March 2019

EXPANDED POLYSTYRENE

WORKING GROUP 2018

APCO

Contents

Executive Summary

APCO has been charged by Environmental Ministers in Australia to lead the 2025 National Packaging Targets. To progress towards these targets, the following areas will need to be addressed:

- **Packaging design** will need to ensure that it is suitable for recovery through either reuse, recycling or composting
- **Infrastructure** will need to be available for the collection and recovery of all packaging types through either reuse, recycling or composting
- **End markets** will need to be strengthened to support the recycling industry
- **Consumers** will need to be informed and educated about the correct recovery channel for all packaging.

In 2018 APCO convened five working groups to investigate barriers and opportunities to improve the recovery of five 'problematic' packaging materials: glass, polymer coated paperboard (PCPB), soft plastics, biodegradable and compostable packaging, and expanded polystyrene (EPS). The groups worked to establish a shared understanding of the problem and to identify projects to be undertaken by stakeholders in the packaging value chain to support achievement of the 2025 National Packaging Targets for each material category.

The identified projects have been reviewed, prioritised and combined with other initiatives to develop projects for implementation in 2019. Priority projects for implementation in 2019 are summarised in Table 1. The individual projects aim to support the achievement of the 2025 National Packaging Targets by addressing packaging design, consumer engagement, recovery systems and end markets.

The issues for this material include:

- Relatively low recovery rates
- Space taken up in landfill due to its low density (not reflected in landfill charges, which are based on weight) and inhibiting compaction of waste in landfill
- Costs to local government of handling EPS in landfill
- Impacts within the litter stream as it easily breaks down into small pieces.

The EPS Working Group 2018's (the Working Group) vision is for EPS packaging to be recycled and reused wherever viable and sustainable (we note that composting is not a possible solution for EPS at this stage). In many applications, EPS could be phased out and replaced with a more traditionally recyclable alternative. There must be sustainable end-markets that achieve the highest potential environmental value for recovered EPS (Figure 1) including greater local processing facilities.

To achieve the recovery targets, all consumers must have access to a convenient drop-off or collection point for EPS, for example through local government resource recovery facilities and/or producer/retailer take-back schemes. The Working Group proposes at least one drop-off site in each local government area.

As seen internationally, if voluntary industry and government efforts to reduce and recover EPS are not successful – i.e. if targets are not being met – packaging/product or landfill bans should be considered.

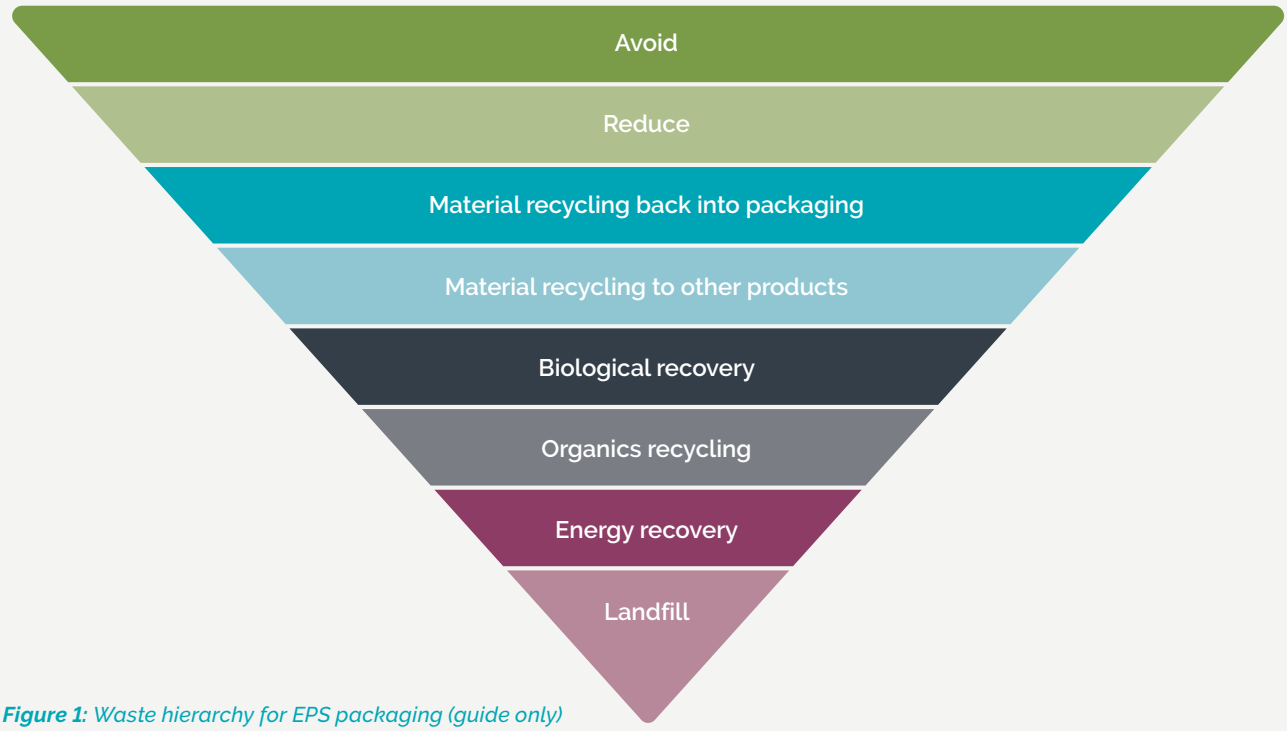

Figure 1: *Waste hierarchy for EPS packaging (guide only)*

Key themes that emerged from the Working Group include:

- The need for more accurate and detailed data on packaging consumption and recycling
- Suggestions for reduction or elimination of problematic and unnecessary packaging
- Additional resources to support sustainable packaging design and procurement
- Consumer education on packaging reduction and correct recycling
- The need for targeted industry education on packaging design, procurement and recycling
- Collection and recycling infrastructure gaps and lack of local end markets
- Government procurement to support end market development

This report has been prepared by APCO in collaboration with the APCO EPS Working Group 2018. The purpose of this document is to analyse the current status of EPS packaging materials and propose projects to increase the recovery of these packaging materials.

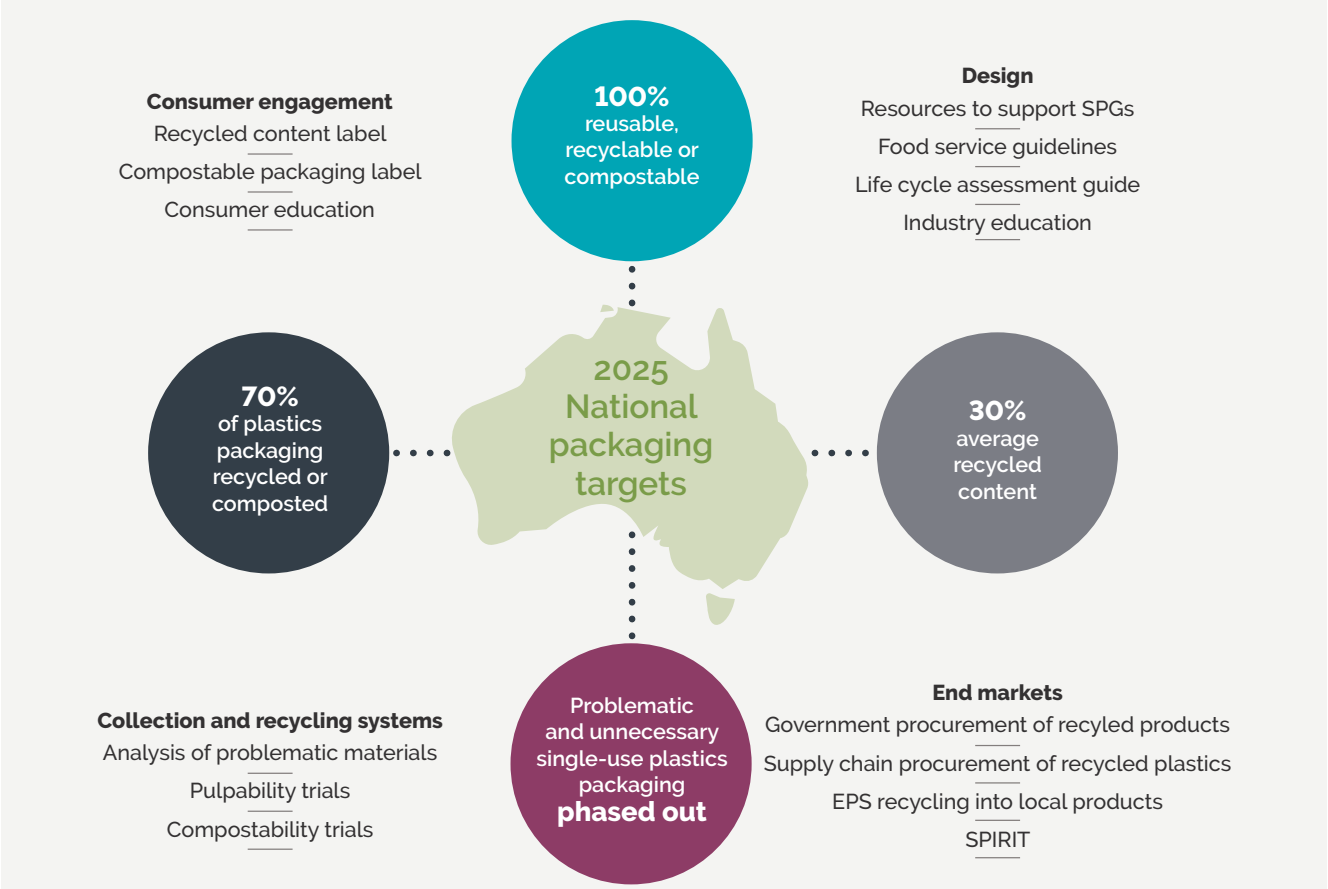

Figure 2. *Projects linked to the National Packaging Targets*

Table 1. *APCO's priority projects for 2019*

PROJECT NAME	DESCRIPTION	APCO 2019 WORKING GROUP
1. Packaging baseline data	1.1 Packaging consumption and recycling	National Packaging Targets Implementation (NPTI)
	1.2 Infrastructure mapping	
	1.3 Economic analysis of alternative collection systems and end markets	
2. Public statements on specific materials	Public statements on outcomes of previous 5 working groups	
3. White paper on problematic and unnecessary packaging	Paper to identify target products/materials and build the case for phase-out	
4. Options to standardise recycling systems	Modelling strategic options to facilitate achievement of the 2025 NPT	
5. Resources to support the Sustainable Packaging Guidelines	5.1 Quickstarts: (i) recovery pathways, (ii) glass, (iii) PCPB, (iv) EPS, (vi) PET, (vii) labelling	Design
	5.2 Design for soft plastics packaging (build on CEFLEX)	
	5.3 Design for compostable packaging	
	5.4 Wine packaging guidelines	

PROJECT NAME	DESCRIPTION	APCO 2019 WORKING GROUP
6. Food service packaging guidelines	Engagement workshops, guidelines & case studies	Design
7. Compostable packaging label	New label to align with the Australiasian Recycling Label (ARL)	
8. Recycled content label	New label to align with the ARL	
9. Life cycle assessment (LCA) guide	Database and guidelines	
10. Consumer education	How to recycle – including the ARL	Systems & Education
11. Analysis of problematic packaging materials	Trials to investigate specific issues	
12. Pulpability trials	Trials to investigate pulpability of polymer coatings, non-wood fibres etc.	
13. Packaging supply chain training	Training in collaboration with AIP on PSF – including SPG, PREP/ARL	
14. Models for phase out of single use plastics	Working with Boomerang Alliance on council / community case studies to reduce/replace plastics	
15. Composting trials	Research to analyse compostability of different certified materials	
16. Regional model for soft plastics recycling	Working with Plastic Police to evaluate and document a regional collection and market development model	
17. Remote/regional waste collection partnerships	Workshop on potential partnership-based solutions to packaging waste collection in remote and regional Australia	
18. Government procurement of recycled products	Guide on buying recycled including case studies and technical information	Materials Circularity
19. Supply chain procurement of recycled plastic products	Case studies with APCO Members to identify end market opportunities for soft plastics	
20. EPS collection and end market pilot	Working with EPSA to document and share a model to collect and reuse EPS in waffle pods	
21. Sustainable Packaging Information and Resource Interactive Terminus (SPIRIT)	Resource to help industry and government make sustainable purchasing choices	
22. Innovation Hub	Driving innovation in Australia to address the future of sustainable packaging	

Definitions

Polystyrene is made from the styrene monomer, a liquid hydrocarbon that is commercially manufactured from petroleum by the chemical industry. For the purpose of this report, expanded polystyrene refers to all foamed polystyrene:

Table 2. *Definitions relevant to EPS Packaging*

TERM	DEFINITION
Design	Includes choice of materials, additives, colours, labels, glues, inks, caps and closures, format, dimensions, etc.
Expanded polystyrene (EPS)	Made using a polymerisation process that produces translucent beads of polystyrene. Expansion occurs when a low boiling-point hydrocarbon, e.g. pentane gas, is added to the material and the material is steamed. Beads are placed within a mold and re-steamed. Beads expand further to fill the mold and fuse together. Once molded, 98% of the EPS volume is air.[1,2]
Foamed polystyrene	Extruded polystyrene sheet packaging is made by injecting molten polystyrene with a blowing agent as its being extruded through a dye. It can then be thermoformed into trays
Highest potential environmental value	Recovery is occurring at the optimal level of the waste hierarchy, based on available recovery systems and sustainability impacts of alternative recovery options (e.g. composting vs. recycling, or recycling vs. energy recovery). Reuse is encouraged prior to recovery when there is evidence that it extends the life of the packaging and achieves positive sustainability outcomes.
Material Recycling	Reprocessing, by means of a manufacturing process, of a used packaging material into a product, a component incorporated into a product, or a secondary (recycled) raw material; excluding energy recovery and the use of the product as a fuel.[3]
Recyclable	In a particular geographical area, at least 80% of the overall population has convenient access to a service that collects the packaging or packaging component, and that this item can be recovered and sorted in a stream where at least 70% of its weight can be recycled into another product. This should consider its design, manufacturing process and most likely way of using, disposing and collecting it.
Recycled content	The proportion, by mass, of pre-consumer and post-consumer recycled material in packaging (AS/ISO 14021). 'Pre-consumer' material is material diverted from the waste stream during manufacturing (excluding rework). 'Post-consumer' material is material waste generated by households or by commercial, industrial and institutional facilities. The amount of renewable or recycled material is expressed as a percentage of the quantity of packaging material put onto the market.
Recycled packaging	Packaging is 'recycled' if at least 70% of its weight is recycled (as per Material Recycling definition) into a product, a component incorporated into a product, or a secondary (recycled) raw material; excluding energy recovery.[4]
Recycling	Includes both material recycling (maintaining material structure) and chemical recycling (e.g. breaking materials down into more basic building blocks). It explicitly excludes technologies that do not reprocess materials back into materials but into fuels or energy.
Reusable	A characteristic of packaging that has been conceived and designed to accomplish within its life cycle a certain number of trips or uses for the same purpose for which it was conceived.
Waste hierarchy	Places the highest priority on avoidance (action to reduce the amount of waste generated) followed by resource recovery (reuse) followed by recycling, reprocessing and then energy recovery, consistent with the most efficient use of the recovered resources; and finally, disposal in the most environmentally responsible manner.

[1] *Expanded Polystyrene Australia (EPSA), 2018. About EPS. Available at:* ***http://epsa.org.au/about-eps/***
[2] *Corrosionpedia, 2018. Expanded Polystyrene (EPS). Available at:* ***https://www.corrosionpedia.com/definition/2473/expanded-polystyrene-eps***
[3] *APCO, 2019. Sustainable Packaging Guidelines.*
[4] *APCO, 2019. Sustainable Packaging Guidelines*

Scope

The scope of this report includes all EPS packaging. Expanded polypropylene (EPP) and expanded polyethylene (EPE) are also considered, where relevant. Significant volumes of EPS are used in long-term applications, such as building insulation panels and waffle pods for the housing construction industry and engineering/manufacturing components, however these applications are out of scope for this project.[5]

Building products are relevant, however, as potential end markets for recovered EPS. The primary focus for this groups was on the problematic and unnecessary packaging formats which can be avoided or replaced (Table 3). These were identified as single-use food packaging, consumer fresh produce packaging and loose fill 'peanuts'.

Table 3. *EPS packaging types*

PACKAGING FORMAT	DESCRIPTION	EXAMPLES
Single-use food packaging	Consumer packaging to insulate hot or cold food (e.g. hamburgers, noodles, ice cream) or beverages. Distributed by quick service restaurants (QSR), food halls, cafes etc.	Foam coffee or juice cups, foam trays and clamshells.
Consumer fresh produce packaging	Consumer packaging used to sell products in retail stores.	Foam meat and fresh produce trays.
Business-to-business (B2B) fresh produce boxes	B2B packaging to distribute fresh produce to supermarkets, restaurants etc. Used to provide insulation and cushioning to fresh or frozen foods vulnerable to temperature and/or impact.	Boxes for broccoli, beans, seafood, etc.
Loose fill EPS 'peanuts'	Used to prevent movement and for cushioning in consumer and B2B packaging.	On-line retail sales, e.g. loose fill in cardboard boxes.
Dry bulky goods packaging	Moulded packaging to prevent movement and protect electrical and electronic products, furniture, homewares etc. Used for consumer and B2B products.	Protective packaging for white good and electronics, e.g. computers, TVs, printers, fridges, toasters.
Specialist applications	Used for insulation and/or cushioning for transport or storage.	Organ transport, temperature-controlled pharmaceuticals, etc.

[5] *Expanded Polystyrene Australia, 2018. Summary of EPS Recycling and Sustainability.*

Stakeholder Identification

Table 4 depicts the key groups across the packaging value chain that will need to be engaged in the design or implementation of the identified projects.

Table 4. *Key stakeholder groups across the packaging supply chain*

STAKEHOLDER	DRIVERS	CHALLENGES
Householders	Lack of space in rubbish bins to dispose of used EPS, high litter presence	No easy access to drop-off points, misunderstanding of recyclability
Large consumers e.g. institutions	Cost of landfill disposal driving recovery solutions	Costs of collection & recycling
Understanding the business case (collection vs landfill costs)		
Councils	Provide recycling solutions for residents, costs of managing EPS in landfill, costs of managing litter	Costs of installing/operating an EPS machine at resource recovery sites
Unsupervised drop-offs leading to contamination		
Brand owners (sectors such as electronics, furniture, food and beverage, etc.)	Product protection, Sustainability / recycling targets, Meet consumer expectations for recyclable packaging – some transitioning to other materials	No viable alternatives to EPS in some applications
Retailers	As above, plus cost of landfill disposal	Contamination (e.g. supermarkets) Cost of installing / operating an EPS machine
EPS recyclers	Strong market for clean, source separated EPS	Contaminated waste streams (more expensive to process, lower value markets), logistics / costs of collection
State and Federal government	Litter costs & space in landfill	Low weight means it is hard to get on the agenda (generally judged by volume)
Industry associations representing waste and recycling companies	Reducing costs and increasing opportunities for members	Low weight means it is hard to get on the agenda (generally judged by volume), mixed waste streams.

Materiality Statement

The national recycling rate for EPS is relatively low at an estimated 29%.[6] A report commissioned by ACT NoWaste summarised the problem for EPS as:

"EPS is inert in landfill and last for hundreds of years. However, it occupies a large volume (space) in landfill for a long time. Positively, it is recyclable and there is a market demand for it in Australia and offshore; however collection costs are often greater than landfill costs."[7]

The key challenges for EPS and other foamed plastics include:

- **Challenges in landfill:** While EPS only makes up a small percentage of solid waste to landfill, it takes up a lot of space and inhibits the compaction of waste. These problems and associated costs to local government are not reflected in landfill disposal costs
- **Impacts in litter:** EPS is one of the most common materials found in illegally dumped rubbish. In the litter stream EPS is a particular problem because it is lightweight and easily breaks down into small pieces
- **Limited collection network:** EPS is generally not collected through kerbside systems and the network of drop-off points are fragmented and not accessible by all consumers. Logistics are relatively expensive due to the high volume-to-weight ratio
- **Economics of disposal:** It is cheaper for a consumer to landfill EPS than pay for recycling
- **Quality of collected materials:** High levels of contamination in many commercial and industrial sources reduces its commercial value
- **Alternative materials:** Some users are switching from EPS to alternative foams such as EPE and EPP, which are less recyclable
- **End markets:** There are limited local markets for recovered EPS (most is exported at present)
- **Consumer engagement:** There is a high level of consumer frustration as they do not know if or how to recycle EPS

Some manufacturers and customers have switched from EPS to more recyclable materials (e.g. moulded pulp or cardboard), but there is currently no commercially viable alternative for some electronics and some fresh produce that require the unique insulation and shock absorption properties of EPS. This limitation reinforces the need for stronger collection and recycling systems for EPS as elimination via alternatives may not yet be technically feasible.

[6] *Envisage Works, 2016. National Recycling and Recovery Survey (NRRS) 2015-16 for plastics packaging (IND 299/16).*
[7] *One Planet Consulting, 2018. The recovery of expanded polystyrene in Australia: current situation and future opportunities. Extract from report to ACT government available for public use, p.15*

Key Priority Areas

The key priority areas to be addressed include:

1. **Develop a stronger knowledge base:** Provide a stronger knowledge base for system-wide decision-making including consumption, where EPS waste is being generated and local markets.
2. **Phase out unnecessary packaging:** Promote a voluntary phase-out of 'unnecessary and problematic' packaging formats, i.e. where there are more sustainable alternatives (e.g. food service packaging).
3. **Rethink packaging design:** Ensure that all EPS is designed for recycling and utilises recycled content where possible.
4. **Expanded collection network:** Increase the number drop off sites to address collection and logistic issues. Ensure appropriate compaction technologies for end markets to ensure efficiency.
5. **Support market development:** Support the development of local end markets, e.g. waffle pods and pelletisation, to enable local manufacture of skirting board, picture frames, concrete panels, or commodity export.
6. **Investigate incentives for recycling:** Explore the potential for landfill disposal fees for EPS based on volume rather than weight, to reflect full costs and impacts
7. **Improve consumer education:** Promote EPS recycling opportunities to consumers and waste generators.

Consumption

a. Main product applications or sectors

EPS is lightweight, durable, thermally efficient and versatile. It also has exceptional shock absorbing characteristics, making it ideal for the storage and transport of fragile and expensive items such as electronic equipment, wine, chemicals and pharmaceutical products. The thermal insulation and moisture resistant properties of EPS enable shelf life extension of perishable products such as soft fruits, vegetables and seafood. EPS can be produced in a wide range of densities, providing a varying range of physical properties. These are matched to the various applications where the material is used to optimise its performance and strength.[8]

[8] *Expanded Polystyrene Australia, 2018. EPS in Packaging. Available at:* ***http://epsa.org.au/about-eps/eps-in-packaging/***

b. Total amount consumed in Australia

There are major data gaps in the amount of EPS that is consumed in Australia. Estimated consumption is 71,000 tonnes, growing at a rate of 5% per annum. This consists of:

- 47,000 tonnes - domestic manufacture from imported resins, of which 70% is used in the built environment and 30% for packaging. Of the 30%, approximately half is exported as fresh food packaging. This data, sourced from the industry association Expanded Polystyrene Australia (EPSA), is considered to be reasonably accurate.
- 24,000 tonnes – high level estimate of EPS imported as packaging with products.[9]
- 3,000 tonnes – EPS reprocessed and used locally.[10]

The total amount of EPS packaging consumed in Australia each year is estimated to be 44,000 tonnes, broken down in to applications of:

- 20,000 tonnes for packaging of electrical and electronic products.
- 24,000 tonnes for other packaging.[11]

Obtaining data on the amount of imported EPS packaging associated with imported white goods and electrical/electronic goods, is historically difficult. The data is based on assumptions about the proportion of imported white goods and household items containing EPS packaging, with the number of imported white goods and household items estimated from customs import data.

The growing demand of EPS foam in Australia is associated with food chain quality and safety, high value building products and overseas demand for Australian fresh food stuffs.[12]

Recent EPS consumption trends in Australia include:[13]

- Replacement of some EPS 'peanuts' with PLA, which causes confusion about recycling
- Declining or stable markets for dry goods packaging, e.g. electronics and furniture. Companies like Dell and Apple have replaced EPS with alternatives such as cardboard, fungi or bamboo
- EPS food packaging (business-to-business) growing at around 5% per year in line with food production and exports
- Some retailers replacing EPS produce boxes for fruit and vegetables with reusable plastic crates

c. Local manufacturers

There are approximately 40 companies nationally that are involved in direct conversion/ manufacturing of EPS. The sector employs around 1000 people nationally and has an estimated industry revenue of AU$200-300 million.[14]

[9] Envisage Works, 2016. National Recycling and Recovery Survey (NRRS) for Plastic Packaging.
[10] Graham Attwood (EPSA), 2018. EPS: Summary, Metrics and Overview.
[11] Envisage Works, 2016. National Recycling and Recovery Survey (NRRS) for Plastic Packaging.
[12] Graham Attwood (EPSA), 2018. EPS: Summary, Metrics and Overview.
[13] One Planet Consulting, 2017. Preliminary regulatory impact statement for recycling scheme for expanded polystyrene in the ACT. Report to ACT Government
[14] Expanded Polystyrene Australia, 2018. Summary of EPS Recycling and Sustainability..

Reuse, Recovery & Recycling

a. Reuse systems

Reuse is common in some applications. The durability of EPS allows it to be continually reused, particularly in the transportation of fresh or frozen foods. However, issues arise with reuse transportation costs – despite being incredibly lightweight, EPS has a considerable volume. Reuse is not practical for most take-away packaging or white goods/electronics packaging.

b. Collection systems for recycling

Kerbside: EPS is generally not collected for recycling at kerbside in Australia. EPS poses issues in the Material Recovery Facility (MFR) as it can break into tiny pieces that contaminate other streams and cause litter issues.[15] An exception has been seen by some councils, such as Lismore Council in NSW (now ceased), which allowed residents to add EPS to their yellow bin in a separate bag for separation at the MRF.[16]

Drop-off: Many councils provide a drop-off facility for EPS from households, including Community Recycling Centres (CRCs) in NSW. Some EPS manufacturers and companies also provide drop-off facilities or collect bulk quantities of waste EPS for recycling.

Commercial: Current commercial collection services include:

- Manufacturer product stewardship take back programs, which offer a free backhaul customer service as a value added service[17]
- Logistics operator backhaul service for EPS packaging from retail customers
- Retailers and warehouses source separate their EPS into bags or cages for collection by a commercial business. Compactors or extruders can also be rented by the commercial business to assist with collection volumes and capacity.

c. Collectors and recyclers

There is a small number of collectors and recyclers across Australia. An industry 'Code of Practice/ Guidelines' for collection and drop-off has been published by EPSA. This encourages collection of a clean stream of EPS to increase the value of the recyclate. EPS recycling is challenging due to volatile recyclate market prices, with pricing swings from $250 - $800 per tonne over a 12-month period. The typical break-even position is $400 per tonne. Education of consumers and businesses on reducing contamination when recycling is vital to assist with meeting these quality requirements. Contaminants include coloured EPS, strapping or tape, labels and food residue or contamination.[18] Transport logistics and double handling dominate the cost equation; packaging is being returned empty for reuse or processing. Processing can also require additional sorting time; a separate sorting chute and additional storage space in recovery facilities due to EPS's voluminous attributes, as well as potential additional space required by the customer. Market demand and prices for collected EPS are influenced by:

- Quality and cleanliness of recyclate
- Consolidation/aggregation from multiple sources
- Bulk density for optimal containerisation for export
- Logistics optimisation e.g. through back loading
- Shared asset utilisation i.e. recycling equipment.[19]

[15] *Planet Ark – Recycling Near You, 2018. Polystyrene: Drop off facilities for polystyrene. Available at:* ***https://recyclingnearyou.com.au/polystyrene***
[16] *Kevin Trustum (Lismore City Council), 2018. Glass recycling: trials and tribulations, the Local Government Experience. Available at:* ***https://az659834.vo.msecnd.net/eventsairaueprod/production-impactenviro-public/c94a8c1282e74d808d893d6d0432cddd***
[17] *Ecycle solutions, 2018. EPS & e-waste recycling services. Available at:* ***http://www.ecyclesolutions.net.au/***
[18] [19] *Expanded Polystyrene Australia, 2018. Summary of EPS Recycling and Sustainability.*

d. Recycling technologies

Following segregation and collection, recycling EPS involves densification and reprocessing. Table 5 provides a summary of recycling technologies.[20] An overview of the domestic recycling process is provided in Figure 3.

Table 5. *Summary of recycling technologies for EPS*

RECYCLING TECHNOLOGY	DESCRIPTION
Generic densification technology	Includes the following steps: • Granulation: Size reduction from original packaging/construction component into millimeter particle size – no reduction in bulk density.
	• Compaction-physical compression: Significant bulk density reduction 20g/l to 200-400g/l depending on technology/proprietary equipment. Uniform/regular dimensions amenable to containerisation for export.
	• Melt extrusion: thermal and physical processing resulting in further density increases over compaction – typically 500-700g/l. Finished product uniformity is sub-optimal for containerisation.
	• High temperature melt extrusion: Similar physical processing to above but with higher temperatures resulting in glass-like recyclate at densities close to GPPS resin – typically 800-900g/l. This method produces a denser product, making transport more efficient.
	Issues identified here are the by-product of densification being a fine powder that can be a health hazard if inhaled.
Densification and on-shore recovery	Densification, compaction and use as polymer component for Australian-made structural products (garden/park benches, fence posts, gates). See Figure 3 Onshore recycling of EPS via densification process.
Densification and off-shore recovery	Densification, compaction and exportation (e.g. China, Korea, Turkey) for use as a virgin raw material substitute in extruded general purpose PS product lines – picture frames, CD/DVD cases, fashion hangers etc.
Granulation of clean EPS and on-shore recovery	Clean recycled EPS generated on shore can therefore replace virgin material – a potential market that is only at investigation stages in Australia. Recycled EPS can then be exported as a product, rather than a waste. This could support local markets such as the manufacturing of waffle pods. Considerations for this technology include: the need for significant volumes to ensure viability of processing, and potential impacts on air pollution from the process creating crumbed/fine EPS.
Developing technologies	A recycling technique has been developed which uses a natural solvent, limonene, to shrink expanded polystyrene by 1/20th of its size[21]. A moulding technology has allowed for the use of recycled EPS in waffle pods, this estimated to be able to consume 30% recycled EPS locally without the need for compaction or melting.

Unlike some other plastics, there is anecdotal evidence that EPS has not been impacted by the Chinese import restrictions. Export markets for EPS include South Korea and Turkey.

[20] *Expanded Polystyrene Australia, 2018. Summary of EPS Recycling and Sustainability.*
[21] *Noguchi, Miyashita, Inagaki, Watanabe (1998) A new recycling system for expanded polystyrene using a natural solvent. Part 1. A new recycling technique. Packaging Technology and Science, 11: 19-27. Available at:* ***https://onlinelibrary.wiley.com/doi/pdf/10.1002/(SICI)1099-1522(199802)11:1%3C19::AID-PTS414%3E3.0.CO;2-5***

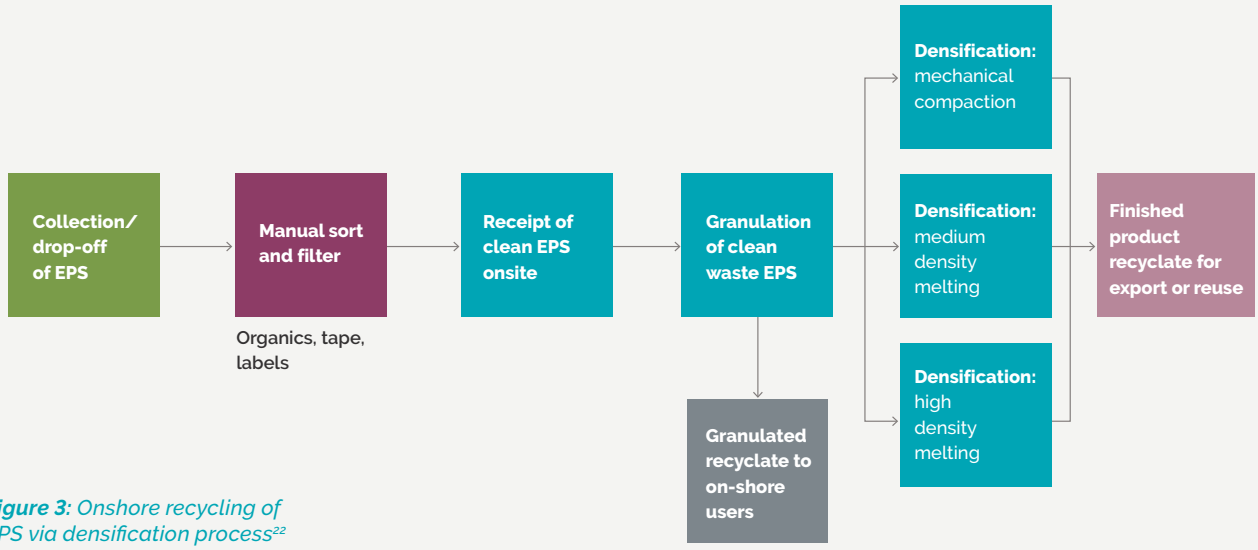

Figure 3: *Onshore recycling of EPS via densification process*[22]

There is no single 'best technology' to recycle EPS. The optimal technology is dependent on a range of factors including:

- Supply rate of EPS input
- Quality of EPS source (seeking lowest possible contamination rates)
- Power availability and cost variation
- Labour availability and cost
- End market and logistics (e.g. containerisation efficiency versus domestic re-use)
- Rate of equipment efficiency and reliability improvements are increasing rapidly
- Supply variations due to available quantity.[23]

e. Amount recycled

There are different estimates of the amount of EPS that is recycled:

- EPSA estimate 3,000 tonnes recycled locally and 6,000 tonnes exported for recycling[24]
- The National Recycling and Recovery Survey for 2015-2016 has estimated 1,800 tonnes are recycled locally and 5,100 tonnes exported for recycling. This forecasts a recycling rate for EPS packaging in Australia at 29%.[25]

In 2011, the NSW EPA reported that less than 10% of EPS was recycled in NSW, being one of the most poorly recycled plastics in the state. It estimated that 12,000 tonnes of EPS is disposed to landfill each year, taking up 240,000 cubic metres of landfill space.[26] In 2015-16, recycling rates for EPS in the ACT were less than 20%, with 500m^3 going to landfill. This has an estimated cost of AUD$3.5 million per year.

Although EPS recycling technologies appear well-understood, the economics are challenging due to volatile prices for recyclate. The majority of recycling operations operate in isolation, and limited collaboration contributes to high logistics costs. There are opportunities for increased recycling, with growing on-shore markets and volumes, as well as the development of new product applications using recycled EPS. Local reprocessing facilities and end markets remain relatively small and need significant support to grow.[27]

[22] *Expanded Polystyrene Australia, 2018. Summary of EPS Recycling and Sustainability.*
[23] *Expanded Polystyrene Australia, 2018. Summary of EPS Recycling and Sustainability.*
[24] *Graham Attwood (EPSA), 2018. EPS: Summary, Metrics and Overview.*
[25] *Envisage Works, 2016. National Recycling and Recovery Survey (NRRS) for Plastic Packaging.*
[26] *NSW EPA, 2017. What can my business recycle? Expanded Polystyrene. Available at:* ***https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/business-government-recycling/what-can-business-recycle/expanded-polystyrene***
[27] *Expanded Polystyrene Australia, 2018. Summary of EPS Recycling and Sustainability.*

Lifecycle Approach

In analysing the lifecycle approach, the Working Group discussed ten potential project opportunities. The proposed projects address issues across the EPS packaging lifecycle and value chain to ensure system-wide engagement and collaboration (Figure 4).

The identified projects have been reviewed, prioritised and combined with other priority initiatives to develop projects for implementation in 2019. Priority projects for implementation in 2019 are summarised in Table 1.

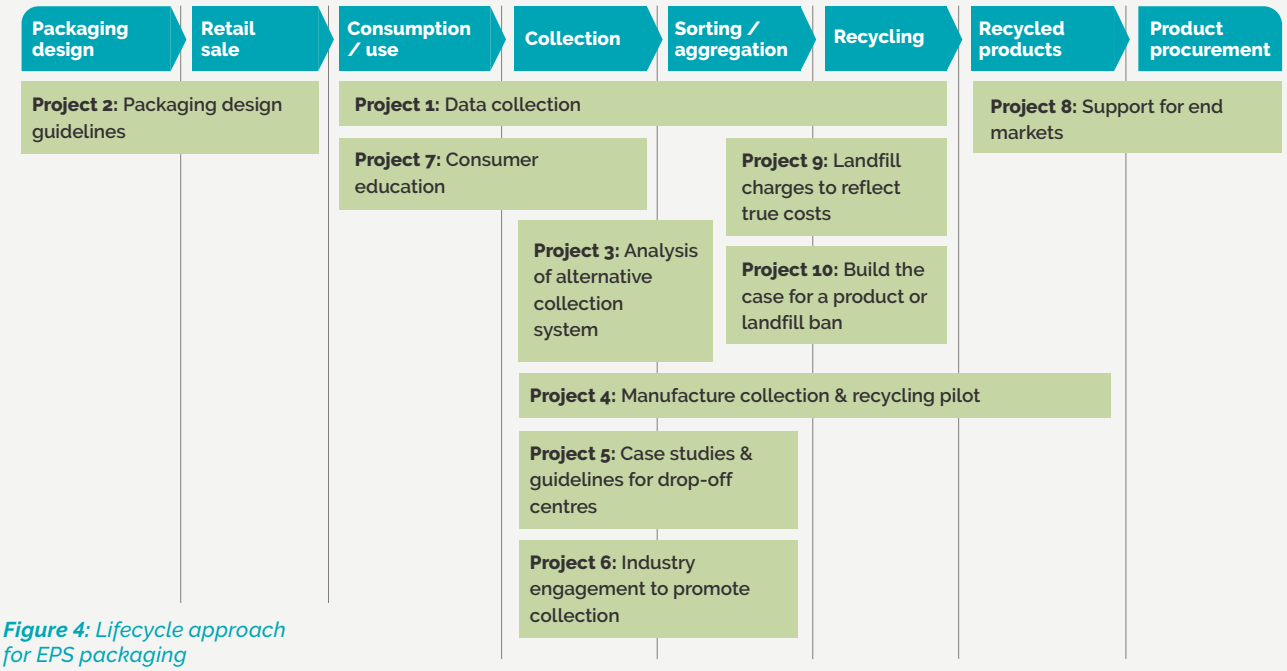

Figure 4: *Lifecycle approach for EPS packaging*

Conclusion

a. Conclusions

1. Accurate consumption, recycling and landfill data is needed to validate EPS as a priority waste issue and to determine the potential for increased collection and recycling.
2. EPS will continue to be used where it provides the best protection, e.g. for electronics and some fresh produce, but it could potentially be phased out where there are more sustainable alternatives that have a current collection and recycling system e.g. in food service packaging.
3. Collection systems for EPS are limited and need to be expanded to provide a more convenient recycling option for consumers and to address collection and logistic issues. For households, this could be through kerbside collection or more drop-off facilities at council sites.
4. There is significant potential in the commercial and industrial sectors for more reuse and recovery through greater collaboration.
5. There is potential to use more recycled EPS locally e.g. in waffle pods, skirting board, picture frames and concrete panels.

b. Knowledge and data gaps

- The quantity of EPS that comes into Australia as packaging with imported products
- Estimated mass and volume of EPS in landfill
- Economic cost-benefit analysis and lifecycle assessment of recycling vs landfilling EPS
- Consumer awareness and knowledge of EPS recycling
- The number and location of collectors and recyclers in Australia
- The critical mass (population and infrastructure) that needs to be reached to encourage individual collection and recycling development
- Litter impact if collection and recycling of EPS was implemented for consumers
- Viability of alternatives to EPS
- International approaches to EPS recycling, e.g. in South Korea and Japan, that could inform approaches in Australia.

To contact APCO please visit our website
www.packagingcovenant.org.au

APCO