Circular Australia

UTS Institute for Sustainable Futures

Plastic Pipes and the Circular Economy

An Australian Perspective

NOVEMBER 2025

PIPA PLASTICS INDUSTRY PIPE ASSOCIATION OF AUSTRALIA LIMITED

Authors

Simran Talwar ISF, UTS
Benjamin Madden ISF, UTS
Clare Perry ISF, UTS
Josie Toakley, ISF, UTS
Lisa McLean, CEO Circular Australia

Published in November 2025 by Circular Australia, PIPA & UTS

Acknowledgement to Aboriginal people

We acknowledge the traditional custodians of Country and pay our respects to Elders past, present, and emerging. We recognise that our built environment and activities are on Aboriginal land and commit ourselves to thoughtful, inclusive, and respectful ongoing management of these places.

1. Table of Contents

2. Executive Summary

Plastic pipes are long life products designed to last more than 100 years and have been used in Australia to provide critical infrastructure since the 1950s, with manufacturing in Australia commencing in the 1960s.

Not all plastics are the same.

Plastic pipes are engineered products which deliver essential services to our homes and communities. They harness the strength and longevity of plastics to provide critical infrastructure. Distributing drinking water, gas and electricity, they protect the network of wires and cables that provide electricity, internet and telephone services. They are widely used in irrigation systems for food production and in industrial applications for resource recovery. They safely convey sewage and stormwater, protecting the health of our communities and waterways.

Plastic pipes inherently demonstrate strong alignment with a circular economy whole of lifecycle approach.

Unlike single use plastics, these engineered infrastructure pipe products provide service life of over 100 years and are designed to remain in use for as long as possible at their highest value.

Circularity is more than recycling.

The Australian plastic pipe industry has a strong track record of aligning with key circular economy "higher" circularity strategies through their long service life, reduction of material use, sustainable procurement, innovative product redesign and capacity for in-situ reuse and repair.

Recycling should only be considered as a last resort after other higher circular strategies have been exhausted. PVC, PE and PP plastic pipes are perfectly suited to recycling, being able to be fully recycled at end-of-life.

Existing product stewardship industry initiatives.

Aligning with circular economy framework including product stewardship programs, pilot recycling schemes, product standards, and manufacturer-led environmental systems.

Most plastic pipes used in Australia are manufactured in Australia.

The Australian market size for plastic pipes is 165,000 to 185,000 tonnes of PVC and 190,000 to 200,000 for Polyolefins (PE and PP) pipes. The vast majority of plastic pipes are made in Australia.

Use of recycled material is longstanding.

The Australian plastic pipe industry actively uses recycled material when manufacturing new products and measures pre-consumer and post-consumer recycled material used. It is standard industry practice to reintroduce manufacturing rework material (scrap) back into the production process, reducing waste and improving resource efficiency. In line with international definitions, rework is not included in recycling data.

Volumes of pre-consumer and post-consumer recycled materials used are currently low, significantly limited by availability.

Most Australian plastic pipes, with lifespans of 100+ years, are still in their first lifecycle and their geographically diverse and often underground installation make recovery challenging. Supply chain schemes to collect offcuts are gradually expanding. The low volume of recycled material available significantly limits manufacturers ability to include recycled content in their products.

Use of recycled material needs to ensure that high quality and standards are preserved to safeguard long term performance and safety.

Recycled material is limited by Australia/ New Zealand product standards to non-pressure applications (eg. electrical conduit, sewer, stormwater and drainage pipes). PIPA's POP208 – *Guidelines for the use of recycled plastics in piping systems* provides guidance to ensure recycled materials are contamination free and processed to maintain high material quality.

Recycling should be a final step in a broader circular strategy, not the primary measure of success.

As a result, conventional annual recycling rates may not fully reflect the long-term circularity performance of plastic pipe systems.

2. Executive Summary cont.

Barriers and Challenges to expanded circularity:

- Limited and sporadic availability of recycled material across a range of industries in sometimes geographically diverse locations.
- Limited infrastructure for collecting, sorting and processing used pipes throughout the country and across different sectors but particularly on-site in regional locations.
- High transport and logistics costs which result in financial barriers to use of recycled materials.
- Government policies and procurement guidelines often focus on simplistic recycled content measures rather than broader and higher order circularity measures. Engineered, long-life plastic pipes need to be recognised as inherently circular and different to short-use or single-use plastics.
- Australian standards restrict the use of recycled material to non-pressure pipes. Entrenching the appropriate use of recycled material (from PIPA's POP208) in Australian non-pressure product standards should be a priority. There needs to be investigation on appropriate use of recycled material in other applications such as pressure pipes.
- Comprehensive data for detailed material sectoral flow analysis is not available. Available statistics often aggregate plastic pipes with other plastic materials such as plastic hoses. This represents an opportunity for future data collection and disaggregation to benchmark circular performance more accurately.

Opportunities and Enablers to expanded circularity:

- Increased collection and processing such as mobile collection systems to improve material recovery.
- Easy access to collection and recycling infrastructure facilities for installers and users would boost availability.
- There is manufacturer demand for increased supply of recycled materials.
- Procurement frameworks could consider higher level circularity such as life cycle assessments, embodied energy, repair and re-use, end of life options, and embed circular design and recovery models.
- Financial enablers such as waste levies can impact the economics of recycling.
- PIPA is currently exploring the development of a national Product Stewardship Scheme that would extend across all pipe types and materials. Rather than focusing solely on recycling, such a scheme could take a more holistic approach by supporting other key elements of the circular economy, including the collection of lifecycle data, promoting design for durability and reuse, encouraging dematerialisation and supporting innovations in material recovery and product traceability.

3. Introduction & Research

A circular economy for plastic pipes enables a whole of lifecycle approach, by promoting actions across design, production, consumption, post-consumption and end-of-life. This research provides an assessment into the plastic pipes industry in Australia, to assess the current practices and approaches towards circularity, and to identify opportunities to increase circular economy approaches and impacts of the industry.

Using desktop research, industry insights and key stakeholder interviews, this report identifies successful approaches, barriers and opportunities to increase circularity for plastic pipe systems in Australia. In particular, this research aims to:

- **Understand the materials, applications, recyclability and circularity of plastic pipe systems in Australia, and provide context on the use of recycled materials in these systems.**
- **Map the circularity of plastic pipes in Australia, including material flows for different pipe applications and assess current industry practices in terms of recovered volumes.**
- **Identify challenges to increasing circularity, and opportunities to further close the loop in plastic pipe systems**

PE and PVC pipes have been part of Australia's infrastructure since the 1950s, supporting water supply, irrigation, gas, and industrial applications. Local manufacturing began in the 1960s, and research from Australia and overseas shows these pipes can last well over 100 years thanks to their physical and chemical durability. This long life has made them a preferred choice for both pressure and non-pressure applications, backed by strict Australian, New Zealand, and international standards that guide manufacturing, installation, and maintenance.

Plastic pipe systems are built for longevity but also for reuse, repair and recycling when their service life eventually ends. Most are made from a single thermoplastic, making recovery/recycling easier.

Current standards already allow recycled materials in non-pressure applications, but the challenge is supply: very little recycled pipe material is available because so few pipes have yet reached end-of-life. This comes down to the very thing that makes plastic pipes so effective: their long life. Because they're engineered to last more than a century, very few have reached the end of their service life and entered the recycling stream. Research consistently shows that only a small proportion of recycled material is currently used in plastic pipe manufacturing, and the main barrier is simply availability.

As a result, only a small amount of recycled pipe material is currently available for reuse. While this may limit recycling opportunities in the short term, it's also a reflection of the circular economy principles that underpin the industry.

By maximising durability and extending the life of materials, plastic pipes help reduce waste and deliver long-term environmental and economic benefits.

Right now, recycling efforts rely largely on off-cuts, unused stock and the small number of end-of-life pipes available. Collecting and processing these materials is difficult due to:

- Low volumes at individual sites
- High costs for collection, transport, and logistics
- Challenges in sorting and recovering suitable materials
- Difficulties in segregating and recovering suitable materials for reuse

Some collection bins and recycling systems exist but aren't yet widespread enough for large-scale recovery. Still, progress is being made: many manufacturers participate in the Vinyl Council's PVC Product Stewardship Scheme, while two PIPA-led pilot programs in Queensland and Western Australia are testing practical recycling solutions. PIPA members also integrate stewardship through their own systems, to help close the loop.

4. Circular Economy Overview

A circular economy approach enables the slowing and narrowing of resource loops by extending the useful life of products and materials already in use and reducing overall waste. The 10R framework[1] puts forth a hierarchy of circular economy strategies, prioritising upstream strategies for avoidance, better design, reuse and repair over end-of-life reprocessing, recycling and material recovery. An update to the 10R framework was published by Circular Australia (Figure 1)[2] that illustrates “high” circularity actions such as refusal, reduction, redesign and sourcing, moving down to repair, reuse and refurbishment, and ultimately, recycling, energy recovery and remaining before retiring materials to landfill.

Figure 1: Hierarchy of Circular Economy Strategies

HIGH

Refuse	Preventing the use of virgin materials in solutions, products and services. Rethink solutions e.g. through sharing or as a service solutions
Reduce	Reducing the use of raw materials. Rethinking the way products are designed
Sourcing	Procuring sustainably. Choosing renewable resources, recovered, high recycled content easily broken down at end of life with no toxins/ pollutants
Redesign	Design products to be more efficient e.g. by dematerialising, designing for disassembly
Repair	Extend the lifespan of products through maintenance, restoration, keeping it at the highest value
Reuse	Re-use products for as long as possible by keeping pre-used items in the economy
Refurbish	Restore products to continue or exceed the expected lifespan/ covered by warranty or performance standard
Remanufacture	Generate a new product from secondary materials through manufacturing
Repurpose	Modify a product through reuse for a different function
Cascade	Sharing materials from one process to another to achieve resource use efficiency e.g. repeated use of renewable resources without contamination
Recycle	Processing materials into fibres or raw materials for reuse in the economy. Materials in this process can have higher order uses
Recover energy	Incinerate waste with energy recovery. Materials in this process can have higher order uses
Remine	Remining minerals or materials recovered from previously mined areas, such as landfills

LOW

1 J. Kirchherr, D. Reike, and M. Hekkert, “Conceptualizing the circular economy: An analysis of 114 definitions,” 2017, Elsevier B.V. doi: 10.1016/j.resconrec.2017.09.005.
2 E. Blinova, T. Ponomarenko, and V. Knysh, “Analyzing the concept of corporate sustainability in the context of sustainable business development in the mining sector with elements of circular economy,” Jul. 01, 2022, MDPI. doi: 10.3390/su14138163. & https://circulareconomy.europa.eu/platform/sites/default/files/building-a-circular-future-jacqueline-cramer-amsterdam-economic-board.pdf & ISO59004:2024 Circular economy — Vocabulary, principles and guidance for implementation

5. Plastic Pipes Industry Circularity

Current state of circularity in the Australian Plastic Pipe Industry

Plastic pipes inherently demonstrate strong alignment with circular economy principles through long-life product design, repairability and the ability to be fully recycled at end-of-life. Unlike single-use plastics, these engineered infrastructure products provide service life of over 100 years and are designed to remain in use for as long as possible at their highest value. Existing initiatives include product stewardship programs, pilot recycling schemes, product standards, and manufacturer-led environmental systems. *Table 1* provides a snapshot of the circular approaches in the Australian plastic pipes industry based on industry input and expertise from PIPA.

Table 1: Current circularity landscape for plastic pipes

Circular economy strategies based on the hierarchy in Figure 1	Examples of industry approaches
Reduction & Avoidance	The Australian plastic pipe industry has a strong track record of aligning with key circular economy principles and is actively advancing practices that support both environmental and performance outcomes. This includes: ◦ a continued commitment to reducing virgin material use ◦ redesigning products and processes for greater efficiency ◦ ensuring long-term functionality across the supply chain. Key examples include: • **Long-life design:** plastic pipes are engineered to last over 100 years, reducing the need for replacement and supporting long-term resource efficiency. • **Fit-for-purpose materials:** Only high-quality materials—virgin or recycled—are used to ensure durability and performance. Poor-quality inputs are avoided to maintain product integrity. • **Standards compliance:** Products are manufactured to strict Australian Standards, Industry Guidelines (e.g. POP208) and international benchmarks to ensure safety, consistency, long term functionality, structural integrity and performance – essential for products used in critical infrastructure. • **Reduced virgin material use:** Industry has had a long-standing focus on material-efficient designs such as PVC-O and structured wall pipes reducing raw material use. • **Improving the quality of recycled outputs:** High-quality recycled materials are used in non-pressure applications, supporting closed-loop recycling where feasible. • **Emission and energy reductions:** Industry tracks emissions (Scope 1, 2, and 3) and implements energy-efficient manufacturing and logistics to lower environmental impact. • **Supply chain efficiency:** Innovations in design, installation, repair, and end-of-life processing help reduce waste and improve circularity. • **Continuous improvement:** The industry continues to invest in R&D to improve sustainability outcomes without compromising product performance. This includes ongoing R&D into the effective incorporation of recycled materials without compromising pipe quality or longevity.

5. Plastic Pipes Industry Circularity cont.

Table 1: Current circularity landscape for plastic pipes cont.

Circular economy strategies based on the hierarchy in Figure 1	Examples of industry approaches
Sourcing/ Procurement	The plastic pipe industry actively contributes to sustainable procurement through material selection, product stewardship, and lifecycle thinking. Key practices include: • **Standards-aligned specifications:** Materials, including recycled content, are selected and used in accordance with industry standards and best practices to ensure safety and performance. • **Safe use of recycled content:** Recycled materials are only used where fit for purpose, with strict controls to prevent contamination. • **Lifecycle thinking:** Products are designed with their full lifecycle in mind—from manufacture and use to repair, reuse and end-of-life recovery. • **Procurement-led circularity:** Contracts and procurement frameworks increasingly support responsible product use and end-of-life recovery (i.e. take back schemes). • **Stewardship across the value chain:** The industry promotes shared responsibility through voluntary stewardship programs and ongoing collaboration with suppliers and stakeholders.
Redesign	The plastic pipe industry has a strong history of innovation in product design, with several past and current redesigns focused on reducing material use while maintaining and improving performance, durability, and sustainability outcomes. Examples include: • **PVC-O (Oriented PVC) Pipes:** Manufacturing and design process allows for significantly less material to be used compared to PVC-U and PVC-M pipes, which also lowers carbon footprint, have lighter weight and increased hydraulic flow. • **Structured Wall (Corrugated twin wall pipes):** Due to a corrugated outer wall and a smooth inner wall structure this design uses less material than solid wall making them lightweight, lower carbon footprint and easier to transport and install. • **Multi-layer pipes:** These pipes can incorporate recycled or foamed core layers to reduce virgin material. These pipes meet performance needs while supporting circular material flows. • **Design for trenchless installations:** Pipes designed for no-dig methods allow for leaner designs without over-specification. These pipes can use less material, minimal ground disruption and lower emissions during installation.
Repair	The long-life design of plastic pipe systems reduces the need for replacement and provides many options for repair, maintenance, and lifetime extension, supporting circularity through asset longevity. These include: • **Targeted repairs:** Damaged sections can be repaired without replacing entire pipelines. • **Routine maintenance:** Minimises wear and supports long-term performance.PVC repair methods: Include relining, saddles, clamps, couplings, valves, and branch fittings. PE repair methods: Include relining, electrofusion fittings, mechanical clamps, valves, and squeeze-off tools. • **Extended asset life:** Efficient repair solutions help maximise infrastructure lifespan.

5. Plastic Pipes Industry Circularity cont.

Table 1: Current circularity landscape for plastic pipes cont.

Circular economy strategies based on the hierarchy in Figure 1	Examples of industry approaches
Reuse	Plastic pipe systems, by virtue of their durability and long design life, are well-suited to reuse, particularly in underground applications where they can remain in place and serve a new function without being excavated. Some key reuse approaches include: • **Host pipe relining:** Most plastic pipes are still in their first lifecycle, given their 100+ year design life. However, where end-of-life is reached, existing pipes can be reused as structural hosts for new liners, often through trenchless methods, reducing excavation, energy use, and environmental impact. • **Cross-sector reuse:** Plastic pipes could be repurposed across sectors (e.g. water, stormwater, electrical, comms, gas) after initial use, supporting cascading reuse models, however noting they are still in their first lifecycle. • **Direct physical reuse:** While limited due to infrastructure-specific design, some components could be reused in select applications.
Recycling	There are many examples of recycling and reprocessing initiatives, mostly through recovered pipe materials in the form of off-cuts and unused stock. While recycling plays an important role, helping minimise waste and maximise resource value - it is considered a last resort after efforts to reuse and reprocess have been exhausted. The industry works collaboratively across the entire supply chain to identify and implement efficient recovery and reprocessing opportunities. Key examples include: • **Closed-loop recycling systems:** Reprocessing off-cuts and end-of-life pipes back into new pipes, maintaining material within the same value chain to preserve quality and performance. • **On-site collection and sorting:** Participating in and supporting systems to collect, separate and prepare off-cuts for reprocessing. • **On-site reprocessing investment:** Installing equipment that enables manufacturers to reintroduce off-cuts into non-pressure pipe applications. • **Quality assurance for recycled content:** Developing and aligning with industry standards and specifications to ensure that recycled materials are safe, consistent, and fit for purpose, including compliance with Australian Standards and industry guidelines. • **Supply chain partnerships:** Collaborating with contractors, installers, and recyclers to recover off-cuts from construction sites and take part in industry collection schemes. • **Data collection and reporting:** Tracking volumes of recovered and recycled materials and contributing to industry-wide sustainability reporting, benchmarking, and product stewardship programs. • **Innovation and global collaboration:** Working with international partners and research initiatives to explore and validate higher percentages of recycled content in plastic pipes without compromising performance or lifespan. • **Education and industry engagement:** Working with stakeholders across the sector to raise awareness and build understanding of where and how recycled content can be appropriately and safely used in plastic pipe products.

6. Stewardship Initiatives

Pipe manufacturers have partnered with waste managers, distributors, suppliers and clients to recover plastic pipes for recycling. While volumes are often small and sporadic, some have established take-back programs, and many collaborate with contractors, installers, and recyclers to collect off-cuts from construction sites and support industry-wide collection schemes.

In advancing product stewardship, PIPA plays a central role in promoting sustainable practices across the plastic pipes sector. Building on this commitment, PIPA is exploring the development of a national Product Stewardship Scheme covering all pipe types and materials. The proposed scheme would aim to:

- Standardise best-practice approaches for pipe recovery, reuse, and recycling.
- Provide guidance on the appropriate use of recycled content in different pipe applications.
- Support infrastructure to enable consistent end-of-life management.
- Align with national circular economy strategies and regulatory frameworks.

The Australian plastic pipes industry has long promoted responsible product stewardship through initiatives that support circularity, quality assurance, and environmental management throughout the product lifecycle.

Examples include the PVC Industry Product Stewardship Program, relevant Australia and New Zealand standards, pilot stewardship programs and individual business-led initiatives.

PVC Industry Product Stewardship Program

The PVC Industry Product Stewardship Program, led by the Vinyl Council of Australia, promotes responsible sourcing, design, manufacture, use, and end-of-life management of PVC products, including pipes. Signatories commit to continuous improvement in environmental and health outcomes, increased use of recyclate, and development of sustainable formulations.

AS/NZS 5395: Best Environmental Practice PVC Pipes and Fittings

The Australian Standard provides a comprehensive framework for assessing the full lifecycle of PVC products. It sets criteria for responsible sourcing, manufacturing, additives, energy use, emissions, recyclability and end-of-life recovery. Adoption of BEP PVC ensures pipes meet strict sustainability benchmarks and helps government and infrastructure clients make environmentally responsible procurement decisions.

Pilot Product Stewardship Programs

PIPA is working with industry on two pilot programs—the Construction Plastics Recycling Scheme in Queensland and the Plumbing Industry Recycling Scheme in Western Australia. These initiatives provide insights on volumes, behaviours and collection methods, forming the foundation for a sustainable, industry-wide approach to pipe recovery and recycling.

Company-Level Stewardship and Environmental Management

Businesses engage in voluntary take-back schemes, resource efficiency initiatives, and partnerships with distributors, installers and contractors to reduce on-site waste and support responsible disposal.

Many manufacturers in the plastic pipes sector also implement internal product stewardship practices aligned with ISO 9001 (Quality Management) and ISO 14001 (Environmental Management), including:

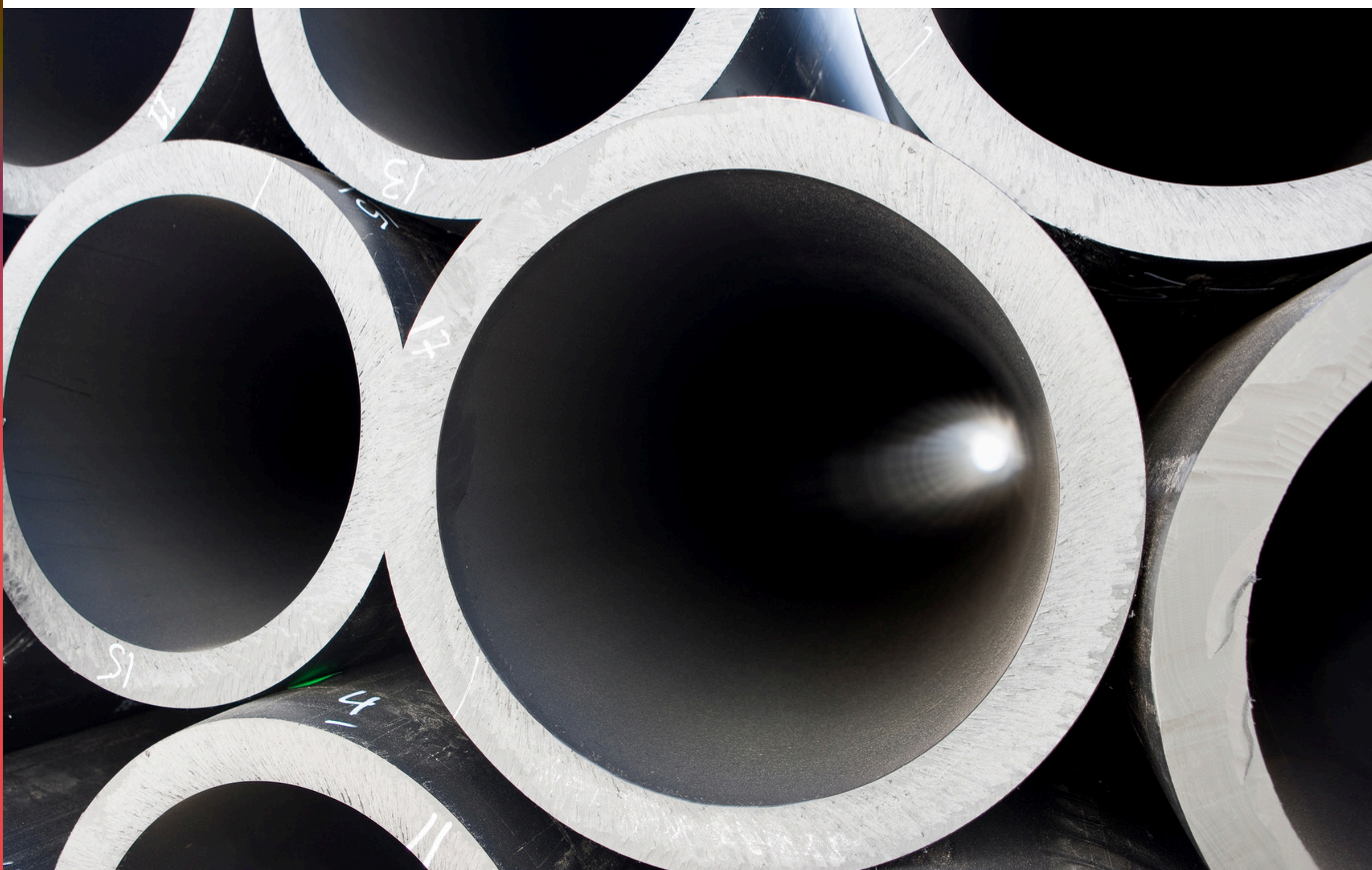
- Rigorous quality control and material traceability
- Integration of recycled content where fit-for-purpose
- Investment in closed-loop recycling infrastructure
- Recovery of off-cuts and end-of-life materials for reprocessing
- Lifecycle assessments and environmental performance reporting

7. Mapping material flows

High-level material flow mapping of Australian plastic pipe systems

Material flow mapping of Australian plastic pipe systems is important to understand and support long-term circular economy objectives. Given the absence of sufficient detailed segment data to undertake a full detailed quantitative material flow analysis, this mapping provides an initial qualitative characterisation of material flows across the pipe lifecycle and management chain. It draws on available data and expert understanding to identify current system structures, major data gaps, and intervention points. The mapping conducted supports the development of baseline estimates and helps inform the design and evaluation of circular economy strategies across key consumption sectors.

More detail can be found in Appendix 1.



7.1 MAPPING MATERIAL FLOWS

Pipe materials, market size and sectoral use

Pipe materials on the market in Australia

Australia's plastic pipe market is primarily composed of three main polymer groups:

1. **Polyvinyl chloride—PVC (including PVC-U, PVC-M and PVC-O types)**
2. **Polyethylene—PE (including HDPE, LDPE, MDPE polymer types)**
3. **Polypropylene—PP**

Table 2 presents estimated quantities (in tonnes) of raw materials used in the manufacture of plastic pipes and fittings in Australia, highlighting the significant local manufacturing footprint of the industry. These figures are based on data provided by PIPA, based on import data.

For clarity, polyethylene (PE) and polypropylene (PP) pipe types have been combined under the category of 'polyolefins'.

Other pipe polymers, including cross linked polyethylene (PEX), polybutylene (PB) and acrylonitrile butadiene styrene (ABS) are also used to a smaller extent in Australia, based on international data, however, data is limited on these polymer types for Australia.[3]

Table 2 Approximate pipe use in Australia (PIPA, 2024a)[4]

Pipe Material	Approximate raw material used [tonnes/year]
PVC	165,000 – 185,000
Polyolefin (e.g. PE, PP)	190,000 – 200,000

While PVC has traditionally dominated plastic pipe manufacturing, polyolefins, particularly PE, now hold a larger market share, driven by demand from mining, gas, and rural irrigation sectors due to PE's versatility, larger diameter options, and suitability for remote or large-scale applications.

Both PVC and polyolefin pipes remain essential for major infrastructure projects, with material choice based on project requirements and performance considerations.

Market volumes fluctuate with demand, project designs, and end-use applications. PVC demand is expected to grow with residential construction and civil infrastructure, while polyolefin use will likely expand with mining, energy, and large-scale projects.[5]

Plastic pipes have been used in Australia since the 1950s, with local manufacturing from the 1960s. Over time, their durability, performance, and cost-effectiveness have made them the preferred choice for water, sewer, gas, and industrial infrastructure. Their long service life means in-use stock accumulates each year.

To date, there has been no comprehensive quantification of Australia's in-use plastic pipe stock, representing a significant data gap and a key area for improvement.

3 Walsh (2017). The Plastics Piping Industry in North America, in Applied Plastics Engineering Handbook, 2nd ed
4 PIPA (2024a)
5 PIPA (2008). Polyethylene – the optimum gas pipe material

7.1 MAPPING MATERIAL FLOWS

Pipe materials, market size and sectoral use cont.

Pipe manufacture, imports & exports

Most plastic pipes used in Australia are manufactured locally, primarily from imported resin.

Assessing the circularity of Australian plastic pipes requires understanding both the origin of raw materials and where pipes are manufactured. While PVC, PE, and PP pipes are largely produced domestically, imports of finished pipes are minimal.

Following the closure of Australia's last PVC and PE resin facilities, all virgin PVC and PE resins are now imported, whereas a small portion of PP resin continues to be produced locally. This reliance on imported resins underscores the importance of supply chain dynamics and highlights opportunities to improve circularity in the sector.

A 2013 study by the Green Building Council of Australia (GBCA)[6] found that approximately 84% of all PVC building products, including pipes, were produced domestically, with imports primarily for specialty products.

Import statistics aggregate pipe data with other plastic materials

The Commonwealth's *Australian Plastic Flows and Fates Study 2021-22*[7] provides national estimates of domestic and imported plastic products, including pipes, but lacks the material-specific detail needed by the pipe industry.

Australian Department of Foreign Affairs and Trade (DFAT) data[8] indicates small volumes of imported PVC, PE, and PP pipes, but aggregates pipes and hoses, limiting accuracy for policy, regulatory and circularity planning.

A clearer understanding of domestic production and import volumes is essential to support closed-loop recycling, manage recycled content, and inform effective industry and policy decisions.

Recycled content in Australian-produced pipes

Understanding recycled content in Australian-produced plastic pipes is critical to assessing sector circularity. Manufacturers use two main categories:[9]

- **Pre-consumer recyclate:** material diverted from the waste stream during a manufacturing process or from unused products (excluding manufacturer's own rework)
- **Post-consumer recyclate:** end-of-life plastic products recovered from households, commercial, industrial & institutional end users

Rework material refers to scrap generated during the manufacturing of plastic pipes and fittings that is retained and reused within facilities owned and operated by the same manufacturer.

It is standard industry practice to reintroduce this material directly back into the production process, effectively preventing it from becoming waste or being sent to landfill.

This internal reuse is a key circularity mechanism, significantly reducing potential material loss and enhancing resource efficiency. In line with international definitions, rework material is not classified as recycled content, and is therefore not included in recycling statistics.

Its consistent use across the industry represents a critical contribution to waste minimisation and responsible manufacturing practices.

6 GBCA (2013). Literature Review and Best Practice Guidelines – Life cycle of PVC building products
7 Blue Environment (2024). Australian Plastic Flows and Fates Study 2021-22 – National Report, prepared for the Department of Climate Change, Energy, the Environment and Water
8. Department of Foreign Affairs and Trade (2025). Trade statistical pivot tables
9. PIPA (2022). The use of recycled material in plastic pipes

7.1 MAPPING MATERIAL FLOWS

Pipe materials, market size and sectoral use cont.

Pre-consumer and post-consumer material supply is extremely limited. This is primarily due to the exceptional service life of plastic pipes of around 100 years, meaning most installed pipes are still in their first lifecycle, however lack of collection pathways for offcuts is also significant.

Pre- and post-consumer material supply is very limited, largely due to the ~100-year service life of plastic pipes, meaning most remain in their first lifecycle. Recovery is also challenging, as many pipes are buried, widely distributed, or in difficult-to-access locations.

An estimated 55% of end-of-life PVC pipes remain in-situ, often serving as host pipes for new systems. This reuse reduces excavation, environmental impact, and infrastructure disruption, supporting efficient upgrades while lowering material and energy inputs.

Consequently, recycled content from old pipes remains low despite the industry's preference for closed-loop recycling. Table 3 shows PIPA members reported 2023 data of pre and post consumer PVC and PE mateirals, with no recycled PP reported due to smaller market volumes.

Table 3: Use of pre-consumer and post-consumer materials in Australian pipe manufacturing for 2023 (PIPA, 2024b) [10]

Pipe material	Pre-consumer source [tonnes]	Post-consumer source [tonnes]	Total recycled content [tonnes]
PVC	52	158	210
PE	822	4,991	5,813

Recycled plastic pipes are the preferred source of recyclate, enabling the industry to close the loop and maintain material value. However, other materials, such as PE packaging, can also be suitable if they meet strict performance, quality, and traceability standards. Any recycled content must maintain the mechanical strength, durability, and long design life expected of pipes in infrastructure applications.

To address limited pre- and post-consumer recyclate, the Australian plastic pipe industry has developed robust testing and validation methods to ensure alternative sources meet required chemical and physical specifications. Innovation in manufacturing technologies allows consistent, reliable use of recycled content without compromising performance or safety, reflecting the industry's commitment to circularity.

Currently, recycled material is mainly used in non-pressure applications, such as electrical conduit, sewer, stormwater, and drainage pipes. Product standards prohibit post- and pre-consumer recyclate in pressure systems (e.g. potable water or gas) due to variability in quality, though in-house rework of the same material composition is permitted. Recyclate from non-pipe plastics can still meet technical standards for non-pressure applications, supporting circularity without compromising safety or durability.

10. PIPA (2024b). Plastic pipes and the circular economy – recycling and much more

7.1 MAPPING MATERIAL FLOWS

Pipe materials, market size and sectoral use cont.

Sectoral use: applications in Australia

Understanding the sectoral distribution of plastic pipe use is critical for characterising circularity performance of plastic pipes, and identifying where circularity interventions, such as **design changes, recovery programs, or recycled content uptake** may be most effectively targeted.

Plastic pipes are widely used across multiple infrastructure and industrial sectors in Australia, driven by their durability, corrosion resistance, cost-effectiveness, environmental benefits and longevity. Applications of pipes can be broadly differentiated by pressure and non-pressure applications.

Table 4 summarises primary applications of pipes by material across different sectors for pressure and non-pressure applications.

Civil and infrastructure projects, including water supply and sewage, are the largest consumption sector of plastic pipes in Australia.

Quantifying actual sectoral use of plastic pipes is challenging given limited available data. This data is essential for accurately characterising the use and circularity progress and opportunities of plastic pipe systems in Australia by segment and represents an opportunity for further analysis if accurate data is available in the future.

Table 4: Applications of pressure and non-pressure pipe by major material, derived from PIPA (2024a) and Walsh (2017))

Pipe material and type	Buildings	Electrical and Telecommunications	Civil and Infrastructure	Gas, Mining and Industrial	Rural Irrigation
PVC – pressure	In use		In use		In use
PVC – non-pressure	In use	In use	In use		
Polyolefin – pressure	In use		In use	In use	In use
Polyolefin – non-pressure	In use	In use	In use		In use

7.2 MAPPING MATERIAL FLOWS

Material flows mapping over the pipe lifecycle

Material flow mapping provides an analytical framework for understanding the structure, scale, and dynamics of material use within plastic pipe systems. By tracing the flows of raw material inputs and production, sales, waste arising across the value chain and its management, it enables a systematic characterisation of where pipe materials originate, where losses occur, and where opportunities for recovery exist.

Long lifetimes of plastic pipes set them apart from other plastic products and presents challenges for a conventional Material Flow Analysis.

Plastic pipe systems are characterised by very long service lifetimes, often extending 50 to 100 years or more, making them different to many other short use plastic products.

In the context of pipes, end-of-life (EoL) flows are minimal relative to the stock currently in use and the volume of new material placed on the market each year. As a result, commonly used recovery and circularity indicators based on annual flows, appropriate for single-use or short-life plastics, can significantly understate the long-term circularity potential of plastic pipe systems.

While more detailed, disaggregated data would help inform better decision-making, the absence of a comprehensive and robust MFA baseline is not a barrier to meaningful action. Effective product stewardship schemes, recycling programs, and circular initiatives have been successfully implemented in other sectors, and within the plastic pipe industry, without the benefit of complete baseline data.

These efforts can begin with the best available information and evolve over time, improving accuracy and impact as more data becomes available.

Different measures are needed to assess plastic pipe circularity

Circularity in pipe systems could be more appropriately assessed against material inputs (e.g. recycled content, and dematerialisation through design choices), given the delayed nature of recoverable EoL pipes. For example, while hypothetical, if the **design life extension** of plastic pipes even further beyond the current 100+ years, this would represent a superior circularity outcome compared to recycling, by maximising the value of the material in service and deferring the need for new resource inputs.

Similarly, **design innovations that reduce material consumption**, such as the development of oriented PVC (PVC-O) pipes or twin-wall structured pipes that achieve the same or better performance with less material than solid-wall alternatives, are key examples of high-impact circular strategies.

However, these innovations also reduce the total volume of material entering the system, which in turn may reduce the tonnes available for recycling in the future. This paradox highlights **the need to shift away from using recycling volumes as the primary measure of circularity, especially for long-life products.**

Traditional flow-based models struggle to capture the true circularity profile of these products, given the delayed and often decades-long nature of end-of-life flows in pipe systems.

While material flow mapping can provide a useful foundation for decision-making, including highlighting where in the lifecycle interventions aimed at increasing collection and recovery used pipe could be targeted, **MFA must be complemented by a broader set of circularity metrics that reflect product durability, design optimisation, and system-wide resource efficiency.**

Only through this more holistic lens can the circular potential of plastic pipes be fully and fairly assessed.

7.2 MAPPING MATERIAL FLOWS

Material flows mapping over the pipe lifecycle cont.

Figure 3 is a system diagram, or system map, representing the Australian plastic pipe lifecycle from manufacturing through to disposal and reprocessing. In a typical quantitative material flow analysis, the system diagram sets the scope of the analysis, including which material flows are in focus for quantification. The system diagram here serves as a qualitative mapping of key flows related to the management of Australian plastic pipes, based on desktop information on pipe manufacturing and used pipe management, and expert knowledge in waste management and material recovery systems.

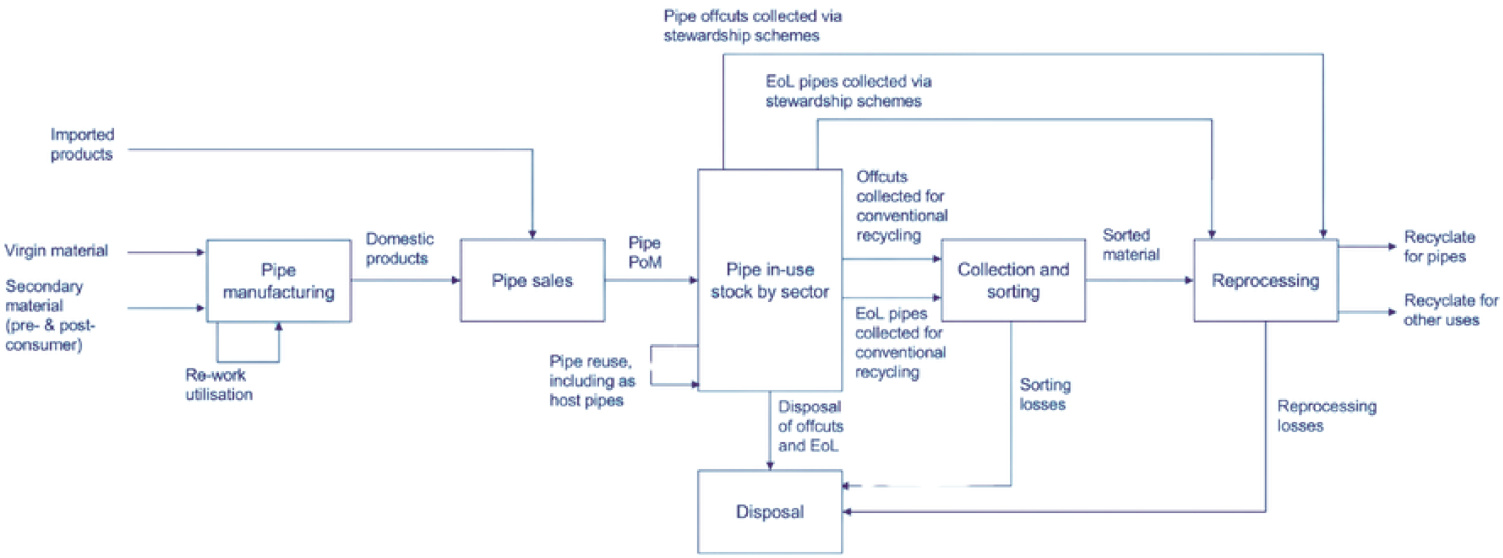
The system diagram below features six main 'processes', which represent material aggregation and transformation processes that occur along the plastic pipe lifecycle and the EoL management system.

These processes and associated material flows are:

1. **Pipe Manufacturing**
2. **Pipe sales**
3. **Pipe in-use stock by sector**
4. **Collection & Sorting**
5. **Reprocessing**
6. **Disposal**

More detail can be found in Appendidx 1.

Figure 3: Preliminary system diagram



7.2 MAPPING MATERIAL FLOWS

Quantifying plastic pipe flows through the pipe lifecycle

Quantifying material flows of plastic pipes is critical for assessing circularity performance and identifying targeted circularity interventions across the product lifecycle. Material flow analysis (MFA) enables system-level insights into where materials are consumed, retained in use, lost, or recovered, supporting the estimation of recovery potentials and benchmarking of circular economy outcomes. However, significant data limitations, particularly relating to historical sales, sectoral distribution of pipes, and EoL arisings, complicate and limit robust quantitative analysis.

Due to their long service life, plastic pipes present challenges for traditional material flow models, which tend to underestimate their circularity performance by focusing on short-term end-of-life flows. A broader set of circularity indicators—such as durability, design efficiency, and reuse potential—combined with existing industry knowledge, can support effective stewardship and circularity actions even in the absence of complete baseline data.

More detail can be found in Appendidx 1.

8. Enablers and Barriers for Circularity of Plastic Pipes

Overview and methodology

This section outlines key findings based on insights from industry knowledge of PIPA, key stakeholder interviews and a recycler processor survey.

Understanding stakeholder insights provides information about the current state of circularity within the plastic pipe industry, which already has strong circulaity credentials, while highighlting opportunties to scale improvements. This will assist the sector in aligning with national and international sustainability targets, including Australia's ambition to double its circularity by 2035.

As part of the research, 11 stakeholders from across the plastic pipes value chain were interviewed between March and April 2025 to capture perspectives on circular economy approaches in the industry.

Stakeholder interviews focused on the following three topics:

- **Understanding the materials, applications, recyclability and circularity of plastic pipe systems in Australia, and providing context on the use of recycled materials in these systems**
- **Mapping the circularity of plastic pipes in Australia, including material flows for different pipe applications, and the assessment of industry practices in terms of recovered volumes**
- **Identifying challenges and barriers for increasing circularity, and opportunities to further close the loop in plastic pipe systems**.

PIPA conducted a survey of 14 processors involved in sourcing and recycling plastic pipes and fittings, achieving a 40% response rate. This excluded those already involved in PIPA's annual recycling survey. Selected respondents were later invited to participate in the stakeholder interviews,

8. Enablers and Barriers for Circularity of Plastic Pipes cont.

Current approaches towards circularity of plastic pipes

This topic investigated current attitudes and practices towards addressing circular economy practices. Stakeholders were asked about their understanding of circularity and how this applied to plastic pipes.

The research team also queried current approaches, strategies, roadmaps and projects/practices to undertake circular approaches, both within the organisation, industry and specifically, in relation to plastic pipes. Stakeholders demonstrated varying levels of engagement with circularity practices. Some manufacturers are exploring ways to enhance circularity. While reuse of pipes was not widely discussed in interviews, some installers noted informal reuse practices, such as retaining small pipe offcuts for repairs in rural irrigation contexts.

Pipe manufacturers emphasised prioritising recycled material to be reused and not downcycled within their waste management strategies, particularly for PVC piping, recognising both environmental and financial benefits. Standards and specifications emerged as an important topic, with industry players generally adhering to them but showing limited awareness of specific guidelines for use of recycled material like POP208. Upon explanation, stakeholders expressed support for these product specifications, viewing them as beneficial for ensuring quality and fostering confidence in recycled content. Responses ranged from enthusiasm to a belief that current supply standards are already sufficiently high, reflecting varied perspectives across the sector.

Existing initiatives like the government-funded Construction Plastics Recycling Scheme (CPRS) have played an important role in advancing recycling capabilities and demonstrate the value of continued support and potential expansion. However, many businesses independently run their own recycling processes outside of formal schemes, underscoring the diversity of approaches within the sector.

While recycling remains central to industry circularity efforts, there is recognition that further improvements in infrastructure, logistics and standards will be necessary to fully optimise these outcomes.

While many stakeholders express an intention to follow the waste hierarchy, most primarily associate this with material recycling, as it is the most tangible and visible outcome within current systems and infrastructure.

This focus is understandable given the long service life of plastic pipes, which embodies circularity through durability and extended use. Emerging international standards, such as those in the US, guide testing to ensure that incorporating recycled content does not compromise this long-term performance; aspects of these methodologies have been adopted in PIPA's POP208 guideline.

Overall, many stakeholders associate their circular economy efforts primarily with recycling and the use of recycled materials, which, while important, represent just one aspect of circularity. This focus is influenced by the circularity principles, particularly the long design life, plastic pipes already possess.

8. Enablers and Barriers for Circularity of Plastic Pipes cont.

Enablers and benefits of circular approaches

Enablers refer to internal and external drivers for circularity. This includes any direct/indirect benefits expected or arising out of those circular economy activities, and could relate to how pipes are procured, collected or processed. Reflective of the focus on recycling of plastic pipes as a circular economy approach, the enablers were associated with financial and market drivers, contractual requirements and ease of access to collection infrastructure. Table 6 summarises the main themes based on stakeholder interviews, the survey and recyclers and PIPA's own knowledge and experience in facilitating circularity within the industry.

Table 6: Stakeholder findings about the enablers and benefits of circularity

	Enablers and benefits of circular approaches	Evidence from stakeholders
1.	**Financial enablers** Financial enablers such as landfill levies, fair collection fees, and viable business models are crucial to supporting plastic pipe recycling. Stakeholders noted that collection costs lower than landfill levies create a strong financial incentive to recover rather than dispose of pipes. Some installers and manufacturers suggested that increasing landfill levies could further boost recycling rates.	Lower fees to collect pipes when compared to the current landfill levies was an important driver. For viability, the need to charge fair costs for material collection from site was reiterated. Free collection proved financially unviable for an interviewed processor, thus justifying collection fees as a key revenue source for viability.Incorporating pipe recycling options into project-specific waste strategies, particularly in civil and infrastructure projects, could further improve recovery and access to end-of-life solutions.
2.	**Market demand for recycled materials** Primary plastic pipe manufacturers and users indicated commitment to secure high volumes of high-quality recycled materials, particularly PVC and PE.	Consistent supply of recycled pipe material is essential to justify the capital investment in processing equipment.There is manufacturer demand for steady, clean supplies, to produce high-quality products. Improving collection and processing systems can unlock greater circularity potential of new and legacy materials.
3.	**Scaling demand through procurement and contracts** Requiring end-of-life management through the collection of off-cuts has emerged as an important enabler, particularly when procurement requirements and contracts explicitly mandate such practices. This typically results in the provision of separate collection bins onsite and coordination with product stewardship or recycling schemes and processors to minimise landfill disposal.	Where procurement requirements existed, e.g. in large construction projects or government contracts, EOL collection of off-cuts was effective either through separate bins or participating in product stewardship schemes. Collection and recovery costs could be justified when EOL management, recycling and reprocessing were mandated in contracts. Several pipe installers noted that actively promoting recycling helps position their businesses favourably for securing government contracts and enhances their professional reputation. There are benefits from access to government-funded recycling programs, such as those in Queensland.

8. Enablers and Barriers for Circularity of Plastic Pipes cont.

Barriers and challenges for increasing circularity

Recycling is widely regarded as an accessible and effective way to reduce environmental impact across the pipe industry, often described as "low-hanging fruit" once the necessary equipment, processes, quality controls, and logistics are established. For many, recycling forms a core part of business operations, particularly for processors and manufacturers who also recover used materials for reprocessing. Challenges such as logistics, transportation costs and distance, material segregation onsite limited by low volumes at small sites and the technical challenges processing certain products such as coils when compared to straight lengths of pipe, pose challenges to increasing material recovery and recycling activities. Table 7 summarises the main themes associated with the barriers for increasing circularity in the industry.

Table 7: Stakeholder findings about the barriers and challenges for circularity

	Barriers and challenges for circular approaches	Evidence from stakeholders
1.	**High transportation and logistics costs** High transportation and logistics costs were identified as the most significant barrier to plastic pipe recycling, particularly for small construction sites or where collection points and processing facilities are widely dispersed.	Owing to the low density of plastic pipes, transport and logistics costs remain high. Onsite cleaning and shredding can alleviate transportation challenges and costs, however, cleaning and shredding infrastructure can be expensive if decentralised and when there are low volumes of off-cuts. There were multiple instances where mobile shredders were suggested as possible solutions to manage capital costs and investment.
2.	**Onsite disposal and separation** Unless the process for separation/collection was clear, onsite segregation remained a challenge, especially for small sites. There is a role for educating and incentivising builders and plumbers and other installers to partner with external recyclers/processors where having onsite bins was found to be unviable.	Where there are onsite pipe collection bins, they need to be strategically located and clearly marked, to avoid offcuts going to general waste. In sites where the offcut volumes were expected to be low, having separate collection bins was unviable unless enabled through backloading or partnering with a recycler/scheme for collection.
3.	**Inadequate awareness about the pathways and benefits of pipes recycling** Some stakeholder groups that are not directly involved in pipe manufacturing or recycling were not fully aware about the pathways, benefits and solutions for offcut recycling.	Training and awareness, especially for tradespeople, was identified as a need, underscoring the practical challenge of maintaining staff awareness and engagement amidst multiple competing demands onsite.The long life of plastic pipes means that end-of-life recycling is currently a non-issue in the industry. Compared to plastic pipes, other materials such as construction and demolition waste are driving more immediate action.

8. Enablers and Barriers for Circularity of Plastic Pipes cont.

Table 7: Stakeholder findings about the barriers and challenges for circularity continued.

	Barriers and challenges for circular approaches	Evidence from stakeholders
4.	**Standards limiting the use of recycled pipes in pressure applications** There is an opportunity to investigate the use of recycled materials in some pressure applications, provided robust testing and compliance measures, such as those outlined in POP208 can be developed.	Current product standards for pressure pipes do not permit the use of recycled materials, due to strict requirements around material performance and consistency. Pipe processors echoed the need to expand standards in alignment with advances in material science, processing technologies, and quality assurance.Especially in sectors such as mining where site lifespans are 25-30 years, there is potential to develop tailored product and material standards to accommodate the shorter service life (as opposed to >100 years intended life for plastic pipes). This will encourage the use of recycled content in short service life applications. However this would require establishment of different testing procedures and development of confidence from industry users to enable the use in pressure pipes.
5.	**Supply and demand for recycled materials** The long service life of plastic pipes and design improvements that can enable a net reduction in demand for virgin materials, can offer significant circularity benefits. Still, there are limitations in terms of volumes available for recycling, highlighting the need for additional support and likely government intervention to scale up demand for recycled pipe products.	The long service life of plastic pipes means recycled pipe supply is scarce. This, coupled with the logistical challenges and financial costs to recover legacy materials, can limit circularity outcomes, if relying solely on material recovery and recycling rates. Outside of government-supported projects, the financial implications of recovery offcuts can be significant, especially in sectors like rural irrigation where funding and infrastructure are less accessible. The costs associated with collection, transport, and processing can pose substantial challenges, underscoring the need for robust waste management systems on all projects, regardless of government involvement. There is thus a need to promote higher-order circular economy outcomes, alongside support and incentives from government, e.g. through funding stewardship schemes, increased landfill levies and through public procurement which recognise circularity more broadly.

9. Conclusion

Not all plastics are the same.

There is a vast variety of plastics, each with different properties, lifespans and applications. Single-use plastics which are designed for short-term convenience are fundamentally different from long-life engineered products like plastic pipes, which are built to last over 100 years and support critical infrastructure.

This distinction must be recognised in policy development. Plastic pipes are designed for long-term performance, can be repaired, and are 100% recyclable at the end of their service life.

At present, Australian and New Zealand product standards only permit recycled material use in non-pressure pipe applications, but this is not a limiting factor, as the volume of suitable recycled material currently available is insufficient even for those applications.

The high-level material flow mapping shows that while the plastic pipe sector is well established and dominated by durable material with long service lifetimes, comprehensive data for detailed material flow analysis and quantitative evaluation of pipe system circularity currently remains limited.

The material flow mapping confirms that majority of plastic pipes placed on the market remain in use for decades, with in-use stock steadily accumulating. EoL arisings are minimal in the short term, and recovery remains limited in scope.

Recycled content is used in plastic pipe manufacturing but restricted to non-pressure applications. While contamination is generally not a major concern in these uses, post-consumer recovery remains challenging due to underdeveloped reprocessing infrastructure, logistical constraints, and economic viability.

10. Recommendations

Recommendations cover a number of key stakeholders and activities from government, industry, procurement and the plastic pipe industry itself.

Government

1. Recognise and reflect the circular nature of infrastructure plastics in policy frameworks.
2. Support and co-invest in national product stewardship infrastructure.
3. Improve data integrity and tracking for circular economy assessments.
4. Integrate circularity principles into procurement guidance and infrastructure funding criteria.

Plastic pipes industry

1. Continue strong stewardship practices and expand recovery infrastructure
2. Advance material testing and innovation
3. Standardise and share data on recovered volumes
4. Develop National Stewardship Scheme

Industry Sectors

Civil, Mining, Utilities, Irrigation, Building

1. Recognise sector-specific opportunities for circularity, particularly at end-of-life.
2. Expand the scope of the Environmentally Sustainable Procurement Policy and Reporting Framework.
3. Collaborate across the value chain to improve recovery logistics.
4. Embed lifecycle thinking into project planning.
5. Engage in pilot/regional stewardship programs.
6. Standards development.

Data

1. Develop national dataset on historical sales of plastic pipes by material and use sector
2. Quantify EoL arisings and offcuts through sector-specific data collection, audits, and modelling
3. Improve transparency and resolution on recyclate utilisation, and recyclate fate

Procurement

Government Agencies, Utilities, Civil Infrastructure Clients

1. Move beyond “recycled content” as a sole measure of circularity.
2. Use procurement to drive innovation.
3. Embed circular design through procurement programs.
4. Ensure performance of products using recycled content.
5. Facilitate collaborative recovery models.
6. Integrate circularity metrics and reporting.

10. RECOMMENDATIONS

Government

Recognise and reflect the circular nature of infrastructure plastics in policy frameworks. Plastic pipes are long-life, engineered products that differ significantly from short-life or single-use plastics. Policies should:

- Differentiate between types of plastics in legislation (e.g. flexible and rigid PVC).
- Recognise that long service life, repairability, and reuse-in-place are valid and superior circular strategies.
- Avoid overly simplistic recycled-content mandates that don't suit long-life products where post-consumer recyclate is limited.

Support and co-invest in national product stewardship infrastructure.

- Provide seed funding or matched contributions to establish national take-back programs for end-of-life and off-cut pipe materials.
- Enable demonstration projects or mobile collection pilots in regional and infrastructure-heavy areas like mining and agriculture.

Improve data integrity and tracking for circular economy assessments.

- Mandate disaggregated reporting of plastic materials and applications in national statistics (e.g. distinguishing between long-life pipes and short-life hoses).
- Fund a national in-use stock and material flow database to help industry and researchers benchmark circular performance more accurately.

Integrate circularity principles into procurement guidance and infrastructure funding criteria.

- Encourage whole-of-life and design-for-performance criteria in state and national procurement guidelines and not just focus on one area e.g. recycling.

10. RECOMMENDATIONS

Industry: Civil, Mining, Utilities, Irrigation, Building

Recognise sector-specific opportunities for circularity, particularly at end-of-life.

- Mining and rehabilitation projects: Likely to generate end-of-life pipe earlier than other sectors; potential for high-recovery take-back or reprocessing.
- Rural irrigation and agriculture: Installers may retain short offcuts for reuse or repairs, and support this by promoting toolkits and mobile reprocessing units.
- Civil infrastructure: Explore how trenchless rehabilitation methods can incorporate in-situ reuse of existing pipes (e.g. host pipes).

Expand the scope of the Environmentally Sustainable Procurement Policy and Reporting Framework to:

- Specify performance based circular targets and outcomes beyond recycled content, including circular design, durability, repairability, product as a service, design for disassembly, dematerialising, regenerative practices such as recycled water and nature based solutions

Collaborate across the value chain to improve recovery logistics.

- Align contractors, suppliers, and recyclers to standardise collection points and material segregation on construction and installation sites.
- Use standardised collection bins and signage to avoid contamination and support reprocessing.

Embed lifecycle thinking into project planning.

- Assess and document potential for pipe reuse, recovery, and recycling during project planning stages, not just during decommissioning.
- Capture data on pipe waste and recovery during construction for reporting and stewardship compliance.

Engage in pilot or regional stewardship programs.

- Participate in state-based pilots like those led by PIPA in QLD and WA to test scalable models for material recovery.
- Share lessons and data to inform development of national stewardship schemes.

Standards development

- Entrench into product standards the safe use of recycled content in non-pressure applications, following the PIPA guideline POP208 Guidelines for the use of recycled plastics in piping systems. Investigate whether there are appropriate testing of recycled material and pipes to potentially extend to pressure pipes in the future.
- Tailor standards to suit specific sectors—such as mining—where shorter operational timeframes support the use of recycled materials, and expand standards to include ancillary components (e.g. fittings, spacers) to promote whole-of-system circularity.

10. RECOMMENDATIONS

Procurement: Government Agencies, Civil Infrastructure, Utilities, Clients

Move beyond "recycled content" as a sole measure of circularity.

- Recognise that recycled content is not always viable (or safe) in pressure systems but that circularity is still achieved through other strategies (e.g. long life, in-ground reuse).
- Require lifecycle-based assessments or certifications that consider durability, embodied energy and end-of-life options.

Use procurement to drive innovation.

- Allow flexibility in specifications to encourage alternative designs that reduce material use (e.g. PVC-O, twin-wall).

Embed circular design through procurement programs.

- Use procurement frameworks as a mechanism to embed circular design and recovery models, especially on publicly funded projects.

Ensure performance of products using recycled content.

- When recycled materials are used, require evidence that the product meets the same long-life performance and safety standards as virgin material equivalents. This ensures durability and reduces maintenance or replacement over time.

Facilitate collaborative recovery models.

- Consider take-back schemes or partnerships with manufacturers to reclaim offcuts or end-of-life pipes, and establish regional recycling hubs to recycle materials.

Integrate circularity metrics and reporting.

- Include evaluation criteria for durability, repairability, and recyclability in tender assessments, and require reporting on recovered material quantities, energy savings, and emissions reductions to continuously improve procurement practices.

10. RECOMMENDATIONS

Plastic pipes industry

Continue strong stewardship practices and expand recovery infrastructure.

- Maintain leadership in rework use.
- Invest in closed-loop systems that reprocess off-cuts, post-consumer materials, and off-site returns into non-pressure applications.

Advance material testing and innovation.

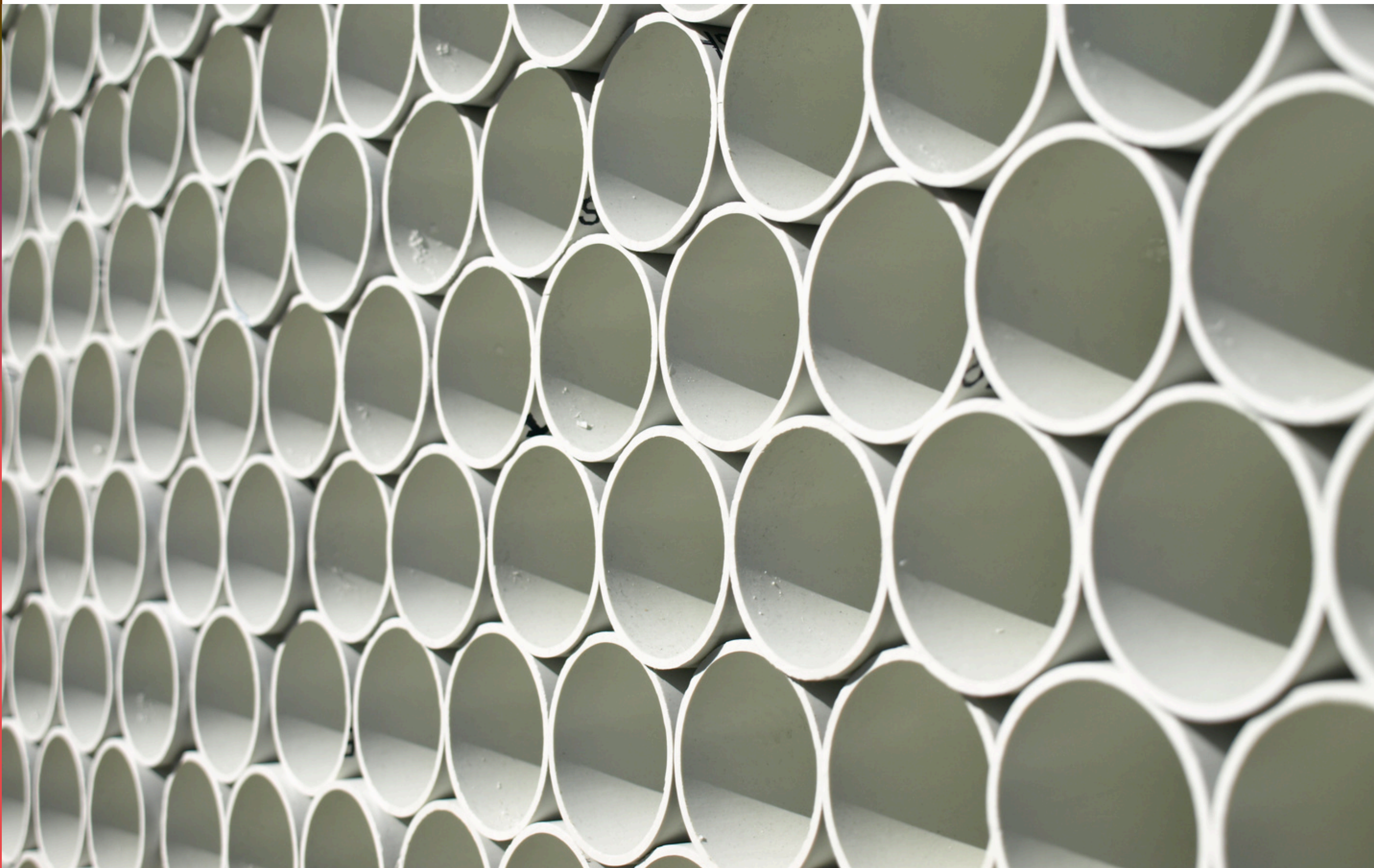
- Validate and document the performance of recyclate sourced from non-pipe sources to support broader uptake.
- Collaborate on R&D to improve recycled content performance, especially for emerging technologies.
- Work with resin manufacturers on alternative sources for raw materials.
- Continue to develop standards and guidelines.

Standardise and share data on recovered volumes.

- Contribute to industry-wide benchmarks by reporting recyclate use, recovery rates and energy efficiency improvements annually.
- Assist downstream users (e.g. installers) in identifying and collecting recyclable material on site.

Develop National Stewardship Scheme

- Design of a national product stewardship scheme, building on insights gained through industry-led pilot programs in Queensland and Western Australia. These pilots have provided valuable experience in logistics, material quality, and stakeholder engagement that can inform a scalable national model.
- Collaborate across the supply chain, from manufacturers and recyclers to installers and asset owners, to ensure the scheme is robust, flexible, and designed to work across all sectors and regions.
- Support the development of shared logistics solutions, such as mobile collection units or hub-and-spoke take-back systems, to improve recovery of off-cuts and end-of-life pipes, especially in remote or decentralised project locations where recovery is currently limited.
- Champion a stewardship model that prioritises whole-of-life performance and circularity, not just recycling rates, recognising that reuse, repair, and in-situ applications are critical circular strategies already embedded in pipe infrastructure.



10. RECOMMENDATIONS

Collectively Addressing Data Gaps

Addressing data limitations is essential for enabling robust quantification of material flows of plastic pipes in Australia and for evaluating the impacts and potential of circularity measures for plastic pipe systems. Without reliable data, material flow analyses (MFA) rely on assumptions, making estimates uncertain or unreliable. Major gaps include sectoral pipe use, historical sales, and end-of-life (EoL) arisings, which are essential for estimating in-use stock and recovery potential. Long pipe lifespans and inconsistent reporting mean primary data collection through surveys or audits may be needed, though this can be resource-intensive.

When primary data is unavailable, modelling approaches—using historical sales, lifetime distributions, or reliability models—can estimate unknown flows, but should be validated with industry input. Estimating end-of-life (EoL) arisings may be feasible for smaller sectors, like rural irrigation. Proxy data from studies such as the Australian Plastic Flows and Fates study can fill gaps but the data for pipe-specific analysis is limited and should be interpreted cautiously. These methods offer useful preliminary insights if data and assumptions are transparent and results are validated by experts.

To prioritise future work for quantifying flows of plastic pipes, data collection and modelling efforts could focus on:

- **In-use stock assessment: Developing methods to estimate current in-service pipe volumes by sector and material**
- **End-of-life recovery pathways: Mapping how pipes are currently collected, processed, or disposed of at EoL, including barriers and opportunities for reuse and recycling**
- **Quality and contaminant profiling: Understanding recyclate quality, contamination issues, and their impacts on circularity potential**
- **Regulatory and policy influence: Identifying how regulations and standards affect pipe circularity and data reporting**

Opportunities include:

1. Develop national dataset on historical sales of plastic pipes by material and use sector

- Establish a framework for collecting and curating historical plastic pipe manufacturing and sales data, disaggregated by material and end-use sector, using industry reporting and targeted surveys. This dataset is essential for material flow modelling and assessing circularity opportunities.
- Develop sector-specific models of in-use pipe stock based on historical sales, product lifetimes, and failure rates. Understanding in-use stock is critical for quantifying EoL arisings and evaluating circularity potential across sectors.

2. Quantify EoL arisings and offcuts through sector-specific data collection, audits, and modelling

- Use sector audits, stakeholder surveys, and additional data collection to quantify end-of-life (EoL) generation, including rehabilitations, replacement cycles, reuse and repairs. Collect data on offcut generation by sector, as these represent the most accessible post-consumer material, to inform the feasibility of targeted recovery measures.

3. Improve transparency and resolution on recyclate utilisation (e.g. sources of recyclate), and recyclate fate (e.g. destined for pipe applications, non-pipe applications)

- Collaborate with recyclers and manufacturers to trace recyclate inputs (e.g. pipe vs non-pipe, post- vs pre-consumer) and outputs (e.g. pipe manufacturing, other construction materials), establishing robust data collection and reporting frameworks.
- Collecting detailed data on recyclate production and end-use is essential for assessing circularity performance and identifying barriers to closed-loop recycling, though it requires significant ongoing investment.

11. Closing Summary

The Australian plastic pipe sector is already on a strong circular trajectory. Its emphasis on durability, in-use longevity, repairability and design efficiency positions it well to contribute meaningfully to national circular economy goals. However, existing circularity is often under-recognised in policy and reporting frameworks that rely heavily on short-term material flows and recycled content indicators.

To accelerate progress, coordinated action is needed to improve recovery logistics, refine performance metrics, and strengthen stewardship frameworks. By recognising the unique characteristics of infrastructure plastics and focusing on whole-of-life performance, stakeholders across government, industry, procurement and manufacturing can unlock further circular benefits—without compromising the safety, reliability or long-term value of essential plastic pipe systems.

12. Appendices

12. APPENDIX 1.1

High level material flow mapping-Pipe sectoral use

Sectoral use: applications in Australia

Understanding how plastic pipes are used across different sectors is essential to assess their circularity and identify where interventions—such as design improvements, recovery programs or increased recycled content—will be most effective. In Australia, plastic pipes are widely applied in infrastructure and industry due to their durability, resistance to corrosion, cost-effectiveness, environmental advantages, and long lifespan. Their applications are generally grouped into pressure and non-pressure uses, with sector-specific distributions summarised in Table 4.

Civil and Infrastructure

Civil and infrastructure projects, including water supply and sewage, are the largest consumption sector of plastic pipes in Australia, with over 75% of all water supply and sewage pipelines in use made of plastics. Pipes used in this sector are PVC (e.g. water, stormwater and sewage pipelines, electrical and telecommunication conduits) and PE. PE has gradually taken a larger share of the infrastructure market in pressure applications, particularly in trenchless installations and situations calling for larger diameters.

Gas, mining & industry

Plastic pipes also play a critical role in Australia's gas, mining and industrial sectors, where the high durability and corrosion resistance of plastic is beneficial. The chemical corrosive resistance properties of polymers also make these pipe materials common in the industrial sector, including for food, chemical processing and transportation. The dominant material across these sectors is PE. In the mining sector, PE pipes are used in slurry transport, dewatering, and process water systems, reflecting its robustness under abrasive and corrosive conditions. Note that growth in fossil fuel and mineral demand, mine site rehabilitation, and the use of above-ground pipeline installations make the mining sector a potential source of post-consumer pipe material.

Building

The building industry also sees a mix of largely PVC and some PE pipes in use for both non-pressure (e.g. drainage, sewage, conduit) and pressure (e.g. water supply) applications. With increasing demand for new dwellings and associated civil infrastructure, it is likely that pipe consumption in the buildings and civil and infrastructure sectors will continue to grow in the near future.

12. APPENDIX 1.1 CONT.

High level material flow mapping-Pipe sectoral use

Rural, Irrigation and Agriculture

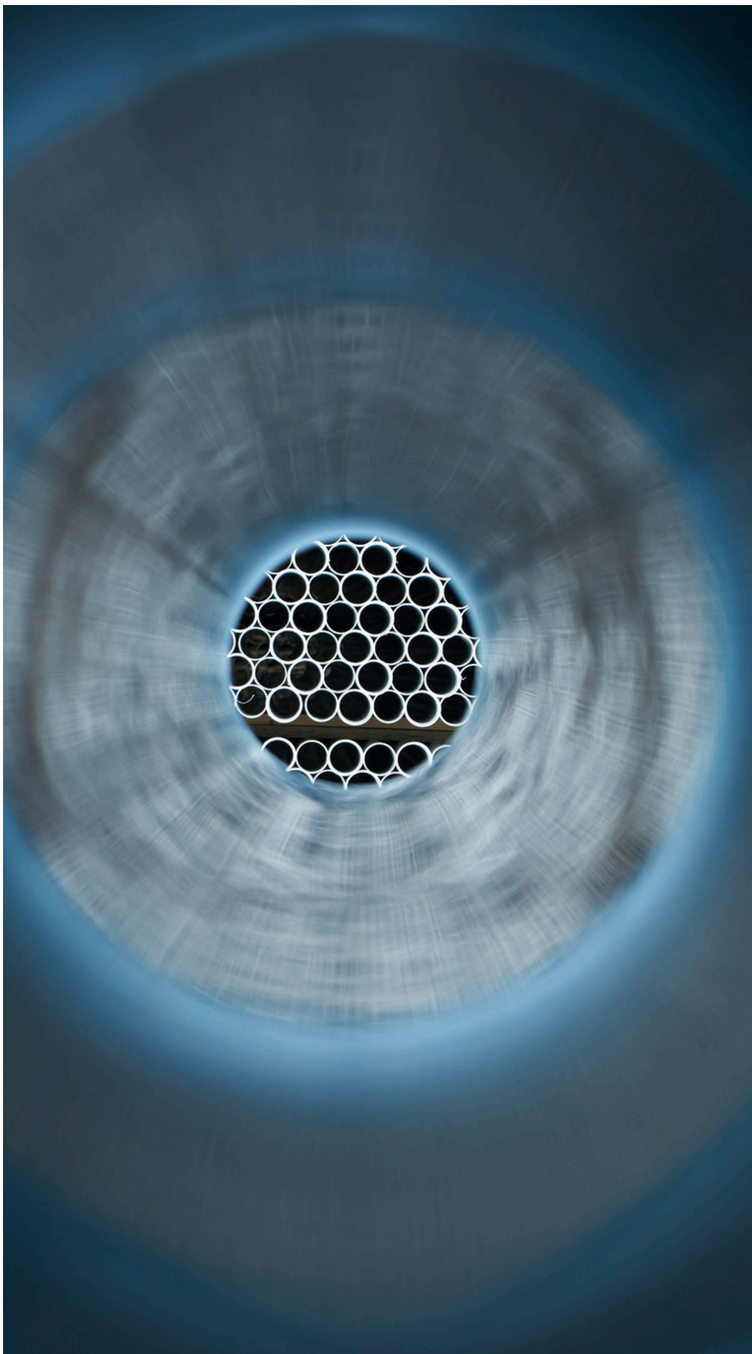
The rural irrigation and agriculture sector in Australia primarily uses PE pipes for pressure applications such as crop irrigation, stock watering, groundwater extraction, and rural water reticulation, due to their flexibility, ease of transportation, and chemical resistance. PVC is also used, particularly in water supply systems where rigidity or compatibility with legacy systems is required. While most applications are pressure-rated, non-pressure uses like drainage and culverts also rely on PE, where the flexibility and ease of installation of PE pipes is beneficial. Recovery of end-of-life pipes is limited due to the sector's geographic dispersion and the prevalence of buried installations, which increase logistics costs (notwithstanding the long-expected lifetimes of pipe installations).

Quantifying sector usage

Quantifying actual sectoral use of plastic pipes is challenging given limited available data. Data approximating polymer use across different sectors in Australia, including the agriculture, built environment, and industrial sectors is available in the Australian Plastic Flows and Fates study (Blue Environment, 2024). While this data provides valuable national-level insights, it includes non-pipe applications (e.g. flooring, profiles, plastic wrap, etc.) and therefore lacks the material and application-level granularity required by the plastic pipe industry.

The data from this presents a broad, provisional proxy of polymer use across sectors, indicating the built environment is the dominant sector for plastic use, particularly for PVC. This aligns with expectations PE and PP are more prevalent in rural irrigation and agriculture. The inclusion of lightweight products (e.g. plastic baling wrap) likely overstates volumes relative to heavier pipe materials. Given the stated limitations, the integrity of available data for pipe-specific analysis is low and does highlight the limited availability of data on sectoral uses of plastic pipe—essential for accurately characterising the use and circularity progress and opportunities of plastic pipe systems in Australia.

While the data may offer a general directional insight into sectoral plastic use, they should be interpreted with caution and not relied upon as an accurate representation of plastic pipe flows or circularity potential.



12. APPENDIX 1.2

High level material flow mapping-processes

Material flow mapping: plastic pipe lifecycle

1. Pipe manufacturing

Pipe manufacturing represents all domestic production of plastic pipes in Australia, utilising virgin and secondary (pre- and post-consumer) material. All virgin resin used for pipe production in Australia is imported, with the exception of a small quantity of polypropylene (PP) produced domestically. Some imported secondary (recycled) resin may also be used, but data on the volume and source of these materials remains limited and unverified. Although there is some information on utilisation of post-consumer material in new pipes (see Table 5), the sources of secondary material are unquantified, with some non-pipe material (e.g. packaging) utilised as sources of post-consumer material. The system diagram also includes the use of rework material, which refers to in-house scrap generated during manufacturing that is reprocessed back into production. While this helps avoid sending material to landfill and contributes to overall resource efficiency, rework is excluded from recycled content reporting, as it does not leave the production system and re-enter as post-consumer or post-industrial recycled material.

2. Pipe sales

This process represents the sales of plastic pipes on the Australian market, from both domestic production and overseas imports. New pipes placed on the market (PoM) contribute to the growing in-use stock of pipes.

3. Pipe in-use stock by sector

This represents the stock of installed plastic pipe systems across Australia. Ideally, data on both new pipe sales and the existing in-use stock would be disaggregated by application sector (e.g. buildings, civil infrastructure, agriculture), as understanding where and how pipes are used is essential for effectively evaluating circularity potential and end-of-life (EoL) management options.

Outflows include:

- **Collection through dedicated stewardship schemes** – e.g., the Master Plumbers' Construction Plastics Recycling Scheme. EoL and discarded pipes, offcuts are collected through these programs are typically processed at manufacturers' facilities.
- **Company-level stewardship or environmental management initiatives** – where manufacturers manage their own collection and processing of EoL and discarded pipes, offcuts on-site.
- **Conventional recycling systems** – materials such as offcuts collected via established waste management pathways, particularly within the construction and demolition (C&D) waste stream.
- **Disposal** – EoL and discarded pipes, offcuts sent to landfill where recovery is not feasible.
- **Re-use** – pipes repurposed in situ as host pipes, typically retained in the ground and used for applications e.g. relining. Here, the pipe is not treated as end-of-life, as it continues to serve a functional role within the infrastructure system.

It is expected a small portion of the in-use stock will reach end-of-life each year; however, this figure fluctuates annually depending on factors such as sector-specific usage patterns, pipe age distribution, maintenance practices, and external influences like infrastructure upgrades or regulatory changes. These EoL materials may enter existing waste or recycling systems, be captured through targeted stewardship initiatives, or remain in-situ underground.

Similarly, a portion of new pipes placed on the market (PoM) will result in offcuts during installation. The quantity and management of offcuts will vary by application and sector—for example, offcuts are more common in building construction, where custom pipe lengths are often required, but are less likely in civil infrastructure or gas pipelines, which typically use standardised lengths and installation practices.

12. APPENDIX 1.2

High level material flow mapping-processes cont.

Pipes and offcuts collected through formal stewardship schemes are generally sent directly to reprocessing by manufacturers, bypassing materials recovery facilities (MRFs). This direct pathway improves recovery efficiency. In contrast, materials collected through conventional waste systems may require additional sorting and require stringent processes to avoid contamination or loss. Pipes retained in the ground and repurposed as host pipes remain functionally in use. Although no longer serving their original purpose, they support new infrastructure applications and are therefore not considered end-of-life material.

4. Collection and sorting

This process refers to the collection and sorting of EoL pipes and offcuts collected via the waste management system. Some C&D waste collected for recycling is first sorted at MRFs, where recyclable materials are positively sorted from the incoming waste stream, and aggregated before transfer to reprocessing facilities. Available data indicates that volumes of pipes collected via the C&D stream is very small. Material loss to landfill is expected due to sorting inefficiencies at MRFs.

While contamination (e.g. attached fittings, excessive soiling, or material degradation) can affect whether pipes are successfully sorted for recycling, it is more pertinent that current sorting technologies and processes may not be well-equipped to handle these specific challenges. Note that this was not raised as a key issue by survey or interview participants, but remains a practical barrier to recovery. It is likely that a small quantity of offcuts and EoL pipes would also be managed through municipal waste collections, and volumes managed via this pathway are assumed to be negligible.

5. Reprocessing

This process represents the reprocessing of EoL and discarded pipes, offcuts into recyclate suitable for use as recycled content in new pipes and other plastic products.

While the system diagram provides a simplified view, actual reprocessing involves multiple sub-processes, including additional sorting and washing, grinding and/or granulation, and secondary washing and grinding steps (see CSIRO 2022 report for a detailed process diagram of the reprocessing stage for PVC).[11]

Further processing may also be required in order to prepare recyclate for use as secondary material in new products, PIPA's POP208 – Guidelines for the use of recycled plastics in piping systems provides clear requirements for ensuring that any recycled material used is free from contamination and processed in a way that preserves the highest possible material quality. This is essential to safeguard long-term performance and safety, particularly in infrastructure applications.

Note that recyclate produced from EoL and discarded pipes, offcuts would be in demand from several manufacturing sectors beyond pipes, including for other construction material such as plastic flooring, profiles and other construction-related materials. Some proportion of material input to reprocessing is also expected to be lost to landfill due to reprocessing inefficiencies and contamination, particularly where incoming material cannot be sufficiently cleaned or sorted for high-quality recycling.

6. Disposal

Disposal represents the discarding of EoL pipe and offcuts to landfill. While material flow mapping of plastic pipes faces limitations due to limited data availability, it remains a valuable tool for qualitatively characterising the key lifecycle and management chain processes, identifying intervention points for circular economy measures, and serving as a platform for further quantitative assessment and modelling. The mapping exercise presented highlights the importance of sector-specific data on in-use stocks, waste generation, and recovery processes to better understand the scale and distribution of pipe material flows.

11. Schuyler Q, Walton A, and Farbotko C. 2022. PVC recycling in Australia: Current status, barriers, and opportunities. CSIRO.

12. APPENDIX 1.3

Quantifying plastic pipe flows through the pipe lifecycle

Data requirements and limitations

MFA is a data-intensive approach that depends on reliable data or assumptions across all stages of the product lifecycle, from manufacturing through to EoL and recovery processes.
In the context of plastic pipes, data limitations present significant challenges for performing an MFA, with data gaps present across several key components of the plastic pipe lifecycle. Table 5 outlines key data requirements and highlights where data may be available for estimating plastic pipe material flows, as well as critical data gaps and limitations. Note that this table is not exhaustive, but serves to help quantify a baseline for pipe material flows.

Table 5: Overview of data requirements and data gaps in the quantification of plastic pipe material flows

Lifecycle stage	Data requirements	Analytical relevance	Potential data sources	Data gaps and limitations
Pipe manufacturing	- Quantities of virgin material used in production, by material- Quantities of secondary materials used in production, by material- Re-work utilisation, by material	- Data needed to quantify domestic production of plastic pipes, including from virgin and secondary material sources	- PIPA industry reports (pre- and post-consumer recycled material in pipes, re-work utilisation estimates)	- No data on post-consumer material derived from non-pipe sources
Pipe sales	- Quantities of pipes imported, by material- Quantities of pipes exported, by material- Sales (or demand) by consumption sector and material	- Data needed to quantify plastic pipes placed on the market each year- Sales or demand by consumption sector required to understand pipe consumption across sectors	- PIPA industry reports (approximate pipe consumption in Australia)- DFAT statistics (imports and exports of pipe material even though this includes flexible pipes and hoses which are outside the scope of this report)	- No data on sales or demand by consumption sector
Pipe in-use stock by sector	- Historical pipe sales by material	- Data to estimate the in-use stock of plastic pipes in Australia, and EoL arisings	NA	- Limited data on historical pipe sales

12. APPENDIX 1.3 CONT.

Quantifying plastic pipe flows through the pipe lifecycle

Table 5: Overview of data requirements and data gaps in the quantification of plastic pipe material flows continued

Lifecycle stage	Data requirements	Analytical relevance	Potential data sources	Data gaps and limitations
Collection and sorting	- EoL arisings (via reaching service EoL, product failure, rehabilitation, etc)- Quantities of pipe offcuts produced by sector, material- Stewardship scheme and take-back initiative collections- Pipes collected via C&D stream- Sorting rates for pipe material	- EoL arisings and offcuts needed to evaluate circularity performance of pipe systems, and to understand potential scale of EoL pipes from which recyclate might be generated- Quantities collected via stewardship and take-back schemes, and via waste management systems needed to quantify flows to sorting and reprocessing facilities and to landfill disposal- Sorting efficiencies required to quantify losses of pipe material through sorting	- Industry statistics (e.g, CPRS collection quantities in Queensland)- C&D waste audit data- PIPA industry reports (lifetime of pipes)- Academic publications (failure rates of pipes, sorting efficiencies for plastic materials)	- No data on EoL arisings- Limited data on stewardship and takeback scheme collections (e.g. data for CPRS in Queensland, but no data for WA scheme)- No data on offcut waste generated- Limited data on collections via C&D stream (e.g. aggregated materials via national waste reporting, not pipe specific)
Reprocessing	- Reprocessing efficiency (i.e., proportion of input recovered as recyclate)- Quantities of recyclate produced from EoL pipe material for pipe and non-pipe applications	- Reprocessor efficiency required to understand proportion of pipes sent to reprocessors lost to landfill (e.g. due to contamination)- Quantities of recyclate produced from EoL pipes required to evaluated circularity performance of pipe systems	- PIPA industry reports (quantities of post-consumer recyclate)- Academic publications (plastic reprocessing efficiencies)	- Limited data on recyclate production (e.g. post-consumer recyclate used for pipes known via PIPA reports, however recyclate produced for non-pipe applications unknown)

12. APPENDIX 2

Adressing the research questions

Addressing the research questions

There is a vast variety of plastics, each with different properties, lifespans, and applications. Single-use plastics which are designed for short-term convenience are fundamentally different from long-life engineered products like plastic pipes, which are built to last over 100 years and support critical infrastructure.

This distinction must be recognised in policy development. Plastic pipes are designed for long-term performance, can be repaired and are 100% recyclable at the end of their service life. At present, Australian and New Zealand product standards only permit recycled material use in non-pressure pipe applications, but this is not a limiting factor, as the volume of suitable recycled material currently available is insufficient even for those applications.

High-level material flow mapping shows:

- The plastic pipe sector is well established, dominated by durable material with long service lifetimes
- Comprehensive data for detailed material flow analysis and quantitative evaluation of pipe system circularity currently remains limited.
- The majority of plastic pipes placed on the market remain in use for decades, with in-use stock steadily accumulating.
- EoL arisings are minimal in the short term, and recovery remains limited in scope.
- Recycled content is used in plastic pipe manufacturing but restricted to non-pressure applications.
- Post-consumer recovery remains challenging due to underdeveloped reprocessing infrastructure, logistical constraints, and economic viability - despite contamination not being a major concern

There were three key research questions (RQ) guiding the research and analysis. Below are the research questions, and the summary of findings.

1. RQ1: What materials and applications characterise the plastic pipe sector in Australia?

The plastic pipe sector in Australia is primarily characterised by the use of PVC and PE, with smaller volumes of PP used in specific applications. Other polymers such as PB, PEX, and ABS are used in niche or specialised contexts, though data on these types remains limited. Plastic pipes are used across a wide range of sectors, including civil infrastructure, building and construction, agriculture, gas distribution, and mining, with applications varying between pressure and non-pressure systems. The majority of plastic pipes used in Australia are manufactured domestically, supporting local supply chains and standards compliance.

12. APPENDIX 2 CONT.

Adressing the research questions

RQ2: How circular are plastic pipe systems in practice?

Plastic pipe systems in Australia demonstrate a high degree of functional circularity, primarily through their long service life, durable design, and capacity for in-situ reuse and repair. These products are engineered for longevity, often exceeding 100 years, and are designed to remain in service at their highest value for as long as possible. In-ground reuse strategies, such as the use of existing pipes as host infrastructure for new installations, further contribute to extended utility, although the scale of such practices is not yet comprehensively documented.

From a material circularity perspective, however, measurable recycling rates appear low when assessed against annual material flow metrics. This is not due to a lack of industry engagement but rather reflects the inherent durability and long lifecycle of plastic pipe products. Current Australian product standards limit the use of recycled content to non-pressure applications, constraining recyclate uptake in pressure-rated systems due to stringent performance and safety requirements.

Overall, the circularity of plastic pipe systems is best understood over extended timeframes and through input-focused indicators such as dematerialisation, design for longevity, reuse and recycled content. The sector's ongoing stewardship initiatives, environmental management systems, and investment in recycling pilots highlight a clear commitment to advancing areas of circular economy principles in practice.

12. APPENDIX 2

Adressing the research questions

RQ3: What barriers and opportunities exist to improving circularity?

The extended service life of plastic pipes means they remain in use far longer than many other plastic products, reducing the need for frequent replacement and conserving resources over time. While this longevity means end-of-life (EoL) material enters the recycling stream more gradually, it reflects the inherent durability and efficiency of plastic pipe systems in delivering long-term value. This highlights that recycling is a final step in a broader circular strategy, not the primary measure of success. As a result, conventional annual recycling rates may not fully reflect the long-term circularity performance of plastic pipe systems.

Additional barriers to improving circularity are the limited infrastructure available for collecting, sorting, and processing used pipes, particularly from construction and rehabilitation sites.

Material availability is also sporadic, as plastic pipes have long service lives and are typically only removed or replaced during major infrastructure works. This irregular flow of recoverable material makes it difficult to establish consistent, efficient recycling operations. In addition, high transport and processing costs, with limited regional reprocessing capacity, create economic and logistical challenges that further constrain recovery efforts.

Despite these barriers, the sector has several promising opportunities to enhance circularity. The long life and durable design of plastic pipes are themselves key features of circular economy thinking, as they ensure minimal resource input over extended timeframes.

Some reuse already occurs in practice—for example, through in-situ applications where existing pipes serve as host structures for rehabilitation works, eliminating the need for removal or disposal.

Furthermore, many manufacturers are actively investing in the collection, reprocessing, and reuse of pre-consumer materials such as offcuts, with some also trialling post-consumer recovery solutions. Mobile and distributed collection systems present another opportunity to improve material recovery, especially in remote or decentralised locations and projects where traditional logistics may not be viable.

Looking ahead, the development of a national product stewardship scheme such as the one being explored by PIPA, has the potential to play a pivotal role in advancing circularity across the sector.

Rather than focusing solely on recycling, such a scheme could take a more holistic approach by supporting other key elements of the circular economy, including the collection of lifecycle data, promoting design for durability and reuse, encouraging dematerialisation, and supporting innovations in material recovery and product traceability.

By coordinating best practices across the industry and strengthening supporting infrastructure, a stewardship framework could help overcome systemic barriers and deliver long-term environmental and economic benefits.

UTS Institute for Sustainable Futures

Circular Australia

PIPA