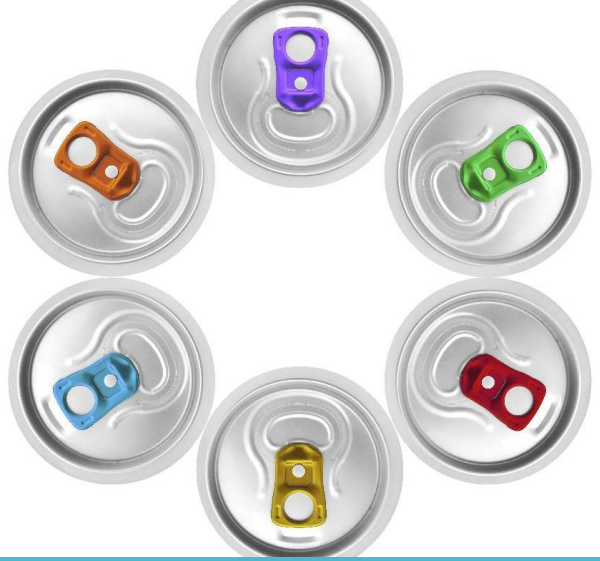
INFRASTRUCTURE VICTORIA



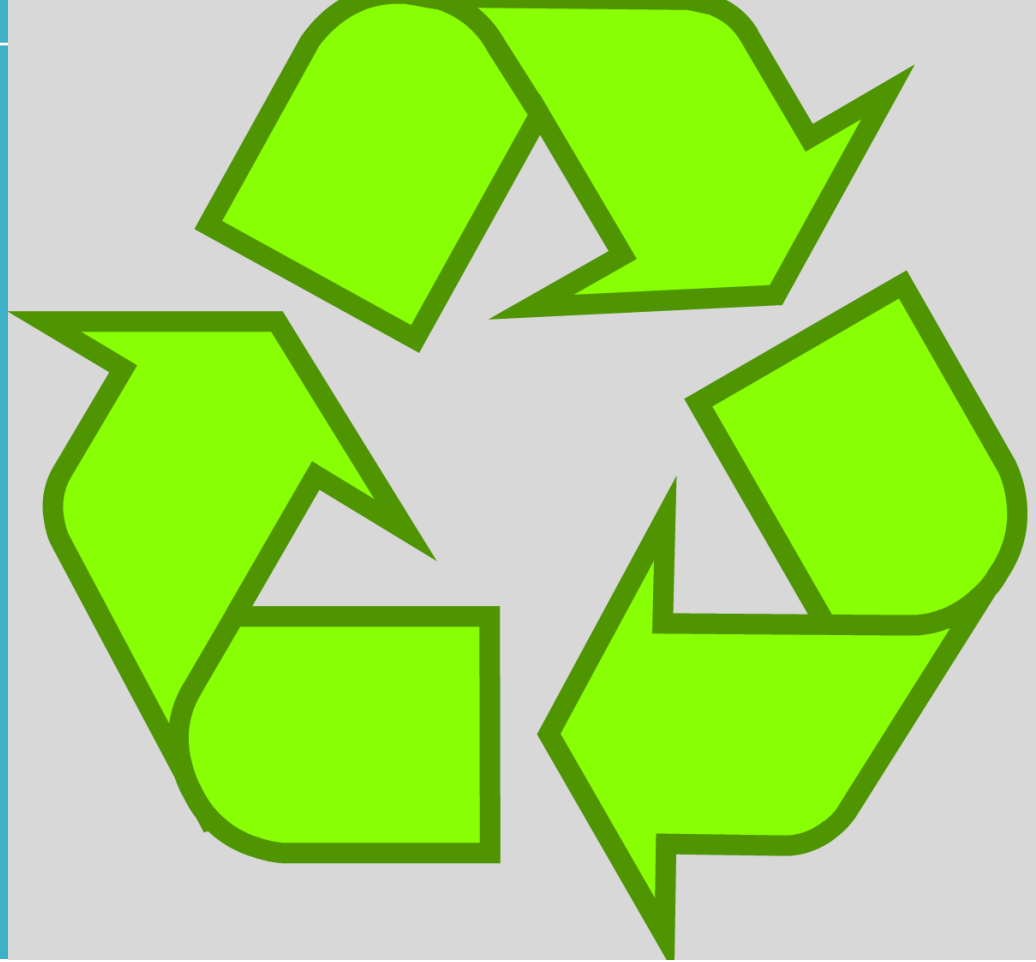
ECONOMIC POLICY DEVELOPMENT FRAMEWORK - RESOURCE RECOVERY & RECYCLING INFRASTRUCTURE ADVICE

FEBRUARY 2020

ECONOMIC POLICY DEVELOPMENT FRAMEWORK FOR IV'S RESOURCE RECOVERY AND RECYCLING FINAL ADVICE

1. Waste sector context and principles of economic policy development
2. Mapping of market failures to different stages of the waste lifecycle
3. Economic policy development framework in the context of market failures and complexities
4. Barriers to end market development for priority materials
5. Market development barriers that are common across materials

WASTE SECTOR CONTEXT AND PRINCIPLES OF ECONOMIC POLICY DEVELOPMENT



WASTE SECTOR CONTEXT AND PRINCIPLES OF ECONOMIC POLICY DEVELOPMENT (I)

1 The waste management economy is highly decentralised	The decisions that determine outcomes in the waste sector are made by multiple industry participants distributed across the waste lifecycle. In other words, the activities that determine the amount and type of waste produced, consumed, sorted, collected, recycled and disposed are performed by several individuals and organizations. These activities are largely delegated to the private sector because it has the skills, information and specialised capital needed to efficiently provide waste services at low cost.
2 Economic policy needs to be developed in the context of this decentralised market environment	From an economic policy perspective, when markets are decentralised, freely functioning markets generally provide the most efficient means of allocating goods and services between members of the community so as to maximise the well-being of the community. In addition, competitive markets encourage innovation and greater consumer choice, thereby maximising society's economic welfare.
3 When there is a 'market failure', free markets will not achieve the best outcomes for the community	When there is a 'market failure', free markets will not achieve the best outcomes for the community, because they fail to allocate resources efficiently. This is because the individual incentives for rational behaviour do not lead to rational outcomes for the group. Put another way, each individual makes the correct decision for him/herself, but those prove to be the wrong decisions for the group. In other words, a 'market failure' refers to a situation in which there is a gap between actual outcomes and socially optimum outcomes.

WASTE SECTOR CONTEXT AND PRINCIPLES OF ECONOMIC POLICY DEVELOPMENT (II)

4

The outcomes observed in the Victorian waste sector are misaligned with the Victorian Government's stated policy intentions.

In decentralised economic systems, such as the waste economy, alignment problems are common. These outcomes may not align with public policy objectives because the motivations of businesses and households do not necessarily align with those of government. Some observed and undesirable outcomes that do not align with public policy objectives are the following:

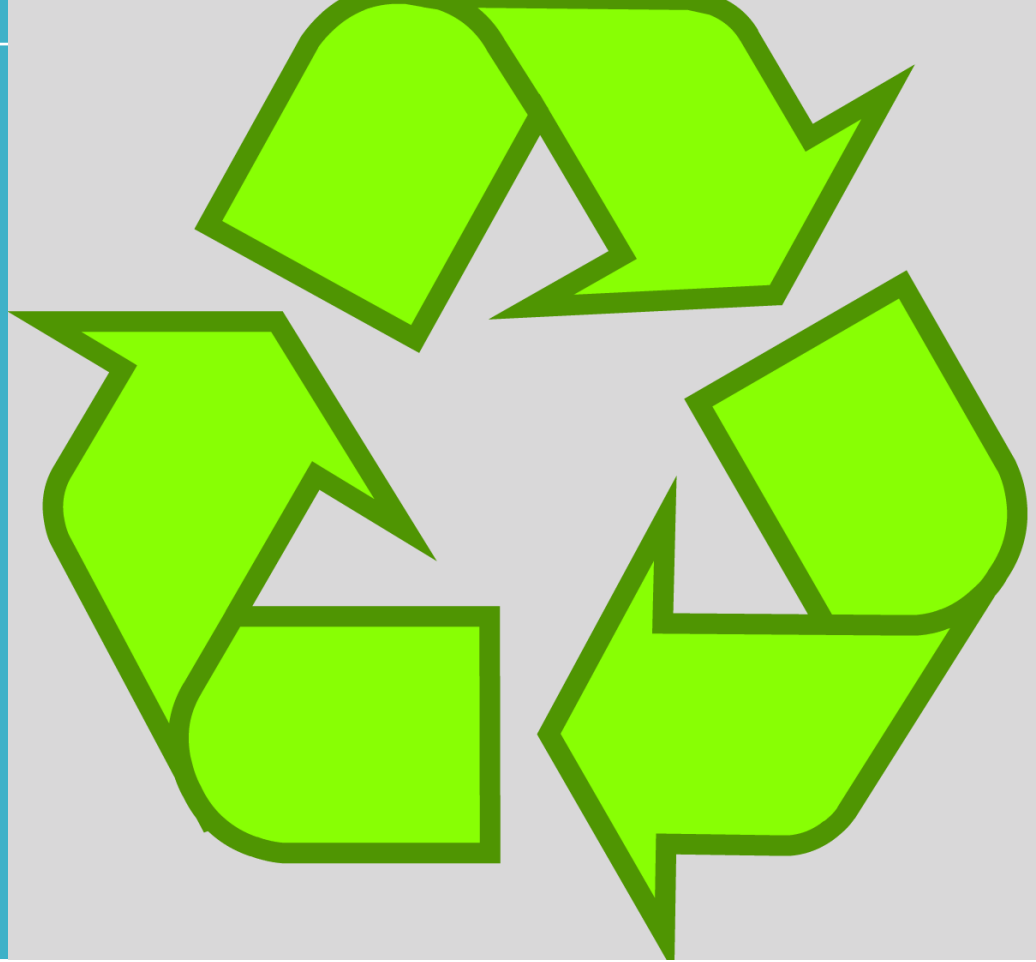
- Total waste generation has steadily increased over time.
- Waste per person has steadily increased over time, before declining in recent years;
- A third of total waste, and more than half of all household waste, is currently diverted to landfill.
- Some waste streams, such as paper and plastic, are heavily reliant on exports overseas.
- The current economic environment in the waste sector creates a range of opportunities for strategic behaviour that is either legal but unwanted or illegal.

5

There existence of market failures is evident from point 4 above

It is clear from the evidence above that there is a gap between actual outcomes and the Victorian government's intended outcomes. Ie., there are a number of market failures.

MARKET FAILURES AND COMPLEXITIES OBSERVED IN THE VICTORIAN WASTE MANAGEMENT MODEL



MARKET FAILURES AND COMPLEXITIES OBSERVED IN THE VICTORIAN WASTE MANAGEMENT MODEL (I)

There are a number of market failures and complexities in the sector that, at present, prevent markets from allocating resources efficiently. The most significant of these are summarised below.

1 Negative externalities	Negative externalities are the unintended costs of an activity that are experienced by people or organisations other than those directly involved in that activity. In the context of waste management, there are negative externalities are virtually all stages of the waste lifecycle. Below are examples of negative externalities associated with waste production, waste consumption and waste disposal.
a Negative externalities associated with waste production	Producers of goods and services do not currently face the cost of waste created by packaging and product redundancy strategies. By not taking these costs into consideration, producers may over-invest in packaging to attract buyers' attention, or increase residual product waste by manufacturing goods that cannot be easily repaired.

MARKET FAILURES AND COMPLEXITIES OBSERVED IN THE VICTORIAN WASTE MANAGEMENT MODEL (II)

b → Negative externalities associated with waste consumption	Consumers of goods and services do not face all the costs of their waste consumption, sorting and disposal strategies. For example, Victorian households face only weak incentives for waste avoidance and for investing effort to properly sort and dispose of waste at source, because they pay an annual fee for waste collection services, rather than a fee-for-service. Poor effort to sort waste at source leads to contamination, which lowers the market value of materials streams further down the waste lifecycle, deterring incentives to invest in re-processing and recycling infrastructure.
c → Negative externalities associated with waste disposal	There are also downstream negative externalities associated with waste disposal. For example, a landfill may leak, causing damage to a valued environment.

If these negative externalities are not addressed in some way, the parties directly concerned (producers, consumers and waste disposal sites, in the examples above) will have no incentive to curb their production, consumption and disposal decisions to take into account their impact on others. There is therefore a role for the Victorian Government in creating incentives to curb negative externalities.

MARKET FAILURES AND COMPLEXITIES OBSERVED IN THE VICTORIAN WASTE MANAGEMENT MODEL (III)

2 Positive externalities	Externalities can also be positive. A positive externality arises when one person's actions benefit another. For example, investment in education campaigns on how to recycle well and reduce contamination would create benefits for individuals and businesses across the waste lifecycle. Similarly, investment in research and development (R&D) on innovative uses of recyclables and end-market development would have wide ranging benefits for the Victorian community. Private investors may have limited incentives to invest in areas R&D and education campaigns, as wider members of the community may be able to benefit from these measures without paying for them. There is therefore a role for the Victorian Government in investing in services that have positive externalities for the wider Victorian Community.
3 Information asymmetries	Information asymmetries arise when markets may not provide enough information during a market transaction because it may not be in the interests of one party to provide full information to the other party. There are also information asymmetries at virtually all stages of the waste lifecycle that impede the efficient functioning of the waste management market in Victoria. Two examples are provided below.

MARKET FAILURES AND COMPLEXITIES OBSERVED IN THE VICTORIAN WASTE MANAGEMENT MODEL (IV)

a	Information asymmetries between buyers and sellers	There are significant information asymmetries between buyers and sellers about the environmental characteristics and recyclability of a product. Sellers of products have a strong incentive to exploit this information advantage if it increases the likelihood of their product being purchased. This results in recyclables being under-produced and under-consumed while non-recyclables are over-produced or over-consumed.
b	Asymmetries between waste generators and landfill operators	There are also information asymmetries between waste generators and landfill operators. For example, variable landfill charging on the basis of waste type gives waste generators an incentive to misrepresent the nature of their waste to achieve the lowest cost disposal option.

Such information asymmetries, if left unattended, will impede the efficient functioning of the market. There may be a role for the Victorian government in addressing information asymmetries by creating the need for greater transparency at each transaction point. For example, information asymmetries between buyers and sellers can be reduced by enforcing greater and more transparent product labelling standards.

MARKET FAILURES AND COMPLEXITIES OBSERVED IN THE VICTORIAN WASTE MANAGEMENT MODEL (V)

4

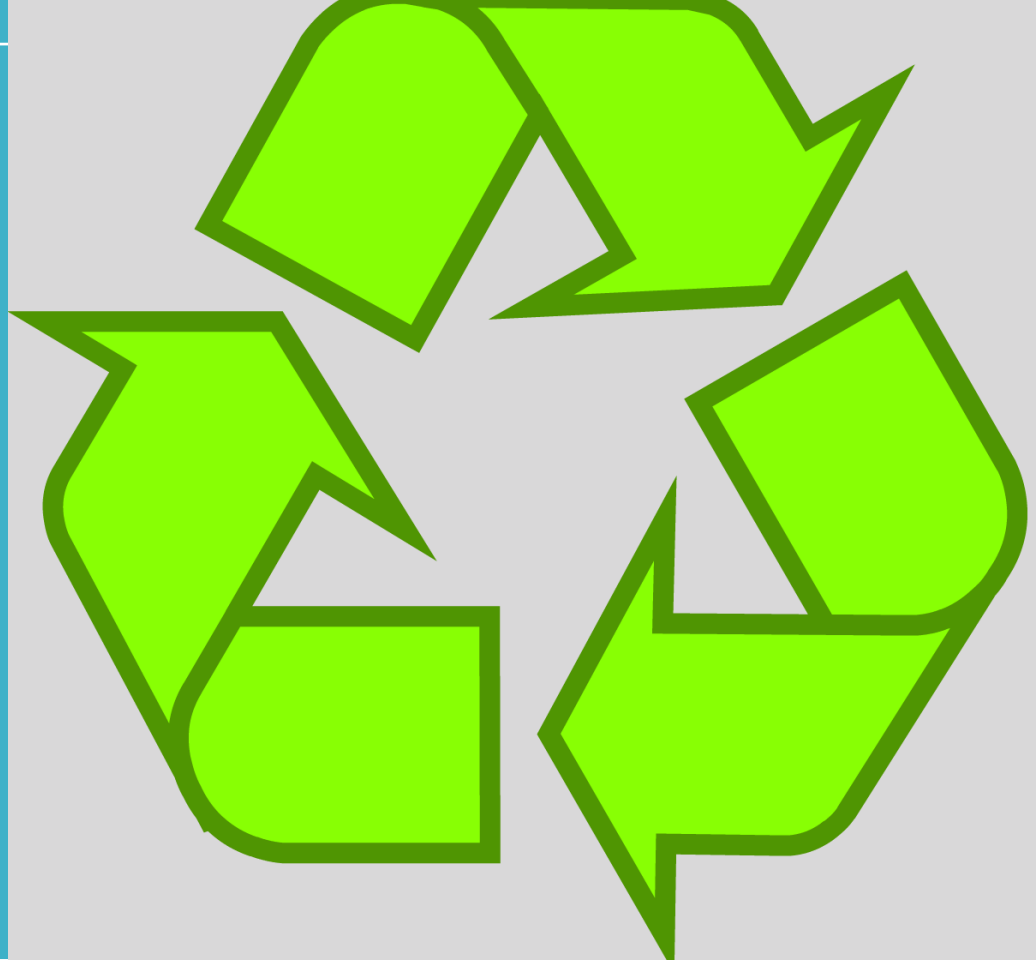
Other market failures and complexities

There are also a range of other complexities that also cause markets (transactions) to allocate resources inefficiency including the following:

- synergies (some goods and services have higher values if they are combined with others);
- timing complexities (goods or services may not be available at right time);
- strategic complexities (individuals employ strategies that are not immediately obvious);
- policy complexities (where the rules and regulatory processes established by government are so complex that their intent is not fully implemented in transactions);
- thin markets (few participants diminish competition); and
- coordination complexities (additional value can be created where individuals are able to coordinate activities).

A full discussion a market failures and complexities is available in the Centre for Market Design (CMD)'s Phase 1 report. To facilitate the development of economic policy levers, IV has conducted an internal mapping of market failures to different stages of the waste lifecycle. This is provided in the following section.

MAPPING OF MARKET FAILURES TO DIFFERENT STAGES OF THE WASTE LIFECYCLE



The market failures and complexities observed from the production to the reprocessing stage of the waste lifecycle and summarised below.

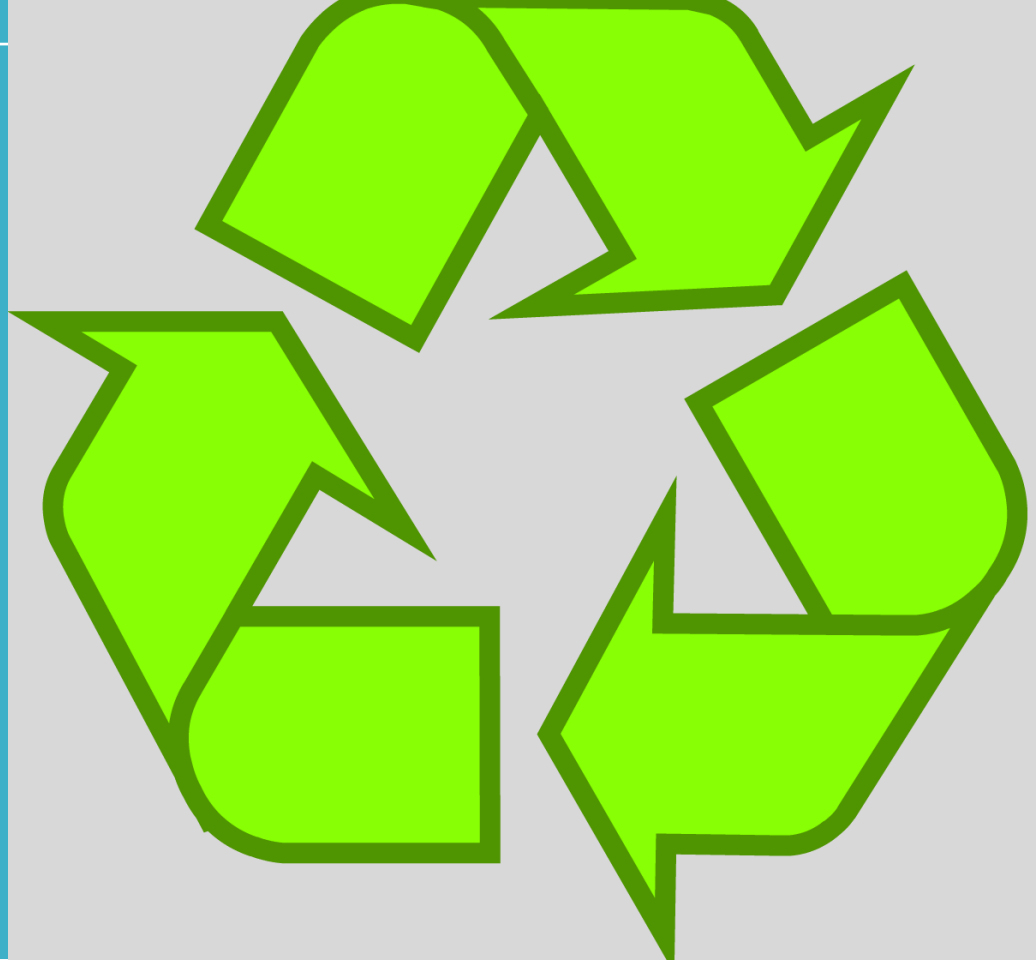
Market failures and complexities mapping – Table 1 of 2

	Negative externalities	Positive externalities	Hidden information	Gaming complexities	Site synergies	Co-ordination complexities	Optimisation complexity	Thin markets
Production of waste	Production externalities: Producers of goods and services do not currently face the cost of waste created by packaging and product redundancy strategies. They are not held accountable for the environmental impacts of their products disposed to landfill.							
Consumption	Consumption externalities: Consumers of goods and services do not face all the costs of their consumption choices		It is not always clear whether materials for purchase are recyclable or not					
Waste services								
Sorting	Contamination externalities: Victorian households face only weak incentives for waste avoidance and for investing effort to properly sort and dispose of waste at source	Investment in education campaigns on how to recycle well and reduce contamination would create benefits for individuals and businesses across the waste lifecycle. This is a positive externality as discussed in the previous section.	It is not always clear which bin to use (eg., in the case of composite products			costs of supplying a service can be reduced if the service is supplied to adjacent sites as a package.	As the number of possible transaction opportunities increase (eg., number of housholds, number of bins, frequency of collections), the computation of how to optimise the value created from these transactions becomes incresingly complex.	Small number of materials recovery facilities (MRFs) in Victoria
collection	Trasportation cost externalities: More bins may mean higher collection and transporation costs (which may be offset by the benefits of lower contamination)	The cost of providing the service reduces as the number of users increases (a positive network externality).	Hidden information about when bins are full		costs may be reduced if site synergies are permitted to influence the routes won in a competitive allocation process.	Participation in waste collection networks also requires coordination between households/business units.		
Re-processing			Need better to metrics to define the quantity and quality attributes that determine value					Small number of large reprocessing plants for some materials

Market failures and complexities mapping – Table 2 of 2

	Negative externalities	Positive externalities	Hidden information	Gaming complexities	Site synergies	Co-ordination complexities	Optimisation complexity	Thin markets
Recycling and other end-of fate		Investment in research and development (R&D) on innovative uses of recyclables and end-market development would have wide ranging benefits for the Victorian community.						
Recycling								
Recovery of energy								
Exports				Where institutions are not well-designed, they are susceptible to strategic behaviour that leads to unwanted outcomes.				
Landfill	Environmental externalities: Disposal of waste to landfill can result in externalities including the impact of releasing methane and greenhouse gases from the decomposition of organic wastes.		Information about the type of waste, volume, level of hazard etc. will need to be truthfully revealed before wastes can disposed of efficiently and effectively. This information is hidden from the regulator of the waste system and there are financial incentives to misrepresent this information.					
Litter			Hidden action problems arise when the attributes of waste are mis-represented and/or when wastes are disposed of illegally.					
Dumping								
Stockpiling	Risk externalities: The stockpiling of waste can result in externalities such a fire risks with have significant adverse environmental and human helath impacts.		Illegal activities cannot be readily observed, and this allows individuals and firms to avoid costs associated with legal waste management pathways.					

ECONOMIC POLICY DEVELOPMENT FRAMEWORK IN THE CONTEXT OF OBSERVED MARKET FAILURES AND COMPLEXITIES

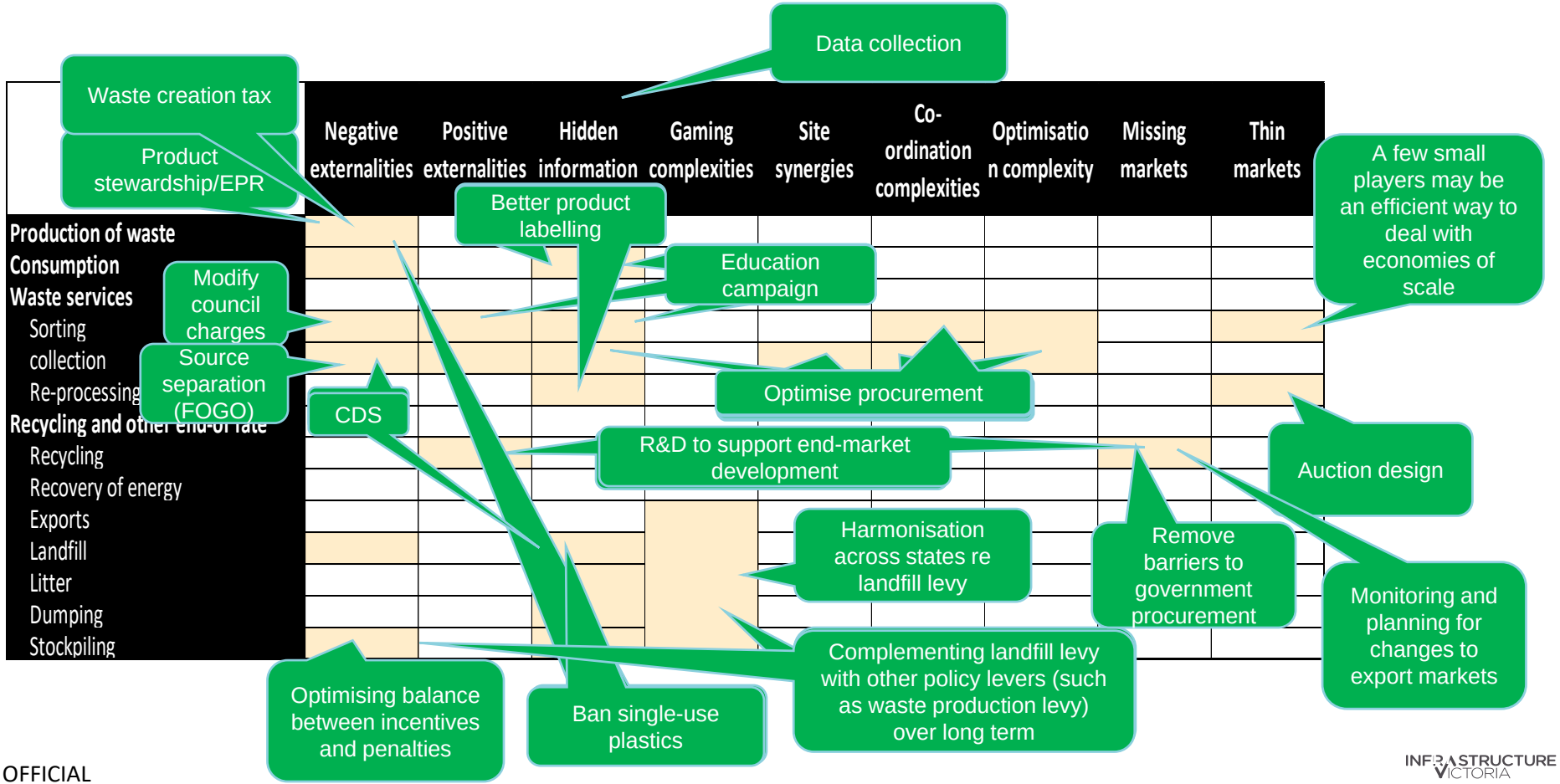


ECONOMIC POLICY DEVELOPMENT FRAMEWORK IN THE CONTEXT OF MARKET FAILURES AND COMPLEXITIES (I)

1 The presence of market failures may justify government intervention	The presence of market failures (such as negative externalities, information asymmetries and other complexities described in the section above) may justify government intervention. The market failures discussed in the section above may be addressed by range of policy levers that are available to the Victorian Government, such as pricing mechanisms, legislation, data collection, and direct investment in the provision of services.
2 In the majority of cases of market failure, a combination of policy levers and remedies is most likely to succeed.	In the context of the decentralised waste management model in Victoria, where market failures are observed across the different staged of the waste lifecycle, single and centralised solutions are unlikely to be effective. In particular, the landfill levy alone cannot achieve the objectives set by Government. The Government needs to consider a range of other policy levers, which need to be spread across waste lifecycle to create incentives at all stages of the value chain. Examples of policy levers that might address the market failures observed in the Victorian waste lifecycle and provided in the figure below.

Note that these are examples of possible policy levers, rather than recommendations. IV's final recommendations are set out in the final advice report.

Examples of policy levers that directly address market failures and complexities identified in section above



ECONOMIC POLICY DEVELOPMENT FRAMEWORK IN THE CONTEXT OF MARKET FAILURES AND COMPLEXITIES (II)

3

Market failures are most efficiently addressed at the point at which they are observed.

A combination of policy levers, such as those described above, could efficiently address market failures are the point at which they are observed. This is not achieved by the Victorian government's current policy framework, in which the landfill levy is the primary pricing lever. The landfill levy has its benefits, as it creates strong incentives to reduce disposal of waste to landfills. However, the landfill levy also has two important limitations, which need to be addressed.

- First, it does not create the incentives that would be necessary to meet a number of the Victorian Government's stated policy objectives (for example, it does not create incentives for manufacturers to optimise the level and type of packaging).
- Second, the landfill levy has some unintended consequences, as it creates incentives for strategic behaviour that is either legal but unwanted (such as stockpiling) or illegal (such as the disposal of waste to non-approved sites).

There is a need to consider new policy levers that create incentives to minimise waste (which is one of the key stated objectives of the landfill levy), and mitigate strategic behaviours that aim to avoid the landfill levy.

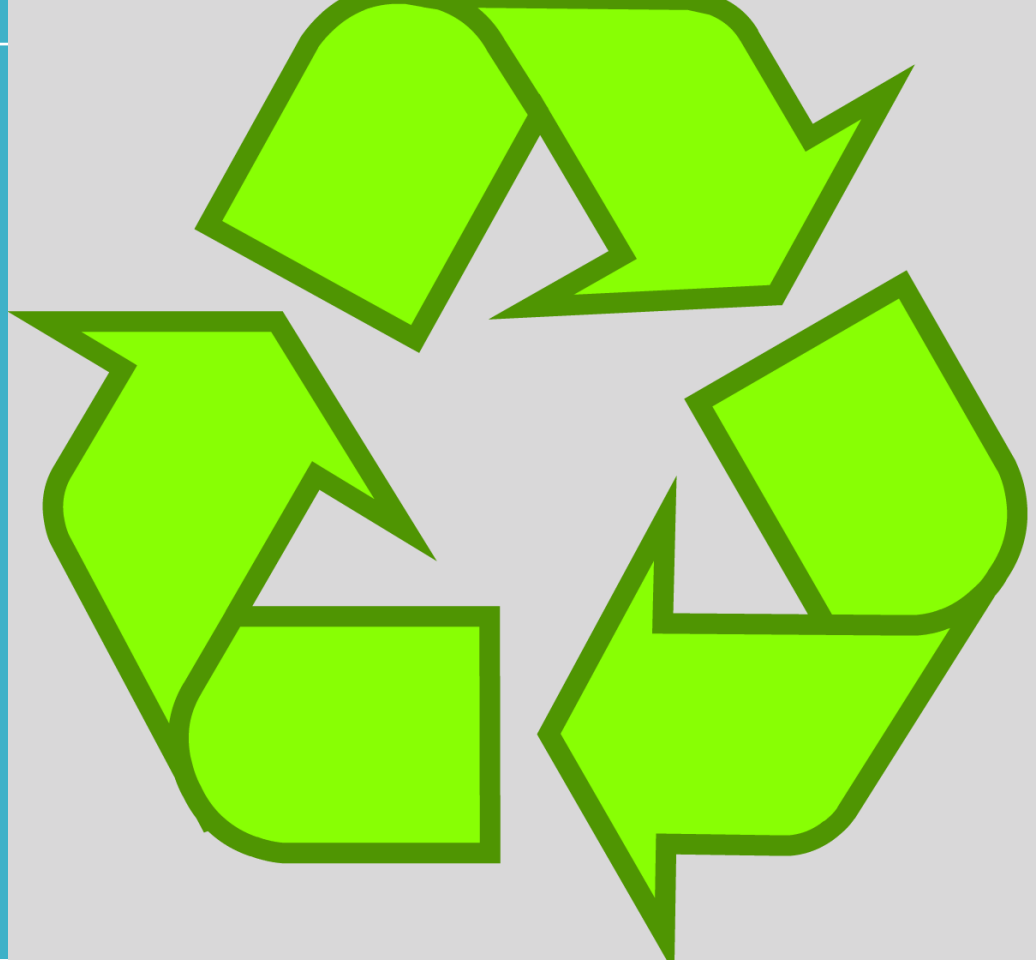
ECONOMIC POLICY DEVELOPMENT FRAMEWORK IN THE CONTEXT OF MARKET FAILURES AND COMPLEXITIES (III)

4 Private investment is likely to be unlocked if market failures are efficiently addressed at the point at which they are observed.	A combination of policy levers, such as those described in the figure above, is likely to incentivise private investment in Victoria's reprocessing sector and in end-markets. In particular, addressing market failures towards the top of the waste lifecycle (in relation to waste production, waste consumption and waste sorting), is likely to result in higher commodity values for materials, which is likely to create incentives for private investors to enter the reprocessing and recycling sector (avoiding the need for the government to make these large investments directly).
5 The successful implementation of the policy levers described above would require support from different levels of government.	The successful implementation of the policy levers described above would require support from the Commonwealth government, and co-ordination with Local Governments and other State Governments. For example, certain policy levers such as taxes and levies may be more efficiently introduced by the Federal government, to ensure consistency across States. Other levers such as education campaigns would require careful co-ordination with Local governments to be properly tailored to account for potential regional differences in awareness about and attitudes to recycling.

ECONOMIC POLICY DEVELOPMENT FRAMEWORK IN THE CONTEXT OF MARKET FAILURES AND COMPLEXITIES (IV)

5	Government intervention is only warranted when the benefits are likely to be greater than the costs involved.	While the presence of market failures may justify intervention from the Victorian Government, it is important to note that government interference can be costly and can introduce its own distortions, and is only warranted when the benefits are likely to be greater than the costs involved. The Victorian Government's waste management policy should focus on net benefits to the community, including all financial and non-financial costs and benefits (economic, social and environmental). In focusing on net benefits to the community, the Government will need to account for trade-offs and competing demands for the community's resources.
6	Intended outcomes cannot be achieved without long-term commitment and policy certainty	This will incentivise private investors to make the large-scale investments that the Victorian waste management sector needs across all stages of the waste lifecycle. For this to successfully happen, investors must have the confidence to invest through stable, predictable and transparent waste policy and regulatory settings.

BARRIERS TO MARKET DEVELOPMENT FOR PRIORITY MATERIALS



FOCUS ON PRIORITY MATERIALS

For the purposes of our advice, we have identified the barriers to market development for the following priority materials

a. Plastic
b. Glass
c. Organics
d. Paper and cardboard
e. Tyres
f. E-waste

Our rationale for focusing on the materials listed above is discussed in IV's Advice.

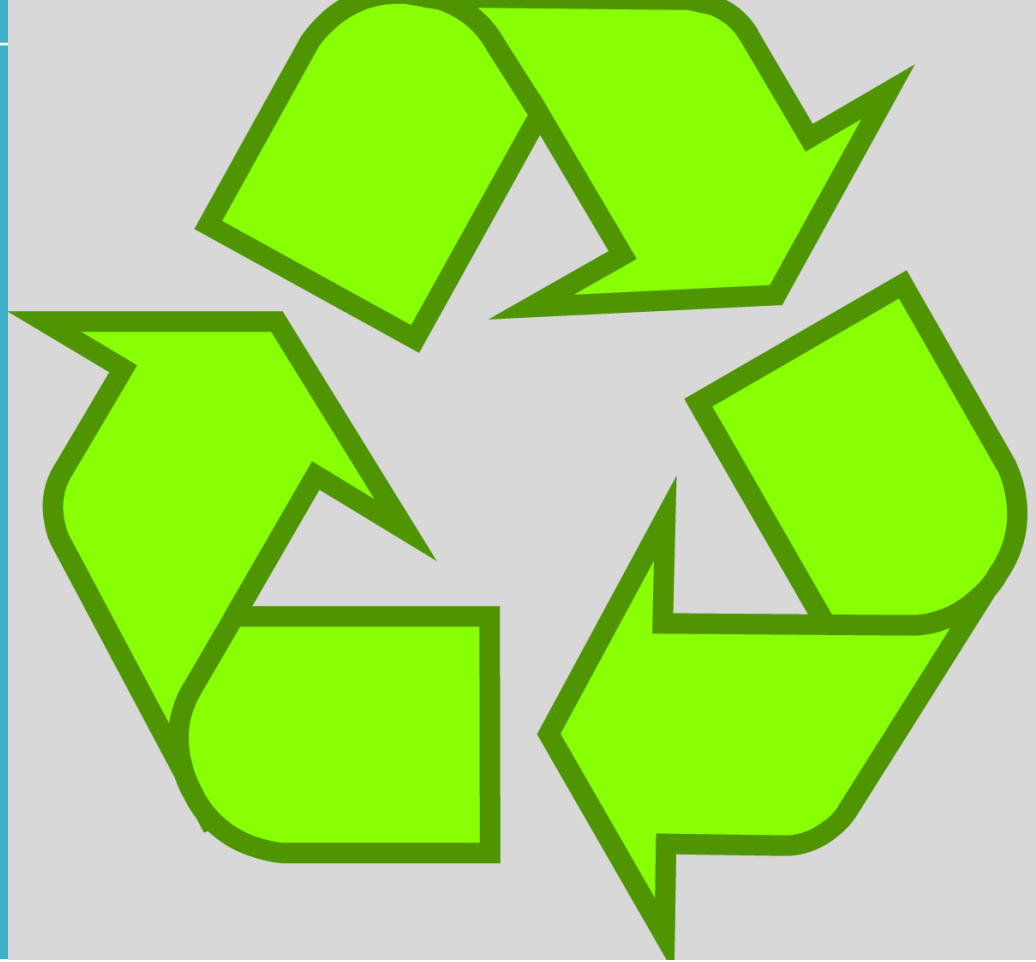
NOTE ON FOLLOWING SECTION ON PRIORITY MATERIALS

1. A number of the market failures are complexities identified in the section above can be observed across the priority material streams
2. The sections below on each priority material stream focus on:
   - a. What are the end-markets for each priority materials?
   - b. What are the material-specific challenges to market development?
   - c. Which policy levers can be used to address each material-specific challenge?
3. Market-development barriers that are common across materials, and policy levers that can be used to address these, are outlined in the final section

These are set out in red boxes

Note that these are examples of possible policy levers, rather than recommendations. IV's final recommendations are set out in the final advice report.

PLASTIC



PLASTICS: HEADLINE

Plastics comprise 4% of total waste generated

	Organics	Plastics	Packaging gl…	…and cardboard	E-Waste	Tyres	Textiles
Tonnes of material generated	2,489,166	586,282	3…53	1,997,800	83,445	69,537	190,411
Tonnes of materials recovered	1,081,845	137,167	263,686	1,481,017	66,162	57,200	165
Proportion of total waste generated	19%	4%	3%	15%	1%	1%	1%
Recovery rate	43%	23%	77%	74%	79%	82%	0.09%
Proportion available in garbage bin	35%		10.80%		1%	0%	0%
Proportion of waste generated that is exported	1.5%	14.8%	…%	31.6%	1.0%	43.2%	14.6%
Proportion of waste recovered that is exported	3.5%	63.3%		42.7%	1.2%	52.5%	#N/A

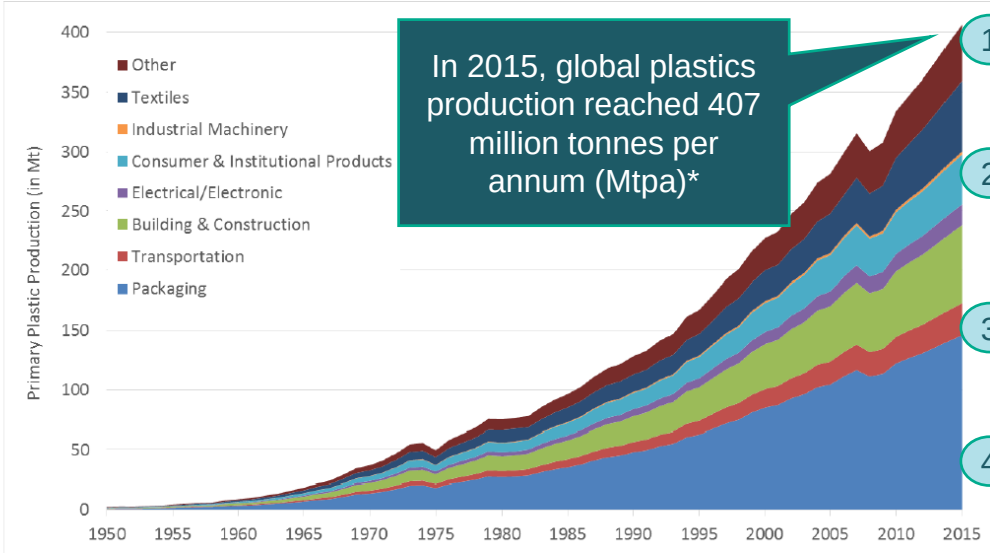
The recovery rate for plastics is low, at 23%

Plastics are highly reliant on exports, with 63.3% of recovered plastics being exported

*Source: IV modelling of Blue Environment data

GLOBAL PLASTICS PRODUCTION HAS RAPIDLY GROWN SINCE 1950

Figure 1. Global plastics production: 1950 to 2015



In 2015, global plastics production reached 407 million tonnes per annum (Mtpa)*

Accelerating consumer plastic consumption over the last 50 years has seen the Global Plastic Product and Packaging Manufacturing industry grow to an estimated worth of $514b in 2018.**

The rapid growth of plastics production and use is largely due to the unique properties of the material.*

1. Plastics are inexpensive, lightweight and durable materials, which can readily be moulded into a variety of products that find use in a wide range of applications.
2. Plastics have a high strength-to-weight ratio, can be easily shaped into a wide variety of forms, are impermeable to liquids, and are highly resistant to physical and chemical degradation.
3. Plastic prolongs the life of produce. It provides a barrier to bacteria, a film to lock in protective gas and a convenient waterproof layer.
4. Plastics can also be produced at relatively low cost. It is these properties that have led to the substitution of traditional materials (e.g. concrete, glass, metals, wood, natural fibres, and paper) by plastics in many applications.

*Source: OECD (2018): Improving plastics management; Page 4

**Source: CSIRO (2017): The recycled plastics market: Global analysis and trends; Page 4-5

GLOBAL END-USES OF RECYCLED PLASTIC

The remaining market segments include construction (14.5%), automotive (8.45%) and other markets (8.15%)

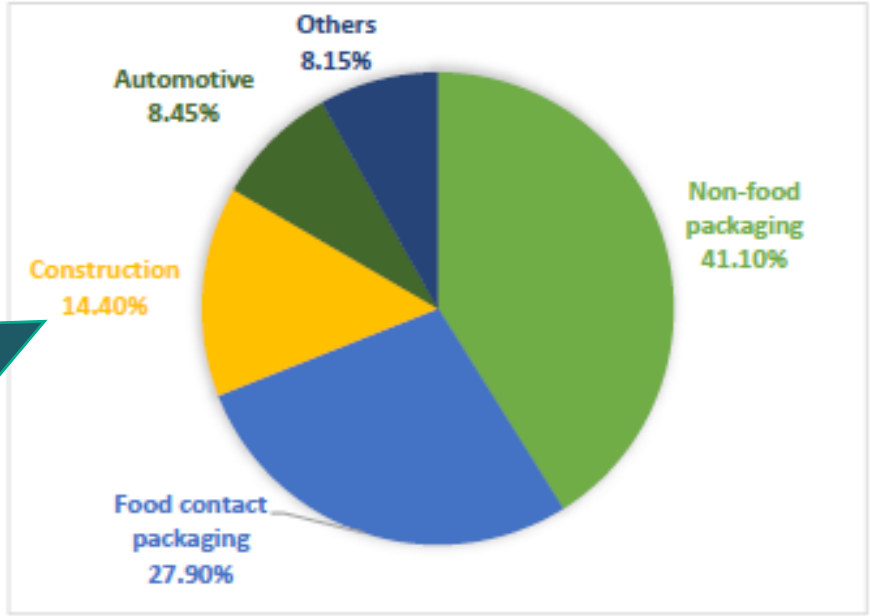


Figure 4. Global end user in 2017 [2]

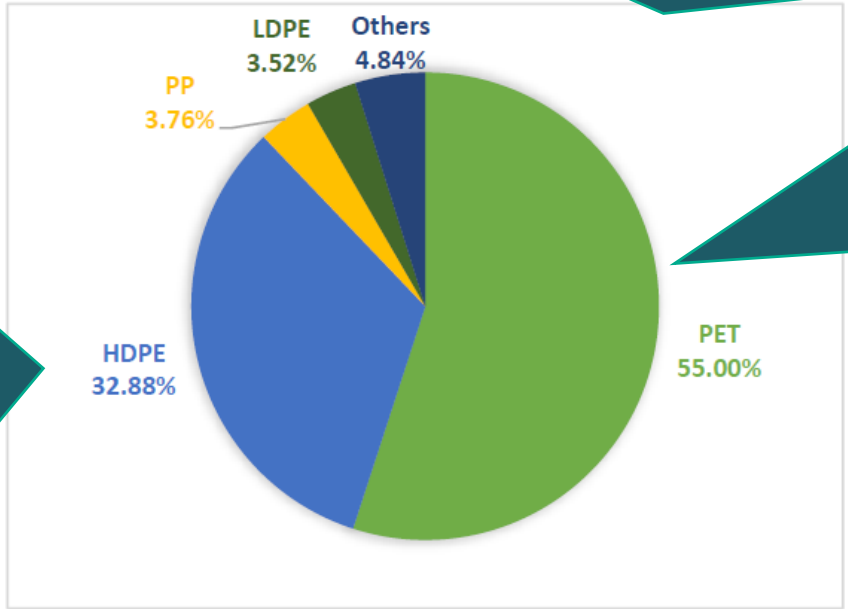
The largest market segments for recycled plastic is packaging (69%). Non-food contact packaging (41%), food contact packaging (28%) dominate the market.

*Source: CSIRO (2017): The recycled plastics market: Global analysis and trends; Page 19

GLOBAL RECYCLED PLASTICS BY TYPE

The global recycled plastics market is dominated by four major plastic resin types, namely PET, HDPE, PP and LDPE**.

The second-largest of these segments is HDPE, with a 2017 market share of 32.88%.



The largest of these segments is PET, with a 2017 market share of 55%.

**HDPE stands for High-density polyethylene; PET stands for Polyethylene terephthalate; PP stands for Polypropylene; LDPE stands for Low-density polyethylene

Figure 5. Global market by type in 2017 [2]

*Source: CSIRO (2017): The recycled plastics market: Global analysis and trends; Page 19

GLOBAL END-USES OF DIFFERENT RESIN TYPES (I)

PET and HDPE constitute 88% of recycled plastics globally

Packaging (food and non-food) constitutes 69% of recycled end-user markets globally

Table 2. Major plastic resins [18]

RESIN CODE	NAME AND STRUCTURE	PROPERTIES	PRODUCT APPLICATIONS	PRODUCTS MADE WITH RECYCLED CONTENT
 PET	Polyethylene terephthalate (PET or PETE)	• Clear and optically smooth surfaces for oriented films • Excellent barrier for O_2, H_2O and CO_2 • High impact capability and shatter resistance • Excellent resistance to most solvents • Hot-filling capability	**Packaging** • Plastic soft drink bottles • Food jars • Ovenable film and microwave trays **Others** • Textiles, carpet, films, engineering mouldings	• Fibre for carpet, fleece jackets, comforter fill and tote bags • Containers for food, beverages (bottles) and non-food items • Films and sheets • Strapping
 HDPE	High density polyethylene (HDPE)	• Excellent resistance to most solvents • Higher tensile strength compared to other PE forms • Relatively stiff material with useful temperature capabilities	**Packaging** • Plastic bottles for milk, juice, water and household cleaners • Retail and grocery bags • Cereal box liners **Others** • Injection moulding, extruded pipes, plastic wood composites, wire and cable covering	• Bottles for non-food items such as personal care and household cleaners • Plastic lumber for outdoor decking, fencing and picnic tables • Pipe, floor tiles, buckets, crates, flow pots, garden edging, film and sheet, and recycling bins
 PVC	Polyvinyl chloride (PVC or vinyl)	• High impact strength, clarity and processing performance • Resistant to grease, oil and chemicals	**Packaging** • Rigid: bottles, blister packs and clamshells • Flexible: medical and bedding bags, shrink wrap, deli wrap **Others** • Rigid: permanent framework, pipe, window frames, fencing, siding, railing • Flexible: medical products (blood bags, tubing), wire/cable insulation, carpet backing, coated fabrics and flooring	• Windows, pipes, decking, fencing, panelling, gutters, carpet backing, floor tiles and mats, resilient flooring , mud flaps, cassette trays, electrical boxes, cables, traffic cones, garden hose and mobile home skirting • Packing, film and sheet and loose-leaf binders

*Source: CSIRO (2017): The recycled plastics market: Global analysis and trends; Page 4-5

END-USES OF DIFFERENT RESIN TYPES (II)

RESIN CODE	NAME AND STRUCTURE	PROPERTIES	PRODUCT APPLICATIONS	PRODUCTS MADE WITH RECYCLED CONTENT
 LDPE	Low density polyethylene (LDPE)	• Excellent resistance to acids, bases and vegetable oils • Toughness, flexibility and relative transparency • Good for packaging that requires heat sealing	**Packaging** • Bags for bread, dry cleaning, newspapers, frozen foods, fresh produce and household garbage • Shrink wrap and stretch film • Coatings for paper milk cartons and hot/cold beverage cups • Container lids • Squeezable bottles **Others** • Toys • Injection moulding, adhesives, sealants, wire/cable coverings	• Shipping envelopes, garbage bin liners, floor tile, panelling, furniture, film and sheet, compost bins, garbage bins, landscape timber and outdoor lumber
 PP	Polypropylene (PP)	• Excellent optical clarity in biaxially oriented films and stretch blow moulded containers • Low moisture vapour transmission • Inertness towards acids, alkalis and most solvents	**Packaging** • Containers for yoghurts, margarine, takeout meals • Medicine bottles • Bottle caps and closures **Others** • Fibres, appliances and consumer products • Durable applications such as automotive and carpeting	• Automobile applications such as battery cases, signal lights, battery cables, brooms and brushes, ice scrapers, oil funnels, and bicycle racks • Garden rakes, storage bins, shipping pallets, sheeting, trays

*Source: CSIRO (2017): The recycled plastics market: Global analysis and trends; Page 4-5

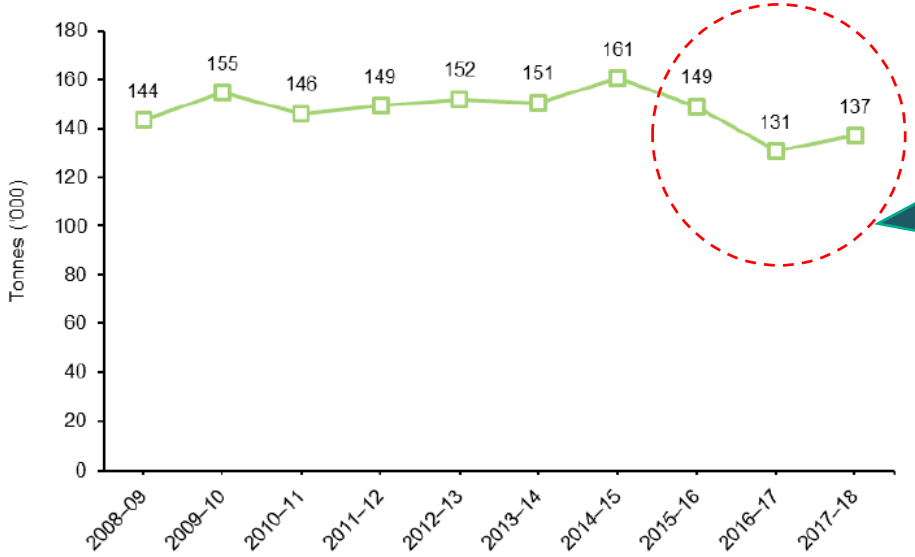
END-USES OF DIFFERENT RESIN TYPES (III)

	Polystyrene (PS)	• Excellent moisture barrier for short shelf life products • Excellent optical clarity in general purpose form • Significant stiffness in both foamed and rigid forms • Low density and high stiffness in foamed applications • Low thermal conductivity and excellent insulation properties in foamed form	**Packaging** • Food service items such as cups, plates, bowls, cutlery, hinged takeaway containers (clamshells), meat and poultry trays and rigid food containers (with foamed or non-foamed PS) • Protective foam for packaging delicate items • Packing peanuts (loose fill) • Compact disc cases **Others** • Agricultural trays, electronic housing, cable spools, building insulation, video cassette cartridges, coat hangers, medical products and toys	• Thermal insulation, thermometers, light switch panes, vents, desk trays, rulers and license plate frames • Cameras or video cassette casings • Foamed foodservice applications such as egg shell cartons • Plastic moulding (i.e. wood replacement products • Expandable polystyrene (EPS) foam protective packaging
	Other Use of code indicates use of resin other than those listed above or is made of a mixture of resins	• Dependent on resin combination used	• Large reusable water bottles, some citrus bottles • Oven-baking bags, barrier layers and custom packaging	• Bottles and plastic lumber applications

*Source: CSIRO (2017): The recycled plastics market: Global analysis and trends; Page 4-5

PLASTIC RECOVERY OVER TIME: VICTORIA

Figure 21: Plastic waste recovered for reprocessing in Victoria, 2008–09 to 2017–18

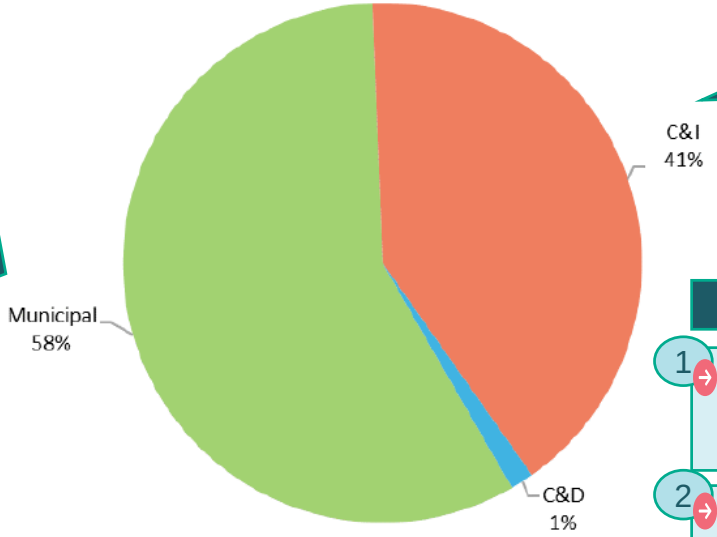


The recovery of plastics declined in 2015-17 and 2016-17, followed by a slight increase in 2017-18.

*Source: SV Victorian recycling industry annual report 2017-18; Page 26

PLASTICS BY SOURCE SECTOR

Figure 19: Source sectors of plastics received for reprocessing (by weight) in Victoria, 2017–18



In 2017–18, most recovered plastics were sourced from the municipal sector (58 per cent) (for example, food and domestic packaging collected by Victoria's councils).

Most of the remaining plastic comes from the C&I sector (41 per cent)

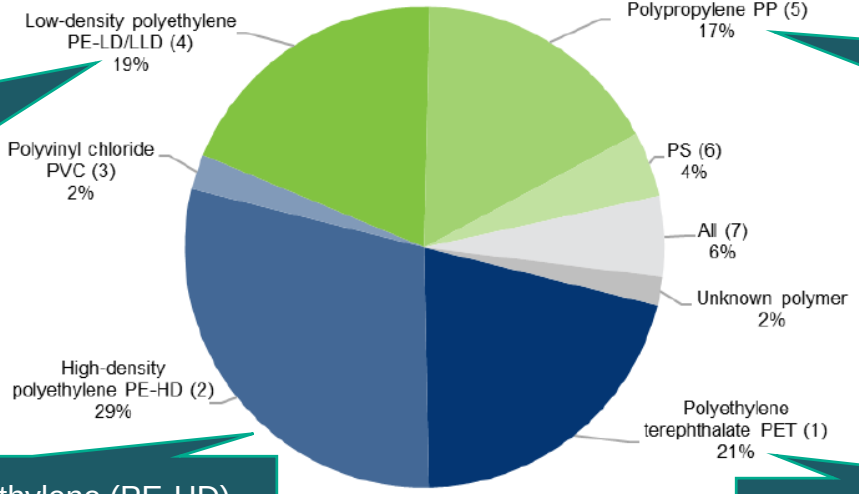
In 2017–18, of the total plastics recovered:

1. Non-packaging material (e.g. pipes, cable casing) accounted for 27 per cent of the total plastics recovered with 37,000 tonnes
2. Domestic and industrial packaging material (used to contain, protect, market and/or handle a product) accounted for 73 per cent with 100,000 tonnes.

*Source: SV Victorian recycling industry annual report 2017-18; Page 25

PLASTICS BY POLYMER

Figure 20: Composition of plastics recovered for reprocessing by polymer type (by weight) in Victoria, 2017–18



Low/linear low density polyethylene (PE-LD/LLD) accounted for 19 per sent.

Polypropylene (PP), commonly used in crates, boxes and plant pots, accounted for 17 per cent.

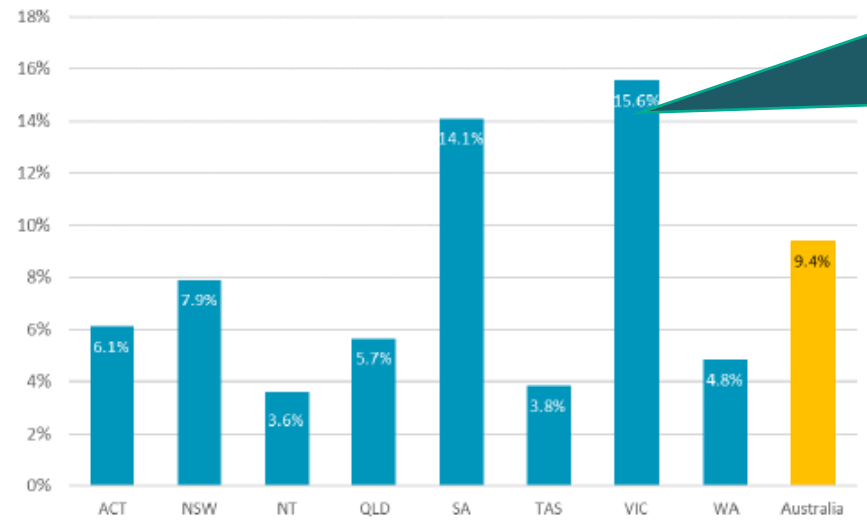
High-density polyethylene (PE-HD) used in pipes, film and blow moulded containers accounted for 29 per cent of all plastics recovered in 2017–18.

Polyethylene terephthalate (PET) accounted for 21 per cent.

*Source: SV Victorian recycling industry annual report 2017-18; Page 25-26.

RECYCLING RATE BY JURISDICTION

Figure 14 – Recycling rates by source jurisdiction in 2017–18 (tonnes)



Victoria has the highest recycling rate at 15.6%, followed by SA on 14.1%.

The Victorian rate is contributed to by the relatively large amounts of manufacturing scrap generated in and recovered from Victoria.

*Source: 2017-18 Australian plastics recycling survey; Pages 40- 42

RECYCLING RATE BY JURISDICTION AND POLYMER TYPE

Recycling rates are highest for certain polymer types

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

Polymer type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
PET (1)	22.0%	20.6%	27.0%	10.5%	30.6%	6.9%	31.1%	13.8%	**21.1%**
PE-HD (2)	6.5%	11.6%	0.4%	10.4%	27.7%	7.2%	23.6%	8.1%	**15.0%**
PVC (3)	0.2%	1.5%	0.0%	0.3%	0.8%	0.6%	3.1%	0.3%	**1.4%**
PE-LD/LLD (4)	12.3%	11.4%	0.0%	6.0%	35.4%	4.0%	25.3%	1.2%	**14.3%**
PP (5)	1.9%	4.9%	0.0%	4.0%	3.2%	1.3%	19.1%	4.1%	**8.0%**
PS (6)	5.9%	11.2%	2.7%	6.4%	5.8%	4.6%	20.4%	7.2%	**11.5%**
PS-E (6)	1.8%	5.5%	0.0%	4.7%	20.9%	3.1%	11.7%	3.1%	**7.6%**
ABS/SAN/ASA (7)	8.2%	8.9%	8.2%	8.1%	0.1%	8.2%	11.1%	9.5%	**8.7%**
PU (7)	0.0%	8.7%	0.0%	9.2%	2.1%	7.0%	8.0%	5.7%	**7.6%**
Nylon (7)	5.9%	6.0%	5.9%	7.3%	0.0%	5.9%	7.2%	5.9%	**6.1%**
Bioplastic (7)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
Other (7)	0.4%	0.8%	0.0%	0.2%	2.8%	0.1%	2.4%	0.6%	**1.2%**
Unknown polymer	2.2%	2.2%	2.2%	2.5%	0.0%	2.2%	2.2%	2.2%	**2.1%**
Recycling rate	**6.1%**	**7.9%**	**3.6%**	**5.7%**	**14.1%**	**3.8%**	**15.6%**	**4.8%**	**9.4%**

*Source: 2017-18 Australian plastics recycling survey; Page 41

LOCATION OF REPROCESSES BY STATE AND POLYMER TYPE

Data is provided for 58 reprocessing facilities nationally, out of 66 reprocessors known to be operating during 2017–18.

Table 20 – Reprocessor counts by facility location and polymer types reprocessed in 2017–18

	ACT	NSW	NT	QLD	SA[1]	TAS	VIC	WA	Total
Number of reprocessors	0	14	0	9	6	2	25	2	58
Polymer reprocessed	**Number of reprocessors in the jurisdiction reprocessing the polymer type**								
PET (1)	0	3	0	1	N/A	0	6	1	11
PE-HD (2)	0	7	0	5	N/A	2	13	2	29
PVC (3)	0	3	0	1	N/A	1	5	0	10
PE-LD/LLD (4)	0	4	0	3	N/A	0	11	2	20
PP (5)	0	3	0	4	N/A	1	10	2	20
PS (6)	0	2	0	1	N/A	0	8	0	11
PS-E (6)	0	3	0	3	N/A	1	4	1	12
ABS/SAN/ASA (7)	0	2	0	1	N/A	0	6	1	10
PU (7)	0	1	0	0	N/A	0	1	0	2
Nylon (7)	0	1	0	0	N/A	0	3	0	4
Bioplastic (7)	0	0	0	0	N/A	0	0	0	0
Other (7)	0	1	0	0	N/A	0	2	2	5
Unknown polymer	0	0	0	0	N/A	0	0	0	0
Total count	0	30	0	19	N/A	5	69	11	134

1. SA data on the number of reprocessors handling each polymer type not available to be reported.

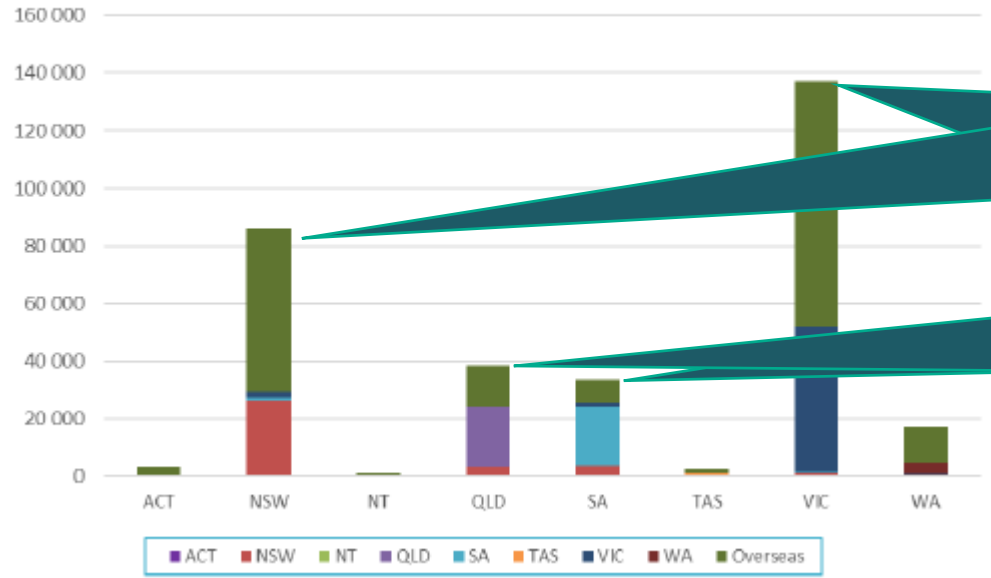
Caution when interpreting this table

1. Number of reprocessors is not meaningful without an understanding of the capacity and capability of each reprocessor
2. A small number of large reprocesses may due to economies of scale
3. Many reprocessors handle more than one polymer type, resulting in improved depth to the reprocessing market. For example, in NSW there are 14 reprocessing facilities included in the survey dataset, however between them these facilities handled a total of 30 polymer types.

*Source: 2017-18 Australian plastics recycling survey; Page 44-45

REPROCESSING BY JURISDICTION

Figure 15 – Recyclate to intrastate (same state), interstate and overseas reprocessors by source jurisdiction in 2017–18 (tonnes)



Victoria and NSW have the largest reprocessing sectors with both jurisdictions locally reprocessing around one third of recyclate that is recovered in each jurisdiction. Two-thirds are exported.

SA and Queensland have smaller reprocessing sectors but reprocess around 61% and 53% respectively, of recyclate generated locally within each state.

*Source: 2017-18 Australian plastics recycling survey; Page 44

BARRIERS TO PLASTICS RECYCLING

There are factors inhibiting development of recycling at every stage of product life cycles: in product design, during waste management procedures, and in the ways that recycled products are used. An effective policy framework would address challenges across the entire plastics life cycle, from plastics and product design through to end-of-life management and recycled plastic production.

1. Competition with virgin materials
2. The use of composite materials in single products
3. Concerns over additives and quality of recycled products
4. High sorting and transportation and reprocessing costs
5. Plastic becomes Litter
6. Unclear which plastics can and cannot be recycled

COMPETITION WITH VIRGIN MATERIALS

1

Manufacturers of recycled plastics operate in the same market as traditional (virgin) plastics producers, and are price takers in that market.

The raw feedstocks for most plastics are fossil fuels, which have historically been cheaper to use than recycled material (because they do not reflect all external costs – market failure).

Using virgin plastic is still cheaper than recycling the plastic already in circulation, and there are few financial incentives for manufacturers to use recycled materials.

A levy on making virgin plastic rather than using recycled material would create a level playing field and raise funds to subsidise the development of recyclable materials.

The lifecycle costs of recycling and disposal can be covered by producers and consumers of plastic goods through extended producer responsibility (EPR).

A requirement to include recycled plastic in products made from plastic would help to create a discrete market in recycled plastic, one where virgin plastic could not be simply used instead. (Eg., In October 2018 the European Parliament voted to make it mandatory for beverage containers to contain at least 35% recycled plastic by 2025).

*Source: OECD (2018): Improving plastics management; Page 13

THE USE OF COMPOSITE MATERIALS IN SINGLE PRODUCTS

Composite plastics: Recycling becomes far more complex when dealing with products that use multi-layer plastics, particularly different polymers or materials.

Combining plastics with other material streams: A significant proportion of the plastics in the waste stream are built into more complex end-of-life products that, in many cases, are difficult and costly to disassemble.

For example, disposable coffee cups are predominantly made from paper, but an interior lining – commonly made of polyethylene - make these cups very difficult to recycle.

While both the paper and plastic components of the cups are recyclable, the production process which heats and binds the materials, renders them difficult to separate. Some paper mills and recycling facilities (with advanced technologies) are able to separate the materials, but only when the cups are provided as a separate waste stream.

Designing packaging so that it's easier to separate (using a design-for-reuse approach) is vital. Product design for recycling has strong potential to assist in such recycling efforts.

A levy on composite materials (such as a levy per disposable coffee cups) would also encourage the use of more sustainable product design.

Extended producer responsibility (EPR) and product stewardship can help address difficult to hard-to-recycle products.

*Source: OECD (2018): OECD Global Forum on Environment: Plastics in a Circular Economy; Page 25

CONCERNS OVER ADDITIVES AND QUALITY OF RECYCLED PRODUCTS

There are also increasing concerns over additives (e.g. colours, plasticizers, flame retardants) used in the manufacture of some virgin plastics that complicate recycling or pose risks to human or ecological health.

For manufacturers of recycled plastics, uncertainty about the presence of these additives in plastic waste can hinder recycling altogether (because the resulting output may be of low quality or pose significant health risks in certain food related applications such as food packaging and children's toys). The lack of information and transparency regarding the use of additives in some plastic waste streams (e.g. electronics and other durables) is thus a major barrier to increased recycling of those products.

The government could address this challenge through the following policy interventions

- Creation of certification standards for recycled plastics
- Restrictions on the use of hazardous additives in plastics manufacturing.
- Facilitation of better coordination and communication across the plastics value chain, including through the promotion of chemical information systems

*Source: OECD (2018): Improving plastics management; Page 14

HIGH SORTING AND TRANSPORTATION AND REPROCESSING COSTS

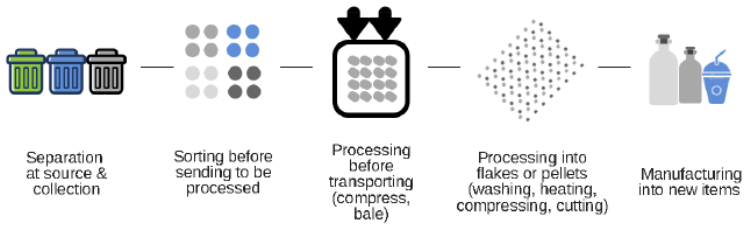
1. In many cases, plastic waste is comingled with food residues, paper, and other materials. The separation of the plastics fraction (and the individual polymers of plastic) into clean feedstock for reprocessing can be technically challenging and involves considerable capital or labour costs.
2. Plastics waste generation is geographically dispersed, and aggregating waste materials into economically viable quantities incurs considerable collection and transport costs.
3. In addition, a significant proportion of the plastics in the waste stream are built into more complex end-of-life products that, in many cases, are difficult and costly to disassemble.
4. While virtually all plastics can be recycled, many aren't because the process is expensive, complicated and the resulting product is of lower quality than what you put in.

Greater source separation/CDS can help reduce sorting costs at MRFs and increase commodity values for cleaner materials streams.

This additional cost can be covered by producers and consumers of plastic goods through extended producer responsibility (EPR). EPR can also incentivise better product design for reuse/recycling.

...nical recycling to take place, the following stages need to happen:

Figure 6: Steps for mechanical recycling



*Source: Zero waste Europe: Changing trend in plastic trade waste; Page 14

PLASTIC BECOMES LITTER

1. Plastic items, particularly lightweight plastic shopping bags, packaging and straws, can easily end up as litter

2. Plastic is a hazard to wildlife, particularly birds and marine animals. Australians use around 10 million plastic bags every day, many of which can end up in the environment.

3. Plastics, when they enter our environment, break up into smaller and smaller pieces, becoming microplastic – it does not biodegrade!

Banning single-use plastics

CDS has been shown to have significant litter-reduction benefits

Clean up and remediation activities, such as beach clean-ups and technology to collect plastics from oceans, would allow the removal of plastics already in the natural environment.

Source: https://www.sustainability.vic.gov.au/About-Us/Latest-News/2018/06/05/03/53/The-Big-Plastic-Problem

UNCLEAR WHICH PLASTICS CAN AND CANNOT BE RECYCLED

1 Confusion about the triangle symbol

People often confuse the 'resin identification code' for the general recycling symbol (mobius loop), which involves three chasing arrows.

Better plastic labelling (to distinguish what can and can't be recycled) and improved consumer education.

Community education can be used to increase the uptake of these programs.

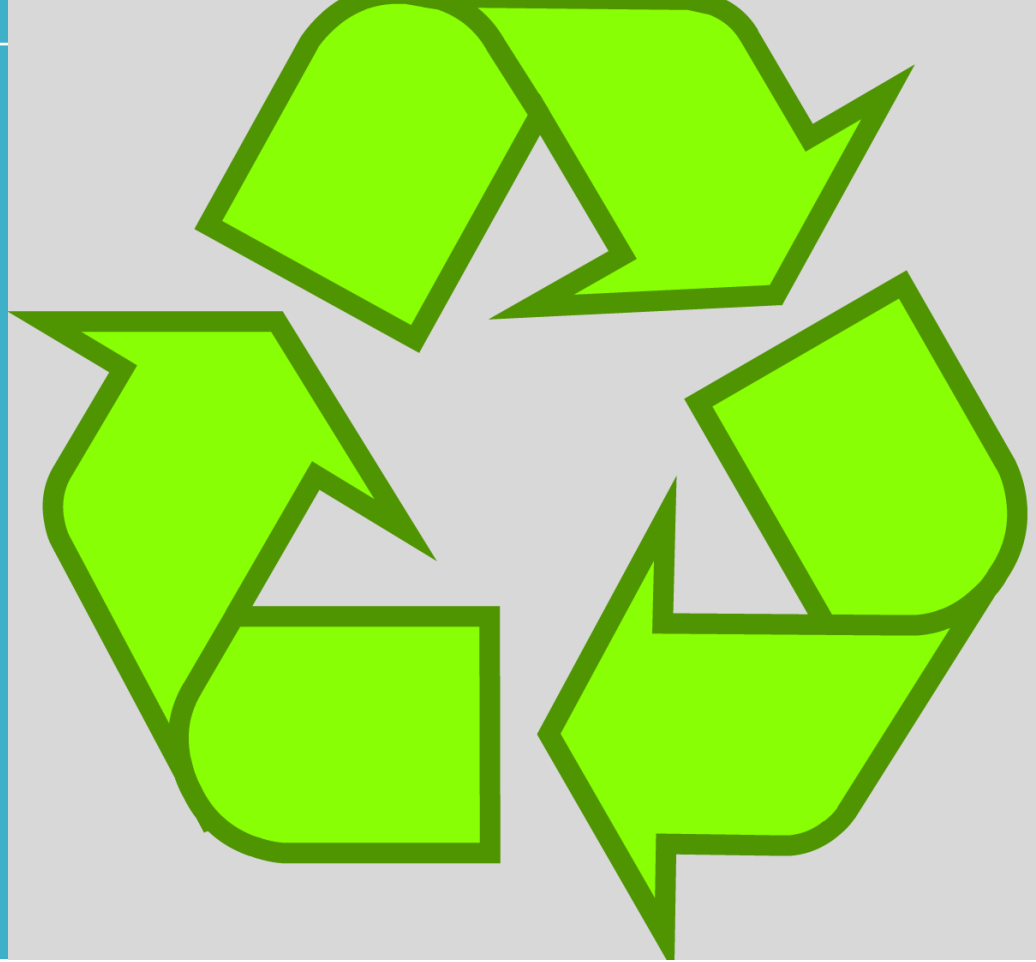
2 Confusion about soft plastics

Soft plastics – the kind that can be scrunched into a ball – are among the biggest problems in the kerbside recycling system, as they get caught in the recycling machinery.

These plastics can be recycled at many supermarkets through the REDcycle program. The plastic is made into furniture for schools and kindergartens among other things.

Source: https://www.sustainability.vic.gov.au/You-and-your-home/Waste-and-recycling/Recycling/Recycling-bins/Plastic

GLASS



GLASS: HEADLINE

Glass comprises 3% of total waste generated in Victoria

	Organics	Plastics	Packaging glass	Pa… …board	E-Waste	Tyres	Textiles
Tonnes of material generated	2,489,166	586,282	344,093	1,997,800	83,445	69,537	190,411
Tonnes of materials recovered	1,081,845	137,167	262,086	1,481,017	66,162	57,200	165
Proportion of total waste generated	19%	4%	3%	15%	1%	1%	1%
Recovery rate	43%	23%	77%	74%	79%	82%	0.09%
Proportion available in garbage bin	35%		10.80%		1%	0%	0%
Proportion of waste generated that is exported	1.5%	14.8%	3.4%	1.6%	1.0%	43.2%	14.6%
Proportion of waste recovered that is exported	3.5%	63.3%	4.4%		1.2%	52.5%	#N/A

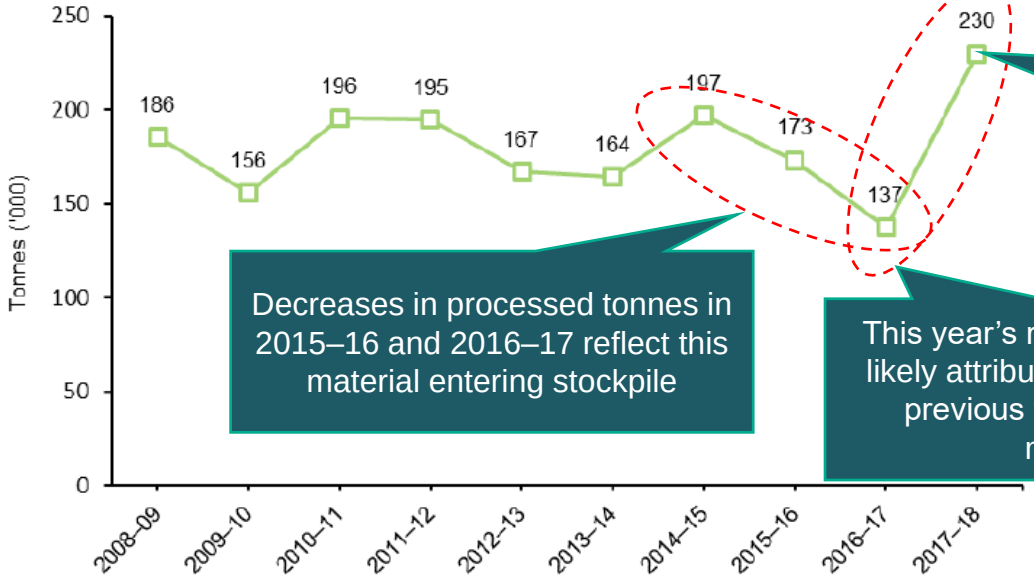
The recovery rate for glass is high, at 77%

Glass has a low reliance on exports

*Source: IV modelling of Blue Environment data

GLASS RECOVERY RATES OVER TIME

Figure 11: Glass waste recovered for reprocessing in Victoria, 2008–09 to 2017–18



In 2017–18, 230,000 tonnes of glass were recovered for reprocessing in Victoria; a 67 per cent increase from 2016–17 and the largest quantity of glass ever managed in Victoria.

Decreases in processed tonnes in 2015–16 and 2016–17 reflect this material entering stockpile

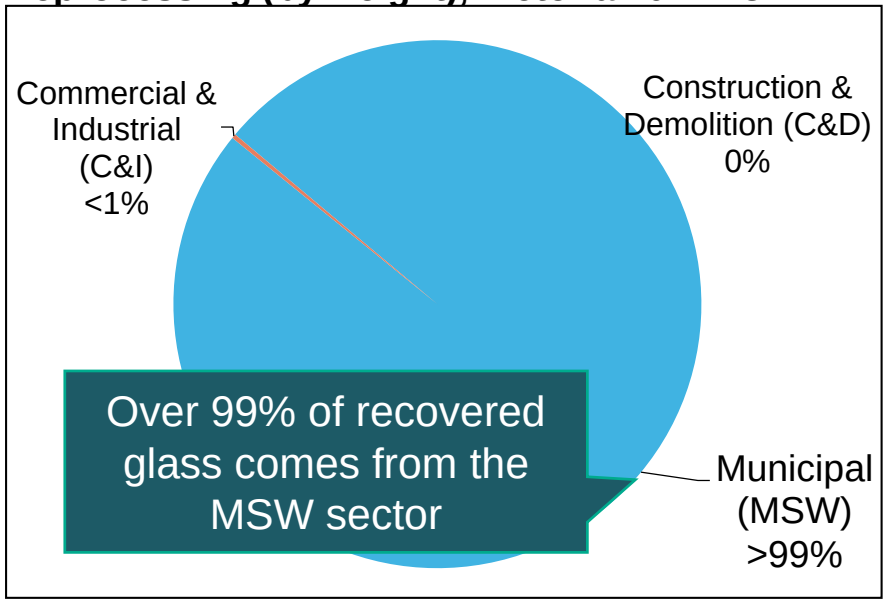
This year's recovery increase is likely attributed to reprocessing previous years' stockpiled material.

Thanks to research, development and demonstration (RD&D) activities conducted by the industry and supported by Sustainability Victoria, glass is increasingly being used in construction activities as a replacement for sand.

*Source: SV Victorian recycling industry annual report 2017-18; Page 20

GLASS: SOURCE SECTORS

Source sectors of Glass received for reprocessing (by weight), Victoria 2017-18



Recovered glass can be classified into two broad groups**:

1. **Glass suitable for recycling** — Glass collected for recycling primarily comes from food and drink bottles and jars, and includes clear, green and amber glass.
2. **Glass not suitable for recycling** — Glass not suitable for recycling include cookware glass, light globes, drinking glasses and window glass

These types of glass have different melting points compared to food and drink bottles and jars, and can also contain additives.

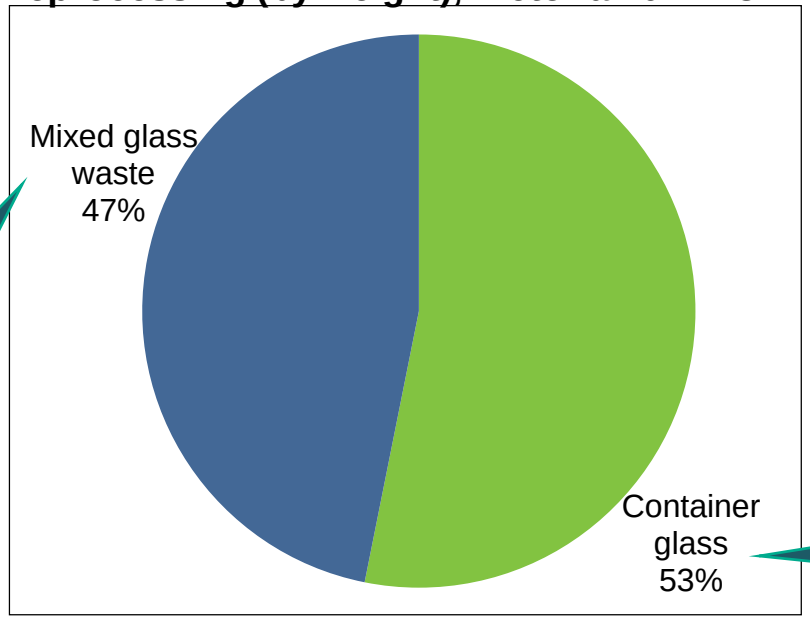
Plate or window glass, may be reprocessed in Australia into insulation. However, this is not widespread and a large quantity goes to landfill. Plate glass can also be used as aggregate and for blast cleaning.

*Source: SV Victorian recycling industry annual workbook 2017-18; Tab 'Glass'

**Source: SV Glass market analysis September 2014; Tab 'Glass'

GLASS: TYPES OF PRODUCTS RECOVERED

Composition of Glass material received for reprocessing (by weight), Victoria 2017-18



Just under half of all recovered glass is mixed glass waste

The municipal waste stream dominates the glass packaging waste system, accounting for almost 80% of total glass packaging waste flows**

Just over half of all recovered glass is container glass

**Source: APCO (March 2019): Glass working group; Page 11.

*Source: SV Victorian recycling industry annual workbook 2017-18; Tab 'Glass'

END-USES OF RECYCLED GLASS

The two main products and applications of recycled glass are:

1. Glass containers

2. Aggregate mixes

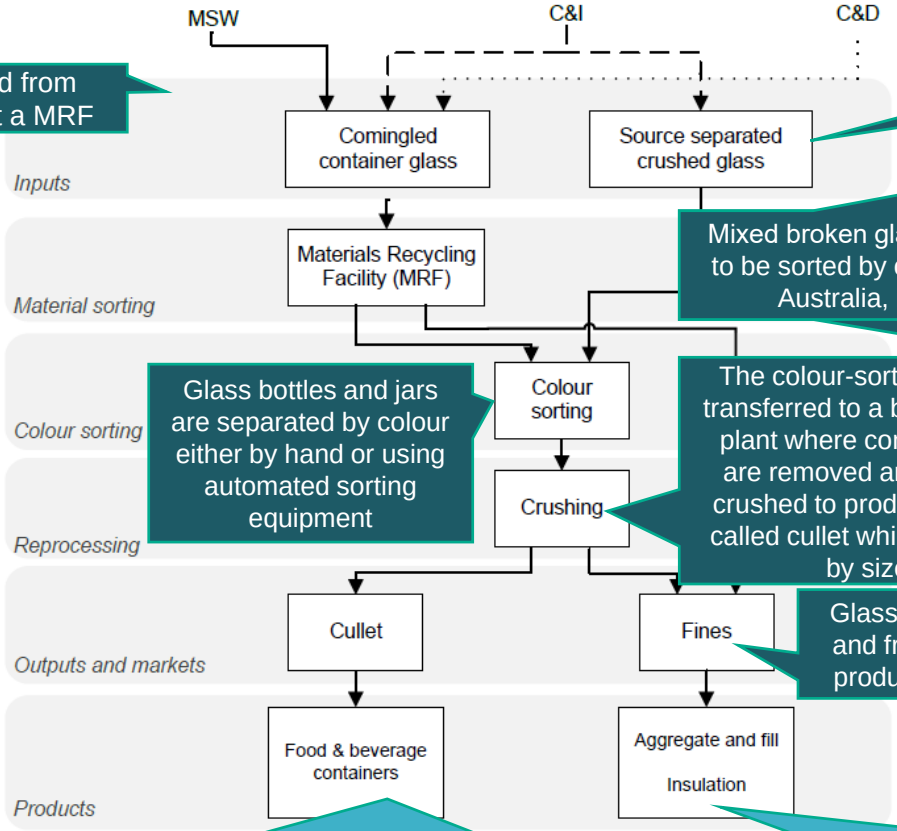
Food and beverage industry	The primary market for glass packaging is the food and beverage industry, for example food and oil jars, bottles including beer, cider, wine, spirits, soft drinks and juices. These sectors use clear, green and amber glass	Used in asphalt, sand/abrasive grit blasting, asphalt (glassphalt), construction and road aggregates, concrete aggregate, sports turf/drainage, brickmaking, water filtration, insulation batts and an alternate day cover for landfills.
The pharmaceutical and personal care	Use glass for medicines, vitamins, ointments, perfumes, liquids, creams and tablets, primarily in amber glass containers.	
Other uses	Other applications include packaging for homewares, cleaning products and chemicals.	

*Source: APCO (March 2019): Glass working group; Page 11.

GLASS REPROCESSING

On-site bottle crushing equipment is used by some businesses in the hospitality sector for onsite bottle crushing, which allows for reduced transportation volumes. These machines reduce volume to at least 80 per cent of original bottle.

Glass is typically sorted from mixed recycled waste at a MRF



Mixed broken glass must be sent to a ”beneficiation” plant if it is to be sorted by colour. There is currently only one such plant in Australia, in Laverton on the outskirts of Melbourne.

Glass bottles and jars are separated by colour either by hand or using automated sorting equipment

The colour-sorted glass is transferred to a beneficiation plant where contaminants are removed and glass is crushed to produce what is called cullet which is sorted by size.

Source: Fact sheet: Market summary: Recycled glass; Page 2.

Cullet can be recycled indefinitely (e.g. as packaging glass), as opposed to fines that are essentially “downcycled” for an alternative and ongoing use

Glass can now be sorted down to 8 mm for use as cullet and fragments smaller than 8 mm are mixed together to produce glass fines for use in aggregate and abrasives.

Cullet is a higher grade product which is mixed in glass manufacturing furnaces with virgin material, such as sand, limestone and soda ash, to produce new glass.

Glass fines are a lower grade product which is used in aggregates and insulation

BARRIERS TO GLASS RECYCLING

Material-specific challenges for glass recycling include the following

1. Glass breakages in comingled collections
2. Lack of quality cullet
3. Lack of demand for recyclate at the time of beneficiation
4. Lack of consumer education around unwanted materials

GLASS BREAKAGES IN COMINGLED COLLECTIONS

Most glass that is recycled in a comingled collection system is broken during collection, compaction and transport. Mixed broken glass must be sent to a 'beneficiation' plant if it is to be sorted by colour.

Of the total glass packaging waste recovered, approximately 30% is estimated to be recovered fines.
While fines are useful secondary materials for inputs into industrial processes (e.g., abrasives, road base), they do not contribute to reducing virgin glass demand for glass packaging. Fines represent an economic loss considering the higher value of cullet for packaging manufacturing*.

Three main issues with glass fines are**:

Contamination	Glass fines are difficult to process after they mix with other materials present in commingled recycling bins, including ceramics, stoneware, Pyrex and plastics.	Could be addressed by trialling separate glass collections/CDS
Difficult to sort	Glass fines have sharp edges and come in various sizes and colours, making them difficult to sort at MRFs	CDS collections would provide a clean stream of colour separated glass
Low market value	Recycled glass fines are a high-supply, low-demand material that give businesses little financial incentive to use recycled glass.	Tax on virgin materials (eg., sand in roads) could make glass fines more cost competitive

**Source: https://www.sustainability.vic.gov.au/Grants-and-funding/Research-Development-and-Demonstration-grants/Using-recycled-glass-fines-in-construction-and-product-design

*Source: APCO (March 2019): Glass working group; Page 23.

LACK OF QUALITY CULLET A BARRIER TO GLASS PACKAGE MANUFACTURING

Glass packaging manufacturers have expressed that they would like to source more quality cullet to increase recycled content, however a high proportion of collected glass does not meet their quality specifications for colour and contamination levels.

Alternative collection systems to improve recovery rates are currently being trialled e.g. by collecting glass separate from co-mingled recyclables, or diverting containers collected at the kerbside to CDS. The outcomes from these trials should be assessed fr their effectiveness.

*Source: APCO (March 2019): Glass working group; Page 4.

LACK OF DEMAND FOR RECYCLATE AT THE TIME OF BENEFICIATION

An estimated 16% of cullet is stockpiled at the beneficiation stage due to a lack of demand for recyclate at the time of beneficiation.

As glass is largely inert, it can be stockpiled safely (under certain conditions).

Legislation that facilitates glass to be stockpiled at times of low demand from end-markets (or low virgin commodity prices) can help produce recyclate feedstock in times of high end-market demand (and high virgin commodity prices)

Demand can be stimulated by mandating recycled glass to be used in end-products (eg., use of recycled glass aggregates in roads)

Demand can be stimulated by R&D in end-market development to find new and innovative uses.

*Source: APCO (March 2019): Glass working group; Page 14.

LACK OF CONSUMER EDUCATION AROUND UNWANTED MATERIALS

Some glass cannot be recycled via the kerbside recycling bin, because the glass is toughened and melts at a higher temperature than normal glass bottles and jars, or because of the use of additives.

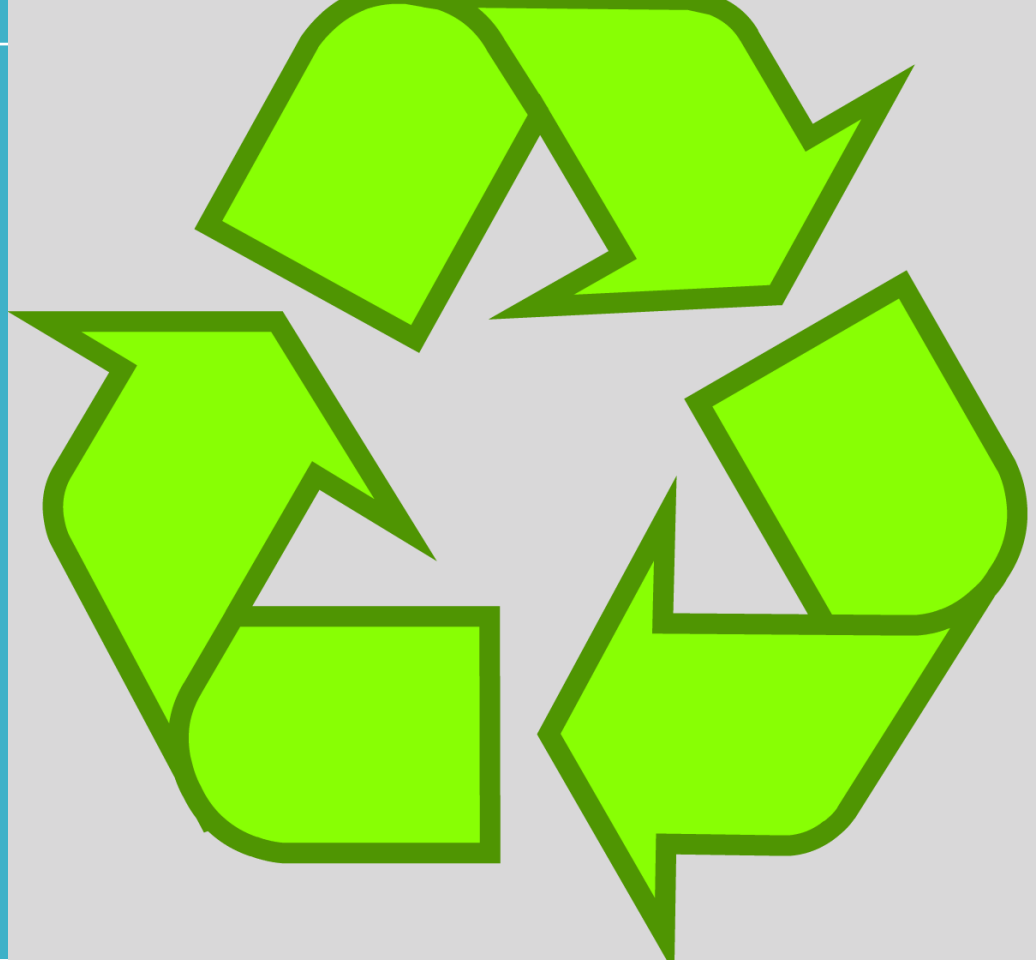
- This includes:
  - broken glass (unless it's broken bottles)
  - ceramics such as pyrex
  - china
  - corning ware
  - drinking glasses
  - light globes
  - medical or laboratory glass
  - mirrors
  - oven-proof glass
  - plate glass (window panes and windscreens)
  - white opaque bottles.

Consumer education about the value of glass recycling and what materials are not wanted (e.g. ceramics)

R&D to find end-uses for these types of glass?

*Source: https://www.sustainability.vic.gov.au/You-and-your-home/Waste-and-recycling/Recycling/Recycling-bins/Glass

ORGANICS



ORGANICS: HEADLINE

Organics comprise a high (19%) proportion of total waste

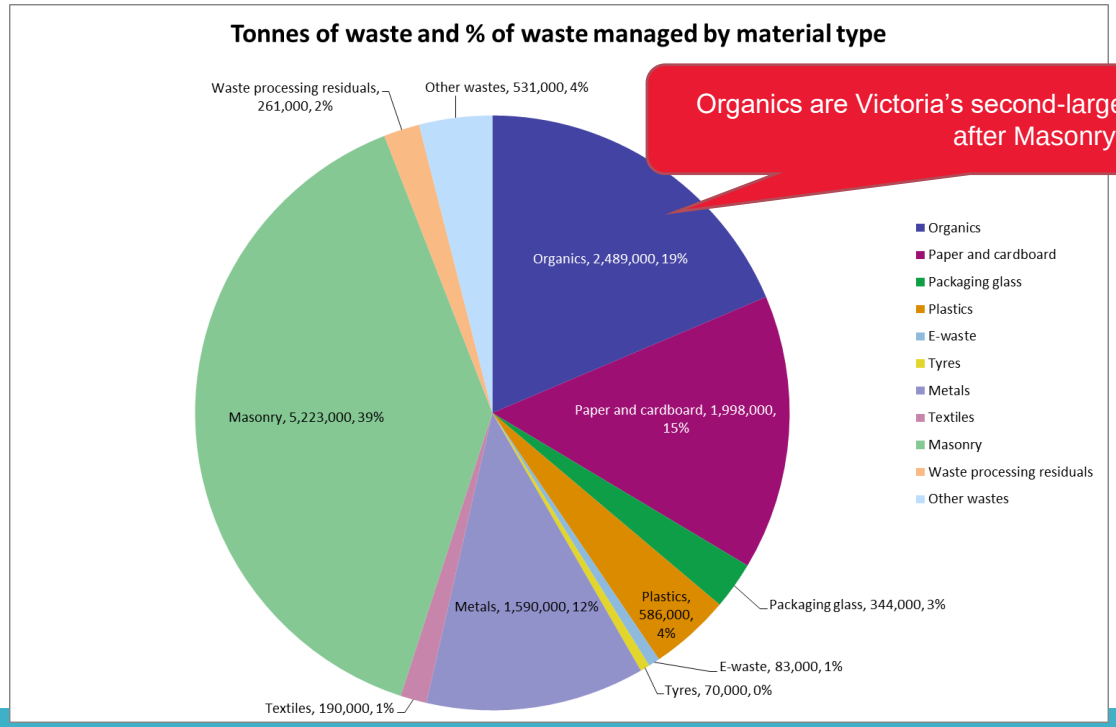
	Organics	Plas	Packaging glass	Paper and cardboard	E-Waste	Tyres	Textiles
Tonnes of material generated	2,489,166	86,282	344,093	1,997,800	83,445	69,537	190,411
Tonnes of materials recovered	1,081,845	137,167	263,686	1,481,017	66,162	57,200	165
Proportion of total waste generated	19%	4%	3%	15%	1%	1%	1%
Recovery rate	43%	23%	77%	74%	79%	82%	0.09%
Proportion available in garbage bin	35%		10.80%		1%	0%	0%
Proportion of waste generated that is exported	1.5%		3.4%	31.6%	1.0%	43.2%	14.6%
Proportion of waste recovered that is exported	3.5%		4.4%	42.7%	1.2%	52.5%	#N/A

~35% of the garbage bin comprises of organics

The recovery rate for organics is low (43%)

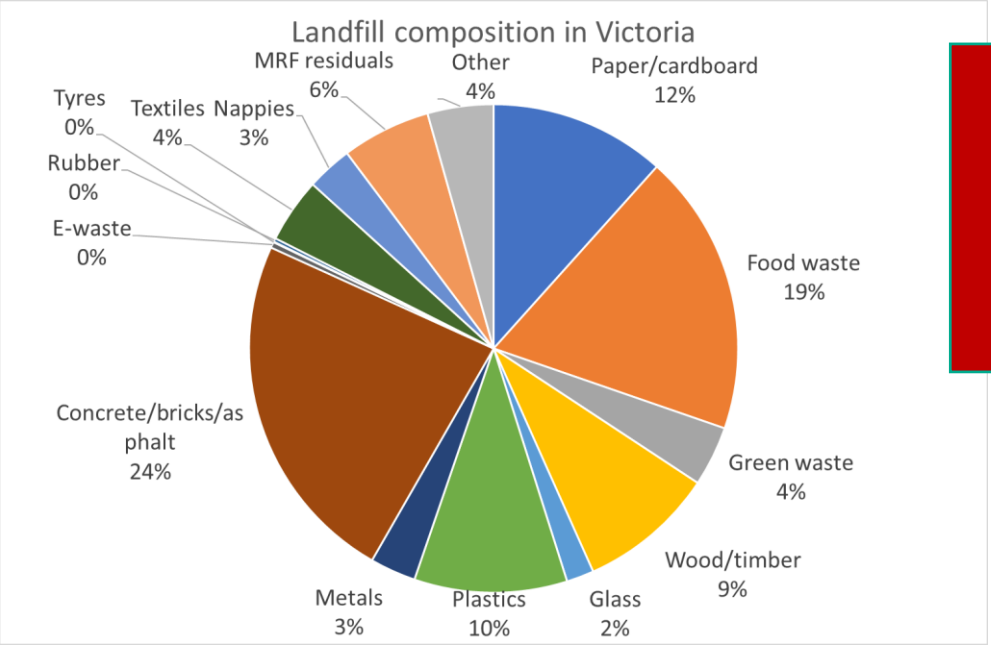
*Source: IV modelling of Blue Environment data

ORGANICS ARE ~20% OF VICTORIA'S WASTE MANAGED



Source: Blue Environment materials flow analysis model; Graph based on data in tab 'Waste flows by material'

FOOD WASTE MAKES UP 19% OF WASTE SENT TO LANDFILLS

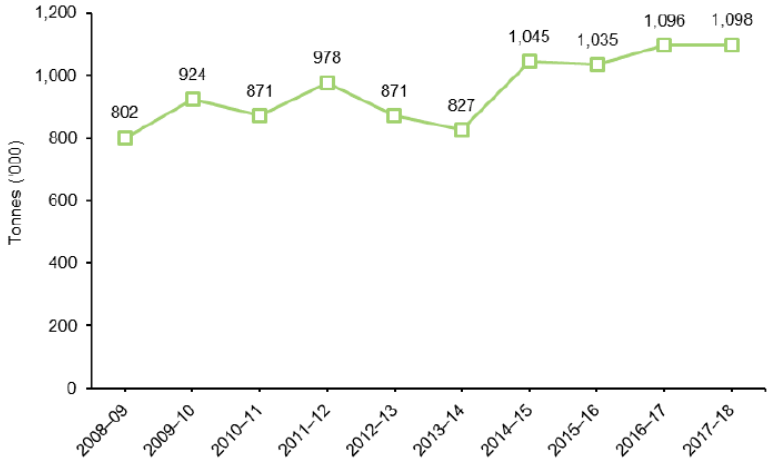


Scope for further food waste reduction and recovery initiatives in Victoria

Source: Blue Environment materials flow analysis model; Graph based on data in tab 'Waste flows by material'

ORGANICS RECOVERY IS GENERALLY INCREASING OVER TIME

Figure 16: Organics recovered for reprocessing in Victoria, 2008–09 to 2017–18



Victoria Recycling Industry Annual Report 2017–18

Organics recovery, although fluctuating from year to year, is generally trending upwards

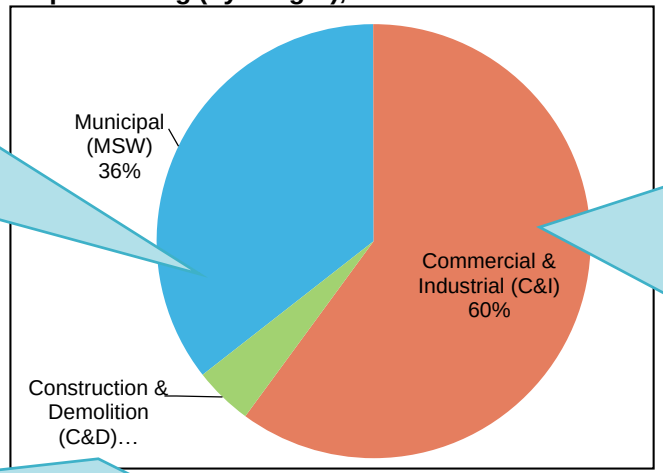
This is likely to be driven by a concerted effort to drive increase in organics recovery in Victoria, as well as the provision of greater source separation infrastructure.

*Source: SV Victorian recycling industry annual report 2017-18; Page 23

ORGANICS: SOURCE SECTORS

This MSW waste stream reflects residential supply from kerbside collection and transfer station drop-off, as well as other council waste (including parks and garden maintenance)

Source sectors of Organic material received for reprocessing (by weight), Victoria 2017-18



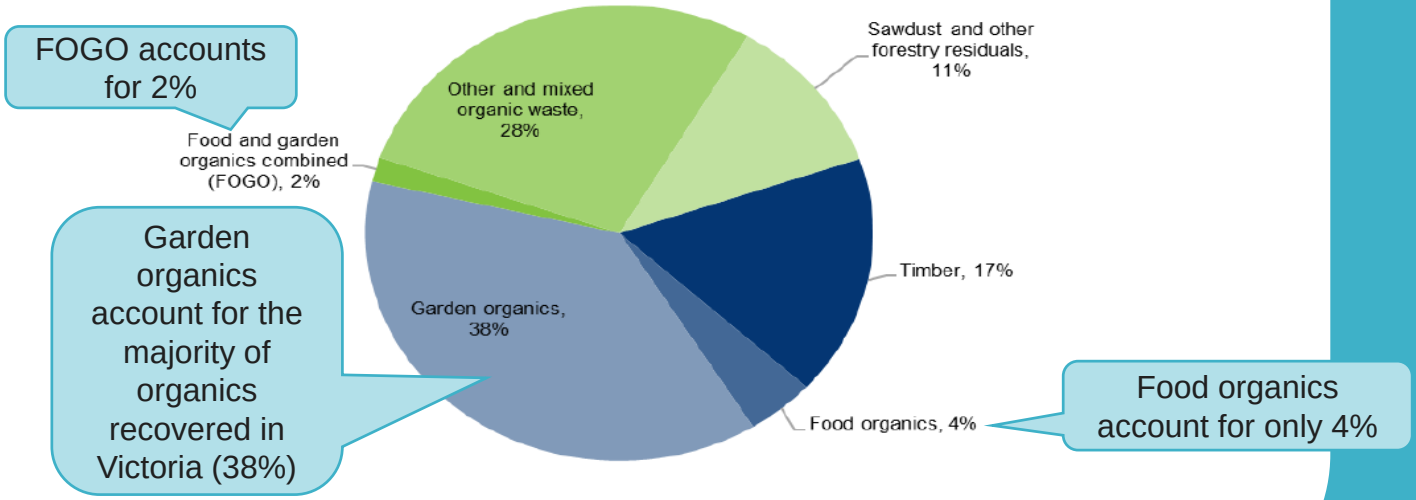
60% of recycled organic waste comes from the C&I sector. This is waste produced from businesses as a by-product of commercial activities. These include timber residuals, food organics and a range of processing by-products (for example, organic waste materials from abattoirs)

This C&D waste stream is largely timber residuals – offcuts from construction or timber products from demolition.

*Source: SV Victorian recycling industry annual report 2017-18; Page 23

ORGANICS: MSW MATERIALS RECOVERED

Figure 14: Composition of organic material recovered for reprocessing (by weight) in Victoria, 2017–18



These recovery rates reflect the higher rollout of garden organic waste in Victoria relative to food organics.

*Source: SV Victorian recycling industry annual report 2017-18; Page 22

FOUR MAIN USES OF COMPOST PRODUCTS

1 Mulching	For water conservation and weed control
2 Soil conditioning	Soil conditioning (to improve soil structure and water holding capacity)
3 Fertilising	Fertilising (to increase levels of nitrogen, phosphorus and potassium and micronutrients)
4 Other	Other (including carbon storage and disease suppression).

*Source: SV Recycled organics market analysis 26 September 2013; Page 7

RO PRODUCTS ARE USED IN FIVE INDUSTRY MARKET SEGMENTS

This is the largest industry segment with 73% industry market share (in 2001)

Timber residuals from the C&I sector are sought after by processors and processed cheaply into high value products (predominantly mulch) to meet demand in the urban amenity market.

1 Urban amenity	For use in urban areas (in and around Metropolitan Melbourne) including residential and commercial landscaping, retail nursery, special projects (such as highway verges).
2 Intensive agriculture	Agricultural use including viticulture, vegetable production, fruit and orchards, turf production, nursery production and wholesaling.
3 Extensive agriculture	Agricultural use including pasture production (livestock including sheep, beef and dairy), broadacre cropping and forestry.
4 Rehabilitation	RO use for landfill cover and rehabilitation, erosion stabilisation, land reclamation, restoration, revegetation and rectification.
5 Environmental remediation:	Contaminated site and soils remediation, water purification and biofiltration uses.

Intensive agriculture accounts for 8-9% of market share, followed by rehabilitation which accounts for 6% of market share. These rely mostly on garden waste sourced from residences

*Source: SV Recycled organics market analysis 26 September 2013; Page 2

RO PRODUCT AND INDUSTRY MARKET SHARES (I)

1

Product market shares (SV 2001)

Table 2-1 summarises these RO market products by total volume, market share and the market segments into which the products are sold.

Product type	Volume (m³)	Market share by volume (%)	Market segment
Composted mulches	113,237	12%	Urban amenity, intensive agriculture
Composted soil conditioners	121,445	13%	Urban amenity, intensive agriculture, environmental rehabilitation
Pasteurised mulches, soil conditioners	54,257	6%	Urban amenity, rehabilitation
Raw mulch, potting mix	426,755	44%	Urban amenity
Soil and soil blends	151,323	16%	Urban amenity
Other	99,706	10%	Various
Total	966,723	100%	

Source: RMCG analysis of SV survey data. Assumes rehabilitation and environmental remediation supply has a market value. Differs from product sales as includes stock levels (unsold stock).

2

Industry market shares (SV 2001)

Table 2-2: Total recycled organics market sales volume and value, 2011-12

Segment	Volume (m³)	Market share by volume (%)	Wholesale value ($m)	Market share by value (%)
Urban amenity	675,000	79%	$21.2m	77%
Intensive agriculture	88,000	9%	$2.2m	8%
Rehabilitation	57,000	6%	$1.6m	6%
Enviro-remediation	38,000	4%	$1.1m	4%
Other	65,000	7%	$1.3m	5%
Total	858,000	100%	$27.5m	100%

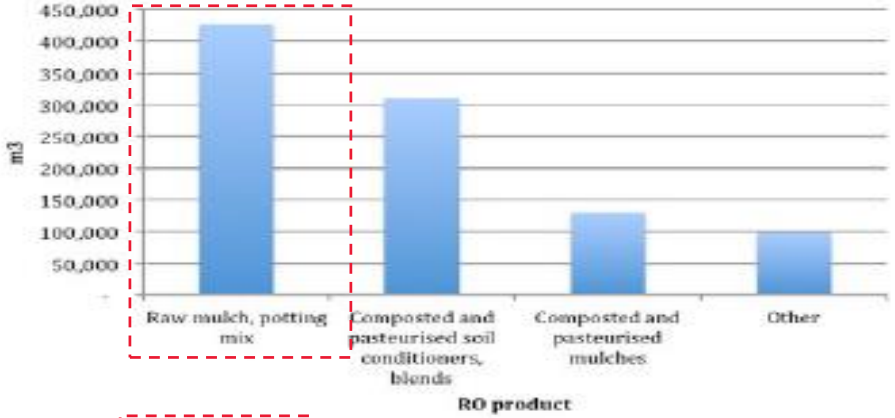
Source: RMCG analysis of SV survey data. Assumes rehabilitation and environmental remediation supply has a market value, wholesale product prices developed through industry consultation.

*Source: SV Recycled organics market analysis 26 September 2013; Page 5

RO PRODUCT AND INDUSTRY MARKET SHARES (II)

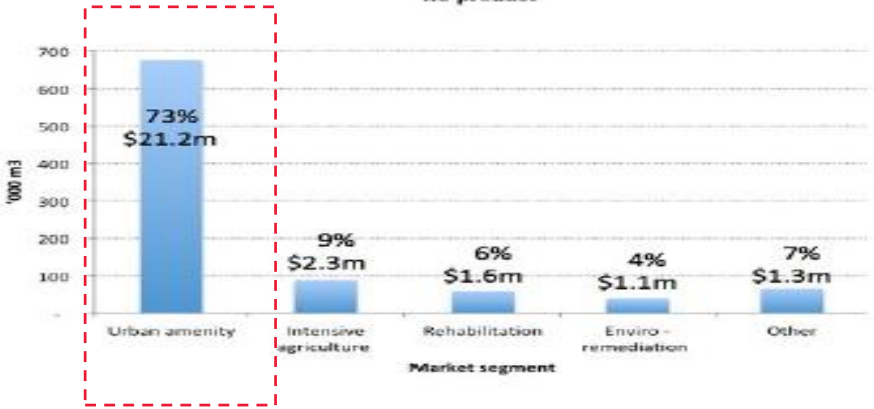
1

Product market shares (SV 2001)



2

Industry market shares (SV 2001)



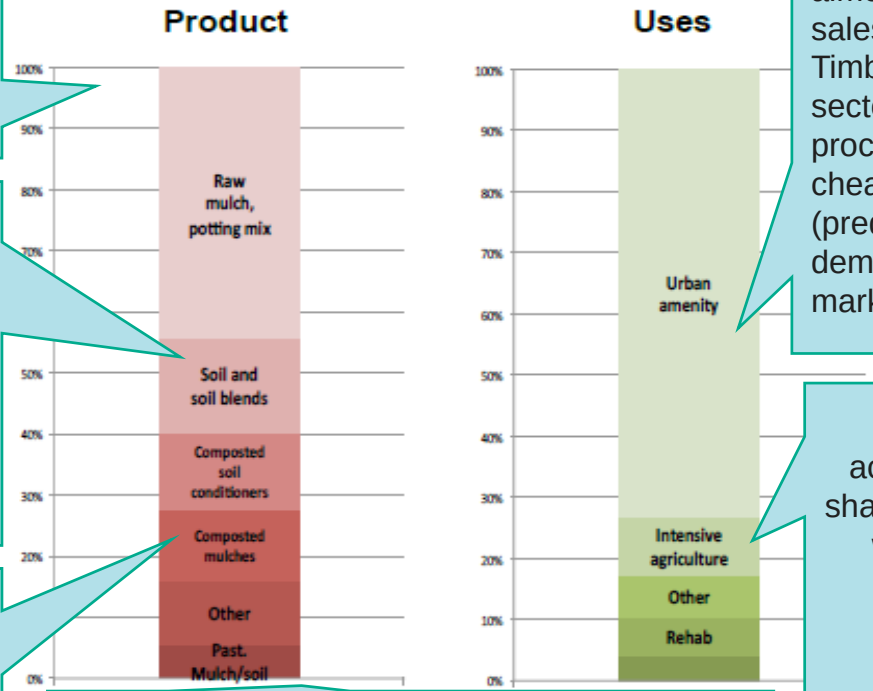
*Source: SV Recycled organics market analysis 26 September 2013; Pages 4,6.

RO PRODUCT AND INDUSTRY MARKET SHARES (III)

Uncomposted mulch products for the urban amenity market comprise ~44% of the recycled organics product market by volume.

Composted and pasteurised soil conditioners and soil blends which are processed from green waste comprise ~30% of the recycled organics product market by volume. These are mostly used in the urban amenity market, but are also used in agriculture and environmental remediation.

Compost and pasteurised mulches comprise ~13% of the recycled organics product market by volume. These are also processed from green waste but with larger particle size and used as a mulch product.



Urban amenity accounts for almost three quarters of market sales by volume (73 per cent). Timber residuals from the C&I sector are sought after by processors and processed cheaply into high value products (predominantly mulch) to meet demand in the urban amenity market.

Intensive agriculture accounts for 8-9% of market share, followed by rehabilitation which accounts for 6% of market share. These rely mostly on garden waste sourced from residences

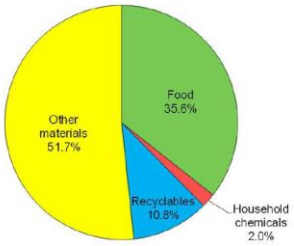
‘Other’ products (~10% of the recycled organics product market by volume) that are not able to be identified or grouped due to their specific nature, for commercial in confidence reasons.

*Source: SV Recycled organics market analysis 26 September 2013; Page 6.

AVOIDABLE FOOD WASTE - MSW

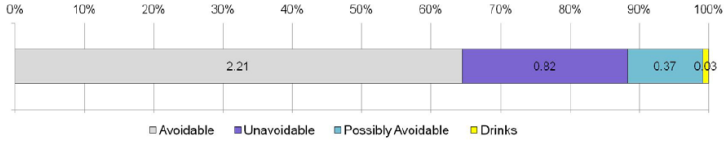
Food waste accounts for a third of Victoria's garbage stream by weight (SV 2013 bin audit)*

Figure 3 - Garbage bin composition by weight as percentage, Victoria 2013



Nearly two-thirds of this is avoidable food waste

Figure 6 - Food generation kg/household/week, Victoria, 2013



Composition of avoidable food waste**

Avoidable food waste	Kg per household per week	Percentage
Bakery	0.56	16.3%
Meals (home cooked/ pre-prepared)	0.44	12.9%
Dairy/eggs	0.3	8.8%
Fresh vegetables	0.27	8%
Fresh fruit	0.2	5.7%
Meat/fish (uncooked)	0.12	3.4%
Staple foods	0.11	3.2%
Fresh salad leaves	0.05	1.6%
Cake/dessert	0.04	1.3%
Processed veg/salad	0.04	1.1%
Condiments/sauces/ herbs/spices	0.04	1.1%
Confectionery/snacks	0.03	0.8%
Processed fruit	0.01	0.3%

Of the weekly household total of food that could have been eaten (2.2 kg), five categories accounted for 1.8 kg. Bakery items (bread, pastry, biscuits, etc.) and meals were the highest, with dairy/ eggs, fresh vegetables and fresh fruit the next main categories.**

- There is a strong case to target avoidable food with waste minimisation initiatives.
- Victorians estimate that the value of food and drink they waste to be around $39 a week – or $2000 a year. Across Victoria, this adds up to about $4 billion**.
- Diverting food from landfills means that methane produced during decomposition is not released to the atmosphere

*Source: SV (2013), Victorian Statewide Garbage Bin Audits: Food, Household Chemicals and Recyclables ; Page 16.

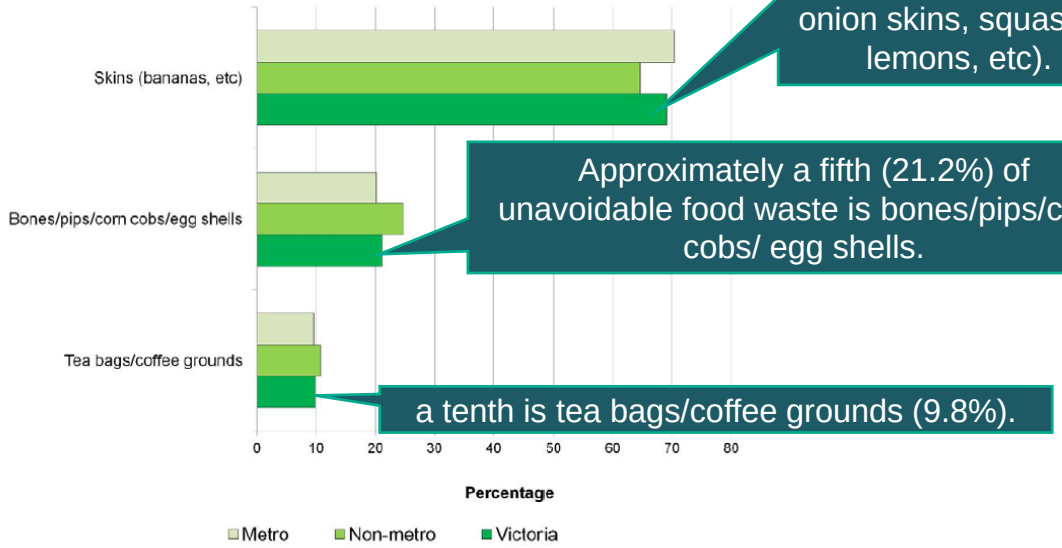
**Source: SV (2013), Food waste in garbage bin; Page 2.

INFRASTRUCTURE VICTORIA

UNAVOIDABLE FOOD WASTE - MSW

Nearly 25% of Victoria's food garbage waste is unavoidable

Figure 11 - Unavoidable food waste composition, Victoria, 2013



Most (69.0%) of the unavoidable food is skins (banana peels, onion skins, squashed lemons, etc).

Approximately a fifth (21.2%) of unavoidable food waste is bones/pips/corn cobs/ egg shells.

a tenth is tea bags/coffee grounds (9.8%).

Unavoidable MSW food waste should be targeted with resource recovery initiatives, to ensure diversion away from landfill.

Kerbside collections programs can include providing households with kitchen caddies and/or biobags and a bin service for food waste.

*Source: SV (2013), Victorian Statewide Garbage Bin Audits: Food, Household Chemicals and Recyclables ; Page 24.

ORGANICS COLLECTIONS - MSW

The proportion of local governments providing FOGO collections is higher in SA (40%) and NSW (26%), when compared to Victoria (24%).

Table 8 Number of local governments with a kerbside organics bin collection service, July 2018

Jurisdiction	Number of local governments...			% of local governments...	
	with GO	with FOGO	trialling or planning FOGO	with GO	with FOGO
ACT	1	0	0	100%	0%
NSW	46	33	4	36%	26%
NT	0	0	0	0%	0%
Qld	10	1	0	13%	1%
SA	17	28	0	24%	40%
Tas	2	3	0	7%	10%
Vic	36	19	3	46%	24%
WA	9	4	1	7%	3%
Australia	**118**	**88**	**8**	**22%**	**16%**

The proportion of households receiving kerbside organics services is also significantly higher in SA (92%) and NSW (60%), when compared to Victoria (56%).

Table 7 Estimated proportions of households receiving kerbside services by jurisdiction, 2016-17

	ACT	NSW	NT	Qld	SA	Tas	Vic	WA
- garbage bin	100%	91%	73%	96%	100%	93%	96%	97%
sent to landfill	100%	66%	73%	92%	100%	93%	96%	69%
sent to alternative waste technology (AWT)	-	25%	-	4%	-	-	-	28%
-recycling bin	100%	89%	60%	86%	98%	93%	95%	92%
-organics bin	5%	60%	-	10%	92%	15%	56%	14%

It has also been noted that the performance of FOGO systems can differ greatly. The 2018 national waste report identifies that well promoted and carefully designed systems can capture about 70% of food waste, but in some local government areas participation rates are less than 4% of the population.

There is scope for a more widespread rollout FOGO in Victoria.

This needs to be complemented with community education initiatives to ensure high participation rates.

*Source: Blue Environment (2018), National waste report; Pages 52-53.

FOOD WASTE: BREAKDOWN BY SECTOR AND STATE

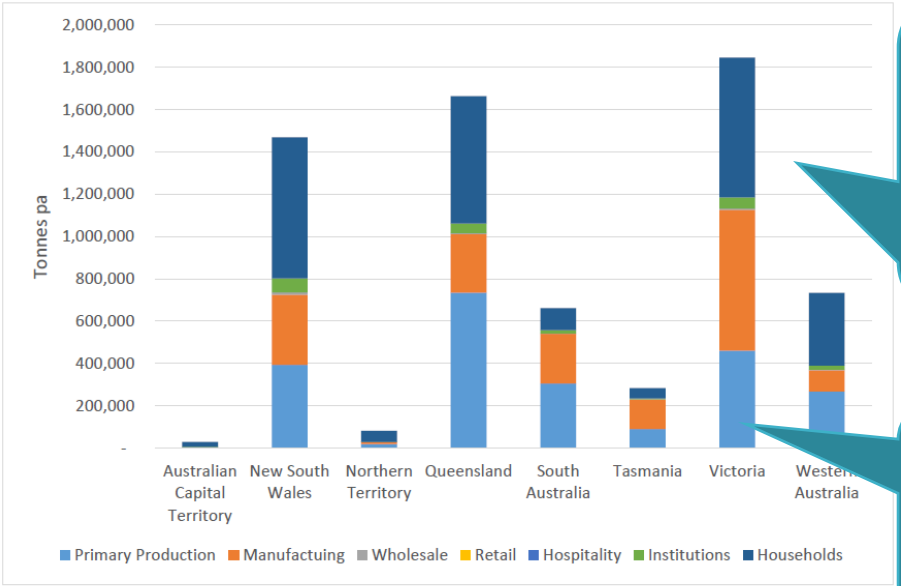


Figure 2: A breakdown of food waste generation by jurisdiction (excluding bagasse)

There is scope for further food recue efforts to be targeted to food waste generated by the manufacturing sector (see next slide)

Roughly 35% of food waste is generated from the manufacturing sector. The largest quantities of food waste are generated in food packing and processing, with the key generators being dairy, livestock, grain, poultry and fruit and vegetables.

The primary destination for food waste from the manufacturing sector is compost, biochemical processing and food rescue.

Roughly 20% of food waste is generated from primary production of vegetables, broadacre crops (maize, wheat, barley for grain), Fruits, nuts and wine grapes

The primary destination for food waste from crops and vegetable production and to a lesser extent, fruit and nuts, is ploughing back in on-farm, or not harvesting in the first place

*Source: Arcadis (2019), National food waste baseline – Final assessment report; Page 7.

C&I FOOD WASTE – SCOPE FOR FOOD RESCUE AND ANIMAL FEED

Food rescue

Food rescue organisations (such as Foodbank Australia, SecondBite and OzHarvest) work through established partnerships with food donor businesses to capture surplus, blemished, expiring and unsaleable food, including from farmers, manufacturers, hospitality (i.e. cafes and caterers), wholesalers and retailers. They redistribute food in the form of groceries or meals to Australians in need. The practice helps combat food waste and food insecurity.

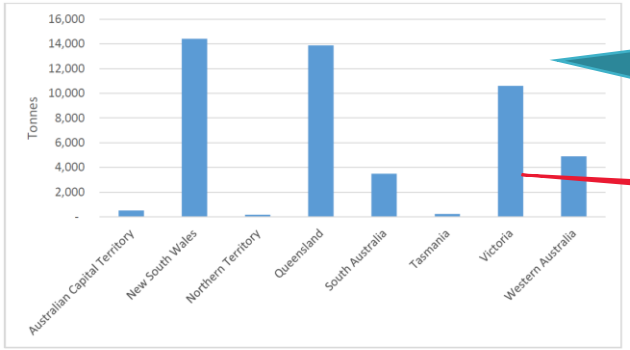


Figure 21: The distribution of food rescue in 2016/17, by state/territory

It has been estimated that approximately 48,000 tonnes of food was donated to food rescue organisations in 2016/17 (Figure 21), which represents around 96 million meals

There is scope for Victoria to increase its food recue efforts

Animal feed

Animal feed represents a substantial diversion of food waste and surplus in Australia, and is high potential pathway for further waste avoidance. The National Food Waste Baseline estimates 3.9MT was diverted from food waste to animal feed in 2016/17, with 87% sourced from the manufacturing sector (Source: National Food Waste Baseline Final Assessment)

*Source: Arcadis (2019), National food waste baseline – Final assessment report; Page 60.

BARRIERS TO ORGANICS RECYCLING

1	Food organics in garbage	Significant volumes of food organics are disposed to the garbage bin, and a large proportion of this is avoidable food waste.
2	FOGO rollout lagging behind other states	Victoria is behind SA and NSW in the provision of kerbside organics services
3	Scope for further food rescue	A large proportion of food waste generated from the manufacturing sector can be rescued using food rescue efforts.
4	Rainfall and seasonality	Rainfall and seasonality can result in a sudden increase in recycled organics supply, while organics processing capacity is fixed in the short term. This can cause market prices to decline and erode market value.
5	Limited scope for stockpiling	Environmental regulation focussed upon odour management inhibits the stockpiling of processed compost in large volumes for long periods.
6	Contamination rates of plastic, glass, and other content	Contamination is variable and difficult to manage, limiting the scope of use for the end product (for example, the potential for glass contamination limits compost use in soils for sports fields or on public garden beds where children may play). This is also a cause for lingering reputational issues for compost products.
7	Threat of substitutes limit viability of agricultural uses.	Alternative products (mainly manures and fertilisers) are well understood and provide cost-effective alternatives to recycled organics.
8	Transportation costs limit viability of agricultural uses.	Demand from agricultural uses is located remotely from the majority of supply (metropolitan Melbourne). High transportation costs limit demand from this market segment.

Low collections

Food avoidance/food recue/greater FOGO rollout

Volatile/low market prices

Cannot be stockpiled

Concerns about quality

Certification standards

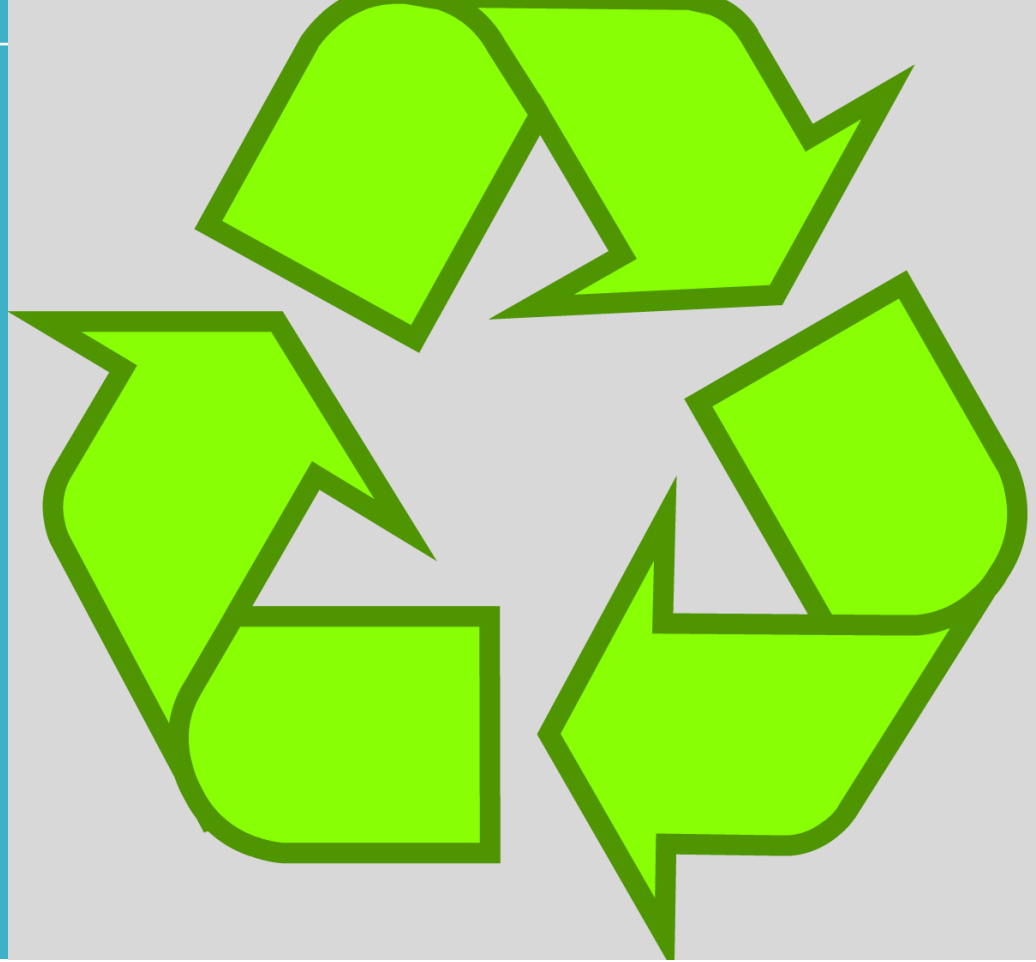
Viable substitutes

Transportation costs eroding value

Technical innovations that enable RO waste processing to be located closer to source and increase the value of RO waste products will have commercial appeal. The government can have a role in funding R&O and removing barriers to innovation

INFRASTRUCTURE VICTORIA

PAPER AND CARDBOARD



PAPER: HEADLINE

Paper comprises 15% of total waste generated in Victoria

	Organics	Plastics	Packaging glass	Paper and cardboard	...ste	Tyres	Textiles
Tonnes of material generated	2,489,166	586,282	344,093	1,997,800	83,445	69,537	190,411
Tonnes of materials recovered	1,081,845	137,167	263,686	1,481,017	66,162	57,200	165
Proportion of total waste generated	19%	4%	3%	15%	1%	1%	1%
Recovery rate	43%	23%	77%	74%	79%	82%	0.09%
Proportion available in garbage bin	35%		10.80%		1%	0%	0%
Proportion of waste generated that is exported	1.5%	14.8%	3.4%	31.6%	1.0%	43.2%	14.6%
Proportion of waste recovered that is exported	3.5%	63.3%	4.4%	42.7%	1.2%	52.5%	#N/A

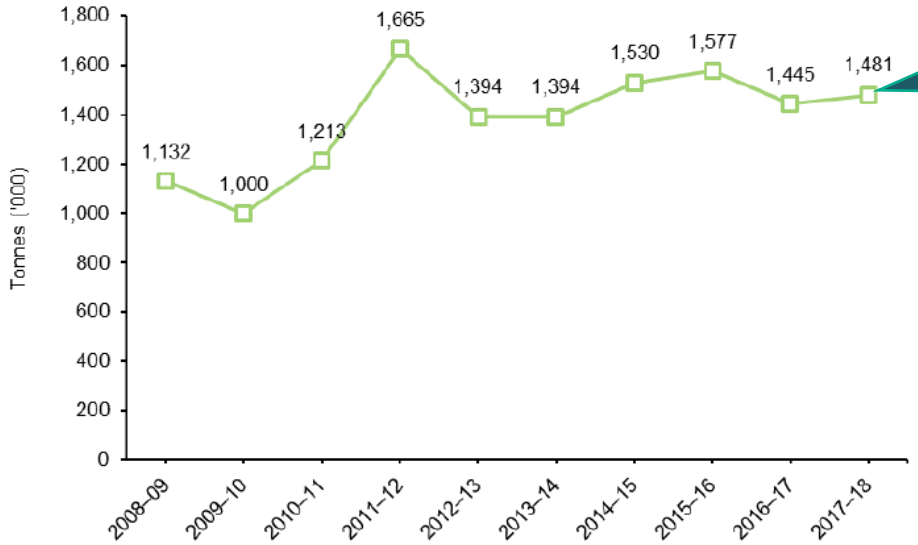
Paper is highly reliant on export markets, with 42.7% of recovered paper being exported.

Paper has a 74% recovery rate

*Source: IV modelling of Blue Environment data

PAPER RECOVERY OVER TIME

Figure 18: Paper/cardboard waste recovered for reprocessing in Victoria, 2008–09 to 2017–18



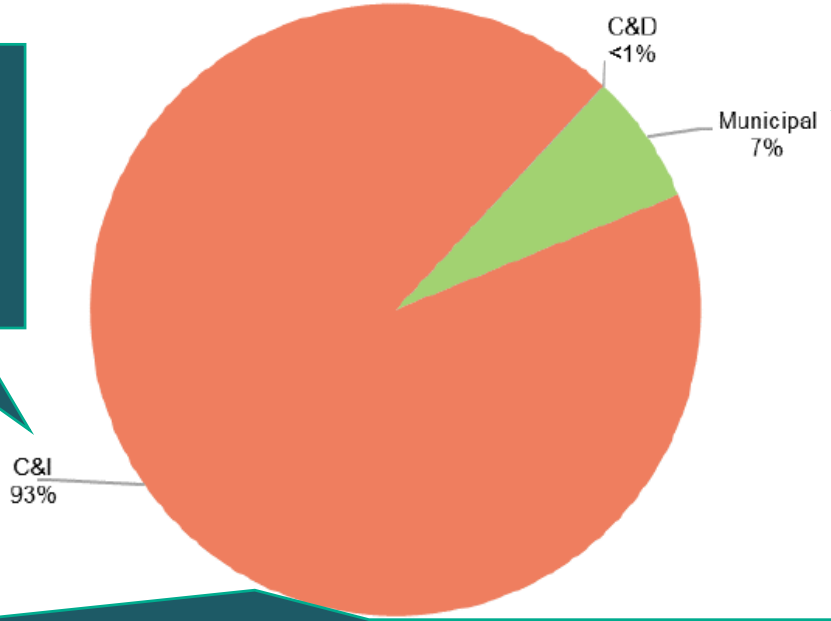
Victoria Recycling Industry Annual Report 2017–18

Paper/cardboard recovery has trended upwards since 2008–09 and has remained relatively stable over the last three years

*Source: SV Victorian recycling industry annual report 2017-18; Page 24

PAPER: SOURCE SECTORS

Figure 17: Source sectors of paper/cardboard received for reprocessing (by weight) in Victoria, 2017–18



93% of recovered paper comes from the C&I sector

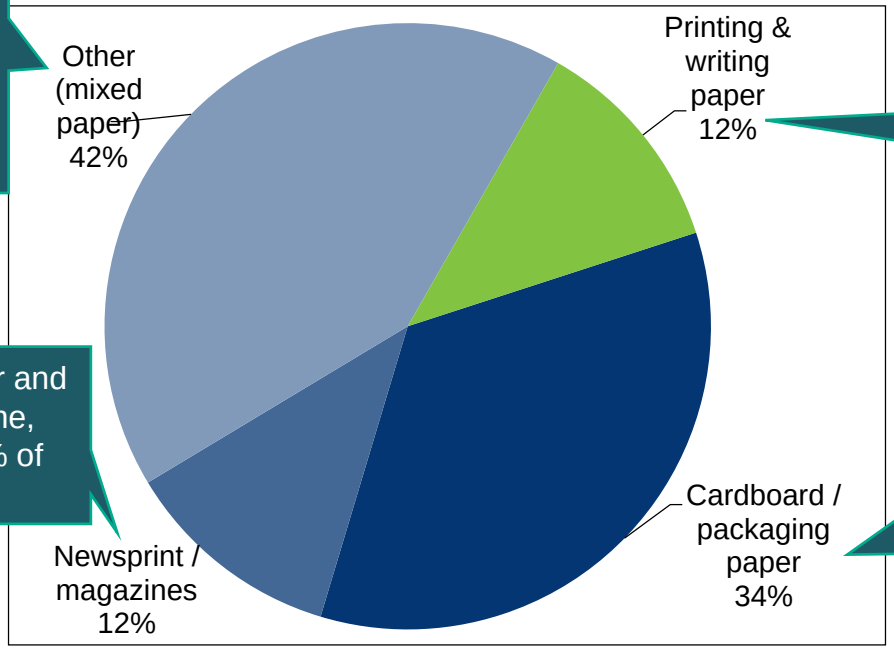
Only 7% of recovered paper comes from the MSW sector

This is a large change from 2016–17 proportions (C&I sector 85 per cent, municipal sector 15 per cent). The recovery rate from MSW may have declined changed following the collapse in export market availability for sorted municipal mixed paper.

*Source: SV Victorian recycling industry annual report 2017-18; Page 24

PAPER: COMPOSITION

Composition of Paper and cardboard received for reprocessing (by weight), Victoria 2017-18



Unsorted mixed paper is the largest proportion of recovered paper (42%)

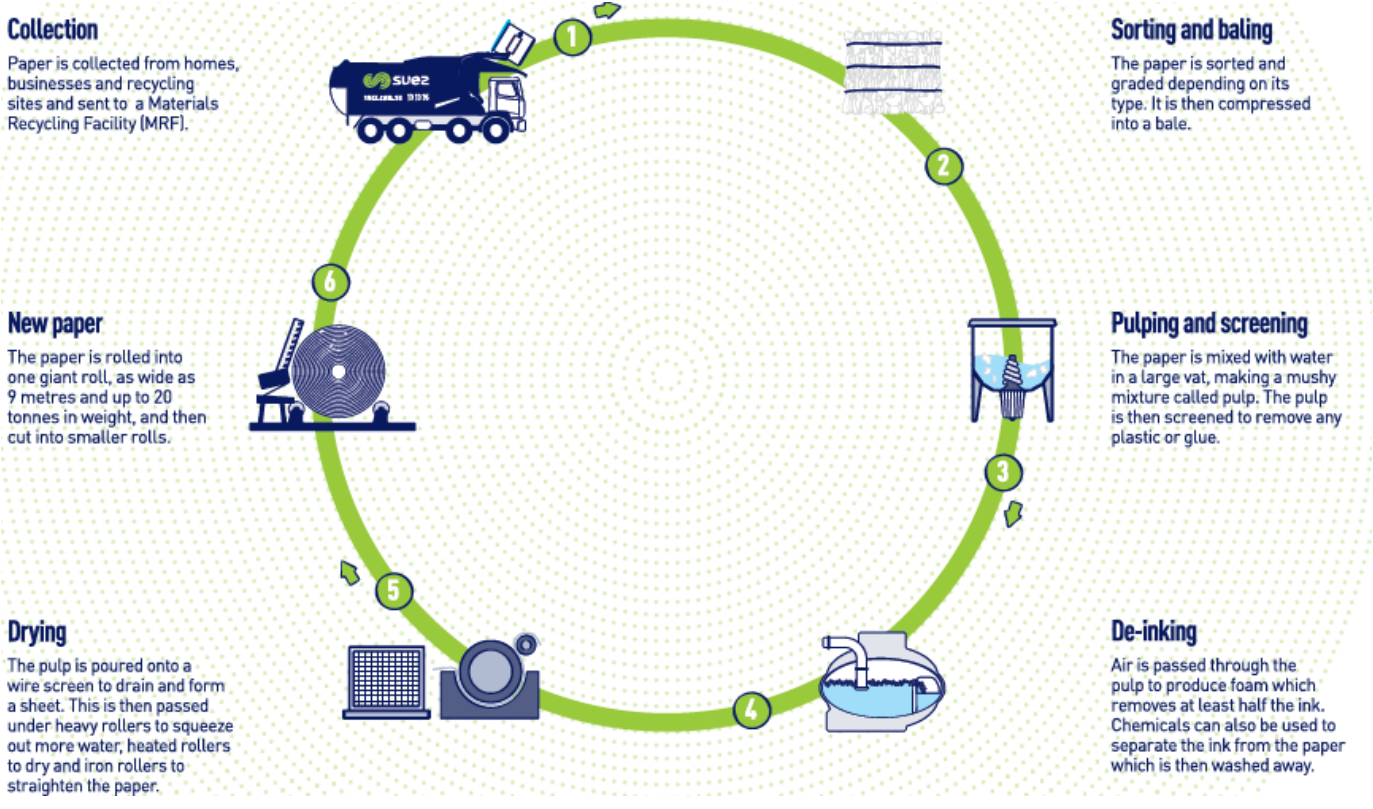
Printing & writing paper and newspapers/magazine, each account for 12% of recovered paper.

Printing & writing paper and newspapers/magazine, each account for 12% of recovered paper.

Cardboard/packaging paper accounts for 34% of recovered paper in Victoria

*Source: SV Victorian recycling industry annual workbook 2017-18; Tab 'Paper'

PAPER LIFECYCLE



*Source: Suez paper and cardboard recycling fast sheet; Page 2

END-MARKETS FOR RECYCLED PAPER

Most recovered paper is recycled back into paper and paperboard products. With a few exceptions, recovered paper is generally recycled into a grade similar to, or of lower quality than, the grade of the original product. For example:

Examples of recycling back into the same product	Old corrugated boxes are used to make new recycled corrugated boxes
	Recovered printing and writing paper can be used to make new recycled copy paper.
Examples of recycled pulp being moulded into other products	Recycled pulp can be moulded into egg cartons and fruit trays.
Examples of other uses	Recovered paper can be used for fuel, ceiling and wall insulation, paint filler, and roofing.

Source(page7):https://web.archive.org/web/20111130061422/http://www.tappi.org/paperu/all_about_paper/earth_answers/EarthAnswers_Recycle.pdf

BARRIERS TO PAPER RECYCLING

Material-specific challenges for paper recycling include the following

1. Competition with virgin paper
2. Limited recyclability
3. Glass breaks into paper in comingled collections
4. Demand and consumption trends are becoming increasingly uneven across the different grades of paper
5. Collapse of export markets
6. Lack of community education about unwanted materials

COMPETITION WITH VIRGIN PAPER

Recycled paper and virgin paper compete in the same market

- If the prices of pulpwood are lower than the cost od recycled paper, this discourages recycling
- High transport and handling costs for the collection of wastepaper make it difficult for them to compete with virgin paper

Scope to incentive use of recycled paper through

*Source: Productivity Commission (1990): Interim report on paper recycling; Page 10

LIMITED RECYCLABILITY

Unlike glass, which can in theory be recycled infinitely, paper can be recycled seven or eight times before it loses its ‘recyclability’.*

Recycling paper is inevitably a downgrading process unless new or higher quality fibre is added**. This means that paper needs to be recycled into something lower grade than the original product (making virgin paper/cardboard more attractive).

Scope to mandate the use of recycled paper (that can be combined with higher-quality fibre) in certain applications.

R&D should be targeted at finding uses for lower grade paper (that has lost some of its recyclability).

*Source: SV Victorian recycling industry annual report 2017-18; Page 16

**Source: Productivity Commission (1990): Interim report on paper recycling; Page 4

GLASS BREAKS INTO PAPER IN COMINGLED COLLECTIONS

Pieces of broken glass get embedded in paper, lowering commodity values

Alternative collection systems to reduce contamination rates e.g. separate glass bin/CDS., are currently bring trialled. These should be evaluated to assess their effectiveness.

*Source: SV Victorian recycling industry annual report 2017-18; Page 16

MIXED PAPER IS RELIANT ON EXPORT MARKETS

What is mixed paper?	The mixed paper grade material that is being produced from Australian kerbside systems is a blend of cardboard, boxboard, newspaper, magazine and printing and writing grades. While each of these grades have markets with strong prices, their value is much lower as a mixed grade product.
How much do we recover?	Unsorted mixed paper is 42% of recovered paper from MSW
What do MRFs do with mixed paper?	Australian MRFs are structured to allow most of their paper to be baled and sorted as a mixed paper grade. This was viable while China was receiving the material.

MRFs also have the option to invest in high-tech sorting technology to further sort mixed paper contents (such as TOMRA)

*Source: SV Victorian recycling industry annual report 2017-18; Page 16

DEMAND AND CONSUMPTION TRENDS UNEVEN ACROSS GRADES OF PAPER

Newsprint	• Newsprint consumption in 2016-17 was just 35% of consumption a decade earlier. • IndustryEdge's forecasts indicate Newsprint demand in Australia will fall by at least 40.7% from 2018 to 2022, and by as much as 64.1%.
Printing and Communication papers	Australian demand for Printing and Communication papers declined an average 2.9% per annum over the decade ended June 2017, driven by a high uptake of by digital and electronic communication technologies.
Tissue	Australia's tissue consumption has grown an average 1.9% per annum over the last decade
Packaging and industrial paper	Demand for packaging and industrial papers is growing as Australasia embraces the 'internet package delivery' phenomenon

Need to target waste reduction initiatives as this product segments

Scope for mandating the use of recycled paper content in this segment can be tested,

*Source: Industry Edge (2017): Pulp & Paper Industry Overview & Outlook ; Pages 17-20

LACK OF CONSUMER EDUCATION AROUND UNWANTED MATERIALS

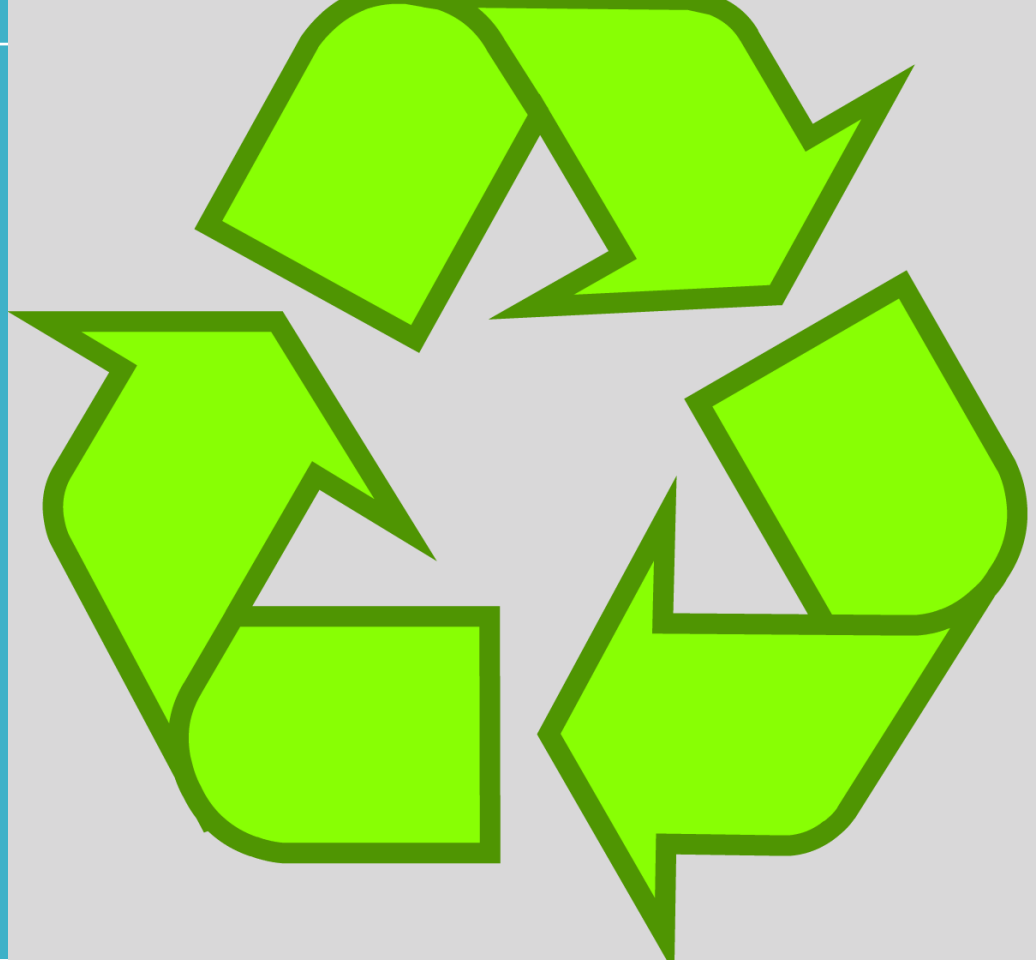
Some paper cannot be recycled via the kerbside recycling bin

- This includes:
  - coffee cups
  - dirty paper plates, napkins or kitchen roll
  - paper towel
  - pizza boxes soaked in oil
  - shredded paper
  - tissues
  - toilet paper
  - waxed cardboard such as fruit boxes.

Consumer education about the value of paper recycling and what materials are not wanted (e.g. coffee cups)

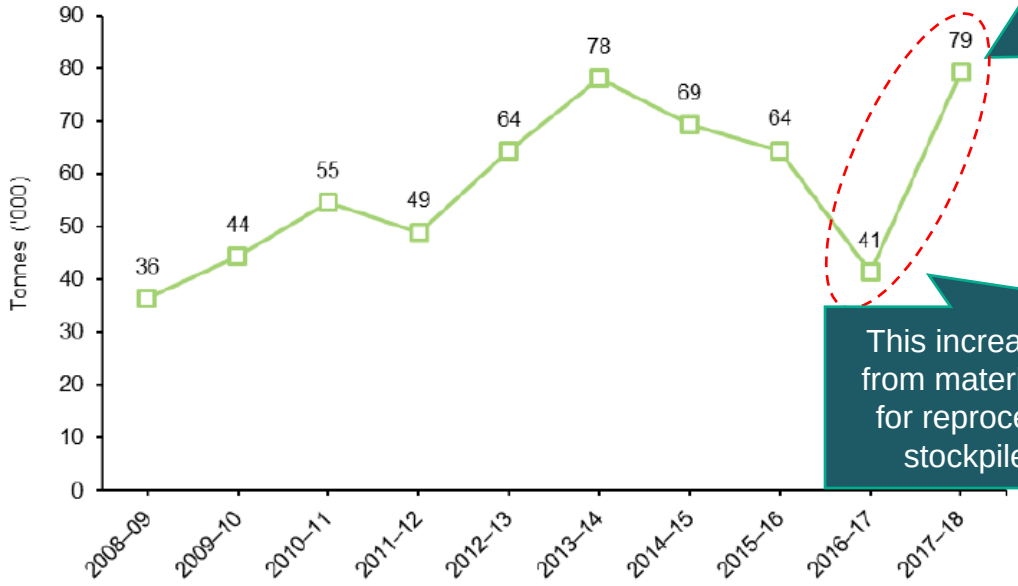
*Source: https://www.sustainability.vic.gov.au/You-and-your-home/Waste-and-recycling/Recycling/Recycling-bins/Paper

RUBBER



RUBBER WASTE OVER TIME

Figure 22: Rubber waste recovered for reprocessing in Victoria, 2008–09 to 2017–18



In 2017–18, 79,000 tonnes of rubber were recovered for reprocessing in Victoria; the most recovered since records began.

This increase in tonnes recovered is likely to be from materials coming out of long-term stockpile for reprocessing (for example, the Stawell tyre stockpile clean up conducted by the EPA).

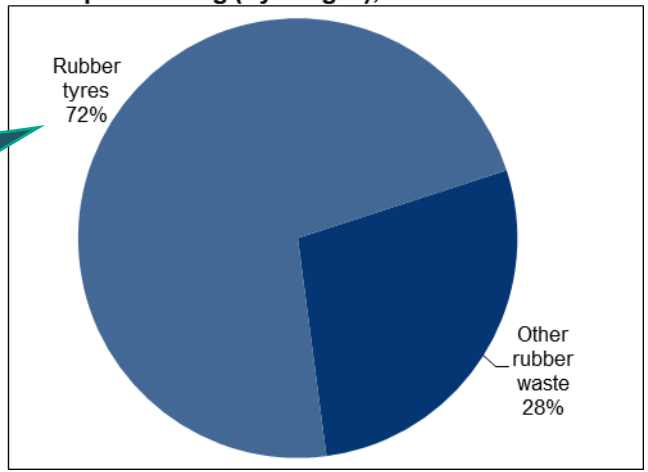
Note: SV reports aggregate data on rubber recovery rates over time. This is not reported separately for tyres.

*Source: SV Victorian recycling industry annual report 2017-18; Page 27

RUBBER: COMPOSITION OF TYRES

Rubber tyres accounted for 72 per cent of the total rubber recovered*

Composition of Rubber material received for reprocessing (by weight), Victoria 2017-



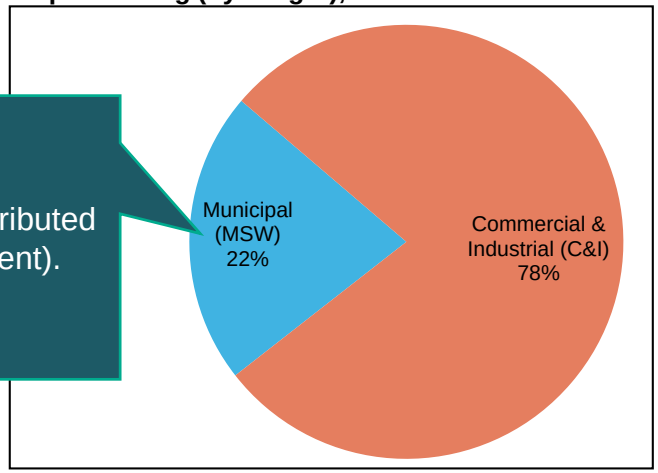
Other rubber waste, including tyre buffings and tread ends, uncured rubber and extrusion waste, accounted for 28 per cent*

*Source: SV Victorian recycling industry annual report 2017-18; Page 27

Source: SV Victorian recycling industry annual workbook 2017-18; Tab 'Rubber'

TYRES: SOURCE SECTORS

Source sectors of Rubber received for reprocessing (by weight), Victoria 2017-18



The municipal sector contributed the remaining (22 per cent).

In 2017–18, the C&I sector contributed significantly to the total rubber recovered for reprocessing (78 per cent).

No recovery from the C&D sector was reported.

Note: SV reports aggregate data on rubber recovery rates by sector. This is not reported separately for tyres.

*Source: SV Victorian recycling industry annual report 2017-18; Page 27
Source: SV Victorian recycling industry annual workbook 2017-18; Tab 'Rubber'

TYRES: HEADLINE

Tyres comprise a small (1%) proportion of total waste

	Organics	Plastics	Packaging glass	Paper and cardboard	E-Waste	Tyres	Textiles
Tonnes of material generated	2,489,166	586,282	344,093	1,997,800	83,445	69,537	190,411
Tonnes of materials recovered	1,081,845	137,167	263,686	1,481,017	66,162	57,200	165
Proportion of total waste generated	19%	4%	3%	15%	1%	1%	1%
Recovery rate	43%	23%	77%	74%	79%	82%	0.09%
Proportion available in garbage bin	35%		10.80%		1%	0%	0%
Proportion of waste generated that is exported	1.5%	14.8%	3.4%	31.6%	1.0%	43.2%	14.6%
Proportion of waste recovered that is exported	3.5%	63.3%	4.4%	42.7%	1.2%	52.5%	N/A

Tyres are highly reliant on export markets

The recovery rate for tyres is 82%

*Source: IV modelling of Blue Environment data

THERE ARE THREE MAIN TYPES OF TYRES USED FOR VEHICLES IN AUSTRALIA

Passenger tyres	Including those used on passenger vehicles, motorcycles and caravans, as well as trailers for domestic use.
Truck tyres	Including those used on buses, light and heavy commercial vehicles, prime movers, trailers and semi-trailers, and fire fighting vehicles.
Off-road tyres	Including those used on machinery or equipment used in areas such as agricultural, mining, construction and demolition.

*Source: SV (September 2014) Fact Sheet: Market summary: End-of-life tyres; Page 1

END-USES FOR TYRE DERIVED PRODUCTS (TDP) FUELS (TDF)

Table 1: End uses for tyre derived products and fuels (TDPs and TDFs)

Type	Size	Potential End Use Markets
Whole tyres		› TDF › Civil engineering
Cut/shredded tyres	300 mm +	› TDF › Civil engineering
Tyre chip	30 mm – 299 mm	› TDF › Civil engineering
Rubber granulate	1 mm - 29 mm	› Soft surfacing and matting › Moulded products › Explosives › Mulches
Crumb rubber/powder	Less than 0.9 mm	› Road surfacing – asphalt and sprayed bituminous surfacing › Adhesives › General rubber mixing › Elastomers
Steel	N/A	› Established metal recycling market › Concrete reinforcing
Textile	N/A	› Carpet backing

Whole tyres can be used as a low cost fill in a number of civil engineering applications, including retaining walls, blast walls and sea walls.

Tyre-derived fuel (TDF) is produced when end-of-life tyres are converted into a product for use as fuel. Typically, cut/shredded tyres and tyre chip can be used as the fuel feedstock. TDF can be used as a replacement for fossil fuels in cement kilns, power stations, smelters or paper mills.

Rubber powders are used in the manufacture of contact adhesives, such as those used in tiling applications.

*Source: SV (September 2014) Fact Sheet: Market summary: End-of-life tyres; Page 2

TYRES: MATERIAL-SPECIFIC CHALLENGES

Material-specific challenges for tyre recycling include the following

1. Stockpiling and fires
2. Lack of industry support for National Product Stewardship Scheme
3. Inferior imports
4. Market price fluctuations

STOCKPILING AND FIRES

Mandate participation in Tyre Stewardship Australia (currently a participation is voluntary)

Unaccounted for tyres*	Each year, approximately 1.5 million passenger car tyres (known as equivalent passenger units or EPUs) are unaccounted for in Victoria – potentially illegally dumped or stockpiled.
Fire risks*	Tyre fires across the state have shown how the incorrect and illegal storage of tyres can result in significant fire risks that may cause impacts on human health, the environment and property.

Efforts to clean-up all existing stockpiles

Tighten environmental regulations and compliance

**Source: SV (September 2014) Fact Sheet: Market summary: End-of-life tyres; Page 2

*Source: https://ref.epa.vic.gov.au/business-and-industry/guidelines/waste-guidance/storage-of-waste-tyres-in-victoria

LACK OF INDUSTRY SUPPORT FOR NATIONAL PRODUCT STEWARDSHIP SCHEME

Tyre Stewardship Australia (TSA) was formed in January 2014 to implement the national Tyre Product Stewardship Scheme. The scheme's objective is to reduce the amount of EOL tyres damaging the environment via landfill, illegal dumping or undesirable export while increasing recycling rates.

Continued stockpiling of end of life tyres demonstrates that there is a lack of industry support for National Product Stewardship Scheme

Mandate participation in Tyre Stewardship Australia (currently a participation is voluntary)

**Source: SV (September 2014) Fact Sheet: Market summary: End-of-life tyres; Page 2

INFERIOR IMPORTS

Local markets for crumb rubber are subject to competition from inferior imported products which come into the market at low cost. While poorer quality inputs may not significantly impact some products, others markets (such as in sprayed bituminous surfacing) are very sensitive to quality issues and reputational damage. Given there are limited controls in place to regulate the quality of imported crumb rubber, local producers must work hard to market the benefits of premium grade material.

Regulate imports of lower quality rubber products (through policy levers such as import levies/impart bans)

Source: https://ref.epa.vic.gov.au/business-and-industry/guidelines/waste-guidance/storage-of-waste-tyres-in-victoria

MARKET PRICE FLUCTUATIONS

Given a significant volume of EOL tyres are exported as TDF, the fluctuations in international market prices have a large bearing on exports volumes. This in turn influences the extent to which local operators stockpile tyres. That is, when prices are down, storing of EOL tyres increases while the owners wait for a better resale price.

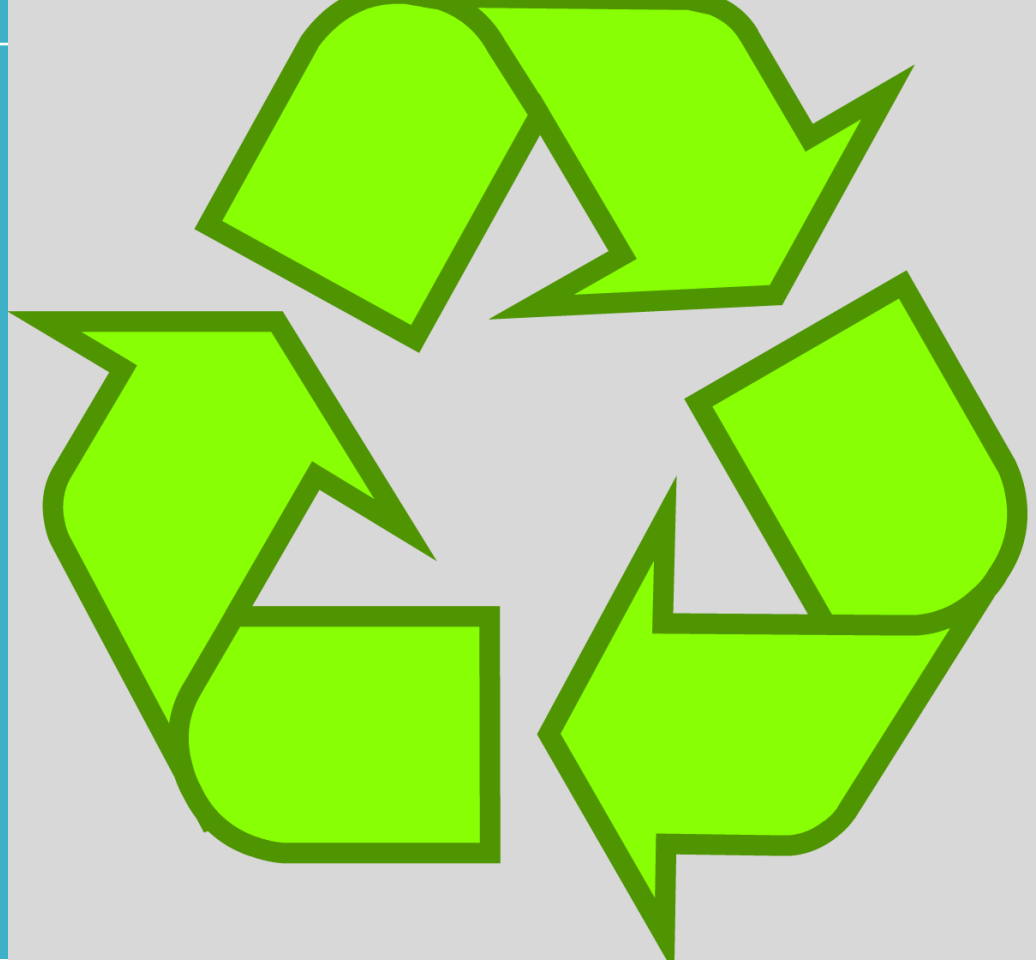
Foster end-market development through R&D support, mandating use of tyres in viable applications.

Create clear standards to encourage use of tyres/mitigate concerns about quality

The introduction of a carbon tax would increase the competitiveness of TDF

Source: https://ref.epa.vic.gov.au/business-and-industry/guidelines/waste-guidance/storage-of-waste-tyres-in-victoria

E-WASTE



E-WASTE: INTRODUCTION

E-waste can contain both hazardous and valuable materials that can be recovered when they reach the end of their working life.

Table 1: Examples of e-waste

Large appliances	Small appliances	IT, telecommunications and TV equipment	Lighting equipment
• refrigerators • washing machines • cookers • microwaves • electric fans • air conditioners	• irons • toasters • coffee machines • hair dryer • watches	• computers • laptops • printers • mobile phones • televisions • remotes	• fluorescent lamps • high intensity • discharge lamps • compact fluorescent • lamps • LEDs
Electrical and electronic tools	**Toys, leisure and sports equipment**	**Other e-waste**	
• drills • saws • sewing machines • lawn mowers • batteries	• electric trains and • racing cars • hand-held video game • consoles • amplifiers • musical instruments • radios	• medical devices • monitoring and control • equipment (smoke • detector, thermostats) • automatic dispensers • photovoltaic (solar) • panels	

Source: DELWP (2017) Managing e-waste in Victoria – Policy impact assessment; Page 2

E-WASTE: MATERIAL-SPECIFIC CHALLENGES

Material-specific challenges for E-waste recycling include the following

1. Rapid innovation
2. Planned obsolescence
3. Falling prices of new electronics
4. Complex composition
5. Growth in solar uptake

RAPID INNOVATION

E-waste drop-off points can be made more accessible to customers.

Consumers are discarding their electronic products more frequently to ensure they have the ‘latest’ product.

Rapid innovation in both existing and new electronics, partly spurred by innovative features being a key differentiator and marketing strategy for consumer products, which creates a perceived need or desire in consumers to update and upgrade to a product that may be more efficient, more attractive or more up-to-date than their current model.

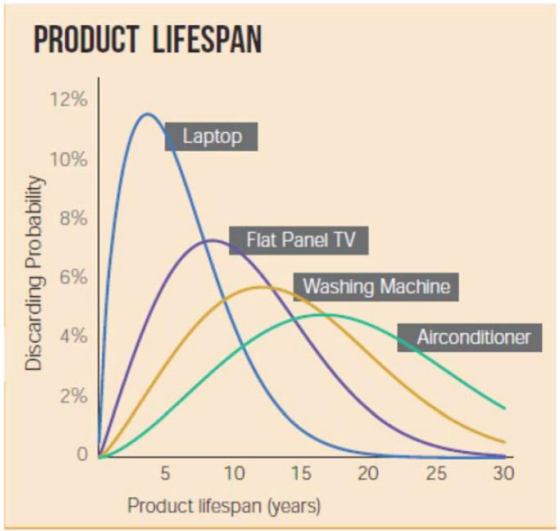
Product stewardship/supplier take back arrangements would push responsibility back to manufacturers

Source: https://www.theatlantic.com/technology/archive/2016/09/the-global-cost-of-electronic-waste/502019/

PLANNED OBSOLESCENCE

Manufacturers are deliberately decreasing in built-in lifespan of electronic products, in an effort to increase sales

Figure 3: Electrical product lifespan[25]



Require longer warranties for the products

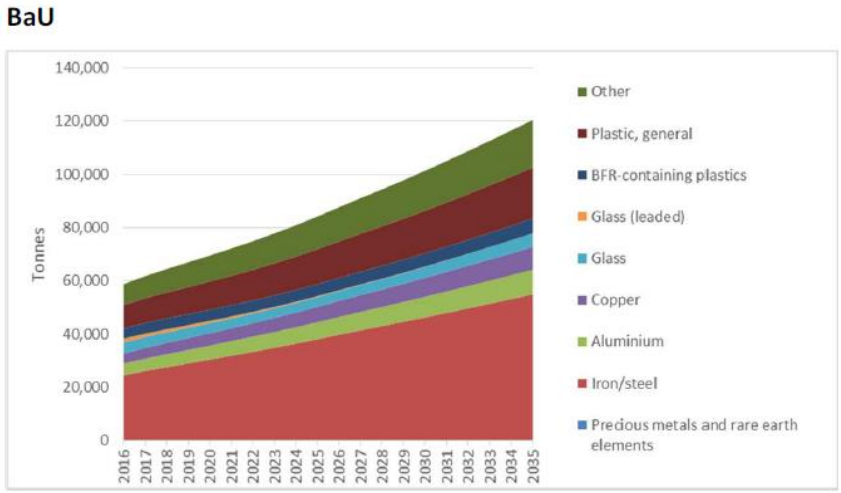
Require spare parts to be guaranteed.

Source: DELWP (2017) Managing e-waste in Victoria – Policy impact assessment; Page 11

COMPLEX COMPOSITION

The range of materials in electrical and electronic products is extremely broad. This varies from product-to-product

Figure 12: Estimates of material recovery from recycling, BaU and options



Owing to the product-specific mix of raw materials included in E-waste, processing is often a manual process which is often associated with dismantling e-waste products and recovering higher value materials (e.g. circuit boards) before lower value items are sent for shredding via a mechanical process

As product manufacturers may be best-placed to dismantle their own products, supplier-take-back arrangements may be a viable solution.

Source: DELWP (2017) Managing e-waste in Victoria – Policy impact assessment; Pages 68, 75

FALLING PRICES OF NEW ELECTRONICS

The falling cost of new electronics over time is prompting consumers to purchase new products rather than repair their existing products

Product stewardship/supplier take back arrangements would push responsibility back to manufacturers

Source: DELWP (2015) Managing e-waste in Victoria – Starting the conversation; Page 5

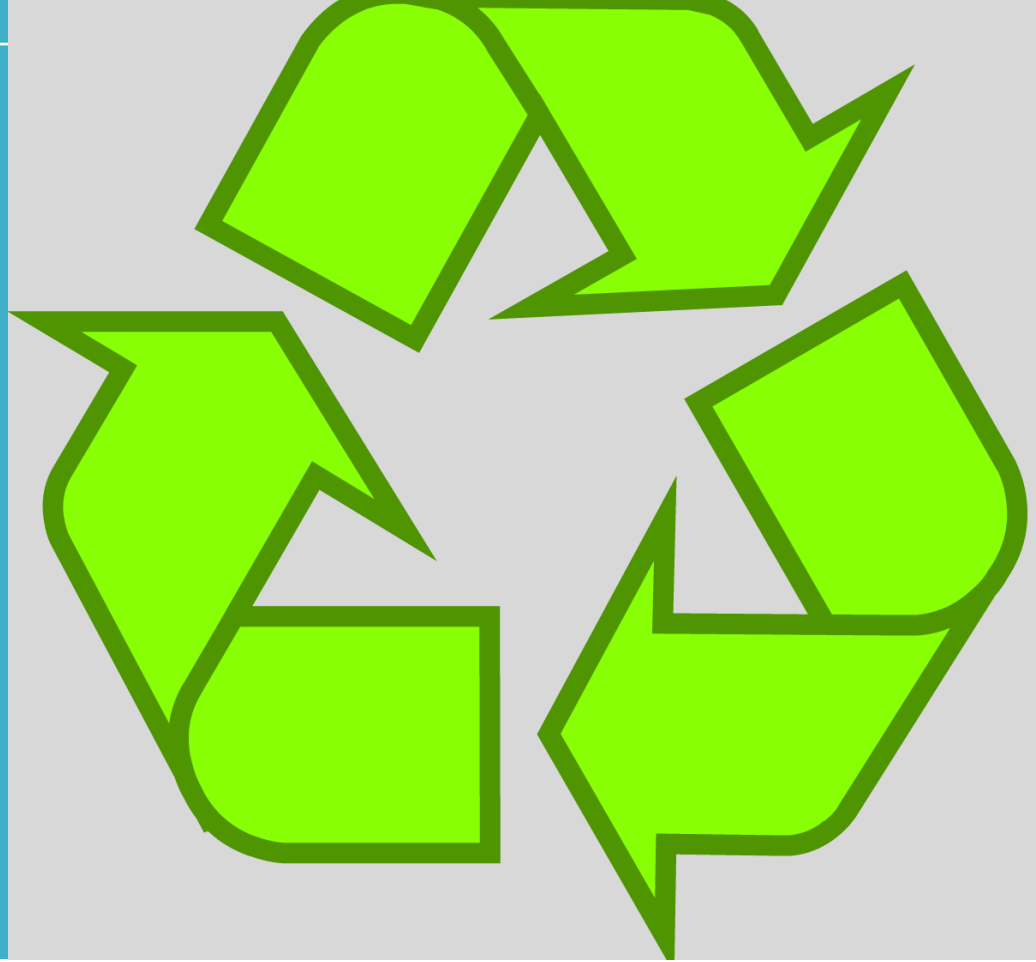
SOLAR PANELS

Photovoltaic (PV) panels are identified to be the most rapidly growing e-waste stream in Victoria in future years. This stream is estimated to be growing from around 550 tonnes in 2014, 0.5 per cent of all e-waste generated in Victoria, to around 25,000 tonnes by 2035, about 24 per cent.

Jurisdictions across Australia are currently working alongside the PV sector to develop a national product stewardship approach for PV systems. It is anticipated that through a stewardship approach, consumers will be able to dispose of end-of-life systems in a safe and environmentally sustainable way.

Source: DELWP (2017) Managing e-waste in Victoria – Policy impact assessment; Page 12.

WHAT THESE MATERIALS HAVE IN COMMON



MARKET DEVELOPMENT CHALLENGES: COMMON THEMES

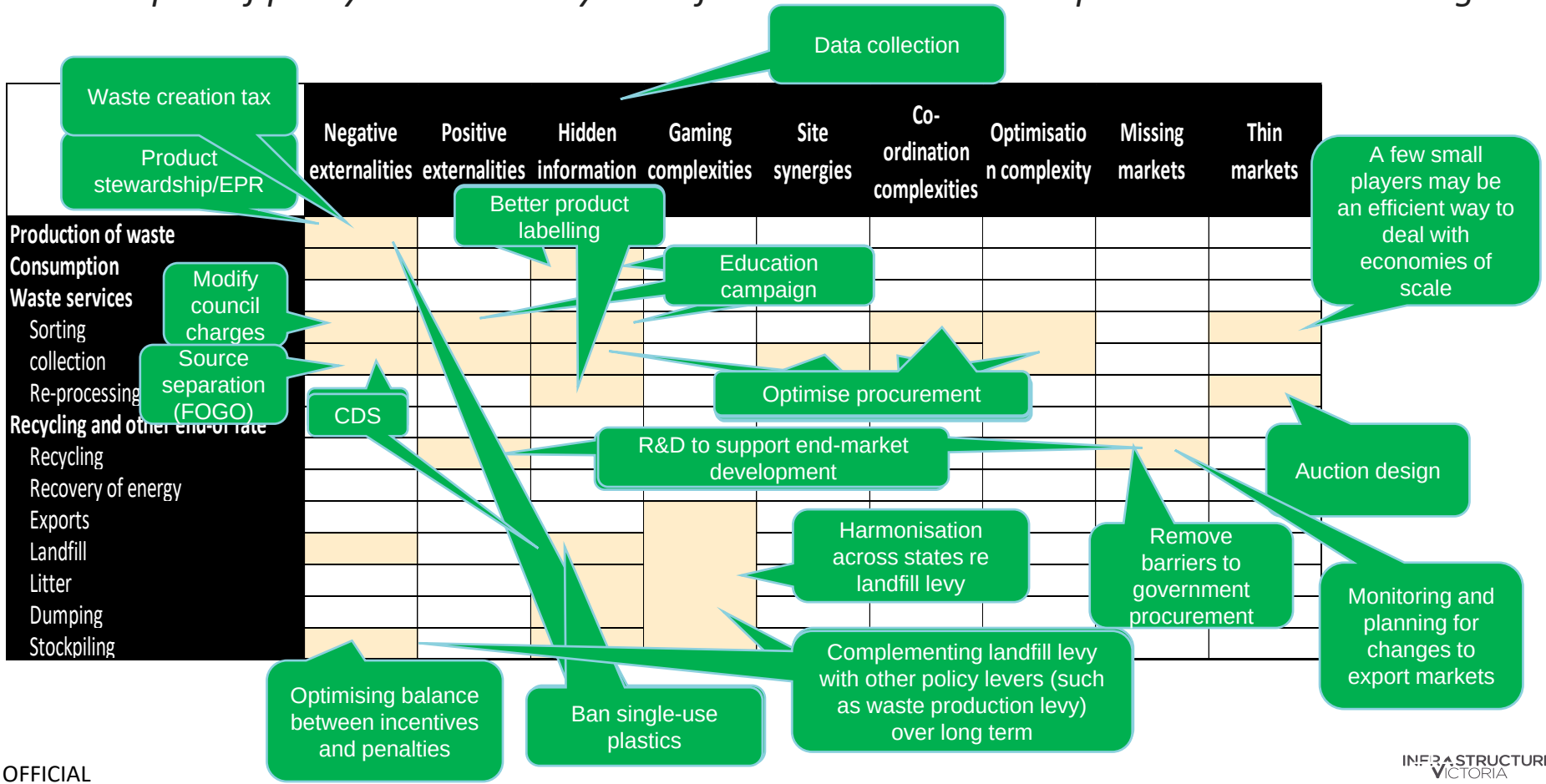
A number of market development challenges are common across material types, as shown in this slide.

		Plastics	Glass	Organics	Paper & card	Tyres	E-waste
1	Competition with virgin materials: High costs associated with collections, transportation and reprocessing make virgin materials more cost competitive.	✓	✓	✓	✓	✓	✓
2	Lack of education results in consumers (especially MSW) disposing of items incorrectly – this is costly to undo further down the value chain.	✓	✓	✓	✓	✓	✓
3	Composite materials used in products are difficult/costly/uneconomic to separate (eg., paper and plastic in disposable coffee cups).	✓			✓		✓
4	Lack of demand for mixed materials (eg., mixed plastic, mixed paper) – no end-markets for these products, and export markets no-longer viable	✓			✓		
5	Challenges associated with materials collection (eg., co-mingled collections problematic for paper and glass, lack of drop-off points for E-waste, limited rollout of FOGO for organics)	✓	✓	✓	✓		✓
6	Concerns about quality of recycled products is a common theme across material types	✓	✓	✓	✓	✓	✓
7	Illegal disposal/legal stockpiling is a also a common theme (eg., plastic litter, fires caused by tyre stockpiles, legal stockpiling of glass when demand is low)	✓				✓	✓

The examples of policy levers shown in section 1 of this report (also shown in the next page), can also be used to address the market development challenges above.

Note that these are examples of possible policy levers, rather than recommendations. IV's final recommendations are set out in the final advice report.

Examples of policy levers already identified in section 1 can help address these challenges



USE OF POLICY LEVERS TO ADDRESS BARRIERS

Complementing landfill levy with other policy levers (such as waste production levy) over long term

The policy levers in the slide above can also be used to address barriers to market development discussed in this section, as shown below.

1. Competition with virgin materials: High costs associated with collections, transportation and reprocessing make virgin materials more cost competitive.
   - Waste creation tax
   - Product stewardship/EPR
2. Lack of education results in consumers (especially MSW) disposing of items incorrectly – this is costly to undo further down the value chain.
   - Better product labelling
   - Education campaign
3. Composite materials used in products are difficult/costly/uneconomic to separate (eg., paper and plastic in disposable coffee cups).
   - R&D to support end-market development
4. Lack of demand for mixed materials (eg., mixed plastic, mixed paper) – no end-markets for these products, and export markets no-longer viable
   - Monitoring and planning for changes to export markets
5. Challenges associated with materials collection (eg., co-mingled collections problematic for paper and glass, lack of drop-off points for E-waste, limited rollout of FOGO for organics)
   - Source separation (FOGO)
   - CDS
6. Concerns about quality of recycled products is a common theme across material types
   - Remove barriers to government procurement
   - Ban single-use plastics
7. Illegal disposal/legal stockpiling is a also a common theme (eg., plastic litter, fires caused by tyre stockpiles, legal stockpiling of glass when demand is low)
   - Optimising balance between incentives and penalties

Note that these are examples of possible policy levers, rather than recommendations. IV's final recommendations are set out in the final advice report.

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