NZIER
NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH

New Zealand's proposed CRS

Considerations for policy improvement

NZIER report to the Packaging Forum

27 August 2020

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NZIER was established in 1958.

Authorship

This paper was prepared at NZIER by Sarah Hogan and Todd Krieble.

It was quality approved by Peter Clough.

The assistance of Sarah Spring is gratefully acknowledged.

Registered office: Level 13, Willeston House, 22–28 Willeston St | PO Box 3479, Wellington 6140
Auckland office: Ground Floor, 70 Shortland St, Auckland
Tel 0800 220 090 or +64 4 472 1880 | econ@nzier.org.nz | www.nzier.org.nz

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1 Background

The Packaging Forum asked NZIER to consider the Ministry for the Environment's proposed container return scheme (CRS) in terms of economic efficiency and cost-effectiveness compared with other possible interventions that might achieve the same objectives or even do more to shift New Zealand towards a more circular economy for packaging.

The Ministry for the Environment's proposed CRS, developed by the Auckland and Marlborough Councils, focuses primarily on the need to change consumer behaviour by encouraging consumers to see in-scheme packaging as a borrowed rather than purchased item through a deposit applied to each item refundable by returning the packaging to a convenient location, and to provide opportunities for community groups and businesses to contribute to recovery efforts through the ability to claim deposits.

The key project outcomes for the CRS are to:

- Change the way New Zealanders see beverage containers in such a way that leads to increased recycling and new opportunities for refilling.
- Reduce the volume of plastics and other container litter currently finding its way into streams, the marine environment, public spaces and landfills.
- Give effect to circular economy outcomes and any future priority product guidelines.

The key project guiding principles of the scheme's development are to:

- Make it easier and convenient to return containers across New Zealand.
- Design a solution that is cost effective and efficient.
- Improve the quality and therefore the marketability of recyclables.
- Assess the impact of scheme design on current kerbside and other collection and processing systems.
- Create new opportunities for employment, community participation and fund-raising for charities and social enterprises.

2 Key points

One of the most successful ways used internationally to achieve better recycling outcomes and reduce litter is Extended Producer Responsibility (EPR). EPR is an approach to environmental policy in which the burden of managing end-of-life products is shifted to the industry (which may include producers of packaging or packaged goods, retailers, and distributors) who place those products on the market. Well-designed EPR incentivises and supports industry to redesign products, packaging, and the recovery and processing of materials to achieve better environmental outcomes.

Efficient and effective EPR schemes are material-based (not product-based) because the product itself has little bearing on most of the recovery and recycling logistics chain and efficiencies are achieved when a recovery scheme targets a greater proportion of material.

European experience indicates that in most cases where a successful container return scheme (CRS) operates, the CRS is one element of a broader EPR scheme and it operates alongside significant public investment to support the triple aims of reducing, reusing and recycling. In many cases, a CRS has been an industry-led initiative in response to well-designed EPR schemes rather than a mandated CRS.

European experience also indicates that in most countries with a mandated CRS, this was introduced when no kerbside collection schemes existed, so the counterfactual for cost-benefit analysis was very different to New Zealand's. Enhancement to kerbside recycling collection achievable through EPR would provide an appropriate counterfactual for New Zealand.

Financially-incentivised EPR will deliver more efficient and effective solutions

On the basis of the evidence, we recommend that the government implement an all-materials, material-based EPR scheme based on recycling targets and tax incentives instead of the proposed CRS. There are three main reasons for this recommendation:

- The proposed CRS was intended to provide an efficient and cost-effective solution to beverage container waste. It does neither: It ignores the cost-efficiencies of combining packaging material with other applications, and results in a significantly higher cost per container than a well-designed EPR scheme – a huge incremental cost for a modest expected gain in outcomes.
- The proposed CRS introduces a significant burden for a narrow range of producers in response to a widespread problem, creating an unfair (not level) playing field for businesses. EPR can be applied more broadly and fairly.
- Industry is best positioned to identify cost-effective means to achieving outcomes while government is best at setting targets and providing financial incentives. A mandated EPR would bring together the relative strengths of both, reducing the risk of unintended harms and providing flexibility to adjust to new technologies, a changing economic landscape for recyclable materials, and future decisions regarding priority product stewardship.

A mandated EPR for New Zealand should operate through a producer responsibility organisation (PRO) which will oversee the collection of fees from industry, coordinate and contract for material collection and processing, support product innovation as well as

innovations throughout the recovery and recycling logistics chain. The PRO would work towards the development of a strong domestic demand for recovered material. For each material, industry should face a tax or levy representative of the cost of the material going to landfill. This tax may be reduced as the scheme improves recycling rates and may be ultimately be lifted when target recycling rates are achieved. This approach is used successfully in Norway.

A mandated and financially-incentivised EPR will drive industry to seek out efficiencies, including the adoption of new scanning technologies, new sorting technologies, efficient transport, and contracting for efficient collection of materials, which could include nationally harmonised kerbside collection. Where a CRS is identified as a cost-effective solution, a PRO may implement this, but the incentive to maximise recovery will also mean the PRO will benefit from financially supporting councils to improve kerbside collection for increased material separation.

The highly successful Norwegian EPR is an example of a system based on financial incentives and targets where industry are responsible for identifying operational solutions. The Norwegian EPR resulted in the creation of a plastic and aluminium beverage container CRS, while alternative systems for glass, with a strong focus on refillables and increasing kerbside collection, reflect the unique characteristics of glass. Because the Norwegian EPR is tax and target-based, the Norwegian government has created an effective and flexible framework to support cost-effective interventions that can adjust as technology evolves.

Based on glass costs, the proposed CRS will result in a net cost to industry of $0.21 per container, compared with EPR based on industry financed glass separate kerbside collection which we estimate would involve a net cost per container of $0.08 to $0.11. This differential could be even greater if kerbside collection costs are applied at $144 per tonne, or 3.9c per container (instead of the assumed $235 per tonne and 6.3c per container), resulting in a 13c per container difference between CRS and EPR.

Table 1 below summarises the benefits of this approach relative to a mandated product-based CRS.

Table 1 Selective product-based CRS compared with materials-based EPR

	Selective product-based CRS	Materials-based EPR	Justification for rating
Recovery of materials	Moderate	Strong	EPR extends recovery beyond packaging and avoids unintended recovery loss.
Litter reduction	Moderate	Moderate	CRS effective but only on a very narrow range. EPR could finance litter collection.
Circular economy	Weak	Moderate	CRS is dependent on overseas markets. EPR can incentivise domestic circular economy.
Cost efficiency	Weak	Strong	EPR incentivises all efficiencies across the logistics chain to be maximised.
Fair distribution of cost	Weak	Moderate	CRS imposes costs on a narrow range of producers for a widespread problem.
Unintended harms avoided	Weak	Moderate	CRS may incentivise consumers and producers to out-of-scheme packaging.
Innovation incentives	Weak	Moderate	EPR can incentivise substitution to re-useable and cost-effectively recycled packaging.
Future-proof, flexible solution	Weak	Strong	Mandated CRS traps government/industry in a fixed solution based on old technologies.
Loss avoidance	Weak	Moderate	Costly CRS results in higher losses in sales, GST and alcohol levy.

Source: NZIER

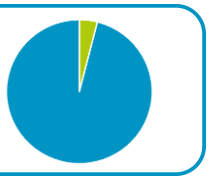
Mandated CRS as proposed is unfair, inefficient and could be counter-productive

Relative to a financially incentivised EPR, critical costs and risks presented by a mandated CRS on a selected range of products are:

- It places a heavy burden on a limited range of producers for a problem that is largely generated by other industries (only 4 percent of litter is beverage containers, with only one fifth of these being glass, and wine and spirits containers being virtually unseen in litter).
- It ignores and undermines existing glass recovery schemes which have been successful at lifting recovery rates using efficiencies from the logistics chain shared with other recovered glass.
- It creates additional inefficiency in the glass recovery system through the creation of another stream for beverage bottles, while other container glass remains in kerbside collection.
- It threatens to make dual stream kerbside collection (glass separate) financially unviable for councils, leading to glass contamination of other recyclables (including paper) which may increase the volume of waste sent to landfill.
- It incentivises consumers to substitute to larger containers, favouring plastic and undermining health messaging about reducing portion sizes.

- The potential loss of $407 million over ten years rising to $900 million over 30 years in excise revenue due to reduced alcohol sales will have a significant impact on Crown revenue[1].

Only 4% of litter items are beverage containers (Keep New Zealand Beautiful, 2018)



Our recommendations for a true circular economy approach

In light of the evidence, we recommend that the government consider:

- A Norwegian-style EPR which is based on an incentivising framework of taxes and targets rather than a pre-designed operational system and is material-based rather than product-based to avoid efficiency loss from duplicate systems for some materials. This has resulted in a cost-efficient and highly successful industry-led CRS for plastic and aluminium beverage containers and effective widespread adoption of refillable glass. Norway's kerbside glass collection recovers 93 percent of glass packaging and recycles 100 percent of this, proving that kerbside collection can be highly effective.
- Harmonising the council-run kerbside recycling collection schemes with at least glass-separate collection[2] and requiring the EPR's industry producer responsibility organisation (PRO) to fund this along with improved labelling to support more informed recycling.[3]
- Requiring councils to provide public infrastructure like public recycling bins, water fountains and re-fill stations to reduce the need for on-the-go single use bottles.
- Implementing national and local government procurement policies that support the markets for recycled material.

Our recommendations for avoiding the worst consequences of a mandated CRS

If a mandated CRS is to be implemented, we recommend that the government:

- Exclude glass until other options have been explored, recognising glass's unique value as an infinitely recyclable material, its potential for refill and reuse, furnace capacity constraints, and lack of secondary material export market.
- Require councils to provide dual stream (glass separate) collection of recyclables to prevent increased glass contamination of paper and other recyclables in what will otherwise be increasingly comingled collection systems.

1 Calculated from $698 million in excise revenue in 2018 (National Accounts), growing at 2.03% per annum in line with consumption growth, and reduced by 6.5% in line with the expected reduction in consumption due to a CRS-induced price increase, discounted to 2020 at 6% per annum.

2 Councils operating a single stream, co-mingled kerbside collection may be under the illusion that this is a less costly system than a dual, glass-separate system. Studies have identified that dual stream collection is less costly overall due to savings in processing costs more than offsetting any additional collection costs.

3 A materials-based (rather than product-based) EPR would generate sufficient revenue to fund this.

3 Policy goals and choices

In developing a CRS, the Ministry for the Environment and the Auckland and Marlborough councils are undertaking a policy exercise in an area that is largely driven by complex market dynamics. It is critical that the fundamentals of good policy are applied to ensure an optimal outcome. Any poorly designed, loophole-ridden EPR system, whether it includes a CRS or not, would be ineffective and validate producers' concerns that the scheme will achieve little by way of benefits but will result in a higher overall cost than the existing approach to waste management.

According to the OECD (2014), the development of product-based economic instruments requires selecting instruments which:

- Are appropriate to environmental problems and policy objectives
- Are capable of achieving the required environmental improvements
- Pose the least cost or burden on the economy relative to the environmental benefits they offer.

The experience of OECD countries in implementing various EPR schemes with or without CRS indicated that these considerations are fundamental to the success of the scheme (OECD, 2014).

Because of the costs and challenges of CRSs, the OECD considers compulsory CRS schemes to be most suitable for hazardous products such as batteries rather than for drinks containers (OECD, 2014). EPR on the other hand, is the OECD's favoured approach for consumer packaging. EPR schemes do not necessarily include a CRS unless a CRS is an efficient and sustainable solution, and if this is the case, the CRS would not need to be mandated under a well-designed EPR.

On the subject of efficient and sustainable EPR specifically, the Institute for European Environmental Policy advises that the development of a CRS or other operational scheme for achieving the government's environmental goals should be industry's responsibility, not the responsibility of national or local government. It advises that the national government's role should consist of creating a policy and legislative framework to guide the development of EPR, but not requiring specific operational solutions (Watkins and Gionfra, 2019).

4 Problem definition

The proposed CRS was conceived of as a means to reduce litter (including litter that finds its way into the marine environment) and increase recycling to reduce the amount of recyclable material that goes to landfill.

The problem that the proposed CRS seeks to resolve, from an economic point of view, is one of externalities. Negative externalities are generated by the consumption of packaged beverages due to the price paid by the consumer not reflecting the full environmental cost of the packaging. This arises for several reasons:

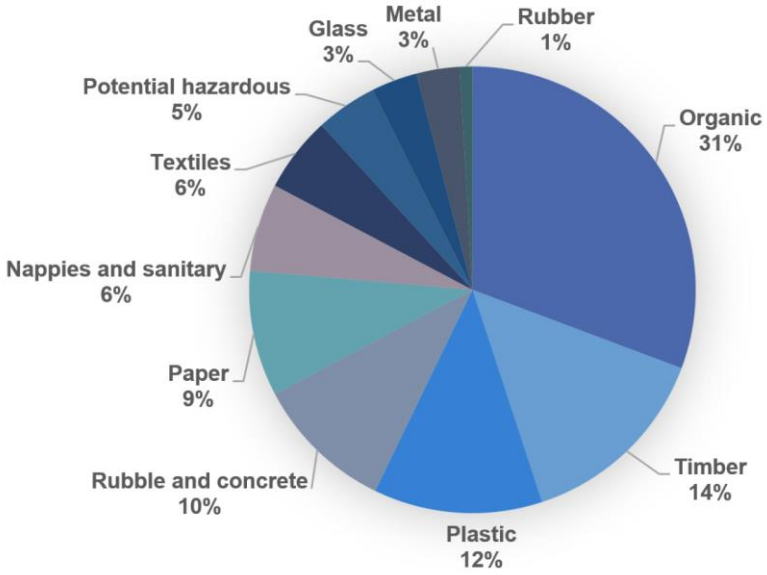
- Natural resources consumed to produce the virgin material used for packaging are not always priced appropriately.
- Environmental taxes and levies imposed on the packaging producer often do not reflect the full environmental cost of the production process.
- The price paid by the consumer does not include the cost of disposing of the packaging (to landfill, or to return to the market through recycling or re-use).
- Where landfill costs are paid, they are often under-priced.

It is important to note that the problem of beverage packaging is only a small proportion of the packaging waste issue in New Zealand.

All types of glass, plastics and metals account for only 18 percent of landfill waste in New Zealand (see Figure 1 below). Only a fraction of this is attributable to beverage containers as flat glass, other container glass, metals from construction, commercial and industrial applications as well as other household items, and plastics from bags, food containers, other household waste, retail and commercial waste are all included in these categories of landfill waste.

Figure 1 Composition of waste disposed to New Zealand landfill

2018



Source: Office of the Prime Minister's Chief Science Advisor, from Perrot, 2018

While high rates of litter and low recycling rates are identified as problems that the proposed CRS aims to address, there are additional problems that can't be ignored in developing a cost-effective solution and a true circular economy for packaging:

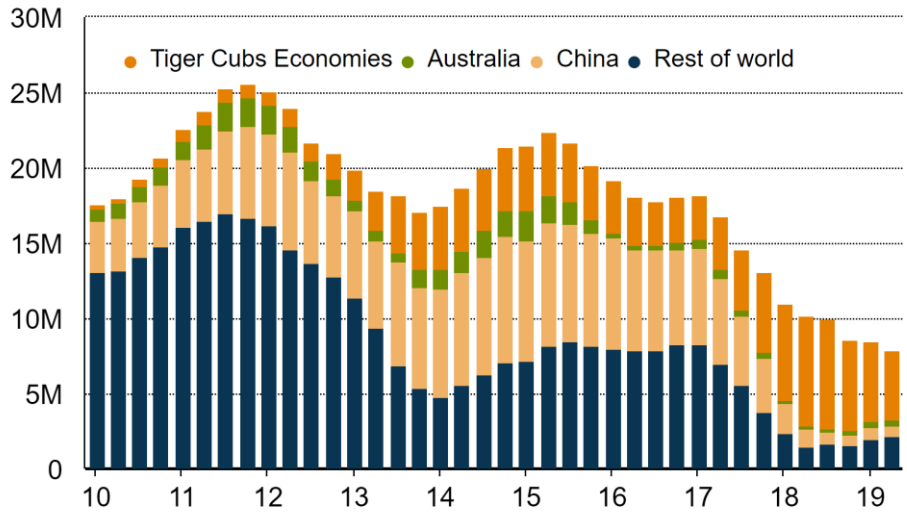
- International markets for recyclables have changed and may continue to change
- Consumer behaviour is complex, heterogeneous and influenced, even limited by the prevailing waste and recycling systems
- Producer behaviour is simultaneously a function of incentives and prevailing market realities

4.1 International markets for recyclables have changed

A key driver of the problem New Zealand faces with landfill waste volumes and the presence of recyclable material in landfill waste is that until recent years, New Zealand has been able to ship recyclable material collected through kerbside recycling schemes to overseas markets. This is no longer possible, due to concerns about health and safety and the abundant supply of recyclable material being generated within overseas markets. China's decision to no longer accept the heavily contaminated material that it had previously accepted (see Figure 2 below for plastics example) has meant New Zealand – along with other first world nations – must now find a way of dealing with contaminated recyclable material.

Figure 2 New Zealand exports of plastic waste, scrap and parings

$m, year-end FOB, by destination



Source: Beattie, 2019

Table 2 below shows the impact of comingling on material value. As the market value of recycled materials is greatly influenced by their quality, there needs to be a focus on properly sorted recycled materials that are free of contamination.

Table 2 Value per tonne of kerbside recycling bins: co-mingled vs sorted

(AUD, 2019)

Average make-up of a kerbside bin	Value per tonne – co-mingled	Value per tonne – sorted
51.5% paper and cardboard	$0	$90.56
27% glass	-$8.25	$19.25
7.5% plastic (grades 1-7)	$8.25	$19.20
4% metal (aluminium and steel)	$15.05	$15.05
Up to 10% contamination	-$13.00	-$1.30
Potential value (rounded nearest tonne)	$2.04	$156.51

Source: EY, 2019

Domestically, there is very little demand for comingled and contaminated recyclable material due to the cost of sorting, cleaning and processing it being substantially higher than the cost of virgin materials.

4.2 Consumer behaviour

Consumer behaviour is a critical part of the problem of packaging waste. There are three dimensions to this problem that the CRS seeks to influence:

- littering behaviour
- recycling behaviour
- consumption choice

4.2.1 Littering

According to the Ministry for the Environment's Environmental Attitudes Baseline, half of New Zealanders are very or extremely worried about the impacts of waste. Most New Zealanders feel that everyone should bear some responsibility for waste reduction, including government, but nearly a third think that the government is not currently doing enough. 55 percent of New Zealanders were highly committed to reducing the amount of waste they generate but barriers to reducing waste were identified as a lack of alternatives to plastic packaging, the cost of reusable items, and forgetting to carry reusable items.

4.2.2 Recycling

One of the aims of the proposed CRS is to increase recycling and improve awareness of the value of recycling amongst New Zealanders. The behaviour change and CRS design are together expected to help to address the low rates of recycling of beverage glass, PET plastics, and aluminium.

Most New Zealanders already value recycling, as evidenced by the Environmental Attitudes Baseline report (2018) which found that 62 percent of New Zealand adults identify themselves as "highly committed to recycling".

But consumer commitment to recycling may not be accompanied by appropriate consumer behaviour. Much of the material currently collected for recycling cannot be economically recycled due to contamination and co-mingling.

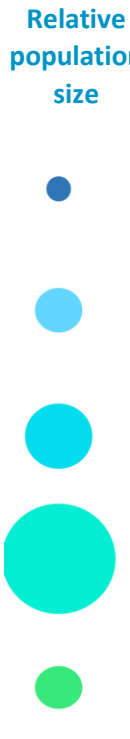
While there is no doubt that improving the quality of recovered material is critical to improving recycling rates and that the proposed CRS would offer a solution, the CRS treats the problem as requiring a financial incentive for consumers.

Responsive policy would suggest that other solutions might be equally effective and potentially less costly, given that the majority of New Zealanders do want to do the right thing. Figure 3 below shows how most New Zealanders can be characterised as "wish-cyclers" – people who are highly committed to recycling but don't understand the rules of the system. Other important groups, based on the litter and recycling survey results, would be the champion recyclers and reluctant recyclers – those who already do all the right things, and those who would if it were made easy. Relatively few New Zealanders fall into the indifferent recycler and litter bug categories where not recognising the value of recycling is an issue.

The key issue is that for the majority of the population, better information supported by reduced co-mingling in the existing system has the potential to make a significant difference to the quality and quantity of recovered material.

Only the litter bug type requires heavy-handed approaches such as taxes and subsidies. Given that other options could achieve good results for the vast majority of the population, these should be evaluated on a cost-effectiveness basis.

Figure 3 Attitudes to recycling and responsive policy



Relative population size	Type	Attitudes and behaviour	Policy response
	Litter bug	Doesn't recognise the importance of recycling or waste disposal. Contributes to contamination, loss of recyclable material, and litter. Unlikely to respond to education or improved systems but will if incentives are strong enough.	Incentives – tax and subsidy
	Indifferent recycler	Doesn't recognise the importance of recycling but does not litter. May use whatever bin (rubbish or recycling) is convenient. Contributes to contamination and loss of recyclable material to waste. Needs education to understand importance of recycling.	Education
	Reluctant recycler	Understands the importance of recycling but inconveniences are seen as significant. Could be an effective recycler if the system were minimally inconvenient. Likely to resent being forced into a more inconvenient solution	Simple and easy access collection system
	Wish-cycler	Enthusiastic and well-meaning. Would be an effective recycler but doesn't understand the system. Potentially worst offender for co-mingling and contamination. Needs clear, easy to understand information.	Information
	Champion recycler	Understands the requirements for well-sorted, uncontaminated recycling. Uses systems effectively. Limited by system constraints, eg. co-mingled collection, infrastructure constraints.	Improved collection and recycling systems

Source: NZIER

4.2.3 Consumption choice

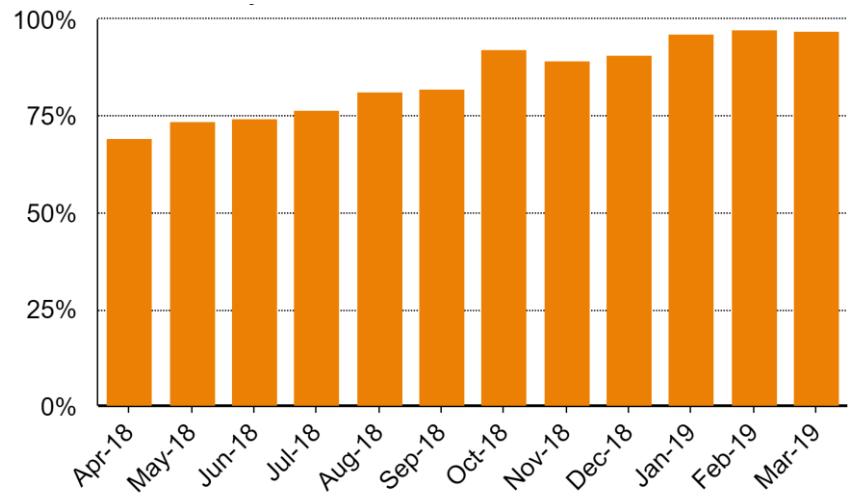
Consumers are an important part of a circular economy, not just because they are critical to material recovery efforts, but because the choices they make when purchasing goods and services can reduce the amount of waste generated and influence producers to design more environmentally friendly products and packaging.

When consumers purchase goods and services, they do not typically take into account the cost to society or to the environment of disposing of any associated packaging. While consumers do pay for councils' waste management schemes through rates, this payment is not directly associated with consumption decisions and consumers are not individually incentivised to change consumption decisions to reduce such costs.

But consumers do not necessarily need to face costs to change behaviour and there are numerous examples of non-cost-based interventions that have led to significant behaviour change, including such interventions as simply raising awareness, providing information, or making it easier for consumers to choose the preferred behaviour.

Most New Zealanders want to do the right thing. For example, from 1 July 2019, single-use plastic bags were banned in New Zealand, but consumers had been slowly converting to reuseable bags for months, reflecting a growing discomfort with unnecessary use of throwaway plastics (see Figure 4 below).

Figure 4 Reuseable bag usage by New Zealand households



Source: Beattie, 2019

Despite growing volumes of packaging waste, it is likely that many households are making efforts to reduce purchases of packaged items or purchase items in recyclable packaging.

Unfortunately, the same lack of awareness that affects many consumers' decisions about recycling will also affect their decisions about consumption. Simply put, if consumers don't know what can be recycled, then recyclability cannot factor into purchasing decisions.

With council recycling collection being a patchwork of different schemes, changing over time with little information provided to households, consumers have lacked much needed

guidance to inform purchasing decisions. Again, most consumers probably want to do the right thing, but this has not been facilitated by the existing systems.

4.3 Producer behaviour and market realities

Consumer commitment and awareness is not enough by itself to generate high recycling rates. There are a number of challenges that keep recycling rates low in New Zealand that are not directly related to consumer behaviour. These include:

- The low price of virgin material and lack of incentive for producers to use recycled material in packaging, resulting in a weak secondary market for recycled beverage container materials.
- A higher volume of imported than exported beverages resulting in a greater volume of material in the New Zealand market than can be re-absorbed by New Zealand producers.
- Lack of a ready market for non-beverage container products with sufficient demand for the current volume of recycled material.
- New Zealand's distance from potential overseas secondary markets for recycled material.

The first of these issues – the lack of incentive for producers to choose recycled material when raw materials are low cost – is easily addressed. Other countries have addressed this problem with raw materials taxes, packaging taxes that adjust to reflect recycled content, and mandated recycled content minima.

But even if a system change can address the producer incentive, the other challenges remain. These challenges apply to many materials used to produce many different goods, and the responsibility for overcoming them should not be disproportionately placed on a small group of producers. Recycled material from beverage containers could find an appropriate use in the manufacture of other products, but if the manufacturers of those products have no incentive to use recycled material and face low virgin material costs, this market will never develop.

The government currently does less than many governments overseas to help create a secondary market for recycled materials. A lack of procurement policies focussing on recycled materials represents a lost opportunity for government to support a strong and stable secondary market.

Finally, New Zealand's distance from potential overseas secondary markets for recycled material poses a challenge for recovered material. Shipping glass is largely uneconomic and other material still faces the difficulty of competing on price when transport costs are added.

5 The counterfactual is critical

The decision to adopt a new system has to be made based on the costs and benefits of the new system relative to a counterfactual – either the status quo, or if an alternative improvement is possible, then the alternative scheme should be the counterfactual. Cost benefit analysis (CBA) results identify whether the intervention represents an improvement relative to the counterfactual.

5.1 The European CRSs have been implemented in a different context

According to a UNESCO report (Fullana i Palmer et al, 2017) the common contextual features of European CRSs are:

- A CRS for single-use packaging implemented in addition to an existing widespread CRS for reuseable/refillable packaging.
- A lack of any other generalised model for recovering single use packaging (e.g. no kerbside recycling collection).

The counterfactuals in European decisions, therefore, rarely included kerbside recycling or any system where enhancements of kerbside recycling might offer a more cost-effective solution. New Zealand's context is clearly different in that kerbside collection exists in most areas, and improvements to these could potentially offer cost-effective improvements to recycling rates.

5.2 A mandated EPR offers the best counterfactual to a mandated CRS

A potential alternative to a mandated CRS is a mandated EPR based on financial incentives. The key difference between a mandated EPR and mandated CRS is that the former creates a legal and financial framework to drive industry to identify and implement effective solutions across the life cycle of recyclable and non-recyclable materials, whereas the latter dictates an operational level solution and imposes it on industry on the assumption that it will achieve the desired results.

The UNESCO-led ARIADNA Project (Fullana i Palmer, et al., 2017) provides an analysis of mandated CRS when the counterfactual is a financial incentives-based EPR. It found that both the mandated CRS and the EPR would be net beneficial to society, but that the CRS resulted in higher collection costs and more environmental damage associated with inefficient collection of materials. Household costs of the CRS were also found to be significantly higher than under the EPR.

The existence of an almost nation-wide kerbside recycling scheme and credible analysis indicating that EPR approaches are more cost-effective, are strongly suggestive that New Zealand should not rush into a CRS, but rather expand the scope of the current project to consider alternatives, such as EPR schemes.

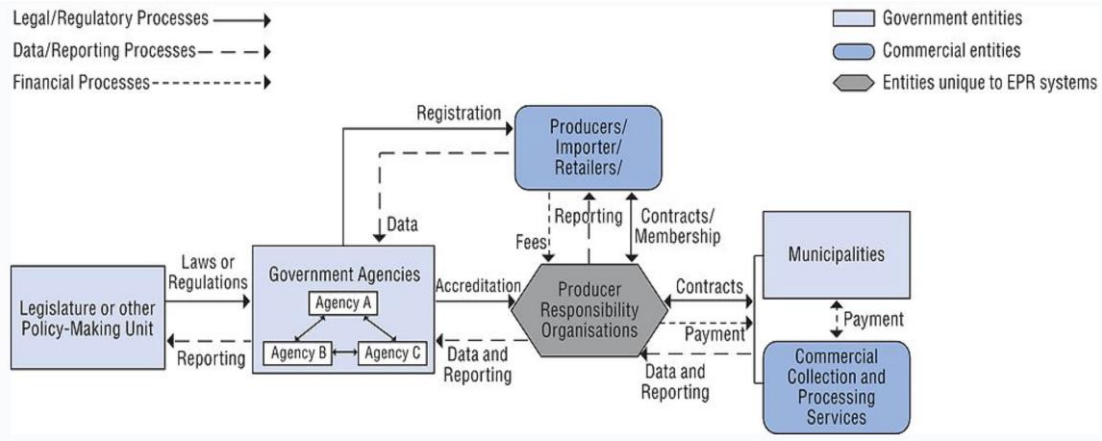
The key elements of an EPR are:

- A PRO – potentially one umbrella PRO managing multiple material – or product-based PROs – is formed by industry to collect fees from industry, finance the scheme(s), fund innovations at all stages, and report to government against targets. The formation of a PRO can be mandated as part of the EPR legislation.

- Industry, via the relevant PRO, contracts with collectors and/or councils to recover materials from households and businesses. The involvement of councils can be left to market forces (dependent on the PRO's ability to provide sufficient financial incentive to councils) or can be mandated (e.g. to ensure material and geographic coverage).

Figure 5 below shows how reporting, contracting, financial and other relationships between government agencies, local government and industry would be altered by an umbrella PRO.

Figure 5 Regulatory, reporting and financial relationships in an EPR



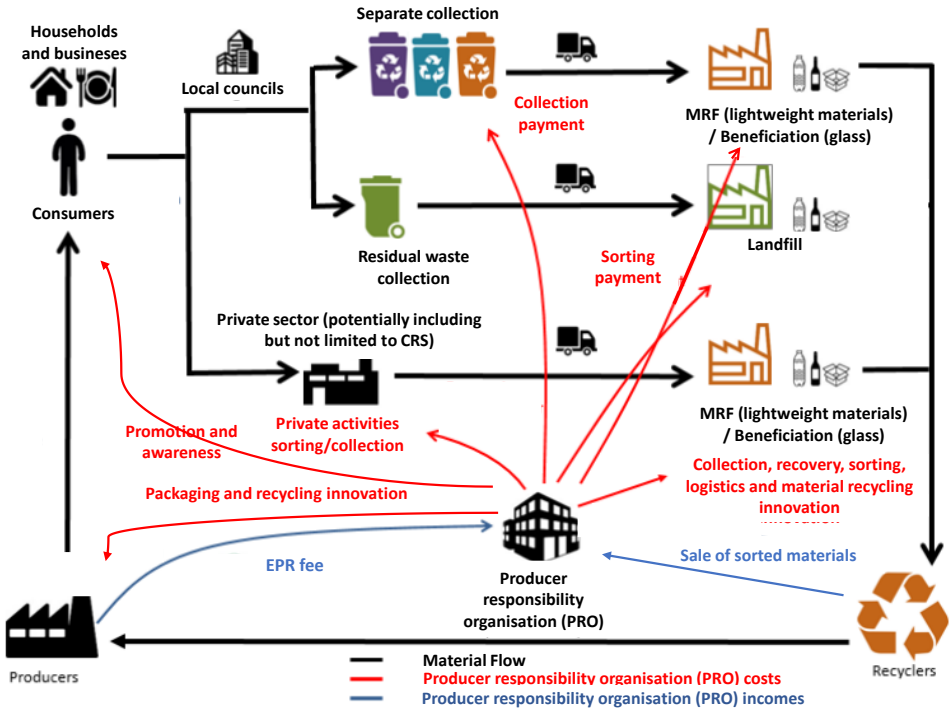
Source: OECD (2016)

The PRO would use fees collected from industry to fund collection of materials either through kerbside recycling collection or industry-led CRS. In the Norwegian system, the beverage industry implemented a CRS for PET and aluminium cans. This system, designed, operated and funded by industry, was then formalised in regulation to ensure that appropriate support systems such as labelling and accessible return/collection points could be established and that industry membership and contributions would be ensured. Originally, glass was included in the Norwegian CRS but it was later removed as industry identified alternative solutions as more cost-effective. Glass is now being increasingly collected through council-run kerbside collection in recognition of the higher material recovery rates that this allows (Papineschi et al, 2019).

An EPR does not pre-suppose what methods of collection work best and does not lock industry into a particular system, but supports multiple approaches based on the particular challenges of recovering and recycling each material. These challenges evolve over time, so the EPR provides the flexibility to respond accordingly.

Figure 6 below shows how material and money flow through an EPR system in which local councils are funded by the PRO to undertake separate collection of recyclable material, potentially alongside an industry-designed CRS. While separate kerbside collection is costly to councils, PROs will be able to fund such collection for many materials due to the higher material value obtained and the financial incentive built-into the EPR.

Figure 6 EPR flows of materials and money



Source: NZIER, adapted from Fullana i Palmer, et al. (2017)

EPR schemes such as this offer the best solution for glass especially due to the use of glass in non-beverage containers and the role of glass in the contamination of other materials collected through kerbside schemes. When glass is included in CRS for beverage containers, there are two systems for household glass and kerbside volumes are too low to justify separate collection. When glass is covered by EPR and the PRO funds separate kerbside collection, the efficiency of glass recovery is enhanced and the value of other kerbside recycling is increased.

5.2.1 Industry collaboration should be a key objective

"A level playing field that drives collaboration" is one of four features of the Norwegian EPR scheme that was highlighted as driving effectiveness in a report by the Office of the Prime Minister's Chief Science Advisor (Jono, 2019).

The Norwegian EPR was designed by industry in response to the government's tax and target-based approach to waste minimisation. Under the Norwegian scheme, all plastic bottle-using producers must pay an environmental tax unless the industry as a whole achieved a 95 percent recycling rate on plastic bottles. The Norwegian government left the design and running of a system to achieve the target up to industry. In response, the industry:

- Created an industry body to develop and operate a cost-effective system to ensure high rates of return, recovery and recycling, and to run public education and awareness campaigns to support this.
- Implemented a container return scheme.

- Introduced standardised packaging materials and components to reduce the cost of recycling and facilitate repeat recycling of packaging.

This difference is critical because the tax is adjusted to reflect the recycling rate, so that the more successful the industry is, the less tax its members pay, up to the target of 95 percent recycling of plastic bottles at which point there is no tax.

Because the tax system rewards and punishes collectively, producers are incentivised to collaborate. This means industry leaders help to bring laggards on board, and innovation that is cost-effective gets widespread take-up. 99 percent of Norwegian plastic bottle-using producers have opted into the scheme. Together they have introduced an industry-designed CRS, industry-led collection systems, and improvements to enable the highest plastic bottle recycling rates in the world, including standardisation of materials, from bottle plastic to labels, tops and even glue.

6 The proposed solution

The proposed CRS attempts to address the problem of litter and recyclables going to landfill by imposing on producers of goods packaged in targeted materials three fees:

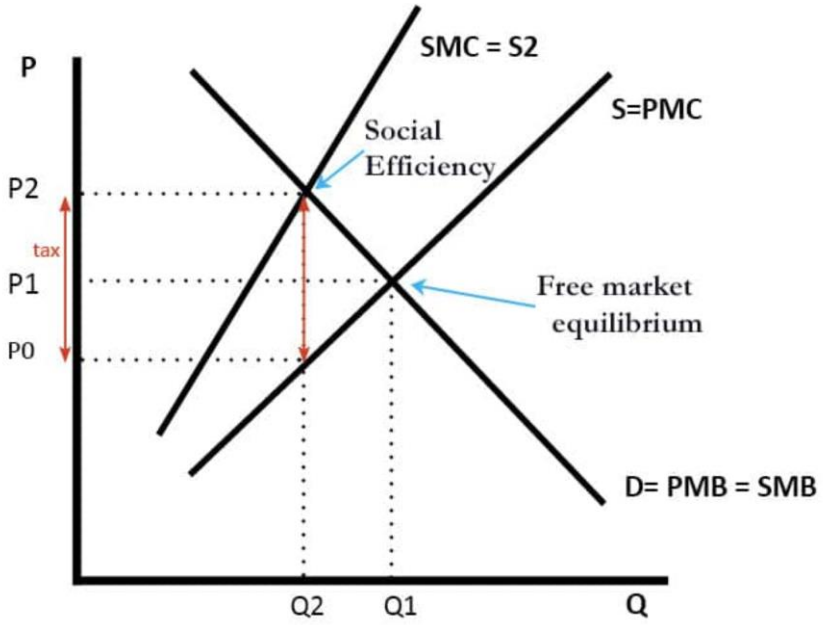
- A deposit fee, expected to be passed through in full to retail and then the consumer, which is fully refunded to the consumer when the container reaches a return facility.
- A scheme fee to reflect the average cost of recycling a container through the CRS (landfill costs associated with containers returned but not able to be recycled will be reflected in this fee).
- An advanced material recycling adjustment to reflect the additional (or lower) cost of recycling the specific packaging type.

The CRS is expected to force producers to change the packaging they use to favour reductions in material used, increased recyclability, and increased recycled content or reuseability, or else increase prices to consumers. There are two important considerations for the likely cost-effectiveness of an intervention that apply in this context: Market efficiency for a socially optimal allocation of resources and targeting efficiency to get the best results for the cost.

6.1 Market efficiency

The most efficient approach to dealing with negative externalities is what economists refer to as a Pigouvian tax. The aim of a Pigouvian tax is to increase the price of the good so that it fully reflects the social marginal cost of the good. The resulting demand and supply equilibrium will then reflect the most socially efficient allocation of resources. The mechanics of the tax will generally result in consumers paying some amount more than they would have without the tax and the producer receiving some amount less than they would have without the tax (the exact balance depending on the price elasticity of demand and the producer's willingness to pass the tax onto consumers versus absorbing it). See Figure 7 below.

Figure 7 Pigouvian tax



Source: Pettinger (n.d.)

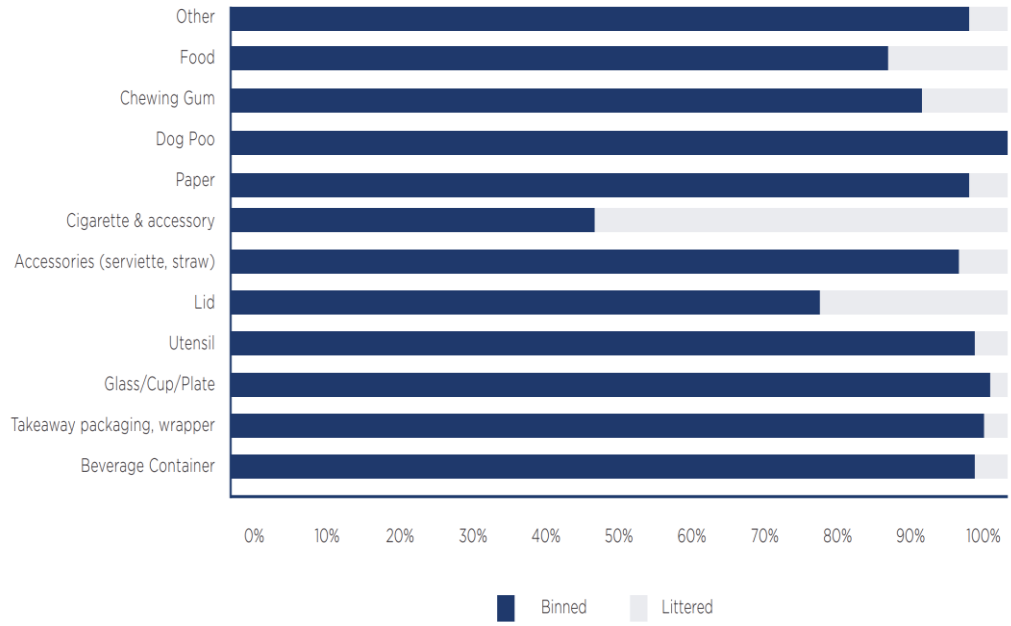
The proposed CRS attempts to offer consumers a Pigouvian tax on packaging consumption and a Pigouvian subsidy on recycling. But a Pigouvian tax and subsidy only result in optimal outcomes when they perfectly reflect costs and benefits. In markets where values vary significantly over time (for example, the value of recycling is lower when there is weak demand for recycled material or when low cost landfill is available for a material that causes little environmental harm), a Pigouvian tax and subsidy approach offers no guaranteed advantage over other approaches and should, therefore, be evaluated against other policy options.

The key issue for the proposed CRS is that although it attempts to take a Pigouvian-tax-and-subsidy approach to a problem of externalities, it will be unable to produce a socially optimal outcome because the fixed fees are too blunt for a multiple-materials market where values change frequently.

6.2 Targeting efficiency with respect to the litter problem

The Keeping New Zealand Beautiful Litter Behaviour Report (2018), identified the common types of littered items and identified cigarettes and accessories, lids (presumably plastic lids off takeaway cups), food and chewing gum as the items most likely to be littered, with proportion littered ranging from around 10 percent to over 50 percent. In contrast, beverage containers are littered relatively infrequently at less than five percent (see Figure 8 below).

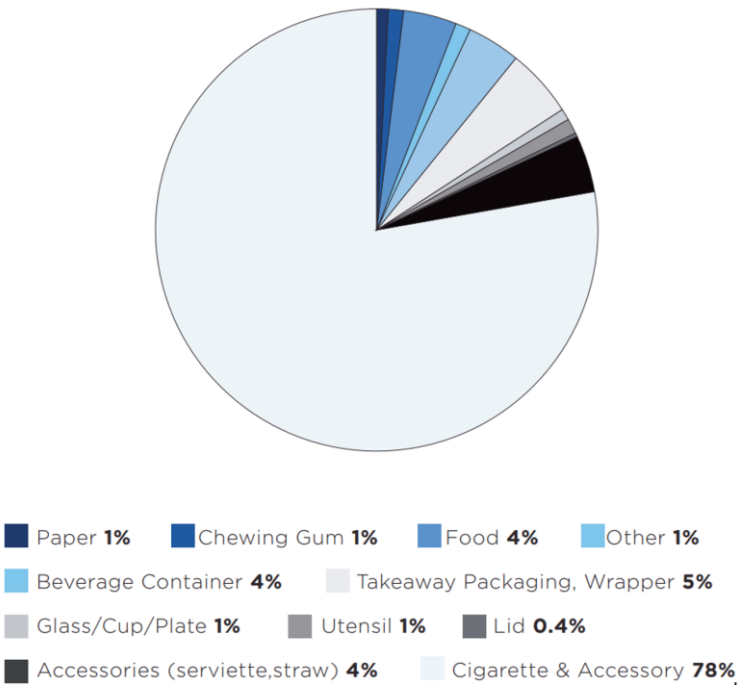
Figure 8 Ratio of binned to littered items by category in New Zealand



Source: Keep New Zealand Beautiful, 2018

The report found that, of items littered nationally, beverage containers made up 4 percent of the problem (as measured by number of items). Within this, glass made up only one fifth of littered beverage containers (0.8 percent overall), and wine and spirits containers were almost unseen (0.01 percent overall).

Figure 9 Items littered nationally



Source: Keep New Zealand Beautiful, 2018

Based on these findings, even a scheme that is 100 percent successful at eliminating beverage containers from litter will have very little impact on the total amount of litter. It's also important to note that not all beverage containers are included in the proposed CRS: Beverages in pouches are excluded and probably represent some proportion of the four percent of litter that is beverage containers.

Furthermore, the proposed CRS does not purport to offer sufficient incentive to prevent any consumer from littering, but rather it expects that it offers sufficient incentive for some consumers to pick up litter with a deposit value attached.[4] Given that some littering of beverage containers is still expected and may lie around for some time before being picked up, and that litter may blow into inaccessible places, or into waterways where they may not be retrieved by deposit-refund-seekers, the real benefit associated with any litter reduction is likely to be trivial and any expected savings in litter collection are likely to be unrealistic.[5]

The targeting efficiency of the proposed CRS is, therefore, weak given that it does not address most of the litter that is identified in its problem definition. An initiative targeting more significant sources of litter like cigarettes or waste from takeaways (wrappers, lids, straws, serviettes),[6] or targeting common locations for litter by providing more rubbish and recycling bins[7] might be expected to achieve better results.

6.3 Targeting efficiency with respect to the recycling problem

With regards to recycling, the proposed CRS is equally poorly targeted.

According to WasteMINZ (2020), an audit of the kerbside rubbish and recycling of 867 households in New Zealand revealed that PET (#1) drink containers have one of the highest recycling rates of any plastic containers on the market, second only to HDPE (#2) dairy containers (76 percent compared with 82 percent, see Table 3 below).

Some types of plastics may not be placed in kerbside recycling due to exclusions from council recycling schemes. However, PET is collected at kerbside for recycling across most of New Zealand with no restrictions on the type of container. Nevertheless, non-drink containers made of PET (#1) have a significantly lower recycling rate than PET drink containers (52% compared with 76%, see below). That is, almost half of salad dressing bottles, biscuit trays, salad domes, peanut butter containers, etc. are thrown into rubbish bins and bags despite being made of a highly recyclable material supported by kerbside collection.

The same comparison is true for HDPE containers. HDPE drink containers have an 82 percent recycling rate, while HDPE non-drink containers only have a 58 percent recycling rate.

4 The proposed benefits even include providing an income source to low income New Zealanders. The government does not appear to have consulted low income New Zealanders about the acceptability of deriving small amounts of income from picking up other people's waste. There is also at least anecdotal evidence that deposit-seeking behaviour can lead to increased litter (Gold, 1990).

5 Even if substantial reductions in litter were achieved, litter collection is largely a labour-intensive activity, the cost of which is more likely to be a function of geographic area covered and speed, rather than volume or weight of litter.

6 In the UK, MacDonalds alone contributes 1/3 of all litter. (https://www.telegraph.co.uk/news/earth/earthnews/4223106/McDonalds-waste-makes-up-largest-proportion-of-fast-food-litter-on-streets.html)

7 An Australian study found that there are concentric rings of litter around fast food outlets. https://www.abc.net.au/news/2017-06-01/circles-of-rubbish-ring-fast-food-restaurants-says-riverkeeper/8578876

Table 3 Plastic containers in kerbside rubbish and recycling collection

Per annum

Plastic containers in kerbside collection	Tonnes collected as kerbside rubbish	Tonnes collected as kerbside recycling	Total tonnes collected	Percent of total collected as recycling	Reduction in kerbside rubbish tonnes if recycling rate raised to 76%*
Drink containers #1	**4,042**	13,003	17,045	76%	n.a.
Other containers #1	6,744	7,194	13,938	52%	**3,399**
Dairy containers #2	1,757	7,861	9,618	82%	n.a.
Other containers #2	3,305	4,506	7,811	58%	**1,430**
Containers #3	49	84	133	63%	**17**
Containers #4	78	160	238	67%	**21**
Containers #5	4,947	5,169	10,115	51%	**2,519**
Containers #6	1,073	642	1,716	37%	**661**
Containers #7	196	395	591	67%	**54**
Unidentifiable containers	3,565	2,171	5,736	38%	**2,188**
Bottle tops and lids (loose)	1,411	1,087	2,498	44%	**811**
Total plastic container items	27,166	42,272	69,438	61%	10,501

*Same recycling rate as drink containers made of PET (#1)
Source: NZIER, adapted from WasteMINZ (2020)

If non-drink containers made of PET had the same recycling rate as PET drink containers, nearly as much PET would be prevented from going to landfill (3,399 tonnes) as a 100 percent recycling rate on PET drink containers (4,042 tonnes). Extending the drink container recycling rate to non-dairy containers made of HDPE (#2), would reduce kerbside rubbish by a further 1,430 tonnes, for a total reduction of 4,829 tonnes of plastic.

This reduction in plastics to landfill could be achieved simply with improved information to households.

How can we be sure that that a reduction in the amount of other plastics placed in kerbside rubbish is achievable? The number one reason given for plastics going to landfill in the WasteMINZ report is “plastic confusion”:

- Only 40 percent of consumers know what the recycling symbols mean.
- 5,736 tonnes (182 million items) of plastic containers have no plastic code on them.

The WasteMINZ report recommended that manufacturers and government investigate adopting a national labelling system such as the Australasian Recycling Label.

The WasteMINZ report also highlighted the importance of other plastics. While PET (#1) and HDPE (#2) are collected by most councils’ kerbside collection schemes, nearly half refuse to accept polystyrene and expanded polystyrene (#6 and #7), and no more than two thirds accept PVC (#3), LDPE and LLDPE (#4) and PP (#5).

A CRS targeting PET drink containers only is targeting a container type that is already achieving a better recovery rate than other items and financially penalising producers who are using easily recyclable material.

7 Uncertainty and risk

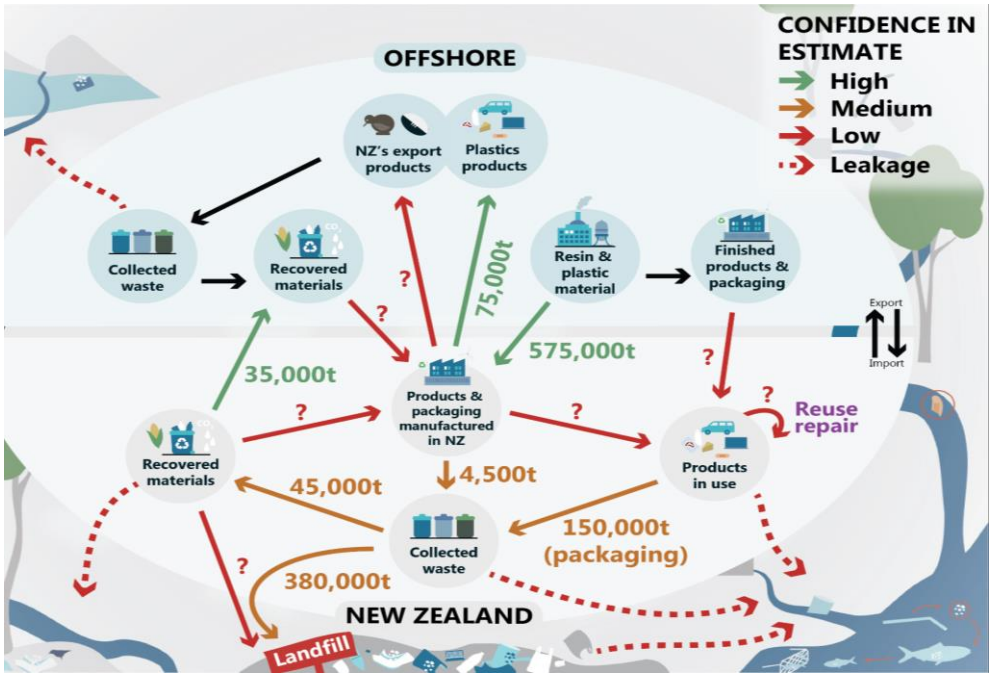
A major issue affecting the credibility of a single proposed solution being considered is the presence of extreme uncertainty across almost every aspect of the proposed CRS.

Even the problem definition is subject to uncertainty because it is not really known:

- What proportion of landfill waste is specifically beverage container material.
- Why beverage container material ends up in landfill.
- What currently prevents consumers from recycling more beverage containers (e.g. not caring, a lack of information, a lack of recycling bins when on-the-go).
- What reduction in litter is necessary to make a meaningful impact on New Zealanders, on marine life, and on the environment more generally.

Quantification of the problem is particularly subject to uncertainty, as illustrated by Figure 10 below, depicting attempts by the Office of the Prime Minister's Chief Science Advisor at quantifying material flows of plastics in New Zealand. Mass balance estimates are equally fraught and this applies to glass and aluminium as well.

Figure 10 Uncertainty in quantifying plastics in New Zealand



Source: Office of the Chief Science Advisor

The presence of extreme uncertainty has a number of important implications for how the government should proceed in identifying solutions. The main implication being extreme caution due to the potential for unintended harm.

7.1 Unintended harms

Unintended harms are a common consequence of policy based on an overly simplified intervention logic that ignores uncertainty or assumes it to be of minor significance. The proposed CRS might cause unintended harms due to:

- unexpected consumer response
- unexpected producer response.

7.1.1 Unexpected consumer response

The assumption that a CRS is cost neutral for consumers and therefore does not incentivise any behaviour change beyond the incentive to return containers to reclaim deposit is flawed. The economic realities of consumer choice indicate that:

- Some consumers will respond to higher prices by reducing demand because they face an immediate budget constraint that is not affected by the potential to reclaim deposits later.
- Some consumers will respond to higher prices and a rigid immediate budget constraint by substituting to lower cost products to compensate for the amount of the deposit.
- A flat deposit on all containers changes the relative prices of products and incentivises consumers to switch to larger containers which are typically made of plastic, but may also mean increased consumption of alcohol and sugar as a result of upsizing.
- If all fees are passed through to consumers, the increase in prices could be substantial on some products, resulting in hardship particularly for lower income households.[8]
- Increasing consumers' incentive to return containers reduces consumers' incentives to re-use containers. In fact, consumers who choose to re-use containers are financially penalised by their loss of the deposit for doing so.
- Some consumers may feel excessively inconvenienced by the requirement to return containers for deposits and substitute to items in less 'green' out-of-scheme packaging which will be placed in kerbside recycling or rubbish bins and result in more waste to landfill.
- The potential for long queues at return facilities at peak times or when some consumers return large amounts of packaging, may incentivise consumers to dump containers in rubbish bins, shattering glass and eliminating any potential for glass containers to be returned and posing a safety risk to anyone who attempts to retrieve other recyclables contaminated with glass shards.
- The potential for return-to-retail storage to run out before collection, may also result in consumers being turned away, increasing dumping/littering behaviour or inconvenience costs.

[8] The OECD points out that while deposit refund schemes are a relatively simple concept, implementation of these schemes is generally very complex and operation costs can be very high (OECD, 2014). As a result, producers, distributors and retailers experience a heavy burden which may be passed on to consumers in the form of higher prices. The OCED cautions that this burden on consumers should be considered carefully against the benefits that the system aims to achieve. Because of the costs and challenges of deposit refund schemes, the OECD considers compulsory DRS schemes to be most suitable for hazardous products such as batteries rather than for drinks containers (OECD, 2014).

Reduction in consumption and impact on Crown revenue

A CRS is expected to increase the price of in-scheme packaged beverages. Consumers will generally respond to an increase in price by reducing consumption. This happens for two reasons: First, consumers respond to the change in relative prices – the fact that in-scheme beverages have become more expensive compared with other goods. Second, consumers respond to the implications of the price increase within their budget constraint which requires that either they consume less of the good whose price has increased or less of other goods (consumer response frequently involves some reduction on a range of goods).

Currently the Crown enjoys nearly a billion dollars of revenue annually in alcohol excise. With growing consumption, this revenue is expected to continue to grow. Based on expected consumption growth of 2.03 percent per year (PWC, 2020) and expected reduction in consumption of 6.5 percent (CRS project team assumption), the reduction in excise revenue in 2020 would be $47.5 million. The present value of a 30-year impact of the CRS on excise revenue is approximately $908 million ($407 million over ten years). Clearly this is a significant impact, and one which may be reduced by a more efficient, less costly system than a mandated CRS.

7.1.2 Producer behaviour

Approximately 80 percent of the environmental impact of a product is determined by its design (Watkins et al., n.d.). It is critical that any scheme aiming to increase recycling rates and reduce waste to landfill maximise influence on the decisions made during product design which will directly influence end-of-life management (including the durability, recyclability, reusability and reparability of products).

Faced with large volumes of recovered material and weak demand for the recycled material, as well as a high cost of landfill disposal, producers would ideally respond by:

- Reducing the amount of materials used in packaging to reduce the supply of recycled material so that it more closely matches demand.
- Including a higher proportion of recycled material in packaging, substituting demand for recycled material for their counterfactual demand for virgin material; or
- Potentially setting up a refill process, which may require a change in containers and will require substantial investment in refillables infrastructure.

Whatever the scheme, the key driver of success beyond recovery from consumers is the relative cost of substitute packaging materials. If virgin material is available at a lower cost than recycled material, producers are likely to use packaging with a lower recycled content and the choice to recycle recovered packaging will be less attractive compared with sending it to landfill. The cost of virgin material will vary, for example as a result of fluctuations in oil prices, resulting in potential for the decision balance to shift. Significant variations in the cost of virgin material over time don't just change the incentives of fees which can't be constantly adjusted to reflect market conditions, they discourage industry from making a commitment to sustained use of recycled material (Voulvoulis and Kirkman, 2019).

Existing measures, including landfill charges, and various producer responsibility regimes or recycling targets, have supported some development of a secondary packaging materials market but have not supported an economically stable environment sufficient to motivate the substantial investment needed to develop an efficient market and generate sustained

demand or deliver optimum environmental performance. It is unlikely that a CRS would provide this environment due to the following weaknesses:

- The fee structure does not directly reward reduced packaging or recycled content since both may require the same resources to recycle.
- The limited range of products included in the scheme incentivises substitution to out-of-scheme packaging which is typically less recyclable and more likely to go to landfill after being placed in co-mingled kerbside bins or rubbish bins.
- Producers may substitute from glass to plastic due to higher advanced material fees on glass. This may not be a desirable outcome, especially if plastics are more likely to end up in the marine environment and to harm marine life. Substitution from glass to plastic may also make other glass recycling schemes (kerbside glass containers and commercial flat glass schemes) uneconomic since these provide recycled glass for bottles.
- Producers using out-of-scheme non-recyclable packaging may be disincentivised to switch to in-scheme packaging.
- The proposed CRS my hinder the emergence of container re-use schemes by incentivising recycling over reusing.
- The financial burden of a poorly designed CRS may hinder packaging innovation rather than encouraging it. Producers who are unable to innovate may suffer financial harm sufficient to result in failure of the business and/or lay-offs.

Retailers' behaviour may also affect the CRS's ability to achieve the desired outcomes:

- Retailers may choose to pass-through scheme costs and fees onto products where demand is less elastic to minimise the reduction in demand that might otherwise be expected to occur, or to spread costs over a wide range of products. This behaviour will reduce the scheme's ability to influence consumer decisions.
- Retailers may resort to comingling of returned containers due to a lack of sufficient storage space (and incentive) to keep material separate.

7.2 Political risk

New Zealanders want to see a solution to packaging waste that works. According to a Colmar Brunton survey, the build-up of plastic in the environment is now the number one issue concerning New Zealanders with 72 percent ranking this their number one concern (Colmar Brunton, Better Futures 2019).

A CRS is expected to require significant behaviour change from consumers in sorting, cleaning, holding onto to containers when on-the-go, gathering and returning containers to return facilities. This may involve queuing and other inconveniences, particularly in the early stages as the scheme becomes established. Expectations for significant benefits are likely to be high.

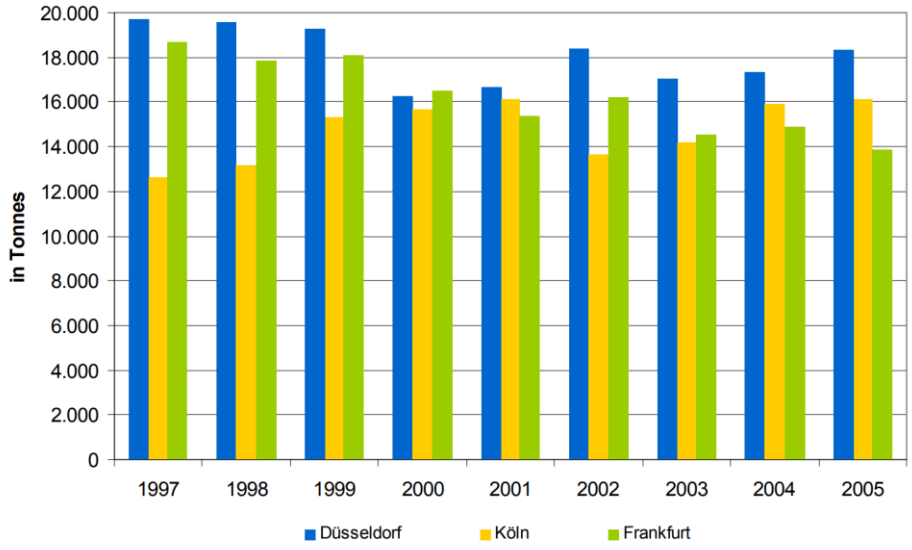
Given the level of uncertainty associated with almost every aspect of the proposed CRS, and the lack of consideration for other options which may be less costly, more effective, more accessible and more convenient for consumers, there is a high degree of political risk associated with the proposed CRS.

Effectiveness of the scheme will be the key consideration for consumers, and the evidence from overseas reveals more uncertainty for the key outcomes of litter reduction and increased recycling.

7.2.1 Litter reduction

Evidence of the impact of CRS schemes on litter indicates that such schemes do not always achieve a noticeable reduction in litter. For example, a study looking at the quantities of waste in three German cities before and after the implementation of a CRS noted that significant waste reduction was not achieved in two of the three cities where it was implemented (see Figure 11 below).

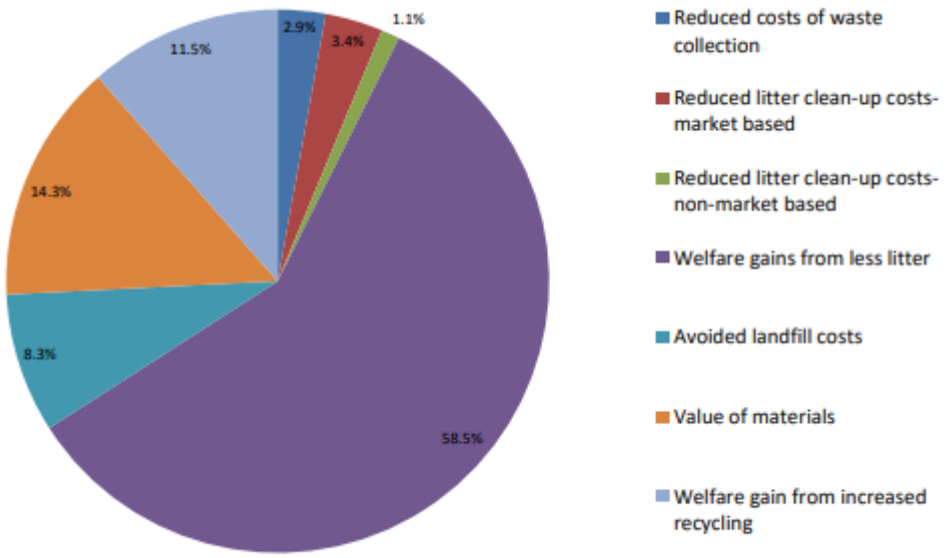
Figure 11 Effects of CRS on waste quantities from street cleaning in 3 German cities



Source: Prognos, 2007.

CBAs of a CRS for New Zealand, such as the one by Sapere (2017), are heavily dependent on litter reduction effectiveness and on the value that households place on this outcome. Sapere estimated that 58.5 percent of the total benefits of a container deposit scheme would be attributed to welfare gains from litter reduction (see Figure 12 below) – a staggering proportion given the very small proportion of litter caused by in-scheme packaging and the German experience of a very minor impact.

Figure 12 Sapere attribution of benefits of a container deposit scheme



Source: Sapere, 2017

Given the very low proportion of glass in litter, these estimates should not be assumed to apply universally to littered containers. With a very low presence in litter, it is unrealistic to assume a CRS for glass would provide similar benefits.

7.2.2 Increased recycling

The CRSs in place in many European countries have recently shown how dependent they were on the Chinese market for exported recyclable material. Since China stopped importing low quality material, Europe has increased incineration of recyclables. So while the CRSs in Europe may continue to ensure high recovery rates, the lack of secondary markets sufficient to absorb the quantity of recycled material has been the driving factor behind recycling's failure to keep up (Katz, 2019).

If the CRS makes kerbside recycling schemes uneconomic, particularly for separate glass collection, resulting in more single-stream collection, this will likely lead to increased recyclable waste to landfill.

A failure of the CRS to achieve what it sets out to achieve on recycling rates for in-scheme material or to cause a reduction in recycling of out-of-scheme material represents a major political risk given the high priority New Zealanders currently place on recycling.

8 Decision-making under uncertainty

Given the range of unknowns concerning the problem and the likely response to the proposed CRS, the government should consider approaches that can improve decision-making under uncertainty. These include:

- Commissioning incremental cost-effectiveness analysis of a range of options, not just cost-benefit analysis of a single option and focusing on costs rather than benefits.
- Opting for a 'least regrets' approach and favouring solutions that offer flexibility and future-proofing.
- Identifying the full range of trade-offs even when they can't be fully quantified.
- Following best practice with regards to roles and responsibilities and leaving those closest to the problem to find the optimal solution.

8.1 Incremental cost-effectiveness analysis of a range of options with a focus on costs

Many of the European countries that have implemented a CRS did not have a pre-existing kerbside recycling scheme. In New Zealand, the existence of kerbside recycling makes consideration of incremental benefits and incremental costs critical to good policy decisions. There are two reasons why incremental cost-effectiveness analysis should be the principal economic tool used by the Ministry for the Environment in this situation:

- Because an existing scheme is already in place which may also be associated with net benefits. To change schemes requires that the incremental cost is justified by the incremental benefit.
- Because there are many options for alternative schemes, including enhancements to kerbside recycling which may offer greater benefits or result in lower costs, or a more favourable incremental cost-effectiveness ratio than the CRS.

A failure to identify other feasible options and to assess the options appropriately against the counterfactual is not good public policy.

In considering the incremental cost-effectiveness, a report by the Institute of Economic Affairs (Snowdon, 2019) found that the proposed UK deposit return scheme would result in a disproportionate cost in order to raise the recycling rates of bottles and cans. It concluded that in financial terms, the scheme would be highly inefficient, largely because the incremental gains over and above existing kerbside collection were insufficient to justify the level of investment.

The focus on costs is important because the benefits of CRS are where there is the greatest uncertainty. One of the first studies of the costs and benefits of container return schemes was published over 40 years ago (Porter, 1978). The study attempted to identify the net social benefit of a container return scheme, including such benefits as reduced litter, reduced energy consumption, and increased employment. The main conclusion of the study was that the results of any cost-benefit analysis of CRS are dependent on the

valuation of welfare improvement from litter reduction balanced against the welfare reduction associated with participation in the scheme. Considering the likely magnitude of costs (even with some uncertainty as to accuracy) against such highly uncertain benefits and valuation of benefits should give any decision-maker pause. A major evaluation of the collection systems in 28 European capital cities concluded that:

> *"…one cannot find publications identifying "the optimal collection system" for the relevant waste streams paper, glass, plastic, metal and bio-waste at European or national level. Generally speaking, this might be because local circumstances, such as the organisation of the waste management system or how long the solutions for waste management have been in place, require different solutions. Therefore, it is difficult to draw strong conclusions. However, it can be summarised that publications clearly agree on the advantages of separate collection, even if opinions with regard to the optimal design of collection systems differ."* (European Commission, 2015, p.27)

A further key consideration for incremental cost-effectiveness analysis is how many products to include in a CRS. Research studies generally find that CRS can achieve high return rates of return for containers but that this is achieved at a relatively high cost, and this is particularly true the wider the range of included packaging types becomes (Oosterhuis et al, 2014). Overseas, EPR schemes like Norway's include more than one recovery scheme (one for PET and aluminium and one for glass, for example), allowing for different operating models for different materials. Norway's kerbside glass collection scheme operated and funded by producers achieves 93 percent recovery and recycles 100 percent of this, proving that kerbside collection can be very effective (Ferver European Federation of Glass Recyclers, 2020).

A sensible staged approach to identifying the right solution would consist of two phases:

1 Analysing a range of kerbside collection options to identify the optimal level of co-mingling in kerbside recycling.

2 Analysing a range of EPR schemes including options for mandatory CRS for different ranges of included products to identify the optimal EPR scheme.

3 Comparing the optimally co-mingled kerbside recycling scheme and the optimal EPR in terms of incremental cost-effectiveness relative to the status quo.

8.1.1 Include kerbside collection options in incremental cost-effectiveness analysis

Other ways of the achieving similar intermediate outcomes should also be explored. The source separation that a CRS achieves is the driving factor for increased recycling rates due to the increased value of recovered material. The high prevalence of single stream kerbside collection is largely responsible for the low rates of recycling in New Zealand and the loss of overseas markets.

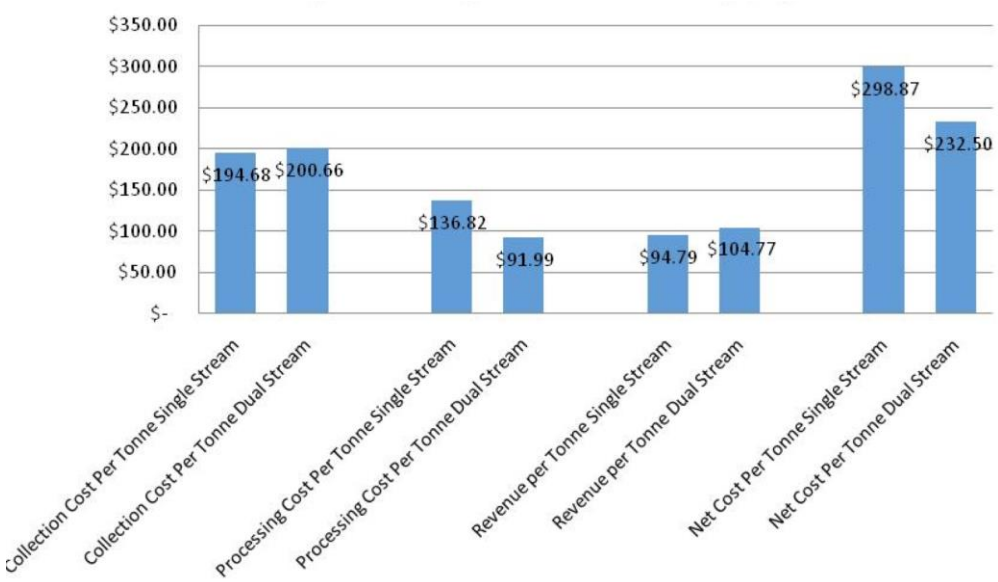
While councils may push back at the suggestion that dual or multi-stream kerbside recycling could be cost-beneficial, evidence suggests that it can be.

A Canadian study tested the assumption, common in municipal waste planning, that the reduction in single stream collection costs would compensate for any additional processing costs. The study examined the costs of single (single bin) and dual stream (glass separate) systems using data from 223 municipalities over ten years. The results show that while single stream systems have lower collection costs, their processing costs are significantly

higher and revenue is lower, resulting in significantly higher net cost per tonne (see Figure 13 below).

Figure 13 Net costs and net cost breakdown of single stream versus dual stream systems

Ontario, Canada ($Cdn)



Source: Lakhan, 2015

The significantly higher processing costs associated with single stream collection are due to the high levels of mechanisation required for single stream material recycling facilities (MRF) resulting in 48.7 percent higher processing costs. The lower revenue associated with single stream collection is due to glass contamination

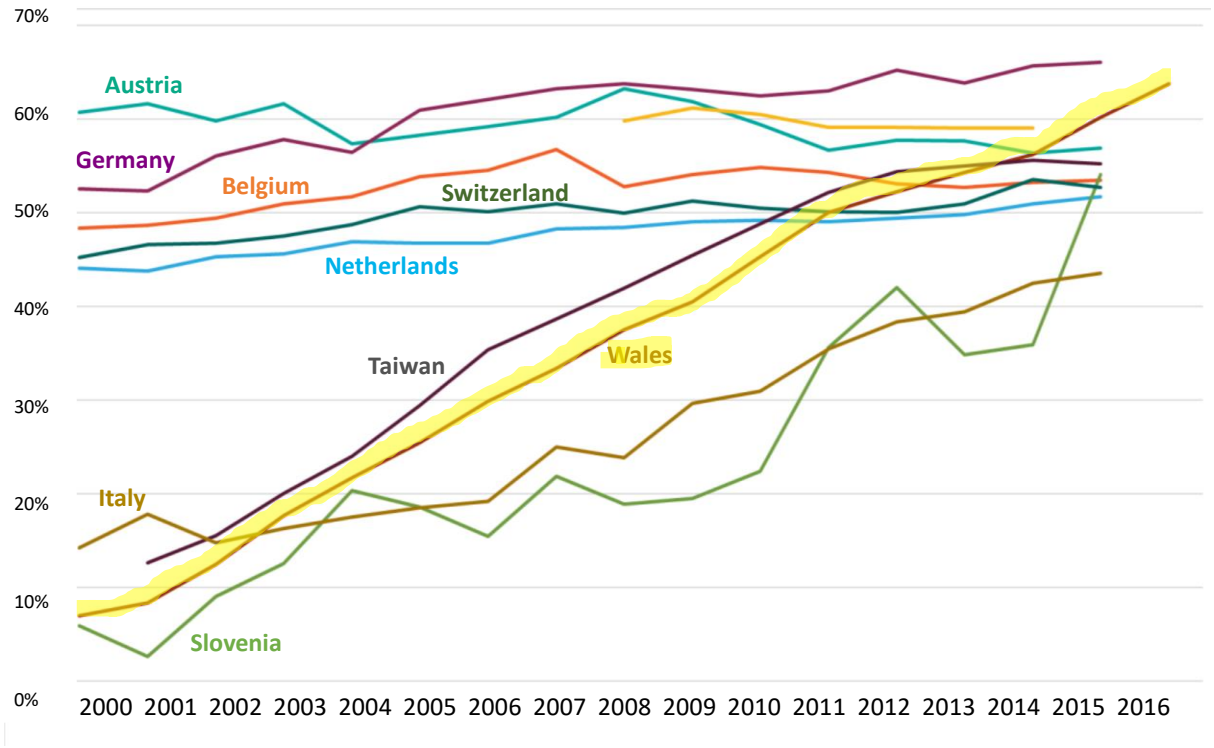
Together these effects resulted in a 9.6 percent lower realised revenue from the sale of recyclable material. It is important to note that as the data for this study was from 2003 to 2012, the difference in revenue is very likely to be an underestimate of what it would be today as markets for contaminated material have largely dried up since 2012.

These figures indicate that an EPR would enable industry to compensate councils for the increased cost of dual stream collection out of the processing cost savings and increased revenue.

Many countries have higher recycling rates than New Zealand, and many of these have not forced industry into a government-designed CRS or even have an industry-designed CRS in place. Wales, for example, has dramatically increased recycling rates with the introduction of multi-stream kerbside recycling and without a CRS, resulting in recycling rates similar to those observed in countries with a successful CRS, like Germany (see Figure 14 below).

Figure 14 European and Asian countries' recycling rates

Definition-adjusted for like-with-like comparison



Source: Eunomia, 2017

The only countries in the figure that do not have a CRS for packaging are Wales and Slovenia, but both have shown that similar recycling rates can be achieved through other means.

According to Eunomia's (2017) analysis of the top performing countries, high performance is attributed to:

- Comprehensive schemes that enable people to recycle, e.g. separate collection.
- Clear performance targets and policy objectives.
- Funding for recycling from either government or EPR schemes.
- Financial and behavioural incentives to directly and indirectly encourage consumers to recycle, including but not necessarily CRS.

Estimates indicate the CRS may be a high cost solution

It is possible to estimate the collection costs of containers in New Zealand using the costs from Lakhan (2015) as estimates. Our estimation is based on the following assumptions:

- Plastic containers weigh 20 grams on average (the approximate weight of a 1 litre PET bottle)
- Glass containers weigh 280 grams on average
- Aluminium cans weigh 14 grams on average

- 7.5 percent of recycling by weight in kerbside bins is plastics (EY, 2019)
- 27 percent of recycling by weight in kerbside bins is glass (EY, 2019)
- 4 percent of recycling by weight in kerbside bins is aluminium (EY, 2019).

Based on these assumptions, each tonne of recycling would contain:

- 964 glass containers
- 3,750 plastic containers
- 2,857 aluminium cans.

In other words, there could be 7,571 containers per tonne of recycling collected at kerbside.

Based on the collection cost per tonne in a dual stream collection scheme as shown in Figure 13 above (converted at NZD1.20 per CAD to $240.79), and the processing cost per tonne in a dual stream collection system (converted at NZD1.20 per CAD to $110.39) each container would cost:

- 3.2 cents to be collected under a kerbside dual stream collection system
- 1.5 cents to be processed through a dual stream system
- 4.7 cents in total for collection and processing in a dual stream system.

These estimates suggest that the 5.5c to 10.5c per container scheme fees are high compared with what could be achieved by improving the kerbside collection schemes of New Zealand's two biggest cities.[9] Over 2.4 billion containers, the difference between a 4.7c scheme cost and a 5.5c scheme cost amounts to $192 million for producers of a narrow range of products to fund – more than three times the current estimated cost of all recycling collection in New Zealand ($53.8 million).[10]

On the effectiveness side, moving to dual stream recycling in Auckland and Christchurch would improve the value of recovered material as well as enabling efficiencies associated with collecting all container glass within the same scheme.

It is possible that multi-stream kerbside collection can also offer similar cost-efficiencies.

Harmonising and improving kerbside schemes to enable source separated collection drastically increased recycling rates in Wales and offered the most cost-effective solution. A report commissioned by the Welsh government confirmed this, identifying that moving from a co-mingled recycling collection (all recyclables mixed) to a twin stream system (glass separated from other recyclables) would increase costs to councils, but moving from either a co-mingled or twin stream system to a source separated system would result in substantial savings across the system (approximately GBP20 per household per annum or up to GBP1.1 million per annum for council operating the system across 60,000 households).

Estimated costs associated with the CRS are real because they are not offset by an increase in the value of material. Estimates for glass, for example, based on 269,000 tonnes of glass collected, result in a net cost to industry of $0.21 per container, compared with EPR based on industry financed glass separate kerbside collection with a net cost per container of

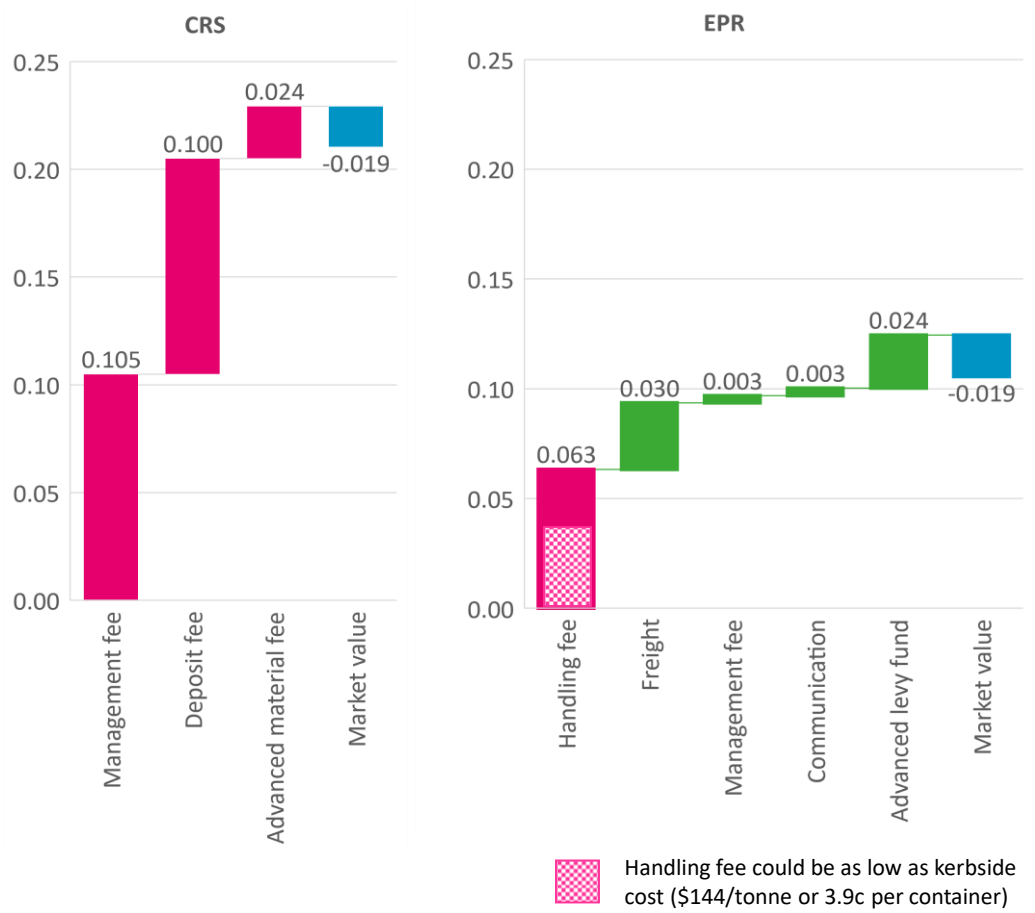
[9] Auckland and Christchurch city councils run single stream kerbside recycling collection.

[10] Packaging forum estimate.

$0.11. This differential could be even greater if kerbside collection costs are applied at $144 per tonne, or 3.9c per container (instead of the assumed $235 per tonne and 6.3c per container), resulting in a 13c per container difference between CRS and EPR. See Figure 15 below.

Figure 15 Cost profile of 1 billion glass containers (269,000 tonnes) in the proposed CRS versus EPR

(dollars per container)



Source: NZIER

The values used for the EPR estimates above are shown in Table 4 below. Per container values are calculated based on an average of 3711 glass containers per tonne.

Table 4 Glass EPR values

(Dollars per tonne and cents per container)

EPR values	Per tonne	Per container
Handling fee	$235	6.3c
Freight	$112	3.0c
Management fee	$12.50	0.3c
Communications	$12.50	0.3c
Advanced levy fund (based on cost of grinding glass to sand)	$90	2.4c
Market value	$70	1.9c

Source: NZIER

8.2 The 'least regret' approach offers flexibility and future-proofing

In situations of extreme uncertainty, the best option is often the one that will result in the least regret. That is, a minimal or reversible cost option or flexible solution.

In implementing new interventions, the government generates the creation of new evidence and with new evidence, better solutions are often identified. Ideally, the intervention provides some ability to make adjustments, even significant ones, if the new evidence indicates this is warranted.

Bayesian approaches, as they are called in economics, are based on the simple notion that the probability of a hypothesis being true depends on how sensible it is based on current knowledge and how well it fits new evidence. Because of this, Bayesian methods are particularly well-suited to analysis of data that is new and subject to frequent updates. Bayesian approaches to decision-making, while less formal are equally useful when new evidence emerges.

Decision-makers take a Bayesian approach when they ask repeatedly "Given what we now know is true, does our belief about the right course of action change?" Bayesian approaches are compatible with experimentation and incremental improvements in knowledge. The more we experiment with approaches, or obtain new information, and evaluate results, the more informed decisions become: We move away from a multitude of plausible hypotheses and a high degree of uncertainty, to a smaller number of hypotheses and less uncertainty.

If the government does proceed with the proposed CRS, there may be few opportunities to maximise learning and minimise harm: Decision-making needs to be able to respond rapidly to feedback to minimise costs and time-lags for effects need to be short to avoid doing long-term damage. In a fully rolled out CRS, heavy investment in systems and infrastructure may preclude rapid scheme changes.

On the other hand, if the government requires producers to take on an EPR scheme and tasks industry with identifying a solution, industry may adopt solutions that do allow flexibility to adjust to new information because changing markets are part of the landscape they typically operate in. Solutions designed with market changes in mind will be best suited to future recovery and recycling needs.

Priority product stewardship schemes which have yet to be determined also require that flexibility is maintained in packaging recovery schemes at least in the short term, due the potential for overlap. Locking packaging into a CRS may undermine the efficiency and effectiveness of priority product stewardship where the same materials are targeted.

8.3 Trade-offs should be well-identified

Trade-offs are important considerations for every decision but it is not necessary to have certainty around quantities and values to be guided by trade-offs. Populating a trade-off matrix with trade-off proportionality such as the one below, which illustrates trade-offs between consumer convenience and quality of recovered material, helps to illustrate why corner solutions are impractical and can show a logical pathway from the current context to an achievable improvement, helping to eliminate a range of other options.

In this example (see Table 5 below), an improvement from the current single and dual stream kerbside collection systems, could involve moving to a CRS but risks around storage capacity mean additional inconvenience for consumers may not translate into increased quality of recovered material.

Table 5 Consumer convenience and accessibility versus quality of recovered material

		Quality of recovered material		
		Low (comingling and contamination)	**Medium** (reduced comingling and contamination)	**High** (minimal comingling and contamination)
Consumer convenience	**Low** (High volume CRS)	Co-mingled CRS on all packaging. Not worthwhile.	Dual stream CRS on all packaging. Benefits may not justify costs to consumers.	Source-separated CRS on all packaging. Storage constraints of retailers probably precludes this.
	Medium (Multi stream kerbside or low volume CRS)	Co-mingled CRS on selected packaging. (Risk of proposed CRS due to return facility storage constraints)	May be achievable with CRS on selected packaging, dependent on storage-comingling risk. Or multi stream kerbside collection.	May be achievable with CRS dependent on storage-comingling risk. Or multi stream kerbside collection with high quality information to minimise contamination.
	High (Requires kerbside collection – single or dual stream)	Single stream kerbside collection. Not satisfactory. E.g. Auckland, Christchurch.	Dual-stream kerbside recycling. E.g. most councils.	Not achievable. High quality will require some effort by consumers to sort appropriately.

Source: NZIER

8.4 Incentives frameworks, roles and responsibilities – the Norwegian model

The Institute for European Environmental Policy advises that efficient and sustainable EPR requires that national governments and local governments resist the urge to specify how EPR should function at operational level and instead focus on creating the policy and legislative framework (e.g. through a system of financial incentives), build effective infrastructure, and produce high quality information for consumers. Identifying the operational solution that will deliver on the government's expectations is considered to be the role of industry, as they are the party best placed to understand market dynamics and operational efficiency considerations (see Table 6 below).

The Norwegian government followed this advice in developing a framework of policies to support the development of EPR for packaging. Through a system of taxes and targets, applied industry-wide, the Norwegian government incentivised industry to form an organisation that developed solutions, including a CRS, to lift the recovery and recycling of packaging for the industry as a whole. The Norwegian model is widely seen as one of the world's most successful and serves a similar population and population density to New Zealand.

Table 6 Roles and responsibilities for efficient and sustainable EPR

Stakeholder	Role
National government	Setting the policy and legislative framework, including: • Identifying the products to be included • Defining responsibilities for producers, manufacturers, retailers and distributors • Defining roles of councils and other stakeholders • Implementing accreditation/approval and monitoring functions for the EPR scheme • Identifying measures to ensure imports of packaging or packaging waste comply with EPR
Local councils	Supporting efficient operation of the EPR through: • Waste collection from households and businesses • Accessible infrastructure • Complete and accurate information to the public
Producers, manufacturers, retailers and distributors[11]	Meeting responsibility and targets set by government, by: • Designing the operational aspects of EPR schemes (including establishment of producer responsibility organisations (PROs) • Administering and running EPR schemes (including setting registration and product fees, collecting fees, establishing relationships with collectors and processors, reporting against targets) • Paying fees to support EPR schemes • Providing information to businesses and consumers on how to use EPR schemes
Waste management companies	Collection and management of waste, through contracts with local councils, PROs or individual producers. Packaging waste collection should be funded directly or indirectly through the PRO.
Consumers	Returning packaging using the infrastructure provided.

Source: Watkins and Gionfra, 2019

[11] Roles will vary within this description and may need to be tailored according to product type or material.

9 Inclusion of glass

A major question for design of a CRS is whether glass bottles should be included in the scheme or remain in kerbside recycling collection schemes. Including glass will increase the cost and complexity of a CRS system and introduces a significant risk of harm. This is because the inclusion of glass along with plastics and aluminium:

- Replaces rather than builds on an existing schemes that are already successful and could be cost-effectively improved.
- Increases the cost of implementing the CRS.
- Incentivises industry to move away from using the least environmentally damaging material towards plastics, especially out-of-scheme plastics and non-recyclables.
- Incentivises consumers to substitute to larger containers which are typically made of plastic.
- May decrease the amount of glass recycled.
- Adds to the burden of the sorting process (sorting between return and kerbside schemes as well as within each scheme and storing separately) and therefore costs to households.
- Places additional burden on retailers and other collection points due to challenges of handling and storing large amounts of glass which, unlike plastic and aluminium, cannot be compressed and is heavy.

A potential shift away from glass to plastics was the reason for France rejecting a proposed deposit refund scheme (Les Echos, 2019).

Inclusion of glass in a CRS adds substantially to the total tonnage handled by the system. Even before alcoholic beverages are included, glass accounts for 55 percent of the total weight expected to be recovered. With the inclusion of alcoholic beverages, with glass accounting for 98 percent of the container tonnage in that category, glass would account for 82 percent of all recovered material by weight.

The massive increase in tonnages and the careful handling required for glass are the reasons for the expected significantly higher costs of running a scheme that includes glass.

9.1 The existing glass recovery and recycling schemes

Glass containers do not pose the same threat to the natural environment that plastics do. Every container that is made of glass rather than plastic is a container that will not become more environmentally harmful as it breaks down, avoiding contaminating soil with chemicals and finding its way into the marine environment. Every container that is made of glass rather than plastic can be recycled infinitely as another container or reused many times before recycling is necessary. Plastic containers may be recycled, but from an environmental perspective, any scheme that seeks to shift New Zealand towards a circular economy for packaging without unintended harms must:

- Avoid substitution from glass to plastic (or encourage the opposite)
- Minimise the transport and processing of glass through the manufacturing, distribution, recovery and recycling system.

The Glass Packaging Forum (GPF) Stewardship Scheme is a government accredited glass recovery and recycling scheme operated by the Packaging Forum with a goal of eliminating container glass sent to landfill.

To achieve its goal, the GPF scheme connects businesses selling items in glass containers with collectors, recyclers, refill and reuse schemes and funds improvements and innovation in glass packaging. Over 100 companies have already voluntarily become members and pay levies to the GPF based on the volume of glass packaging they generate. These members account for 85 percent of the total glass to the New Zealand market.

The GPF has been operating since 2006 and has identified and developed solutions for challenges facing glass recovery and recycling. It does not have the mandate to bring onboard all producers of goods packaged in glass containers, but has a ready-system to improve recovery and recycling that has been designed around the market features unique to glass.

As a voluntary scheme, the GPF currently works through relationships and funding limited by the voluntary-membership levy. If membership were to be made mandatory by the government, the GPF's increased levy revenue would give the scheme more power to:

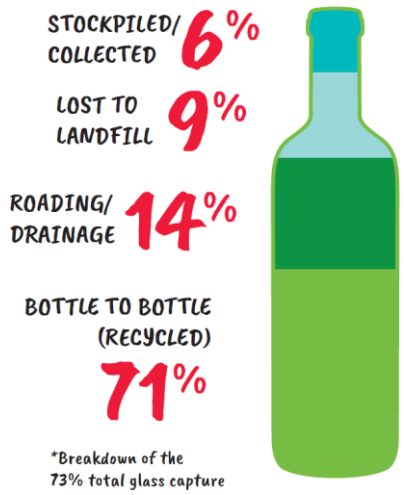
- Ensure quality collection through direct funding opportunities
- Fund research and business case development
- Influence collection methodology to reflect best practice and cost-effectiveness considerations across the logistics chain
- industry and build relationships
- Hold producers accountable for material ownership and responsibility.

The GPF has provided funding to increase storage capacity for bulk storage of glass to enable transport efficiencies to be achieved and smooth out flows and timing at the glass beneficiation plant. Storage is a major issue for glass at every stage along the logistics chain and costs for this are not currently reflected in the proposed CRS. These investments and others that support the recovery and recycling of glass across New Zealand have been made possible by over $3.3 million in grants since 2006.

The GPF is already highly effective and has proven cost-effective for producers. 73 percent of glass bottles are captured by the scheme in 2018-2019. Of these, 71 percent are recycled into new bottles and 14 percent are recycled for roading and drainage applications (see Figure 16 below). The nine percent lost to landfill represents an opportunity to make improvements across the supply chain but this is possible within the GPF scheme with support from local and national governments to improve consumer awareness and reduce co-mingled collection.

The cost of including glass packaging in a CRS should be calculated to include the loss of efficiency costs in other glass recovery systems and any increase in recovery of glass packaging should be offset by reduced recovery or reduced value of other types of glass.

Figure 16 Breakdown of the GPF glass capture



Source: Glass Packaging Forum, 2020

9.2 Potential for reduction in recycling of non-CRS glass and other material

If a CRS is implemented and this includes all beverage glass, there will still be some container glass that will be recovered through kerbside collection. Apart from Auckland, Christchurch and Kapiti councils, this is currently done through dual-stream, glass separate collection.

With the introduction of a CRS including beverage glass, the limited quantity and quality of container glass remaining in kerbside collection schemes could jeopardise dual stream glass-separate collection systems. If councils combine glass with other material in a single stream collection, the additional contamination of paper, cardboard and plastics is likely to result in reduced recycling of these materials and more recyclable waste being sent to landfill. Existing separate glass collection has been enabled in some areas through funding from the Glass Packaging Forum, but this is unlikely to be cost-effective when beverage glass is diverted to a CRS.

Unless all glass containers are included in the CRS, it is critical that councils not shift to single stream collection but industry should not be expected to support this alongside the CRS due to the duplication of glass collection logistics and reduced efficiency relative to a kerbside solution alone.

9.3 Existing glass recovery systems recognise the interaction of glass markets in recycling

Existing glass recovery systems source material from households and commercial and industrial uses (beverage glass and flat glass) and these are combined to ensure the most efficient collection and transport of recovered glass to O-I New Zealand in Auckland. Without the combination of different types of glass, glass recovery from some areas would not be viable due to the transport costs to beneficiation in Auckland.

Flat glass is recyclable into bottles and jars. If the supply of uncontaminated recovered container glass increases, the amount of flat glass that goes to landfill may increase. A CRS

focused only on beverage glass may report laudable results for beverage glass while the glass to landfill volumes may not change due to substitution between different glass types.

9.4 Glass requires a unique solution

The question about inclusion of glass in a CRS and whether the additional benefits are really worth the substantial additional cost of inclusion in the scheme needs to be considered against the problem definition that has driven the design of the scheme in the first place.

While the problem definition for New Zealand's proposed CRS has not been entirely clear, it has included concerns about:

- litter
- damage to marine life
- waste to landfill.

The National Litter Audit (Keep New Zealand Beautiful, 2019) found that glass was a relatively rare material to be found in litter, although due to its relative heavy weight it still accounted for a high proportion of litter weight. But the disamenity caused by litter is irrespective of weight. In finding that plastic items are found in litter nearly two and half times as often as glass items, and not nearly as often as cigarette butts, the audit revealed that New Zealanders are far less likely to see glass litter than plastics and cigarette butts and are therefore far less likely to experience any disutility from it, or conversely to benefit from reduced glass in litter.

The audit also found that relative to plastic and cigarette butts, glass was most likely to be found in litter at railway sites and least likely to be found in litter at retail sites, public recreational sites, residential sites, and carpark sites, which is significant as the latter are the types of sites where litter is most likely to be an annoyance to the general public, while railway sites are likely to be less concerning[12].

Since the vast majority of marine litter also consists of plastic, targeting plastics for EPR (with or without CRS) stands to make the greatest contribution to marine litter reduction.

The need for glass to have a unique solution is recognised in many European countries where the focus for glass is first on refillable solutions and second on recycling, but through a separate CRS to ensure comingling of glass and other materials never happens and recognising that other materials can be efficiently processed through MRFs but glass should be processed separately (Norway's EPR, for example, has a separate glass CRS).

[12] Much of the glass found at railway sites was in fact not beverage glass, so would not be reduced by a CRS on containers only anyway.

10 Recommendations

The Ministry for the Environment, with Auckland and Marlborough councils, has designed a detailed container return scheme which poses several significant risks and is unlikely to offer the most cost-effective way of achieving the desired outcomes. It will not offer an efficient solution, does not target the problem efficiently, and is subject to significant risk.

Most alarmingly, the proposed CRS is not being subject to incremental cost-effectiveness analysis along with other options to properly identify an ideal solution.

International best practice indicates that industry should take on the role of designing a CRS to meet government objectives. At the very least, industry should have an opportunity to identify and alternative approach or suggest amendments to the scheme to ensure it provides a cost-effective solution and remains sustainable as product, packaging and raw and recycled materials markets evolve.

In addition to engaging industry to assess and refine the proposed CRS and consider options with incremental cost-effectiveness analysis, we recommend that the government consider:

- Harmonising the council-run kerbside recycling collection schemes with at least glass-separate collection and requiring industry to improve labelling to support more informed recycling.
- Improving consumer education through national public awareness campaigns.
- Investigating technology solutions such as app-based consumer support to complement a nationally harmonised kerbside recycling scheme, and barcode or watermark scanning technology to improve data on waste streams and contents.
- An EPR system like the Norwegian EPR which is based on an incentivising framework of taxes and targets rather than a heavy-handed pre-designed operational system.
- A material-based EPR rather than a product-based EPR to avoid efficiency loss from duplicate systems for some materials.
- Investigating an expanded refillables scheme for glass, which would be more efficient than putting glass through a CRS.
- Requiring councils to work with industry on glass-specific EPR, building on existing systems.
- Requiring councils to provide public infrastructure like public recycling bins, water fountains and re-fill stations to reduce the need for on-the-go single use bottles.
- Implementing national and local government procurement policies that support the markets for recycled material.

If a CRS is to be implemented, we recommend that the government:

- Exclude glass until other options have been explored, recognising glass's unique value as an infinitely recyclable material, its potential for refill and reuse, furnace capacity constraints, and lack of secondary material export market.

- Require councils to provide dual stream collection of recyclables to prevent increased glass contamination of paper and other recyclables in what will otherwise be increasingly comingled collection systems.

11 Next steps

11.1 Getting the policy right

Starting with a solution without policy analysis runs a big risk of not achieving the goal. In order to ensure high-quality and durable policy decisions it is important start from the beginning and not with a solution. That means the next steps include:

- Clarifying the problems/objectives to be addressed including which has primacy (e.g. recourse recovery, waste minimisation, littering, land-fill capacity)
- Setting out the option set for achieving the objective
- Establishing assessment criteria
- Reviewing international evidence and best practice for the chosen objectives (drawing on the work undertake to date (e.g. Prime Minister's Chief Science Advisor report)
- Undertaking an integrated cost-effectiveness analysis of the options
- Undertaking general equilibrium modelling to show the full economic impact
- Seeking agreement amongst stakeholders and reaching decision with Cabinet.

11.2 Getting the legislative framework right

Modern legislation is driven by principles and performance expectations rather than prescription. Modern legislation is flexible to accommodate changing dynamics without having to return to Parliament. The Norwegian legislation is an example of good legislative practice because it provides incentives, drives collaboration and largely allows producers to design the scheme to meet government objectives

Detail design can be handled in secondary legislation (i.e. regulation making powers) and tertiary legislation,[13] often seen in agricultural, food and parts of the resource management sector. Once policy is agreed then a suitable Bill can be drafted.

11.3 Getting the implementation right

Two strong public policy and economics principles are to 1) get the incentives right and 2) allow those closest to the information to make the decisions. If producers can be incentivised in policy and legislative design, they are best placed to use their information. They are then in a position to allow dynamic market forces to make the changes necessary to achieve the overall outcome efficiently and equitably.

In addition, if transitions are phased well, they reduce implementation costs and can improve trust and confidence in the scheme's durability.

That means allowing producers to run the agreed scheme and be held accountable for their performance.

[13] https://treasury.govt.nz/sites/default/files/2009-06/tgls-burrows.pdf

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