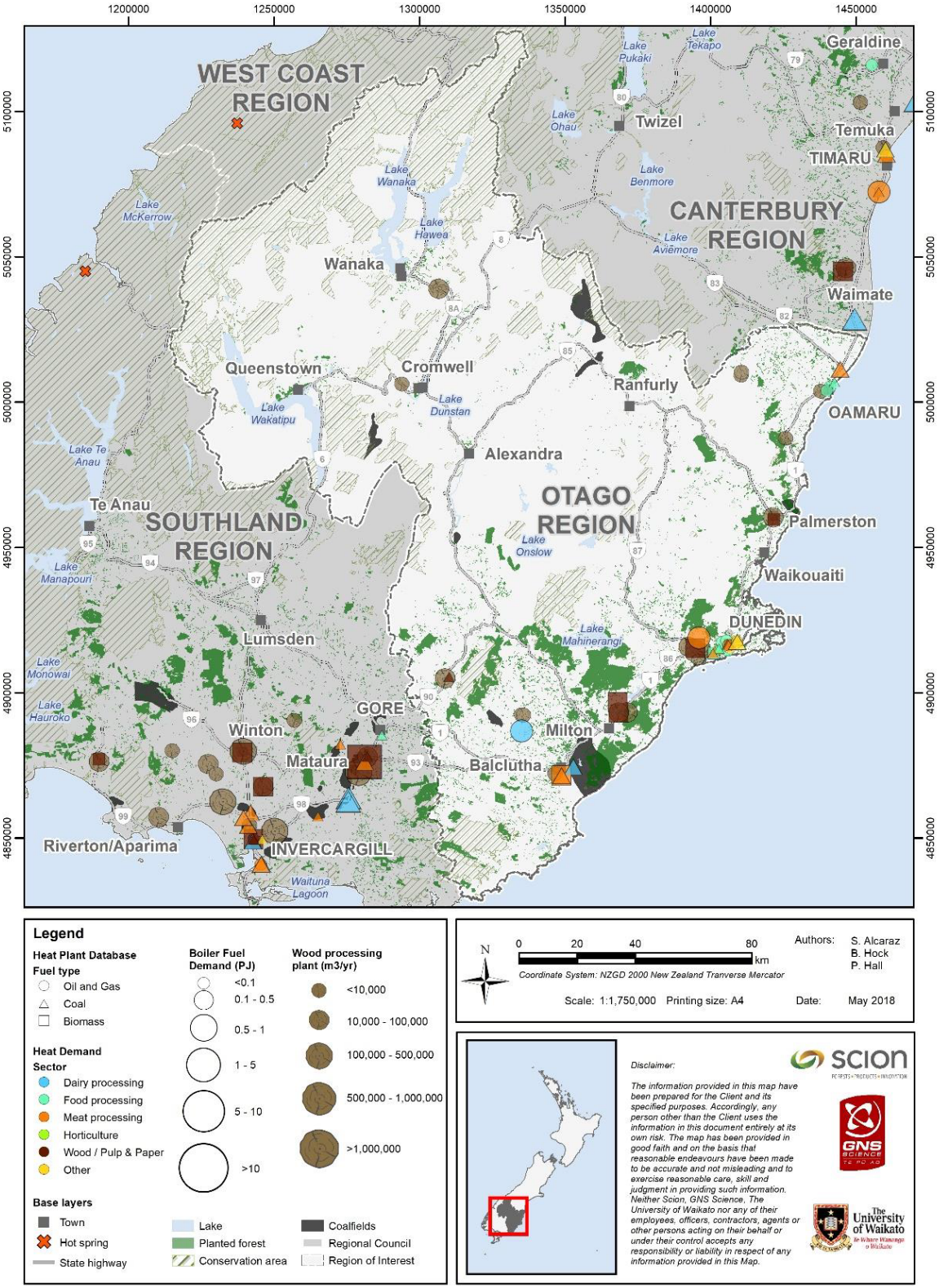
The above estimates suggest that around half of all woody waste are potentially practically recoverable, with the largest potential source being in-forest wastes (in

[12] Scion (2017) Residual biomass fuel projections for New Zealand - indicative availability by region and source. Report to BANZ / EECA

particular ‘cutover’ wastes which are the large branches left behind while harvesting timber).

The material is relatively unevenly distributed around the region with the majority of forestry in the Southern part of the region, and orchard residues in Central Otago.

The map below (Source: Scion) shows the distribution of forestry alongside existing facilities that could utilise recovered biomass for process heat.



4.7.2 Management

There are several sawmills in Otago including:

- Pan Pac, Milburn[13];
- Stuart Timber, Tapanui, West Otago[14];
- North Otago Sawmilling, Oamaru;
- Valley Lumber, Dunedin;
- Timber Direct, Dunedin; and
- Otago Lumber Company, Mosgiel.

The Daiken MDF plant in Mataura (Southland) utilises forestry waste, as well as the waste wood, bark, chips, branches, side parts, and sawdust from sawmills in Otago and Southland. Some sawmill and forestry waste not utilised in the Daiken plant is sold as firewood or is used in process heat. The quantities utilised by Daiken were not available at the time of writing.

In Otago, one million tonnes of low-grade logs are exported annually to China where they are used for concrete forming (boxing) then they are used as fuel in biomass boilers in China.

The bioenergy association database lists 36 suppliers and users of bioenergy in Otago. A breakdown of these is provided in the table below.

Table 27: Energy Recovery Facilities by Type

Facility Type	Count
Biogas	2
Electricity	0
Emerging technologies	2
Commercial heat	13
Industrial heat	1
Landfill gas	0
Liquid biofuel suppliers	1

[13] https://www.panpac.co.nz/Lumber.html. produces around 100,000 m3 per annum of green sawn output. Focused on the processing of small diameter sawlogs. Utility quality corewood is sold green sawn and the outerwood is kiln dried. Solid waste, including bark, sawdust, shavings from the planer mill, and effluent solids, is burnt in the site boilers to provide energy for drying lumber and wood pulp.
[14] https://www.stuarttimber.co.nz/

Facility Type	Count
Liquid biofuel users	0
Sawmill boilers	1
School boilers	13
Solid biofuel manufacturer	3
WTTP gas	0
TOTAL	**36**

Source: https://www.bioenergyfacilities.org/bioenergy-facility-list

Crop residues are generally not harvested for further use but are left in situ. Most of the biomass currently used as fuel is from sawmilling operations.

4.7.3 Trends and Drivers

Wood biomass, primarily from forestry slash and, to a lesser extent, sawmill by-products is the most commonly used biofuel in New Zealand. Despite this, industry sources suggest that New Zealand is behind in realising its potential. Pioneer Energy, who are a key player in this space, estimate that we are achieving about 20%-25% of the biomass energy potential so far. They report that there are tenders currently out for projects which will bring this figure to about 28%, and that other bigger projects in the pipeline (such as dairy factory conversions) could take this as high as 50% -60%. At this stage, however, industry sources suggest that a lack of local supply issues could start to make switching to wood biomass boilers uneconomic. There is a need to match capacity with viable supply, and forestry wastes are driven by regional factors and market conditions.

The 'Wood Energy Industrial Symbiosis' project[15] undertaken by Scion identifies wood processing clusters in regions with significant forestry resources co-located with other industries can make the best use of wood and energy supply and demand. Otago and Southland are regions of potential identified by the initiative.

The study identifies potential to expand wood processing with an integrated heat supply based on unused logs. Excess heat could also be provided to dairy factories and freezing works at several locations in the wider area. A processing cluster near Balclutha consisting of a sawmill providing feedstock for cross-laminated timber (CLT) and remanufacturing, plus an OEL™ plant would provide enough processing residues to

[15] Scion wood energy industrial symbiosis. From: https://www.scionresearch.com/science/bioenergy/towards-biorefining

replace coal at either the Stirling dairy plant or the Finegand meat works. Alternatively, the processing residues, together with forest and other biomass residues, could replace LPG as an energy source at the Clydevale dairy plant.

The Bioenergy Association, which promotes bioenergy uptake, notes that the use of some waste materials as feedstocks is restricted by regional air plan rules. These reportedly tend to place restrictions on the materials that can be used in boilers including some painted or treated timbers, rather than taking full account of the technical capability of boilers to combust that material while maintaining safe emission limits.[16] In its view, a more consistent national approach that takes better account of technical capabilities could result in greater utilisation of waste timbers. They also note that they would like to see standards for the production of wood pellets to ensure greater consistency and consumer confidence.

The announcement by Government in 2021 to phase out use of fossil fuels for process heat by 2037, and to transition all government owned heating facilities to using low emission fuels (biomass or electricity) by 2030 will provide a strong incentive for investment in biomass-fuelled plants. The timelines around the phase out mean that, in effect, any new plant installed from this point would likely to need to burn biomass to comply with the requirements.

4.8 Other Waste Streams

4.8.1 Tyres

4.8.1.1 National Situation

Historically the majority of New Zealand's end-of-life tyres (ELTs) have been landfilled (approximately 52,000 tonnes a year), stockpiled or illegally dumped (around 3,000 tonnes a year). ELTs are accepted at some (but not all) transfer stations and landfills (refer the landfill and transfer station section[s]). Roughly 35% of tyres have been repurposed or recycled. Repurposing of tyres mainly occurs on farms, where (whole or quartered) tyres are used to line pits and hold down silage. Tyres are also repurposed for temporary roading and erosion control. Tyre-derived medium (TDM) is used as an aggregate in roading, or as turf and matting. New Zealand also has tyre-derived fuel (TDF) capacity, as a facility in Northland (Golden Bay Cement) will be able to use up to 3.1 million tyres a year (about half of NZ's total annual tyre numbers) as a fuel source for the cement works. This is expected to significantly increase the quantities recovered. Some tyres are exported, either baled or shredded.

4.8.1.2 Otago Situation

There is very limited information on what happens to tyres locally. If national data is pro-rated on a per capita basis this implies there are an estimated 3,988 tonnes of ELT

[16] Personal communication, Brian Cox, Bioenergy Association

generated in Otago, annually. Currently there are no facilities to process these tyres in Otago. In Dunedin and Queenstown, tyres collected for processing are sent to Christchurch, where it is understood they are baled for export to India.

4.8.1.3 National Environmental Standard (NES) for Tyres[17]

From 20 August 2021, a new NES for storing tyres outdoors (enabled under sections 43-44 and 46A of the RMA) came into force. The NES deals with the effects of storing tyres outdoors that fall within the functions of regional councils under section 30 of the RMA. This is related to water quality, control of discharges of contaminants into land, air or water, and the mitigation of natural hazards. The NES sets certain thresholds for action:

- storing amounts under 20m3 is a permitted activity;
- storing amounts between 20m3 and 100m3 is permitted but with general conditions around the height and proximity to 'sensitive' areas (e.g. waterways, powerlines); and
- storing amounts over 100m is a regulated discretionary activity, and this will require a resource consent.

4.8.1.4 Product Stewardship

Tyres were declared a priority product in 2020. A proposed product stewardship scheme 'Tyrewise' has been accredited by the Minister for the Environment, and is currently in the process of establishment and awaiting enabling regulations. The Tyrewise scheme would impose a per tyre fee on import which would cover the end-of-life costs of collection, sorting, transport, processing and recovery. Establishing the Tyrewise scheme is expected to substantially resolve the current ELT issues.

4.8.2 Farm Plastics

Farm plastics and agrichemical containers are associated with almost all farming activities and include the packaging of products such as fertiliser, animal feed, wrapping material (hay and bailage/silage), various chemicals and veterinarian products. This material stream stands out due to its sheer size that arises over the entire region, and the fact that its disposal is mainly unregulated and likely to bypass formal collection systems. Available but incomplete data shows that less than 30% of material that is accepted through product stewardship schemes is recovered.

There are three organisations running voluntary accredited product stewardship schemes addressing silage wrap and agrichemical container waste streams: Plasback, Agrecovery and ChemCollect. Whereas Plasback and Agrecovery just deal with farm waste, ChemCollect also serves other markets.

[17] https://environment.govt.nz/acts-and-regulations/regulations/nes-storing-tyres-outdoors/

Plasback collects clean and packed silage wrap from farms, and stores these at regional hubs where material is compacted and condensed with balers and stored for transport and export.

ChemCollect collects chemicals, sprays, solvents, unknown liquids and powders and other hazardous materials. The nearest ChemCollect facility is in Canterbury. Collection services are available, although acceptance criteria can vary.

Agrecovery has developed (with WMF funding) a proposal for mandatory product schemes addressing farm plastics[18]. Silage/baleage wrap collected from farms is transported to a baler, where it will again be stored until a container is filled up. Since there are less balers than regional collection points, cross boundary movements occur. All the collected silage wrap is exported, mainly to Malaysia.

Small amounts of (clean) agrichemical containers can be dropped off at regional locations; or direct pickup can be arranged for larger quantities which are transported to the processing facility in Christchurch. Depending on the material type and additional processing needed, disposal occurs at a Class 1 landfill.

The vast majority (90%) of agrichemical containers are disposed to landfill; 2% of which are shipped to Europe due to the need to for a higher standard of landfill. The remaining 10% of containers is recycled by Astron in Auckland.

All operators acknowledge they are only capturing a fraction of the existing material streams. There is considerable uncertainty over the quantities of materials not being captured. Stakeholder estimates were that they are capturing less than 45%.

Farm plastics and agrichemicals are a part of farm operations. The fact that less than 50% is collected for recycling or safe disposal raises questions about how the remaining material is being disposed of.

Anecdotal information suggests that farms that do return and recycle their materials do so because:

- they want to do the “right thing”;
- they do so as a requirement of an accreditation scheme for commercial contracts (e.g., Fonterra and Synlait);
- there is a subsidised take back scheme through a local or regional council; or
- requirements to decontaminate the land upon sale or transfer of farm.

This is not an exhaustive list, as farmers have not been interviewed for this project.

Prior research showed that economic levers such as the accreditation schemes tied to commercial contracts stimulate farms to increase sustainable behaviour and practices.

[18] For example: Agrecovery’s project to process farm plastics: https://www.agrecovery.co.nz/wp-content/uploads/2020/09/Farm-Plastics-Materials-Flow-Analysis-web.pdf

These efforts are often supported by tools calculating GHG emissions (e.g., Overseer and Toitū)[19,20].

There may be mechanisms such as including waste management aspects in accreditation schemes and tools that could be used to improve data, and address waste issues, on farms.

Nationally there are 4,626 tonnes of farm plastics collected; made up of 4,067 tonnes of silage wrap and 559 tonnes of chemical containers. The quantities for Otago are show in the table below, alongside an estimate of the uncollected quantities.

Table 28: Otago Region Farm Plastics Collected and Uncollected (Estimates)

	Collected (tonnes per annum)	Uncollected (tonnes per annum)
Silage wrap	470	705 – 776
Agrichemical containers	25	38 – 64
Total	**495**	**743 – 840**

***based on National Resource Recovery Infrastructure and Services Stocktake and Gap Analysis (2021) Prepared for MfE, Eunomia**

The Office of the Prime Minister's Chief Science Advisor[21] estimates an annual usage of 0.25 tonnes of silage/baleage wrap, and ~0.04 tonnes of containers and drums per farm[22]. The Otago region counts 3,291 farms[23], which would equate to 823 tonnes of silage/baleage wrap and 132 tonnes of agrichemical containers, resulting in slightly lower estimates than provided in the table above by the service providers.

However, neither estimate takes into account legacy plastics on farms, nor farm plastics not covered by existing product stewardship schemes; for example, polypropylene feed and fertiliser bags, nets and twine.

[19] https://www.overseer.org.nz
[20] https://www.toitu.co.nz/what-we-offer/farm-certification
[21] Rethinking Plastics in Aotearoa New Zealand, 2019, Office of the Prime Minister's Chief Science Advisor
[22] https://www.pmcsa.ac.nz/2019/11/05/agricultural-plastic-waste/
[23] NZ Stat, Dataset: Geographic units by Industry and statistical area 2000-20, extracted on 1 July 2021

5.0

Issues and Opportunities

5.0 Issues and Opportunities

Investigations to date have revealed a range of opportunities to improve waste management and ultimately reduce waste in Otago. This section outlines these opportunities, first setting out the issue and then presenting high level options to address them as a region.

A cross-cutting theme is way the region splits into two parts: a coastal zone consisting of Waitaki, Dunedin and Clutha, and an inland zone with Central Otago and Queenstown Lakes. The synergies that exist are mainly within these zones. Queenstown Lakes, Central Otago and Clutha also have more natural transport connections with Southland than with Dunedin/Waitaki. These are important considerations for each of the discussions that follow.

5.1 Reprocessing Infrastructure

Issues: Several previous sections have highlighted the sheer distance from the Otago region to several key reprocessing facilities. For example, fibre, glass and soft plastics reprocessing options are almost completely located in Auckland. Other key reprocessing facilities are in other parts of the North Island, such as PET and PP recycling in Wellington and the Hawkes Bay. While these materials are often transported a long distance for reprocessing, the Otago region is one of the furthest from these facilities (along with Westland and Southland).

At present, there is almost a complete lack of reprocessing facilities for organic waste and construction and demolition waste – these are waste streams that do not lend themselves to being transported long distances.

The nearest shredders for metal recovery, and the only ones located in the South Island, are in Christchurch (although there is a logistics hub in Dunedin associated with one of those shredders).

Options: As a region, the councils may be able to lobby for better infrastructure provision in the lower South Island; particularly in partnership with Southland. If infrastructure can be located in the Otago region, there is potential for other regions that suffer from the same geographical issues as the Otago councils to become customers. For example, there is currently high demand for on-shore processing of #5 or PP plastics. This type of plastic has been included in the government's recent proposals to standardise kerbside recycling, and government funding has been allocated elsewhere for PP reprocessing facilities.

Distance to reprocessing could make reusables schemes more feasible in comparison. Active viticulture and brewing industries (in central Otago and Dunedin respectively) may be interested in the benefits of a refillable approach for local customers.

5.2 Organics

Issues: Organic waste was the predominant waste stream to emerge from the analysis to date in terms of both current tonnage to disposal, and in terms of a focus for action. Kerbside food waste is the largest single source of organic waste to landfill and has been targeted for action by both Dunedin and Queenstown Lakes. Biosolids is also a significant waste stream. Organic waste from commercial and industrial sources was found to be generally well managed but there are some exceptions such as animal skins and ash.

Options. There are a wide range of potential options for processing organic wastes. The most problematic organic wastes are putrescible materials with a high moisture content. These are likely to lend themselves to processing technologies, such as anaerobic digestion or vermicomposting, that do not require large quantities of carbon-rich feedstocks or 'bulking agents' to work.

There are a number of companies investigating the potential to establish operations in (or servicing) the region, and consequently it may be possible to leverage and coordinate these opportunities to achieve outcomes that align with the needs of the councils of the Otago region and beyond.

5.3 Construction and Demolition Waste

Issues: Construction and demolition waste is an issue in Queenstown Lakes, Central Otago and Dunedin. While some recovery is occurring, most construction and demolition waste appears to be sent to some form of landfill disposal. There are likely to be opportunities to divert significant quantities of material.

Options: Dunedin is planning to take measures to develop construction and demolition waste sorting and diversion. However, there are no significant planned activities in Queenstown Lakes and Central Otago. There may be opportunities to develop a consistent approach to construction and demolition sorting and diversion in the region. While sub-regional facilities may be most sensible there is potential to align standards, material acceptance, access and markets. It may also be possible to access central government funding to assist in the development of facilities.

5.4 Recovery (MRF) Infrastructure

Issues: Recycling processing infrastructure in Otago is currently problematic. As noted in the QLDC section, the Queenstown MRF is overdue for replacement, and there are issues with recovery of glass – particularly from Queenstown and Central Otago – which means some of this material is currently being sent to low value applications. In addition, the Dunedin MRF is due for an upgrade, which is expected to be included as part of the new council contracts due to commence in mid-2023.

Options: There may be potential to explore consistent provision of MRF infrastructure across the region (although this would have to be in the context of existing contract arrangements). This could take the form of a single provider, a single facility or greater alignment in terms of standards, material acceptance, access and markets.

5.5 Resource Recovery Parks

Issues: Most of the TAs of the Otago region expressed an intent to develop some form of resource recovery park. QLDC has identified a site near Queenstown that could potentially accommodate a full resource recovery park, new MRF, and small composting operation (termed a Resource Recovery Hub). It is currently exploring the consenting and site requirements. Dunedin is looking to expand the operations at Green Island to become a resource recovery park, including construction and demolition waste sorting Clutha DC are looking to develop a RRP on its Mt Cooee Landfill site; and Waitaki DC has noted the lack of local construction and demolition sorting, composting and MRF infrastructure.

Options: There is opportunity to coordinate and align RRP service provision to develop a high level of consistent service. Done well, developing a regional resource recovery network has the potential to catalyse a range of resource recovery activity. A network approach can enable product stewardship schemes to function effectively and efficiently; ensure consistency of service provision and messaging, which will help increase engagement and recovery rates; and potentially lower costs for recovery of a wider range of materials. It may also be possible to access central government funding to assist in the development of facilities.

5.6 Rural Waste

Issues: Nationally, rural wastes are estimated to account for up to 12% of unrecovered waste.[24] When discussing rural waste during interviews with the TAs, it became apparent that there is very little information available and no substantive intent in any of the WMMPs to address rural waste. Rural waste is highlighted here for this reason: it is an area that has not to date received the attention it most likely needs. Rural wastes are most commonly managed on-farm with material stockpiled, burned and buried. There are very few controls on what happens on farms, and much of the material which is currently managed casually could be recycled or recovered, or properly disposed of.

Further to this, the information from the Ernst & Young study on regional carbon emissions suggests that rural wastes may be a substantial source of emissions from the waste sector (although it is our view that this requires further investigation).

The key issue is that current management methods are essentially no-cost and relatively convenient for farmers. Services that collect non-natural materials for recovery or proper disposal are likely to be costly due to the distances involved and remoteness from processing and consolidation points.

[24] Ministry for the Environment. 2019. *Reducing waste: a more effective landfill levy – consultation document*. Wellington: Ministry for the Environment.

Current product stewardship programmes such as Agrecovery and Plasback apply charges to farmers who participate in the schemes.

Options: There have been a number of trials of farm waste collection services, and limited services occur in some areas (including Clutha District). In addition, there are steps being taken to develop regulated product stewardship schemes for farm plastics and agricultural chemicals and their containers, which will provide a more comprehensive approach with (potentially) no direct charges to the end-user at end of life. There is an opportunity to leverage these initiatives to create an on-farm collection service for non-natural rural wastes that offers a high-quality collection service at below cost.

5.7 Landfills

Issues: The landfill market is an important aspect of the picture. AB Lime recently received consent for receiving unlimited tonnage into its facility (although the facility footprint won't change); DCC is proceeding with plans to develop a landfill at Smooth Hill as a replacement for the Green Island landfill (although the scale of this may be smaller than initially announced); Clutha DC is pursuing a 30-year renewal of the resource consent for a landfill at Mt Cooee, with the existing consent due to expire during 2023; Waitaki DC is looking at options for Palmerston landfill, with a potential view to utilising more of the airspace at the facility before the consents expire. In addition, private operators are likely to consider options for disposal and send tonnages where it is going to be most cost effective. With the increase in the waste disposal levy and the increasing cost of carbon emissions through the ETS this is likely to change the current dynamic of where and how waste is disposed of.

Options: There is a range of possible options to consolidate disposal in the region. This could include a regional decision to focus on just two Class 1 facilities in the region (along with the option of AB Lime in Southland); with other facilities (such as in Waitaki and Clutha) being converted to Class 2 fills with organic waste diverted, and any non-compliant material transported to a Class 1 facility.

5.8 Soft Plastics

Issues: Although household soft plastics has not been identified as a significant issue, many of the non-household waste producers across the region mentioned that soft plastic-based waste items were one of the remaining waste management issues they had yet to solve. Although soft plastics are not a significant issue in landfill, either by weight or by environmental impact such as GHG emissions or leachate, the production of soft plastics does have an environmental impact and soft plastics escaping to the open environment is a significant wildlife risk.

Options: There are two organisations currently working proactively on soft plastics nationally and regionally. Future Post is an organisation focused largely on household soft plastics recovery to produce items such as vineyard posts, although it does incorporate pre-consumer feedstock in the process and other specific items such as

Fonterra HDPE milk bottles. Production is currently based in the North Island but Future Post is actively seeking a South Island location.

There are currently very few household soft plastics collection points in the lower South Island (usually located in supermarkets), largely due to the high cost of transporting collected plastics to the North Island.

The Otago region could proactively liaise with Future Post to explore the potential for a South Island processing site to be located in the region, which would naturally lead to a network of collection points.

SdE is also working on increasing processing capacity for soft plastics, although its focus is on industrial plastic sources. Once again, the Otago region could proactively work with SdE to ensure that Otago soft plastic waste streams are able to be incorporated in infrastructure capacity as far as is possible

A.1.0 Composition of General and Overall Waste to Class 1 Landfills

Composition of waste to Class 1 landfills - Tonnes/annum - 2020		General waste - excludes kerbside rubbish and special wastes		Overall waste - includes kerbside rubbish and special wastes	
Paper	Recyclable	5.4%	4,058	5.2%	7,407
	Cardboard	6.6%	4,985	3.7%	5,357
	Non-recyclable	1.8%	1,332	1.4%	2,022
	Subtotal	**13.8%**	**10,375**	**10.3%**	**14,787**
Plastics	Recyclable	0.9%	648	1.2%	1,756
	Non-recyclable	17.8%	13,363	11.9%	17,133
	Subtotal	**18.6%**	**14,011**	**13.2%**	**18,889**
Organics	Kitchen waste	4.6%	3,487	14.1%	20,314
	Compostable green waste	5.3%	3,983	8.8%	12,667
	Non-compostable green.	1.7%	1,273	1.6%	2,237
	Organics other	4.8%	3,639	3.8%	5,405
	Subtotal	**16.5%**	**12,381**	**28.3%**	**40,624**
Ferrous	Primarily ferrous	1.4%	1,021	1.0%	1,394
	Steel other	2.1%	1,562	1.5%	2,175
	Subtotal	**3.4%**	**2,582**	**2.5%**	**3,570**
Non-ferrous	**Subtotal**	**0.5%**	**404**	**0.6%**	**831**
Glass	Recyclable	0.9%	652	1.9%	2,661
	Glass other	1.1%	842	0.8%	1,161
	Subtotal	2.0%	1,495	2.7%	3,822
Textiles	Clothing/textiles	2.6%	1,973	2.2%	3,180
	Other textiles	5.0%	3,750	3.2%	4,543
	Subtotal	**7.6%**	**5,722**	**5.4%**	**7,724**
Sanitary paper	**Subtotal**	**3.0%**	**2,275**	**4.6%**	**6,614**
Rubble	Cleanfill	3.6%	2,714	1.9%	2,714
	New plasterboard	0.1%	84	0.1%	84
	Other	7.6%	5,720	5.3%	7,539
	Subtotal	**11.3%**	**8,518**	**7.2%**	**10,337**
Timber	Reusable	0.6%	441	0.3%	441
	Unpainted & untreated	2.9%	2,166	1.5%	2,166
	Non-recoverable	16.6%	12,495	9.4%	13,461
	Subtotal	**20.1%**	**15,101**	**11.2%**	**16,067**
Rubber	**Subtotal**	**1.6%**	**1,200**	**0.9%**	**1,356**
Potentially hazardous	**Subtotal**	**1.5%**	**1,121**	**13.2%**	**18,943**
TOTAL		**100.0%**	**75,185**	**100.0%**	**143,564**

A.2.0 Waste to Class 1 Landfills - By Activity Source - By % of Total

Composition of waste to Class 1 landfills - by activity source - By % of weight - 2020		Construction demolition	Industrial/ commercial/ institutional	Landscaping	Residential
Paper	Recyclable	0.1%	7.4%	0.0%	2.5%
	Cardboard	2.1%	8.6%	0.2%	5.6%
	Non-recyclable	0.3%	2.2%	0.0%	0.3%
	Subtotal	**2.6%**	**18.2%**	**0.3%**	**8.4%**
Plastics	Recyclable	0.1%	1.2%	0.0%	0.8%
	Non-recyclable	2.5%	23.3%	0.7%	6.9%
	Subtotal	**2.6%**	**24.6%**	**0.7%**	**7.7%**
Organics	Kitchen waste	0.0%	6.2%	0.1%	2.2%
	Compostable green waste	0.8%	2.2%	46.4%	9.0%
	Non-compostable green.	0.1%	0.7%	33.6%	1.1%
	Organics other	0.1%	5.9%	0.0%	0.1%
	Subtotal	**1.0%**	**15.0%**	**80.2%**	**12.4%**
Ferrous	Primarily ferrous	1.9%	1.2%	0.0%	3.2%
	Steel other	0.4%	1.7%	0.0%	8.0%
	Subtotal	**2.2%**	**2.9%**	**0.0%**	**11.2%**
Non-ferrous	**Subtotal**	**0.1%**	**0.6%**	**0.0%**	**0.8%**
Glass	Recyclable	0.0%	1.3%	0.0%	0.4%
	Glass other	0.4%	1.2%	0.0%	1.7%
	Subtotal	**0.4%**	**2.5%**	**0.0%**	**2.1%**
Textiles	Clothing/textiles	0.1%	3.1%	0.0%	2.7%
	Other textiles	2.2%	4.7%	0.2%	14.4%
	Subtotal	**2.3%**	**7.8%**	**0.2%**	**17.0%**
Sanitary paper	**Subtotal**	**0.0%**	**4.3%**	**0.0%**	**0.7%**
Rubble	Cleanfill	10.3%	0.3%	17.2%	0.6%
	New plasterboard	8.6%	0.0%	0.0%	0.2%
	Other	16.5%	5.7%	0.1%	2.2%
	Subtotal	**35.4%**	**6.0%**	**17.3%**	**2.9%**
Timber	Reusable	3.9%	0.4%	0.1%	0.9%
	Unpainted & untreated	7.0%	2.5%	0.2%	3.0%
	Non-recoverable	40.8%	11.5%	1.0%	31.8%
	Subtotal	**51.7%**	**14.5%**	**1.3%**	**35.7%**
Rubber	**Subtotal**	**1.0%**	**2.1%**	**0.0%**	**0.6%**
Potentially hazardous	**Subtotal**	**0.7%**	**1.6%**	**0.0%**	**0.4%**
TOTAL		**100.0%**	**100.0%**	**100.0%**	**100.0%**

A.3.0 General Waste to Class 1 Landfills - By Activity Source - By % of Total

Composition of waste to Class 1 landfills - by activity source - Tonnes/annum - 2020		Construction demolition	Industrial/ commercial/ institutional	Landscaping	Residential
Paper	Recyclable	32	2,891	1	190
	Cardboard	560	3,374	6	415
	Non-recyclable	90	851	1	24
	Subtotal	**682**	**7,117**	**8**	**629**
Plastics	Recyclable	23	477	0	58
	Non-recyclable	664	9,118	19	518
	Subtotal	**687**	**9,595**	**19**	**575**
Organics	Kitchen waste	0	2,418	3	164
	Compostable green waste	213	866	1,193	672
	Non-compostable green.	29	280	863	81
	Organics other	17	2,298	0	7
	Subtotal	**260**	**5,862**	**2,060**	**924**
Ferrous	Primarily ferrous	484	456	0	240
	Steel other	96	681	0	600
	Subtotal	**580**	**1,137**	**0**	**840**
Non-ferrous	**Subtotal**	**37**	**248**	**0**	**60**
Glass	Recyclable	3	491	0	29
	Glass other	108	484	0	126
	Subtotal	**111**	**974**	**0**	**155**
Textiles	Clothing/textiles	28	1,207	0	199
	Other textiles	563	1,839	4	1,076
	Subtotal	**591**	**3,046**	**4**	**1,275**
Sanitary paper	**Subtotal**	**0**	**1,686**	**1**	**49**
Rubble	Cleanfill	2,685	128	443	44
	New plasterboard	2,244	0	0	13
	Other	4,289	2,211	2	164
	Subtotal	**9,217**	**2,339**	**444**	**220**
Timber	Reusable	1,025	170	3	66
	Unpainted & untreated	1,817	984	4	228
	Non-recoverable	10,619	4,500	25	2,378
	Subtotal	**13,461**	**5,655**	**32**	**2,672**
Rubber	**Subtotal**	**258**	**805**	**0**	**48**
Potentially hazardous	**Subtotal**	**171**	**618**	**0**	**31**
TOTAL		**26,056**	**39,082**	**2,569**	**7,478**

A.4.0 General Waste to Class 1 Landfill – By Activity Source – By Tonnes

Composition of general waste to Class 1 landfills - by activity source - Tonnes/annum - 2020		Construction demolition	Industrial/ commercial/ institutional	Landscaping	Residential
Paper	Recyclable	32	2,891	1	190
	Cardboard	560	3,374	6	415
	Non-recyclable	90	851	1	24
	Subtotal	**682**	**7,117**	**8**	**629**
Plastics	Recyclable	23	477	0	58
	Non-recyclable	664	9,118	19	518
	Subtotal	**687**	**9,595**	**19**	**575**
Organics	Kitchen waste	0	2,418	3	164
	Compostable greenwaste	213	866	1,193	672
	Non-compostable green.	29	280	863	81
	Organics other	17	2,298	0	7
	Subtotal	**260**	**5,862**	**2,060**	**924**
Ferrous	Primarily ferrous	484	456	0	240
	Steel other	96	681	0	600
	Subtotal	580	**1,137**	**0**	**840**
Non-ferrous	**Subtotal**	37	**248**	**0**	**60**
Glass	Recyclable	3	491	0	29
	Glass other	108	484	0	126
	Subtotal	**111**	**974**	**0**	**155**
Textiles	Clothing/textiles	28	1,207	0	199
	Other textiles	563	1,839	4	1,076
	Subtotal	**591**	**3,046**	**4**	**1,275**
Sanitary paper	**Subtotal**	**0**	**1,686**	**1**	**49**
Rubble	Cleanfill	2,685	128	443	44
	New plasterboard	2,244	0	0	13
	Other	4,289	2,211	2	164
	Subtotal	**9,217**	**2,339**	**444**	**220**
Timber	Reusable	1,025	170	3	66
	Unpainted & untreated	1,817	984	4	228
	Non-recoverable	10,619	4,500	25	2,378
	Subtotal	**13,461**	**5,655**	**32**	**2,672**
Rubber	**Subtotal**	**258**	**805**	**0**	**48**
Potentially hazardous	**Subtotal**	**171**	**618**	**0**	**31**
TOTAL		**26,056**	**39,082**	**2,569**	**7,478**

A.5.0 Composition of Kerbside Rubbish

Composition of kerbside rubbish from Otago Region - 2020		Tonnes per annum	% of total
Paper	Recyclable	7.3%	3,721
	Non-recyclable	1.4%	690
	Subtotal	**8.6%**	**4,411**
Plastic	#1-7 containers	2.2%	1,108
	Plastic bags/film	4.4%	2,251
	Other non-recyclable	3.0%	1,519
	Subtotal	**9.5%**	**4,878**
Organics	Kitchen waste	32.9%	16,827
	Green waste	18.9%	9,649
	Other organic	3.5%	1,767
	Subtotal	**55.3%**	**28,243**
Ferrous	Steel cans	0.7%	373
	Other ferrous	1.2%	614
	Subtotal	**1.9%**	**987**
Non-ferrous	Aluminium cans	0.3%	165
	Other non-ferrous	0.5%	262
	Subtotal	**0.8%**	**427**
Glass	Glass bottles & jars	3.9%	2,009
	Non-recyclable	0.6%	319
	Subtotal	**4.6%**	**2,327**
Textiles	Clothing/textiles	2.4%	1,208
	Multimaterial/other	1.6%	794
	Subtotal	**3.9%**	**2,002**
Sanitary paper	**Subtotal**	**8.5%**	**4,339**
Rubble	**Subtotal**	**3.6%**	**1,819**
Timber	**Subtotal**	**1.9%**	**966**
Rubber	**Subtotal**	**0.3%**	**156**
Potentially hazardous	**Subtotal**	**1.1%**	**556**
TOTAL		**100.0%**	**51,112**

A.6.0 Activity Source Definitions

ACTIVITY SOURCE	Generally, the type of activity that generates the waste being recorded. The Activity Sources for use in National Waste Data Framework are listed below and defined in the following rows: • Domestic Kerbside • Residential • ICI • Landscape • C&D • Special • VENM
Construction and Demolition (C&D)	Waste produced directly or incidentally by the construction and demolition industries. This includes building materials such as insulation, nails, plasterboard and timber, roofing materials, as well as waste originating from site preparation, such as dredging materials, tree stumps, and rubble.
Domestic Kerbside	Domestic-type waste collected from residential premises by the local council (or by a contractor on behalf of the council), or by private waste collections (through kerbside or similar collection).
Industrial/commercial/ institutional (ICI)	Waste from industrial, commercial and institutional sources (ie supermarkets, shops, schools, hospitals, offices). For the purposes of these protocols Illegal dumping and litter should be classified under ICI
Landscaping	Waste from landscaping activity and garden maintenance (including public gardens), both domestic and commercial, as well as from earthworks activity, unless the waste contains only VENM, or unless the earthworks are for purposes of construction or demolition of a structure.
Residential	All waste originating from residential premises, other than that covered by any of the other Activity Source categories. For example, a person arriving with a trailer

	load after cleaning out the garage would classify as residential waste.
Special	Waste that fits into significant, identifiable waste streams, usually from a single generator. Special wastes are those that cause particular management and/or disposal problems and need special care. This includes, but is not restricted, to hazardous and medical wastes (including e-wastes). It also includes any substantial waste stream (such as biosolids, infrastructure fill or industrial waste) that significantly affects the overall composition of the waste stream, and may be markedly different from waste streams at other disposal facilities.
Virgin Excavated Natural Material (VENM)	Material that when discharged to the environment will not have a detectable effect relative to the background and comprising virgin excavated natural materials, such as clay, soil, and rock that are free of: • manufactured materials such as concrete and brick, even though these may be inert •combustible, putrescible, degradable, or leachable components • hazardous substances or materials (such as municipal solid waste) likely to create leachate by means of biological breakdown; • any products or materials derived from hazardous waste treatment, stabilisation or disposal practices; • materials such as medical and veterinary waste, asbestos, or radioactive substances that may present a risk to human health if excavated; • contaminated soil and other contaminated materials; • liquid waste.