



ARTICLE

Taking in the recycling

For many years, Australia simply exported its paper recycling obligations. Those days are over, and we've got a 5.6 million tonne problem on our hands. Jodie Lea Martire opens the blue bin to investigate.

According to the latest National Waste Report, the average Australian generated 229kg of paper and cardboard waste in 2016–17. This makes for 5.6m tonnes of waste, only 60% of which was recycled.

Paper-based packaging is currently recycled at a rate of 49%. In 2018–19, 3.4m tonnes of paper waste was exported, valued at \$235m, but the Council of Australian Governments (COAG) will end the off-shoring of Australian recycling from 2024. We've been left with little choice—China's new (and rather dramatically named) National Sword Policy reduced waste imports severely from February 2018 onward, a move that was followed by other major importing nations like Indonesia and India.

This means we're finally being forced to deal with our own wastepaper. This comes in many forms: newspapers (although the amount of these is falling with increased online news consumption), office and writing paper, cardboard and boxboard (like cereal boxes), and Kraft paper (in paper bags). The cellulose fibres in paper can be recycled an average of seven times, making progressively lower-quality paper products: office paper can make new office paper to start with, but later becomes newsprint, paper towels and corrugated cardboard. Not everything that looks like paper is recyclable—copy paper packaging, baking paper, tissues and paper towels aren't suitable, nor are takeaway coffee cups (see the case study that follows this feature).

How is paper recycled?

The first stage of paper recycling is the collection of paper waste: from bins in offices and universities, commingled domestic

recycling or pre-consumer waste (e.g. offcuts from paper mills). Mixed recyclables are taken to a materials recovery or recycling facility (MRF), where paper is separated from glass, aluminium, plastic, etc. The paper is then sorted into grades (such as newspaper, cardboard and office paper) and each grade is baled separately. Paper can be contaminated if it's wrongly sorted, and/or by paper clips, liquids, pizza grease, or glass slivers from a mixed bin.

Each wastepaper grade then undergoes the recycling process. This starts with the paper being shredded and soaked in large, hot vats to disintegrate the cellulose fibres. The result is called "pulp". This is spun to remove heavy contaminants like staples, then filtered through a series of increasingly fine meshes. This "screening" removes some glue and adhesives (like that on sticky notes).

Once this is done, the pulp moves through a series of processes that are collectively referred to as "laundering". First, the pulp is "washed" to remove ink from it. Sometimes it also undergoes "flotation", which removes both ink and contaminants by injecting soap bubbles into the vat; these bubbles collect impurities and rise to the tank's surface to be skimmed off.

When it's clean, the pulp is beaten and thickened to make the fibres swell. At this point, it's ready to be turned into paper. The papermaking involves refining the pulp into smaller fibres, and bleaching

those fibres with hydrogen peroxide or oxygen to remove dyes and "brighten" the mixture (especially if its destination is office paper). Colours, coatings and additives can also be included now.

After this process is complete, the pulp can basically be used in the same way as virgin wood pulp. (At this point, virgin fibre can also be added to the recycled pulp to add strength or smoothness, although it's not necessary. To make sure you're using post-consumer recycled paper, check the FSC label on your product.)

The pulp is then loaded into a paper machine's head box, diluted until it is 99.5% water, then spread on a large moving screen which drains the water and leaves a long paper sheet or "web". The web is pushed





through felt-covered rollers to dry, then passes through heated rollers before being turned into giant paper rolls (up to 9m wide and weighing some 27 tonnes). These immense rolls can be “slit” into sheets or smaller rolls before being printed or fashioned into the final product at a converting plant.

Most recycled paper reappears as standard paper products: toilet paper, paper towels, stationery, printer paper, newsprint, egg cartons, takeaway trays, etc. One Australian company produces cat litter and small animal bedding, and recycled paper can also be used as cellulose insulation in roofs once it is pulverised and has boric acid added (as a fire retardant and pesticide).

What are the benefits of recycling paper?

Paper recycling has significant environmental benefits. According to 2018 report *The State of the Global Paper Industry*, published by global environmentalist collective Environmental Paper Network, one tonne of 100% recycled office paper saves 4.4 tonnes of wood—around 26 trees—when compared to virgin paper. Producing a tonne of recycled paper uses 39% less energy and 9% less water than producing the same amount of new paper, emits 58% less greenhouse gases, causes less than half the amount of ocean acidification, and creates 20% less mercury, 26% less dioxins and 13% less air pollutants.

Apart from the relative benefits of the production process, recycling paper also diverts waste from landfill, which in turn avoids the release of methane as the paper breaks down. As

we discuss in this issue's *Up Front*

section (see page 10), better understanding of methane's effect as a greenhouse gas shows that it is worse than first thought. According to a recent paper in the journal *Carbon Balance and Management*, copy paper degrades to produce an average of 326 L of methane per tonne of paper in landfill—and one tonne of recycled paper saves 3m³ of landfill.

Local paper recycling supports green manufacturing jobs in Australia, reduces waste management costs in your area, and helps offset the costs of importing paper goods. And crucially, recycling paper also helps protect Australia's native forests, which are still being logged for paper production—especially in Tasmania and Victoria.

According to ANU research, the oldest trees in Victoria's mountain ash forests hold up to 54% of the ecosystem's stored carbon. Each hectare of *Eucalyptus regnans* that is logged releases over 1000 tonnes of greenhouse gases. It's also worth noting that when they are

logged, only 40% of Victoria's mountain ash forests become usable products; the other 60% is left as debris, to rot or be burned. (Nevertheless, VicForests remains determined not to make a complete switch to plantation logging until 2030; the body was censured by the Federal Court in May this year for logging endangered possum habitats.)

Are there drawbacks to recycling paper?

Paper recycling is currently slightly more expensive than logging trees for paper production. Because of Australia's geography—with its few, far-flung population centres—it can be expensive to transport baled paper stock to central recycling and manufacturing facilities. The cost of virgin paper is also reduced by the generous subsidies that state and federal governments offer for native forest logging, as well as long-term logging contracts that drastically undervalue forests' economic and environmental worth.

One environmental impact which papermills manage is that of sludge—the runoff that contains the ink, adhesives



Image: baranordemir/StockPhoto



The shredded remains of books, baled in preparation for transport to a recycling factory.

Image: Beau Claar/Wikimedia Commons

and other contaminants removed from the paper pulp. Poorly handled, it can damage surrounding soils; well-handled, up to 50% can be used in roadwork and agriculture, and the other 50% must be safely disposed of.

Some critics of recycled paper have also argued that the recycling process demands more grid energy than virgin papermaking. This is a furphy: some papermills cogenerate their energy by burning up to 77% of each incoming tree (the portion unsuitable for paper). According to the Environmental Paper Calculator, this process still uses 50% more energy overall than 100% recycled paper.

Another issue that is often raised is the question of quality. Again, this is something of a non-issue: 20 years ago, recycled office paper was certainly of poorer quality than virgin paper, and many people have traumatic memories of trying to remove it from a stuck photocopier.

With today's recycling and manufacturing infrastructure, however, the gap in quality is basically gone. Environmental organisation Planet Ark notes that these days, printer makers consider recycled paper safe to use—and also reports that in blind tests, consumers can't actually tell the difference between recycled and virgin paper.

How good is Australia's paper recycling?

Recycling—Who Leads the World?, a 2017 report produced by the European Environmental Bureau and environmental consultancy Eunomia, collates various waste statistics and reporting methods to create a global recycling league table. The report ranks us 21st in the world with a "recycling rate" of 41.6%, which basically means that 41.6% of all the waste we generate is recycled. (Germany, South Korea and Wales—all of which have rates above 60%—make up the top three.)

Tips for better paper recycling

- Don't be a "wish-cycler"! Remind yourself of your council's rules on what to include and not include in your recycling, especially the contaminants that can turn recyclables into landfill.
- If your council supports it, separate your glass, metals and plastics from your recycled paper.
- Don't leave printed paper in the sun or rain, as this makes it harder to extract the dyes.
- Buy Australian-made, FSC-certified recycled paper products that are not made with wood from our native forests.

As far as paper alone goes, pulp and paper industry publication Industry Edge reports that we're among the world's best newspaper recyclers—68% of our newsprint is recycled, a figure that rises to 76% if it includes the reuse of newsprint at home. However, our overall paper recycling rate decreased from 66% to 60% in the two years to 2016–17, meaning the amount of paper that went to landfill rose from 34% to 40%.

In comparison with achievers overseas, our paper recycling system needs serious work. The European Union's Circular Economy Plan, launched in 2015, allows it to account for all products in its territory through a "cradle-to-cradle" lifecycle. The policy has led to dramatic increases in related employment (6%), as well as the repair, reuse and recycling of suitable materials (worth close to €147b). Australia, however, missed the chance to implement a similar system in our National Waste Policy 2018: as the 2018 senate inquiry into waste and recycling stated, "Australia's failure to invest in the development of such an economic model is a significant policy error."

How can we improve our paper recycling?

In the wake of China's National Sword Policy bans, plans are afoot to make our recycling systems fit for purpose. Paper is one of the waste materials being prioritised in Round 8



of the Cooperative Research Centres Projects (CRC-P) Grants recently announced by the Morrison government and in the newly founded Australian Research Council (ARC) Industrial Transformation Research Hub at RMIT. The government also announced a \$190 m investment in a Recycling Modernisation Fund last year, which will finance paper-recycling infrastructure and research. These measures go some way to setting up the comprehensive vision, strategy and targets needed to improve our paper recycling. As it stands, a 2019 report from accounting firm Ernst & Young reports that Australia could be losing \$324 m annually due to poor recycling management.

Australia only had 193 MRFs operating in August 2019—far too few to sort the recycling we produce each year. Thoughtful communication will be needed to explain why more small recycling plants are needed in neighbourhoods near all of us. In addition, more kinds and grades of paper must be sorted through our collection bins and MRFs. This is crucial to reducing contaminants and improving paper quality. Victoria has committed to introducing a purple-lidded bin for glass by 2030, which will get pesky slivers out of paper stock. New investment could also establish MRFs that sort paper into newspaper, magazines, pamphlets and cardboard. Other important measures should include mandating minimum recycled or recyclable inputs into all paper products, implementing pay-as-you-throw and container deposit schemes, establishing paper industry training, and enforcing landfill bans.

But we need to improve both supply and demand in this equation. Because Australia simply exported its recycling problem, manufacturers have not been creating and selling products using our wastepaper—and consumers have not been demanding them. Limited demand means that even high quality materials have painfully low commodity values: the oversupply of recycled paper has led to its value sitting near \$0 per tonne since mid 2018.

All levels of government can implement policies that can mitigate this situation, right now. By putting into place procurement policies that require high percentages of recycled materials, government can drive demand, innovation, employment and market acceptance for the products already available. Every government office could easily begin by buying only 100% recycled, locally made photocopy, printing, tissue and packaging paper. (So can you and I!)

There is one use of paper and cardboard waste, however, that we should resist as long as

The Wilderness Society's Victorian Campaign Manager Richard Hughes on why native logging is unsustainable and destructive.

Renew: Is the use of tree-based paper sustainable?

Not from native forests, where clearfell logging has enormous impacts on native plants and animals; washes mud, soil and sediment into streams and water supply catchments; and increases greenhouse gas emissions through loss of large old trees from carbon-rich forests. We should instead be recycling and sourcing any new fibre from more sustainable sources—such as plantations that are certified to FSC full forest management standards.



Image: Wilderness Society/Dean Gollia/Image United

Are there things that need to happen—legislative reform, a change in public behaviour, etc—to improve or ensure the sustainability of this material?

The main thing that is required to strengthen the paper recycling sector is [ending] special treatment of the native forest logging sector. [This happens] through Regional Forest Agreements (which exempt logging from national environmental laws) and the Wood Pulp Agreement (which guarantees a supply of pulplogs from Victoria's endangered mountain ash forests). These two [agreements] incentivise logging of precious forest areas and reduce the competitiveness of recycling and plantations.

possible. Energy from Waste (EfW) is a process that removes garbage from landfill by burning it to create steam, or digesting organic material to create methane for heat, fuel or electricity generation. Some in waste management support this option, but environmentalists warn that it is literally both quick and dirty when compared to more complex recycling processes, and should be used only when all other methods have been exhausted.

What is the future for paper recycling?

By improving our recycling systems, we can move the dial for our paper use from “destroying native forests” to “sustaining green industries”. The federal government's recent funding announcements indicate it is finally becoming accountable for our wastepaper—if only because it hates to be seen to be losing money from its precious surplus. The \$1.2b raised in landfill levies each year can also boost recycling capacities, and other sectors could do worse than imitate the Australian Packaging Covenant Organisation (APCO). Its 2025 National Packaging Targets state that all packaging must be 100% recyclable and contain 50% recycled material.

Other paper recycling methods are, of course, just over the horizon. Japanese researchers have developed a dry paper recycling machine, small enough for each company to have one in its office. Other manufacturers have made papermaking equipment less sensitive to contamination, or developed micropulp from nanocellulose that

can be moulded and finished in any number of ways (that's Zeoform in Mullumbimby). COAG's own strategy for phasing out wastepaper exports suggests research into mixed-paper use, micro papermills, compost, soil conditioners and construction uses.

Overall, though, the quickest path to sustainable paper use and reuse comes from following best-practice models and research: funding and regulating the industry so it can be creative and competitive; improving the quality of incoming paper through better sorting, higher recovery rates and adaptable recycling processes; driving demand through procurement policies and manufacturing rules; and banning the use of native forests in Australian papermaking. Our paper recycling is on the cusp of becoming creative, effective and essential to local manufacturing—government funds and policies are required to make sure it gets there.

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RESOURCES:

Your local paper recycling:
recyclingnearyou.com.au/paper-cardboard
Recycled paper products: ethicalpaper.com.au;
planetark.org/about/supporters/planet-ark-paper
Forest Stewardship Council (FSC) labels:
fsc.org/en/fsc-labels

Case study: Simply Cups

No, you can't put your takeaway coffee cup in the recycling. Sure, it *looks* like it's made of paper—and 90 to 95% of it is—but there's a thin polyethylene coating on the inside to keep your hand dry. That cardboard-plastic combination means that your average takeaway cup can't be recycled in public or domestic yellow bins. There is currently no commercial process for separating the paper from the cardboard, and bioplastic alternatives must be commercially composted (not recycled) to return them to their organic components.

So what are we supposed to do? Australians bin around 1 billion cups a year—and that was before coronavirus made reusable cups “dangerous”! Fortunately, there are companies out there that are trying to address the problem.

One of them is Simply Cups (a project of circular-economy company Closed Loop), which aims to connect coffee drinkers, manufacturers and purchasers of upcycled products. With the support of major companies (including 7-Eleven, Muffin Break, and shopping centre chains like Lendlease), Simply Cups have set up collection points for used cups and lids in most Australian capitals. At the time of writing, the company has over 1000 locations nationwide, and has diverted nearly 14 million cups from landfill.

The bins are emptied regularly, and the cups are then distributed to local manufacturers to make upcycled products. A few examples: plastic manufacturer Newtecpol uses whole cups to strengthen its recycled-plastic products like roadside curbing and outdoor seating, while Albury start-up Plastic Forest produces mini wheel stops, air-conditioner mounting blocks and garden beds. Recycled cups are also used in the manufacture of the Stay Tray, a reusable drinks holder invented by Melbourne entrepreneur Kate Stewart, which is made from 100% recycled material, while Simply



Behold, a minor miracle: a place to recycle your takeaway coffee cup!

Image: Courtesy of Simply Cups

Cups and 7-Eleven sell the rCUP, a reusable mug made wholly from upcycled takeaway cups.

It is vital that the rescued cups become viable commercial products: recycling only happens when waste is given a second life. According to John Ryan, Closed Loop's head of marketing, Simply Cups had no finalised plans for reusing the cups when it was founded back in 2017. However, Ryan says, “we did know that if we built a system to collect the cups, solutions would come”. Five years later, they're on track to divert 1 million cups a month.

Simply Cups has been able to make an impact because of its understanding of local waste systems, and also because of its connections with major Australian brands and innovative manufacturers who can capitalise on recycled materials. Simply Cups works because, as Ryan says, “it joins the dots to build

a circular economy”.

As that economy grows, so do the possibilities for recycled cups. One “superexciting” future concept is melding rescued cups into asphalt, a process being trialled by Sydney company State Asphalt Services. That company's new road surfacing, which uses coffee cups as a glue replacement, is proving significantly better than the material that it normally uses. (The current material is imported from China or Germany, so producing a local replacement will also save a whole lot of carbon in transport emissions.)

The cup-enhanced surface has shown it is quieter to drive on, more skid resistant and more durable—and uses 80,000 to 90,000 cups per council job. As John Ryan says, “When the roads go live, we've got a solution for every cup in Australia.” - Jodie Lea Martire