



Finding treasure in our trash

The \$324 million wasted opportunity
sitting on our kerbs

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EY

Building a better
working world



Restoring faith in recycling

Australia will have to manage its waste onshore and has no consistent or robust infrastructure to do so. We need to restore faith in recycling by encouraging transparency in the process in order to shift consumer's perception of what they put in their bins.

Instead of 'waste' we need them to see a tradable asset, a commodity with a market value. The first step in changing consumers behaviour is restoring their belief that what they are putting in the recycling bin is actually being recycled.

It's not waste,
...it's a resource

As part of EY's commitment to building a better working world, we have examined the issue of household recycling and the domestic opportunity at hand if we can change our behaviours.

This report focuses on material collected from households for recycling through regular kerbside collections. This material is typically in the form of packaging containers, bottles and paper.

Within this report, EY estimates Australia could be missing out on up to \$324 million of value that could be extracted from the waste in our kerbside bins each year.

This opportunity will only be realised if households take a more diligent approach to sorting, councils assist through education and infrastructure and by a greater focus on waste as a resource, like we do with mined resources such as iron ore or even gold.

The recent announcement from the Council of Australian Governments (COAG) to ban the export of recyclable waste makes the opportunity not only compelling, but also necessary.

Executive Summary

The announcement on Friday 9 August 2019 that Australia's Environment Ministers had been tasked with banning the export of recyclable plastic waste and other materials in favour of developing a domestic market was welcomed by many, including the recycling sector.

The announcement came amid a worsening national recycling crisis. In July, the collapse of Victorian recycler SKM saw thousands of tonnes of valuable recyclable material from households being sent to landfill.

It is hoped that COAG's leadership will provide much needed direction and stimulus, to start the process of solving the current crisis and helping Australia build a functioning and productive resource recovery market for waste. A commitment to local processing, and the creation of local markets for hundreds of thousands of tonnes of recovered materials represents a considerable challenge. However, it all starts with recognising recyclable materials as a valuable resource and not merely as a burden.

Key Trends

- ▶ EY estimates that only \$4.2 million worth of recyclable material is currently captured from our waste each year. If Australia built a world-class recycling system locally, EY estimates that more than \$328 million worth of recyclable material per year could be captured and used in manufacturing and construction.
- ▶ This means that Australia is wasting an opportunity worth up to \$324 million per year by not taking advantage of the recyclable material that goes in kerbside bins.
- ▶ Australia's waste problem is largely a behavioural problem. Reducing contamination in our recyclables requires a fundamental behavioural shift - better information for households, clearer rules on what can be recycled, and possible new infrastructure and incentives.
- ▶ A model for improving recycling means looking at a product's life-cycle, from packaging design, materials choice including reusable packaging [and recyclable packaging] to on-pack information, packaging systems and collection and recycling services.
- ▶ Proper sorting of recyclable before collection, rather than after, is key to extracting maximum value from recyclables.
- ▶ More recycled material should be included in the production of goods, infrastructure and packaging.
- ▶ Harmonisation of regulation between federal, state and local governments should be considered as a way to provide clarity about the types of materials that can be recycled.
- ▶ Data collection should be improved to better understand both the issues in the market, as well as the opportunity in our kerbside bins.
- ▶ Further investment, drawing on state waste levies and federal funding, should be directed to developing the collection, recycling and markets to create a sustainable domestic recycling industry.



Australia's wasted opportunity

Australia's kerbside recycling system is dominated by a single bin system where different materials (plastic, metal, paper and glass) are 'co-mingled'. This approach increases contamination rates and reduces the quality of the collected materials. For example, glass and paper become cross contaminated (glass dust in the paper), dramatically reducing the value of the paper. Further, the compacting process during collection can crush the glass to a size that is challenging, and therefore expensive to sort.

As an example, a high-density polyethylene (HDPE) milk bottle collected as mixed plastic waste has a market value of \$110 per tonne. This is well short of the market value for clean HDPE of \$500 per tonne.

Worse, if the milk bottle is contaminated with food, a label, or even a lid, it might need to be disposed of in landfill at a cost of \$130 per tonne.

Contamination comes in two main forms: one is the addition of foreign matter (food residues, non-recyclable materials,

other types of waste in the recycling bin); the other is cross-contamination (glass in paper being the strongest example). Contamination rates in Australia average between 4 and 16 percent of collected recyclable material¹. These high contamination rates are a key reason why countries across Asia closed their doors to Australia's waste.

Removing contamination is a labour intensive and therefore costly process. Contaminated waste also costs recycling material processors up to \$200 per tonne to dispose of in landfill². This cost is subtracted from the recoverable value of the materials in the kerbside bin.

In short, Australia's kerbside recycling is not optimised to gain the best value from the materials collected, especially in the current climate. While we are seeing early signs of hope with some councils responding to the recycling crisis by introducing additional bins to better separate materials³, more needs to be done to extract the full value of this resource.

¹ Department of the Environment and Energy: National Waste Report, November 2018

² Report to the Senate of the inquiry into the waste and recycling industry in Australia, 2018 (page 54)

³ City of Yarra 'waste revolution trial' <https://www.yarracity.vic.gov.au/waste-revolution-abbotsford-trial/how-to-recycle-glass>

Finding the treasure in trash

The communique from COAG emphasised high-value recycled commodities. 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.

Market price data for recovered recyclable materials illustrates the significant difference between sorted and unsorted materials. The same materials when sorted are

worth significantly more than when they are mixed or contaminated, as seen in Figure 1. In the current market some unsorted materials (paper/cardboard and mixed plastic type 3-7) have zero or negative value. For other materials, prices are quite strong.

Figure 1: Commodity prices for low value and high value materials

Material type	Material grade	Market value (per tonne) at July 2019
Paper and paperboard (cardboard)	Mixed paper and paperboard	\$0
	Newsprint and magazine	\$190
	Old corrugated paperboard	\$200
	Box board	\$75
Glass packaging	Mixed glass	-\$30
	Source separated glass	\$70
Plastic packaging	Polyethylene terephthalate (PET)	\$380
	High-density polyethylene (HDPE)	\$500
	Mixed (1-7)	\$110
	Mixed (3-7)	-\$20
Metal packaging	Steel/aluminium packaging	\$135/\$1100
Contamination/sorting losses	Landfill	-\$130

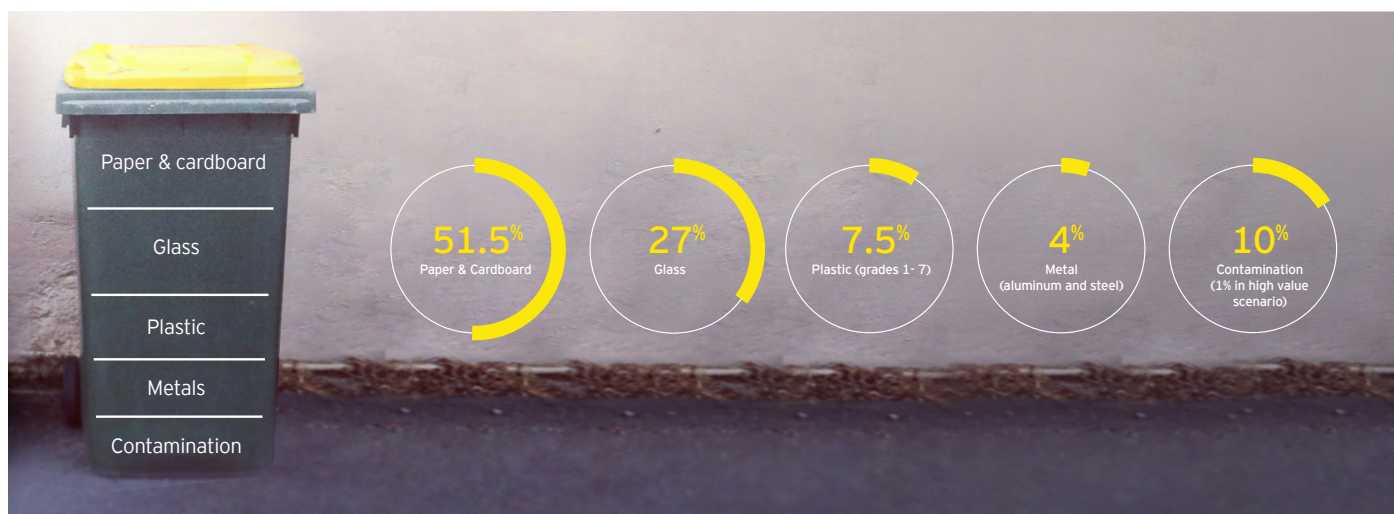
Source: Sustainability Victoria Recovered Resources Market Bulletin, July 2019

EY estimates the actual value of a co-mingled bin to be as low as \$2 per tonne when factors such as contamination and unsorted materials are taken into account. EY based this finding on the co-mingled value of the materials in Figure 1, in the proportion they occur in a typical kerbside bin.

Using the prices for sorted materials, a typical kerbside bin could be worth as much as \$156 per tonne. In this scenario,

paper and cardboard are separated, glass is sorted not crushed, valuable plastics are separated, and contamination is eliminated. This shows that the same materials if collected differently have a considerably higher value than the current business model achieves (see comparison in Figure 2 below).

Figure 2: Co-mingled versus sorted recycling



Typical make up of a bin (average) ⁴	Value per tonne - Co-mingled ⁵	Value per tonne - sorted ⁶
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
10% contamination (1% in high value scenario)	-\$13	-\$1.30
Potential value (rounded to the nearest tonne)	Value of bin if co-mingled = \$2.04	Value of bin if sorted = \$156.51

Source: EY, 2019

EY estimates that only \$4.2 million worth of recyclable material is captured from our waste each year. If we built a world-class recycling system, EY estimates that we could capture up to \$328 million worth of recyclable material⁷.

Ultimately, there is an opportunity worth up to \$324 million per year sitting in Australia's kerbside bins that is not being grasped.

To achieve the higher value scenario, considerable market development would be required either locally or in overseas markets. Prices quoted are for high quality materials for which there may be limited local supply or markets.

⁴ Department of the Environment and Energy: National Waste Report, November 2018

⁵ Based on data from the Sustainability Victoria Recovered Resources Market Bulletin, July 2019

⁶ Based on data from the Sustainability Victoria Recovered Resources Market Bulletin, July 2019

⁷ Based on data from the 2018 Sustainability Victoria Report



How do we maximise the value of Australia's recyclables?

A coordinated approach to optimise the value of the resources in the recycling stream is required. Materials should be used for the highest value application possible. A coordinated approach will help the transition to a circular economy that encourages the continued use of resources. For example packaging containers should be recycled into high value applications such as more packaging where possible rather than into lower value applications.

EY analysed the materials in a typical household bin, the current market and potential market opportunities. For each material, EY identified the opportunities and market intervention required to maximise the value of recyclable materials, including the current and potential grade and therefore the potential increase in value. EY also identified the interventions that would be required to achieve the maximum benefit for that recovered material in Figure 3.

Figure 3: Opportunities and interventions required to unlock the value in recycled materials

Material	Current Grade	Current Value	Potential Grade	Potential value	Potential value Increase	Market opportunity	Intervention required
Paper and Cardboard	Mixed	L	Sorted paper	M	H	Local paper manufacturers	Source separation Market development
			Sorted cardboard	M	H	Local carton manufacturers	Source separation Market development
Glass	Mixed crushed	VL	Mixed crushed/ fines	L	M	Increased use as road base/ replacement for natural sand	Market development including commitment from markets, specification development, trials Investment in production facilities
			Sorted glass/ cullet	LM	M	Local container manufacturers	Source separation (kerbside, CDS)
Plastics	Mixed 1-7	L	Sorted 1-2	H	H	Strong international market	Source separation (kerbside, CDS) Post collection sorting
		L	Mixed 3-7	VL	-	Plastic roads Energy from waste	Product development Market development Infrastructure development
Contamination	Mixed	-	N/A	H	H	Elimination of contamination Energy from waste	Household education Improved labelling

Source: EY, 2019

What changes need to be made?

Australia will need to adopt best practice local and international models of resource recovery, recycling and market development if it is to build a sustainable domestic recycling sector. These changes will help facilitate Australia's move to a circular economy model that encourages the continual use of resources. The following suggestions are based on compelling local and international approaches:

01 Education to reduce contamination

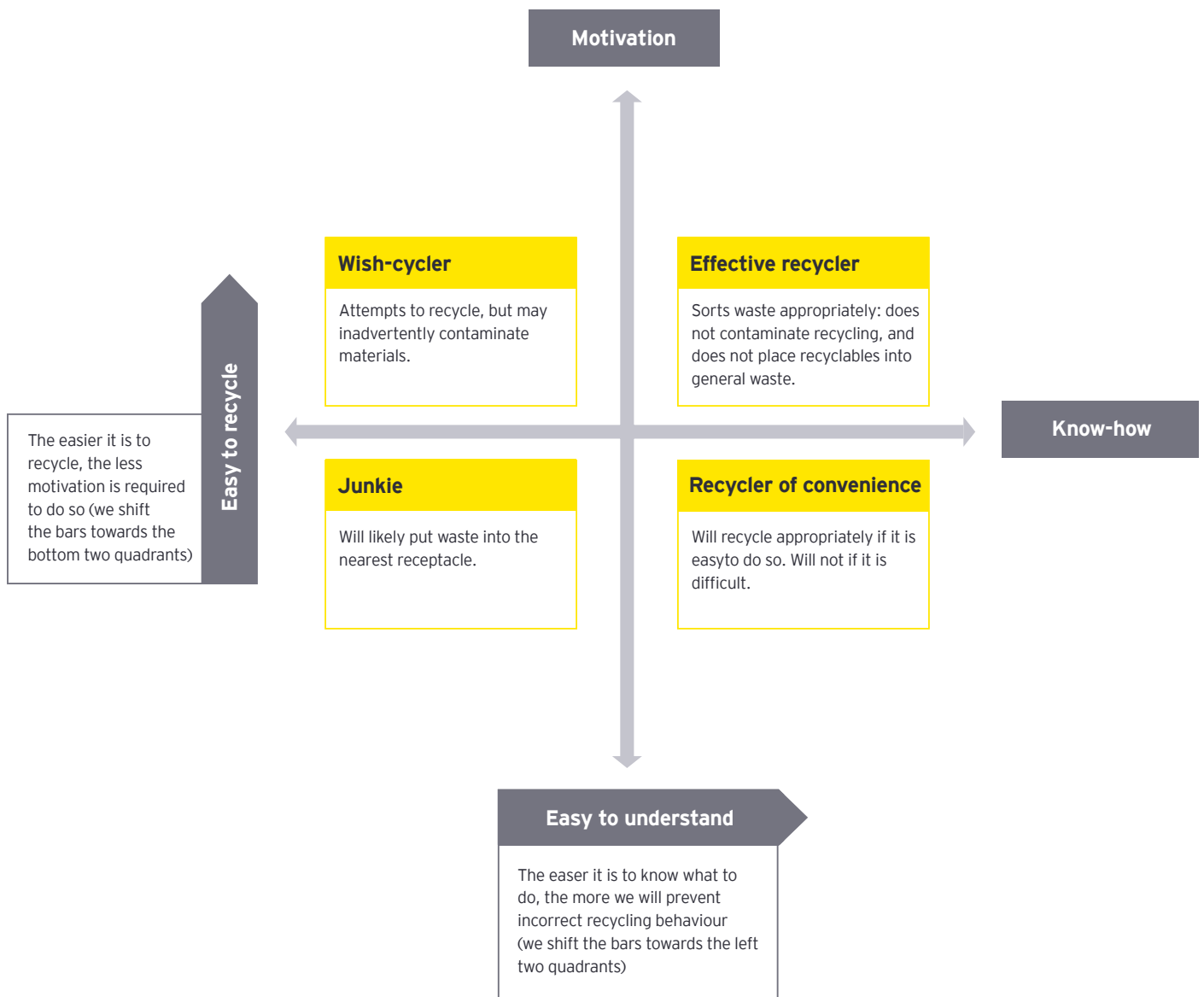
Reducing contamination requires better information for households, clearer rules on what can and can't be recycled, and possible incentives.

- ▶ Ensure households are suitably informed about what can be recycled.
- ▶ Reduce cognitive and motivational ask of people to interpret recycling. For example, use unmissable STOP/GO labelling on packaging matching that on bins (consistent across the nation) or use deliberate identifiers such as bins shaped like bottles.
- ▶ Provide incentives for brands to include adequate information on packaging (including taxes and policy settings).
- ▶ Provide incentives for households to reduce contamination.
- ▶ Provide convenient alternatives for recycling materials not currently recyclable through kerbside schemes (soft plastics, composites).

Faced with uncertainty, some people are even tempted to 'wish-cycle', which is the act of placing non-recyclable materials in the recycling bin, in the hope it might be recycled. The behaviour of others, such as recyclers of convenience and "Junkies", people who do nothing despite all available information (see Figure 4 below), also need to be addressed.

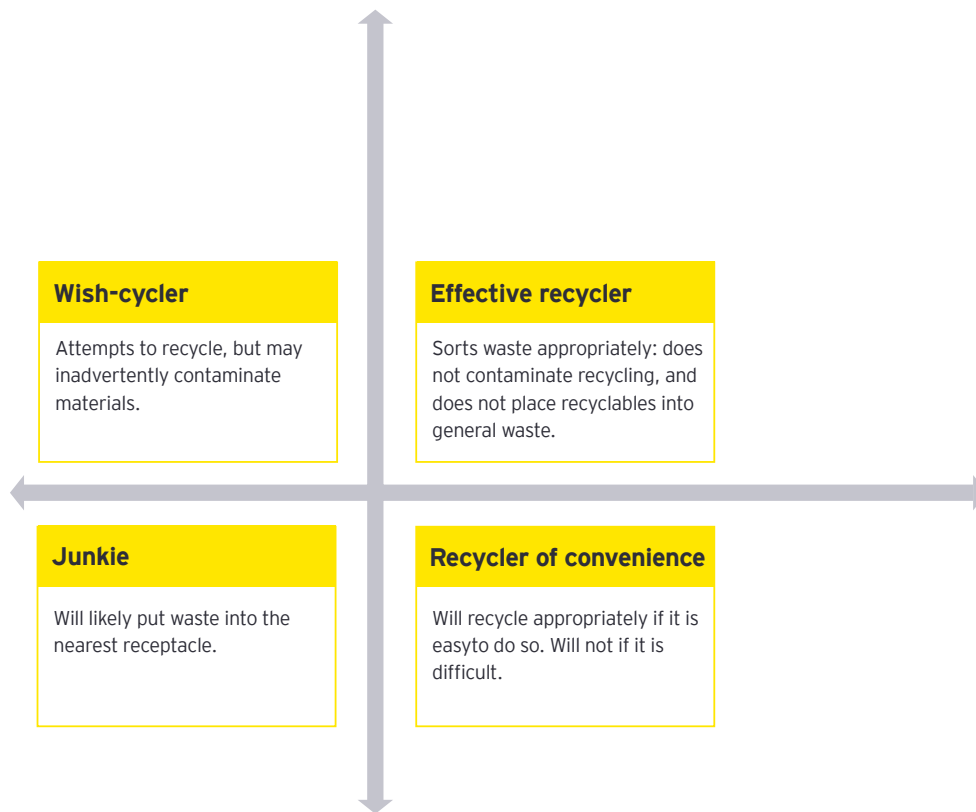


Figure 4: Archetypes of typical recyclers based on behavioural attributes



Source: EY, 2019

Figure 5: Effective environmental and education design increases the proportion of people who are effective recyclers



Source: EY, 2019

To avoid this, EY’s behavioural change experts recommend both making it easier to understand what to recycle, as well as making it more convenient to do. By doing so, we create a larger group of effective recyclers, and reduce the number wish-cyclers, recyclers of convenience and people who do nothing.

Making it easier to know what to do, for example, could be achieved by having well-designed recycling bins, appropriate signage and reward systems for people/households that do the right thing.

There is also evidence that the most effective behavioural interventions happen as close as possible to the decision being made. This means that information provided at the point of putting something in the bin (or other key decision points like buying products that have more or less waste) is likely to be more effective. These sorts of interventions are a type of education, but it doesn’t require as much recall or cognitive attention on the part of individuals.

In this model, impact is more about ‘moving the bars’ rather than ‘moving the people’. For instance, in an environment where it’s easier to recycle, you move the horizontal axis (or measure of motivation) shifts down so that more people fit into the ‘effective recycler’ and ‘wish-cycler’ quadrants (equating to an intervention that induces more people with a lower motivation to act and recycle properly).

In an environment where it is easier to know what to do, the vertical axis moves to the left (equating to an intervention that induces more people to act based on lower “know-how”) so that more people are in the ‘Effective Recycler’ and ‘Recycler of convenience’ quadrants seen below in Figure 5.



02 Improved sorting at source

We need to consider sorting prior to collection, rather than after.

- ▶ Re-consider household collection systems to maximise sorting and maintain the quality of collected materials. The glass industry states that glass only collection could increase to 90 per cent compared to between 30 and 60 per cent currently⁸
- ▶ European models include a greater emphasis on source separation including dividers in bins and/or colour coded bags that can be optically sorted at the recovery point such as Germany which has multiple bins just to sort coloured glass. Other countries like Sweden have recycling stations in residential areas.
- ▶ Build a national container deposit scheme (CDS) which will increase the quality of recovered materials. For example, the quality of glass collected through CDS is considerably higher than glass collected through co-mingled kerbside and therefore more easily recycled. Similarly, plastics collected through CDS are expected to be higher quality than via kerbside⁹.
- ▶ Consider container re-use schemes. Most European and some North American jurisdictions have re-use schemes for bottles. These models could work in the more densely populated parts of Australia.
- ▶ Ensure packaging is easily separable and recyclable by working with the Australian Packaging Covenant Organisation and their members (who sell goods with packaging) to develop packaging that is easily separated by users and recyclable through kerbside schemes.

Recent announcements in Victoria indicate households could be given a greater number of bins to facilitate better sorting in an effort to address the recycling crisis in the state. As identified above, this is in line with international best practice.

However, EY also advocates a consistent national approach be adopted as the recycling sector notes variations within states and between states hampers coordination and ultimately leads to an increase in low value 'mixed waste'.

⁸ Report to the Senate of the inquiry into the waste and recycling industry in Australia, 2018 (page 102)

⁹ APCO Packaging Material Flow Analysis 2018 (page 40)

03 Market development

Considerable growth in the uptake of recycled materials will be required to realise the high value prices. However, as a principle, high quality materials are more likely to find a market. Unless properly sorted, materials such as paper and cardboard will not find a market and will lead to further stockpiling. Innovation to grow the markets for these materials is required.

Recycled materials are already used in roads and infrastructure including recycled glass fines, plastic as an additive to asphalt, and recycled plastic railway sleepers. While the Prime Minister's announcement provides confidence to the sector, if Australia is to find a use for all its recycled and recyclable materials, it will require considerable additional interventions and investment.

Support from government procurement policies and initiatives, supported by an investment of waste levies, alongside federal funding would help achieve the level of market growth required, including:

- ▶ Incentives for investments in new product development to ensure products meet technical specifications and can meet demand for recyclability.
- ▶ A tax or levy on virgin materials to create a price advantage and hence greater demand for recycled content, as has been suggested in the European Union and United Kingdom recently.
- ▶ Coordinated policies at the national, state and local government level to ensure products meet environmental, and community expectations.
- ▶ Research to understand the environmental and economic impact of using these materials in roads and rail infrastructure.
- ▶ Subsidies for materials to reach regional areas
- ▶ Documented trials to demonstrate the feasibility and techniques for working these new materials.
- ▶ Procurement policies, and mechanisms including targets and other incentives to support the market for recycled materials.

In addition, the use of recycled materials in roads and infrastructure will need to be matched to the value of the material. Where possible, materials should only be used when other higher value opportunities for the material have been exhausted.



Conclusion: A future model for recycling in Australia

The lost value of kerbside recycling is almost \$324 million each year. This presents a clear opportunity to reform and reshape the sector, starting with household recycling and consumer behaviours, and extending to the development of a world class and sustainable recycling system.

We cannot realise this value without a seismic shift in consumer behaviour. Firstly, we need to treat waste as a tradeable commodity where quality is an important driver of price. Secondly, we need to restore people’s faith in recycling so that they believe that what they put in recycling bins is actually being recycled.

The most effective way for this to occur is through the formation of a nationally consistent scheme, that includes a consumer education program, clearer packaging to aid better sorting, and more transparency around supply and demand to enable investment in infrastructure so we can deal with our waste onshore.

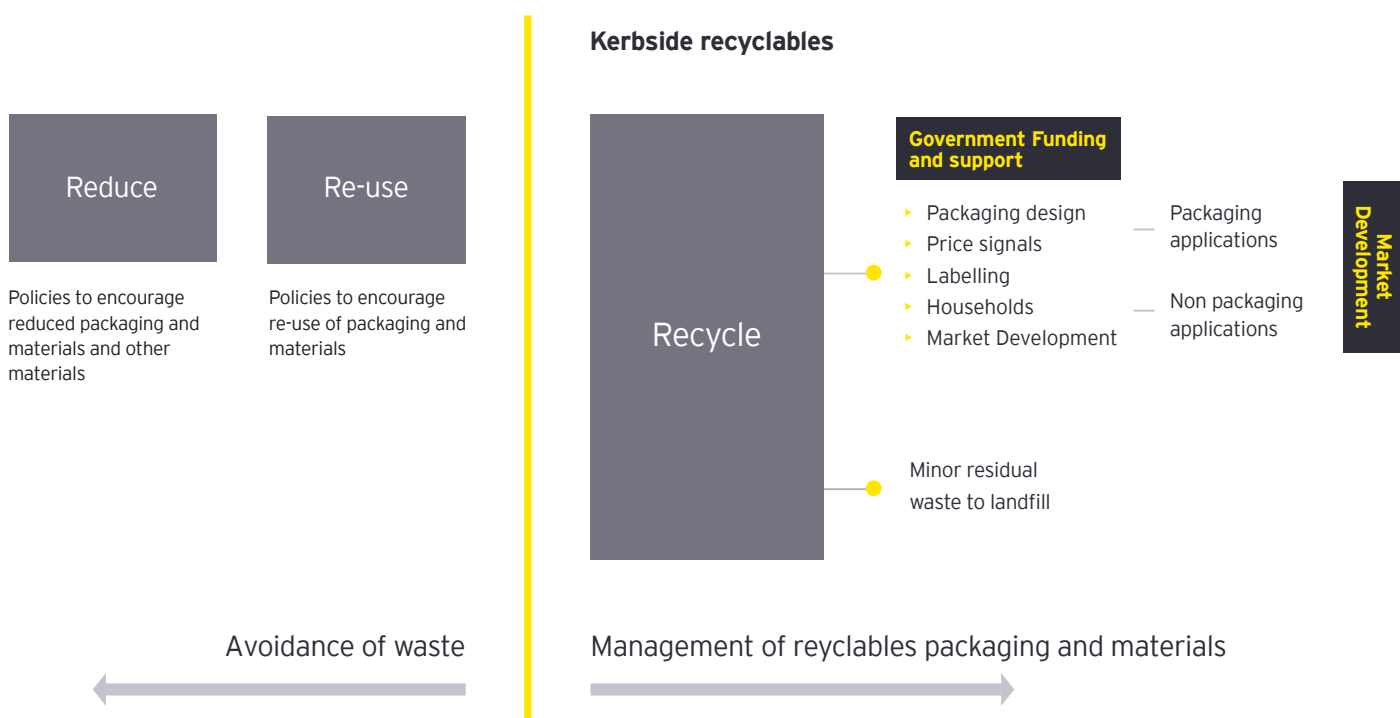
The first step of committing to domestic processing of Australia’s recycling has been achieved and is a turning point in Australian waste management. We are starting to see a shift in our thinking but need to do more to treat our waste as a tradeable resource, like iron ore or gold, rather than just waste.

However, recycling only addresses the end of the supply chain. A comprehensive approach includes encouraging a reduction in waste, re-use, recycling and most importantly market development.

An investment in systems of production and consumption that recognise the waste management hierarchy - Reduce-Re-use-Recycle - and where possible operate on circular economy lines, to align with worlds best practice are required.

This change in approach, coupled with adequate investment of state waste levies, and Federal funds will achieve a sustainable domestic recycling industry.

Figure 7: A systems approach to recycling in Australia



Source: EY, 2019



Methodology

EY's modelling leverages waste commodity price data from Sustainability Victoria's July 2019 Recovered Resources Market Bulletin with research from the Department of the Environment's 2018 National Waste Report recycling data.

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