The Status of Post-Consumer Polypropylene (#5 PP) in Aotearoa NZ

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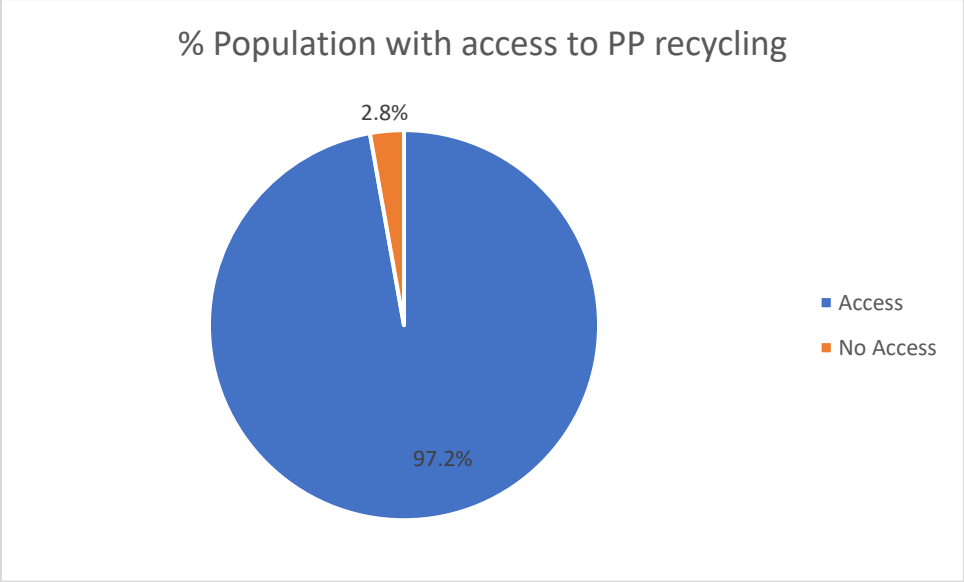
Contents

Highlights

Recycled polypropylene ("rPP") is a sought after, valuable material both globally and in Aotearoa NZ, but we continue to see demand for this material outstripping supply. Plastics NZ has been working across the value chain for post-consumer PP for several years (from manufacturers to retail, resource recovery to reprocessors). The focus has been on resolving the system challenges that polypropylene ("PP") has faced and there has been improvements across four key areas:

- Increased residential access to PP recycling
- Retailers accepting PP packaging as a sustainable packaging type
- Decreases in imported rPP
- Increased onshore demand for rPP

Increased residential access to polypropylene recycling



Graph 1: Percentage of New Zealand's population with access to PP recycling at kerbside

We've measured the percentage of population in NZ who have access to PP recycling, and this now sits at 97.2%. This has increased by ~17% (or 850,000 people) since the establishment of a PP cross industry working group in March 2021.

Figure 1: Optical sorting machine installed in the Nelson-Tasman Material Recycling Facility

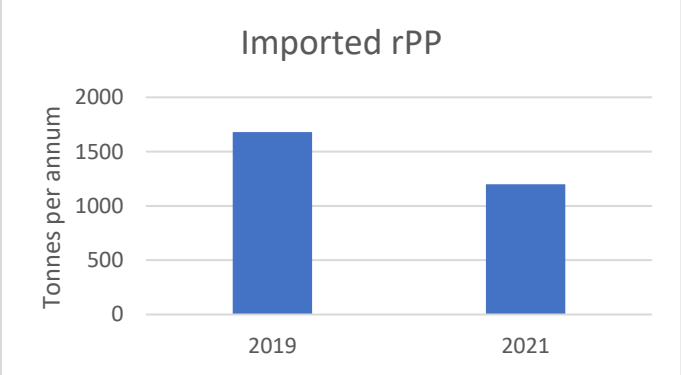
Larger scale PP recycling has been enabled through installation of automated sorting technologies (e.g. optical sorting) at Material Recycling Facilities ("MRFs") across NZ.

Retailers accepting PP packaging as a sustainable packaging type

While Foodstuffs' preference is for plastic packaging made from #1 and #2, they have modified their Product Packaging Guidelines to accept PP #5 where the product requires it (e.g. hot fill).[1]

Countdown has recently released a list of problematic and preferred packaging materials which they use to guide their own packaging decisions, and PP is listed as preferred material type.[2]

Decreases in imported rPP



Graph 2: Levels of imported rPP between 2019 and 2021

Imported rPP has reduced in the last 3 years from ~1680 tonnes p/a to ~1200 tonnes p/a.

[1] Refer: https://www.foodstuffs-exchange.co.nz/processes-and-guides/regulations-and-compliance/packaging-sustainability/

[2] Countdown's List of Problematic and Preferred Packaging Materials was released in June 2021. This is used to guide Countdown's own packaging decisions and was shared with suppliers to support packaging decisions and to work together to increase the recyclability of packaging in our stores. This guide is a helpful tool to select packaging materials that are widely recyclable in Aotearoa such as clear, natural or non-coloured Polypropylene (PP) which is in the preferred materials (green) list. In October 2021, Countdown relaunched it's own ice cream range in white polypropylene rather than black to increase recyclability.

Increased onshore demand for rPP

Onshore reprocessors and manufacturers continue to increase their capacity to process rPP, and over the last four years, onshore reprocessing of rPP has roughly doubled.[3]

Polypropylene … what's the problem?

While we're continuing to see improvements in the area of PP recycling, we need to see further change to ensure this valuable material isn't lost to the circular economy Aotearoa New Zealand. Demand for rPP from NZ reprocessors and manufacturers has continued to increase and while we have feedstock of rPP (through post-consumer packaging as well as post commercial materials), rPP is still being imported into NZ.

The problem

> How do we maximise the amount of good quality NZ sourced PP recyclate getting to NZ based manufacturers to keep it in use in the economy in Aotearoa NZ?

There are a number of systemic barriers that are hindering our country's ability to achieve a vastly improved circular economy for rPP in Aotearoa NZ, and these include:

- lack of standardisation around plastic types that are collected at kerbside (impacting public/consumer confusion around recyclability of plastic types)
- lack of understanding around NZ's onshore reprocessing and manufacturing capability/capacity
- problematic packaging design (including mandatory identification and labelling)

As part of Plastics NZ's *Advancing the New Plastics Economy in Aotearoa* Programme, Plastics NZ is facilitating a cross industry working group tasked with helping to solve this challenge. The working group has been formally meeting since March 2021 and was initially focussed on resource recovery in relation to post-consumer PP packaging. Opportunities exist to expand our work into post-commercial recovery of PP as well as opportunities to better partner[4] with brands to help with education and funding to increase the resource recovery of PP.

The purpose of this report is to share the insights gathered from our PP working group as well as to share the challenges and opportunities we have in NZ to create a circular economy for PP.

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[3] Based on research with NZ based reprocessors and manufacturers, we understand that this increase has been demand driven as manufacturers look for secure local supply, not only due to increased freight costs and supply chain issues, but also because customers are interested in lowering the carbon footprint of materials they use.

[4] An example of public/private partnership is The Recycling Partnership's Polypropylene Recycling Coalition in the USA. One programme run by The Recycling Partnership is the Polypropylene Recycling Coalition which is focused on:

- increasing access for people to recycle PP through kerbside recycling programmes;
- ensuring more recycling processing facilities can sort the material successfully; and
- stimulating a robust end-market of high-quality rPP for reuse in packaging.

This is a model we're reviewing to see which initiatives might work for Aotearoa NZ.

Why polypropylene?

PP has a number of properties which make it a useful plastic material for a number of applications. It is chemical resistant (e.g. manufacturers don't need to worry about leaching, taste or odour issues), lightweight as well as able to handle a wide temperature variation (heat and cold resistant). It also has better performance than materials like PET #1 plastic in of drop tests and has a high impact strength. It is also a lower density polymer which means that it's cost effective to use as there's a higher yield per kg of material processed.

Post-consumer PP is typically found in the following types of packaging: ice cream containers, large yogurt tubs, dip pottles, margarine containers and many clear takeaway containers. PP is the third most prevalent plastic type found in residential recycling (behind PET #1 and HDPE #2 plastics).

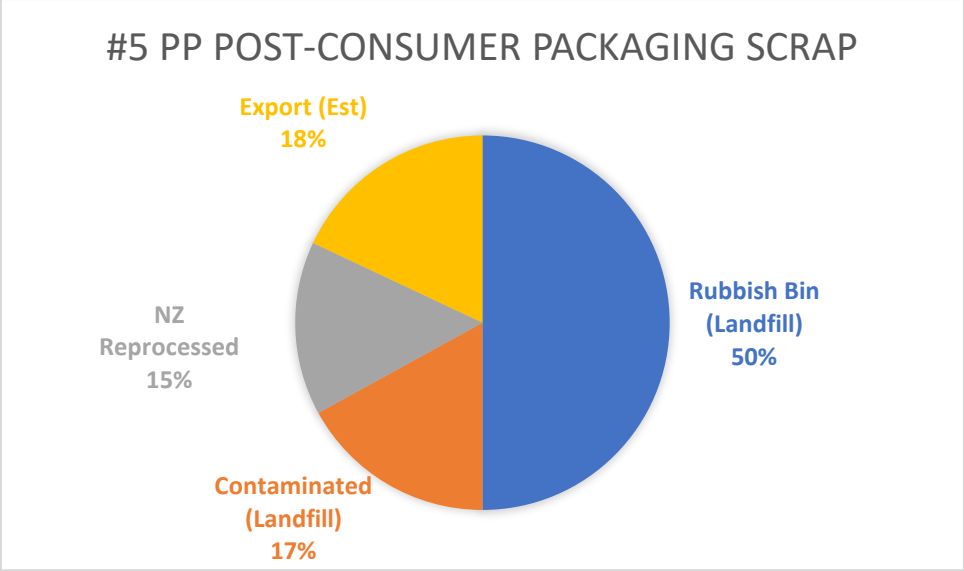
Figure 2: Common food packaging made from PP

Volumes of polypropylene in New Zealand

Post-consumer packaging

There has been some debate within the resource recovery sector in NZ regarding the volumes of PP scrap that exist within the NZ system. Based on both the WasteMINZ report, *The Truth About Plastic Recycling Aotearoa New Zealand in 2020* prepared for the WasteMINZ Territorial Authorities' Officers Forum[5], and the recent Food and Grocery Council plastic survey, there is between 8,000-10,000 tonnes of PP in the post-consumer kerbside recycling stream.

[5] The audits undertaken in *The Truth About Plastics Recycling in Aotearoa New Zealand in 2020* included rubbish or recycling (or both) from a total of 867 households from 8 locations (Whangarei, Auckland, Lower Hutt, Dunedin, Clutha, Gore, Southland and Invercargill). The results were extrapolated against the total population of NZ.



Graph 3: Destinations for post-consumer PP scrap

Unfortunately, a large portion of this tonnage is being lost to the circular economy, as our best estimates have shown that only between 1200-1500 tonnes of post-consumer PP scrap is currently being sourced from MRFs in New Zealand. The question is, where is the rest of the PP scrap going today?

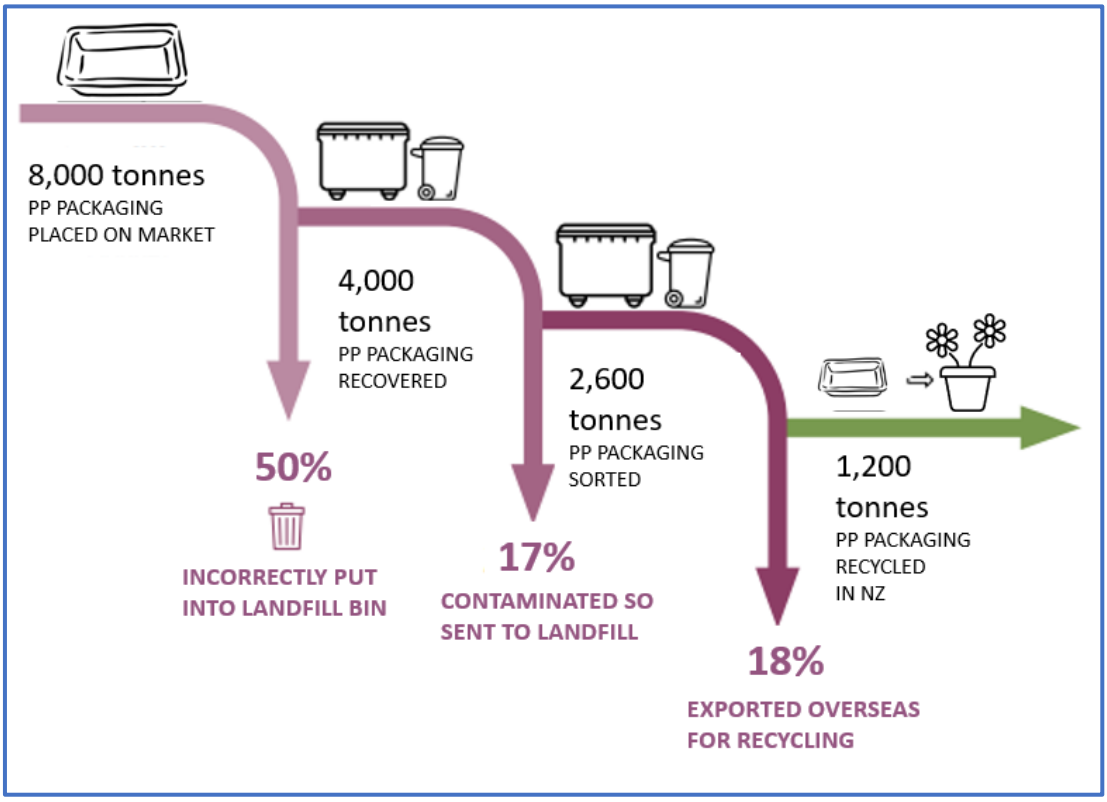
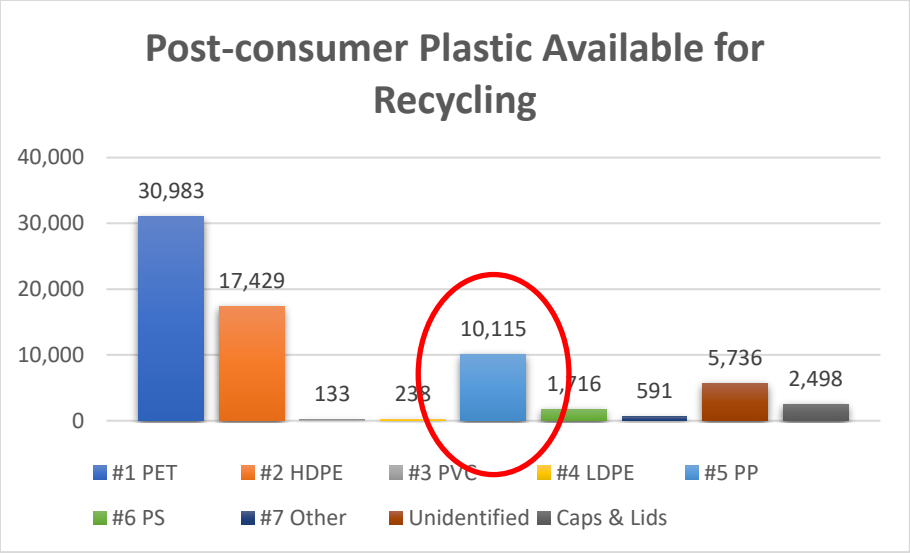


Figure 3: Estimated Volumes of Post-Consumer PP Packaging Material Flow

There are a few possibilities:

- Households are putting PP consumer packaging in the rubbish bin[6];
- Households aren't recycling correctly and the PP consumer packaging is being sent to landfill from a MRF as it's contaminated with food waste[7]; or
- MRFs are selling the PP scrap to overseas markets.

There's a real opportunity to enhance our resource recovery of post-consumer PP through household/consumer education as approx. 67% of this valuable material is going to landfill (refer Graph 3 above).



Graph 4: Data sourced from *The Truth About Plastic Recycling Aotearoa New Zealand in 2020*, WasteMINZ, TAO Forum

	Resin	FGC Tonnes (60% FGC total	Total Food & Grocery Tonnes	Adjusted with industry info
1	PET	21,483	35,804	36,000
2	HDPE	10,172	16,953	20,000
3	PVC	482	803	800
4	LDPE	9,123	15,205	15,000
5	PP	4,883	8,138	8,000
6	PS	1,594	2,657	3,500
7	Other	6,410	10,683	11,000
	Total	54,157	90,245	94,300

Table 1: Food and Grocery Council Plastic Consumption Data 2020 (survey collated by Dynata)

[6] *Rethinking Rubbish & Recycling* (Sunshine Yates) May 2020 (see p 35) showed that just over 50% of PP containers by number of items is incorrectly put into household rubbish (i.e. 4000-5000 tonnes p/a)
[7] *Rethinking Rubbish & Recycling* (Sunshine Yates) May 2020 (see p 35) showed that ~17% of PP containers in kerbside recycling bins were contaminated with food waste (i.e. 1360-1700 tonnes p/a).

While there is debate about the exact volumes of PP available in the NZ system, it is clear that PP is the third largest rigid[8] plastic type in post-consumer plastic packaging, behind PET and HDPE.

Value of post-consumer rPP packaging in the market

Based on the current market value of repelletised rPP, the potential value of the circular economy is between $10.4m to $17m p/a. NZ is currently losing between $8.45m to $14.9m of value as PP material continues to be sent to landfill or exported to overseas markets.[9]

Post-commercial feedstock

While the focus of Plastics NZ's PP working group has been on resource recovery of residential PP (post-consumer packaging), there is also a significant amount of post-commercial PP that is currently being sent to landfill.

Post commercial PP is typically found in the following types of industries: building and construction (e.g. siding, air/moisture membranes, some piping), automotive (e.g. car bumpers, truck mudguards), household appliances (e.g. refrigerators), medical (e.g. syringes and IV bags), agriculture (e.g. woven sacks, strapping, films, ground cover).

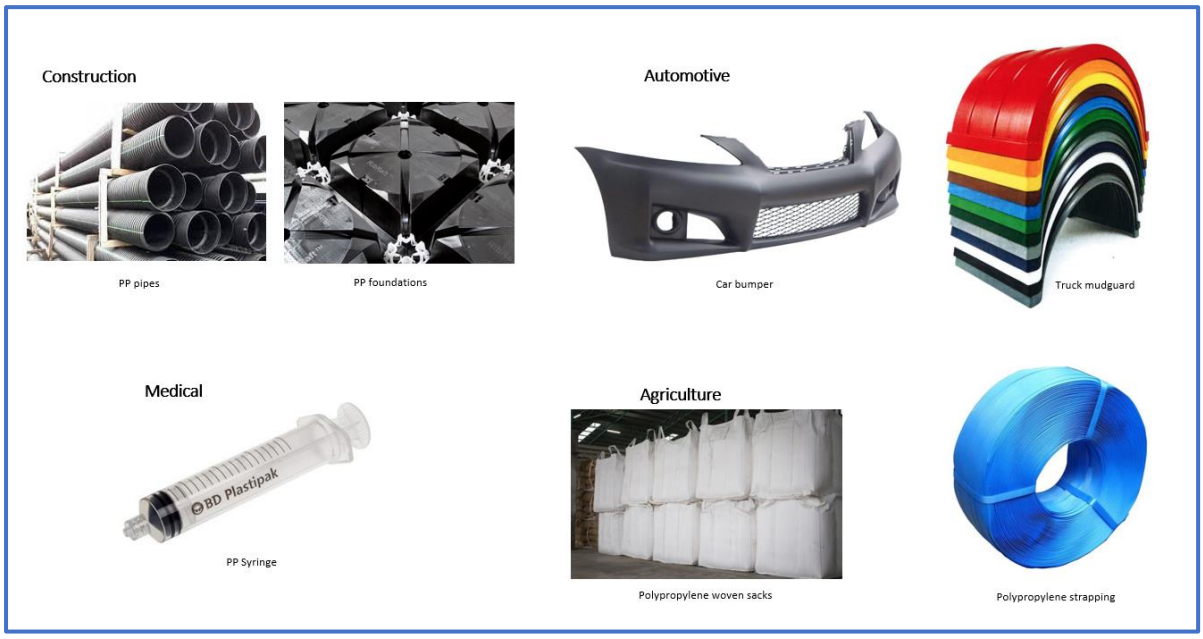


Figure 4: Common sources of post commercial PP

Work is ongoing to collect the data for post-commercial PP waste streams. This includes determining both the sectors which are producing the most waste PP, and the volumes involved.

[8] Note that the Food & Grocery Council data refers to there being 15,000 tonnes of LDPE consumed and this relates predominantly to soft plastics, not rigid plastic collected through kerbside recycling efforts.
[9] NZ based reprocessors are reprocessing approximately 1200-1500 tonnes of rPP p/a across the NZ system which means there's between 6,500-8,800 tonnes of post-consumer PP being lost to the circular economy.

The market

Demand for rPP is strong in the NZ market, and today, we still have many manufacturers having to import rPP. After speaking with importers of raw materials, it appears that imported rPP levels have dropped to 1200 tonnes p/a being imported (down from ~1680 tonnes p/a in 2019, refer Graph 2).[10] Reprocessors of rPP continue to seek more supply based on increased demand from manufacturers.

The value of pelletised rPP in New Zealand is strong and currently sits between NZ$1300-$1700 per tonne. Recycled polypropylene has continued to increase in the international commodity markets, with the value having increased significantly in the last few years.[11] This indicates a strong global market, and it is expected that further increases will be seen as demand grows. Projects are underway around the world to scale up the use of rPP as recycled content in food-grade packaging (e.g. Nextek project in the UK[12] and LyondellBasel partnership with Suez[13]). Companies will continue to look to increase their use of rPP to meet their circular economy commitments and customer demands.

Products being made from recycled polypropylene in NZ

Recycled PP is used to make many durable products which are showcased below, and this is widely considered upcycling as these products are largely made from single use PP packaging.

Method Recycling Bins

Method utilises rPP from the central north island kerbside collections to make the Method 20L Bin. The 20L was designed to maximise recycled material inputs resulting in a product that is made of 80% post-consumer recycled content (the 60L bin is 50% rPP). The current constraint in getting to 100% NZ recycled materials for the 20L is that Method is unable to find a sustainable source of clear rPP from NZ reprocessors. Method also accepts its product back at end of life.

The Warehouse Rolling Organiser

This bin was manufactured for The Warehouse and was made from 100% rPP. These organising bins are used as a hobby box and general household storage. They are a durable product that has a long life expectancy. The rPP for these bins are currently having to be imported.

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[10] It is difficult to fully measure the level of imported rPP as some companies may directly import material. rPP is not separately identified in customs import data.

[11] In the US, rPP commodity pricing has doubled in the last 6 months from USD18.44 cents/lb in Mar ’21 to USD38.28 cents in Aug ‘21. In the EU, the price per tonne has increased 30% since February 2021 (from EUR850 to EUR1280 per tonne).

[12] Refer https://www.nextek.org/project/food-grade-recycled-pp

[13] Refer https://www.lyondellbasell.com/en/news-events/corporate--financial-news/lyondellbasell-and-suez-increase-plastics-recycling-capacity/

Zealandia Horticulture Plant Pots and Trays

Zealandia's plant pots are made from 100% NZ sourced rPP. The pots display a readily identifiable plastic identification code. The transport trays used to transport plants from the nursery to retail outlets is made from virgin PP and have a service life of approximately 10 years, at which time they are recycled back into PP that is reused through the system. The plant label is also made from PP and is able to be recycled. Mitre 10 has launched a plant pot stewardship programme partnering with Zealandia Horticulture that effectively recovers the plant pots and labels to remake back into plant pots.[14]

Diamond grid Ground Stabilisation Grid

This product is use for surface stabilization and erosion control and it's made from 100% rPP for the North Island market.

[14] Refer https://www.mitre10.co.nz/potrecycling

Opportunities and challenges to effective resource recovery of post-consumer polypropylene

Lack of understanding around NZ's onshore reprocessing and manufacturing capability/capacity

There are currently seven reprocessors of PP in NZ15:

- 5 in Auckland (Pact Recycling, Polymer Processing NZ, RD Manufacturing, Recycling Group and Mammoth)
- 1 in Palmerston North (Aotearoa NZ Made)
- 1 in Christchurch (Comspec)

Based on speaking with NZ based reprocessors of rPP, we are reprocessing approximately 1200-1500 tonnes of post-consumer rPP p/a across the NZ system which based on there being 8000-10,000 tonnes of PP post-consumer packaging, means there's between 6,500-8,800 tonnes of post-consumer PP p/a still being lost to the circular economy in Aotearoa NZ.

We understand that these reprocessors do have capacity to process the additional supply in relation to post-consumer packaging. We still need to scope whether these reprocessors have processing capacity if all post commercial PP was also flowing through the system.

Lack of standardisation around plastic types that are collected at kerbside

Today, we have over 97% of the population of NZ having access to PP recycling. However, we still have eight councils (~12%) around Aotearoa NZ that do not collect PP either through kerbside recycling or through drop off at community recycling centres/transfer stations. In the absence of government mandated standardisation of kerbside recycling, this has meant that each of NZ's 67 councils have determined what plastic materials to collect. A council will make this decision based on a number of factors, including advice from their recycling partner about the value of the materials they are collecting.

[15] While there are seven PP reprocessors across NZ, only three of reprocess PP post-consumer packaging (Pact Recycling, Aotearoa NZ Made and Comspec).

Public/consumer confusion around recyclability of plastic types

This lack of consistency can be illustrated by the map below (refer Figure 5). While the areas in green represent councils that collect 1, 2 and 5 plastic, there are 8 councils that continue to 1-7 plastic. This unfortunately creates consumer confusion about what is recyclable and what isn't.

Councils that have recently changed

We've seen a number of councils start collection of PP since February 2021, namely: Tauranga, Upper Hutt (drop off at transfer station), Lower Hutt, South Wairarapa, Masterton, Carterton, Waitaki (drop off at transfer station), Far North, Kaipara, Whangarei, Western Bay of Plenty, Hastings, Napier, Hauraki, Thames-Coromandel and Ruapehu. Aotearoa NZ now has 97.2% of it's population with access to PP recycling.

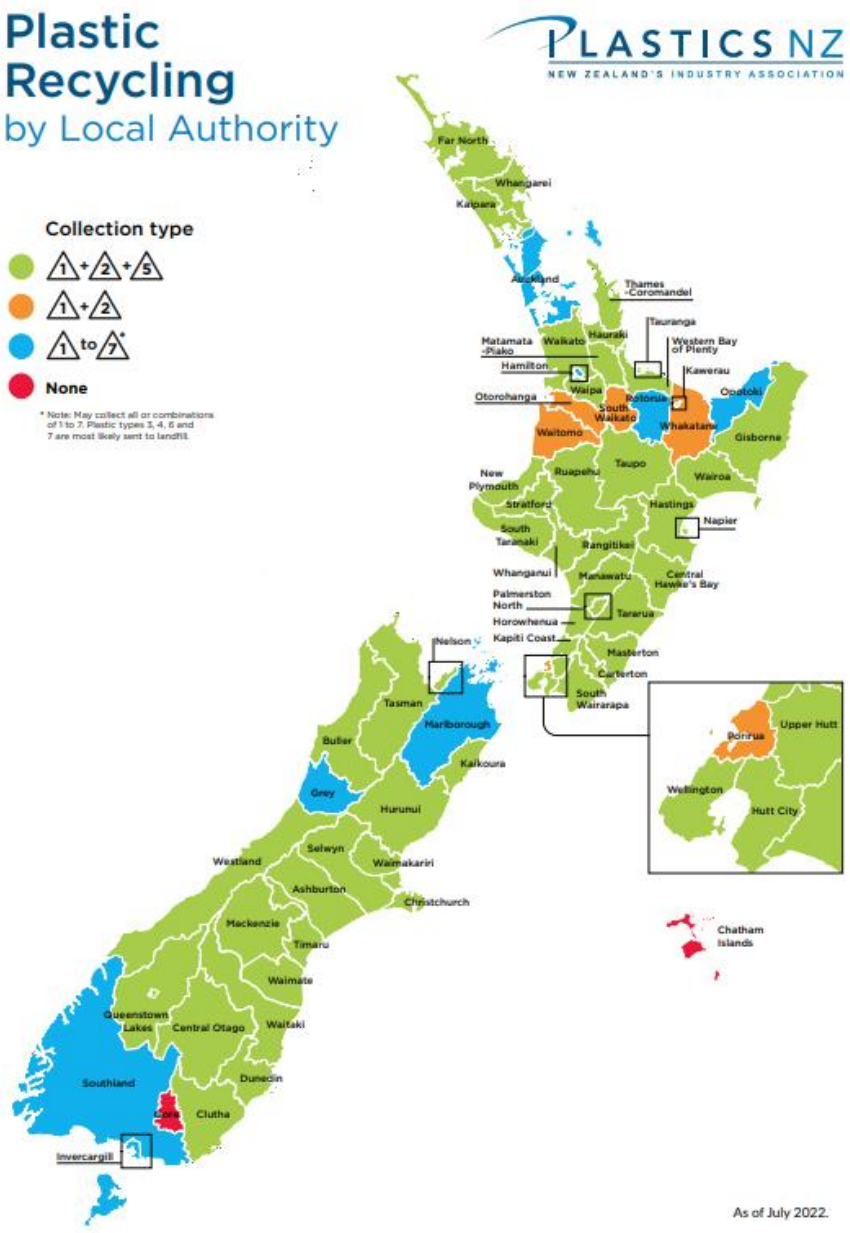

Figure 5: Plastic Collection Map showing which regions do not collect #5 PP (Plastics NZ, July 2022)

We will continue to work with the councils that are not currently collecting PP to help to address the key themes which have been raised as barriers to collection. While there are 5 key themes, two of those themes in (1) and (2) below are most prevalent.

Theme 1: Commercial relationship between council and contractor dictate what's collected

> "Our council doesn't really have any control over recycling in our region, it's our contractor's decision about what's collected as they 'own' the recyclate that they collect. They told us there's only a limited market for PP in NZ. We may look to add in #5 when our contract comes up for renewal."

What are our opportunities to improve this?

- Support Government mandated standardisation of kerbside recycling across Aotearoa New Zealand.
- Advocate for public transparency as to where kerbside collected plastics are sent for recycling (onshore or export).
- Ensure councils understand why PP is used, how it is recycled and why it is important to keep it circulating through the economy.
- Continue to advocate for improved sorting and processing capability and capacity in New Zealand

Theme 2: We'd like to understand the 'end market' more

> "Our contractor told us there's no viable end market in NZ for #5. We are keen to collect as much plastic as possible, but I don't want to flip flop by taking #5 plastic today, and then having to stop if the end market dries up in the future."

What are our opportunities to improve this?

- Ensure councils understand why PP is used, how it is recycled and why it is important to keep it circulating through the economy.
- Provide practical advice to councils on options for reprocessing rPP in NZ

Theme 3: Adding #5 will increase the contamination of our recycling stream or simply go to landfill

> "We're worried that if we add #5 plastic that will mean that our recycling stream will become even more contaminated than it already is. Today we only accept #1 and #2 plastic, and we can't even get that right.
>
> Recycling well requires our residents to want to recycle in the first place. Today, we have 20% or more of our recycling going to landfill as some households use their recycling bin as an overflow for their household rubbish."

What are our opportunities to improve this?

- Support an education campaign around the plastics that can go into kerbside recycling
- Support a national recycling campaign aimed at educating consumers that recycling should be "empty, clean and dry"
- Support the widespread use of a standard recycling label to enable quick identification of what to do with materials (recycling, rubbish, return to store, etc).

Theme 4: Product stewardship is our priority

"The government announced that plastic packaging is a priority product for mandatory product stewardship and our assumption is that we will see less plastic packaging in kerbside recycling bins and we will also see manufacturers contributing toward the cost of dealing with this waste. We believe in product stewardship and that it's not council's responsibility to sort out recycling.

What are our opportunities to improve this?

- Support the government initiative around the co-design of mandatory product stewardship for plastic packaging.
- Ensure that sorting & processing capability and capacity exists in New Zealand (e.g. Northland needs a MRF and that we need optical sorting installed in Thames and Hawkes Bay regions).

Theme 5: Making this change for our residents will take time and resources

"Recycling is confusing as it is for our residents, and it will take time and resources to make this change with our residents.

We have to update all our marketing, communications, training resources and collateral."

What are our opportunities to improve this?

- Support the widespread use of a standard recycling label to enable quick identification of what to do with materials (recycling, rubbish, return to store, etc).
- Provide an education and resource toolkit for councils, brands and manufacturers to be able to use to help make this change.

Problematic packaging design

From a consumer packaging perspective, there's a real opportunity in Aotearoa NZ to create packaging with circular systems and the waste hierarchy in mind during the initial design phase. What the opportunities to:

- refuse packaging altogether where it's possible and won't create an unintended consequence (e.g. food waste)
- lightweight packaging
- replace hard to recycle plastic packaging with materials that are readily recyclable within the NZ system

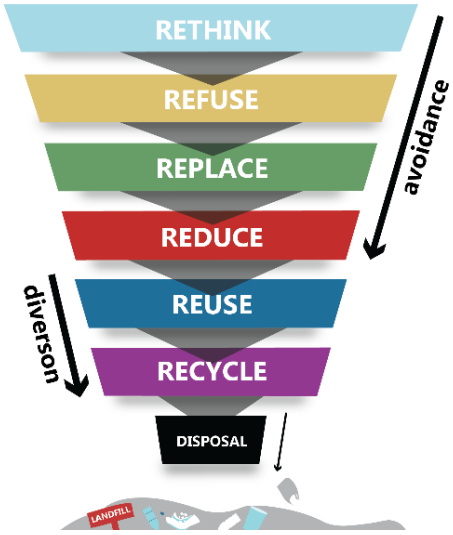

Figure 6: Waste Hierarchy from the *"Rethinking plastics in Aotearoa New Zealand Report"* (A report from the panel convened by the Office of the Prime Minister's Chief Science Advisor), December 2019.

We continue to see packaging being made that does not fit within NZ's recycling infrastructure. While NZ manufacturers have their role to play, packaging across NZ is also imported (e.g. imported products into NZ as well as NZ products being packaged in imported packaging).

Plastic identification code and recyclability

While the mobius loop (commonly referred to as "chasing arrows") is widely adopted by many brands globally, it has created consumer confusion around the recyclability of plastics as many assume the use of chasing arrows means a product or packaging is recyclable. The plastic identification code ("PIC") was created to assist recycling programs, as a tool to more effectively sort plastics into their respective types.

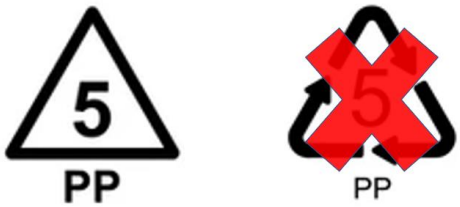

Figure 7: The plastic identification code for PP should be in a solid triangle

The PIC be easily visible and should be on every plastic item that forms the packaging (e.g. the bottle, and the lid).

It is widely accepted in Aotearoa NZ that use of a PIC alongside a recycling label will assist in alleviating consumer confusion.

Recycling labelling

A recent report commissioned by the Ministry for the Environment, *"Recycling Labelling – Options for New Zealand"* (Martin Jenkins, August 2021), recommends that the Australasian Recycling Label ("ARL") should form the basis of NZ's recycling label.

Use of ARL recycling information is the information that advises consumers how to recycle the packaging. It would be best practice for the ARL to sit separately from the PIC to ensure that consumers can easily see how to recycle the packaging or its component parts.

Conclusion

Work continues in the area of PP recycling across the NZ system. We're making good progress in the post-consumer packaging space, with increased collection across a number of regions. Further work needs to be done to improve the sorting capability across MRFs and to prevent sorted, or partially sorted, PP from being sold to overseas markets when a sustainable market exists in NZ.

There is also further engagement needed with the remaining councils who are reluctant to start collecting PP despite a strong market for the material.

Opportunity exists to increase awareness on the recyclability of PP within NZ and to mainstream the messaging around PP in the same way there is now such good awareness of the recyclability of #1 and #2 plastics. Resources need to be developed for use by all stakeholders, to educate businesses and consumers that rPP is valuable material that shouldn't be lost from the circular economy in NZ.

More work needs to be done in the post-commercial area to find consistent, good quality feedstocks of PP for recycling to ensure that our manufacturing demand is met by our sources of onshore PP, creating an improved low emissions circular economy for Aotearoa NZ.

Appendix A: The PP Working Group Activity

Working Group Meetings

- 10 March 2021 - Zoom
- 8 June 2021 – In person and Zoom
- 10 August 2021 – In person and Zoom
- 5 October 2021 – Zoom
- 30 November 2021 – Zoom
- 2 February 2022 – Zoom
- 5 April 2022 - Zoom

The Participants

The working group is comprised of a wide range of members from those experienced in the resource recovery, to those new to the field, but with new ways of looking at potential solutions.

- Bob Gutsell (Business Unit Manager, Pact)
- Debra Goulding (Sustainable Packaging Project Manager, Foodstuffs)
- Bob Leeming (Owner, Orion Plastics)
- Khan Aronsen (Senior Project Manager, Plastics Innovation, MFE)
- Chris Williams (General Manager, PackTech Moulding)
- Lyn Mayes (Director, Mad World)
- Jake Banks (Founder, The Recycling Hub)
- Robert Fowler (Managing Director, Comspec)
- Kevin Weir (Recycling Manager – Lower NI, Waste Management)
- Sarah Pritchett (Sector Projects Manager, WasteMINZ)
- Millie Porter (Resource Recovery and Waste Reduction Manager, Countdown)
- Tamoko Ormsby (Director, Ka Awatea Services)
- Rachel Barker (CEO, Plastics NZ)
- Sam Wixon (Student, Bach Design Innovation)
- Simon Wilkinson (Environmental Projects Manager, Plastics NZ)
- Steve Mead (General Manager, Astron)
- Toni Kereama (Kaimahi, Para Kore)
- Yuri Schokking (National Resource Recovery Manager, Smart Environmental)
- Sarah Baylis (Packaging Innovation Manager, Fonterra)
- Spring Humphreys (National Product Recovery Solutions Manager, EnviroWaste)
- Cameron Smith (General Manager, Proline Plastics)
- Jacob Stapleton (Branch Manager, EnviroWaste)
- Sandy Botterill (Circular Economy Manager, Plastics NZ)

Subgroups

Education & Communication

- Simon Wilkinson, Toni Kereama, Sam Wixon, Millie Porter, Tamoko Ormsby, Jake Banks

Advocacy

- Rachel Barker, Sarah Pritchett, Debra Goulding

Technology & Infrastructure

- Bob Gutsell, Bob Leeming, Yuri Schokking, Steve Mead, Kevin Weir, Robert Fowler, Chris Williams, Khan Aronsen, Spring Humphreys, Cameron Smith, Sarah Baylis, Jacob Stapleton