All redactions are S.9(2)(b)(ii)

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National Resource Recovery Project - Situational Analysis Report

Prepared for the Ministry for the Environment

CONFIDENTIAL

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Report for:

Ministry for the Environment

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1.0 Introduction

1.1 Overview

Eunomia Research & Consulting (Eunomia) is pleased to present this situational analysis report to the Ministry for the Environment (MfE) on the impact of China's National Sword/Blue Sky initiatives on the New Zealand recycling sector.

China has introduced extremely strict quality controls for the materials that it accepts for recycling. This has led to a significant decline in the demand for, and hence the value of, certain grades of material on international commodity markets – in particular mixed paper and mixed plastic. These grades are typically outputs of household kerbside recycling systems as opposed to commercial or industrial systems. This constriction in the market has resulted in loss of income for recyclers and some stockpiling of materials locally.

The purpose of the situational analysis is to ensure that there is an accurate understanding of the problem and of the potential flow-on effects as the situation evolves. A situational analysis is necessary because there is limited empirical information readily available on the scope, scale and depth of the impacts on the industry in New Zealand. Addressing this information gap and ensuring that the issues are framed and understood correctly will be vital in determining the nature of the response by the industry, local and central government.

1.2 Structure of the Report

The report is structured as follows:

Overview of the recycling sector. This section provides some background for and analysis of how the recycling sector has operated in New Zealand. The way the sector operates; in particular who is responsible for risk and how risk is managed, the size of the sector, and the drivers for recycling; are key factors that influence outcomes.

Summary of International Impact. A high level review is provided of how international markets function and the changes that have been precipitated by China's National Sword policy. Some thoughts are also provided on how the markets may respond into the future. As the prices received by the New Zealand recycling sector are substantially driven by international conditions, even where domestic processing is undertaken, this is likely to be of vital importance is planning any future responses.

Impact of National Sword in New Zealand. This is the key focus of the report. It provides a review and assessment of the impacts to date of changes to international commodity markets on the New Zealand recycling sector. It aims to identify the key issues, the drivers behind how different organisations have been able to respond, and provides an assessment of the health of the sector. The information in this section is

primarily derived from interviews with key organisations involved in the sector including private operators, community groups and councils.

2.0 Overview of Recycling Sector

For the purposes of this report we have considered the recycling sector only in so far as it relates to recycled commodities. The businesses and organisations within the scope of the work are those who are involved in the handling of recycled commodities. The commodities covered include:

- Paper and cardboard
- Plastic containers
- Plastic film
- Steel and aluminium cans (excluding other forms of scrap metal)
- Glass bottles and jars (excluding window glass)

The report considers commercial and domestic sources of materials. Available information on commercial collections is limited due to commercial sensitivity in a very competitive market. However, feedback from larger operators suggests that the only emerging issues in the commercial collection market is with those collections which are 'household-type' i.e. are collected in small quantities, comingled. This market is estimated to provide between 3-5% of the total quantity of commercial material

Due to this, and because the grades of material that are most affected are those that generally come from household-collected recycling - and in particular the mixed paper and plastic commodities from households - the main focus is on household collections.

2.1 Material Flows

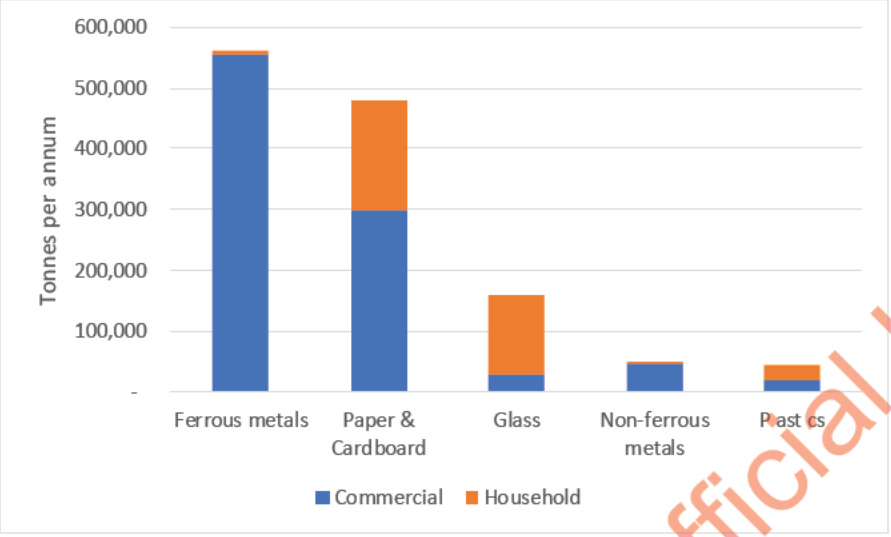
The table and chart below show an estimate of the quantities of material managed by the recycled commodities sector in NZ.

Table 1: Annual Tonnage of Recycled Commodities

	Total	Household Sources	% exported
Paper & Cardboard	480,000	180,000	60%+
Plastics	45,000	25,000	90%
Ferrous metals	560,000	5,500	95%+
Non-ferrous metals	50,000	3,000	95%+
Glass	160,000	130,000	0%
TOTAL	**1,295,000**	**343,500**	

Source: Data is compiled from a range of sources including information supplied in confidence during interviews.

Figure 1: Annual Tonnage of Recycled Commodities

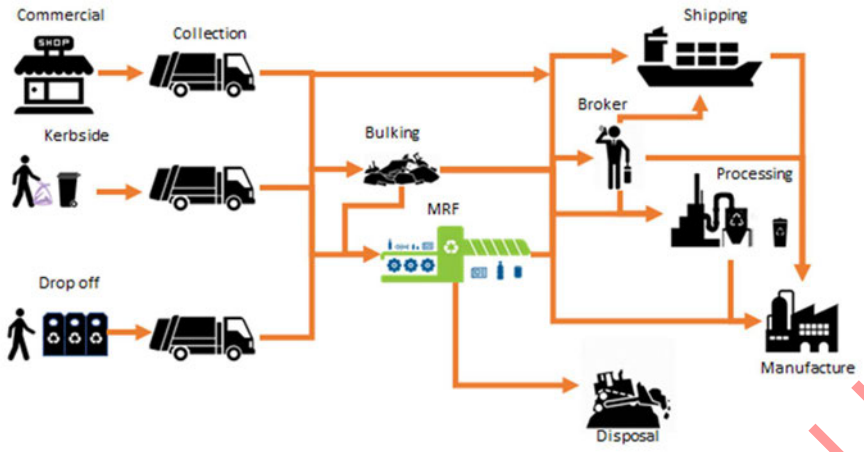


The above table and chart show that the New Zealand recycling sector manages approximately 1.295 million tonnes of material per annum. The overall quantities are dominated by ferrous metals and paper and cardboard, with glass also being important. Notably, material from household sources makes up approximately a quarter (27%) of the total quantity of material. The main materials from households are paper, glass, and plastics. Glass is the only material for which household sources are clearly the most important.

The above data highlights that while domestic recycling may have a high public profile, commercial and industrial sources of material are more important for the recycling sector as a whole. Detailed information regarding commercial collections hasn't been provided due to commercial sensitivity, however available information suggests that only a very small proportion of the commercial quantities collected is potentially impacted (the collections of small quantities of mixed recyclables from businesses).

The diagram below illustrates the generic flows of materials within the New Zealand recycling sector.

Figure 2: Recycling Material Flows



Key features of each of these steps as they relate to the impact of China's National Sword are discussed briefly below:

2.1.1 Commercial Collections

The bulk of recyclable material from commercial sources is clean, homogeneous material that is able to be provided in relatively large quantities. Key materials include paper and cardboard, metals, and plastics including plastic films. Collections are able to be made using large bins and, if material is from a reliable source it may be delivered straight to a factory for processing.

2.1.2 Drop off

Recyclables are deposited at drop-off sites or transfer stations. Material from these sites is sorted by the public into material types and sometimes grades. Although gross contamination[1] can be a factor in some unstaffed sites, the quality of material is generally high.

[1] Contamination is usually one of two forms; gross contamination by items that are not accepted in the recycling service, or cross-contamination where one recyclable material is mixed with another (often the case with fibre, which can be contaminated with broken glass that is too small to be removed at the MRF stage).

2.1.3 Household Kerbside

The majority of material collected from households comes through kerbside collection schemes. The quantity and quality of recyclables collected can vary according to the scheme type. The main types of collection services offered are:

- Fully comingled (usually paper, cardboard, glass, plastic (of various grades), and tins and cans, usually from a wheeled bin)
- Comingled but excluding glass (usually from a wheeled bin)
- Two stream, glass out (as above, but with a separate collection of glass, usually from a small crate)
- Kerbside sort (same materials as the full comingled collection, but sorted into streams at the kerbside; usually from crate/s)
- Kerbside sort, glass out (as above, but excluding glass from the accepted materials)

There are some variations on the types of material accepted, with the main variation being whether plastics 3-7 are accepted or not. Other variations include acceptance (or exclusion) of pizza boxes, lids, tetra paks, aerosol cans, and soft plastics. An analysis of what is accepted at kerbside across councils is provided in 2.3.2.

2.1.4 Collection

The type of collection methodology impacts on the quantity and quality of material collected. In essence, the larger the weekly volume provided to households the more material that is collected. Good performing systems can collect in the order of 250kg per household per year. Because wheeled bin type systems usually offer more capacity, they tend to collect more material compared to crate-based systems. Available data[2] suggests a differential in the order of 25% in favour of wheeled bin-based systems[3].

Wheeled bin-based systems typically suffer more, however in terms of contamination. There are two types of contamination that occur: the contamination from the mixing of recyclable materials (plastic in with paper, paper in with plastic, glass in with paper etc.); and gross contamination from householders placing non-recyclable items in the recycling containers. In kerbside sort systems gross contamination can be removed at kerbside (although it is not always removed from all streams – it depends on the level of sorting at kerbside) and materials have less opportunity to become mixed. In wheeled bin-based systems gross contamination is impractical to identify or remove before it is collected, and material becomes mixed as it is emptied into collection vehicles, compacted, discharged, and loaded onto sort lines. Some contamination arises from confusion about what can be recycled in the kerbside service, while other contamination consists of waste deliberately placed in the recycling bins for convenience or because

[redacted]

rubbish bins are full or would incur a cost. The presence of lids on wheeled bins also offers opportunities for householders to 'hide' rubbish in the wheeled bins.

Most councils and operators around New Zealand have noted a rise in the amount of contamination present in recycling collection systems. [redacted]

2.1.5 Bulking & Transport

Material that is collected at kerbside is often bulked before transport to a material recovery facility (MRF) or a reprocessor. Material that has been source separated at kerbside (for example colour-sorted glass) is consolidated before bulk transport to a reprocessor. Bulking reduces transport cost.

2.1.6 Material Recovery Facilities

MRFs remove contamination and sort collected materials into types and grades. There are many different types of MRFs - from simple manual sort lines, to fully automated facilities. Their functions, and how they are operated, depend on a number of factors including the input materials that are accepted, who owns the materials, and the contractual arrangements that are in place in respect of the operation (refer section 2.7).

In theory a MRF should aim to remove as much contamination as possible and sort material to its highest value use. In practice there are trade offs to be made by the operator to try and optimise efficiency and income.

Removing contamination and sorting material to specific grades adds cost as more sorters and/or equipment are required, sort lines may need to be slowed down, and storage and logistics become more complex. MRF operators will consider the returns available from sorting particular materials to a certain standard against the cost of separating the materials and achieving that standard.

In addition, there is a disincentive to remove more contamination than is required to meet a certain market requirement because they will then have to pay disposal costs on the contamination that is removed where, if that contamination had been included in the material sold, they would have received an income on it.

2.1.7 Disposal

Contamination that is removed at the sorting stage needs to be disposed of and this incurs a cost for the MRF operators. The higher the level of contamination and the higher the applicable disposal cost, the more cost this adds for an MRF operator.

2.1.8 Brokers

Reclaimed materials are traded on international commodity markets and compete with virgin materials on price and quality. While virgin materials are often the default option, many processes such as glass, aluminium, steel, and paper making benefit from recycled

content as it is less energy intensive to include in manufacture and can reduce costs without compromising quality. Brokers match recycled commodities from collection and MRF operators with buyers across a range of markets and countries. Some large operators manage their own commodity trading through direct relationships with buyers, or through periodic tendering; while smaller to medium operators will usually use independent brokers or partner with a larger company that will amalgamate material from a number of sources. Brokers are able to achieve better pricing than small operators (given the same quality of material) as they can obtain bulk pricing. The brokers take a commission from the sale of the commodities. With the advent of China's National Sword policy, established arrangements to supply material have largely been disrupted and brokers are having to work to seek new markets for materials.

2.1.9 Shipping

In New Zealand approximately half of all reclaimed fibre is sold offshore as well as the majority of plastics and virtually all metals. Shipping to international markets adds cost not only through the freight costs but through the requirements to have import licenses, and documentation and the additional time taken to reach the markets. There are also risks associated with material being rejected at the destination port and being required to be shipped to a further destination.

Compacted and baled materials are transported in shipping containers (usually 40ft). Shipping costs to destinations where NZ imports a lot of goods from can be reduced through backloading. This was the case with China but is less so with other destinations. Distance is not the only determinant of cost. Port costs and compliance can add significantly to shipping costs. For example, Australia is more expensive to ship to than parts of Asia because of port costs.

For material to be shipped to a country it requires import permits. Difficulty in obtaining or renewing import permits in China and now other parts of Asia is one of the ways that material flows are being restricted.

2.1.10 Processing

Before material is able to be used in manufacture it must be cleaned and prepared to make it a suitable input material for manufacture. The processes involved depend on the material type. In paper manufacture contaminants are removed through the pulping stage. In plastics manufacture material is usually sorted then washed and flaked and/or pelletised. In glass manufacturing material goes through a beneficiation process to remove contaminants and do a final colour sort before use in the furnaces.

2.1.11 Manufacture

A wide range of products are made from recycled content. Glass and metals can be endlessly recycled without any degradation in quality. Paper can be recycled approximately five times before the fibres become too short to bind properly. This means up to 20% of input material may be lost each time (if the input material is from 100% recycled sources). Plastics, similarly, degrade with use. PET, for example, may be

recycled about eight times, and most plastics that are recycled are 'down cycled' into lower grade uses. However, there are a number of examples in New Zealand where plastics are reprocessed into higher grade uses.[4]

2.2 Key Players

The recycling sector in New Zealand is well established for most materials. There are a large number of businesses of all sizes involved across all aspects of the industry. The sector can be loosely divided into customers (households, councils, and businesses), collectors, processors, brokers and markets. Some operators work across two or more parts of the sector.

The main organisations involved in the recycling sector in NZ are shown in the table below:

Table 2: Key Recycling Sector Organisations

	Collector	Processor	Broker	End Market
Waste Management	●	●	●	
Envirowaste	●		●	
Smart	●	●	●	
Northland Waste	●			
Metallic Sweepings	●	●		
JJ Richards	●			
Earthcare Environmental	●	●		
Delta	●			
All waste	●			
Metro waste	●	●		
Wanaka WB	●	●		
Xtreme Zero	●	●		

[4] For example, Comspec do this for a number of products. Flight Plastics can make PET packaging that is up to 80% recycled PET packaging content, by applying a film of virgin PET to the surface.

Russell Recycling		●		
Green Sky	●	●		
Rubbish Direct	●	●		
Reclaim	●	●	●	
Sims		●	●	
Eco Sort		●	●	
Southland disAbility Enterprises		●		
Visy		●	●	Visy is not an end market for any NZ materials
OJI		●	●	●
OI				●
Flight				●
Hawk Packaging				●
Enviroplas/Plasrock				●
Polybuild				●
General Recycle			●	
Comspec				●
Polymer Processing Ltd				●
Budget Plastics				●
Aotearoa Int (Broker)			●	
Astron				●

In addition, there are a number of industry associations that are active in the resource recovery sector in NZ. These include the following:

- Packaging Forum
- Plastics NZ
- WasteMINZ
- Scrap Metal Recyclers Association
- Zero Waste Network

2.3 Kerbside Collections

2.3.1 Service Provision

All but ten councils in New Zealand provide kerbside recycling collections to householders, and a few extend use of those services to non-household customers on a user-pays basis (refer A.1.0. for more detail). Of those that do not, all provide facilities at drop off or transfer stations, and there are private recycling collections available in seven of the ten districts or cities where no council recycling service is provided. Data on the utilisation of private recycling services is extremely variable and depends on the circumstances in which services are provided.[5]

Councils and the material they collect therefore play a key role in the dynamic of the recycling sector in NZ.

Table 3: Kerbside Collection Services by Collection Service Type

	Councils Covered	% of all Councils	Households Covered	% of all HH
Comingled	13	19%	872,700	49%
2 Stream Glass Out	24	36%	462,741	26%
Kerbside Sort	21	31%	313,532	18%
Drop off only	3	4%	25,000	1%
Mixed no glass	5	7%	86,500	5%
Kerbside sort no glass	1	1%	7,200	0%

[5] For example in Western Bay of Plenty a survey found that 31% of households had a private user pays recycling co ection. By comparison 69% of households reported having a private user pays rubbish collection. Simila ly, in Upper Hutt residents must contract a private collector for recycling and in the order of 26% f households use a private recycling service. In Kāpiti Coast however recycling collections have t b provided alongside rubbish collections under the KCDC bylaw and so use of private recycling se ices is high.

Total	**67**	**100%**	**1,767,673**	**100%**

While there are in the order of 20 operators who provide kerbside collection of recyclables on behalf of councils, it is dominated by four operators: Waste Management, Envirowaste, Smart Environmental, and JJ Richards, who together provide services to councils covering 76% of households.

The types of services provided to the households covered by these operators are dominated by comingled and 2 stream (glass out) systems. This is shown in the table below:

Table 4: Collection Service Profile of Largest Collectors

	Councils Covered	% of all Councils	Households Covered	% of all hh
Comingled	8	12%	791,300	45%
2 Stream	23	34%	400,733	23%
Kerbside Sort	5	7%	139,700	8%
Other	2	3%	9,400	1%
Total	**36**	**54%**	**1,341 133**	**76%**

Figure 3: Kerbside Collection System Profile by Councils Covered

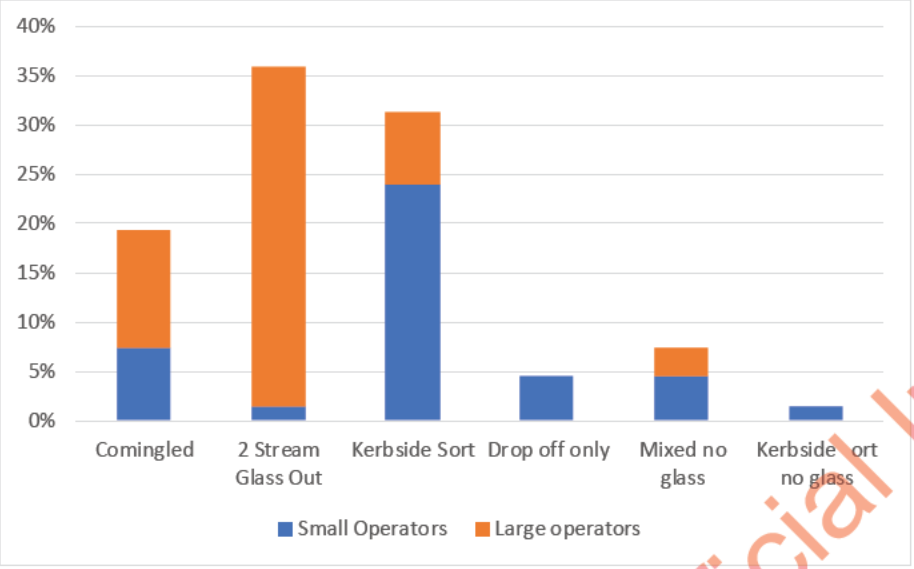


Figure 4: Kerbside Collection System Profile by Households Covered

2.3.2 Materials Collected

The table below shows the typical proportions of materials from kerbside recycling collections.

Table 5: Typical Composition of Kerbside Commodities (excl contamination)

Material Grade	Proportion of Kerbside (percentage)	Proportion of Kerbside (weight)[6]
Mixed Paper	38%	128,630
Card	13%	44,005
Glass	38%	128,630
Plastic 1	2%	6,770
Plastic 2	2%	6,770
Plastic 3-7	4%	13,540
Aluminium Cans	1%	3,385
Steel Cans	2%	6,770

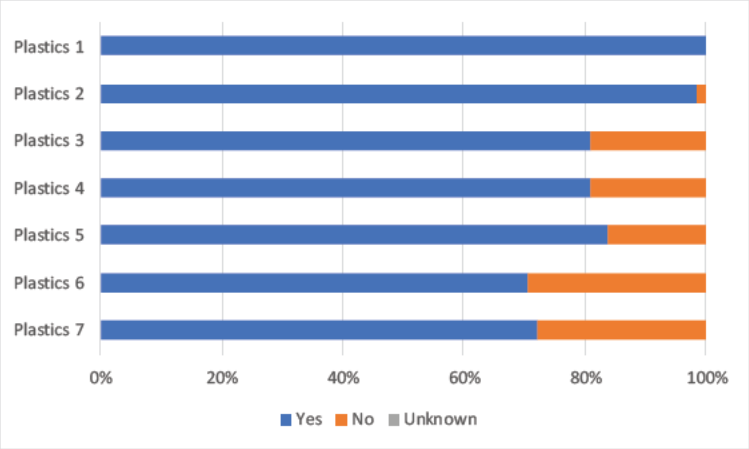
Source: Based on material quantities reported by councils and operators

While the above show common grades there is significant variation in some of the materials that are accepted at kerbside to make up these grades. In August 2018 WasteMINZ collected data from all councils acro s NZ on what materials are accepted through kerbside and drop off systems. An analysis of this data is presented below. Further detail is contained in Appendix A.2.0

The chart below shows the proporti n of councils that accept each plastic polymer type.

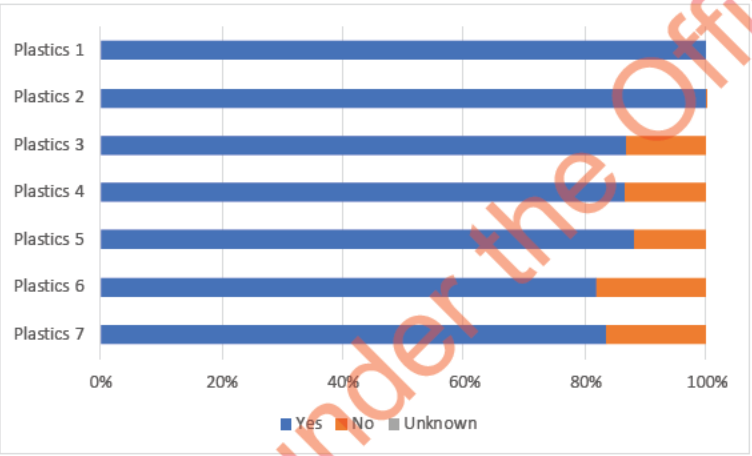
[6] Based n a total household stream of 338,500

Figure 5: Collection of Plastic Types by Proportion of Councils



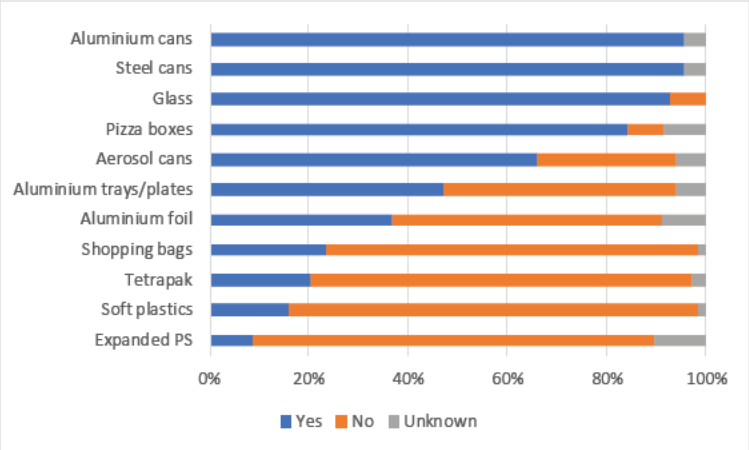
Plastic 1 (PET) is accepted by all councils while plastic 6 (polystyrene) is only accepted by 71% of councils.

Figure 6: Collection of Plastic Types by Proportion of Households



The above chart presents the same data but as a proportion of households. The overall profile is largely unchanged but the proportion of households accepting plastics 3-7 is greater due to the influence of the larger councils that collect these materials.

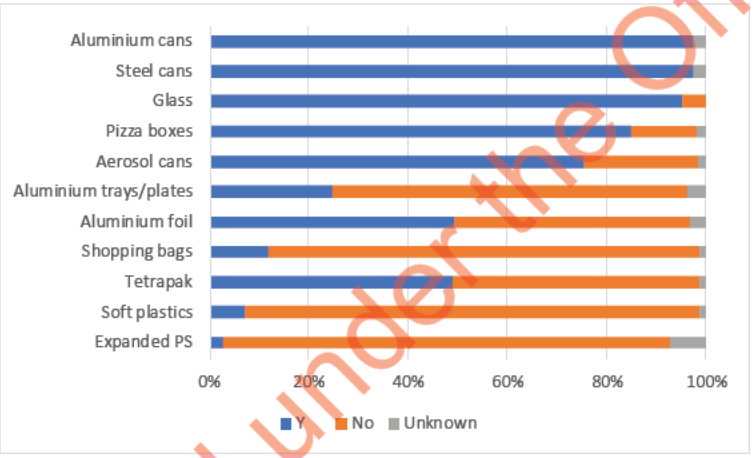
Figure 7: Collection of Other Key Materials by Proportion of Councils



The above chart indicates that aluminium cans, steel cans and glass are the most widely accepted, while expanded polystyrene is the least widely accepted with only 9% of councils indicating they accept this material.

The same data is analysed below in terms of the proportion of households

Figure 8: Collection of Other Key Materials by Proportion of Households

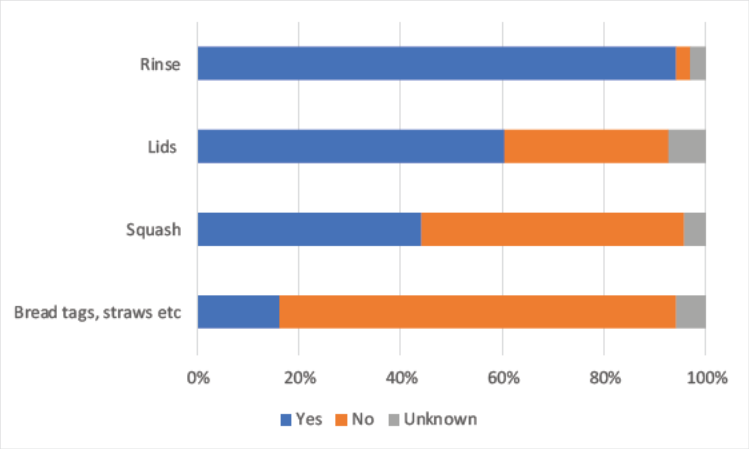


Looking at the data in terms of proportion of households changes the profile somewhat with recycling for aluminium foil and tetrapak notably available to a greater proportion of households.

2.3.3 Contamination Rules

The chart below illustrates the advice provided to households by different councils in respec of how items should be presented for recycling.

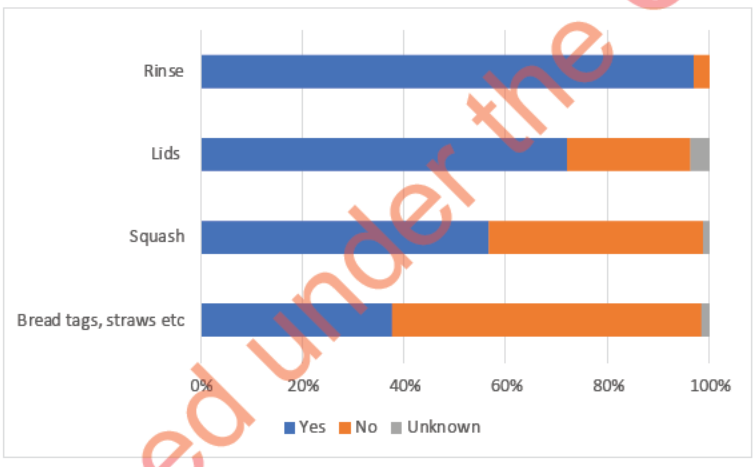
Figure 9: Contamination Rules by Proportion of Councils



94% of councils advised householders that items should be rinsed. The majority (60%) indicated that lids could be included in the recycling – this was split between advi e that the lids should be left on or put loose into the collection system. 44% indicated that plastic containers should be squashed, while only 16% of collection services advised that small items such as bread tags, plastic straws etc could be include .

The same data is analysed below in terms of the number of h useholds.

Figure 10: Contamination Rules by Proportion of Households



The profile of the contamination rules remains similar but greater numbers of households are advised that lids can be included (72%), bottles should be squashed (57%) and small items can be accepted (38%).

No similar survey has been carried out for non-household collections. Anecdotally, the issue of contamination is far less significant in most commercial collections, as they are usually single stream.

2.4 Material Recovery Facilities

There are 14 MRFs in NZ (of any significant size[7]) that accept household kerbside collected material, operated by nine different organisations. Five operators (Visy, OJI, Waste Management, Smart Environmental and Eco Sort) dominate the industry. Between them they process material from areas covering 79% of households.

Of these, there are five MRFs that accept material from comingled glass in collections: Visy in Auckland, Eco Sort in Christchurch, Waste Management in Timaru, Smart Environmental in Queenstown, and Southland DisAbility Enterprises in Southland. Together these facilities process 76% of the tonnage of kerbside collected recyclables.

A further five MRFs process material from two stream, glass-out collections. These are Smart Environmental in Kopu, Waste Management in Tauranga, OJI in Seaview (Wellington) and Dunedin, and Enviro Waste in New Plymouth.

In addition, there are four MRFs that process material from kerbside sort collection. Typically, the kerbside sort systems separate glass and paper at kerbside and send the mixed plastic and metal containers over a sort line. The sort line removes the metal containers and usually the uncoloured PET and HDPE containers. These MRFs include: Metro Waste in Huntly, Green Sky in Hastings, Earthcare in Masterton, and Metallic Sweepings in Marlborough.

The table below shows the MRFs, tonnages received and sen for sale, and the kerbside collection methodology.

Table 6: Tonnages and Kerbside Collection Methodology for Large MRFs

[7] MRFs accepting over 1,000 tonnes of input material per annum

[redacted]

2.5 Manufacturing

[redacted]

2.6 Recycling Value Chain

2.6.1 Households

The table below provides a high-level generic illustration of where the cost and value lie in respect of kerbside recyclables collections and the impact on total cost of recent changes in commodity pricing.

It should be noted that individual service costs may vary significantly from those illustrated based on a range of factors including urban vs rural household mix, quantities collected, risk allocation, contract bundling etc.

Table 7: Indicative Costs Per Tonne Across the Kerbside Collection Value Chain

[8] Although material such as glass and paper may not be processed through a MRF the container fraction us ally . Although this is a small fraction by weight it is more expensive to sort on a per tonne basis.

[redacted]

2.6.1.1 Commercial

As illustrated in Table 1 (Section 2.1) the majority of recyclable materials collected in NZ are from commercial and industrial sources. The values and quantities of materials collected by operators from commercial sources were considered commercially sensitive. In general material from commercial sources was highly valued by operators as it was clean, of a consistent standard, and could be collected in bulk quantities from relatively few point sources. These considerations mean that commercial recycling collections are able to operate on a purely commercial basis. If there are considered to be issues in respect of contamination these can be relatively easily addressed at an individual customer level. This was particularly the case for paper and cardboard, as well as metals and some grades of plastic, (mainly post-industrial).

Operators that provide commercial collections generally report that income received for the material is towards the higher end of those received for material collected from householders, as the majority of collections are single stream and tend to exclude some of the more problematic materials such as mixed 3-7 plastics, and glossy paper. The exception is where commercial customers require a 'household-type' collection where material may be comingled in a wheeled bin. Operators report that this material usually makes up less than 5% of the total volume collected.

Small businesses receiving collections of mixed recyclables have to pay for these collections (the economics are similar to household collections). There is therefore a certain level of price sensitivity, where if the costs of separate recycling collection become much greater than a rubbish only collection, some businesses could choose to cease recycling. One operator reported that some customers had ceased their recycling services when charges were raised due to the commodity markets.

2.7 Council Contracts

This section outlines the key elements of council contracts that affect how council recycling services operate in NZ. It is not intended to be an exhaustive analysis of council recycling contracts.

2.7.1 Service integration

The main variation in terms of service integration is whether the collection, processing, and sale of materials are undertaken by a single operator or by specialist operators.

If a single operator is responsible for all elements of the recycling service, they can make decisions on where resources are best directed to maximise recovery rates and value. This could include how materials are collected at kerbside, compaction rates, and contamination management, etc.

Where specialist operators are used this can have advantages in terms of their expertise and focus on optimising their part of the service. However there need to be clear,

enforceable, contractual standards relating to input contamination, compaction ratios, and operating procedures for the transfer of material between the collector and the MRF. The level of service integration also impacts where risk is allocated in the contracts.

Other service integration issues in relation to recycling include acceptance of material from drop off and refuse transfer stations (RTS), operation of bulking facilities, clearance of litter from recycling collection, servicing of council facilities, and whether material is accepted from commercial premises.

2.7.2 Ownership of materials and risk

One of the key issues in terms of recycling services is who owns the materials or, more importantly, who is responsible for the risk associated with price fluctuations for the materials. There are a range of approaches taken by councils and contractors in NZ.[9] The key approaches and their characteristics are:

Contractor owns all materials and takes all the price risk. This has historically been the most common approach. The main advantages are that it is simpler for councils – they can budget for a fixed annual amount, and that the contractor is generally best placed to manage the risk through operation of the service. Most contractors take a medium-term view of income from materials and so price the value of commodities based on historical averages, with some margin if material prices remain low for an extended period, although downside risk is not always priced in. The larger operators may also hedge their risk through purchasing commodities futures or operating foreign currency accounts to hedge exchange rate risk. [redacted]

Contractors owns all materials and takes all the price risk but offers an 'above-the-line' payment if commodity prices are high. This option may be offered to 'sweeten the deal' when negotiating. The above-the-line payment usually relates to a share of income above an aggregate basket of commodities level. This does mean that the contractor will miss some upside, which would be taken into account in their assessment of future income. [redacted]

Contractor owns all materials but shares the price risk above and below the line with council. In this scenario councils receive a payment if prices rise above an agreed value and pay an agreed amount per tonne to the contractor if prices fall below an agreed floor value. This arrangement helps the contractor reduce their risks on the contract. Under current market conditions this is likely to be a favoured model.

Contractor owns all materials but shares the price risk below the line. This essentially means the council is underwriting the contractor's risk but receives no upside benefit. Reducing the risk to the contractor should however in theory result in lower standard pricing.

[9] Comprehensive data on the risk sharing models was not available at the time of writing this report.

Contractor and council split income. All price risk and income is shared. While this reduces the contractor's risk, it does not eliminate the downside for them, and the income from materials is lessened for the contractor meaning standard pricing will be higher. The proportion of income split can vary. [redacted]

Council owns materials and/or receives all income from sale of materials. All price risk is essentially held by the council. The advantage of this model is that the price risk from the sale of materials is likely to be relatively small compared to total council budgets and if they choose, councils can take a long-term view of the risk. [redacted]

2.7.3 Contamination management

One of the key issues that has been highlighted with the advent of China's National Sword policy is the level of contamination in recyclables. As discussed above, this is usually an issue only with comingled collections through council household recycling collections. While there are some commercial customers that use a 'household-type' collection system, these make up a very small proportion of the overall quantity of material collected commercially.

Council contracts often specify a maximum level of contamination that a contractor is expected to keep below. However, enforcing these levels is difficult in practice as a number of factors driving contamination levels – such as education, rubbish service configuration (e.g. user pays), monitoring and enforcement are determined by council. Contamination management measures that may be specified vary depending on the type of service but include:

- Rejection of material at kerbside (applicable to kerb sorted material)
- Stickering of bins or rejected material explaining that the material placed in the bin was not recyclable
- Bin inspections. Bins containing contamination are stickered or a letter is left with the householder
- Education. This can include leaflets, brochures, fridge magnets, bin labels, social media, doorknocking, advertisements etc.
- Withdrawal of service. Repeat offenders who persist in gross contamination may have their recycling service withdrawn (for example after 'three strikes').

2.7.4 Key Performance Indicators & Incentives

Contracts usually contain a range of key performance indicators (KPIs). In the context of recycling collections these are generally used to govern service quality such as missed collections, replacement of bins after emptying, clearance of spillages etc. These types of metrics are important for ensuring good household participation and compliance. There may be penalties for when KPIs are not met, such as reduced payments or remediation at the contractor's expense. Few contracts include KPIs or performance incentives for achieving recycling targets.

2.7.5 Data and reporting

Most contracts require some level of data provision and reporting in respect of recyclables. However, there is often limited transparency about the grades of materials, their value, and what happens to them, (particularly if some elements of the service such as MRF operation are contracted out, or materials are mixed with other sources).

2.7.6 Comment

There are a range of contract issues and approaches that can impact how a recycling service functions. It is worth noting that this lack of standardisation may be an issue in itself. While best practice is an evolving situation, there are no standardised approaches to procurement and contracts, and councils generally have to determine their own approach as best they can. For more well-resourced councils this may produce acceptable results. However, smaller councils do not necessarily have simpler situations to deal with (in fact they may be more complex), and lack of resourcing may be an issue when approaching a procurement process. The wide variation in approaches is not necessarily helpful in enabling industry to consistently provide best practice, and contributes to an uneven level of exposure to market risk by different operators and councils.

2.8 Current Legislation and Regulation

This section provides a brief overview of existing legislation and regulation as it relates to the recycling industry. Further detail is contained in Appendix 0

2.8.1 Overview

The Waste Minimisation Act. The Waste Minimisation Act 2008 (WMA) sets the framework for the sector. It clearly establishes 'waste minimisation and a decrease in waste disposal' as a key driver. It requires local authorities to plan for waste management and minimisation, and to give consideration to the waste hierarchy.

The WMA also establishes the waste levy, which if it is extended and raised, could be a tool to drive waste minimisation and fund recovery infrastructure.

Provision is made in the WMA for product stewardship. While there have been no priority products declared to date, the proposed ban on plastic bags, and the possibility of a container deposit scheme or similar being established could have a significant impact on the industry.

Finally, the WMA also provides for councils to enact bylaws and license waste operators. There are a number of licensing schemes in operation currently, and a range of councils considering establishing licensing schemes.

Health and Safety at Work Act 2015. The increased obligations to consider the health and safety impacts of workplace practices has added to a shift away from manual handling in recycling collections and operations. This is particularly relevant as automated systems that use wheeled bins have experienced issues with contamination.

Resource Management Act. As the major piece of legislation for managing environmental impacts the RMA has had an important, if indirect, impact on the recycling sector. Specifically, it has resulted in the closure of many smaller landfills and the consolidation of disposal into fewer, more highly engineered landfills. The economies of scale have generally meant reduced cost of landfilling in reasonable proximity to the landfills. In addition, the RMA effectively prevents the burning of wastes and the establishment of processing facilities that will negatively impact the environment.

2.9 Assessment of Strengths and Weaknesses of Current Model

The current recycling sector model is perceived to have a number of important strengths.

- **Flexibility.** The industry delivers a wide range of services across an increasing array of materials and has shown capacity to grow and develop in response to demand.
- **Economic Viability.** The commercial recycling collection and processing industry is essentially un-subsidised and has proved adept at identifying and extracting value from waste materials within a free market environment. Ho sehold kerbside recycling has traditionally been partially subsidised, with councils usually covering the cost of the collection component (at kerbside or from drop-off points), and the income from materials usually covering most of the cost of processing and transport to market[10]. Although certain sectors of the industry are experiencing difficult market conditions (mostly council contracted-household recycling collections) the wider industry is not endangered. The industry has experienced a number of downturn over the last 25 years and has adapted and survived. This current downturn may be more significant and enduring than previous ones however, which s discussed further in the next section.
- **Good Environmental Standards**. On a global scale, the New Zealand waste industry has been able to deliver positive environmental outcomes in terms of resource recovery, while demo strating a reasonable track record in regard to pollution. Legislation (such a the Resource Management Act) ensures that most operations are respons bly managed, and waste operators generally aim to be good corporate citizens

[10] This is a very ough division of cost, and obviously the intricacies of individual contract arrangements and collec ion/processing methodologies will dictate the total cost of the service and how this cost is allocat d. Th impact of the recent drop in income from commodity sales has also disturbed this basic principle significantly, with the cost of processing some materials now significantly higher than the income ab e to e received at market.

The principal perceived weakness of the industry that was highlighted by stakeholders during discussions is that there has not been standardisation and central coordination and planning of waste management and minimisation. This was most notably the case in respect of municipal recycling. The present approach is perceived to have led to the following:

- **A lack of standardisation of what material is collected.** This leads to confusion amongst the public about what can be recycled (and how), which contributes to issues of contamination
- **A lack of standardisation around best practice collection systems.** While good practice is an evolving situation, councils end up each going over the same ground in trying to determine the best systems and service levels. This also contributes to public confusion.
- [redacted]
- **Access to facilities**. Because most MRFs are privately owned and operated, this can disadvantage other operators in the local market, who may not have the same level of access to the facilities (or may not be able to obtain favourable pricing)
- **Procurement.** Procuring services can be complex and difficult and smaller councils in particular do not necessarily have the resources or expertise to obtain best value from the market. An accepted industry default standard contract including standard clauses for risk sharing arrangements is likely to be of benefit.
- **Relative cost.** Because the cost of landfilling is relatively low (depending on locality), the avoided cost of disposal means recycling must be done at a cost.
- **Maximum diversion is not incentivised**. Contractors set up systems and infrastructure to achieve maximum allowed contamination levels and minimum capital investment for maximum return.

3.0 Summary of International Impact of National Sword

This section provides a broad overview of international responses to the advent of China's National Sword policy.

According to the CCIED National Issues Paper (2017) China has set out national aims in the context of an "Ecological Civilization Shaping China's New Era"; part of a general drive to improve environmental performance within China. Restricting imports of recovered wastes is part of this overall programme of economic and environmental improvement.

Two main groups of material were affected in January 2018 within an outright ban on importing into China:

- Mixed paper grades;
- Plastics scrap (covering the majority of post-consumer plastics).[11]

The importing of other recyclable grades into China is still permitted but all grades are subject to a maximum 0.5% contamination limit. This limit is generally considered unattainable for most mixed grades of post-consumer material.[12] The focus in this section is therefore on recyclable paper and plastics as these are the key commodities affected.

Fibre grades such as newsprint and 'old corrugated cardboard' (OCC) are at present still able to be imported into China but a strict limit of a maximum of 0.5% non-fibre 'outthrows' is being enforced through the Blue Sky 2018 enforcement programme.

Global trade in scrap paper is estimated to be worth in the order of $9 billion and scrap plastics approximately US$6 billion.[13]China was by far and away the biggest importer of recovered fibres and plastics accounting for approximately half of the world markets.[14]

China has capacity for approximately 26 million tonnes annually of recycled fibre. It imported around 21 million tons of fibre last year, of which the EU supplied around 7 million tons, the USA 11.5 million tons and Japan 2.3 million tons. Australia exports

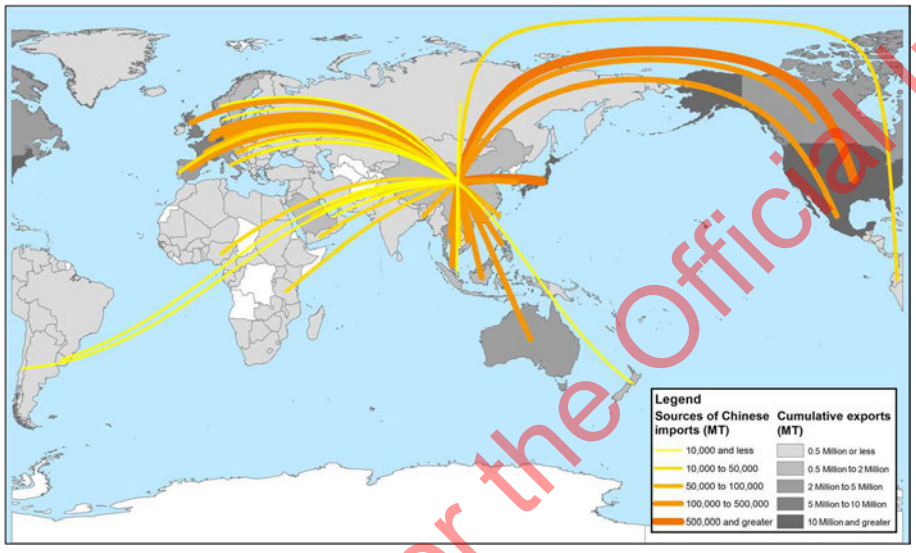
[11] https://resourc -recycling.com/resourcerecycling/wp-content/uploads/2017/07/CHN1211.pdf
[12] https://resource recycling.com/recycling/2017/12/05/chinas-slightly-laxed-limit-little-paper/
[13] https://at as media.mit.edu/en/profile/sitc/2511/, https://atlas.media.mit.edu/en/profile/hs92/3915/
[14] https // ww p .org/stories/2018-01-01/mountains-us-recycling-pile-china-restricts-imports. Velis C A. (2014). Globa recycling markets - plastic waste: A story for one player – China. Report prepared by FUELogy and formatted by D-waste on behalf of International Solid Waste Association - Globalisation and W ste Management Task Force. ISWA, Vienna, September 2014.

approximately 1.1m tonnes of cardboard annually of which 638,000 tonnes was going to China.[15]

In January/February 2018, China imported only 2.5 million tons of fibre, with the USA supplying about 45% and the EU around 30%. OCC made up nearly 75% of the total. New Zealand is a very small supplier in the international context with our total exports of fibre being in the order of 300,000 – 350,000 tonnes.

Global trade in reclaimed plastic totals approximately 14 million tonnes per annum with 7.35 million tonnes of this destined for China (2016 data). The main exporters of plastic waste are the USA, UK and Europe, Japan, Mexico, and Canada. Importing of scrap plastic was dominated by China, with China and Hong Kong together accounting for 65% of imports. Other large importing nations include USA, Europe and India.[16]

Figure 11: Sources of Reclaimed Plastic Exported to China (2016)



Source: http://advances.sciencemag.org/content/4/6/eaat0131.full

New Zealand exported 41,000 tonnes of plastic waste in 2017. More than 7,000 tonnes of New Zealand's plastic waste was shipped to China last year. Hong Kong, a separate import jurisdiction, received 13 500 tonnes[17], and another 19,000 tonnes was sent to Indonesia, Thailand, Malaysia and Vietnam. For further detail, refer to Appendix A.6.0.

[15] MRA Consulting (2018) *China National Sword: The role of Federal Government*. A discussion paper prepared for the Australian Council of Recycling (ACOR)
[16] http://advances.sciencemag.org/content/4/6/eaat0131.full
[17] Hong Kong acts as an entry port for China with most plastic waste (63%) then exported to China. http://advances.sciencemag.org/content/4/6/eaat0131.full

https://www.stuff.co.nz/business/better-business/100630697/Recycling-industry-scrambles-to-sol our-dirty-waste-secret

3.1 Summary of Commodity Markets Over Time

Overall, the majority of recyclable commodities traded internationa ly come from United States, UK and Europe, Japan, and Australasia. Key destinations fo materials include: China, Malaysia, Philippines, Thailand, India, Indonesia, Vietnam, Hong Kong, Taiwan, Germany, Mexico and Turkey.[18]

3.1.1 International Recycled Commodity Prices

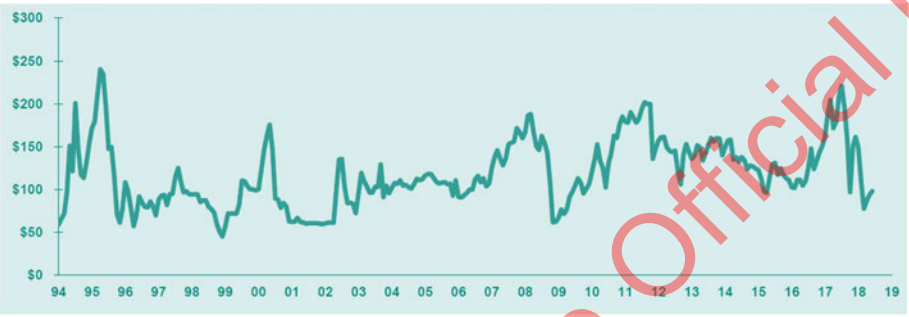
International commodity prices for recycled materials have historically been volatile and there have been some significant downturns over he last 25 years, most notably in 1996 and 2008 as well as 2018. The series of cha ts below illustrates the nature of this market volatility for key exported materials. All charts show US$ prices (excluding shipping costs) from Northwest USA.

[18] ttps //atlas.media.mit.edu/en/profile/sitc/2511/, https://atlas.media.mit.edu/en/profile/hs92/3915/

Figure 12: Mixed Paper Market Prices 1988 – 2018 (US$ FOB)

Source: http://zerowaste.com/northwest-price-histories/

Figure 13: OCC (Cardboard) Market Prices 1994 – 2018 (US$ FOB)



Source: http://zerowaste.com/northwest-price-histories/

Figure 14: PET Bottles Market Prices 1994 – 2018 (US$ FOB)

Source: http://zerowaste.com/northwest-price-histories/

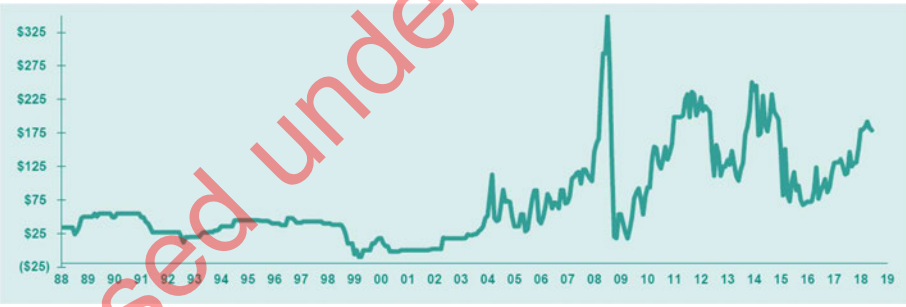
Figure 15: HDPE Bottles Market Prices 1993 – 2018 (US$ FOB)

Source: http://zerowaste.com/northwest-price-histories/

Figure 16: Aluminium Can Market Prices 1988 – 2018 (US$ FOB)

Source: http://zerowaste.com/northwest-price-histories/

Figure 17: Steel Can Market Prices 1988 – 2018 (US$ FOB)



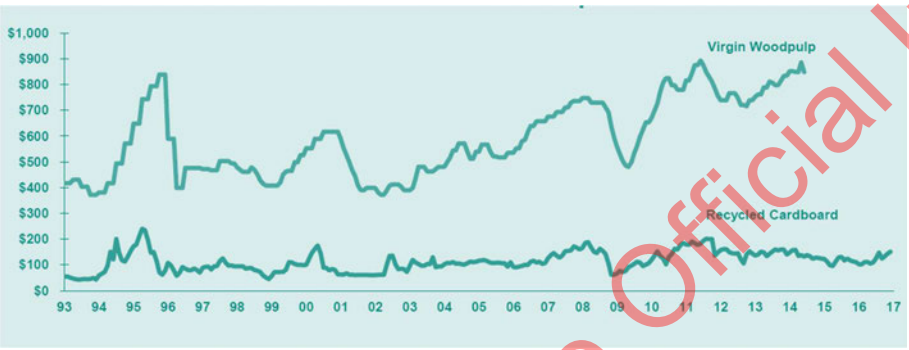
Source: http://zerowaste.com/northwest-price-histories/

A couple of key points emerge from the above series of charts. The first is that there have been large peaks and troughs across the trading history for commodities, with the fall in 2008-9 the clearest illustration. The second point is that the present situation is notably different in that while previous falls were common across all commodity types, the 2018 price falls have had different effects on different commodity types and grades. Mixed paper, for example, has dropped to very low levels, while pricing for OCC is not significantly below historical averages, and steel and aluminium can prices are actually at historically relatively high levels.

3.1.2 Recycled vs Virgin Commodities

The charts below show how recycled commodity prices have historically tracked against their virgin counterparts.

Figure 18: Virgin Woodpulp vs OCC (Cardboard) Market Prices 1993 – 2018 (US$ FOB)

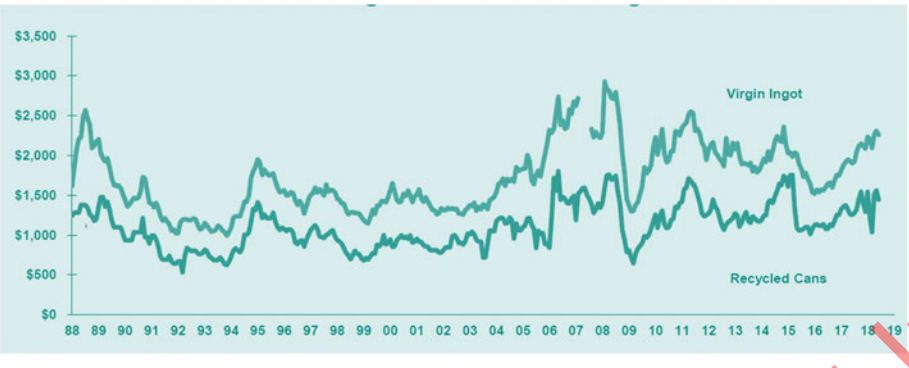


Source: http://zerowaste.com/virgin-vs-recycled/

Figure 19: PET Virgin Pellets vs Used Bottles Market Prices 1994 – 2018 (US$ FOB)

Source: http://zerowaste.com/virgin-vs-recycled/

Figure 20: Aluminium Ingot vs Used Can Market Prices 1988 – 2018 (US$ FOB)



Source: http://zerowaste.com/virgin-vs-recycled/

The above charts illustrate that recycled commodity prices generally track in line with international virgin commodity prices. In essence commodity prices are demand driven, and this usually tracks with economic conditions.

The current situation precipitated by China's National Sword policy is different from what has happened historically as the price falls are confined to certain grades of material and do not reflect overall economic conditions.

3.2 Reaction from International Suppliers

The preparation and response to the impacts of National Sword on producers broadly falls into three categories; transfer of materials to new markets, trying to increase domestic capacity, and adaptation for the Chinese market.[19]

Clearly given the significant capacity that China represented, finding new markets has been challenging. Generally, there has been a significant increase of both recovered fibres and plastic scrap into other Asian markets such as Vietnam, Thailand, Malaysia, Indonesia, Taiwan, and India. There has also been an increase of export to other markets such as Turkey. The significant increase of tonnage into these other countries has, in some case, caused significant backlogs of full containers at ports. In many cases the imports probably don't match the domestic reprocessing capacity of the country. This in turn has resulted in a considerable number of these countries (e.g. Thailand,

[19] There have also been reports of landfilling of some recyclables as well as ceasing collection of certain materials for recycling. https://resource-recycling.com/recycling/2017/10/24/china-ban-causes-programs-cut-collection/

Malaysia, Vietnam and Indonesia) placing their own import restrictions.[20] It is highly unlikely that the genuine world capacity for these materials has increased to match the shortfall from the Chinese bans.

Producers in countries that are typically exporters of recyclable materials have also attempted to adapt their processes to be able to keep exporting recovered fibres into China. This has involved both reducing the amount of mixed papers produced whilst increasing the amount of newsprint (usually grade 2) and OCC, and also investing in cleaning processes to reduce the amount of contamination to below 0.5%. This has involved both investment into primary MRF infrastructure, and more re-sorting of mixed papers post-primary MRF.

Finally, there have been some attempts to increase domestic processing capacity in recyclables exporting countries or shift production methods to accept different grades of recycled material. For example, the UK domestic market has been swamped with both OCC and mixed papers over the last year, but there has been a shift in the UK mills being able to utilise the hard mixed papers (kerbside card) as part of the 'recipe' in the production - i.e. they are using 25 to 35% mixed papers that are cheaper to buy and give the same fibre yield for their own products.[21]

3.3 Market Conditions

The outcome is demand for mixed papers and municipal plastics is low and therefore prices remain low.

3.3.1 Mixed Paper

The value of mixed paper grades has plummeted, losing in the order of ¾ or more of its value (see Figure 21, which show UK export values). Since April 18 there has been a slight improvement. Values for other recovered fibre grades have remained good and if anything, National Sword has increased demand for OCC and newspaper grades.

Recycled fibre has also been caught up in the developing trade war between the USA and China with China imposing a 25% tariff on OCC, recovered paper, waste plastics, and some recovered metals.[22] While this will negatively impact the US exports of these materials it may improve the situation for exporting materials from other countries.

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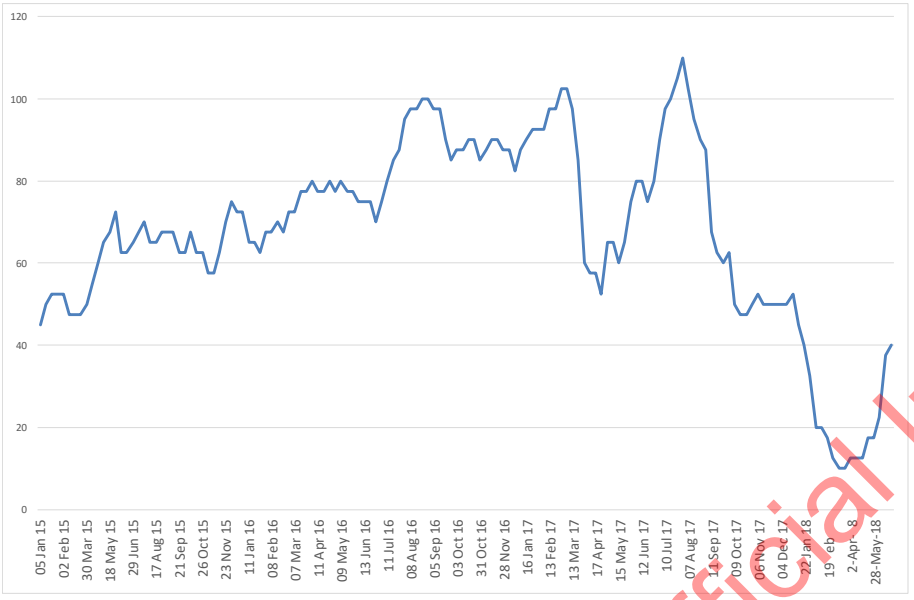
[20] https://resource-recycling.com/plastics/2018/06/27/thailand-bans-scrap-plastic-imports/. https://resource.co/article/malaysia-and-vietnam-follow-china-s-lead-waste-import-restrictions-12777

[21] Personal communication with Steve Thorne, Futurepoint Environmental LLP. He adds "In an ironic way it is the OCC (OKLS) that is now the issue with China not accepting anything but the highest end material and again this has forced the otherwise good OCC back in to the UK/EU markets. This has created a slight false market in the demand for the hard mixed papers as the mills have too much OCC and need the hard mixed papers to blend."

[22] https://resource-recycling.com/recycling/2018/08/28/chinese-tariffs-on-u-s-recyclables-go-into-effect/

Figure 21: Mixed Paper Sales Values (Export from UK) (GBP)



Source: WRAP

3.3.2 Mixed Plastics

The chart below shows the decline in mixed plastic export values from the UK. The data suggests that mixed plastics have lost approximately ½ to 2/3rds of their value since before 2017.

Figure 22: Mixed Plastic Sales Values (Export from UK) (GBP)

Source: https://www.letsrecycle.com/prices/plastics/

It is worth noting that grades that are predominately plastic bottles (PET & HDPE) are still moving and prices have not been that significantly badly impacted (see Figure 23).

Figure 23: Mixed PET & HPDE Bottles Values (UK Sales) (GBP)

Source: WRAP

From the non-bottle municipal plastics grades, PP plastic packaging still has a small market within Europe. All other municipally derived polymers (including non-bottle PET and HDPE) are extremely challenging to find genuine markets for (especially films) and it is likely that large amounts of this material are ultimately ending up in disposal. It is, however, debatable how much of this material was disposed of anyway prior to National Sword.

3.4 Future Expectations

It is highly likely that not only are the current Chinese restrictions here to stay but quite likely that further restrictions covering many, if not all recovered grades of materials may be excluded in the future. Sources have indicated that the Chinese government intends to ban virtually all recycling grades from being imported into China.[23] [24] The current rollout of restrictions appears to be part of a plan to eventually end imports of waste materials that can be substituted by Chinese domestic sources.[25]

It also seems quite likely that other Asian markets will continue to follow China's lead and will restrict imports in various ways.[26]The collection system most impacted by these materials are the commingled dry recycling collection systems, as they result in higher amounts of mixed papers and higher levels of contamination. However, this is not the only collection system impacted as separate collection systems also end up with cardboard which is a mixed paper (OCC mixed with grey and white boards). Generally, there is an emerging industry view that the days of fully comingled collections are numbered (this includes, for example, the second largest fully comingled MRF operator in the UK). So, the focus is again moving back to quality as the key to moving material.

What happens in terms of reprocessing capacity is a more debatable issue and movement is slow on this. Large reprocessors within the Chinese market such as Lee & Man have had to curtail Chinese production and are looking at expanding in overseas markets. It would seem likely that there will be more of a focus on reprocessing boards and plastics in home markets. However, the significant capacity for recycled paper that has been lost out of China cannot be replaced quickly in other countries. Paper mills take at least two years to construct, and adding the capacity currently taken off-line in China could take 5-10 years.[27] Even if there was certainty over China's plans, mixed

[23] http://www.recyclingtoday.com/article/china-scrap-recycling-import-ban-2020/
[24] Fibre research firm RISI have stated that a recent Chinese publication "floated a 2020 implementation date for an all-out ban" https://resource-recycling.com/recycling/2018/07/18/china-moves-to-extend-ban-to-all-materials/
[25] http://english.gov.cn/policies/latest_releases/2017/07/27/content_281475756814340.htm
[26] https://resource-recycling.com/recycling/2018/08/21/markets-update-more-domestic-talk-as-overseas-options-dwindle/
[27] Personal communication, Mark Bendikson & Matthew Hitchings, OJI Fibre 16/08/18

paper grades will continue to be a difficult investment decision as demand for newsprint drops year on year (due to the decline in newspaper sales).

Mixed plastics grades are subject to a different dynamic. The viability of recovering grades 3-7 has always been weak due to the relatively small quantities of each grade, the additional sorting required, and relatively low polymer values. It is likely that the economics of recovery in Chinese markets relied on 'cherry picking' the more valuable polymer types (such as polypropylene).

Unlike paper manufacture, plastics processing can be undertaken efficiently at relatively small scales. This means that processing capacity for plastics can be shifted relatively easily. This has already happened to a degree with Chinese processing companies relocating to other Asian countries such as Malaysia[28]. However, as noted, these countries are moving to restrict the importation of waste materials including waste plastics in an effort to avoid the development of the environmental issues China now faces. Because of this it is unlikely that demand for mixed plastics grades will ever recover to previous levels. This means that if these polymers are to be recycled there may be a need for reprocessing to take place in the local markets where material is generated.

Countries around the world are also grappling with the implications in terms of not only how to manage reclaimed materials, but with how materials are managed through an economy and the degree to which they should be allowed on the market in the first place if there is no clear pathway for recovery. For example, in Europe extended producer responsibility is being brought to the forefront due to new EU regulations mandating producers pay for the full costs of collection and material sales[29].

[28] https://www.reuters.com/video/2018/06/26/chinas-ban-on-foreign-trash-hits-recycli?videoId=439526299

[29] A result of various components of the EU 2018 Circular Economy Package – more detail can be found at www.ec.europa.eu/environment/circular-economy/.

4.0 Impact of National Sword in New Zealand

There has been an effect from the National Sword polices on NZ, and there has been some mainstream media coverage of the issues. Frequently, the issue is expressed as 'China no longer taking New Zealand's recyclables'.

The extent of the impact varies according to a number of factors, including:

- Distance from transport options;
- Size – of the company, specific recycling operation, and/or processing site;
- Method of collection, sorting and processing; and
- Approaches to finding markets and selling material.

A recent survey of councils and recycling operators[30] found that:

- Four of the nine operators surveyed are stockpiling mixed plastics 3-7
- 82% of the councils surveyed indicated that they have been affected by the Chinese restrictions and are selling 3-7 plastics at a lower price, stockpiling, or struggling to find new buyers.
- Although the issue with mixed paper is less pronounced, 40% are still indicating they are having to sell mixed paper at a lower price, stockpiling, or struggling to find new buyers.

4.1 Viability of Operators

[redacted]

[30] WasteMINZ March 2018. Responses were received from 38 Councils, and 9 recycling operators.

[redacted]

[redacted]

[redacted]

4.2 Pricing by material grade

Commented [le1]: Same as above

[redacted]

[redacted]

4.3 Destinations by material grade

To maximise return, many operators have begun selling commodities to a variety of international markets. The table below shows the key international and local markets currently accepting material from New Zealand.

Commodity	Market	Future Potential

Mixed 3-7 plastics	China	Stable as long as operator can meet standards
	Other Asian countries such as Indonesia, Thailand, Malaysia, Vietnam	While these markets initially accepted a lot of the material that used to be sold in to Chinese markets, controls in these countries are becoming more strict and buyers are becoming more difficult to find.
Janitorial plastic	As above	Reasonably stable but extremely low value
	Comspec (Christchurch)	Will match international market prices, local market Currently processing 2,500 per annum. Some additional capacity available.
	Enviroplas	Capacity is small, but local market
	Budget Plastics	Capacity is small (1 300 tonnes per annum) but local market
Clear PET	Asian markets	Stable and reasonable prices can still be achieved
	Flight Plastics (Wellington)	Will match international market prices; local market Processed 2,000 tonnes in last 12 months. Significant additional capacity but constrained by end markets
	Comspec	As above
White/clear HDPE	Asian markets	Stable, and reasonable prices can still be achieved
	Comspec	As above
	Enviroplas	Capacity is small, but local market

Fibre	OJI New Zealand	Capacity for approximately half of New Zealand's fibre; prefers high quality feedstock Processing around 240,000 tonnes per annum
	Hawk Packaging	Accepts fibre from Green Sky (Hawkes Bay) and Palmerston North City Council Processing around 3,400 tonnes per annum
	OJI Australia	Will buy quality fibre, but shipping costs make Asian markets preferable
	Asian markets	Still buying fibre at present, but concern from a number of operators that this will not continue
Steel/tin	SIMS	Stable, but low value, market
Aluminium	Scrap Metal Recyclers	Stable, but decreasing value, market
	Australia markets	Stable, but high shipping costs
	Asian markets	Stable, but decreasing value.

4.4 Interaction of Collection and Sorting Methodologies with Quality, Pricing, and Markets

There did not appear to be a clear pattern in the relationship between collection and sorting methodologies with quality, pricing, and markets. This is largely due to the effect of other factors such as isolation, transport costs, longstanding arrangements, and contracts. However three factors became clear that either enable operators to access markets, or hinder their access to local or high value markets. These were:

1. Minimising contamination;
2. Sorting to a range of materials; and
3. Maximising the quality of fibre.

The first two factors are frequently the result of kerbside and/or hand sorting of material.

4.4.1 Kerbside/Hand Sorting

It was clear from our discussions with operators that those that are able to sort material to a very low level of contamination, and to a range of material types, have access to the widest range of markets and therefore can expect the highest price. Kerbside sorting enables contamination to be identified and rejected at this point, preventing the need for subsequent sorting and reducing the overall level of contamination in the end product.

[redacted]

This is not to say that these operators would necessarily always sort to this level – several operators reported that the only market they can access for plastic grades 3-7 is by also selling grades 1 (PET) and 2 (HDPE) in the mix. Usually, a ratio of 4:4:2 is expected by international markets (PET:HDPE:other plastics).

This has implications for local markets, as the highly sought after feedstock of PET and HDPE is lost to international markets as it enables the operators to also pass on the other grades of plastic.

4.4.2 Fibre Quality

The other clear relationship was between access to fibre markets, and the presence of glass in the comingled collection stream.

[redacted]

The added implications of glass being collected with other materials is the additional wear and tear, and consequential maintenance costs, on MRF plant – operators estimate this as adding between 15 – 50% to maintenance costs on an ongoing basis.

There was concern expressed generally that overseas markets for fibre are getting harder to find, and returns are dropping, with many operators sending fibre for zero

payment. Fibre is an extremely difficult material to stockpile, as it cannot be kept outdoors without degrading rapidly.

4.5 Local Processing Capacity and Ability to Expand

While there are a number of local processing options, some of which have achieved some systems that are aligned with circular economy principles, there are limiting factors to capacity of these options. The table below sets out some local processing capacity and an outline of the potential of some of the more significant opportunities as a market. There are a large number of proposals that are currently in the scoping or feasibility stages that may or may not come to fruition and provide additional local processing capacity.

In addition, there are a number of companies that do not currently process post-consumer material but that are examining the feasibility of using this feedstock. Further work would be required to assess the feasibility of these processes and their potential scale, perhaps following a sector-based staged approach.

Two key themes became apparent during discussions with processing companies.

Firstly, the ability for plastic recyclers to expand is largely driven by the limits of existing markets for end product, rather than lack of feedstock or capacity within existing infrastructure.

The second key theme was around fibre, and the significant capital investment and lead-in time that would be required to increase the capacity of fibre processing within New Zealand, compared to plastic material streams.

4.6 Impact of Local Disposal Pricing

In general, the cost of local disposal had little relationship with the amount of material that was being landfilled. Decisions as to whether or not to landfill material were generally made on political and environmental grounds, rather than purely financial.

Several operators and councils pointed out that if council-funded household kerbside recycling were a service that was provided purely on a financial cost-benefit basis, then few places would have household recycling collections and MRFs at all. [redacted] To then landfill this material, rather than selling it at a loss or stockpiling, was seen as the very worst option.

The exception to this approach was glass, which is used as fill, landfill face cover, or ground cover in several locations in the South Island. [redacted]

Charges for commercial recycling collections have a much more direct link between the cost-benefit of the collection, and the charge to the customer. In some cases, the cost of the collection has reached a level where the customer would be financially better off by solely using a rubbish collection. As a result, some commercial customers that use a 'household-type' collection (fully comingled, or with several materials comingled in a wheeled bin) have cancelled this service. Commercial operators report, however, that these customers provide a very small proportion (less than 5%) of their total volume collected.

Generally, respondents commented that household kerbside recycling was a service provided due to demand, rather than commercial viability. When kerbside recycling collections were first introduced (for material other than fibre), many households were consulted about the potential cost of the service, and the response was that householders were willing to pay the additional cost of the service for the perceived environmental benefit[33]. This concept is captured through the economic measure of 'consumer surplus', which aims to quantify the willingness to pay for something beyond the monetary value. A study by economists Covec in 2007 found the average perceived value for a household was $1.68 per week for recycling plastics, paper, and glass. This is equal to $87.36 per year (greater than the costs of most household collection services) or $183 per tonne.[34]

Since the original introduction of the service, respondents report a growing perception that operators 'make money' out of recycling, and that the service 'pays for itself'. There is a feeling, particularly amongst council officers, that some householders perceive recycling as an activity that provides benefit to the council and the contractor, rather than an activity that the householder feels a personal obligation to complete in order to manage their household's waste effectively[35].

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[33] Various councils including the legacy Auckland City Council, North Shore City Council.
[34] Covec (2007) Recycling Cost Benefit Analysis. Prepared for Ministry for the Environment
[35] This perception has come through in surveys [redacted] and anecdotally through interviews with council officers and other project work.

4.7 Research and development and innovation in sector – new materials products, markets, quality

It was apparent from discussions with operators that there has been significant investment, both financial and time, in exploring and developing alternatives to international markets. Unfortunately the funds many operators had previously set aside for this work have been exhausted in maintaining day to day operating costs in an environment where income has significantly decreased.

An issue that was frequently raised by councils and operators was that they felt they were only looking at one small piece of the puzzle, and therefore may not be focusing on the best option from an overall systems perspective. It was felt that there was a lack of one single agency or body having oversight of the issues from a cross-regional or national perspective, and undertaking an informed cost-benefit analysis of issues with a wider scope.

4.8 Responses of Operators to National Sword

The key response to National Sword issues so far have been:

- Stockpiling material;
- Using reserves to cover lost income;
- Discussing the implications with client councils; and
- Changing collection and processing systems.

4.8.1 Stockpiling

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]		[redacted]	

It is more common to stockpile plastics simply because it can be left outside for reasonable periods, whereas paper is generally not stockpiled because it will get wet. This means that operators will usually shift paper even if it is at an unfavourable price, where they are less likely to with respect of plastics.

4.8.2 Using Reserves

Because commodity price fluctuations are a fact of life when selling recyclable materials, it is normal to operate with margins to ride out times of low prices. The difference in the current situation is that the mixed paper grade which historically represents that largest income stream for recyclables has been so low. Many operators mentioned that reserves had been exhausted in an effort to cover running costs while income had reduced so significantly. Previously, these reserves would have been used to invest in improved or additional infrastructure, or for research and development to provide local options for various materials.

[redacted]

4.8.3 Negotiations with Clients/Councils

The financial impact has largely been felt in relation to council-contracted services. In many cases, contractors have opened discussions with their client councils regarding the ongoing reduction in income, and the implications for ongoing service delivery.

[redacted]

Others are currently in discussions. This situation applies to the majority of larger waste companies throughout New Zealand. Work is currently underway to quantify the impact at a local scale with higher accuracy, to enable negotiations with their clients.

Many contractors raised the potential barrier of not meeting the requirements in their contract for a variation claim, although some believed that this did qualify as a 'force majeur'. Further clarification on the legal framework for contract negotiations appears to be necessary in many cases.

4.9 Responses of Councils to National Sword

[redacted]

However, given the competitive tendering process that most councils in New Zealand undertake, it seems reasonable that operators would attempt to provide the best service for the lowest price. In many cases, given the previous relatively strong and stable prices for recyclable commodities over time (as discussed earlier in section 3.1), operators have aimed for a level of infrastructure which provides maximum cost-benefit given international markets.

While there are some operators that have established collection and processing systems that produce high quality material, this is often done in the face of health and safety recommendations (e.g. the increased risk management required for kerbside sorting) and through a business model that prioritises labour costs and management over capital investment.

5.0 Analysis

Several key themes have emerged through the course of this research. These are as reported by those in the sector during the research and are described below.

5.1 Impact is Manageable

With one exception, all operators reported that while they were experiencing varying levels of financial impacts due to loss in income, this was manageable in the short term (three to six months). [redacted]

Many operators are assessing the extent of the impact to a detailed level, and are entering into discussions with their client councils regarding financial assistance.

[redacted]

5.2 Income Loss

The extent of the income loss, when broken down to a household level, isn't signi icant compared to the cost of a waste management service in total.

While the impact of the National Sword policies has pushed up the cost per tonne of recycling, from collection through to transport to market, this is no a great percentage of the overall waste management costs.

5.3 Market Stability

Some commentators had previously expected the Chinese government to relent on their strict policies. It has now becoming accepted that this is very unlikely to happen, and other countries that have been alternative destinati ns for recyclable as a result of the market shift away from China are also hinting that similar controls may be introduced there.

Given the forecast for fuel prices and t e impact this will have on shipping costs, alongside the expected ongoing constriction of the international markets, it seems unlikely that commodity prices will ecover to levels seen over the last ten years. Many operators and councils have concluded that the only reliable way to ensure material is recovered is to invest in and develop local capacity.

5.4 Fibre Markets

While much of the profile so far is related to issues to do with plastics recycling, it is clear that potentially the most significant difficulties are in relation to recycling fibre. Internatio ally, China has been consistent in enforcing their policies relating to the import of mixed fibre.

For seve al reasons, fibre appears to be a high priority. These include:

- Fibre is more difficult to stockpile as it requires indoor storage
- It makes up a significant proportion of the recycling stream (35 – 40%)
- As a result of its high proportion in kerbside recycling it is one of the key materials in terms of recycling income
- Landfilling fibre would have a significant emissions impact at a local and national level; and
- Increasing capacity to recycle fibre locally or internationally requires significant capital investment and a lengthy lead-in time.

5.5 Sorting Material

It is still possible to find good markets for material if it is low in contamination and sorted into specific material types.

It is likely that offshore processing of mixed material grades is going to remain limited, due to the environmental issues that resulted in the restrictions being introduced in th first place. However demand for good quality plastic and fibre is still strong. Separating plastics and fibre into clean specific-material streams on-shore may enable access to a wider range of markets.

5.6 National Strategic View

Many operators and councils commented that, while they had their own views as to what potential solutions might be, they felt that there was a lack of general oversight and understanding of the industry in New Zealand. This means tha it is difficult to understand what overall cost-benefit various interventions or changes may have.

The problems caused by this lack of a holistic view extend to:

- An inability to identify the priority changes or int rventions, particularly for the fibre and glass systems where several agencies are involved in the material flows from import/production, consumption, co lection, processing and export or local recycling.
- A lack of consistency across the co ntry in terms of contracts, collection systems, communications, and accept ble materials.
- Lack of scale required to support possible local processing solutions.

5.7 Essential Supporting Actions

Despite a lack of policy incentives for recycling, New Zealand is perceived by operators and council staff to generally have a strong recycling culture, and the provision of council recycling services to the household has been driven by strong public demand.

Council officers and operators perceive New Zealand as generally favouring a free market-le approach, with infrequent utilisation of legislative drivers found in other parts of t e world such as high landfill levy rates, mandatory recycling targets, container deposit schemes, packaging recovery notes, landfill bans, etc.

New Zealand's legislative and policy settings are perceived, to date, to have resulted in the creation of a sector where waste materials are generally responsibly managed but where low cost options are favoured, and high rates of recovery are not directly incentivised.

Across the country, talking to operators, councils, and agencies, several issues were mentioned time and time again. It was felt by most that these were essential, and should be progressed without delay regardless of what other actions were agreed. These actions include:

- Reviewing the landfill levy
- Improving product stewardship – through nominating priority products, product stewardship schemes, extended producer responsibility, and container deposit schemes
- National communications about contamination of kerbside recycling collections with incorrect items[36]
- Working to increase markets for recycled-content products, and particularly local options.

[36] While the specific materials accepted in kerbside recycling collections vary nationally, the items and material types that are frequently identified as the 'top ten' sources of contamination are quite consistent.

6.0 Summary and Conclusions

For the purposes of this report we considered the recycling sector only in so far as it relates to recycled commodities, in particular paper and cardboard, plastic containers and film, steel and aluminium cans, and glass bottles and jars.

6.1 Recycling System Overview

The analysis of how the recycling sector works in NZ highlighted a number of key points including:

- Household sources only account for just over a quarter of the material collected for recycling in NZ. Commercial sources are more important on a tonnage basis particularly for metals and fibre. Glass is the only material where domestic sources are dominant.
- The materials that are collected from households are the grades that have been most impacted by the China National Sword policy developments. Commercial grades of materials are relatively unaffected. These are being recovered on a purely commercial basis and this is likely to remain the case.
- All but ten NZ councils provide a kerbside recycling service, with private kerbside services available in a further seven councils and the remainder offering drop off facilities for recycling.
- In terms of number of each type of kerbside service, 'two-stream glass out' is the most common service type followed by kerbside sort. However, if the numbers of households covered is considered, then fully comingled services are actually the most common, covering nearly half of all households, followed by two-stream systems with a quarter, and kerbside sort with less than 20%.
- While the core materials collected are common across virtually all systems, there are a wide range of definitions around what is accepted into these systems, for example types of plastics, pizza boxes, aerosol cans, tetrapaks etc.
- There are two large MRFs (Auckland and Christchurch) which together process about ¾ of the material processed through such facilities. These are both fully comingled glass-in MRFs (which is one reason their tonnages are high, as they include glass which can account for about 40% of the weight of kerbside material).
- There is limited on-shore processing capacity. There is some capacity to expand processing for glass and plastics. Fibre processing is at capacity and it would take significant capital investment to increase on-shore capacity.
- Recovery of recyclable materials from households is (and has always been) at a net cost. Difficulty finding markets for these materials is likely to raise the cost of service provision.
- There are a wide range of contract arrangements and, in particular, risk-sharing arrangements in place across the councils. The level of risk sharing between

councils and contractors is one of the factors that is affecting how impacted contractors are across the country.

- The legislative and policy environment enables the recycling industry to be competitive and broadly responsibly managed. Stakeholders however perceive a need for greater standardisation and planning in respect of municipal recycling.

6.2 International Impact of National Sword

Key point from the analysis of the international impact of China National Sword include:

- China has made it clear that it intends to move towards a ban of all recyclable materials that it can replace with domestic sources by the end of 2019. National Sword is the first step in this programme.
- China was by far and away the biggest importer of recovered fibres and plastics, accounting for approximately half of the world markets.
- New Zealand historically exports in the order of 300,000 tonnes of fibre, with Indonesia the most common destination. China was the second most common destination until mid-2017. Thailand and Vietnam have to date replaced the capacity lost in China.
- In terms of plastic, New Zealand exports in the order of 40,000 tonnes annually. China (together with Hong Kong which is an entry port for China) accepted the bulk of this material until mid-2017, since which time it has fallen away dramatically as a destination. Malaysia, Thailand and Indonesia have been the main recipients for material no longer sent to China. Up to the second quarter of 2018 however overall tonnages had not been impacted significantly
- Commodity prices for most grades of recyclable materials have either remained relatively unaffected or come down from previous peaks but still retained value. The exceptions are mixed paper and mixed plastics which are at historically low levels.
- The current recycling market issues are notably different from previous market declines in that they affect mainly certain grades and are not driven by a decline in the demand for raw materials.
- Future expectations are that there will continue to be good markets for clean high-quality materials, but that mixed grades may struggle to find any buyers. Because plastic processing is less capital intensive there may be opportunities to shift pre-processing to onshore operations. Paper processing could be more problematic due to the level of capital required to build new processing capacity to replace what has been lost out of China.

6.3 Impact of National Sword in New Zealand

Key points from the analysis of China National Sword in New Zealand include:

- There is a clear and discernible impact on the industry in New Zealand with respect to the operation of household recycling services.
- The extent of this impact varies by locality. There is no single determining factor, but the level of impact is affected by:

  - Distance
  - Size of the operation
  - Site considerations
  - Collection, sorting and processing methodologies
  - The exposure to risk in the marketplace (such as through contracts)
- Operators are stockpiling materials, mainly mixed plastics. Mixed plastic grades are currently being sold at low prices or at a loss where markets can be found.
- A number of operators have reported that it has very recently become difficult to find any buyers at all for mixed grades of plastic.
- The viability of operators was categorised. No operators were facing imminent threats to the viability of their businesses due to China National Sword. [redacted] There were a number of small operators who indicated that they had no issues at present with markets for their materials. These were all small community-run enterprises that hand sort material to a very high grade.
- In terms of how pricing has impacted operators there has been a clear decline in the overall income received. [redacted]
- There is some capacity to expand local process for some materials. This includes glass (bottles and jars as well as aggregate), and plastics in various processes.
- Most contractors and councils are currently in negotiations in regard to the response to the impact of National Sword and how risk may be shared within the scope of current arrangements.

6.4 Conclusions

Key conclusions from the situational analysis are:

- The impact is currently manageable although adjustments are being made, and further adjustments to contract arrangements will be required
- Income has been lost from the low commodity prices but in the context of total waste management costs the level of impact on service cost is not overly significant.
- It is clear that China intends to stick to its programme that it has announced and that, as a consequence markets for mixed grades of materials are only likely to become more constrained.
- Investing in local processing or pre-processing is seen as a potentially viable option by the industry to secure more stable markets.
- The main impact from National Sword in terms of income is the impact on fibre prices (due to the proportion of the recycling stream this comprises).
- Although plastics have made the headlines fibre is a more serious issue for the industry because:
  - Fibre is more difficult to stockpile as it requires indoor storage

    - It makes up a significant proportion of the recycling stream (35 – 40%)
    - As a result of its high proportion in kerbside recycling it is one of the key materials in terms of recycling income
    - Landfilling fibre would have a significant emissions impact at a local and national level; and
- Increasing capacity to recycle fibre locally or internationally requires significant capital investment and a lengthy lead-in time.
- It is still possible to find good markets for clean single grade materials and this is likely to continue.
- Stakeholders consider that there is a need to improve our understanding of the industry in New Zealand including better data, and how to deliver a more consistent approach to contracts, communications, collection systems and accepted materials.
- Stakeholders indicated that the following actions should be prioritised:
    - Reviewing the landfill levy;
    - Improving product stewardship – through nominating priority products, product stewardship schemes, extended producer responsibility, and container deposit schemes;
    - National communications about contamination of kerbside recycling collections with incorrect items; and
    - Working to increase markets for recycled-content products, and particularly local options.

Appendices

A.1.0 Kerbside Methodologies and Operators by Council

Kerbside Recycling Service Types:

CWB: Comingled wheeled bin

GC: Glass crate (alongside CWB, this indicates a two-stream glass out collection)

CC: Comingled crates

PCS: paper/card separate

HSB: household-supplied bag/bin

CRB: council recycling bags

Council	Household kerbside recycling	Sorting methodology	Plastics accepted	**Household numbers (2018)[37]**	**Recycling Collector[38]**	**MRF Operator[39]**
Ashburton District	CWB GC	MRF machine sort	1-7	14,100	ESL	Eco Sort
Auckland	CWB	MRF machine sort	1-7	558,700	JJ Richards/ ESL/ Smart	Visy
Buller District	CWB GC	Local and EcoSort MRF	1-7	4,900	Smart	Smart

[37] Eunomia data
[38] As above
[39] As above

Council	Household kerbside recycling	Sorting methodology	Plastics accepted	Household numbers (2018)[37]	Recycling Collector[38]	MRF Operator[39]
Carterton District	CC CG	Kerbside hand	1, 2, 3, 4, 5, 7	3,900	Earthcare Environmental	Earthcare Environmental
Central Hawke's Bay District	CC GS	curbside for glass we think	1-6	5,600	Green Sky	Green Sky
Central Otago District	CWB GC	MRF machine sort	1-7	8,500	Smart	Smart
Chatham Islands	Drop off only		1	300		
Christchurch City	CWB	MRF machine sort	clean hard plastic household containers and bottles	148,400	WAM	Eco Sort
Clutha District	CWB	MRF machine sort	1-7	7,300		
Dunedin City	CWB GC	Kerbside for glass	rigid plastics	50,100	ESL	OJI
Far North District	private - Northland Waste or Waste Mgmt		1-5	24,800	WAM	
Gisborne	CC GC	Kerbside hand	1-7	18,100	WAM	WAM
Gore District	CWB	SDE MRF	Listed individually	5,300		Southland disAbility Enterprises
Grey District	CWB	Local and EcoSort	1-6	5,900	Smart	Smart

Council	Household kerbside recycling	Sorting methodology	Plastics accepted	**Household numbers (2018)[37]**	**Recycling Collector[38]**	**MRF Operator[39]**
Hamilton City	CC	Kerbside hand	1-2	55,000	WAM	WAM
Hastings District	HSB	Kerbside hand	1-7	30,000	Green Sky	Green Sky
Hauraki District	CWB	separate blue bin for glass	1-7	8,200	Smart	Smart
Horowhenua District	CWB	crates	1-7	13,700		
Hurunui District	ORB	Hand sort at transfer station and sent to MRF machine	Clean plastic bottles (no lids), plastic containers and carrier bags, Clean polypropylene meat trays	5 500	ESL	ESL
Lower Hutt	CC	Kerb hand and MRF hand/machine	1-7	39,000	WAM	OJI
Invercargill City	CWB	MRF hand sort	Individually listed	23,100	WAM	Southland disAbility Enterprises
Kaikoura District	CC GC		1-7	1,600	Innovative Waste Kaikoura	Innovative Waste Kaikoura
Kaipara District	CRB	?	1-2	7,800		

Council	Household kerbside recycling	Sorting methodology	Plastics accepted	Household numbers (2018)[37]	Recycling Collector[38]	MRF Operator[39]
Kāpiti Coast District	CWB GS/CC	?		22,700	WAM/ESL/Low Cost	OJI
Kawerau District	CC	Local and WAM MRF	1-7	2,400	Council	Council
Mackenzie District	CWB GC	MRF machine sort	1, 2, 3, 4, 5, 7 (Not 6)	1,900	WAM	Eco Sort
Manawatu District	CWB GC	plastic crate	1-6	11,800	Smart	Smart
Marlborough District	CC	Kerbside hand	1-7	19 300	Metallic Sweepings	Metallic Sweepings
Masterton District	CWB PCS	Kerbside hand	1-7	10,500	Earthcare Environmental	Earthcare Environmental
Matamata-Piako District	CWB GC	Glass at kerbside and rest at MRF at Kopu	1-7	13,700	Smart	Smart
Napier City	HSB - all separate	Kerbside hand	1-7	25,300	Green Sky	Green Sky
Nelson City	CWB GC	MRF	1-5, 7	21,300	Smart	Smart
New Plymouth District	CWB GC	MRF machine sor	milk bottles, cleaning bottles, drink bottles, plastic containers	33,200	ESL	ESL
Opotiki District	CC	Kerbside hand, partially p e-sorted	"plastic bottles and plastic bags"	3,500	Handee Can Services	Council

Council	Household kerbside recycling	Sorting methodology	Plastics accepted	**Household numbers (2018)[37]**	**Recycling Collector[38]**	**MRF Operator[39]**
Otorohanga District	CC	Kerbside hand, partially pre-sorted	1-2	3,700	ESL	
Palmerston North City	CWB GC	MRF machine/hand sort	clean hard plastics that have the recycling triangle label moulded into them	33,100	Council	Council
Porirua City	CWB GWB	MRF machine hand	1-7	19,000	WAM	OJI
Queenstown Lakes – most	CWB	MRF	1-7	10 000	Smart	Smart
Queenstown Lakes - Wanaka	CC CG	Kerbside hand	1-7	3,100	Smart	Smart
Rangitikei District	Drop off only	Customer sorted	1-6	6,100		
Rotorua Lakes	CWB GC	MRF machine sort	1-7	26,700	Smart	Smart
Ruapehu District	CC PS in bags	crate plus plastic bags household provided) for cardboard and paper	1-2	4,900	ESL	ESL
Selwyn District	CWB	MR	1-7	20,100		Eco Sort
South Taranaki District	CWB	MRF	1-7	11,400	ESL	ESL

Council	Household kerbside recycling	Sorting methodology	Plastics accepted	Household numbers (2018)[37]	Recycling Collector[38]	MRF Operator[39]
South Waikato District	Crate for glass & plastic & Crate for cardboard, paper & metal	SWAT MRF	1&2 (this is a recent change)	9,200	Me allic Sweepings	SWAT
South Wairarapa District	Crate for glass & plastic & Crate for cardboard, paper & metal		1-7	4,400	Earthcare E vironmental	Earthcare Environmental
Southland District	CWB	MRF hand sort	Individually listed	12 700	WAM	Southland disAbility Enterprises
Stratford District	CWB GWB	MRF	1-7	3,800	ESL	ESL
Tararua District	HPB		1, 2, 3, & 5	7,200		
Tasman District	CWB GC	MRF hand	1-7	20,600	Smart	Smart
Taupo District	CWB / CC GC	Kerbside hand	1-7	14,600	ESL	ESL
Tauranga City	Private only (glass from October 2018)	Private – to MRF	1&2	51,900		WAM
Thames-Coromandel District	CWB GC	MRF for omingled kerbside hand for glass	1-7	12,700	Smart	Smart

Council	Household kerbside recycling	Sorting methodology	Plastics accepted	**Household numbers (2018)[37]**	**Recycling Collector[38]**	**MRF Operator[39]**
Timaru District	CWB	MRF machine sort	Rigid plastic containers	20,200	WAM	WAM
Upper Hutt City	Private only		1-7	16,800	WAM	OJI
Waikato District	CWB HPB for cardboard/paper	Hand sorted	1,2,5 except Raglan which accepts 1-7	18,373	Metr waste	Metro Waste
Waimakariri District	CWB	MRF machine sort	Individually listed	23,300	WAM	Eco Sort
Waimate District	CWB	MRF	Not clear, just says plastics	3,600	Metallic Sweepings	
Waipa District	CWB HPB for cardboard/paper	Kerbside hand	1-7	20,300	Smart	Smart
Wairoa District	CC	Kerbside hand	1-7 rigid containers	3,200		
Waitaki District	drop off or private company	facility	1 – 7	9,600	WAM	Waitaki Resource Trust
Waitomo District	CC	Kerbside hand	1 and 2	3,600	ESL	
Wellington City	CWB or bags GC	MRF hand sort	1-7	79,400	ESL	OJI
Western Bay of Plenty District	Private only		1 & 2	19,000		WAM
Westland District	CWB	facility	1,2,4,5	3,900	ESL	

Council	Household kerbside recycling	Sorting methodology	Plastics accepted	**Household numbers (2018)[37]**	**Recycling Collector[38]**	**MRF Operator[39]**
Whakatane District	CWB GC	MRF machine/hand sort	1-7	13,300	WAM	WAM
Whanganui District	NA	NA	1-7	18,600		
Whangarei District	CC PCS	facility	1-2	35,000	Northland Waste	Visy

A.2.0 Map of Glass Collection Services by Local Authority (Glass Packaging Forum)

WasteMINZ Survey of Materials Accepted at Kerbside (August 2018)

Consistencies across the country for kerbside recycling collections for 67 councils[40]

- Of these 57 have a council-funded kerbside collection
- 10 either have drop-off only or private recycling collections.
- All information was collected for council-funded recycling but not all information could be found for privately run services, so unknowns refer to non-council funded collections.
- NB there are two entries for [redacted] Council as the recycling services for [redacted] are separate and have different criteria **so the total numbers add up to 69 and 59 respectively**.

1. **Plastic types accepted (rest don't accept this number – all data collected)**

1	2	3	4	5	6	7
68	67*	55	55	57	48	49

[redacted]

2. **Other materials**

Accept soft plastics	Don't accept soft p astics	Unknown
11	56	1

Accept shopping bags	Don't accept shopping bag	Unknown
16	51	1

[40] Date collected via TA Forum survey (WasteMINZ), council websites and emailing or callling relevant council taff.

Accept Polystyrene, expanded	Don't accept Polystyrene, expanded	Unknown
6 (4 of these non food grade only)	55	7

Accept aerosol cans	Don't accept aerosol cans	Unknown
45	19	4

Accept steel cans	Don't accept steel cans	Unknown
65	0	3

Accept aluminium cans	Don't accept aluminium cans	Unknown
65	0	3

Accept aluminium foil	Don't accept aluminium foil	Unknown
25	37	6

Accept aluminium trays/plates	Don't accept aluminium trays/plates	Unknown
32	32	4
Accept tetrapaks	**Don't accept tetrapaks**	**Unknown**
14	52	2

Accept pizza boxes free of food	Accept pizza boxes in organics collection	Don't accept pizza boxes	Unknown
59	2	5	4

Accept glass	Don't accept glass	unknown
64	4	0

Contamination rules

Accept small plastics ie bread tags, straws	Don't accept small plastics ie bread tags, straws	Accept bread tags but not straws	Unknown
10	53	1	4

Lids can be recycled	41 (15 specify left on, 10 specify if oose, 1 if plastic 1&2 only)
Lids can't be recycled	22
Unknown	5

Recycling needs to be rinsed	Doesn't need to be rinsed	Unknown
64	2	2

Recycling needs o be squashed	Doesn't need to be squashed	Unknown
30	35	3

A.3.0 National Legislative and Policy Context

A.3.1The New Zealand Waste Strategy 2010

The New Zealand Waste Strategy 2010 provides the Government's strategic direction for waste management and minimisation in New Zealand. This strategy was released in 2010 and replaced the 2002 Waste Strategy.

The New Zealand Waste Strategy has two goals. These are to:

- reduce the harmful effects of waste
- improve the efficiency of resource use.

The strategy's goals provide direction to central and local government, businesses (including the waste industry), and communities on where to focus their efforts to manage waste. The strategy's flexible approach ensures waste management and minimisation activities are appropriate for local situations.

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

A copy of the New Zealand Waste Strategy is available on the Minis ry's website at

www.mfe.govt.nz/publications/waste/new-zealand-waste-strategy-reducing-harm-improving-efficiency.

A.3.2 Waste Minimisation Act 2008

The purpose of the Waste Minimisation Act 2008 (WMA) is to encourage waste minimisation and a decrease in waste disposal to protect the environment from harm and obtain environmental, econom c, socia and cultural benefits.

The WMA introduced tools, includ ng:

- waste management and minimisation plan obligations for territorial authorities
- a waste disposal l vy to fund waste minimisation initiatives at local and central government evels
- product stewardship provisions.

Part 4 of the WMA s dedicated to the responsibilities of a council. Councils "must promote eff ctive and efficient waste management and minimisation within its district" (section 42).

Part 4 requires councils to develop and adopt a WMMP. The development of a WMMP in the WMA is a requirement modified from Part 31 of the Local Government Act 1974, but with even greater emphasis on waste minimisation.

To support the implementation of a WMMP, section 56 of the WMA also provides councils the ability to:

- develop bylaws
- regulate the deposit, collection and transportation of wastes
- prescribe charges for waste facilities
- control access to waste facilities
- prohibit the removal of waste intended for recycling.

A number of specific clauses in Part 4 relate to the WMMP process. It is essential that those involved in developing a WMMP read and are familiar with the WMA and Part 4 in particular.

The Waste Minimisation Act 2008 (WMA) provides a regulatory framework for waste minimisation that had previously been based on largely voluntary initiatives and th involvement of territorial authorities under previous legislation, including Local Government Act 1974, Local Government Amendment Act (No 4) 1996, and Local Government Act 2002. The purpose of the WMA is to encourage a reduction in the amount of waste disposed of in New Zealand.

In summary, the WMA:

- Clarifies the roles and responsibilities of territorial authorities with respect to waste minimisation e.g. updating Waste Management and Minimisation Plans (WMMPs) and collecting/administering levy funding for waste minimisation projects.
- Requires that a Territorial Authority promote effective and efficient waste management and minimisation within its district (Section 42).
- Requires that when preparing a WMMP a Territorial Authority must consider the following methods of waste management and minimisation in the following order of importance:
    - Reduction
    - Reuse
    - Recycling
    - Recovery
    - Treatment
    - Disposal
    - Put a levy on all waste disposed of in a landfill.
    - Allows for mandatory and accredited voluntary product stewardship schemes.

- Allows for regulations to be made making it mandatory for certain groups (for example, landfill operators) to report on waste to improve information on waste minimisation.
- Establishes the Waste Advisory Board to give independent advice to the Minister for the Environment on waste minimisation issues.

Various aspects of the Waste Minimisation Act are discussed in more detail below.

A.3.3Waste Levy

From 1st July 2009 the Waste Levy came in to effect, adding $10 per tonne to the cost of landfill disposal at sites which accept household solid waste. The levy has two purposes, which are set out in the Act:

- to raise revenue for promoting and achieving waste minimisation
- to increase the cost of waste disposal to recognise that disposal imposes costs on the environment, society and the economy.

This levy is collected and managed by the Ministry for the Environment (MfE) who distribute half of the revenue collected to territorial authorities (TA) on a population basis to be spent on promoting or achieving waste minimisation as set out in their WMMPs. The other half is retained by the MfE and managed by them as a central contestable fund for waste minimisation initiatives.

Currently the levy is set at $10/tonne and applies to wastes deposited in landfills accepting household waste. The MfE published a waste disposal levy review in 2014.[41] The review indicates that the levy may be extended in the future:

"The levy was never intended to apply exclusively to household waste, but was applied to landfills that accept household waste as a starting point. Information gathered through the review supports consideration being given to extending levy obligations to additional waste disposal sites, to reduce opportunities for levy avoidance and provide greater incentives for waste minimisation."

A.3.4Product Stewardship

Under the Waste Minimisation Act 2008, if the Minister for the Environment declares a product to be a priority product, a product stewardship scheme must be developed and accredited to ensure effective reduction, reuse, recycling or recovery of the product and to manage any environmental harm arising from the product when it becomes waste.[42] No Priority Products have been declared as of September 2017.

[41] Ministry for the Environment. 2014. Review of the effectiveness of the waste disposal levy, 2014 in accordance with section 39 of the Waste Minimisation Act 2008. Wellington: Ministry for the Environment

[42] Waste Management Act 2008 2(8)

The following voluntary product stewardship schemes have been accredited by the Minister for the Environment:[43]

- Agrecovery rural recycling programme
- Envirocon product stewardship
- Fonterra Milk for Schools Recycling Programme
- Fuji Xerox Zero Landfill Scheme
- Holcim Geocycle Used Oil Recovery Programme (no longer operating)
- Interface ReEntry Programme
- Kimberly Clark NZ's Envirocomp Product Stewardship Scheme for Sanitary Hygiene Products
- Plasback
- Public Place Recycling Scheme
- Recovering of Oil Saves the Environment (R.O.S.E. NZ)
- Refrigerant recovery scheme
- RE:MOBILE
- Resene PaintWise
- The Glass Packaging Forum

Further details on each of the above schemes are available on:
http://www.mfe.govt.nz/waste/product-stewardship/accredited-voluntary-schemes

A.3.5Waste Minimisation Fund

The Waste Minimisation Fund has been set up by the Ministry for the Environment to help fund waste minimisation projects and to improve New Zealand's waste minimisation performance through:

- Investment in infrastructure;
- Investment in waste minimisation sys ems and
- Increasing educational and p omotional capacity.

Criteria for the Waste Minimisati n Fund have been published:

1. Only waste minimisa ion projects are eligible for funding. Projects must promote or achieve waste minimisation. Waste minimisation covers the reduction of waste and the reuse, recycling and recovery of waste and diverted material. The scope of the fund includes education l pr jects that promote waste minimisation activity.

[43] ttp:/ www.mfe.govt.nz/waste/product-stewardship/accredited-voluntary-schemes

2. Projects must result in new waste minimisation activity, either by implementing new initiatives or a significant expansion in the scope or coverage of existing activities.

3. Funding is not for the ongoing financial support of existing activities, nor is it for the running costs of the existing activities of organisations, individuals, councils or firms.

4. Projects should be for a discrete timeframe of up to three years, after which the project objectives will have been achieved and, where appropriate, the initiative will become self-funding.

5. Funding can be for operational or capital expenditure required to undertake a project.

6. For projects where alternative, more suitable, Government funding streams are available (such as the Sustainable Management Fund, the Contaminated Sites Remediation Fund, or research funding from the Foundation for Research, Science and Technology), applicants should apply to these funding sources before applying to the Waste Minimisation Fund.

7. The applicant must be a legal entity.

8. The fund will not cover the entire cost of the project. Applicants will need p rt funding from other sources.

9. The minimum grant for feasibility studies will be $10,000.00. The minimum grant for other projects will be $50,000.00.

Application assessment criteria have also been published by the Ministry

A.3.6Local Government Act 2002

The Local Government Act 2002 (LGA) provides the general framework and powers under which New Zealand's democratically elected and accountable local authorities operate.

The LGA contains various provisions that may app y to councils when preparing their WMMPs, including consultation and bylaw provisions. For example, Part 6 of the LGA refers to planning and decision-making requirements to promote accountability between local authorities and their communities, and a long-term focus for the decisions and activities of the local authority. Th s part includes requirements for information to be included in the long-term plan (LTP), including summary information about the WMMP.

More information on the LGA can be found at ww.dia.govt.nz/better-local-government.

A.3.6.1 Section 17 A Review

Local authorities are now under an obligation to review the cost-effectiveness of current arrangements fo meeting community needs for good quality infrastructure, local public services and local regulation. Where a review is undertaken local authorities must consider options for the governance, funding and delivery of infrastructure, local public services and local regulation that include, but are not limited to:

a) in-house delivery

b) delivery by a CCO, whether wholly owned by the local authority, or a CCO where the local authority is a part owner
c) another local authority
d) another person or agency (for example central government, a private sector organisation or a community group).

Local Authorities have three years from 8 August 2014 to complete the first review of each service i.e. they must have completed a first review of all their services by 7 August 2017 (unless something happens to trigger a review before then).

Other than completion by the above deadline, there are two statutory triggers for a section 17A review:

- The first occurs when a local authority is considering a significant change to a level of service
- The second occurs where a contract or other binding agreement is within two years of expiration.

Once conducted, a section 17A review has a statutory life of up to six years. Each service must be reviewed at least once every six years unless one of the other events that trigger a review comes into effect.

While the WMMP process is wider in scope – considering all waste service provision in the local authority area – and generally taking a longer term, more strategic approach, there is substantial crossover between the section 17A requirements and those of the WMMP process, in particular in relation to local authority service provision. The S17A review may however take a deeper approach go into more detail in consideration of how services are to be delivered, looking particularly at financial aspects to a level that are not required under the WMMP process.

Because of the level of crossover however it makes sense to undertake the S17A review and the WMMP process in an iterative manner. The WMMP process should set the strategic direction and gather detailed information that can inform both processes. Conversely the consideration of options under the s17A process can inform the content of the WMMP – in particular what is contained in the action plans.

A.3.7Resource Management Act 1991

The Resource Management Act 1991 (RMA) promotes sustainable management of natural and physical resources. Although it does not specifically define 'waste', the RMA addresses waste management and minimisation activity through controls on the environmental effects of waste management and minimisation activities and facilities through national, regional and local policy, standards, plans and consent procedures. In this role, the RMA exercises considerable influence over facilities for waste disposal and recycling, recovery, treatment and others in terms of the potential impacts of these facilities on the environment.

Under section 30 of the RMA, regional councils are responsible for controlling the discharge of contaminants into or on to land, air or water. These responsibilities are addressed through regional planning and discharge consent requirements. Other regional council responsibilities that may be relevant to waste and recoverable materials facilities include:

- managing the adverse effects of storing, using, disposing of and transporting hazardous wastes
- the dumping of wastes from ships, aircraft and offshore installations into the coastal marine area
- the allocation and use of water.

Under section 31 of the RMA, council responsibility includes controlling the effects of land-use activities that have the potential to create adverse effects on the natural and physical resources of their district. Facilities involved in the disposal, treatment or use of waste or recoverable materials may carry this potential. Permitted, controlled, discretionary, noncomplying and prohibited activities, and their controls, are specified in district planning documents, thereby defining further land-use-related resource consent requirements for waste-related facilities.

In addition, the RMA provides for the development of national policy statements and for the setting of national environmental standards (NES). There is currently one enacted NES that directly influences the management of waste in New Zealand – the Resource Management (National Environmental Standards for Air Quality) Regulations 2004. This NES requires certain landfills (e.g., those with a capacity of more than 1 million tonnes of waste) to collect landfill gases and either flare them or use them as fuel for generating electricity.

Unless exemption criteria are met, the NES for Air Quality also prohibits the lighting of fires and burning of wastes at landfills, the burning of tyres, bitumen burning for road maintenance, burning coated wire or oil, and operating high-temperature hazardous waste incinerators.

These prohibitions aim to protect air quality.

A.3.8New Zealand Emissions Trading Scheme

The Climate Change Response Act 2002 and associated regulations is the Government's principal response to manage climate change. A key mechanism for this is the New Zealand Emissions Trading Scheme (NZ ETS) The NZ ETS puts a price on greenhouse gas emissions, providing an incentive for people to reduce emissions and plant forests to absorb carbon dioxide. Certain sectors are required to acquire and surrender emission units to account for their direct greenhouse gas emissions or the emissions associated with their products. Landfills that are subject to the waste disposal levy are required to surrender emission units to cover methane emissions generated from landfill. These disposal facilities are required to report the tonnages landfilled annually to calculate emissions.

The NZ ETS was introduced in 2010 and, from 2013, landfills have been required to surrender New Zealand Emissions Units for each tonne of CO_2 (equivalent) that they produce. Until recently however the impact of the NZETS on disposal prices has been limited. There are a number of reasons for this:

- The global price of carbon crashed during the GFC in 2007-8 and has been slow to recover. Prior to the crash it was trading at around $20 per tonne. The price has been as low as $2, although since, in June 2015, the Government moved to no longer accept international units in NZETS the NZU price has increased markedly (currently sitting at around $19 per tonne[44]) .
- The transitional provisions of the Climate Change Response Act, which were extended in 2013 (but have now been reviewed), mean that landfills have only had to surrender half the number of units they would be required to otherwise. These transitional provisions were removed in January 2017 which will effectively double the price per tonne impact of the ETS.
- Landfills are allowed to apply for 'a methane capture and destruction Unique Emissions Factor (UEF). This means that if landfills have a gas collection system in place and flare or otherwise use the gas (and turn it from Methane into CO2) they can reduce their liabilities in proportion to how much gas they cap ure. Up to 90% capture and destruction is allowed to be claimed u der the regulations, with large facilities applying for UEF's at the upper end of the range.

Taken together (a low price of carbon, two for one surrender nly equired, and methane destruction of 80-90%) these mean that the actual cost of compliance with the NZETS has been small for most landfills – particularly those hat are able to claim high rates of gas capture. Disposal facilities have typica ly imposed charges (in the order of $5 per tonne) to their customers, but these charge ha e mostly reflected the costs of scheme administration, compliance, and hedging against risk rather than the actual cost of carbon.

The way the scheme has been structured has also resulted in some inconsistencies in the way it is applied – for example class 2-4 landfills and closed landfills do not have any liabilities under the scheme. Further the default waste composition (rather than a SWAP) can be used to calculat the theoretical gas production, which means landfill owners have an incentive to import biodegradable waste, which then increases gas production and which can t en be captured and offset against ETS liabilities.

Recently, however the scheme has had a greater impact on the cost of landfilling, and this is expected to continue in the medium term. Reasons for this include:

[44] ttps /carbonmatch.co.nz/ accessed 25 October 2016

- In June 2015, the Government moved to no longer accept international units in NZETS. This has had a significant impact, as cheap international units which drove the price down cannot be used. Many of these were also of dubious merit as GHG offsets[45]. This has resulted in a significant rise in the NZU price.
- The transitional provisions relating to two-for-one surrender of NZUs were removed from 1 January 2017, meaning that landfills will need to surrender twice the number of NZUs they do currently – effectively doubling the cost of compliance.
- The United Nations Climate Change Conference, (COP21) held in Paris France in November – December of 2015, established universal (but non-binding) emissions reduction targets for all the nations of the world. The outcomes could result in growing demand for carbon offsets and hence drive up the price of carbon. Balanced against this however is the degree to which the United States, under the new Republican administration, will ratify its commitments.

These changes to the scheme mean that many small landfills which do not capture and destroy methane are now beginning to pay a more substantial cost of compliance. The ability of landfills with high rates of gas capture and destruction to buffer the impact of the ETS will mean a widening cost advantage for them relative to those without such ability. This could put further pressure on small (predominantly Council owned) facilities and drive further tonnage towards the large regional facilities (predominantly privately owned).

If for example, the price of carbon were to rise to $50 per tonne, the liability for a landfill without gas capture will be $65.50 (based on a default emissions factor of 1.31 tonnes of CO_2e per tonne of waste), whereas for a landfill claiming 90% gas capture (the maximum allowed under the scheme), the liability will be only $6.55. This type of price differential will mean it will become increasingly cost competitive to transport waste larger distances to the large regional landfills.

More information is available at www.climatechange.govt.nz/emissions-trading-scheme.

A.3.9Litter Act 1979

Under the Litter Act it is an offence for any person or body corporate to deposit or leave litter:

- In or on any public place; or
- In or on any private land without the consent of its occupier.

[45] http://morganfoundation.org.nz/wp-content/uploads/2016/04/ClimateCheat_Report9.pdf

The Act enables Council to appoint Litter Officers with powers to enforce the provisions of the legislation.

The legislative definition of the term "Litter" is wide and includes refuse, rubbish, animal remains, glass, metal, garbage, debris, dirt, filth, rubble, ballast, stones, earth, waste matter or other thing of a like nature.

Any person who commits an offence under the Act is liable to:

- An instant fine of $400 imposed by the issue of an infringement notice; or a fine not exceeding $5,000 in the case of an individual or $20,000 for a body corporate upon conviction in a District Court.
- A term of imprisonment where the litter is of a nature that it may endanger, cause physical injury, disease or infection to any person coming into contact with it.

Under the Litter Act 1979 it is an offence for any person to deposit litter of any kind in a public place, or onto private land without the approval of the owner.

The Litter Act is enforced by territorial authorities, who have the responsibility to monitor litter dumping, act on complaints, and deal with those responsible for litter dumping. Councils reserve the right to prosecute offenders via fines and infringement notices administered by a litter control warden or officer. The maximum fines for littering are $5,000 for a person and $20,000 for a corporation.

Council powers under the Litter Act could be used to address illegal dumping issues that may be included in the scope of a council's waste management and minimisation plan.

A.3.10 Health Act 1956

The Health Act 1956 places obligations on TAs (if required by the Minister of Health) to provide sanitary works for the collection and disposal of refuse, for the purpose of public health protection (Part 2 – Powers and duties of local authorities, section 25). It specifically identifies certain waste management practices as nuisances (S 29) and offensive trades (Third Schedule). Section 54 places restrictions on carrying out an offensive trade and requires that the local authority and medical officer of health must give written consent and can impose conditions on the operation. Section 54 only applies where resource consent has not been granted under the RMA. The Health Act enables TAs to raise loans for certain sanitary works and/or to receive government grants and subsidies where available.[46]

Health Act provisions to remove refuse by local authorities have been repealed.

[46] From MfE 2009: Waste Management and Minimisation Planning, Guidance for Territorial Authorities.

A.3.11 Hazardous Substances and New Organisms Act 1996 (HSNO Act)

The HSNO Act addresses the management of substances (including their disposal) that pose a significant risk to the environment and/or human health. The Act relates to waste management primarily through controls on the import or manufacture of new hazardous materials and the handling and disposal of hazardous substances.

Depending on the amount of a hazardous substance on site, the HSNO Act sets out requirements for material storage, staff training and certification. These requirements would need to be addressed within operational and health and safety plans for waste facilities. Hazardous substances commonly managed by TAs include used oil, household chemicals, asbestos, agrichemicals, LPG and batteries.

The HSNO Act provides minimum national standards that may apply to the disposal of a hazardous substance. However, under the RMA a regional council or TA may set more stringent controls relating to the use of land for storing, using, disposing of or transporting hazardous substances.[47]

A.3.12 Health and Safety at Work Act 2015[48]

The new Health and Safety at Work Act, passed in September 2015 replaces the Health and Safety in Employment Act 1992. The bulk of the Act came into force from 4 April 2016.

The Health and Safety at Work Act introduces the concept of a Person Conducting a Business or Undertaking, known as a PCBU. The Council will have a role to play as a PCBU for waste services and facilities.

The primary duty of care requires all PCBUs to ensure, so far as is reasonably practicable:

1. the health and safety of workers employed or engaged or caused to be employed or engaged, by the PCBU or those workers who are influenced or directed by the PCBU (for example workers and contractors)

2. that the health and safety of other people is not put at risk from work carried out as part of the conduct of the business or undertaking (for example visitors and customers).

The PCBU's specific obligations so far as is reasonably practicable:

- providing and maintaining a work environment, plant and systems of work that are without risks to health and safety
- ensuring the safe use, handling and storage of plant, structures and substances

[47] From: MfE 2009: Waste Management and Minimisation Planning, Guidance for Territorial Authorities.
[48] http://www.legislation.govt.nz/act/public/2015/0070/latest/DLM5976660.html#DLM6564701

- providing adequate facilities at work for the welfare of workers, including ensuring access to those facilities
- providing information, training, instruction or supervision necessary to protect workers and others from risks to their health and safety
- monitoring the health of workers and the conditions at the workplace for the purpose of preventing illness or injury.

A key feature of the new legislation is that cost should no longer be a major consideration in determining the safest course of action that must be taken.

WorkSafe NZ is New Zealand's workplace health and safety regulator. WorkSafe NZ will provide further guidance on the new Act after it is passed.

A.3.13 Other legislation

Other legislation that relates to waste management and/or reduction of harm, or improved resource efficiency from waste products includes:

- Hazardous Substances and New Organisms Act 1996
- Biosecurity Act 1993
- Radiation Protection Act 1965
- Ozone Layer Protection Act 1996
- Agricultural Chemicals and Veterinary Medicines Act 1997

For full text copies of the legislation listed above see www.legislation.govt.nz.

A.3.14 International commitments

New Zealand is party to international agreements that have an influence on the requirements of our domestic legislation for waste minimisation and disposal. Some key agreements are the:

- Montreal Protocol
- Basel Convention
- Stockholm Convention
- Waigani Convention
- Minamata Convention.

A.4.0 Methodology

A.4.1Scope

The focus of the project is on gathering information regarding the impact of changes to recycling commodity prices and markets, following China's introduction of their National Sword policy. This is to inform development of potential central government responses.

While the research is expected to point towards possible solutions and interventions, identification and formulation of these is considered outside of the present scope.

A.4.2Methodology Overview

There was an initial outline of the current situation to establish a common understanding; followed by a series of workshops to engage with key stakeholders, secure their cooperation in providing information and input into the study, and inform the development of the research approach. The main research method was stakeholder interviews across the sector, supplemented by desktop research.

A final series of workshops presented the draft findings and solicited high level feedback. The final report takes account of comments from the client and stakeholder groups

Each step in the methodology is discussed further in the subsections below:

A.4.3Precis of Current Effects of Changes in Commodity Prices

Eunomia understands that this piece is intended to establish a common understanding of the issue and the focus of the work required. As noted earlier in our proposal, this is a topic that Eunomia has followed closely, and has alre dy conducted work on. We have spoken to a number of contacts in the sector – bot in New Zealand and internationally - and are familiar with the issues. This was a relatively brief desktop exercise drawing on our existing knowledge.

A.4.4Brief Report for Use With stakeholders

This contained much of the same information as the precis mentioned above, but with a different purpose and audience in mind. The report aimed to outline the nature of the situation to date, including the impact on the recycling sector in New Zealand and why central government considers it may have a role to play in facilitating solutions.

We would note that one of the key elements that requires investigation in the situational analysis is the scale of New Zealand's exposure, and so while some indicative information and da a may be able to be included, confident estimates were not be able to be prov ded at this stage.

A.4.5Initial Workshops

Two workshops are specified, one with the 'Local Government Group' and the other workshop with the 'Feedback Group' as identified in the CSO.

Eunomia sees these meetings not as a primary data-gathering exercise, but as an opportunity to identify, at a broad level, the scope and scale of the issues being faced by local government and by the recycling industry, and to identify where further detailed research is required.

These sessions are also expected to be useful in identifying the key targets for further research.

The preferred content and structure of the workshops was discussed and agreed during the inception phase.

A.4.6Draft Report on Effects of Commodity Price Changes

A.4.6.1 Research Methodology

The primary research mechanism for this element was in-depth interviews with the key stakeholders in the resource recovery sector, including councils and operators. Much of the essential information may be considered commercially sensitive and so would not be shared in a workshop situation. By undertaking one-on-one interviews, we were able to offer commercial confidentiality and assurance that information would only be shared in an aggregated form, thus adding significant detail to the overall pictu e.

A list of stakeholders to contact was discussed and agreed w th the Ministry for the Environment before being finalised. The stakeholders contacted are shown in the table below:

Organisation	Contact Name
Waste Management	David Howie
EnviroNZ	G en Jones
Smart Environmental	Ben Day and Grahame Christian
Northland Waste	Andrew Slater and Ray Lambert
Metallic Sweepings	Clive Peter
Earthcare	Mike Jones
Delta	

All waste	Peter Carnahan
Metro waste	Danelle Matthews
WanakaWB	Sue Coutts
Green Sky	Darren and Frederika Green
Xtreme Zero	Rick Thorpe
Russell Recycling	Ryan Russell
Rubbish Direct	Mark Smith
WasteCo	Dawn
Reclaim	Peter Thorne
Sims	Aaron Ballard
Eco Sort	Craig Downie
Southland disAbility Enterprises	Hamish McMurdo
Visy	Nick Baker
OJI	Matthew Hitchings
OI	Penny Garland
Flight	Keith Smith
Hawk Packaging	Marie Tor
Enviroplas/Plasrock	Peter Barrow
Polybuild	Robert Owen
Plastoil	Paul Wilton
General Recycle	Victor Guo
Compsec	Robert Fowler
Polyme Processing Ltd	Ken Johns

Budget Plastics	Kevin Joe
Aotearoa Int (Broker)	Paul Cash
Astron	Steve Mead
Packaging Forum	Adele Rose, Dominic Salmon
Plastics NZ	Simon Wilkinson
WasteMINZ	Paul Evans
Scrap Metal Recyclers Association	Trevor Munroe
Zero Waste Network	Dorte Wray
Auckland Council	George Feitje
Marlborough District Council	Alec McNeil
Tauranga City Council	Rebecca Maiden
Hamilton City Council	Charlotte Catmur
Christchurch City Council	Ross Trotter
Hastings District Council	Martin Jarvis
New Plymouth District Council	Kimberley Hope
Dunedin City Council	Cat er ne l vine
Wellington City Council	Emily Taylor Hall
Southland	Donna Peterson
Waikato	Patricia Cronin
East Waikato	Ron Tuiavii
Queenstown	Laura Gledhill
Whangarei	David Lindsay

South Waikato	Andrew Pascoe

A pro-forma was developed for the interviews, which was discussed and agreed with the Ministry for the Environment before interviews are conducted. The content of the pro-forma is shown below:

Ministry for the Environment National Resource Recovery Project Pro-Forma

Organisation Name:
Households Served/Tonnage processed:
Contracted Operator (s):
Operation Location (s)
Applicable Disposal Price:
Ownership of materials/risk sharing
Basis of payment:
Changes made/planned (e.g. not collecting 3-7):
Business model characteristics:
Assessment of Service Viability:
Comments:

Collection Method	Material Type	Grade	Tonnes Collected (month)	Contamination Rate Collected Material	Contamination Rate Sorted Material	Price pre Jul 2017 (range)	Price post Jul 2017	Current Price	Destination (incl Stockpiling)

In addition, we undertook a range of desktop research. This included an analysis of the international situation, which was substantially be informed by existing research carried out by our UK office, and an analysis of available data such as export data and publicly available information on quantities of materials collected and recovered.

A.4.7Follow Up Workshops

Following development of the draft report, further workshops were held with the Local Government Group and the Feedback Group to present the draft findings of the report and to solicit feedback for the final report.

A.4.8Final Report

A final report was provided two weeks after the workshops.

A.5.0 International Import - Export Market Share

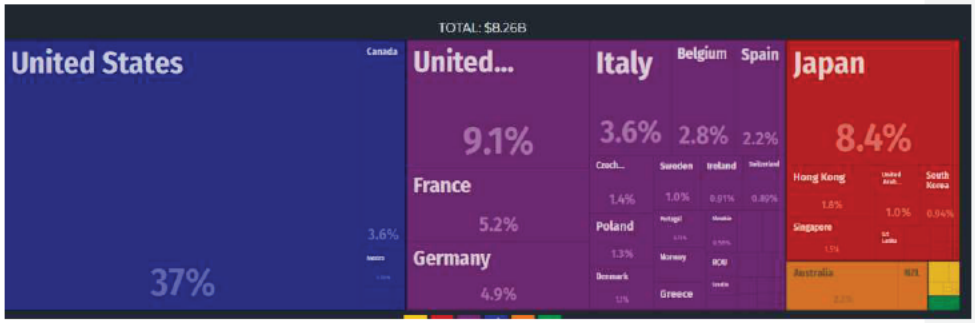
A.5.1Scrap Plastic Exporters

https://atlas.media.mit.edu/en/profile/hs92/3915/

A.5.2Scrap Plastic Importers

https://atlas.media.mit.edu/en/profile/hs92/3915/

A.5.3Scrap Paper Exporters



https://atlas.media.mit.edu/en/profile/sitc/2511/

A.5.4Scrap Paper Importers

https://atlas.media.mit.edu/en/profile/sitc/2511/

https://atlas.media.mit.edu/en/resources/data/

A.6.0 NZ Scrap Paper and Plastic Export Data

Table 11: Quarterly Exports of Scrap Paper and Cardboard (All Grades) in Metric Tonnes by Destination

	2015Q3	2015Q4	2016Q1	2016Q2	2016Q3	2016Q4	2017Q1	2017Q2	2017Q3	2017Q4	2018Q1	2018Q2
Australia	0	0	0	0	0	323	397	0	0	0	0	1,201
Bangladesh	2,129	2,993	651	784	1,775	585	102	95	1 532	1,107	1,989	1,596
China, People's Republic of	14,722	18,761	8,741	14,047	16,425	24,186	23,174	10,163	9,385	985	316	5,402
Egypt	0	0	0	0	0	0	0	22	0	0	0	0
Hong Kong	22	16	0	0	59	0	90	0	17	0	0	0
India	9,217	12,311	9,277	15,122	9,579	12,740	10 561	12,783	6,320	12,365	12,045	14,625
Indonesia	38,661	20,333	50,891	36,756	45,888	41,401	38,745	45,271	50,340	65,922	55,841	32,549
Korea, Republic of	254	487	95	245	720	675	526	1,212	1,589	1,158	690	1,307
Malaysia	367	126	588	138	119	273	62	205	536	0	3,106	0
Pakistan	19	0	777	691	98	545	616	214	0	174	325	0
Philippines	0	0	240	284	42	378	495	823	297	42	731	600
Singapore	0	0	429	0	0	0	0	126	240	192	284	184
Thailand	4,435	15,268	3,280	9,009	2,435	2,031	4,236	4,846	8,364	5,909	9,737	22,495

Viet Nam	1,479	4,068	1,124	520	315	760	755	5,436	1,981	4,010	417	9,381
Total for all countries	**71,305**	**74,363**	**76,093**	**77,596**	**77,455**	**83,897**	**79,759**	**81,196**	**80,601**	**91,864**	**85,481**	**89,340**

Source: Statistics NZ Infoshare

The above data is also plotted on the chart below to illustrate the trends over time.

The table and the chart show that exports of paper have in fact steadily increased since 2015 from 70,000 tonnes per quarter to 90,000 tonnes per quarter. Indonesia has been the primary market for scrap paper over this time, although it has fallen away in the most recent quarter. China which was the second most important destination has fallen away almost completely over the last two quarters, while India has remained relatively steady as a destination. The drop in material to China and Indonesia has been compensated for by an increase in material to Thailand and Vietnam.

Figure 24: Quarterly Exports of Scrap Paper and Cardboard (All Grades) in Metric Tonnes by Destination

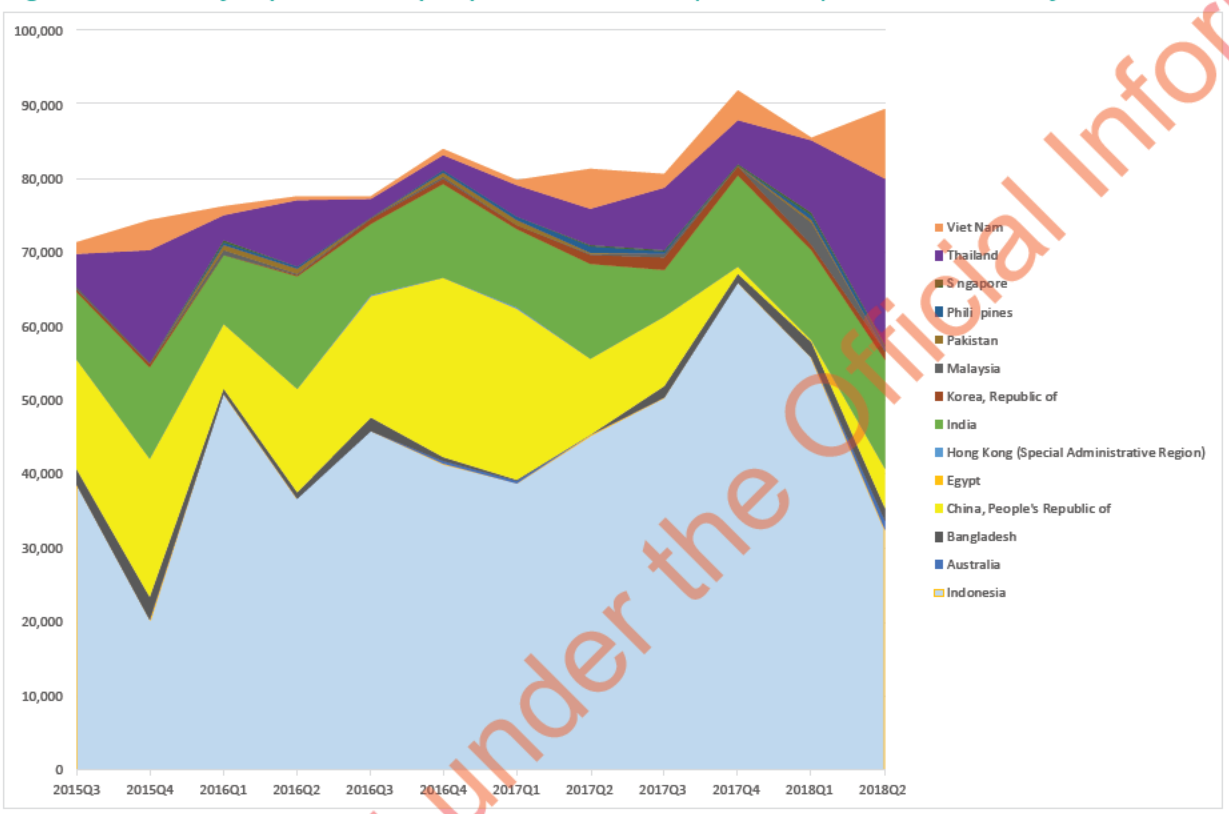


Table 12: Quarterly Exports of Scrap Plastic (All Grades) in Metric Tonnes by Destination

	2015Q3	2015Q4	2016Q1	2016Q2	2016Q3	2016Q4	2017Q1	2017Q2	2017Q3	2017Q4	2018Q	2018Q2
Australia	242	0	73	38	422	583	310	150	117	96	0	13
Bangladesh	42	145	0	0	0	107	0	0	0	0	0	0
China, People's Republic of	2,902	3,125	2,986	3,149	3,440	2,610	2,925	1,937	1,588	313	100	159
Germany	0	0	8,680	0	0	0	0	0	0	0	0	0
Hong Kong	5,020	5,385	5,150	8,630	6,740	6,887	5,147	2,960	2 402	783	340	973
India	268	135	229	0	15	12	25	238	12	83	44	80
Indonesia	1,076	999	908	1,224	1,112	847	484	1,609	1,161	2,725	3,145	4,381
Korea, Republic of	23	21	118	230	0	0	0	29	0	0	15	48
Malaysia	766	828	238	401	770	623	316	973	2,247	2,806	2,230	2,827
Philippines	95	0	0	0	19	0	0	0	0	0	0	0
Singapore	0	0	0	0	0	0	0	0	327	0	0	101
South Africa	0	17	68	0	0	0	0	0	0	0	0	0
Spain	0	0	0	0	0	0	0	0	0	50	39	32
Taiwan	165	105	102	161	79	24	0	69	36	149	150	158
Thailand	307	329	1,128	148	74	427	769	1,713	1,857	2,790	3,076	1,731

United States of America	0	0	0	0	0	0	0	0	11	0	0	60
Viet Nam	322	333	245	283	283	262	136	548	482	975	61	430
Total for all countries	**11,228**	**11,422**	**19,923**	**14,264**	**12,954**	**12,382**	**10,114**	**10,226**	**10,240**	**10,77**	**9,757**	**10,993**

Source: Statistics NZ Infoshare

The above data is also plotted on the chart below to illustrate the trend over time.

Unlike for paper, scrap plastic exports have shown a decline over time, down from a peak of nearly 20,000 in Q1 of 2016 to approximately 11,000 tonnes in the most recent quarter. A one-off export of material to Germany distorts the picture however, with the previous high point more around 13,000 tonnes in the remainder of 2016. What is cl ar from the data is that the amount of material destined for China (including via Hong Kong, which is a gateway port for China) has fallen away dramatically from Quarter 2 of 2017. This has been largely compensated for by an increase in material going to Indonesia, Malaysia, and Thailand in particular.

Figure 25 Quarterly Exports of Scrap Plastic (All Grades) in Metric Tonnes by Destination