

Glass Mountains: Options for Glass Recycling in Otago



Prepared for the Community Recyclers
of Otago and the Otago Regional
Council

December 2005

CONTACT DETAILS

Envision New Zealand Ltd
Unit 5, 192 Victoria Street West
PO Box 91-1155
Auckland

Phone: 09 303 4746
Fax: 09 309 9655
Email: mailbox@envision-nz.com
Website: www.envision-nz.com

Authors: Warren Snow and Julie Dickinson

Contributors: Clair Higginson (Central Otago Wastebusters), Sue Coutts (Wanaka Wastebusters), Marian Shore (Waitaki Resource Recovery Trust), Craig Smith (Wanaka Wastebusters).

15th December 2005

Executive Summary

Project Background

In May 2004, only months after the Packaging Accord was signed, New Zealand's only glass container manufacturer, ACI-OI reduced the price it would pay for clear glass cullet from \$75 per tonne to \$10 per tonne.

The additional glass on the market resulted in excess supply over demand for ACI-OI. Because it is both costly and unacceptable to the wider community to landfill glass, recyclers in Otago had been stockpiling glass for several years.

The situation presented a challenge for the Packaging Accord and its principle of producers taking responsibility for the whole life cycle of their products. This challenge was met by the formation of a Glass Users Group (GUG) which imposed a temporary voluntary levy on importers of glass containers. The temporary levy which expired at the end of November 2005 raised \$1.5 million. These funds were used to pay recyclers \$65 per tonne for clear glass sent to ACI - the difference between the original price of \$75 per tonne received and the new price of \$10 per tonne. It was also intended to fund research into new uses for glass, although funds have not been allocated at this point.

However from the point of view of Otago communities, the levy had no benefit. Glass recycling was uneconomic before the price drop for glass. The levy simply restored the situation to that same uneconomic level.

Otago's Glass Problem

As a result of the low price and reduced demand, mountains of un-recycled glass have continued to grow around the Otago region.

In an attempt to address the problems faced by communities and recyclers, the Community Recyclers of Otago and Otago Regional Council commissioned this report to investigate new uses for glass.

While undertaking research for the report, it became apparent that to achieve long term solutions to the Otago's glass problem, it would be necessary to review the structure of the Packaging Accord and the roles of the various players and industry groups involved in glass packaging issues.

This resulted in a change of focus from simply technical solutions that address an end-of-life problem, to a 'systems' approach that addresses the whole life-cycle. An approach which attempts to place responsibility for the problem where it should be - the product stewardship model espoused in both the New Zealand Waste Strategy and the 2004 Packaging Accord.

Gone are the days when ACI-OI had an open door policy, where they purchased all container glass from all over New Zealand. The lifting of export controls in the mid eighties allowed for the importation of increasing volumes of glass containers to the point where approximately 81,000 tonnes of glass containers are now imported into New Zealand each year leading to the current glass problem.

The Future

Unless real product stewardship programmes are put in place, the future is uncertain for glass recycling in Otago. A new group to be known as the Glass Product Stewardship

Forum (GPSF) is likely to put a small levy on all players in the glass container supply chain to fund new uses for glass, but it is unlikely that they will prop up glass recycling costs in the future. This leaves communities and recyclers to pick up the tab if there are further volume and price reductions from ACI-OI, and provides more reason to find alternative uses for glass, as well as looking for wider product stewardship solutions.

One development that could hold promise for the future is the MfE's 'Product Stewardship and Water Efficiency Labelling' discussion document released in July 2005. This report introduces new thinking on the preferred ways to develop product stewardship in New Zealand that if implemented could result in significant outcomes for glass recycling in Otago.

Conclusions and Strategy Recommendations

The primary conclusion of this report is that the only long term sustainable solution to the problem of utilising discarded glass in Otago, and in other regions, is to take a systemic approach that captures all glass (for reuse, remanufacture or recycling) and puts the responsibility for the cost of doing so squarely on glass users and brand owners.

Secondary conclusions of this report are that:

- Glass is a problem waste but not a hazardous waste and has only come to the forefront because of the inability of the players involved to come up with a long term sustainable solution.
- The glass problem is an economic problem and as such is relatively simple to solve. It simply gets down to deciding who should pay for it to be recycled or reused; the wider community at the end of the supply chain, or the manufacturer and user of the product.
- There is a disconnect between community concern and brand owner actions and objectives.
- Glass is the first big test for the Packaging Accord
- Short to medium term solutions to the glass problem should be adopted, within a long term 'User Pays' framework

The strategy recommendations of this report are as follows:

Immediate (2005) Actions (for the Community Recyclers of Otago)

- Notify stakeholders of an all-party meeting in early 2006 to alert those involved that Otago communities are dissatisfied with the current industry-led approach and want better representation as well as sustainable long-term solutions.
- Before Christmas, encourage all South Island councils (local and regional), as well as glass recyclers to write to the Packaging Council in support of the intent of the Fulton Hogan proposal to enable specification of glass aggregate as a roading aggregate.
- Put a proposal to the Packaging Council before the end of January (when applications will be reviewed), to seek support from the glass fund to hold the all-party meeting in 2006.
- Continue to collect and divert glass from landfill. Glass can be stockpiled unsorted to keep costs low (apart from high value glass for which there are existing markets).

Immediate (2005) Actions (for Otago Regional Council and TLAs)

- Encourage and assist local entrepreneurs to apply for seed funding from the glass fund before the end of January to help establish local uses for glass. Contact LGNZ

to pass on Otago community, council and recycler concerns regarding the Packaging Accord, and to ask for stronger representation on the Packaging Accord Governing Board. Request that glass be raised as an issue at the LGNZ conference in July.

- Regional Council needs to help local councils obtain consents to store glass and local councils need to help local recyclers find locations to stockpile glass over the short term while bulk uses for glass are being developed.

Actions for 2006 (for Community Recyclers of Otago)

- Hold the all-party meeting in February/March to address better representation by community and environmental interests on the Packaging Accord, (or establishing an independent packaging action group), development of uses for glass, lobbying for Extended Producer Responsibility, and protecting and enhancing bottle refilling operations in the region.

Actions for 2006 (for Otago Regional Council and TLAs)

- Actively support local, high volume uses for glass, the most promising of which at this stage appears to be roading aggregate. Local and Regional Councils should meet with Fulton Hogan (and other local initiatives as they emerge) to discuss their proposals and develop funding mechanisms. Councils can also specify glass aggregate as a roading material in their procurement policies.
- Actively support local, high value uses with economic development potential. There are a number of individuals in Otago who, with the right support, could potentially create viable businesses using recycled glass.

Long Term Actions (for all)

- Lobby Government for Extended Producer Responsibility .Local and Regional Councils can influence LGNZ and other councils around the country for a full review of the Packaging Accord and a review of the potential of Extended Producer Responsibility programmes for New Zealand (including Container Deposit Legislation). Local recyclers can work with other community and environmental organisations to raise awareness of Container Deposit Legislation with the public and Central Government, and participate in national 'Bottle Bill days'
- Encourage the re- introduction of refillable containers. While this cannot be achieved quickly it should, nevertheless, be a long term goal for South Island councils, recyclers and manufacturers. Local and Regional Councils can support the local refilling operations that remain. Local recyclers and manufacturers can assist by building support for a national beer bottle and for the reintroduction of milk bottles.

CONTENTS

1. **Introduction**
 - 1.1 Background to project
 - 1.2 Participants and roles
 - 1.3 Process
2. **Overview of Glass Manufacturing and Recycling in New Zealand**
 - 2.1 A brief history of glass manufacturing in New Zealand
 - 2.2 How recycled glass (cullet) is purchased and processed
 - 2.3 The future of glass manufacturing in New Zealand
 - 2.4 Glass recycling problems – the story so far
3. **Policies Affecting Glass Recycling**
 - 3.1 Introduction
 - 3.2 The New Zealand Waste Strategy (2000)
 - 3.3 The first voluntary Packaging Accord (1996)
 - 3.4 The second voluntary Packaging Accord (2004)
4. **Industry Organisations Involved in the Glass Recycling Issue**
 - 4.1 Packaging Council of New Zealand (PacNZ)
 - 4.2 Environmental Beverage Action Group (EBAG)
 - 4.3 Glass Users Group (GUG)
 - 4.4 Glass Recycling Advisory Group (GRAG)
 - 4.5 Industry groups involved in glass recycling issues
 - 4.6 The temporary glass levy
 - 4.7 Glass Product Stewardship Forum (GPSF)
 - 4.8 The future according to industry players
5. **The Current Situation**
 - 5.1 Glass landfilled and diverted from landfill annually in Otago
 - 5.2 Costs to landfill glass and savings from diversion
 - 5.3 Recycling infrastructure in Otago
 - 5.4 Current glass uses in Otago
6. **Refillable Versus Single Use Containers**
 - 6.1 Refillables in New Zealand
 - 6.2 The Demise of refillable milk bottles in the South Island
7. **International Trends**
 - 7.1 Recycling rates
 - 7.2 Support organisations
8. **Barriers and Enhancers to Glass Recycling in Otago**
 - 8.1 Barriers
 - 8.2 Enhancers
9. **Key Principles**
 - 9.1 Reduce, reuse, recycle
 - 9.2 Closed loop recycling
 - 9.3 Proximity principle
 - 9.4 Diversity principle
 - 9.5 Local economic development
 - 9.6 Precautionary principle
 - 9.7 Polluter pays
 - 9.8 Extended Producer Responsibility
 - 9.9 Volume versus value
 - 9.10 Maintaining material value for future use
10. **Uses for Recycled Glass**
 - 10.1 High volume, low value uses
 - 10.2 Low volume, high value uses
11. **Conclusions**
 - 11.1 Overall conclusions
 - 11.2 Secondary conclusions
12. **Strategy Recommendations**
 - 12.1 Immediate actions (2005)
 - 12.2 Actions for 2006
 - 12.3 Long term actions
13. **Funding Sources**
14. **Appendices**

1. INTRODUCTION

1.1 Background to Project

In early 2005 the Community Recyclers of Otago made a joint submission to Otago Regional Council's Draft Annual Plan suggesting that Council give consideration to developing a partnership with the group, to facilitate information collection, pilot projects and reports.

The aim of this work would be to develop a range of options for Otago Regional Council (ORC) to consider regarding strategic investment in glass processing technology and infrastructure for Otago.

Prior to this ORC, the Community Recyclers of Otago and industry players had been meeting over a period of time with Dunedin City Council, Queenstown Lakes District Council, and Waitaki District Council to develop a coordinated strategic approach to waste based issues in the area. At a meeting in November 2004, it decided to focus on one major issue at a time – and glass was chosen as a pilot for a series of possible future studies.

This pilot project, looking at the options for utilising and minimising Otago's glass, is an outcome of these earlier discussions and has been produced with the support of Otago Regional Council. Funding was also provided to the Community Recyclers of Otago by Zero Waste New Zealand Trust.

The views and recommendations in this report are those of the authors and not necessarily those of the sponsors or the Community Recyclers of Otago.

1.2 Participants and Roles

The project was initiated by the Community Recyclers of Otago. The key people responsible for development and oversight of the project are Clair Higginson (Central Otago Wastebusters), Sue Coutts (Wanaka Wastebusters) and Marian Shore (Waitaki Resource Recovery Trust).

Envision New Zealand was contracted to undertake the research, run community meetings and develop strategy recommendations on the best way forward for Otago.

Envision New Zealand is a sustainability and local development planning group. We work with local authorities, community enterprises and businesses to develop initiatives that strengthen community, protect natural resources and encourage local enterprise

1.3 Process

Community Meetings

An important aspect of the project was to bring key players together from the community to seek the opinions of local people and to access local knowledge and expertise. People have been grappling with Otago's glass issue for years and many had ideas and opinions to share.

Advertisements were placed in local papers and a media release¹ was sent to local radio stations and newspapers to draw as many interested people as possible to meetings which were held in Oamaru (25th October), Dunedin (26th), Alexandra (27th) and Wanaka (27th).

The meetings were well attended with between 10 and 25 people per meeting. The meetings were introduced by a local representative, followed by a short presentation from Warren Snow from Envision, after which the meeting was opened up for general discussion.

Comments and themes that emerged from the meetings included:

- Resources are finite
- Manufacturers should be more responsible
- Otago doesn't have a glass problem – it has an asset
- There is a need for legislation – Government is not doing what is required
- The bottle deposit system used to work really well – why not bring it back?
- Keep refillable glass milk bottles
- The 'swappa crate' system is working well for refillable beer bottles
- Economics are important – got to determine who is responsible for paying for collection and processing
- Use the avoided cost of landfilling to offset the cost of alternate disposal options
- Establish a regional landfill levy to finance alternatives
- Storage is a problem – councils could provide land
- There is increasing pressure from landfill customers to recycle
- Extended Producer Responsibility is required
- Important to know what the end use is before processing
- There are health and safety issues associated with glass crushing

Technical ideas that were raised included:

- Use a windmill made from recycled materials to crush glass (a 'Willy Wonka' style recycling factory that could become a tourist attraction)
- Debate over the advantages of mobile or static crushing plant
- Glass can be stored in old buildings that don't have any other use (Oamaru)
- Can be used for decorative uses – but only small quantities
- Use bottles as housing insulation
- Crush and stockpile glass for mining at a later date
- Use energy from other activities (ie vehicles running over weighbridges – or gravity) to crush glass
- Use whole bottles as insulating air space in house foundations
- There are inherent problems with using refillable bottles in the wine industry
- Why not backload bauxite ships with glass back to Australia
- Specialist manufacture of bullet-proof glass
- Glass plant for the South Island to service the growing wine market
- Heat capture – incorporate recycled glass in solar panels
- Crush glass in the desert – and take advantage of the heat
- Standards are required for roading, construction etc to specify crushed glass

Local Visits

In addition to the public meetings, private meetings were held with Resource Recovery Centre operators, recyclers, council staff and local businesspeople to gain as much local

¹ See Appendix 12.1

insight and information as possible. While every attempt has been made to contact all local players, inevitably some may have been missed however.

Discussions with Industry Leaders

After the public meetings, discussions were held with industry leaders around the country to gain background on the current situation and gauge where glass recycling is heading nationally. Key individuals from organisations such as BRANZ, Full Circle, the Packaging Council of New Zealand, the Recycling Operators of New Zealand, ACI-OI , and the Ministry for the Environment etc were contacted .Their thoughts and opinions were helpful in arriving at the conclusions in this report.

Comments were also sought from community enterprises and recyclers around New Zealand and from overseas organisations to cast as wide a net as possible for ideas and solutions.

Background Research

A review of previous reports and a desk-top information search were also conducted. Craig Thomas's 2005 report, produced for Zero Waste New Zealand Trust ('Market Study for Recycled Glass in the South Island') provided background material for this report.

Consultation with Community Recyclers of Otago

After all meetings and research had been concluded, the final strategy recommendations in this report were developed in consultation with the Community Recyclers of Otago.

2 Overview of Glass Recycling in New Zealand

2.1 A Brief History of Glass Manufacturing in New Zealand

The first successful bottle works in New Zealand was set up in 1922² by the Australian Glass Manufacturers' Company in Penrose, Auckland – later known as ACI Glass Packaging (New Zealand) Ltd. For over a hundred years the demand for bottles in New Zealand had been closely related to brewing beer.

Beer was brewed all over New Zealand by the mid-19th century, local breweries re-using bottles from English beer. The shortage of bottles became chronic, and many attempts were made to set up successful bottle and glassworks in New Zealand, all of them failing. Part of the problem was opposition by bottle importers and the pro-British lobby. So when the Australian Glass Manufacturers Company, major exporters of bottles to New Zealand, built their bottle works in Auckland in 1922, they were careful to seek local favour. Before the factory was finished, they were already advertising in New Zealand. They took a stand at the 1921/1922 Trade Fair (see picture below) and made a real effort to win over local and British industrialists and opinion leaders to the idea of their bottle works. Their sign at the Trade Fair read:

"These Goods were Made at our Australian Works.
We will shortly be Manufacturing Similar Ware at
PENROSE
where we will Employ a Large Staff and consume
thousands of
TONS of LOCAL COKE, COAL & SAND Annually.
For Box Making alone We will use a Large Quantity of
N.Z. TIMBER
& for Glass Making we will Export from Britain Soda
Ash & Other Chemicals
NEW ZEALAND HAS AS LARGE A POPULATION
AS VICTORIA
Victoria Employs Directly 1000 MEN in this Industry.
Why Not New Zealand?"



Above, Trade Fair stand showing samples of bottles and a "Semi-automatic Bottle Blowing Machine"

ACI is still based in Penrose and is now part of the OI (Owens Illinois, USA) group of companies³. It is the only manufacturer of glass containers in New Zealand.



² Information from the Glass Museum On Line – www.glass.co.nz

³ Information from ACI-OI website - www.recycleglass.co.nz

Since its establishment in 1922 it has gone from producing 50,000 bottles per week to 50,000 bottles an hour. It currently operates two glass furnaces from its Auckland plant which run continuously and are re-built every 12-15 years.

Until the early 1980s, glass was king in terms of beverage containers – it was largely used for everything. After this, aluminium cans gained a share of the market and plastic followed. Overall increases in consumption of all forms of food and beverage packaging has meant that whilst glass share of the total supply has reduced, total quantities manufactured have continued to rise.

2.2 How Recycled Glass (Cullet) Is Purchased and Processed

ACI-OI buys recycled glass cullet through its network of Principal Suppliers around New Zealand, who collect glass from kerbside collections and public recycling facilities.

Sorted cullet arrives at the Visy Recycling plant, adjacent to ACI-OI, for ‘benefication’. Already separated by colour, the cullet is placed into a hopper and fed onto a belt. The belt carries the cullet through a powerful magnet to remove bottle tops and other metals. The belt then carries the cullet below a metal detector, which removes segments of glass contaminated with aluminium and other metals.

It then passes through picking stations to remove contaminants such as ceramic, pyrex and other rubbish that cannot be removed mechanically. It is then crushed and fed via a weighing conveyor into the ACI-OI Glass Packaging site to be made into new bottles and jars.

ACI-OI currently manufactures approximately 125,000 tonnes of glass containers at its Penrose plant. It accepts around 90,000 tonnes of cullet from its Principal Suppliers, and uses 75,000 tonnes of this in the manufacture of new containers.

Plans to establish a third furnace are currently before the ACI-OI Board. Although the outcome is uncertain, ACI-OI are optimistic that it will be approved. Once it is built, the plant will be able to use over 100,000 tonnes of recycled glass. The ACI-OI plant is currently awaiting the go ahead from its owners to add the third furnace.

ACI-OI imports over 50,000 tonnes (estimated) of sand per annum from Brisbane for the manufacture of glass. Up until recently (over the period the glass levy has been in place) they have been backloading loads of excess glass to Australia on the sand barges. Some recyclers believe that this is a good long term solution.

2.3 The Future of Glass Manufacturing in New Zealand

It appears that the future of glass manufacture in New Zealand is not guaranteed. A Ministry for the Environment source explained that if ACI-OI’s third furnace is not built, he fears that within 5 years the whole plant could close. He explained that, internationally, glass plants with two furnaces tend to close down whereas those with three furnaces tend to survive. He cited the example of Western Australia, which had a two furnace plant which closed down and South Australia, which has a three furnace plant which has survived and is still in operation. For this reason the Ministry for the Environment is working with New Zealand Trade and Enterprise to do all that is required to help ensure the new owners do in fact give approval for the new plant.

2.4 Glass Recycling Problems – the Story So Far

The seeds of today’s glass recycling problem were probably first sown in 1976 when recyclable single-use bottles replaced refillable bottles in the New Zealand market. Prior to this, a large proportion of glass containers were reused many times and didn’t become waste until they were broken or chipped – and were then recycled. There was a balance

between the supply and demand for used bottles which enabled a variety of people all around New Zealand to run successful businesses collecting and reselling bottles and crates for reuse. Also, countless New Zealanders made their first few pennies as children collecting and reselling used bottles for the refundable deposit.

Even after the advent of the one-way bottle, glass waste was not a significant problem because New Zealand's only glass manufacturer, ACI-OI in Auckland, was able to purchase all cullet from around New Zealand to make it into new glass containers. Although significant quantities of glass containers were sent to landfill, there was a rough balance between the amount of glass produced and the amount of glass available for recycling. Supply and demand were still in balance because the price paid for cullet was sufficient incentive to ensure that most recycled glass in New Zealand had a viable end market.

The problems communities face today with glass recycling began to emerge with the lifting of import licensing restrictions after deregulation of the New Zealand economy in 1984. From then on, every glass user who wanted a unique bottle that distinguished them from competitors could import any glass container from anywhere. There was also an increase in indirect imports (South African wines, Australian and French jams etc). Also, from the late 1980s general consumption levels have risen for beverages such as wine, leading to increasing glass use.

Since deregulation, quantities of imported glass have continued to rise to the point where an estimated 81,000 tonnes⁴ of whole glass packaging is now directly imported into New Zealand each year (not including indirect imports via packaged goods). The widespread adoption of kerbside recycling programmes since the mid 1980s has also increased the amount of glass being collected and made available for recycling.

The increasing quantities of glass in the system gradually upset the previous balance between supply and demand and the amount of cullet available exceeded the amount of glass ACI-OI could use.

The rise in the New Zealand dollar over the last few years has also had a significant double impact. Firstly, it has made it cheaper to import new glass bottles, and secondly it has made soda ash (which can be used in place of cullet to make up to 19% of glass), cheaper to buy than recycled glass. John Webber, from the Packaging Council of New Zealand explains that, "ACI-OI must remain competitive on world markets and must therefore purchase the cheapest feedstock to do so". Both factors have increased the supply of recycled glass which in turn has put downward pressure on the ability of ACI-OI to pay high enough prices to make it economic to send glass to Auckland - especially from distant regions such as Otago.

As a result of all these factors, ACI-OI has faced a growing problem with increased supply of glass. The over-supply led to ACI-OI dropping the price it paid for cullet in late 2004. This sent a shockwave through the recycling industry and local government who had collectively set up a logistics system for a product that now seemed largely unwanted by the only major end user in the country. Worse, it was a product that had for a long period, provided a stable income for recyclers when other commodities such as paper and plastic had fluctuated.

The Chair of the New Zealand Packaging Accord Governing Board⁵, Tony Ryall, understood this point when he pointed out that, "...each sector is inevitably co-dependent, given that recyclers collect multiple packaging types, each with a different commercial market. A problem in any one sector, ultimately places pressure on the overall viability of the recycling service".

⁴ Source, John Webber, Packaging Council of New Zealand

⁵ Chairman's introduction in the Year One Progress Report

It has reached the point where the highly visible rising piles of un-recyclable glass in Otago have become a public issue. Communities are demanding solutions and will not accept landfilling as an option after having sorted and separated glass for so long. Many feel let down, especially as the new Packaging Accord is only two years old.

3. Policies Affecting Glass Recycling

3.1 Introduction

Various policies and initiatives have been put in place over the last 20 years to address the problem of rising packaging waste. The first attempt was through the original voluntary Packaging Accord, introduced in 1996 by the then National Government Minister for the Environment, Simon Upton. The New Zealand Waste Strategy was introduced in 2000 and a second voluntary Packaging Accord was introduced in 2004, followed by a number of industry initiatives to address glass recycling or reuse. These legislative and industry initiatives are summarised below.

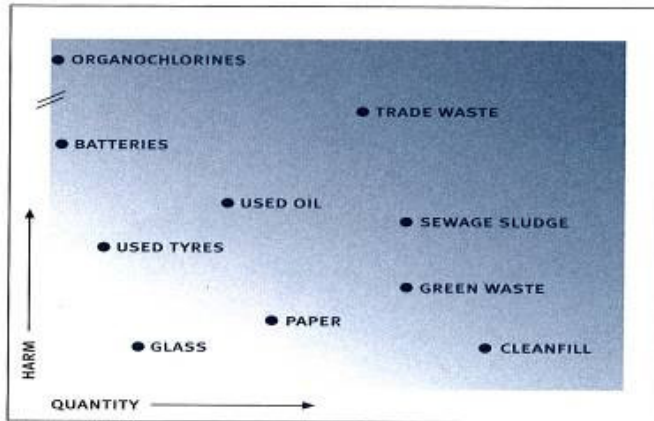
3.2 The New Zealand Waste Strategy (2000)

In 2000 the Ministry for the Environment, in association with Local Government New Zealand, released the New Zealand Waste Strategy.

The strategy set guiding principles for working, 'Towards Zero Waste and a Sustainable New Zealand', including Extended Producer Responsibility, Full Cost Pricing, the Life Cycle Principle and the Precautionary Principle. It also set targets for priority wastes, based on volume and harm.

As shown by the figure below, glass is categorised in the Strategy as being quite a low risk in terms of quantity and harm to human health and the environment.

Figure 3: Relative quantities and harm for some wastes



NB: Diagram is illustrative only

One of the policy and programme objectives outlined in the strategy is to "Reduce barriers to using recovered materials in New Zealand". Extended Producer Responsibility is discussed as a method for ensuring businesses take back products for reuse or recycling.

3.3 The First Voluntary Packaging Accord (1996)

The first voluntary Packaging Accord was signed in 1996 in response to public concerns at the rise of packaging waste with a proviso that if it didn't reduce packaging waste, Government would legislate.

The primary objective of the first accord was, ***"To minimize adverse environmental effects arising from packaging waste by the adoption of an agreed waste reduction strategy"***. Due to councils introducing kerbside recycling schemes, significant reductions in the amount of packaging waste going to landfill may initially have occurred, but waste in general, and packaging waste in particular, still rose significantly under the first Accord.

This was borne out by the New Zealand Waste Strategy (2000) which stated that, *"The 1996 Packaging Accord sought to minimise the environmental effects of packaging waste, and has improved rates of packaging recycling. Innovations such as light-weighting have slowed the growth in this waste. As in other countries, however, the total quantity of packaging waste has increased."*

The early gains in recycling rates are now being lost as new types of non-recyclable packaging are introduced into the market. This is a worldwide phenomenon. In the US, beverage container recycling rates have come down from 52% a decade ago, to 32% in 2002 - despite an increase in the number of kerbside recycling programmes from about 2,000 in 1990 to more than 9,000 in 2002.

3.4 The Second Voluntary Packaging Accord (2004)

Eight years after the signing of the first Packaging Accord⁶, a second voluntary Packaging Accord was signed on August 10th 2004. The signatories were the Minister for the Environment and the New Zealand Packaging Council. Local Government New Zealand and the Recycling Operators of New Zealand were endorsing parties to the Accord.

As with the 1996 Accord, the 2004 Accord takes a voluntary approach with little to compel producers to reduce packaging waste. Voluntary agreements have been shown around the world to be ineffective and susceptible to manipulation by the industries they are supposed to regulate.

The Packaging Accord secretariat reports to the Packaging Council Governing Board which has 8 representatives: 5 from industry and 1 each from Local Government New Zealand (LGNZ), the Recycling Operators of New Zealand (RONZ) and the Ministry for the Environment (MfE). The secretariat is based at the Packaging Council of New Zealand and its reporting and accounting functions are also provided by the Packaging Council.

The Accord's objective is: ***"To improve the sustainability of packaging used in New Zealand through:***

- ***Improved partnerships, policies and processes***
- ***Brand owners and retailers accepting the primary responsibility for product stewardship over the full packaging life cycle***
- ***Supply chain initiatives to foster markets for sustainably produced packaged goods, including greater utilisation of recovered packaging materials"***

The duration of the current agreement is for five years with an option for renewal subject to agreement between the parties. There are no penalties for non performance although the

⁶ With no study into its effectiveness in reducing packaging waste

Accord states that, “If a voluntary approach does not provide sufficient gains in design, packaging waste reduction and demonstrable adoption of product stewardship, the Government is prepared to consider mandatory regulation measures”. This is, however, more or less what the Government promised with the first Accord.

The 2004 Accord has a glass recycling target of 55% by 2008.

Packaging Accord Sector Groups

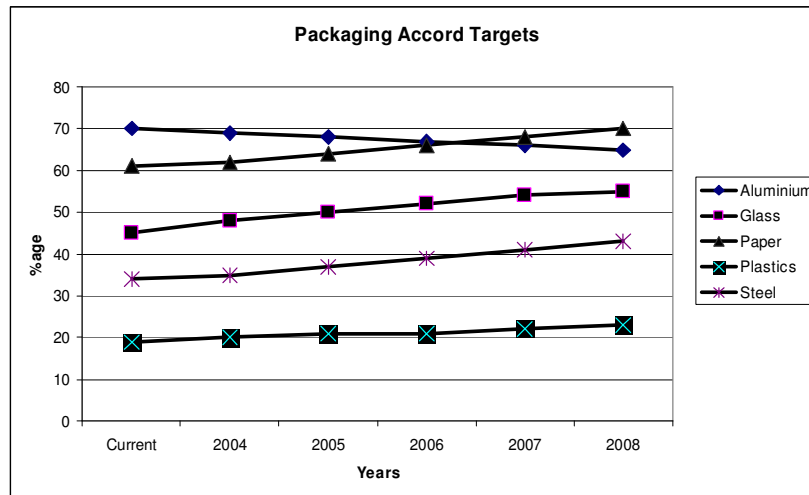
There are five commercial sector groups who have signed up to the Packaging Accord, along with MfE, LGNZ and RONZ. Each sector group (Aluminium, Glass, Steel, Paper, Plastics, Local Government New Zealand, Brand Owners & Retailers and Central Government) has, over a period of 18 months, prepared a specific sector action plan against an Accord template. The “Sector Action Plans” outline each sector group’s commitments under the Accord and proposed actions for the year.⁷

2004 Packaging Accord Targets

Following are the 2008 national recycling targets for recovery of packaging materials (by weight as a percentage of consumption)

- Aluminium 65%
- Glass 55%
- Paper 70%
- Steel 43%
- Plastic 23%

The following table was produced by Envision to highlight the similarity between the recycling rates (on the left of the graph) stated on the Packaging Council of New Zealand’s website at the time, and the 2004 Packaging Accord targets (on the right of the graph).



The targets were so comparatively low that they could have been achieved through a reasonable margin of statistical error. In the case of aluminium, the target was actually less than the existing claimed recycling rate.

⁷ The full reports are available on www.packagingaccord.org.nz/sector.php and are amalgamated in the Year One Progress Report of the New Zealand Packaging Accord.

The following table from the Year One Packaging Accord report shows increased recycling of packaging and increased consumption of packaging.

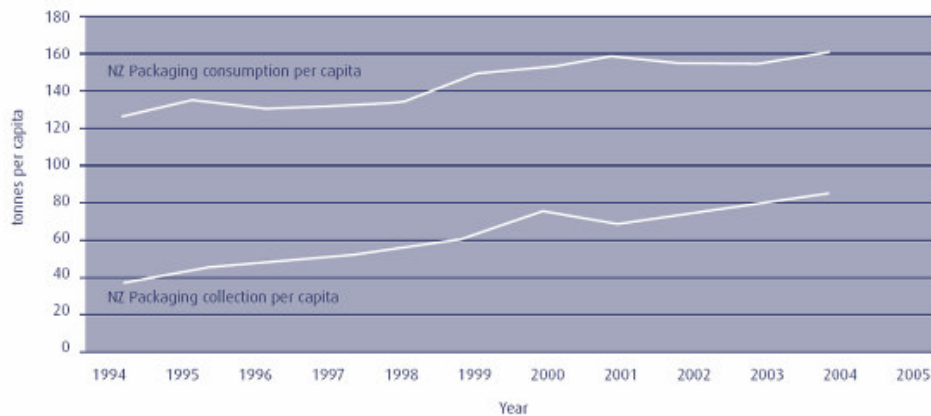


Figure 2 Packaging consumption and collection trends per capita

Code of Practice

The ‘Code of Practice for the Packaging of Consumer Goods’ is located on the Packaging Council’s website. During research into this project it was pointed out to the Packaging Council that it was hard to find and it has subsequently been located in the Packaging Accord website as well.

Complaints Handling Procedure

The Code of Practice contains a Complaint Handling Procedure which leads complainants through a process involving contact firstly with the manufacturer or supplier whose address is on the package, then the Packaging Council Secretariat, then the Complaints Committee of the Packaging Council, and finally, if the company in question, or the complainant does not accept the view of the Complaints Committee, the Independent Packaging Review group (IPRG).

IPRG (Independent Packaging Review Group)

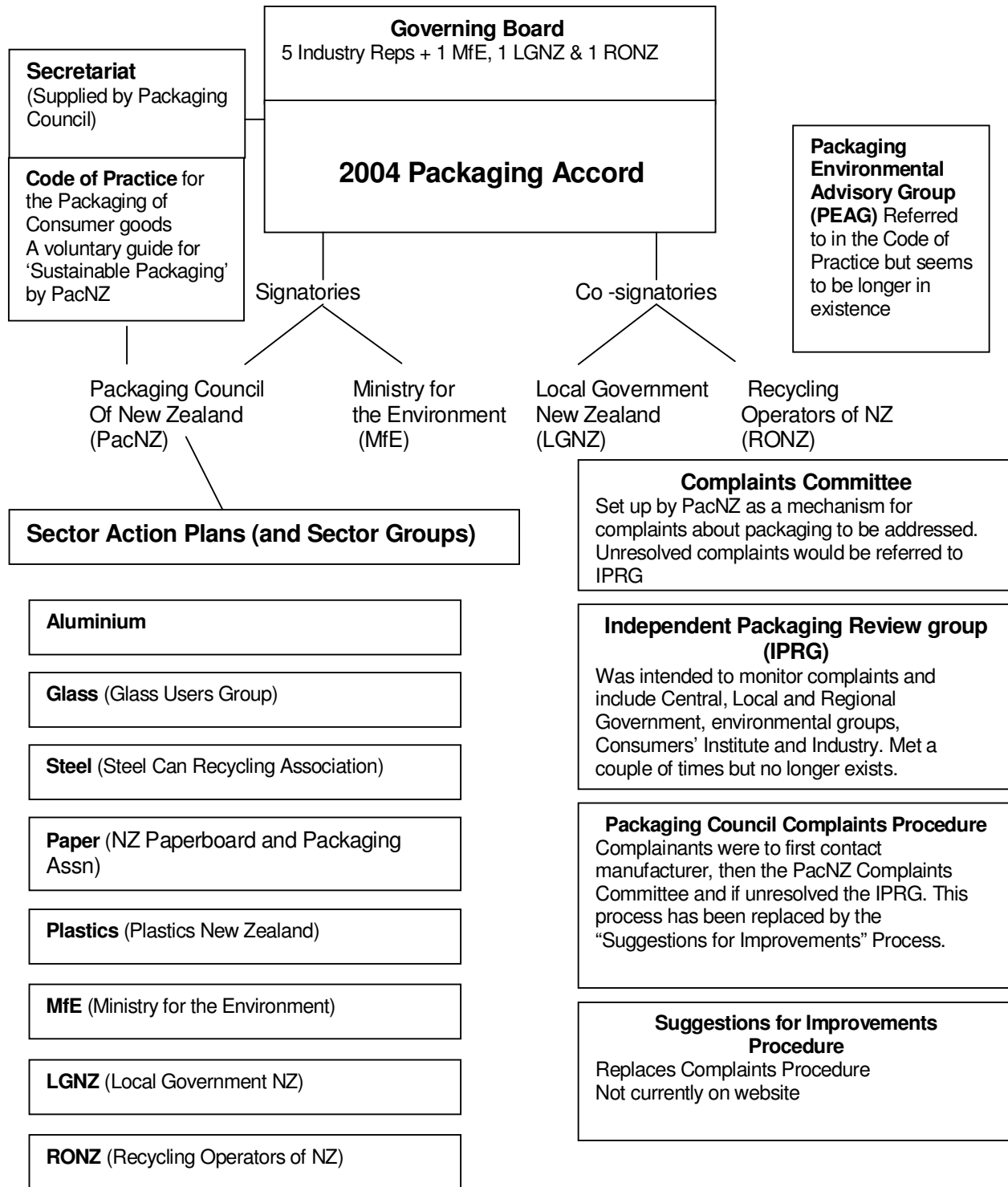
According to the Code of Practice, The IPRG was to be “structured on the same basis as the Packaging Environmental Advisory Group (PEAG) and comprise a representative from:

- Ministry for the Environment
- Ministry for Foreign Affairs and Trade
- Regional Government
- Territorial Local Authorities
- Environmental Groups
- Consumers’ Institute
- Industry (2)”

Unfortunately it seems this group (or part of it) only met a couple of times. According to the Ministry for the Environment the initial enthusiasm that led to the establishment of the first Packaging Accord was not supported with adequate resources – presumably the reason this group was discontinued. The Packaging Council was able to confirm that the group

doesn't actually exist and that a new procedure has been drafted. It is called 'Procedure for Suggested Improvements' as the Packaging Council felt 'complaints' sounded too negative. At the time of this report's release it has yet to be posted on the Packaging Council's website but it is attached in the Appendices (section 14).

Relationship Diagram for the 2004 Packaging Accord



4. Industry Organisations Involved in the Glass Recycling Issue

4.1 Packaging Council of New Zealand (PacNZ)

The Packaging Council of New Zealand (PacNZ) was formed in 1992 at the request of Government and works closely with the Ministry for the Environment and other Government sectors.

The Council currently has 140 plus members and expects this to grow. It represents manufacturers, fillers, wholesalers, brand owners and retailers and also claims to represent consumers of packaging.

The Council's key proposition to members and potential members is that it is opposed to any legislative action on packaging waste, *"The Council strives to ensure that the New Zealand packaged goods industry addresses on a voluntary basis, those issues relating to packaging usage and waste which have, in many other countries, resulted in legislative actions with costs to both producers and consumers⁸"*.

The overriding expectation of the Council's members is their support of the ACCORD 2004 programme, which is the prime focus of the organisation and the principal method by which it expects to reach its objectives.

As well as individual members, a number of industry associations belong to PacNZ including:

- New Zealand Paperboard and Packaging Association
- Plastics New Zealand
- Steel Can Recycling Association
- Glass Users Group (informal group of glass users made up of Brand Owners and retailers).

4.2 Environmental Beverage Action Group (EBAG)

The Environmental Beverage Action Group (EBAG) was formed in October 2004 to specifically address the plastic beverage packaging industry's obligations to the Accord. The group consists of the major plastic beverage container producers, manufacturers and distributors in New Zealand⁹.

EBAG aims to help achieve the Accord's target of 23% plastics recovery by 2008 by delivering an increase in beverage plastics recycling from 42% to 50% over the same period. While EBAG's primary focus is plastic, other beverage materials will also be addressed (e.g. glass and aluminum).

EBAG has two main objectives:

- To ensure all beverage containers can be recycled in New Zealand, and

⁸ The New Zealand Packaging Council Website www.packaging.org.nz

⁹ Alto Plastics, Amcor PET Technologies, Coca-Cola Amatil, DB Breweries, Fonterra Co-operative, Foodstuffs, Frucor Beverages, Mainland Products, NZ Dairy Foods, NZ Juice & Beverage Association, Visy PET together with representatives from the Packaging Council of New Zealand, the Ministry for the Environment, Local Government New Zealand and the plastics and recycling industries

- To identify and implement methods to improve the collection rates of beverage containers for recycling.

Event recycling guidance is being developed by EBAG on the basis that ‘away from home’ consumption represents a significant system loss. Event recycling and ‘out and about’ (public) recycling have been identified as good ways to improve recovery.

Additionally, Coca-Cola Amatil New Zealand is piloting a public-space recycling system at Botany Downs in Auckland. Both of these initiatives are examples of voluntary initiatives by industry to find ways to recover beverage containers that are not picked up at kerbside.

4.3 Glass Users Group (GUG)

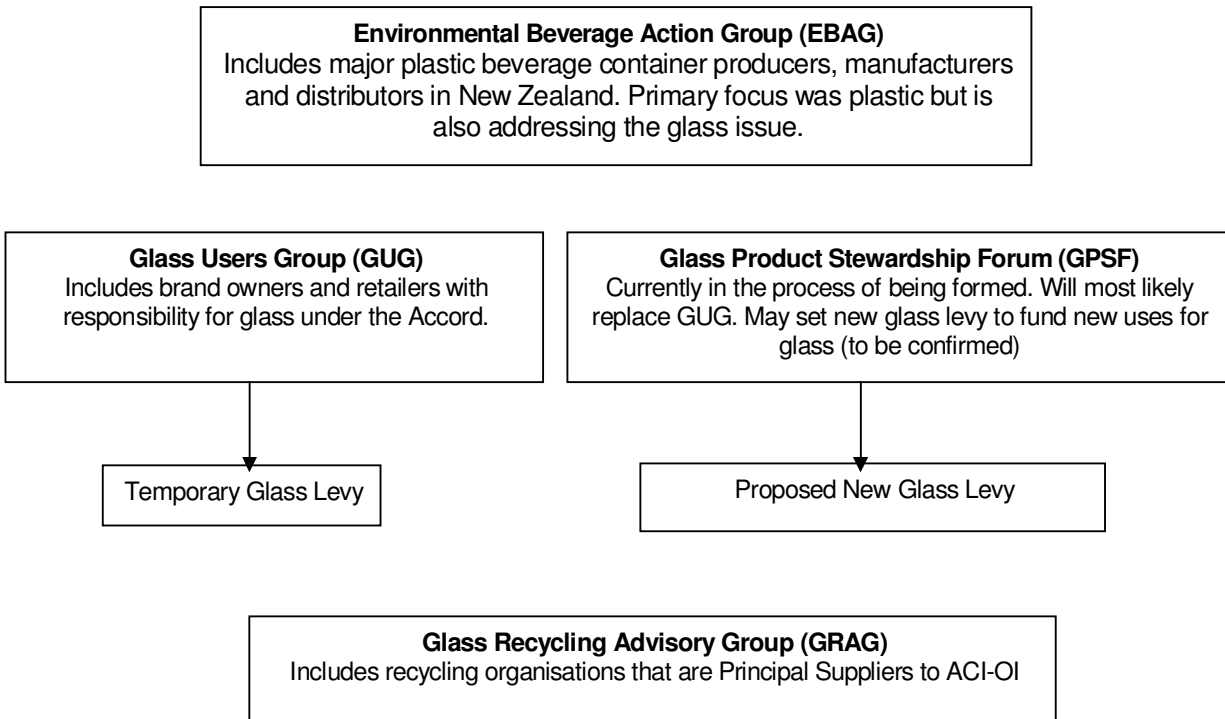
The Glass Users Group (GUG) is an informal group initiated by brand owners and retailers who have some responsibility under the Accord for the life cycle of glass containers they market. They established the temporary glass levy which committed \$1.5 million to assist recyclers by making up the difference between the amount they were previously paid for clear cullet (\$75 tonne) and the reduced price (\$10 tonne).

Some funds from the Glass Levy were made available to assist with the development of new uses for glass.

4.4 Glass Recycling Advisory Group (GRAG)

The Glass Recycling Advisory Group (GRAG) is an informal group made up of 12 recycling organisations that are Principal Suppliers of recycled glass to ACI-OI. The group was set up to provide the glass recyclers’ response to the Glass Users Group (GUG).

4.5 Industry Groups Involved in Glass Recycling Issues



4.6 The Temporary Glass Levy

Up until 2005 there was at least 10 years of stable pricing for recycled glass, providing a core income stream for recyclers that many came to rely on. In late 2004, ACI-OI dropped the price it paid for cullet from \$92 to \$75 per tonne. Again, in March 2005 ACI-OI dropped the price to \$75 per tonne for green and amber glass and \$10 per tonne for clear glass. The price drops were attributed to changes in the relative costs of raw materials and an oversupply of glass at its Auckland plant.

The price changes brought to an end 10 years of price stability. Additionally, local authorities faced the problem of growing quantities of glass that they had collected in good faith at cost to their communities, but for which there was now no end market. They, along with recyclers, community organisations and many in the public, saw this as a test of the new Packaging Accord.

Industry responded by setting up the Glass Users Group (GUG) *“to mitigate the short-term impacts of this market change (for example, diminished viability) while long-term solutions were sought (for example, new markets for cullet)”*

GUG is made up of a significant proportion of glass importers and, although headed by David Carter of Lion Nathan (who resides in Australia), much of the coordination for the group has been carried out by John Webber of the Packaging Council.

Complex negotiations involving recyclers and local government, with the support of the Ministry for the Environment, resulted in a majority of glass importers agreeing to contribute to a funding pool of around \$1.5 million for a six-month period (until the end of October 2005). This enabled continued supply of glass to ACI-OI while alternatives were investigated. This period was extended by one month until the end of November

The Year One Progress Report of the New Zealand Packaging Accord states:

“All of the issues around price variances have heightened the awareness of the Accord and its processes. With glass arrangements continuing to run smoothly at the time of writing, emphasis is now on finding alternative markets for cullet and exploring arrangements post-October.

There is little doubt that Year Two will be a busy one for the glass sector. Putting in place a long-term solution to financing glass recovery remains the principal challenge. Providing more recycling facilities such as kerbside recycling and drop-off points, which are still not available in all areas of the country, will result in less glass being disposed of to landfill but may compound the glass recovery issue unless significant alternative uses for cullet are found. However, it is expected that activity on glass will continue to provide a positive example of the Packaging Accord in action.”

4.7 Glass Product Stewardship Forum (GPSF)

On the 6th December 2005, while this report was being written, the Governing Board of the Packaging Accord issued a memo saying that the Temporary Glass Levy (which had been funded by some glass importers and had raised \$1.5 million) had ceased on 30th November 2005. It also announced that in its place the Glass Sector proposed a Glass Product Stewardship Forum (GPSF) to which all players in the glass sector had been invited to contribute. Through the GPSF, initiatives would be led in partnership with recycling operators to develop and bring to fruition alternative uses for glass.

The memo noted, *“that given the realisation of the true market price for clear glass, there would be an impact on those recovering these materials, the local councils for which they operate and therefore the feasibility of continuing with recycling activities, at least in the short term.”* The memo also explained that, *“notwithstanding these short term impacts, there would be ongoing efforts to shift costs away from ratepayers and towards consumers through the application of a product stewardship approach”*.

At the time of completing this report, input from recyclers and Local Government is being sought, before proceeding with the GPSF proposals.

4.8 The Future According to Industry Players

The future is, if nothing else, uncertain. In the short to medium term glass prices could come down further and the levy on imported glass may be dropped and replaced with a levy on all glass. The result could be that only glass sourced from an area within close proximity to the ACI-OI factory will be paid full price for and the general levy will be available to support research and development of local uses for more distant areas such as Otago.

On the other hand, if ACI-OI approves the addition of a third furnace at its Penrose plant, demand will increase for recycled glass. The risk for ACI-OI is that if significant alternative uses are found for glass as a result of the current crisis, it will have to compete with them to secure sufficient glass to meet their requirements. A low value, high volume use such as roading aggregate should not present a threat to ACI-OI as industry sources say it would be a flexible end use, able to substitute with traditional aggregate if glass became less unavailable.

Since writing this section, new unconfirmed information suggests that ACI-OI will be introducing a quota system for their supply which will see them take a reduced amount of glass each week from each of their Principal Suppliers. Indications are that there could be an excess of 20,000 -25,000 tonnes of unwanted glass over the next year. It seems at this point that a proportion of all glass colours will be required from the South Island as all Principal Suppliers will receive quotas regardless of location.

A final discussion with an ACI-OI representative confirmed that from January 1st 2006, they will be implementing a quota system. A quota for 2006 has been set for 70,000 tonnes based on ACI-OI's feedstock requirements - down from an (unconfirmed) estimate of 95,000 tonnes the previous year. The quota is broken down by colour -20,000 tonnes of clear, 20,000 tonnes of amber (brown) and 30,000 tonnes of green. Deliveries over the 70,000 tonne quota will be purchased at \$10 per tonne and any amount that ACI-OI don't require will be exported to Australia.

ACI-OI will divide the 2006 quota allocation amongst the Principal Suppliers on the basis of the last 12 months history of glass supply.

5 The Current Situation

5.1 Glass Landfilled, and Diverted from Landfill, Annually in Otago

Area and population	Waste Totals (tonnes)	Glass Proportion (% and tonnes)	Glass Diverted from Landfill (tonnes)**	Glass Landfilled (estimated tonnes)
Dunedin* 100,000	100,000	4% 4,000	1,000	3,000
Oamaru 20,000	15,000	4% 800	208	592
Central Otago* 20,000	10,000	4% 400	300	100
Clutha District 18,000	18,000	4% 720	10	710
Wanaka* 3,500	5,500	12% 660	500	160
Queenstown 9,000	14,000	9% 1,260	208	1,052
Totals	144,500	7,840	2,008	5,614

- * Councils with kerbside recycling.
- ** Recycled or stockpiled
- Landfill Totals are approximate only, as cleanfill is not included, and some private contractor waste is not included. Wanaka, Central Otago and Queenstown all utilize the Victoria Flat landfill, which accepts a total of approximately 38,000 tonnes per annum.
- The amount of glass in the waste stream varies from 3% to 12%, depending on location and is higher in areas based around the tourism and hospitality industries
- The costs of recycling and or land banking glass are not included.

5.2 Costs to Landfill Glass and Savings from Diversion

Area	Transfer Station Charges	Glass Landfilled (tonnes)	Cost to Landfill Glass	Glass Diverted from Landfill (tonnes)	Savings from Diversion	Cost if All Glass Was Landfilled
Dunedin	\$64	3,000	\$192,000	1,000	\$64,000	\$256,000
Oamaru	\$50	592	\$29,600	208	\$10,400	\$40,000
Central Otago	\$100	100	\$10,000	300	\$30,000	\$40,000
Clutha District	\$40	710	\$28,400	10	\$400	\$28,800
Wanaka	\$100	160	\$16,000	500	\$50,000	\$66,000
Queenstown	\$100	1,052	\$105,200	208	\$20,800	\$126,000
Totals	-	5,832	\$342,280	2,008	\$158,400	\$564,000.00

5.3 Recycling Infrastructure in Otago

Otago is fortunate to have an existing Resource Recovery Network with the capacity to manage (receive, collect, sort and store) glass from throughout the region. This network has been partly formalised through the establishment of the Community Recyclers of Otago (CRO). Combined with smaller rural facilities and larger ones in Dunedin, this network is a valuable infrastructural asset for Otago. The main 'hubs' of the network are:

- Waitaki Resource Recovery Centre (run by the Waitaki Resource Recovery Trust)
- Alexandra Resource Recovery Centre (run by Central Otago Wastebusters)
- Wanaka Resource Recovery Centre (run by Wanaka Wastebusters)
- 'Restore' at Green Island Landfill (owned by Dunedin City Council and run by Delta) - along with recycling facilities at the transfer station
- Envirowaste's Recycling Centre in central Dunedin

Drop off facilities also exist in the Central Otago townships (run by Central Otago Wastebusters) and Queenstown (Wakatipu Recyclers), along with greenwaste drop-off at Hawea (run by the Hawea Community Association). A Resource Recovery Centre is also being planned for Queenstown.

5.4 Current glass uses in Otago

A wide variety of initiatives are already diverting glass from landfill in Otago. The following list has been compiled from feedback from the public meetings and from discussions with local operators. It is not exhaustive but gives an idea of the range of initiatives being undertaken.

Refillables:

- **Wanaka Beerworks** (Dave Gillies)

Dave washes his own bottles. He has a swappa crate system and imports European bottles as ACI-OI only make single use bottles. He uses 100,000 bottles per annum but this is declining which he says is due to larger companies locking him out of bars and restaurants.

- **Green Man Brewery Ltd** (Tom Jones¹⁰)

This is a new beer-making business. It aims to be in production before Christmas 2005 and will make 1,900 litre batches per week of which half will be sold in bottles and half in kegs. Tom is currently making beer on a smaller scale and sells half litre Euro Bottles. The new production capacity will be approximately 4,000 litres per week. He would like every bottle to come back to him as they can be used up to 50 times. He hopes not to have to import many bottles and will use bottles already in the system that are used by at least three other breweries. Tom set up the 'Bottle Reuse Initiative' and sells beer at the Otago Farmers Market by the railway on Saturdays (selling about 14 dozen every Saturday morning). Dominion Breweries currently wash bottles for Green Man Brewery.

- **Dominion Breweries** (Kim Haack¹¹ and Sharon Jereb¹²)

DB operates a swappa-crate system. The crates contain 12 x 750 ml beer bottles and there are also returnable quart bottles. The bottles and crates are owned by ABC Bottlers, which is in turn owned by the two big breweries (DB and Lion). The cost of buying a bottle back from ABC is cheaper than buying a new one. One-way bottles are not designed for washing and re-use.

¹⁰ Contact details 03 477 7755 tom@greenmanbrewery.co.nz

¹¹ Phone 03 684 1846

¹² Phone 09 259 3250

There are four bottle washing plants in New Zealand - in Timaru, Christchurch, Auckland and Mangatinoka. The swappa-crate system has been going for many years. Sharon Jereb of DB believes there is no move at present within DB to stop using refillables, although it is a very small percentage of their overall production. She says there would have to be an enormous pool of reusable glass bottles to service the brewing industry. With the long distances in New Zealand and the trend towards single use containers she doesn't see new local breweries being built to replicate the European model where refillables are common.

Processed (crushed) Glass:

- **Works Infrastructure** (Stuart Thian¹³)

Works Infrastructure have been experimenting with crushing glass and using it in 'glassphalt' in Invercargill. They blend glass aggregate with gravel mix traditionally used for this purpose. They struggled to find enough footpaths that needed resurfacing and are not currently producing glassphalt due to the current, poor economics (without incorporation of a diversion fee)

- **Blackhead Quarries** (Tony Hunter¹⁴)

Blackhead Quarries were crushing glass for Envirowaste in Dunedin using a hammer mill. They hoped it would go into house foundations. It is still at an experimental stage as they are competing with an aggregate price of \$28/tonne.

- **Fulton Hogan** (Geoff Hemm¹⁵)

Fulton Hogan has done extensive research and has trials in place at present that could potentially use all waste glass in South Island as roading aggregate. See section 10 for more information on this initiative.

- **Steve Rout Contracting** (Hannifi Dennison)

Steve Rout Contracting receive glass from OSWS in Queenstown from public drop-off. They experimented unsuccessfully with glass crushing recently and the end product ended up in clean fill. Queenstown Lakes District Council has various ideas on how to use recycled glass – one of which was in drainage fields for new wastewater treatment plants. This would have required significant quantities of glass sand (potentially 500 tonnes per drainage field) but has not been proceeded with due to cost implications. Steve Rout are now storing glass at a site near the river outside Queenstown to run further trials.

- **Miranda Hill and Sandy Anderson (Central Otago)**

Miranda and Sandy are preparing a business plan for a venture that would produce a decorative product from recycled glass. The venture is confidential at this stage but would require up to 10 tonnes of glass a week.

- **Mike Olsen (Central Otago)**

Mike has applied for a preliminary patent for a process producing decorative building material. It is in its final stage of testing and, according to Mike, has the potential to use all of Alexandra's waste glass.

¹³ Phone 03 488 5642

¹⁴ Phone 0274 360 041

¹⁵ Contact details (03) 547-9789 Geoff.Hemm@fh.co.nz

6 Refillable Versus Single-Use Containers

6.1 Refillables in New Zealand

The most preferred option in the International waste hierarchy is reduce, followed by reuse and recycling - and finally disposal¹⁶.

Refillable beverage containers represent possibly the best solution for reducing packaging waste. Before 1960, locally owned and operated refilling systems were the standard way of delivering soft drinks, milk and beer in New Zealand. When purchasing a soft drink at the store, people would pay a deposit on the bottles. The store would refund the deposit when the bottle was returned and it would be returned to the bottling plant to be washed and refilled. A soft drink bottle could make 21 such trips. Although the technology has advanced significantly since 1959, the basic processes of refilling systems have remained the same.

Unlike New Zealand, countries like Denmark, Finland and the Canadian province of Prince Edward Island have kept their refilling systems and a high proportion of soft drinks are still packaged in these containers. Policies have also been put in place in Norway, the Netherlands, Belgium and Germany to preserve and protect refilling¹⁷.

Lack of protection in New Zealand, along with a concerted effort by major manufacturers to introduce one-way packaging has seen the demise of locally owned and operated soft drink manufacturing and with it the bottle washing industry. As Richard Tong explains: "*The Bottle Collection Association (BCA) closed down around 1990. The final death knell for the bottle washing industry came when Edwards Enterprises closed down their bottle washing operation in West Auckland around 1994*"¹⁸.

While legislation to promote use of refillable containers is the best option from a sustainability point of view, decline of the local soft drink industry means that on a national level we may have to look at the next best option, legislation to promote recovery for recycling as an immediate goal, while continuing to investigate options for re-introducing refillable containers.

Refillable containers tend to favour short, local supply chains while single-use containers tend to favour long supply chains. The former provide more local work and business opportunities than the latter so regardless of the pros and cons environmentally, there is a local economic development argument in favour of refillable containers.

6.2 The Demise of Refillable Milk Bottles in the South Island

The demise of refillable milk bottles in the South Island (25,000 of which are washed and reused every day) which occurred while this report was being written, is an example of industry passing costs on to ratepayers. It is also a direct challenge to the principle of Extended Producer Responsibility expounded in the New Zealand Waste Strategy and the concept of Product Stewardship espoused as an objective of the 2004 Packaging Accord.

¹⁶ From the New Zealand Waste Strategy, 2002

¹⁷ Reduce, Reuse, Refill! - www.gm.org/beverage/refillables/refill_report.pdf

¹⁸ Richard Tong, Environmental Consultant, Phone Conversation 14th June 2004

Many of the environmental arguments put forward by beverage industry brand owners in favour of single-use containers are being challenged by organisations carrying out independent research. This from the Container Recycling Institute¹⁹:

“The manufacturing of non-refillable, one-way glass, aluminium, plastic and bi-metal containers is an energy intensive process that depletes our mineral resources, pollutes air and water resources, and generates millions of tons of post-consumer waste each year. Replacing one-way beverage bottles and cans with refillable bottles conserves energy and natural resources, and reduces waste at the source.”

“Several industry-funded studies confirm this fact. For example, a 1989 study conducted for the National Association for Plastic Container Recovery (since renamed the “National Association for PET Container Resources”), found that a refillable glass bottle, used as few as eight times, consumes less energy than any other container including recycled containers. The study further found that the 16 ounce refillable bottle produces the least amount of waterborne waste and the fewest atmospheric emissions of all container types.”

“With few exceptions, industry has been unwilling to promote refillable bottles, claiming that customers prefer the convenience of one-way disposable cans and bottles. A growing chorus of decision-makers in government, industry and the environmental community is advocating the promotion of reusable packaging to help stem the ever-increasing volume of post-consumer waste.”

It is perhaps understandable that the Packaging Council has been silent during the debate surrounding Meadow Fresh’s ending of refillable milk bottles. It is notable however that the Governing Board of the Packaging Accord has remained silent while a company has moved away from one of the most sustainable forms of packaging (re-usable glass bottles) to one that will result in considerable quantities of material going to landfill. Enquiries for this report found no pre planned system for recovery or recycling of the new packaging that, as one recycler put it, *“is a mixed media carton (plastic/card) combo that bears all the symbolism traditionally associated with recyclable packages – it is very confusing for the public, a real backward step”*.

The lack of a planned system for recovery of a new type of container leads to the assumption that Meadow Fresh have calculated that the community will pay the cost for its disposal without complaint.

¹⁹ <http://www.container-recycling.org/glassfact/reducing.htm> Another good website is the Greeneyes website <http://www.grm.org/beverage/refillables/ecologic.html>

7 International Trends

7.1 Recycling Rates

The New Zealand Packaging Council estimates that nationally, 48% of container glass is recovered. This is low compared with return rates in places where Container Deposit Legislation (CDL) has been implemented. For example:

- South Australia - 86% (with 600 people employed in independently run collection depots and other Infrastructural facilities).
- British Columbia - 60.6%
- Alberta – 81.3% (programme run by the Beverage Container Management Board which employs 1,500 people in its collection infrastructure)
- Saskatchewan, Canada – 82.9% (programme run by the Saskatchewan Association of Rehabilitation Centres – which employs 365 people)

Container Deposit Legislation is proving to be effective at reducing packaging waste because it puts the responsibility for packaging back on producers and consumers.

As a comparison, the Canadian province of Manitoba has a multi-material system financed by non-refundable levies placed by government on the distributors of disposable beverage containers. This “enviro-levy” of 2 cents per container is used to fund municipal multi material recycling programmes. The return rate for glass containers in this province is 39%.

7.2 Support Organisations

A large amount of research is going on all around the world to find new uses for recycled glass. This has been occurring at the local level as community groups, private businesses and councils grapple with the problem, and at national and state level where significant resources have been made available in some countries.

In the UK, landfill levies fund a ‘government organised, non governmental organisation’ called the Waste and Resources Action Plan (WRAP) whose specific role is to, *“accelerate resource efficiency by creating efficient markets for recycled materials and products, while removing barriers to waste minimisation, re-use and recycling.”* For more information see www.wrap.org.nz

Similar support organisations exist in Australia – such as Victoria’s Sustainability Victoria (formerly EcoRecycle) - www.ecorecycle.sustainability.vic.gov.au and South Australia’s Zero Waste South Australia – www.zerowaste.sa.gov.au

The only comparable organisation in New Zealand is the Recovered Materials Foundation (now TerraNova), established by Christchurch City Council and funded by a landfill levy. See www.terranova.org.nz.

8 Barriers and Enhancers to Glass Recycling in Otago

Glass recycling is a major problem for communities and recyclers all around New Zealand at the moment, but Otago faces some particularly difficult barriers.

8.1 Barriers

Distance to Auckland

Otago is the most distant region (apart from Southland) from the ACI-OI plant in Auckland and faces the highest transport costs. Transportation costs are increasing as a result of increasing oil prices and this, allied with the recent drop in price for glass cullet has made it increasingly uneconomic to ship glass to Auckland.

Low Landfill Charges

Otago's low landfill gate fees (\$40 - \$100 per tonne) work against glass recycling because recycling competes with landfilling as a disposal option. Higher landfill charges would provide more incentive to keep glass out of landfill.

Lack of Funding

Despite high tourist numbers, Otago has a comparatively small rating base which means Council funding for recycling schemes has to go a long way. The community is, in effect picking up the tab for manufacturers and consumers of packaged goods. This happens all over New Zealand but its effect is particularly acute in places with a large transient population.

8.2 Enhancers

Despite the barriers to glass recycling in Otago, there are some strong local factors that enhance recycling.

Existing Resource Recovery Network

Otago already has an established network of community, business and council resource recovery facilities that can collect and process glass. Although not formalised as a network, this is how it operates, with good communications and working relationships between the operators. The region is probably one of the best serviced in the country in terms of localised infrastructure and has an excellent base upon which to build.

Proactive Regional Council

Otago Regional Council has taken a leadership role in the glass issue by providing funding for the current project and participating in workshops and discussions. Regional Councils can play a vital coordinating role in waste reduction issues but there are different levels of involvement around the country. Otago is fortunate that ORC has seen fit to become involved.

Public Pressure to find a Solution

Otago locals want to recycle and want to find solutions to the glass issue. This was borne out by high attendance at the recent public meetings. This public pressure is a strong incentive for councils to support solutions.

Local Ownership of the Problem

Apart from an expectation that producers will play their part by taking their share of responsibility for waste they create, Otago people do not expect anyone else to solve the

problem for them. There is a high degree of local ownership of the problem and an understanding that waste glass is a local asset that can be used to the region's advantage.

Tourism

Tourists visiting the Otago region come to experience the clean environment and expect to be able to recycle. Initiatives that show the region is handling materials in a sustainable manner enhance its image and reputation. Conversely, poor handling of materials has the ability to damage this major contributor to the Otago economy.

Increasing Energy Costs

Although Otago's distance from the ACI-OI plant in Auckland is a barrier to recycling it also enhances the region's potential to develop sustainable solutions. Energy costs, while they are increasing, do not yet reflect the true environmental costs of transportation. The pressure of rising energy costs is helpful in that it is steering the development of local solutions that are inherently more sustainable in the long term than long distance solutions.

Zero Waste Goals

All councils within the Otago region (apart from Clutha) have adopted Zero Waste goals which provide a strong incentive to find a sustainable solution for glass.

9 Key Principles

The following principles can be used when developing uses for recycled glass. Each principle reflects a slightly different aspect of sustainability, but all are in agreement.

9.1 Reduce, Reuse, Recycle

The internationally accepted waste hierarchy, Reduce, Reuse, Recycle, followed by residual management, highlights the fact that the most sustainable solution for glass is to reduce the amount used in the first place, followed by the use of refillable containers. Recycling glass at the end of its life is the last option for consideration from a sustainability point of view.

9.2 Closed Loop Recycling

Systems that capture wasted materials and feed them back into the manufacture of the original product (eg glass containers to glass containers) are inherently more sustainable than systems that down-cycle materials into 'lower' uses.

This doesn't take into account, however, the energy required to transport recovered materials to a manufacturing site. Because there is only one glass manufacturing plant in New Zealand, closed loop recycling is a less sustainable option for South Island recyclers than those in the north.

9.3 Proximity Principle

Nature follows the proximity principle by ensuring the maximum number of needs (for each organism) are met within the shortest distance. This means short supply chains with few long distance transactions. From a local development point of view it is often said, "the closer you are to the problem the more likely you are to solve it". For resource recovery, the proximity principle suggests that we seek "the highest use (for used materials and products) within the shortest possible distance".

9.4 Diversity Principle

A fundamental principle of Ecology is that 'diversity (or complexity) lends stability. The more diverse and complex a system is, the more stable it is and more able to withstand shocks. The diversity principle suggests that we need complex and flexible options for dealing with wasted resources as opposed to relying on large, simple, capital-intensive structures.

9.5 Local Economic Development

Recycling systems that create local jobs and business opportunities help create sustainable local economies. Materials that have been recovered from the waste stream are local resources that can be translated into jobs, not only through the recovery process, but also in the processing and remanufacturing processes.

"Recycling is an economic development tool as well as an environmental tool: there are 10 times as many jobs just sorting recyclables and 25 times as many jobs remanufacturing from recycled materials." Neil Seldman, President, Institute for Self Reliance.

9.6 Precautionary Principle

Where there is a threat of serious or irreversible damage, lack of scientific certainty should not be a reason for postponing cost-effective measures to prevent environmental degradation or potential adverse health effects – or, "it's better to be safe than sorry".

9.7 Polluter Pays

The individual or entity that produces a waste stream should be the one that pays for its disposal. User pays is an associated concept that is favoured amongst policy makers around the world for allocating costs of landfilling and even recycling.

9.8 Extended Producer Responsibility

Producers have a degree of responsibility for their products throughout the product's lifecycle, from production through to final disposal.²⁰

9.9 Volume versus Value

When dealing with a high volume waste stream such as glass it is necessary to develop at least one high volume use to soak up the bulk of the material. The end product may be of low value but it is essential to develop high volume uses, at least as a temporary measure, to keep the material out of landfill. A range of higher value uses can be developed over time, but in the short term they are likely to require only small volumes.

It is advantageous for the high volume, low value uses to be flexible - that investment in technology and/or systems is not so large that it precludes the development of higher value or more sustainable uses in the future. Roading and construction fit these criteria well because while they can absorb considerable amounts of glass, they can also continue to operate seamlessly without it – thus giving the required flexibility.

9.10 Maintaining Material Value for Future Use

Maintaining the integrity of resources for future use is critical. If materials are recovered from the waste stream, only to be used in such a way that they are unfit for future use, it may be better for them to be land-banked. A number of recycling initiatives save materials from landfill, but then bond them with other materials or treat them in such a way that they have to be landfilled at the end of their life - the reprieve was temporary. An example is using recycled PET bottles to make clothing which, when discarded, are still landfilled.

²⁰ From the New Zealand Waste Strategy 2000

10 Uses for Recycled Glass

Following is a list of potential uses for recycled glass researched from local recyclers, overseas literature and local manufacturers. Further detail on some of these uses can be found in the 'Market Study for Recycled Glass in the South Island' report²¹.

The uses have been split into two broad categories, 'high volume – low value' and 'low volume – high value' to give an indication of the amount of glass that each initiative might require.

10.1 High Volume Low Value Uses

Remanufacturing Containers

The most obvious use for recovered glass is to remanufacture it into new containers. As noted previously ACI-OI do this at their Auckland plant and are the principal user of recycled glass in New Zealand. However, no glass is currently being sent from Otago due to the recent drop in price for clear cullet, increasing transportation costs and ACI-OI's increasingly stringent contamination standards.

Construction Aggregate

Glass can be used as a replacement aggregate in a number of construction applications²².

- Backfill

It is used as fill material overseas for pipe bedding, site grading, under concrete slabs, behind retaining walls etc.

- Concrete (Glasscrete)

Recycled glass aggregate can also be used in concrete (glasscrete). Potential exists for deleterious chemical reactions to occur however, which affect concrete strength. These include alkali-silica reaction – which can be avoided²³ and sugar contamination from the contents of used containers.

- Asphalt (Glassphalt)

Glassphalt is basically the same as conventional hot-mix asphalt, except that 5% to 40% of the rock and/or sand aggregate are replaced by crushed glass. Trials have met Transit New Zealand's' specifications. It was used extensively in 2004 in Invercargill, was but discontinued for economic reasons.

In the UK there has been a rapid increase in the use of recycled glass aggregate over the last few years and this is predicted to continue. A tax (around 15%) on virgin material has played a big part in this.

- Roothing

Glass is used as a replacement aggregate for rooding in the UK and USA and there is extensive research supporting this application.²⁴

In New Zealand a number of local trials have been undertaken using crushed glass aggregate mixed with natural aggregate for rooding. The main impediment to its use in New Zealand is that overseas data has not been sufficient to give either Transit New Zealand

²¹ Author, Chris Thomas. Downloadable from www.zerowaste.co.nz

²² See Appendices for further information

²³ Enviro, 2002. Recycled glass market study and standards review – 2003 Update, WRAP. www.wrap.org.uk

²⁴ For example see the WRAP website www.wrap.co.uk

(responsible for national roads) or local councils (responsible for roads in their territories) the confidence to approve its specification.

Fulton Hogan²⁵ (the parent company of Envirowaste) has recently expressed its interest in doing trial work to generate data enabling glass to be specified as roading aggregate. The company has indicated that it would accept and crush glass locally at its existing quarrying and crushing plants around the South Island. By crushing locally they would avoid the need for centralised processing plants and because existing equipment (in the main) would be used, they would not be significantly affected if better technologies or uses for glass emerge in the future. They are looking at accepting glass from anywhere in the South Island for which there is no other use. They do not want to compete with existing users such as TerraNova for raw material.

Fulton Hogan has made formal approaches to the Packaging Council and MfE for funds to undertake a Pilot Project in Nelson, which consists of two stages:

- a) Undertake lab tests in late 2005 to develop the best methodology and operating parameters.
- b) Follow with the construction of a road incorporating glass aggregate in early 2006. Information generated from this pilot project will then be provided to Transit New Zealand and Local Government New Zealand. If favourable, the results will be able to be used around the country²⁶.

They are also seeking financial partners to extend glass crushing over the whole South Island because although processing costs will come in well under the cost of landfilling glass, funding will still be required to cover costs. If the trials go according to plan, they could commence processing glass South Island-wide from March 2006. They also plan to expand into the North Island where, although transportation of glass to ACI-OI is cheaper, aggregates are in shorter supply.

Advantages of the Fulton Hogan proposal:

- It is effectively a “one stop shop” solution, as Fulton Hogan is prepared to accept responsibility for all glass waste produced, as well as current stockpiles.
- Processing could start in the very near future.
- Glass would be used locally in a manner which has a relatively low energy trail.
- Replaces use of a non-renewable natural resource.
- Requires little or no capital or human resource investment from councils.
- Stockpiling can continue as usual at recycling facilities, with no change in the type of glass accepted, and no need for sorting
- There is no problem with contamination with pyrex, window glass etc
- Fulton Hogan is willing to work with other users of glass cullet and does not wish to control the market.
- Existing facilities would be used so less capital requirement
- Fulton Hogan would not be dependent on an ongoing supply of glass and if a better, more sustainable use for glass emerges, could substitute with traditional aggregate

Disadvantages:

- Fulton Hogan may expect a relatively high investment per tonne from financial partners such as local councils. Negotiations around this point will be vital to the success of this project.

²⁵ There are other roading contractors considering similar initiatives. Fulton Hogan's proposal appears to be the most advanced but this has yet to be confirmed .

²⁶ For further information contact Geoff Hemm, Project Manager, Fulton Hogan. (03 547-9789)

Communities too far from Fulton Hogan's crushing facilities could still link in to the initiative by setting up their own low tech crushing plant (depending on aggregate specifications etc). John Ransley, former Manager of Innovative Waste Kaikoura has devised a simple but effective method for crushing glass utilising a second hand roller, a front-end loader (most sites would already have one of these) and a specially designed concrete bunding. The cost of this low tech system would be around \$6,000²⁷ with an operating cost of around \$8 per tonne.

Fibre Glass Insulation

Manufacturers of fibre glass insulation are able to replace a large percentage of their raw material with recycled glass, leading to energy savings in the production process and reduced demand for raw materials. The process is relatively insensitive to colour so mixed cullet can be used.

In New Zealand, Tasman Insulation New Zealand Ltd, the manufacturers of Pink Batts, use 80% recycled feedstock in their product which is sold in local and export markets with plants in Auckland and Christchurch. Although container glass can be used in the Auckland plant, window glass is preferred and this is sourced from contractors who pick up offcuts and broken glass from manufacturers/ suppliers such as Pilkington, Metro Glass etc. These contractors sort and crush for Tasman. The Christchurch plant only uses flat glass.

Although there does not appear to be much opportunity for recyclers to supply container glass, to Tasman there is potential to supply window glass²⁸.

Foam Glass Insulation

Foam glass, also referred to as cellular glass, has been manufactured for a number of years mainly in the USA and continental Europe as a lightweight, high strength insulating material, either as blocks and shapes or as loose replacement aggregate. It is produced by generating a gas in glass at high temperature, which produces a porous material suitable for a number of construction products, eg loose fill, insulation, blocks and slabs. It has characteristics of low flammability, thermal stability and high chemical durability and contains no fibrous material. It was originally produced using virgin material but there are currently a number of companies using up to 98% post consumer waste glass in their product.

Foam glass is best suited as a rigid insulation material. Due to its excellent structural properties it is suitable for use as insulation in roofs, walls and traffic areas such as flat roofs or floors.

The material is not manufactured in New Zealand but a Christchurch company has expressed an interest in setting up a plant

Heavy Clay Industries

Investigations are underway in the UK into the use of recycled glass in the heavy clay industries in the manufacture of products such as bricks and tiles. Recycled glass is used as a fluxing agent, lowering the top firing temperature and reducing emission of harmful gases such as hydrogen fluoride and the greenhouse gas, carbon dioxide.

²⁷ For further information contact John on 021 0564571

²⁸ For further information contact Alistair Meadows in Auckland (09 525 9818) or Darren Thornton in Christchurch (03 349 9059).

Landfill Cover

Crushed glass has been used here and overseas as intermediate landfill cover. Processing requirements are low as there is no need to screen out contaminants or meet grading standards.

Abrasives

The performance of recycled glass grit as an abrasive has been extensively tested in the UK and the USA. Tests have shown that the material is suitable for a wide range of blasting applications and is suitable as a replacement for traditional abrasives such as copper slag, olivine, garnet or sand. It has comparable or superior performance benefits over many of these traditional materials. One key advantage crushed glass has over sand is that it is safer to use, containing less than 1% of the silicosis-causing crystalline silica. Both recycled container glass and flat glass are suitable and there is no need for colour separation.

In New Zealand, Terra Nova (formerly the Recovered Materials Foundation) produces a number of grades of 'Blastglass' for abrasive blasting. A number of other South Island businesses manufacture glass abrasives for their own use.

Filtration Media

Crushed recycled glass is used successfully as a sand replacement filter material for swimming pools, fish farms and industrial wastewater treatment plants. TerraNova produce two grades of 'FilterCrystal' for swimming pool and spa pool filtration.

Sports Turf Soil Conditioner

Finely crushed recycled glass is being investigated overseas for use as a soil conditioner in sports turf to improve drainage characteristics – particularly in golf courses. It is also used as a sand replacement in bunkers.

Lime Mortar Aggregate

Lime mortar/plaster that uses recycled glass as an aggregate instead of sand is currently being tested in the UK with a view to gaining full certification. Traditional lime mortar/plaster currently is mostly used to renovate old buildings, but it is increasingly being used as an environmentally-friendly option in new buildings. The new product could have exactly the same applications, such as internal plasters, external renders, and for building and pointing mortars. In addition the appearance of a product containing glass aggregate could offer possibilities for other uses, for example decorative applications such as flooring screed.

Export

Potential exists for crushed glass to be exported to overseas markets. Sheryl Stivens from Mid Canterbury WasteBusters has located a customer for clear cullet who wants 10,000 m³ and is prepared to pay for freight out of New Zealand. She has negotiated a reasonable price and all clear glass is acceptable, including window glass, drinking glasses etc. South Island recyclers are invited to provide cullet to fill this order²⁹.

ACI-OI have recently been back-loading excess glass cullet to Australia. There is potential³⁰ for glass to be back-loaded to Australia directly from the South Island. The question that has to be answered, to which ACI-OI does not currently have an answer, is whether Australia will accept non-beneficated (ie decontaminated) glass.

²⁹ For further information contact Sheryl - mcwastebusters@clear.net.nz 021 9278328

³⁰ According to Gary Shuttleworth from ACI-OI

Beach Sand

In 2003 Mid Canterbury Wastebusters produced a “Crystal Beach” at a local lake from sand made from crushed recycled glass³¹. The cost of producing the sand was quite high. However the cost may not prove so prohibitive if the avoided cost of dredging and transporting sand to beaches being reclaimed (as is happening in Auckland and Wellington) is factored in³².

Vineyard Mulch

Crushed glass is being used as a reflective mulch and weed suppressant around the base of grapevines. It has frost reduction capacity and, being heavy (particularly the 10mm grade), is resistant to migration. Trials are currently being carried out by Lincoln University into its effectiveness³³. The research to date looks promising and if trials prove successful reasonably large volumes of glass could be required by 2007/2008.

10.2 Low Volume High Value Uses

Tiles

Recycled glass is used overseas in the manufacture of decorative ceramic tiles. In New Zealand, TerraNova has been working on this for a number of years and is currently developing a pilot plant. While the initial requirement for glass may be small, potentially up to 3,000 tonnes per year could be required.

Art Glass

Recycled glass can also be used for a number of other high value decorative uses including tableware, bench tops, mosaics and art works.

Colour sorting is obviously crucial for decorative purposes. The volumes used will never be huge, but high value products are produced by a highly skilled labour force. The products have special appeal to customers with an interest in sustainability and the production facilities can become tourist attractions in their own right..

See Appendices for information on Counter Production Ltd (Berkeley, California), Fire and Light Originals (Arcata, California), Marvel Glass (NSW, Australia) and Recycled Glassworks (San Francisco, California).

Landscape Aggregate

Decorative glass aggregate can be used for landscaping purposes. It generally has to be tumbled to remove sharp edges and screened to fit a tight particle size range – maximum 20mm. The amount of recycled glass required for this purpose is likely to be quite small and would also be fashion dependent. A small amount of decorative glass chip is currently imported into New Zealand.

³¹ For more information see www.wastebusters.orcon.net.nz/crystal-beach.html

³² Tonkin and Taylor are apparently investigating these costings

³³ For more information contact Prof. Glen Creasy creasyg@lincoln.ac.nz

11 Conclusions

11.1 Overall Conclusion

Initial planning for this project, and much of the initial research, focused on ways of utilising glass in Otago. These were largely technical solutions that would soak up various amounts of used glass.

It became apparent from the community meetings and subsequent research, that whilst technical issues relating to utilising recycled glass are important, they could not take precedence over discussion on the wider issues relating to the sustainability of glass packaging.

Taking this approach, the research and investigations for this report led to the following overall conclusion:

The only long term sustainable solution to the problem of utilising discarded glass in Otago, and in other regions, is to take a systemic approach that captures all glass (for reuse, remanufacture or recycling) and puts the responsibility for the cost of doing so on brand owners and glass users.

This overall conclusion is the bottom line of this report and the basis upon which the remaining conclusions are made.

11.2 Secondary Conclusions

11.1 Glass is a Problem Waste but not a Hazardous Waste

There are environmental impacts from the extraction, manufacture, transport, filling, marketing, selling and disposal of glass, but although these are important environmental issues, glass when stockpiled or even landfilled is not a hazard to human or environmental health. There are more harmful and costly problems that need addressing such as organic waste and product waste (especially e-waste). However glass has come to the forefront because of the inability of the players involved to come up with long term sustainable solutions - notably only one year after the signing of the second Packaging Accord.

11.2 The Glass Problem is an Economic Problem

As an economic problem, the issue of glass recycling is relatively simple to solve. It simply gets down to deciding who should pay for it to be recycled or reused; the wider community at the end of the supply chain, or the original manufacturer and user of the product.

In keeping with the principle of Extended Producer Responsibility espoused in the New Zealand Waste Strategy, brand owners have prime responsibility for the full life cycle of their products. They can pass these product stewardship costs on to their customers ensuring that the user pays, rather than the whole community, regardless of whether they actually used the product.

A survey³⁴ reported in the New Zealand Packaging Accord 2004 – One Year Progress Report, showed that the general public agrees that consumers and manufacturers (or brand owners) should pay. When asked ‘Who should be responsible for minimising the environmental problem of packaging?’, 53% of respondents identified the public (consumer) and manufacturers or brand owners,, significantly ahead of other sectors including local government.

³⁴ The survey was carried out by the New Zealand Paperboard and Packaging Association (NZPPA)

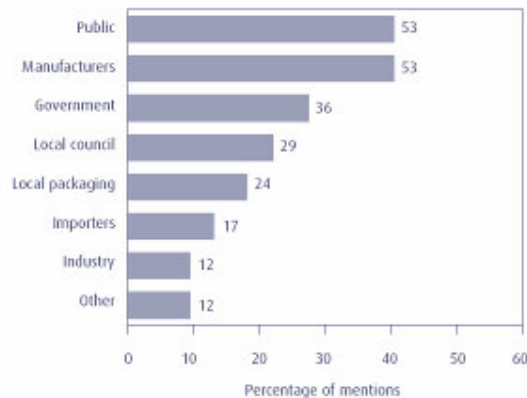


Figure 5 Responses to the question 'who should be responsible for minimising environmental pollution?'

11.3 There is a Disconnect Between Community Concern and Brand Owner Actions and Objectives

The research for this project highlighted an apparent disconnect between community aspirations and expectations on the one hand, and industry (brand owners and retailers) actions and attitudes on the other hand.

A closer look at the makeup of the organisations and groups set up to deal with the glass issue, including the Packaging Accord Governing Body, helps explain this disconnect between the two major stakeholder groups. The direction and mechanisms for solving the problems of packaging waste are almost entirely controlled by industry and industry interest groups. There is little or no community or environmental group involvement in PacNZ, GRAG, EBAG, GUG or even in the Accord itself. This tight control of all processes relating to the implementation of the Packaging Accord means that vested interests have a more or less concerted voice and influence whilst community have theirs indirectly via Local Government New Zealand, the Ministry for the Environment and RONZ who each hold one seat on the eight member Governing Board of the Packaging Accord. Packaging Council members hold the majority with five seats.

This exclusion of the general public who are the consumers and users of glass is institutionalised in the Packaging Accord 2004 which states that: ***"The Packaging Accord (the Accord) is a voluntary product stewardship agreement bringing together key players from throughout the packaging life cycle: the packaged goods industry, central government, local government and recyclers."***

The largest and most important 'key player' in any supply chain is the end user. All of the products and all of the development, branding, marketing, consumer research, logistics and sales are geared at this single sector – yet they are completely absent from the Governing Board. The question must be asked whether this an accidental oversight, or a deliberate exclusion because consumers appear to want something quite different to manufacturers and owners – some direct form of Extended Producer Responsibility.

The communities consulted for this project through public meetings gave clear and consistent messages³⁵. They want glass kept out of landfill and used in some way for the

³⁵ Listed in Section 1

community's economic benefit. They want brand owners to take responsibility for the costs of recovery and reuse or recycling of their products. People know that they may have to pay a few cents more for the privilege of having a systemic recovery system but there is wide acceptance of this reality.

There seems however to be a consistent and unified reluctance on the part of industry (brand owners, retailers) to embrace any sort of systematic product stewardship programme. In fact the Packaging Council states the following on its website:

"The Council strives to ensure that the New Zealand packaged goods industry addresses on a voluntary basis, those issues relating to packaging usage and waste which have, in many other countries, resulted in legislative actions with costs to both producers and consumers"

This statement could explain why two topics, the reuse of beverage containers and Container Deposit Legislation (CDL) are not discussed in any of the literature relating to the Packaging Accord. This, in spite of, the well documented successes of CDL, the sustainability of current reuse operations in the South Island, and community interest in these options.

11.4 Glass is the First Big Test for the Packaging Accord

The temporary glass levy is an example of product stewardship. It is difficult to determine if the existence of the voluntary Packaging Accord was a significant influence in the final decision to set up the levy. The Ministry for the Environment appears to have played a hand in influencing this decision and it could have happened without the Accord. The Accord certainly didn't stop the crisis of glass recycling occurring in the first place. The temporary glass levy is, however, a weak form of product stewardship for three reasons:

1. It was voluntary, enabling freeloaders to avoid participation (Independent Liquor was one major example)
2. It was not a systemic solution to the problem. It required intervention because of a system breakdown and was only temporary, thus requiring further interventions.
3. The interventions did not involve the community or environmental stakeholders

In fairness, the 2004 Accord has only just completed its first year and Government is apparently giving it time to prove itself before resorting to the back-up legislative options it promised in the event of non-performance.

Regardless of whether the Accord passes the test on glass, it could be improved significantly and suggestions for this are made in the following Strategy Recommendations.

11.5 Short to Medium Term Solutions to the Glass Problem Should be Adopted, Within a Long Term 'User Pays' Goal.

A strategy for Otago is required that will provide short term outcomes without compromising options for the long term. The immediate goal will be to ensure that all glass is diverted from landfill in Otago and utilised for existing purposes or stockpiled for future use. The strategy should at the same time have an overriding objective of achieving best practice Extended Producer Responsibility. The strategy would deal with the immediate problem and capture all glass, then find uses for the material collected whilst working towards long term solutions.

12 STRATEGY RECOMMENDATIONS

The over-riding impression gained during the research for this report is one of confusion and frustration that, in spite of all the discussion about Product Stewardship, recyclers and the wider community are still bearing the brunt of the costs associated with packaging waste, including glass. Costs are still not being adequately shifted to brand owners and users.

The solutions proposed in this report are mostly known to those involved in glass recycling in Otago. This section brings the various solutions together into an action plan that can be implemented immediately and over the long term.

12.1 IMMEDIATE ACTION (2005)

12.1.1 Notify Stakeholders of an All-Party Meeting on the Glass Issue in Early 2006

Before Christmas, Central Otago Recyclers could write all stakeholders involved in the South Island glass issue inviting them to a meeting in early 2006. The letter will state that the Community Recyclers and the public are dissatisfied with the current industry-led approach and want representation as well as sustainable long-term solutions. If industry and other key stakeholders do not engage with the group, the group will be forced to take action to ensure the issue becomes a media and political issue.

Groups that could be invited:

- Packaging Council of New Zealand
- Ministry for the Environment
- Environmental Beverage Action group (EBAG)
- Glass Recyclers Action Group (GRAG)
- Glass Users Group (GUG)
- Local Government New Zealand
- Community Recyclers Network
- South Island Councils and recyclers
- Potential glass users (eg Fulton Hogan)
- Local MPs

12.1.2 Write to Packaging Council re Fulton Hogan Proposal

As soon as possible, encourage all South Island Local and Regional Councils, as well as glass recyclers to write to the Packaging Council in support of the intent of the Fulton Hogan proposal. Local trials are required to enable specification of glass aggregate as a roading aggregate and need to be started as soon as possible.

12.1.3 Apply for Funding from the Glass Fund

Before the end of January (when applications will be reviewed), Central Otago Recyclers should put a proposal to the Packaging Council to seek funds to hold the meeting in 2006.

12.1.4 Encourage and Support Other Applications to the Glass Fund

Before the end of January, Local and Regional Councils could encourage and assist local entrepreneurs to apply to the Packaging Council for seed funding to help establish local uses for glass.

12.1.5 Make Contact with LGNZ

Local and Regional Councils should contact LGNZ to pass on the Otago community, council and recycler concerns regarding the Packaging Accord, and ask for stronger representation on the Packaging Accord. Also, request that glass be raised as an issue at the next LGNZ conference in July.

12.1.6 Capture and Divert All Glass from Landfill

Continue to collect and divert glass from landfill while all of the above is taking place. Glass can be stockpiled unsorted to keep costs low, in anticipation of its use as a roading aggregate in the near future (apart from high value glass for which there are existing markets).

12.1.7 Assist with Consents for Glass Storage

Regional Council will need to help local councils obtain consents to store glass and local councils may need to help local recyclers find locations to stockpile glass over the short term while bulk uses for glass are being developed.

12.2 ACTIONS FOR 2006

12.2.1 Hold All Party Meeting in February/March

Issues to be addressed at the meeting include:

- Inclusion of community and environmental interests on the Governing Board of the Packaging Accord or else establishment of an independent community/environmental action group on packaging³⁶
- Ongoing development of alternative uses for glass
- Lobbying for true Extended Producer Responsibility for glass
- Protecting and enhancing bottle refilling operations

The outcomes from this meeting will determine much of what follows

12.2.2 Actively Support Local, High Volume Uses for Glass

Research undertaken for this report revealed a number of high volume low cost uses for glass, some of which could be suitable for Otago. These include:

- Construction aggregate (backfill, concrete, glasscrete etc)
- Roading aggregate
- Abrasives
- Filtration media
- Sports turf conditioner
- Vineyard mulch
- Export overseas

The most promising of these in terms of their ongoing requirement for large volumes of glass and the timeframe in which they could be established is roading aggregate. A number of interests are investigating this use but it appears that Fulton Hogan's proposal is the most advanced³⁷.

³⁶ The Kangaroo Alliance in Australia is such an Group

³⁷ Discussions with John Webber indicate that two applicants (including Fulton Hogan) have made applications to the Glass Users Group (GUG) for funds to develop glass for use in roading.

Using glass as a roading aggregate is not the panacea to Otago's glass problem as it does not address the glass problem at source. But it would provide a breathing space while other solutions are being developed and, once they are developed, would provide an ongoing 'sink' for glass that cannot be used more sustainably.

The main requirement for getting the Fulton Hogan (or a similar initiative) up and running, once funding issues for the pilot project have been resolved, is finding a way to fund its establishment around the South Island. A combination of funding sources may need to be put in place to help establish the initiative for the long term. Funding options are outlined in section ¹³.

In the short term Local and Regional Councils should meet with Fulton Hogan (or other local initiatives if they emerge) as soon as possible to discuss their proposals and develop funding mechanisms.

Local Councils can also specify glass aggregate as a roading material in their procurement policies to encourage demand.

12.2.3 Actively Support Local, High Value Uses with Economic Development Potential

The highest priority is to develop high volume uses for glass that will economically divert it from landfill. Finding low volume, high value uses is a lower priority, but one that can be done while developing high volume uses, as different funding sources can be accessed (see section 13).

There are a number of individuals in Otago who are keen to establish businesses using recycled glass. With some start-up funding they could potentially create viable businesses that, while they may not use large volumes of glass, would add value which would flow back into their communities. Some initiatives could become tourist attractions in their own right (see Appendices for case studies).

Local and Regional Councils could assist these initiatives by helping to access funding and, once they are up and running, with promotion.

12.3 LONG TERM ACTIONS

12.3.1 Lobby Government for Extended Producer Responsibility

To have a real impact on the amount of glass going to landfill Extended Producer Responsibility needs to be introduced.

The Ministry for the Environment has recently released a discussion document on Product Stewardship³⁸. The report notes that, "*In the past, New Zealand had schemes that would now be classed as product stewardship. For example, the old system of deposits on bottles was a form of product stewardship. There are currently several schemes in New Zealand that incorporate elements of product stewardship, including the recovery schemes for vehicle batteries, whiteware and used oil, and the 2004 - 2009 Packaging Accord. All current New Zealand schemes are industry-led and participation is voluntary.*"

³⁸ Product Stewardship and Water Efficiency Labelling. New Tools to Reduce Waste, July 2005. Downloadable from www.mfe.govt.nz/publications/waste/product-stewardship-water-labelling-jul05/html/index.html

The MfE's preferred option for a Product Stewardship scheme is for voluntary product stewardship agreements with industry as, *"This retains the flexibility and strengths of the voluntary approach, and reflects concern that poorly designed regulation can be administratively expensive and result in significant efficiency losses in the economy."* *"Regulation would be considered only where no effective voluntary scheme could be developed and where there was a clear indication that there would be net benefit from such intervention."*

Table 7: The preferred approach (from MfE discussion document)

Features	The preferred approach will:	The preferred approach will not:
<ul style="list-style-type: none"> • Product stewardship agreements between industry and government • Legislation can regulate free-riders • As a backstop regulation could require industry to operate product stewardship schemes 	<ul style="list-style-type: none"> • Enable industry-led schemes • Allow a range of economic and other tools to be used to back up schemes • Provide certainty and a 'level playing field' for producers • Give government control over the performance of product stewardship activities, if necessary • Give clear performance expectations 	<ul style="list-style-type: none"> • Rely on industry leadership • Avoid regulation entirely - regulation may be needed for free-riders

The MfE's discussion document is encouraging in that it contains a balance between voluntary actions and legalisation and has provision to legislate to regulate free loaders. It also prefers not to rely on industry leadership alone and seems compatible with the introduction of some form of Container Deposit Legislation.

Container Deposit Legislation (bottle deposits) is an effective form of Extended Producer Responsibility and, as outlined in Envision's 2004 report, "Getting Serious about Packaging Waste"³⁹, one of the most successful programmes is run in South Australia.

Local and Regional Councils are in a position to lobby and potentially influence LGNZ (a key signatory to the New Zealand Packaging Accord) and other local and regional councils around the country for a full review of the Packaging Accord and to explore the potential of Extended Producer Responsibility programmes for New Zealand - including Container Deposit Legislation (CDL).

Local recyclers can work with other community and environmental organisations to raise awareness of CDL with the public and Central Government, including participating in national 'Bottle Bill days'

12.3.2 Encourage the Re- Introduction of Refillable Containers.

The reintroduction of refillable containers cannot be achieved quickly on a large scale due to the logistics of developing collection systems and infrastructure. Also, refillable bottles will not be suitable for many products, so there will still be large quantities of single use bottles for which recycling uses will be required. Nevertheless, reintroducing refillable containers

³⁹ Download from www.envision-nz.com

should be a long term goal for South Island councils, recyclers and manufacturers to aim for. Increasing oil prices may well play a big role in the future in making the economics of refillable containers more favourable.

In the meantime Local and Regional Councils can support the local refilling operations that remain.

Local recyclers and manufacturers can assist by building support for a national beer bottle and for the reintroduction of milk bottles.

13 Funding Sources

13.1 Avoided Landfill Disposal Costs

Some local authorities (such as Central Otago District Council) are already paying collectors an avoided disposal fee to stockpile glass. This concept could be extended across the region. The cost to landfill in the Otago region ranges from \$50 to \$100 per tonne (landfill gate or transfer station charges). The true cost of landfilling⁴⁰ is likely to be much higher. This real value of keeping a tonne of glass out of landfill should be assessed for the region to help decide the value of diverting glass and how much should be paid to fund alternate disposal options.

Funding from avoided disposal costs could be raised relatively quickly and would provide a strong incentive for collectors and processors to keep glass out of landfill. Councils would need to seek longer-term funding sources however as avoided disposal costs are still paid by ratepayers, not the manufacturers and consumers of glass packaging.

13.2 Sustainable Management Fund

The Sustainable Management Fund (SMF) could provide short-term funding to help establish regional initiatives.

13.3 Glass Levy Imposed by the Glass Users Group (GUG)

The Glass Recycling Levy imposed by the Glass Users Group, officially finished on October 31st but was extended just prior to that by one month (end of November). At the time of writing it is likely that the levy will be dropped in favour of the establishment of a “Product Stewardship Fund” which will be contributed to by importers, manufacturers, fillers, retailers and recyclers. It is rumoured that recyclers are asking not to be required to contribute because they are already carrying out a product stewardship function and cannot bear the additional costs as they are less able than other players to pass these costs on to consumers.

There is no set funding criteria for this fund. Applications should be sent to the Glass Users Group, care of The Packaging Council of New Zealand. They should contain information on:

- The initiative the funds will be used for
- The amount of funding sought
- The amount of glass the initiative would use

As a medium term solution the glass levy is an appropriate funding mechanism as it ensures manufacturers play their part in paying for the cost of recycling. To be effective for the long term it would need to be permanent, and a Producer Responsibility Organisation (PRO) set up to manage the levy and ensure it is sufficient to cover collection and processing costs. The Glass Users Group (GUG) has the makings of a PRO – it would need to be formalised with input from Government to ensure that a permanent, sustainable product stewardship approach was taken.

While this report was being completed, proposals to establish a Glass Product Stewardship Forum involving all players in the glass sector were put to the Governing Council of the Packaging Accord. Information is still sketchy at this point, but it will probably replace the role of the Glass Users Group and the Temporary Glass Levy with a fund to develop and bring to fruition alternative uses for glass. For further information, contact the Packaging Council of New Zealand – 09 271 4044 or go to the website, www.packaging.org.nz

⁴⁰ As outlined in the Ministry for the Environment’s report, ‘Landfill Full Cost Accounting Guide for New Zealand’

13.4 Regional Landfill Levy

A regional landfill levy could provide consistent long-term funding for glass diversion and processing. Local landfill levies are another option but there are significant benefits in dealing with levies at a regional level – especially as the Ministry for the Environment has indicated that it is unlikely to implement a national levy⁴¹. Waitakere and North Shore City Councils are currently pushing for a regional levy⁴² but have been taken to court by Waste Management Ltd and Full Circle on this issue. The court case will be held in February 2006, and if the councils are successful, it will open the door for other councils to follow suit. It may be that because of the low population density in the South Island, several Regional Councils could band together to create a pan-regional levy.

A regional landfill levy is fairer to the community than avoided landfill costs as it is a form of 'Polluter Pays'. However, it still doesn't ensure that brand owners pay their share of costs of disposal so it is still an interim measure for funding glass recycling.

13.5 BRANZ

BRANZ is a company owned by Building Research – which is an independent association owned and directed by the building and construction industry in New Zealand. The association collects the Building Research Levy which funds research and information transfer activities undertaken by BRANZ.

Building Research could potentially provide funds for BRANZ to undertake research into using recycled glass as a construction or building material (not roading). This work would need to be undertaken in conjunction with a non profit group.⁴³

For more information see www.branz.co.nz

13.6 Enterprising Communities

Enterprising Communities replaces the Community Employment Group and provides grants to non profit groups that are seeking to create jobs through new initiatives. Businesses or individuals can apply for funding if they apply in association with a non profit group. Activities funded include, salaries for key workers to deliver a project, costs of running the project (phone, photocopying etc), leasing equipment, staff training and insurance and ACC levies.

For more information see www.workandincome.govt.nz

13.7 Trade and Enterprise

New Zealand Trade and Enterprise provides support for business development, export development, sector development and regional development. Each of these areas has potential for Otago glass recyclers and users.

Start up businesses can access Enterprise Development Grants for capacity building (business mentoring, strategic business development etc).

At a regional level funding is available for strategic planning, capacity building, inter-regional capacity building and major regional initiatives. Proposals are developed by "communities of interest" working together for sustainable regional economic growth. The key is cooperation between a region's stakeholders and government.

For more information see www.nzte.govt.nz

⁴¹ Paddy Gresham, Waste Levy Panel Discussion, WasteMinz Conference, November 2005

⁴² See Appendices for proposed Auckland Regional Levy flowchart

⁴³ Information provided by Bill Irving, BRANZ, Auckland office

14 Appendices

Contents

- 14.1 Media Release Sent to Otago Radio Stations and Newspapers
- 14.2 Suitability of Glass as an Aggregate
- 14.3 Outline of Different Crushing Technologies, Advantages and Disadvantages, and Costs
- 14.4 Comparative Costs: Land filling, Transporting to OI and Crushing.
- 14.5 Procedure for Suggested Improvements
- 14.6 Art Glass Case Studies
- 14.7 Auckland Regional Levy Proposal
- 14.8 Auckland Regional Waste Levy Flow Chart
- 14.9 Acknowledgements
- 14.10 Links and Contacts

14.1 Media Release Sent to Otago Radio Stations and Newspapers

MEDIA RELEASE

PUBLIC INPUT SOUGHT TO HELP SOLVE OTAGO'S GROWING GLASS RECYCLING PROBLEM

A series of public meetings are being held next week to gather input and ideas on how to develop sustainable solutions to glass recycling in Otago. With stockpiles growing around the country, glass recycling is becoming an increasing problem for New Zealand communities. Landfilling is not a sustainable solution, and new solutions are being sought that will not only reduce Otago's glass mountains but also create local jobs and business opportunities.

The Community Recyclers of Otago and the Otago Regional Council are holding public meetings in Oamaru, Dunedin, Alexandra and Wanaka to gather ideas and input from anyone interested in developing strategies for the region. The meetings will be facilitated by sustainability planning group, Envision New Zealand.

Along with Otago many other communities around New Zealand and the world are grappling with the problem of recycling glass. A number of innovative uses are being developed, such as construction and roading aggregate, insulation materials, filtration medium, blasting material and high quality bench-tops, tiles, tableware and artwork. Overseas, in places like South Australia and British Columbia, the problem is being tackled at source through container deposit legislation – where 5 or 10 cents is added to the cost of drinks and refunded when the container is returned.

These and other ideas will be discussed at the meetings.

The meetings are open to everyone with an interest in the issue who would like to contribute.

Venues/Dates

Oamaru – Tuesday 25th October (7.30 pm Lindis Room, Brydone Hotel)

Dunedin – Wednesday 26th October (2.30 pm Otago Regional Council Chambers, 70 Stafford St)

Alexandra – Thursday 27th October (2.00 pm at REAP, Ventry Street)

Wanaka – Thursday 27th October (7.30 pm St Johns Rooms, Link Way)

For further information contact:

Clair Higginson (Central Otago Wastebusters) - 03 448 9948

Sue Coutts (Wanaka Wastebusters) - 03 443 8606

Marian Shore (Waitaki Resource Trust) – 03 434 0999

Warren Snow (Envision New Zealand) – 09 303 4746

14.2 Suitability of Glass as an Aggregate

Compiled by Craig Smith, Wanaka Wastebusters

Overview

Glass is a relatively new construction aggregate material. Glass aggregate can include up to 100% glass cullet. The term "glass aggregate" includes, 100% glass cullet, or a mixture of cullet and natural aggregate or glass-soil mixtures. It may also be called sand, gravel, chip, GAP (General All Passing) or Crusher Dust/Fines. Glass aggregate is durable, strong, and easy to place and compact.

Testing and trials in the USA and UK have demonstrated that crushed recycled glass can be successfully used in a variety of aggregate applications. This is supported by projects in Christchurch and Invercargill, which have confirmed that recycled glass can be used in a variety of non-structural fill applications, generally as a blend with natural aggregates for use in making asphalt. The key activities involved with creating aggregates are mining/extraction, crushing, screening and grading, drying and transportation. Market entry costs are low to moderate with the key capital requirements being crushers, screening and grading equipment and transportation systems. Existing machinery and equipment can usually be easily adapted to glass crushing operations. Glass crushing could easily be contracted out to existing aggregate manufacturers or second-hand machinery could be acquired.

Advantages of glass cullet aggregates

In general, glass aggregate is durable, strong, easy to place, and easy to compact making it suitable for a wide range of construction applications.

Disadvantages

The two major disadvantages of using glass are the health and safety issues associated with handling glass and potential movement of the compacted glass sub-base material with heavy traffic loads.

The Market Structure and Size

The aggregate industry is mature, with a large number of well-established local, national and international suppliers and uniform application of standards and product specifications. Many suppliers have their own quarrying and crushing operations.

Crushed glass aggregate is a substitute for these natural aggregates and therefore aggregate suppliers are potential competitors to marketers of glass aggregates. However, they are also obvious industry partners and wholesale customers for glass aggregates. The size of the market is unknown, but is substantial. For example a single medium to large commercial crusher could process up to 1,000t per day. There are at least 10 crushers of this size plus numerous other small machines operating in the South Island. This indicates the entire South Island used glass market would be less than 0.5% of the total South Island aggregate market.

Glass cullet can be used in various applications including general backfill, roadways, utility backfill, drainage media, and miscellaneous uses such as landfill cover. For each application, the material should be specified based on the cullet content, gradation, debris level, and compaction level. Criteria for developing the specifications for any aggregate rely on a combination of technical data and practical historical experience.

Generally minus 20mm grading is required to eliminate major safety hazards from sharp edges. Most aggregate applications can tolerate higher contamination levels from ceramics, pyrex, light bulbs etc without affecting the quality.

Pricing

In most areas of the South Island, natural aggregates (sand and shingle) are readily

available at relatively low cost, around \$10 - \$25 per tonne. The costs of crushing, screening and blending glass for aggregate applications vary, with rates as low as \$10-15 per tonne and as high as \$100 per tonne.

Market Barriers

There are two major barriers to increased use of glass in aggregates for road/highway construction:

1. Lack of Standards, specifications and general information

Glass cullet can be processed to conform to existing standards for gradation, debris level and compaction level. However there is a lack of agreed standards as to the level of cullet content for specified applications. Standards are being developed overseas based on testing and field trials, but standards have generally not yet been applied in New Zealand. Transit New Zealand sets roading construction standards and supports waste minimisation. Transit would support moves to incorporate glass cullet into roading aggregate specifications.

2. Competing natural products - low cost alternatives

Aggregate products are proven, reliable and meet existing standards and specifications. Glass is generally more expensive to process and blending increases the cost. In most cases it is unlikely that recycled glass could be collected, processed, and delivered to a construction site and compete with the cost of natural aggregate. However, if the right kinds of economic incentives are in place, glass aggregate could be a "relief valve" for excess collected material.

If the cost savings (i.e. landfill charges) and other benefits of waste diversion are taken into account, then glass and other processed aggregates can compete with natural aggregates. One approach here is to take account of the total cost of glass waste. Glass waste sent to landfill incurs dumping charges. If the contractor or council does not incur these charges, due to waste diversion there is a cost saving. The cost of reprocessing waste glass could take account of this cost saving. There are specific exceptions where local market conditions make glass economically viable. For example, nature tourism, particularly hiking, is a major economic activity on Stewart Island generating a demand for aggregates to build and maintain walking tracks. However, there is a shortage of natural aggregates on the island and natural aggregates have to be shipped from the mainland at considerable expense. At the same time, the high level of tourism generates a high level of glass waste. Trials are under way to collect this waste and reprocess it into aggregates suitable for use on walking tracks.

In the UK the Aggregate Tax imposes a duty on sand, gravel or crushed rock used as an aggregate. As the tax is only applied to virgin quarried materials it encourages the use of recycled materials. The tax at around 15% is a significant driver to the use of recycled materials for aggregate applications (in particular glass).

14.3 Outline of Different Crushing Technologies, Advantages and Disadvantages, and Costs

Compiled by Craig Smith, Wanaka Wastebusters

Crushing Glass

One of the essential steps to converting recovered glass into a resource suitable for use in other applications and markets is crushing or pulverizing the glass, then screening or grading the glass to meet customer specifications. Glass can be crushed using a variety of methods depending on the proposed applications. Generally speaking, lower cost crushing methods produce a lower value resource, which in turn can only be used for limited low value applications. Following is an analysis of several different approaches as an indication of the economics of crushing recovered glass.

A - Breaking glass using heavy machinery

This approach produces a very coarse, ungraded crushed glass suitable for low value applications such as landfill cover. Large heavy earthmoving machinery such as that used at landfill sites, for road construction or construction excavation is driven over crushed glass stockpiles, until glass is crushed to the desired level. Using equipment such as vibrating rollers, glass can be crushed to finer levels.

Advantages:

- High throughput and low cost – approx \$2 to \$4 tonne.
- Minimal issues with contamination or colour sorting.
- Volume reduction for future storage.

Disadvantages:

- Limited markets
- Low value
- Potential health and safety issues.
- No confirmed impending uses for this low-grade glass.

B - Crushing glass using portable crushing equipment

There are a variety of portable crushing systems available specifically designed for glass or designed for other uses, but easily adapted to glass usage. Many of the larger aggregate supply companies have portable crushing and screening equipment that can produce graded crushed glass. There are several variables with crushing glass using a portable crushing system.

The following examples are based on indicative figures provided by the companies concerned. These are not quotes. Examples do not take into account other handling or waste disposal costs, or interest on money tied up with plant ownership.

1/Fulton Hogan

Fulton Hogan is proposing a different solution whereby they use all glass produced in the South Island. They will crush on site and use it in their local roading programmes. Costs for this are yet to be confirmed, but they consider they will be able to come in well under the cost to go to landfill. See separate section on Fulton Hogan proposal.

2a/ South Canterbury Screening and Crushing.

Fixed cost of using portable crusher \$3500

Transport Cost to move crusher to site \$5/km

Processing cost to crush and screen to minus 7mm \$25/t

1. Cost to process a 500t stockpile in Timaru (no transportation charge) is:
 $\$3500 + (500t \times \$25/t) = \$16,000$. This equates to \$32/t.

2. Cost to process a 1000t stockpile in Central Otago (700km round trip) is:

$\$3500 + (700\text{km} \times \$5/\text{km}) + (1500\text{t} \times \$25/\text{t}) = \$44,500$. The equates to **\$29.67/t**

2b/ Steve Rout Contracting Queenstown.

Establishment to Wanaka \$2250

Crushing approx \$30 per tonne (based on \$12.50m³ feed)

For a 300 tonne stockpile, cost per tonne is \$30 plus \$7.50 location cost - total of **\$37.50/t**

Advantages:

- High throughput
- No sorting necessary
- Product has high potential for future use in a variety of applications.
- Relatively low contamination issues
- Low investment of capital by council for crushing processes.

Disadvantages:

- Cost of processing.
- Costs of distributing product to market.
- Transport costs to move crusher to stockpile.

3/Purpose built glass crusher

A mobile containerised plant has been sourced that processes approx. 8 tonnes per hour yielding a mix of <3mm (50%) and <10mm (50%) during a single pass. Samples are available at Wanaka Wastebusters. No prior treatment of glass is necessary. The plant has capacity to process approx. 15000 tonnes per annum, giving the capability to cover the Central Lakes, Central Otago and areas of North Otago if required. The cost for this plant is approx. \$310,000 ex. Sydney. As an option to ensure power supply, a Generator 65 kVa diesel generator is \$24,200.00 ex Dunedin is included in costing. Maintenance of this plant is put at \$NZ5 per tonne for parts, excluding labour. The life expectancy of the plant itself is indefinite, as parts are constantly being replaced. The life of conveyors and trommels (screens) is estimated to be 5 years (cost \$130,000).

Cost to crush per tonne over 5 years (75000 tonnes):

Parts	\$5
Plant	\$7
Labour	\$5 (2 persons @\$20 p.h.)
Total cost	\$17 per tonne.

Figures do not cover transportation of plant between sites, or peripheral machinery such as loaders. If plant was owned and operated by an independent contractor, would expect cost to be around **\$34 per tonne.**

Advantages:

- High throughput
- No sorting necessary
- Product has high potential for future use in a variety of applications.
- Relatively low contamination issues
- Very high quality cullet – maximum downstream use.
- Lower end of cost to produce cullet if council owned.

Disadvantages:

- Costs of distributing product to market.
- Transport costs to move crusher to stockpile.
- High initial capital investment if council owned.
- Unknown quantity as would be first of type in NZ.

14.4 Comparative Costs: Land filling, Transporting to ACI- OI and Crushing.

Landfill – current costs in Otago range between \$40 and \$100 per tonne. This is likely to rise as the true costs of land filling are recognised. These are the charges at the gate of the landfills. To dump to landfill via the transfer stations in outlining areas, such as Wanaka, the charge is \$100 per tonne.

Transporting to ACI-OI

ACI-OI is based in Auckland, and purchases cullet from its Principal Supplier Network. The prices paid by ACI-OI to suppliers are commercially confidential information. However publicly available information suggests the prices paid for clear cullet is \$10/t and for green or amber cullet is \$75/t. Shipping of glass cullet from the South Island is usually done by rail in open top containers or coal wagons. These 20-foot containers hold 16-20 tonne of compacted glass.

The following are the quoted costs to transport a container to ACI-OI in Auckland. This includes pickup, delivery and container return. There are very strict criteria for colour sorting, contamination with ceramics, lead crystal or other impurities, so there are high sorting costs at collection points

Place of origin	Container Price	Cost per tonne
Christchurch	\$1,600.00	\$80 - \$100
Timaru	\$2,000.00	\$100 - \$125
Invercargill	\$3,840.00	\$192 - \$240

Example:

Wanaka

Transport to railhead in Dunedin:	\$20
Rail to Auckland:	\$150
Total transport cost:	\$170
Possible payment from ACI-OI	-\$75

Cost per tonne to ship **\$95**

A worst case scenario would be for the glass to be rejected and the full containers returned to the place of origin. Rejection of loads is not unusual. After speaking with ACI-OI (Russell Chambers 09 9767100), there is a possibility that in the short term there will be a reduction in the amount of glass accepted due to new plant being developed. In the long term they see themselves continuing to accept a significant amount of glass.

Crushing

Costs range between **\$4 and \$37 per tonne** depending on process used and quality of cullet desired. At the lower end of the scale, the cullet is of poor quality, and has limited uses. The main benefit is from reduced volume for storage. At the mid to upper end the cullet produced has a wide variety of uses and it is likely the market can absorb all the cullet produced. If a relationship is formed with Fulton Hogan, the cost of crushing has yet to be determined.

14.5 Procedure For Suggested Improvements

(Yet to be posted on Packaging Council website)



NEW ZEALAND PACKAGING ACCORD 2004 SCHEDULE 2: PROCEDURE FOR SUGGESTED IMPROVEMENTS

Suggested improvements received by the Secretariat or the Governing Board from the public will be classified as being either issues of “functionality” (i.e. fit for purpose), “environmental acceptability,” or “procedural” (i.e. related to Accord process, results, reporting etc.).

Those of functionality will not be considered under the Accord process.

For all genuine environmental suggestions, the Secretariat will assist the correspondent in contacting the party to whom the suggestion applies (‘the recipient’). If the recipient is a party to the Accord 2004, the Secretariat will formally advise that party that a suggestion has been received and that a direct approach will be forthcoming. There is an expectation that the recipient party will consider the suggestion in good faith and respond to the correspondent.

The Secretariat will monitor the outcome of the proceedings and report to the Governing Board. In the event that there is no resolution the Secretariat will organise a sub committee of disinterested parties from the Accord to revisit the suggestion for improvement.

If there is still no resolution, the suggestion will be referred formally to the Governing Board for consideration.

The Governing Board shall be ‘the recipient’ of suggestions for procedural improvement. All genuine suggestions for procedural improvement will be referred formally to the Governing Board for consideration.

In all instances where a suggestion for improvement is referred formally to the Governing Board for consideration, all parties to the suggestion will be informed of subsequent recommendations/proceedings.

With respect to any suggestions not related to Accord parties, the Secretariat will, without prejudice, seek to involve the parties in a reconciliation process without commitment.

This procedure is intended to assist Accord parties in identifying opportunities for improvement. Upon enquiry, individuals and/or organizations will be informed of this procedure. Considered promotion of this procedure will also be used to maximize value to the Accord.

14.6 Art Glass Case Studies

Fire and Light Originals – Arcata, California

Fire & Light Originals was formed in 1995 as a partnership between the Arcata Community Recycling Center in Humboldt County, California, and a group of local investors who wanted to develop an innovative plan for using crushed, recycled glass. After careful consideration, the group decided upon a distinctive line of dinnerware which was created by melting crushed glass in furnaces, adding pigment, and pressing the molten glass into bowls, plates, and glasses.

The company was purchased by John and Natali McClurg in 1999 and now, with a team of 20 people, Fire & Light Originals is handcrafting giftware and dinnerware that is shipped to specialty stores and galleries throughout the USA. Fire & Light still strives to find new ways to incorporate recycling into production process, whether it's tumbling broken dishes to make Sea Glass, a product used in aquariums and decorating, or using recycled beer kegs from local microbreweries as vats to cool ladles.

More information: www.fireandlight.com



Counter Production Ltd – Berkeley, California

Counter Production Ltd use recycled glass to produce Vetrazzo® slabs that are used for countertops, bar tops, hearths/fireplace surrounds, tub decks, tables, floors, walls and entryways.

In 1996, Counter Production began selling custom countertops to a small group of green architects and designers attracted to the mechanical strength, chemical durability, and cost effectiveness of Vetrazzo. Word spread and soon people in the recycling industry, editors, homeowners, and designers looking for something different began to drop by the tiny West Berkeley workshop. In June 2002, operations were moved into a larger premises and today, Counter Production is one of the leaders in a growing community of environmentally-minded businesses in Berkeley. As this community grows and as the demand for recycled materials increases, the company continues to challenge itself to stay out in front of the effort to reduce waste to landfill and to educate people about the benefits of sustainable products and practices.

More information - www.counterproduction.com



Recycled Glassworks, San Francisco

Recycled Glassworks is an art studio that uses recycled glass to produce dishes, bowls and giftware. One particular line is plates made from old traffic light lenses, which have been made redundant due to the conversion to brighter LED.

More information: www.recycledglassworks.com



Marvel Glass, NSW, Australia

Marvel Glass's mission is to "produce a glass of strength and beauty and in doing so, to help preserve the environment". They use a low heat process to produce marble-effect sheet glass from old bottles. These sheets can be formed into floor and wall tiles, bench tops, coffee table tops, bathroom vanity basins, panelling for building exteriors, for chemically active areas, such as laboratory fume hood benches, translucent panels and under-lighted indoor/outdoor walkways.

More information: www.marvelglass.com.au and www.wastebusters.orcon.net.nz/marvel-glass.html



14.7 Regional Levy Proposal

Information on the regional versus national landfill levy debate - provided by Jon Roscoe, Waitakere City Council.

“It is acknowledged that a degree of coordination between councils would be required to achieve the objectives of our respective waste management plans. Discussions to date have considered the various benefits of how waste levies may be implemented nationwide.

The key objectives and their ability to be achieved under the three alternatives to waste levies are summarised as follows:

Objectives	Stand alone Council	Region by Region	National
Provide information on waste production	√	√	
Retain levy funds locally	√	√	
Provide incentives for local waste reduction/diversion initiatives	√	√	
Provide incentives for regional waste reduction/diversion initiatives		√	
Disincentives for waste production considering local landfill rates	√	√	
Security of funding long term projects	√	√	
Efficient distribution of funds	√	√	
Efficient administration		√	√
Efficient implementation		√	
Avoid waste flight		√	√
Retain control and ownership of waste – alignment with current legislative requirements	√	√	

Principal industry concerns over the regional approach have been the possibility of waste ‘flight’ to landfills outside the region by operators wanting to avoid the payment of levies. Two initiatives have been considered to address this.

- That any regional approach that was developed could be used as a model for the rest of the country. This would largely negate the risk of waste companies transporting to landfills located in other districts outside of Auckland.
- It is proposed that Waikato District Council be included within the Auckland regional model which would then capture the new landfill at Hampton Downs.
- Waikato District Council is in principle comfortable with the concept and is keen to see more detail.

With regard to regional initiatives, a contestable fund is also an option where terms of support would be specific. Any funding could be in the form of an operational subsidy or interest free loan for the benefit of regional initiatives. It is proposed that initiatives

could be prioritised in some manner i.e. a landfill SWAP analysis, with the largest components getting the highest priority. For example, regional initiatives could be a regional food waste composting or demolition timber reprocessing.

14.8 Acknowledgements

The following people provided ideas and information for this project:

- John Webber (Packaging Council of New Zealand)
- Craig Forsman (CHH Full Circle)
- Geoff Hemm (Fulton Hogan)
- Peter Thorne (Paper Reclaim)
- Jon Roscoe (Waitakere City Council)
- Sheryl Stivens (Mid Canterbury Wastebusters)
- Alistair Meadows (Tasman Insulation)
- Gary Shuttleworth (ACI-OI I)
- Bill Irving (BRANZ)
- John Ransley (Innovative Waste Kaikoura)
- Richard Tong (Consultant and waste historian)
- Bill Bayfield (Ministry for the Environment)

14.10 Links and Contacts

- Aggregain: www.aggregain.org.uk/index.html
- BRE Centre for Waste and Recycling: www.bre.co.uk
- Canadian Glass Recycling Organization: www.glassworks.org
- Center for Environmental Economic Development: www.ceedweb.org/glass
- Clean Washington Centre: www.cwc.org/index.htm
- Container Recycling Institute: www.container-recycling.org/
- Envision New Zealand website www.envision-nz.com
- Glass Manufacturing Industry Council: www.gmic.org
- Ministry for the Environment. www.mfe.govt.nz
- Packaging Council of New Zealand: www.packaging.org.nz
- Recycler's World. www.recycle.net/Glass/index.html
- Tasman Insulation New Zealand: www.tasmaninsulation.com
- TerraNova: www.terranova.co.nz
- Tile Council of America: www.tileusa.com
- WRAP (Waste & Resources Action Plan): www.wrap.org.uk
- Zero Waste New Zealand: www.zerowaste.co.nz