



Australian Government
Department of the Environment and Energy

SRU Sustainable
Resource
Use

Recycling market situation

Summary Review





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1 OBJECTIVES

1.1 Project overview

The Department of the Environment and Energy has stated that to assist work on an action plan for the updated national waste policy, the taskforce has agreed to a literature review of opportunities to grow markets in recycled glass, plastics and rubber and paper & cardboard.

1.2 Project scope

SRU has assessed a range of publicly available reports that have been produced on the state of markets for recycled materials. These have generally been initiated following challenging conditions for the export of collected recyclables. The reports are mostly focussed on the range of materials collected through household kerbside systems. This includes packaging made from paper and cardboard, plastics, glass, steel and aluminium.

The scope is generally to provide contemporary information on the market flows and conditions for each of these materials and for rubber. As steel and aluminium are a small component of the kerbside system, and are largely unaffected by trade conditions, these are not always a focus of the studies behind these reports. This report draws extensively on, and quotes from, the findings of the reports listed in the reference section and acknowledges the work of the following authors:

- Envisage Works
- Sustainable Resource Use
- Helen Lewis Consulting
- Industry Edge
- Blue Environment
- MRA Consulting Group
- Steve Balmforth

As it is export markets that have undergone the major changes, these are often the primary focus of the reports. Glass packaging is not widely exported and therefore is not dealt with in analysis on changes to export markets. Glass is, however, a major component of kerbside systems, accounting for 30% of collected material by weight. It is also a product with recycling market difficulties reflecting the lack of revenue for MRF operators due to the cost of preparing to the specification for use back into packaging. For this reason, it is a key focus of much of the recycling analysis and is included for focus in this report.

The two products that have been most profoundly hit by export market restrictions are mixed grade paper and mixed polymer plastics. These are therefore of primary focus in several reports.

The Australian recycling collection, sorting and processing system is very broad in activity covering materials as diverse as concrete, steel, paper, food organics and textiles. In scale it is much larger than the kerbside recycling activity. Much of what is handled outside the kerbside system is largely unaffected by the restrictions imposed by China and others.

Media reports have sometimes failed to convey this, and many in the community would be surprised that many millions of tonnes of recycling continue to be processed in Australia unaffected by China restrictions and associated developments. Similarly, many of the non-



kerbside collected paper and plastic materials continue to be exported without the same difficulty that some household sourced materials face. In the following section there is a summary of the key findings and reporting on each of the kerbside materials.

Reference to consumption in the report is the total amount of the material entering use on an annual basis, whether sourced locally or through export. Some of this material will be of a long-term durable nature and will therefore not necessarily result in waste generation at the same levels.



2 SUMMARY

Market

In summary, the local and global markets for the recyclable materials - paper and cardboard, plastics, and glass are all volatile in 2019. This is largely due to regulatory restrictions on the import of recycled material into China, and then into some other Asian nations. The market security and pricing for recyclables is strongly linked to the availability of markets back into new product, either as packaging or durable goods.

There is a recognition that government and major brands have a role in procuring recycled content product in order to create the market pull for a healthy circular outcome.

It is unlikely that Australia will have the same opportunities to export recyclable materials in either the quantity or quality that existed previously. If the recycling system is to remain robust and national targets for packaging are to be met, then each of the stakeholders will need to address the issues raised here.

Stakeholder roles

Challenges are apparent for consumers to present recyclables clean and free of contaminant material. Local government is facing uncertainty in collection and sorting pricing and is under challenge to commit to procurement of recycled material. It is also facing calls for greater effort to control contaminants and to adjust collections to accommodate soft plastics and collect glass separately.

State and federal governments are being challenged to play a strong role in procurement of recycled content product, particularly in road and parks agency works. There are also calls for funding assistance to support new reprocessing infrastructure and modifications to sorting and collection systems.

Brand owners and retailers are being challenged to modify their packaging to conform with recyclability and to utilise recycled content, particularly in plastics.

Key opportunities

The following opportunities for increased recovery and recycling are covered in each section of this report.

Plastics	Expansion of chemical recycling capacity for PET
	Development of chemical recycling capacity for PE
	Expansion of mechanical recycling capacity with a focus on post-consumer PE and PP material
	Development of recycling strategies for each significant durable plastic product
	Inclusion of flexible plastic packaging in kerbside collections
	Committed procurement of recyclate by governments
	Committed procurement of recyclate into packaging by consumer brands



Paper and Cardboard	Separate collection of glass for improved kerbside paper quality
	Subsequent sorting of mixed paper streams
	More stringent sorting of paper grades at MRF
	Screening and certifying of paper for export
Rubber	Tyre derived aggregate
	Pyrolysis
	Spray seals
	Adhesives
	Explosives
	Playgrounds
	Asphalt
	others
Glass	Geographic expansion of CDS schemes
	Expansion of CDS eligible glass to wine and food
	Separate collection of glass at kerbside
	Brand owner commitment for increased recycled content



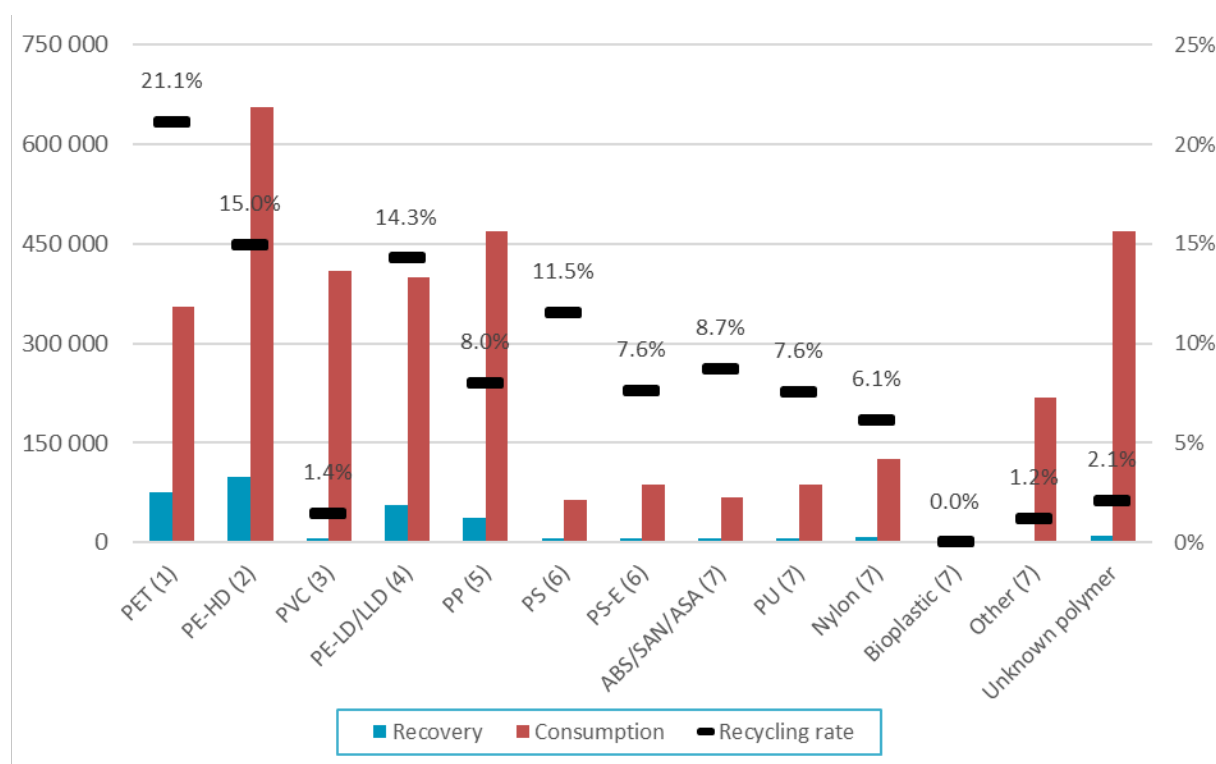
3 MARKET ASSESSMENT FOR PLASTICS

Production and Consumption

According to the Australian Plastics Recycling Survey report, in 2017-18 total plastics use was 3,407,300 tonnes. Of this, 320,000 tonnes were recovered and recycled. This gives a recycling rate of 9.4%. The consumption and recovery rates for each individual polymer varied significantly as shown in the following table.

While rubber can be classified as a plastic, this can cause some confusion and therefore rubber is not included in plastics consumption or recycling numbers (See section 4).

Plastics consumption and recovery by polymer type in 2017–18 (tonnes and % recycling rate)



Of the total plastics consumption of 3,407,300 tonnes, 790,200 tonnes were municipal or domestic packaging, with 163,400 tonnes of domestic packaging recycled, while a further 304,300 tonnes went into commercial and industrial packaging, with 62,300 tonnes recycled.

The overall plastic packaging recycling rate was 27.6%.

The following table shows the consumption and recovery for each plastics application area.



Plastics consumption and recovery by application area in 2017–18 (tonnes and % recycling rate)

Application area	Recovery	Consumption	Recycling rate
Agriculture	6 400	90 900	7.0%
Automotive	600	219 700	0.3%
Built environment	5 800	579 300	1.0%
Electrical & electronic	10 500	188 900	5.5%
Packaging – municipal	163 400	790 200	20.7%
Packaging – C&I	62 300	304 300	20.5%
Other application area	58 300	837 500	7.0%
Unidentified applications	12 800	396 500	3.2%
Total	320 000	3 407 300	9.4%

The following chart indicates the relative size of consumption for each plastic polymer and the recovery rate.

Plastics consumption and recovery by polymer type in 2017–18 (tonnes and % recycling rate)

Polymer type	Recovery	Consumption	Recycling rate
PET (1)	74 900	355 300	21.1%
PE-HD (2)	98 100	656 500	15.0%
PVC (3)	5 900	410 200	1.4%
PE-LD/LLD (4)	57 100	399 900	14.3%
PP (5)	37 500	468 900	8.0%
PS (6)	7 300	63 600	11.5%
PS-E (6)	6 600	87 100	7.6%
ABS/SAN/ASA (7)	5 900	67 300	8.7%
PU (7)	6 500	86 600	7.6%
Nylon (7)	7 700	125 500	6.1%
Bioplastic (7)	0	<100	0.0%
Other (7)	2 600	218 000	1.2%
Unknown polymer	9 800	468 400	2.1%
Total	320 000	3 407 300	9.4%

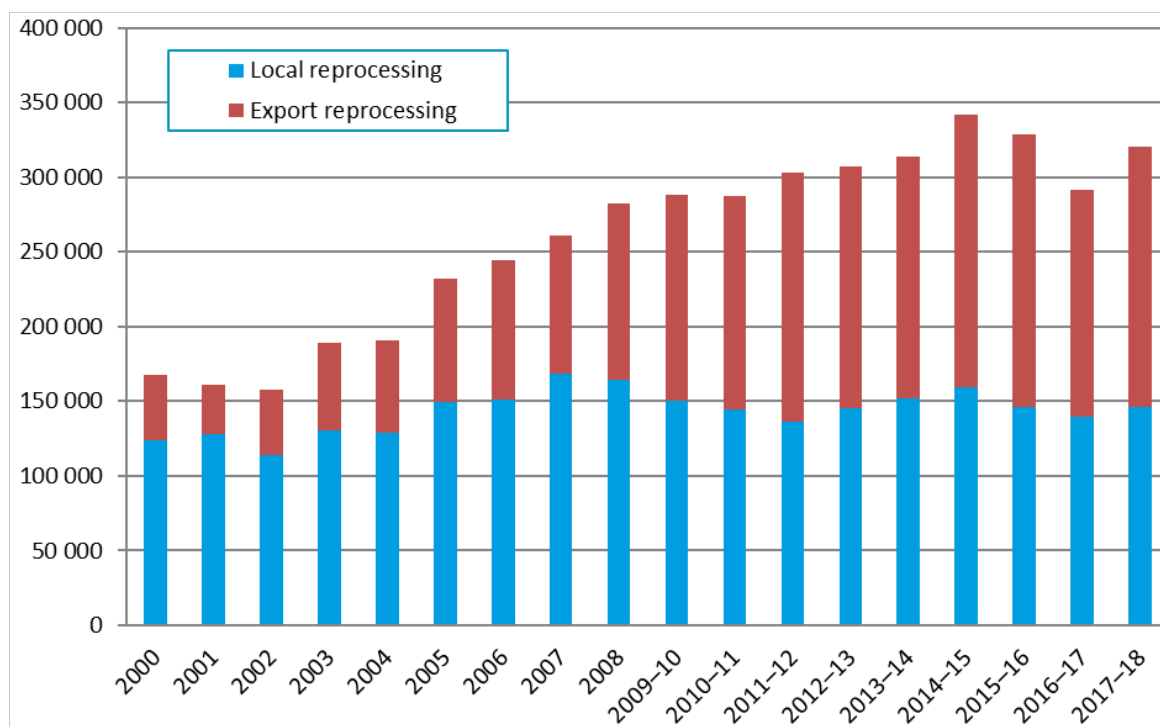
Current Recycling

The level of export of plastics for reprocessing determined for 2017-18 is the highest yet observed. In this year 54% of recyclable plastics collected were exported for recycling. For comparative purposes, in the year 2000 the level of export for reprocessing was 26.0%.

The chart below shows that as plastics recycling has increased over the past two decades, most of this has resulted in increased export rather than expansion of our local plastics recycling sector. The local plastics recycling sector is now smaller than it was in 2005.

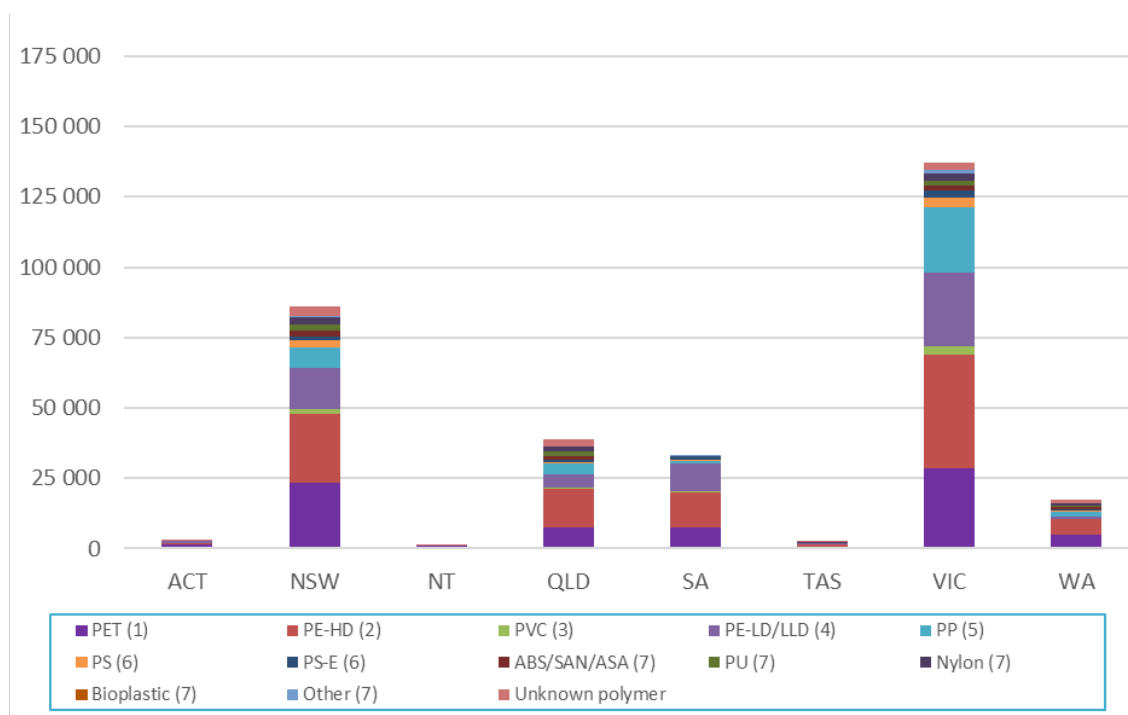


Annual Australian plastics recovery 2000 to 2017–18, by location of reprocessing (tonnes)



Presented in the following chart is plastics recycling by source jurisdiction and polymer type in 2017–18. The high level of recycling in Victoria is contributed to by the disproportionately large plastics manufacturing sector based in Victoria. Out of the 52,100 tonnes of plastics recovered from Victoria and reprocessed in Australia, 33,900 tonnes were manufacturing scrap (or ‘pre-consumer’ scrap) sourced from the plastics manufacturing sector. This compares with only 15,400 tonnes of manufacturing scrap recovery reported as recovered from NSW.

Recycling by source jurisdiction and polymer type in 2017–18 (tonnes)



Recent assessments of the local and export markets for plastics have shown the following conditions.



Plastics collected through kerbside collections are generally sent to MRFs and sorted from commingled recycling into either a single mixed plastics grade (1–7 plastic-polymer mix), or more commonly three grades, which are PET, HDPE and the residual mixed plastics grade (a 3–7 plastic-polymer mix, but with some residual quantities of PET and HDPE still present).

Most MRF operators undertake the polymer sorting locally, but others have overseas partners for the polymer sorting so are particularly exposed to import restrictions on mixed and contaminated materials. This is because mixed polymer loads requiring subsequent sorting, are the loads most restricted from Asian market destinations.

Baled PET and HDPE packaging is processed and remanufactured locally and is also exported to a wide range of countries. The main overseas destinations for sorted PET and HDPE across January to May 2019 were Indonesia, Malaysia and Taiwan (in order of quantities). New Malaysian import restrictions entered into force in July 2018 and had a major impact on Australian exports. However, Malaysia receipts of Australian shipments recovered in February and March and were steady in April but a fall in exports in May is apparent.

Prices, demand and supply

There continues to be strong local and export markets for clean baled PET that are collected and sorted to specification, with prices holding fairly steady over the past April–June quarter at \$350–\$400 /tonne (EXW MRF¹).

The price of recycled resin is linked to the price for virgin resin. In the case of PET, the virgin price generally increased across 2018, in part due to China utilising more of this material as it received less imported recyclate, however virgin prices did see some significant falls starting in October 2018 and continuing into early 2019.

The situation is similar for HDPE, with markets and pricing for clean material remaining strong. There was some export price reduction due to the Chinese restrictions with prices falling to around \$500 /tonne in early to mid-2018. Prices then recovered somewhat but over the last couple of months have fallen back to the \$500 /tonne level. Virgin resin prices have been fairly steady since the first quarter of 2018 at around \$1,700–\$1,800.

The market for mixed plastic packaging bales continues to be very poor at \$0 /tonne or less, assuming it can be sold. Due to a lack of demand for this product it is understood that storage of mixed plastics packaging continues to be undertaken by both MRF operators and reprocessors.

Exported plastics packaging has specifications relating mostly to contamination levels. The positive sorting of PET and HDPE that is undertaken at MRFs allows the baled material to generally meet these specifications without major difficulty or manual sorting input.

Previously plastics packaging has been overwhelmingly exported to China, until the latest round of restrictions. Indonesia is now the largest destination for Australian kerbside plastics, followed by Malaysia and Thailand.

A proportion of the mixed plastic packaging is reprocessed locally and is used in durable (timber substitute type) plastics applications such as outdoor equipment and building materials. This market is constrained by the scale of sales for the end products. If government and others buy more of the end products, there is an ability for the companies to take in more material for recycling.

Plastic packaging exports from Australia compete in receiving countries with plastics from the US, Europe and many other countries. It is destined for wherever the market requires material for production. Generally, demand and pricing will increase or decrease based on worldwide supply and demand conditions.

¹ EXW MRF means that the sale price is an estimate at the outgoing gate of the MRF.



Exports of kerbside recovered mixed plastic packaging have dropped dramatically over the past few years. In 2016 exports were around 42,000 tonnes, down to 37,000 tonnes in 2017 and then 29,000 tonnes in 2018. So far this year, January to May 2019 exports have been around 12,000 tonnes, so the level appears similar to that of 2018.

The falls across 2017 and 2018 were driven entirely by lost sales to China, with exports to Malaysia and Indonesia taking up some of this material. Malaysian sales dropped sharply after the introduction of import restrictions around July 2018 but have seen strong recovery across February–April of this year, and steady exports in May.

The level of stockpiling of sorted and baled plastics has become a much more significant issue around the country. It is particularly acute in Victoria where the challenges at SKM (fires and enforced closures) have seen material destined for export banking up.

Context

The following table shows the virgin prices for different polymers in Australia.

Material category	Value
Plastic – PET (1) virgin resin	\$1,300–\$1,400
Plastic – HDPE (2) virgin resin	\$1,700–\$1,800
Plastic – PVC (3) virgin resin	\$1,000–\$1,200
Plastic – LDPE (4) virgin resin	\$1,700–\$1,800
Plastic – PP (5) virgin resin	\$1,600–\$1,700
Plastic – PS (6) virgin resin	\$1,900–\$2,000

To provide some context, plastics manufacturers sometimes report that recycled plastics have to be around 10–20 per cent cheaper than virgin resin to justify the additional purchasing, handling, processing and quality assurance cost imposts associated with introducing a significant proportion of high quality recycled content into the incoming material mix.

In 2018 all State and Federal governments committed to targets related to the recycling and waste reduction of packaging.

The 2025 National Packaging Targets are:

1. 100% of all Australia’s packaging will be reusable, recyclable or compostable by 2025 or earlier
2. 70% of Australia’s plastic packaging will be recycled or composted by 2025
3. 30% average recycled content will be included across all packaging by 2025
4. Problematic and unnecessary single-use plastic packaging will be phased out through design, innovation or introduction of alternatives

The achievement of the target for 70% of Australia’s plastic packaging to be recycled is going to require a major expansion of plastics recycling activity.



Expanded activity

In an environment of constrained export markets for some plastics, the need to dramatically increase local plastic reprocessing is seen as crucial. That expansion may need to be a 400% increase in throughput and this in turn will require new market outlets for recycling plastic resin, both into packaging and other applications.

In relation to flexible plastics, this is the fastest growing packaging media and now accounts for a third of all plastic packaging. The achievement of the target for 70% of plastic packaging to be recycled by 2025 will require a significant increase in both rigid and flexible plastic packaging recycling from its current level of 27.6%.

Flexible plastic packaging is currently not designated for inclusion in most kerbside collections. Point of sale drop off collections are seen as an interim measure and are yielding a very small proportion of flexible plastic packaging. There are four councils in Melbourne who include flexible plastic packaging into commingled kerbside collection. This is in the form of putting bags in a bag to aid sorting at the MRF. This approach is being actively considered by other councils in several jurisdictions.

Opportunity 2020-25	Current Take (tonnes)	Potential Take (tonnes)	Current Price/tonne
Expansion of chemical recycling capacity for PET	>12,000	>50,000	\$300-500
Development of chemical recycling capacity for PE	0	>50,000	\$300-500
Expansion of mechanical recycling capacity with a focus on post-consumer PE and PP material	225,000	>200,000	\$200-500
Development of recycling strategies for each significant durable plastic product	minimal	> 300,000	\$200-500
Inclusion of flexible plastic packaging in kerbside collections	minimal	>100,000	\$0-150
Committed procurement of recycle by governments	minimal	>100,000	\$300-500
Committed procurement of recycle into packaging by consumer brands	minimal	>100,000	\$300-500



4 MARKET ASSESSMENT FOR PAPER AND CARDBOARD

Paper market

Paper and cardboard packaging is the dominant form of packaging and accounts for over half of the packaging in the Australian market. For many years, the collection and sale of paper and cardboard packaging has underpinned the kerbside recycling system and commercial recycling collections. The dominant fibre packaging material is corrugated cardboard for box production. There are also significant quantities of non-corrugated boxboard into applications such as a cereal box.

There is also a supply of moulded fibre packaging into applications such as egg cartons. These packaging formats account for the biggest fibre use format. There is also fibre consumed at household level as newspaper and magazine, and printing and writing paper grades across household and commercial sectors. Both of these paper uses are declining. A smaller amount of fibre goes into tissue product production and most of this is into applications that are not recoverable.

Demand for products that need to be packaged locally in corrugated boxes has remained relatively stable.

Prices, demand and supply

Recovered paper and paperboard prices appear to have stabilised somewhat in the global market in June. Local demand and supply are generally unaffected because the main local users (manufacturers of recycled paperboard for use in corrugated carton manufacture and newsprint manufacturers) are experiencing relatively normal demand.

Kerbside collected mixed paper & paperboard continues to be almost unsaleable locally or through export in any significant volume and has a current value of around \$0 /tonne. Little has changed in the local market over the last few months, with respect to sales.

Non-kerbside (and low contamination) sourced newsprint and magazine grades continue to be purchased in the Australian market at prices as high as \$250/tonne. However, there is generally no sorting of these grades by most Australian MRFs, severely limiting the supply and quality of available material.

Premium prices (as much as \$350 /tonne) are available for the negligible volumes of post-consumer sorted white office paper or bleached kraft, that is available in the market. Pre-consumer volumes from printers and converters is highly sought after and premiums are still paid for what is a limited supply.

Sorted and baled cardboard prices continued to be under stress at the end of June 2019.

Sorted grade paper

Market demand for the MRF sorted mixed paper & paperboard product remains negligible. Visy is understood to be the only MRF operator moving any paper & paperboard. This is due to its vertical integration with its own papermills. It is unique in being able to take material in and produce a recycled sheet with strong end-markets.

Unless secondary sorting of MRF mixed paper & paperboard (to multiple higher quality grades) meets the requirements of a local or international market, it will not find an end market.



Sorted grades can be achieved by two methods or a combination of these. Firstly, different grades of paper and cardboard can be kept separate at the generation source. This then requires each grade to be collected separately to maintain its fibre purity and value. This method of source separation means the different grades do not require subsequent sorting and can be delivered directly to the end market either locally or globally. Source separated material usually is in stronger demand and attracts a high purchase price accordingly.

The alternative is to collect all grades together, and often with other materials, and then subject this material to a paper grade separation. This allows a more efficient collection, particularly at a household level. The product of subsequent sorting often produces a grade separation below the internationally accepted specifications for each paper grade.

If the paper and cardboard has not been mixed with glass, is not highly compacted and is sorted at a rate below some high speed MRF's, it can produce paper of sufficient quality. It is one of the key reasons, collection of glass separate from other recyclables is being trialled and considered for adoption at kerbside.

Sites that generate larger volumes than detached housing, such as commercial sites and multi-unit dwellings, offer the opportunity to collect paper and cardboard separate from other materials, and often to collect specific grades separately for optimal market outcomes.

Export and interstate market review

In May, kerbside related exports from Victoria were around 12,000 tonnes, and total recovered paper exports from Victoria totalled 46,000 tonnes (kerbside plus all other sources). This result was similar to April.

The average export price in May was down to around \$160 /tonne on a free-on-board (FOB) basis (\$170 /tonne in April). Given the sharp downturn in virgin pulp prices reported last month, expectations are that export prices will trend a little lower in coming months.

The following key observations have recently been made:

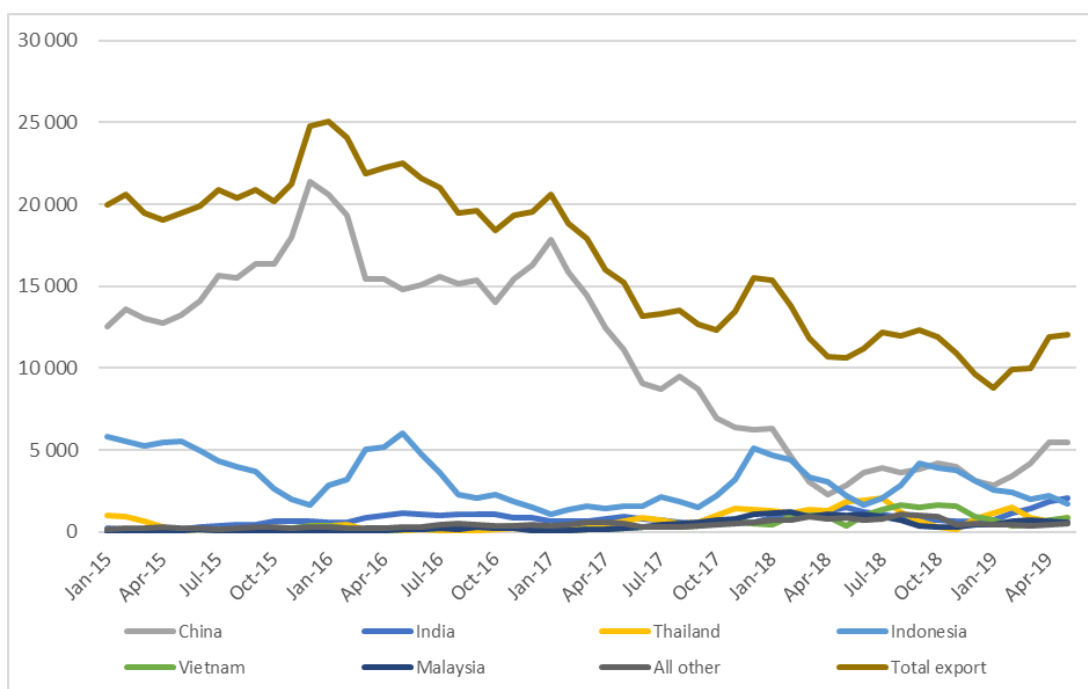
Contaminant standards will tighten in key markets across the second half of 2019 and into 2020, implying less recovered paper will be exportable than normally observed.

In May 2019, virgin pulp prices slumped in the main Chinese market. The major traded pulps experienced, on average, a 12.5 % decrease in prices in May relative to April 2019. Prices fell a little further into June but appear to have largely stabilised.

The closure of SKM Recycling is likely to result in significant quantities of paper & paperboard being sent to landfill in the short to medium term. This will affect Victoria, Tasmania and, possibly, South Australia.

The following table shows the trend in export of Victorian recovered kerbside paper & paperboard. The trend and destinations are likely to be similar for other states.

Victorian recovered kerbside paper & paperboard, to export country (tonnes/month)



Source: ABS (2019) and Envisage Works

Market risks, opportunities and activities

One of the major risks associated with stockpiling materials has crystallised over the last couple of months, with the distressed sale and/or insolvency of Victorian sorter SKM. The other MRF operators in Victoria are likely to also be highly stressed at the current time. The increasing stockpiles of recovered paper, and other recyclables, are economically damaging and increase the risks of operating MRFs, from a regulatory and commercial perspective.

Over the next few months it appears likely that significant quantities of kerbside commingled recyclables, previously going to SKM, will be disposed to landfill (possibly around 10,000–20,000 tonnes/month).

Some material will be diverted to the other MRF operators. However, a proportion of the recovered mixed paper & paperboard, mixed glass and mixed plastics still do not have end-markets and so will be placed into storage, increasing the storage related risks for those companies.

Moving on from the SKM situation, a significant opportunity in the fibre market is to undertake a secondary sort (following primary sorting by MRFs) of larger quantities of paper and cardboard, free from the major contaminants. A major contaminant is glass, and as Australian Paper Recovery (APR) appears to be demonstrating, when the glass is removed (or excluded from the incoming stream in the case of APR) and sorting occurs, satisfactory grades of recovered papers can be achieved.

This approach appears to be a path forward, where source separation might be introduced selectively and progressively. This would provide scrap paper and paperboard products of ever improving quality and quantity, suitable for domestic reprocessing or for sale into export markets.

Opportunity	Current Take (tonnes)	Potential (tonnes)	Take	Current Price/tonne
Separate collection of glass for improved kerbside paper quality	0	>200,000		\$0-50



Subsequent sorting of mixed paper streams	minimal	>100,000	\$0-50
More stringent sorting of paper grades at MRF	minimal	>200,000	\$0-50
Screening and certifying of paper for export	980,000	980,000	\$150-200



5 MARKET ASSESSMENT FOR RUBBER

5.1 Tyre consumption and waste generation

Rubber, in the form of tyres is a significant resource and also a major waste management challenge. The primary materials for end of life tyres-rubber and steel, are valuable materials, however the economic recycling of these is difficult.

In 2017 a used tyres market development strategy was developed by Tyre Stewardship Australia and a range of government agencies.

In 2015-16 Australia generated 447,000 tonnes of end of life tyres. This equated to 56.3 million Equivalent Passenger Tyre Units (EPU's). The generation of end of life tyres (EOLTS) had increased by 16% over the previous six years. New tyre sales had increased 50% since 2007-08. Based on this increase the projected tyre sales for 2019-20 was over 58 million EPU's. The industry currently lists sales at 56 million EPU's, possibly reflecting reduced new car sales or a decline in mining activity. Data for 2015-16 showed 60-65% of all waste tyres were disposed of to landfill or dumped or illegally stockpiled.

The fates of EOLTS were summarised as:

- 63% landfill or unknown (no value)
- 27% exported (low value)
- 10% locally recycled (high value)

Local recycling was limited by both lack of markets for tyre derived products and a strong international demand for tyre-derived fuels.

Local recycling, though small was increasing significantly, doubling to 44,000 tonnes between 2013-14 and 2015-16.

Markets for Tyre Derived Products (TDP's) were summarised in descending order of size as follows:

- Tile adhesives
- Spray seals
- Playgrounds
- Sports surfaces
- Steel making (steel component)
- Other minor markets

The tyres being exported were in the form of baled tyres (81%) or shredded tyres (19%). These were used predominantly as a fuel in cement kilns, industrial boilers, power plants and other industrial applications. When burnt in a controlled environment, the tyres have a similar calorific value to black coal. There was no current burning for recovered energy in Australia.

5.2 Market Barriers

A range of barriers to growing the market for TDP's were identified. These included:

Low barriers to entry for collection

New collectors can capture volume from retailers, undercutting larger recyclers and often ending in stockpiling or dumping.



Transport costs

The geographic scale of Australia presents challenges to collection costs and accordingly more tyres are landfilled in rural and remote areas.

Regulatory settings

States with weak regulatory frameworks can see higher levels of stockpiling and dumping. Conversely, restrictions on storage of processed EOLTs can restrict large contracts being serviced.

Infrastructure costs

There are high infrastructure costs for higher value facilities such as crumbing and granulating. These can cost between \$2M and #10M depending on scale.

Retailer disposal fees

These are often inflated by as much as 500% and not passed through to the tyre recycling industry. In some cases, this is referred to as a recycling fee despite the tyres going to landfill.

Cheap imports

Import of cheaper crumbed rubber product can undercut the markets for locally produced recycle. Sometimes the lower price is the result of subsidies in the generating country and can be as much as 40% cheaper.

Standards and specifications

The lack of standards that apply directly to TDPs or excluding standards can be a major barrier to market use.

Attitudes and awareness

Entrenched attitudes tend to favour virgin or traditional products and so new products can find it difficult to enter new markets.

Market scale

The local recycling industry can struggle to scale up to meet demand in some markets.

5.3 Opportunities

In estimating the market impact of different opportunities for TDP's, the analysis looked at short, medium- and long-term impacts. The following table indicates the scale of long term (10 year) market opportunities.

Opportunity	Potential Take (tonnes)
Tyre derived aggregate	>50,000
Pyrolysis	>35,000
Spray seals	>25,000
Adhesives	>25,000
Explosives	>25,000



Playgrounds	>20,000
Asphalt	>10,000
others	>50,000

The key focus of attention in the shorter term is in the following:

1. Road construction applications such as a polymer modified binder in sprayed seals and asphalt production
2. Rail construction as ballast stabilization
3. Nonstructural civic construction, particularly as a drainage medium.



6 MARKET ASSESSMENT FOR GLASS

Production and Consumption

There are two glass packaging manufacturers in Australia. Glass packaging is produced from virgin materials such as silica and soda ash or from recycled glass known as cullet. The largest producer is Owens Illinois (O-I) who produce around 650,000 tonnes of glass packaging for a range of beverage and food applications. Beer and wine bottle usage dominates this.

They operate glass making plants in four locations - Adelaide, Melbourne, Sydney and Brisbane. In addition, they operate the glass beneficiation plant in Brisbane. Their other manufacturing plants are supplied with cullet from beneficiation plants operated by Visy Recycling, SKM and Polytrade. Their total cullet (recycled glass) usage is around 350,000 tonnes.

Orora operates glass manufacturing in Adelaide, primarily geared to supply wine bottles for the South Australian wine producing market. Their total production is around 380,000 tonnes. Their cullet usage is between 75-80,000 tonnes. They source from the Visy Adelaide beneficiation plant that supplies cullet to the Orora bottle production plant.

In combination, the two companies-O-I and Orora, produce a little over one million tonnes of glass packaging each year. Some of this is exported as bottled wine. Offsetting this export is the import of a quantity of both empty glass packaging and full beer, wine and food packaging. In total the glass packaging consumption figure for Australia is estimated at 1.275 million tonnes.

Current Recycling

The cullet use in Australian bottle production is around 407,000 tonnes or an estimated 32% post-consumer recycled content in Australian bottles. A further 146,000 tonnes of pre-consumer glass is estimated to be added to production. This varies from state to state with higher levels in South Australia and lower in other states. This variation is linked to two aspects. Deposit collection systems in SA, NT, NSW and recently QLD have seen more higher quality cullet available in these markets. In addition, the demand for packaging can vary by state, by colour and by season. It is easier to utilise recycled content in amber and green coloured bottles than it is for clear (flint) coloured packaging.

O-I has adopted an international target to achieve 50% post-consumer recycled content in its glass packaging. Here in Australia and New Zealand it is setting a goal to achieve 60% content. Technically it can go higher, possibly to 80% depending on quality of cullet and the colour specifications of its customers. For every 10% of cullet used, the energy saving is 3%. The same increase also results in a carbon emission reduction of 5%. The O-I furnaces in each capital city benefit from cullet use as it requires less maintenance.

The prices paid for glass cullet into the furnace is complex. The glass coming out of sorting facilities carries significant levels of contaminants. As a result, losses during beneficiation can be significant. A market analysis of glass packaging published by Sustainability Victoria in 2014 estimated that around 34 per cent of glass that is collected for recycling is lost through collection, sorting and beneficiation losses. This has been verified recently by glass industry sources.

Gate fee rates for MRFs sending material for beneficiation can vary, based on quality and quantities. Gate fees of \$0 /tonne (EXW MRF²) to -\$30 /tonne (EXW MRF) are reported.

² EXW MRF means that the sale price is an estimate at the outgoing gate of the MRF.



There is a small amount of separated glass going directly from pubs and clubs to beneficiation. This material is cleaner and generates a gate price of approximately \$70 per tonne.

The cost of beneficiation is estimated at around \$150–\$200 per tonne.

Container Deposit Schemes

When the glass is coming from CDS schemes, the contaminant levels are lower, and the value into beneficiation is higher accordingly. It is reported that the figure applied to pub collections is around \$70 tonne depending on quality. Colour sorted CDS glass is higher value than mixed colour CDS glass. CDS schemes vary in how they handle the glass, and some have different levels of optical sorting equipment based on the minimum fragment size they can sort for contaminants and colour. The bottles collected in South Australia stay intact longer, reducing the risk of contaminants, and would therefore be expected to gain a higher price into beneficiation.

While there are prospects for increased glass to be collected at a higher quality through CDS schemes, the matching of these tonnes to beneficiation plants and demand for each colour in each state may present challenges. A key aspect is that the beneficiation plant operators are often the MRF operators and will prioritise processing their own sourced material over CDS sourced glass.

New approaches to collection and reprocessing

Beyond taking glass packaging waste back into packaging production, there are a range of other secondary markets that can be used, but these do not offer a high market price. These include glass into road base material, abrasives, and filter media. The Alex Fraser Group has recently announced a new plant geared to blend glass into asphalt and a range of other road making products. Their plant, which opened in Melbourne in 2018, is capable of recycling up to 150,000 tonnes a year, equating to four million bottles per day. This process separates metals, paper and other contaminants. It has a higher tolerance of CSP (ceramics, stones and porcelain). The gate fee for glass fines into road material is likely to be -\$75 tonne. This places it below the cost of landfill but higher than applies into beneficiation.

In recent weeks, the regulatory enforced closure of the beneficiation plant operated by SKM and sister company Glass Recycling Service is likely to result in significant quantities of glass being sent to landfill in the short to medium term. Thirty Victorian councils were sending material to this sorter.

The pricing of cullet into glass packaging production is competing directly with virgin material production. The virgin material inputs are estimated to be in the range \$550-650 tonne.

Source Separation

A number of councils are currently trialling the collection of glass separate from other recyclables. The driver for this is twofold. First, by collecting and sending glass directly to beneficiation, there is a saving from glass losses in MRFs and a cleaner product is provided for bottle production. Second, the glass fragments that cause significant problems to recycled paper production are kept out of the fibre. Based on European experience and the current trial results, separate glass collection could become a major focus in Australian kerbside systems.

Non packaging glass

There are quantities for sheet glass reaching end of life in the automotive and building sectors. Each year over 800,000 vehicles are taken off the road and, in most cases, these are sent to metal recyclers for steel and non-ferrous recovery. There is little glass window recovery in vehicle recycling systems in Australia. In the Netherlands all material from vehicle metal recyclers are required to be sent to a plant equipped to recover glass as well as plastics, rubber and textiles. This offers a model for consideration by Government and industry in Australia.



In addition to vehicle shredding, there is also a significant windscreen replacement industry. Some of these windscreens are sent to Potters Industries who grind the glass into round spheres where they are added to road line marking paint to aid reflect ability. Other smaller, high end military applications can command very high value. There is presently very little recovery of window glass from either the automotive or building demolition industry.

6.1.1 Opportunities for increased recyclate take

Glass back into packaging

If glass can be collected and provided for beneficiation in large enough fragment size for sorting, and in a form free from contaminants, there are opportunities for additional cullet usage into packaging production. This could amount to an additional 200,000 tonnes.

This material could be sourced from either CDS systems or from glass separate collections. The quality requirement would also extend to matching glass colour supply and demand in each capital as interstate transport is very costly. There would also need to be acceptance of a higher recycled content product by the brand owners utilising glass packaging.

Beneficiation access and capacity

In some cities, the ability to process additional tonnes would require an increased throughput of tonnes at beneficiation plants. Some of these plants may have throughput constraints due to optical sorting equipment that is not able to detect below a certain fragment size. There may also be competition for access for material coming from contracted kerbside contracts rather than CDS. Some expansion of beneficiation capacity or sorting technology may be crucial if existing beneficiators

CDS expansion

Road material applications

Opportunity	Current Take (tonnes)	Potential Take (tonnes)	Current Price/tonne
Geographic expansion of CDS schemes	126,000	200,000	\$70
Expansion of CDS eligible glass to wine and food	126,000	200,000	\$70
Separate collection of glass at kerbside	minimal	200,000	\$70
Brand owner commitment for increased recycled content	300,000	450,000	-\$30-\$0



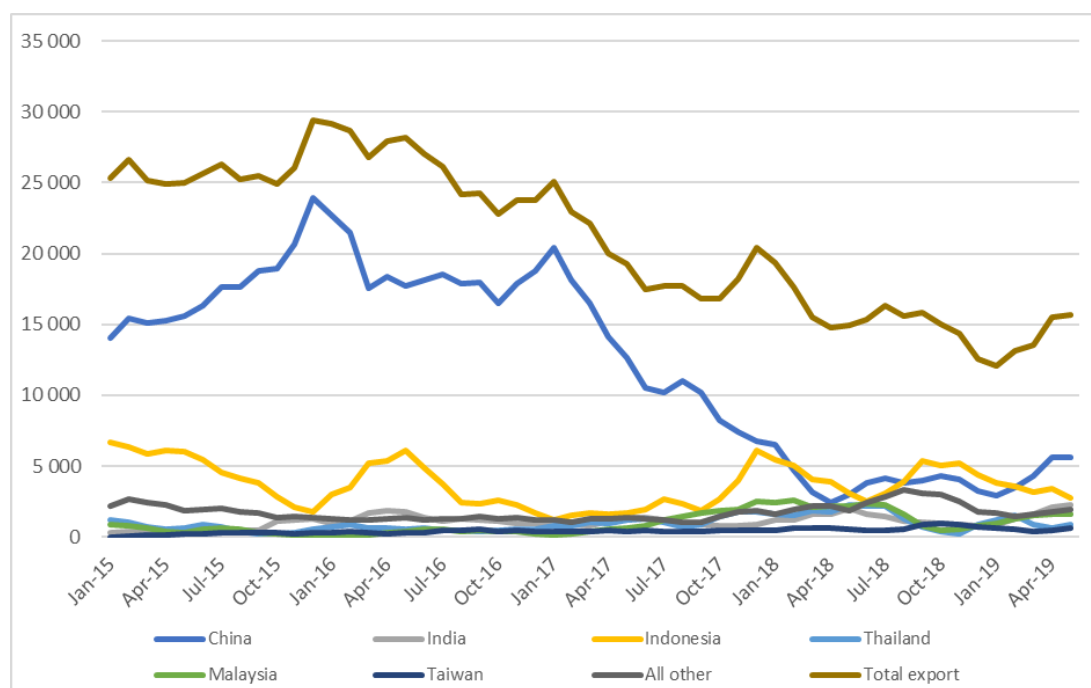
7 KEY FINDINGS

Export volume and price reduction

Australian exports of kerbside recovered material have dropped by around 50 % over the past couple of years. These falls have been driven entirely by lost sales to China, with the fall in export of bales of mixed paper & paperboard the main products contributing to the export reduction. From February to April 2019 there was some recovery in exports from the low in January 2019, which had the lowest export volumes for many years.

May 2019 exports across all materials are fairly steady from April, with some unconfirmed glass cullet export activity possibly developing. The following chart shows the Victorian export trend. It is reported that other jurisdictions have experienced a similar trend.

Victorian recovered kerbside materials, to export country (t/month)



7.1 Plastics

In our key export destinations of South and East Asia, Australian volumes are usually competing for market against material from other countries.

Contamination levels are a growing issue. The drive to keep levels below those required in specifications has increased the sorting task. The market for mixed polymer plastics is highly restricted and the price for this material is \$0 or less.

Overall, the price paid for clean, baled PET and Polyethylene has held up quite well. On the other hand, mixed polymer plastic has limited market outlets and poor prices are paid locally or into export.

There is now considerable effort going into finding new outlets for mixed polymer products. A major plastics recycling plant was opened in the north of Melbourne by Advanced Circular Polymers in June 2019 at a cost of \$20M with \$500,000 support from the Victorian Government. It is capable of



processing 70,000 tonnes of plastic annually. The company may have market connections for the product that the plant produces.

There is now an increased focus on markets for recycled resin, including assessment of the role government procurement can play in providing outlets for kerbside sourced recycle.

7.2 Glass

There are currently excessive losses of glass in collection and sorting of around 30-40%. A lot of thought, and some trialing of different systems, is occurring to seek a better outcome for collected glass packaging.

There are adequate glass packaging market outlets back into packaging production through beneficiation facilities in four capital cities.

More glass is coming through deposit systems which produce cleaner glass with less contaminants and generates a higher price into packaging production.

O-I and Orora are committed to increased cullet usage through each of their five glass production facilities.

In some states there are now strong secondary markets for application to road construction material. These may prove to be substantial and deal with glass fragments that cannot meet packaging production requirements.

Most sorters receive no revenue for their glass but pay a fee. This is at a level well below landfill disposal costs. With more material coming back through deposit systems, the MRF tonnes may decrease and access to beneficiation will need to be assured.

7.3 Paper and cardboard

The sorting of paper and cardboard more diligently to specification will likely open up greater local and export destinations and prices. The Australian recycling system will need to evolve to be less reliant on export destinations. Recycled material will need to lock markets into packaging production, newspaper and magazine manufacture, and moulded fibre products. To achieve this, glass separate collections will assist in specification compliance, as will a more diligent sorting of fibre fractions.

The market pull for paper will increase as more brand owners demand higher recycled content of their packaging.

There also needs to be a recognition that Australia is a net importer of goods and therefore export of packaging to supplying country markets will be necessary. Rather than focussing on export of wastepaper, the domestic pulping of the paper and export of pulp may be more market secure and will maximise employment through the value adding of the pulping process.



8 SUMMARY

Market

In summary, the local and global markets for the recyclable materials - paper and cardboard, plastics, and glass are all volatile in 2019. This is largely due to regulatory restrictions on the import of recycled material into China, and then into some other Asian nations. The market security and pricing for recyclables is strongly linked to the availability of markets back into new product, either as packaging or durable goods.

There is a recognition that government and major brands have a role in procuring recycled content product in order to create the market pull for a healthy circular outcome.

It is unlikely that Australia will have the same opportunities to export recyclable materials in either the quantity or quality that existed previously. If the recycling system is to remain robust and national targets for packaging are to be met, then each of the stakeholders will need to address the issues raised here.

Stakeholder roles

Challenges are apparent for consumers to present recyclables clean and free of contaminant material. Local government is facing uncertainty in collection and sorting pricing and is under challenge to commit to procurement of recycled material. It is also facing calls for greater effort to control contaminants and to adjust collections to accommodate soft plastics and collect glass separately.

State and federal governments are being challenged to play a strong role in procurement of recycled content product, particularly in road and parks agency works. There are also calls for funding assistance to support new reprocessing infrastructure and modifications to sorting and collection systems.

Brand owners and retailers are being challenged to modify their packaging to conform with recyclability and to utilise recycled content, particularly in plastics.



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