

Resource recovery and waste materials analysis

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Resource recovery rates

Australia's national resource recovery rate in 2022–23 was 66%. This comprised 63% recycling, 0.2% waste reuse and 3% energy recovery, mostly associated with the use of landfill gas for generating electricity. In 2016–17, the resource recovery rate was 61% (this differs from the value given in the [NWR 2022](#) (/environment/protection/waste/national-waste-reports/2022) due to revisions to the Standard and the data since then). [The Standard](#) (/environment/protection/waste/publications/national-standard-waste-resource-recovery-data-reporting-second-edition) is helping to standardise national waste reporting but there may still be differences in the scope of state and territory data, including when it comes to assessing and comparing resource recovery rates for jurisdictions and the 3 main source streams. Caution should be exercised in comparing jurisdictions' data.

For clarity, the resource recovery rate is the proportion of generated waste that is allocated to waste reuse, recycling or energy recovery.

Resource recovery rates in 2022–23

Data viewer 10 shows the estimated resource recovery and recycling rates for each state and territory. For both headline waste (core waste plus ash) and core waste (i.e. excluding ash), SA had the highest recovery rate at 82%. In the headline data set the subsequent ranking is NSW and the ACT (both 73%), WA (69%), Vic (66%), Tas (56%), Qld (47%) and NT (34%).

Ranked under the core waste data, Vic is third, NSW fourth, WA fifth and Qld sixth.

Trends in resource recovery rates

Data viewer 10 also shows the trends in resource recovery rates by jurisdiction and by source stream over the 6 years from 2016–17 to 2022–23. In general, and across Australia in aggregate, recovery rates are trending upwards. Australia's resource recovery rate rose from about 61% in 2016–17 to 66% in 2022–23. In 2006–07, Australia's recovery rate was about 49%.

Tasmania completed a major upgrade of its waste data collection and reporting systems, starting in 2022–23. This explains the high rate in that year and the lower rate in 2021–22, when data collection systems were disrupted by the changes. The low ACT recovery rate in 2016–17 was due to the demolitions of asbestos-contaminated houses in that year.

Examined by source:

- C&D recovery rates remain the strongest and continue to climb.

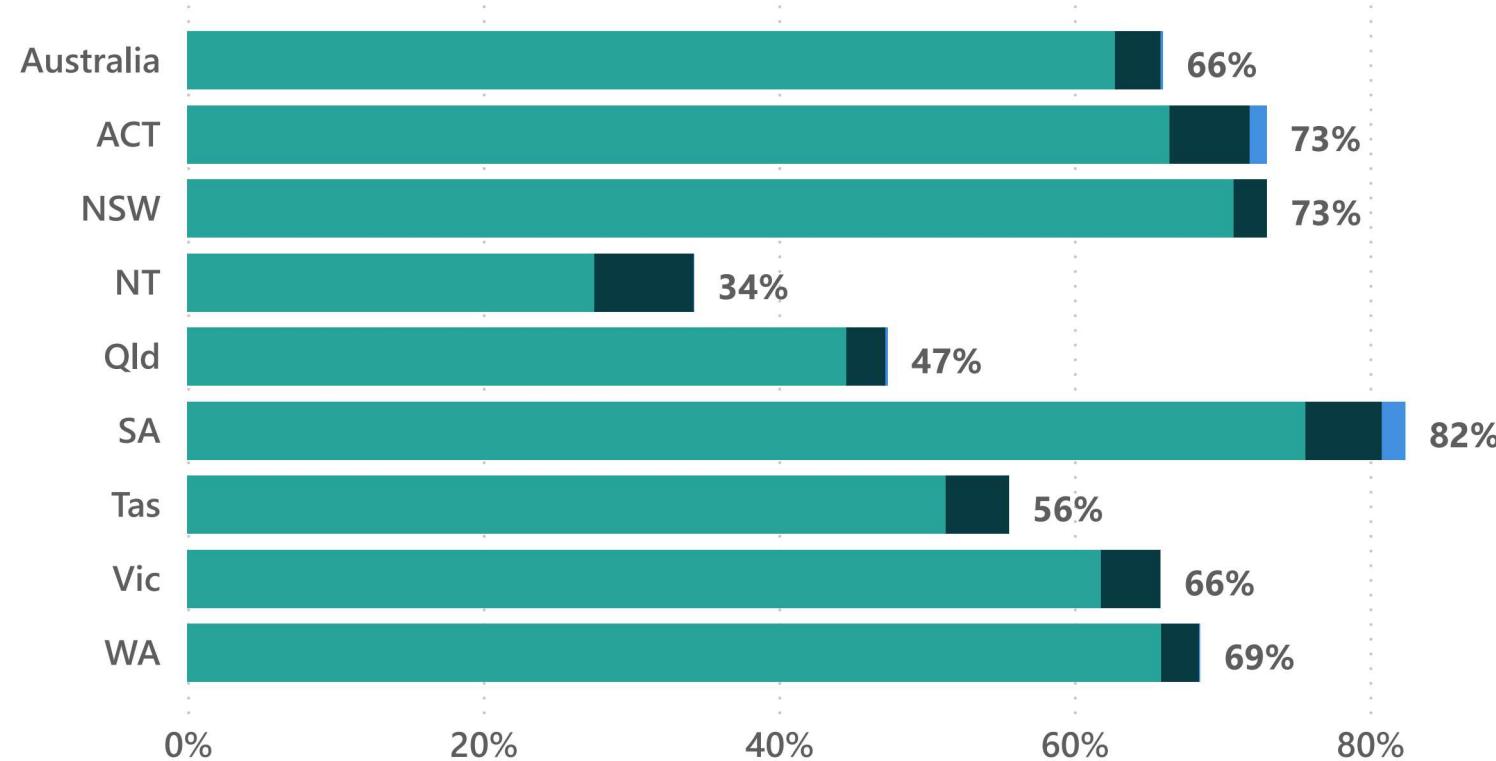
- MSW recovery rates have climbed strongly in the last 2 years of the data trend. During this period many households received an organics service bin for the first time, and many others have been asked to put food waste into their organics bin.
- C&I recovery rates also climbed following 2 or 3 years of decline.

Data viewer 10: Trends in resource recovery rate (2016-17 to 2022-23)

Jurisdiction	Source stream	Waste category
Data scope	Jurisdiction	
Headline waste	All	
		  

Resource recovery rates of headline waste by jurisdiction, 2022-23

● Recycling ● Energy recovery ● Waste reuse



[Trends in resource recovery rate \(2016-17 to 2022-23\) \(XLSX 34 KB\)](#) (/sites/default/files/documents/trends-resource-recovery-rate-2016-17-2022-23.xlsx)

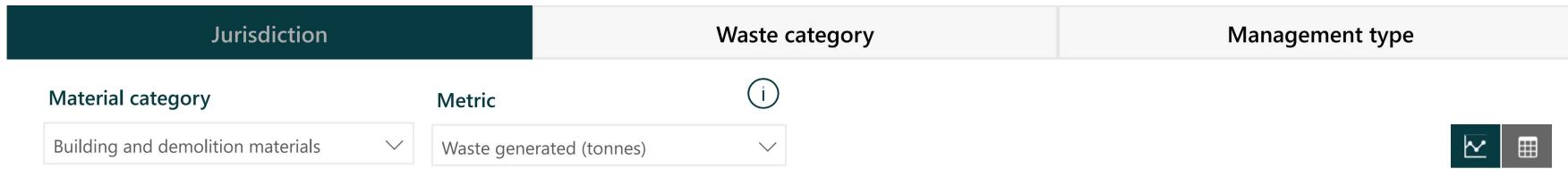
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Waste materials analysis

This section reports on the status and trends of particular waste materials. It opens with an overview comparing waste generation, management type, recovery rate and trends by material category. It then addresses the status and trends in generation and management of key waste categories in turn.

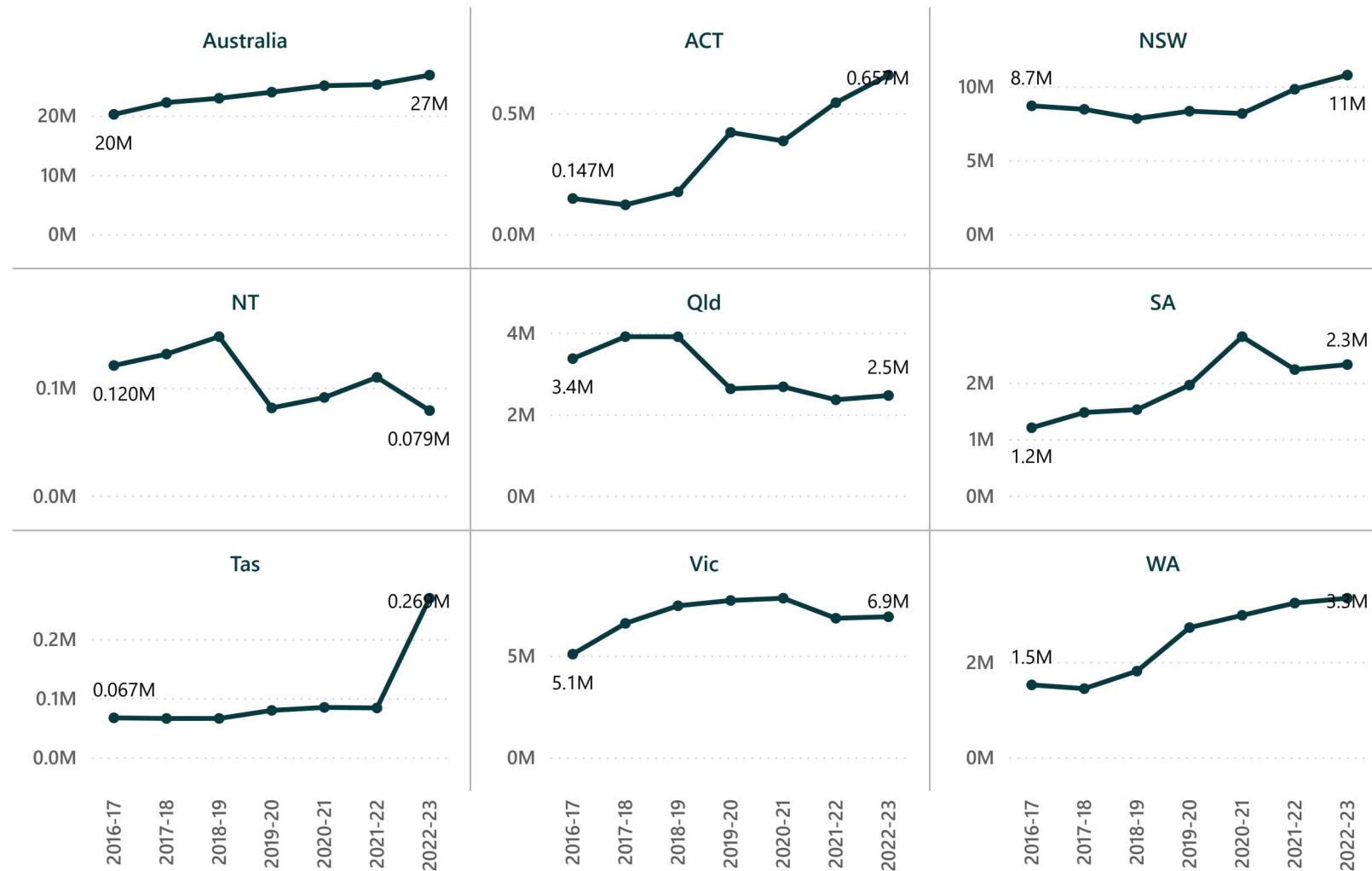
The highest rate was for metals (90%), followed by building and demolition materials (84%). The recovery rate for plastics was the lowest at only 12%. The recycling rate for textiles, leather and rubber (excluding tyres) was the lowest at an estimated 5% but this excludes charitable donations. End-of-life tyres generally form part of the ‘hazardous waste’ category because of fire risk but they are addressed separately.

Data viewer 11: Waste materials analysis (2016-17 to 2022-23)



Building and demolition materials waste generated (tonnes), Australian states and territories, 2016-17 to 2022-23

Note: Y-axis may not share same scale



[Waste materials analysis \(2016–17 to 2022–23\) \(XLSX 141 KB\)](#) (/sites/default/files/documents/waste-materials-analysis-2016-17-2022-23.xlsx)

Ash

Coal-fired power accounted for 47% of Australia's electricity in 2022–23, down from 63% in 2016–17 ([DCCEEW 2024d](#) (<https://www.energy.gov.au/publications/australian-energy-update-2024>)). This produced about 10.3 Mt of ash, or 391 kg per capita, compared with 12.2 Mt in 2016–17 (Ash Development Association of Australia ([ADAA](#)) [2024](#) (<https://www.adaa.asn.au/resource-utilisation/ccp-utilisation>)) (data estimated from calendar year reports). The quantity of ash produced exceeds the quantity of all MSW kerbside bin collections from households. About 89% is ‘fly ash’, the lightweight particles that rise with flue gases before being captured. The remainder is coarser ‘bottom ash’ that settles to the combustion chamber floor.

Waste generation fell 16% over the period reflecting the decline in coal-fired power in Australia. Ash is produced by a host of other industrial operations but on a smaller scale. As energy-from-waste facilities become operational, there will be a need to recycle or dispose of their ash waste.

About 56% of this ash (5.7 Mt) was recycled in 2022–23, up from 49% in 2016–17. Its primary uses are site rehabilitation and material substitutes in the mining and construction industries. Surplus material is typically placed in on-site ‘ash dams’ within the footprint of the coal-fired power station. Australia’s rate of utilisation of coal ash is lower than the global average, and much lower than Japan (97%), China (70%) or Great Britain (70%) (Randell Environmental Consulting, 2020). Internationally, ash repositories are sometimes harvested to supplement increased resource demand.

Building and demolition materials

In 2022–23 about 26.8 Mt (or 1,020 kg per capita) of building and demolition wastes were generated. This material category includes heavy waste types such as concrete, bricks and rubble, and is mostly recorded in the C&D stream. Building and demolition wastes are recovered from most large development projects but less so from smaller projects, from which mixed material loads may be sent directly to landfill. Development projects also often generate contaminated soils, which are dealt with under Hazardous wastes.

Data viewer 11 shows the trend in building and demolition waste generation and management types from 2016–17 to 2022–23. Waste generation grew by 33% from the 20.2 Mt generated in 2016–17. The high growth rate is associated with high rates of urban development, especially in NSW, Vic, WA and SA.

The 2022–23 resource recovery rate for building and demolition materials was 84% (22.4 Mt), up from 76% in 2016–17. There are good markets for recycled concrete aggregate for use as road base, aggregates and hardstand areas. Recycled concrete aggregate consolidates well and forms a harder and more stable hardstand than pure virgin aggregate. There are also good options for recycling bricks and asphalt. Asbestos contamination risks are generally well recognised and managed.

Glass

In 2022–23 about 1.36 Mt or 52 kg per capita of glass waste was generated. About two thirds of this material was MSW.

Data viewer 11 shows the trend in generation and management type of glass from 2016–17 to 2022–23. Glass waste generation increased by an estimated 20% over this period. The proportion recycled has stayed fairly consistent over this period, rising slightly from about 57% to 61%. The steep increase in 2019–20 was mostly reported by Vic and was apparently due to processing of accumulated stockpiles. While this material is attributed to 2019–20, it was generated over previous years.

Glass recycling has always suffered from breakage in collection trucks and material recovery facilities. This leads to high wastage of small fragments to landfill and contamination of paper and cardboard with embedded glass pieces. The establishment of container deposit schemes across the country is helping to [alleviate these problems](#) (/environment/protection/waste/publications/national-waste-resource-recovery-reporting/international-comparisons-exports-2024). Victoria is also establishing separate household glass collections to deal with this problem.

Scrap glass can be colour separated, cleaned and used for making new glass packaging. Australia's major glass manufacturers Visy and Orora are both working to increase the recycled content of their product. Clean and well-separated glass cullet requires less processing and energy than virgin sand. Another growing market for crushed glass is in civil construction projects.

Export of mixed glass has been regulated since January 2021, requiring additional processing and licencing prior to export. Exports of recovered glass subsequently fell from 3% to 0.1%.

Hazardous waste (excluding tyres)

In 2022–23 Australia generated 5.97 Mt of hazardous wastes, or 227 kg per capita. This excluded tyres, which are classified as hazardous wastes due largely to fire risk and are considered separately. The quantity of hazardous waste generated including tyres was 6.47 Mt or 246 kg per capita.

This is slightly down from the 6.08 Mt generated in 2016–17. About half of this category comprised contaminated soils and asbestos (mostly soil contaminated with asbestos).

About 27% was sent for treatment processes that reduce or remove the hazard, facilitating recovery or disposal. When the outputs of treatment are added, about 42% of hazardous waste was recycled, 1.6% was used for its energy value and 56% was disposed of. Disposal was nearly all to landfill but about 30 kt of medical wastes were incinerated.

Quantities fell by 2% over the reporting period, with a larger decline of 21% from the peak of 2018–19. Most of the change is associated with changing rates of urban development, resulting in lower quantities of contaminated soils and asbestos waste.

Hazardous waste generation and management are examined in more detail in our Hazardous Waste in Australia report series. A new version of this report is expected in 2025.

Metals

In 2022–23 about 5.97 Mt, or 227 kg per capita, of metals waste was generated, up 5% from the tonnage in 2016–17. An estimated 65% was C&I waste, 19% C&D waste and 16% MSW.

Data viewer 11 shows the trend in metals waste generation and management type from 2016–17 to 2022–23. Waste generation fell for most of this period then jumped to a peak in 2022–23. Quantities tend to increase with prices as stocks of stored material are retrieved from scrap yards, industrial sites and farms.

The 2022–23 resource recovery rate of 90% was higher than any other waste category and was unchanged from 2016–17. An estimated 43% of recovered metals was exported for recycling, including all aluminium and tin-plated steel cans. Some toxic metals (e.g. cadmium and cobalt) and precious metals (e.g. gold and palladium) are landfilled in composite material products such as electronic waste.

Organics

This includes waste food, vegetation, timber, sawdust, biosolids (stabilised organic solids produced by wastewater treatment) and agricultural organics that are sent to waste and resource recovery facilities. It excludes paper and cardboard, textiles, rubber, leather, nappies, compostable plastics and hazardous organic wastes.

In 2022–23 about 14.6 Mt, or 556 kg per capita, of waste organics were generated. This comprised about 31% vegetation, 28% food organics, 14% timber, 11% biosolids, 1.5% sawdust and about 14% other organics. Other organics is mostly unidentified mixes of vegetation, food and timber, which means the true proportions of these materials are likely to be higher than those stated above.

About 49% of organics were generated as MSW, 47% was C&I waste and 4% was C&D waste.

Data viewer 11 shows the trend in organic waste generation and management types from 2016–17 to 2022–23. The quantity of organics generated in 2022–23 is about 2% higher than the quantity recorded for 2016–17. The estimated recovery rate of 62% compares with 59% in 2016–17. Recovery in 2022–23 included 6.12 Mt of composting and mulching, 1.38 Mt of biosolids applied to land, 87 kt used as fuels, 36 kt processed via anaerobic digestion, and 1.43 Mt recovered through use of landfill gas to produce electricity.

Paper and cardboard

About 4.88 Mt of scrap paper and cardboard were generated in 2021–22, or 185 kg per capita. This is a large drop of 21% from the 6.19 Mt recorded for 2016–17. About 61% was from the C&I stream and almost all the remainder from MSW.

Data viewer 11 shows the trend in paper and cardboard waste generation and management type from 2016–17 to 2022–23. The falling quantities are linked to the shift from paper publications to digital. Annual consumption of newsprint and magazine material has fallen over the last decade by 400 to 500 kt per year and printing and writing papers by another 300 to 400 kt per year. Packaging papers, including cardboard, have grown strongly but not enough to offset these major declines.

The estimated resource recovery rate was 56%, down from 68% in 2016–17. The decline can be linked to reduced consumption of newsprint and magazines and printing and writing papers – grades with traditionally high recycling rates. Exports of scrap paper and cardboard have fallen by more than a third from their peak in 2012–13. From July 2024 Australia began regulating paper and cardboard exports through the implementation of a licensing and declaration scheme, with [licensing mandatory](#)

(/environment/protection/waste/publications/national-waste-resource-recovery-reporting/international-comparisons-exports-2024) from 1 October 2024. This is to ensure exported materials are of a quality suited to direct recycling without removal of contamination overseas.

Plastics

About 2.99 Mt (114 kg per capita) of plastic waste (excluding plastic material in textiles and tyres) were generated in 2022–23. This is up from 2.66 Mt in 2016–17. However, the Australian Plastics Flows and Fates Study ([DCCEEW 2024e](#) (/environment/protection/waste/publications/australian-plastic-flows-and-fates-national-report-2021-22)) estimates this value at about 25% lower. That estimate is based on reported materials placed on the market and their typical lifespan. The difference between the 2 values highlights the uncertainties in both approaches to data collection and modelling. The 2022–23 values are similar using both methods.

An estimated 53% was from the C&I source stream and 44% was MSW.

The quantity of plastic waste generated per year increased by about 12%. Over the same period, the population grew by 8%.

The 2022–23 recovery rate for plastics was about 12.5%, almost identical to the 12.6% estimated for 2016–17. About 1% of this recovery was for its energy value. The rest was recycled. Landfills received an

estimated 87.5% of plastics waste.

Exports of scrap plastics to Asia grew in the early part of this century and by 2016–17 had become the dominant market for plastic scrap. Much of this material was in poorly sorted bales that were then sorted and processed at lower cost overseas. This resulted in poor environmental outcomes such as use as fuel or unmanaged release into the environment. China and other destination countries imposed import restrictions and Australia matched these with export regulations. Exports are now much reduced ([/environment/protection/waste/publications/national-waste-resource-recovery-reporting/international-comparisons-exports-2024](#)) and are increasingly comprised of sorted and processed product requiring no further preparation.

Major investments in plastics sorting and processing infrastructure are underway to soak up the additional demand and meet Australia's targets for recycling of plastic packaging ([/environment/protection/waste/publications/national-waste-resource-recovery-reporting/product-stewardship-2024](#)).

To meet the targets, it will be necessary to greatly expand recovery of soft plastic packaging. Trials are in progress to collect these materials in domestic recycling bins.

There is also a need to find more onshore productive uses for recovered plastics. Opportunities include use in civil infrastructure such as roads. Recovered plastics can also potentially be processed by chemical recycling, breaking them down into their chemical building blocks from which fuels or new plastics can be created.

Textiles leather and rubber (excluding tyres)

Textiles, leather and rubber is a single category with types comprising textiles and rubber and leather. Textiles are the largest portion of this category, and include a broad range of products including clothing, carpets, manchester and others.

In 2022–23 an estimated 860 kt, or 33 kg per capita, of textiles, leather and rubber waste were generated. This is up from about 780 kt in 2016–17. About 70% was from the C&I source stream and most of the rest from MSW. The recycling rate for products in this category is estimated at only 5%, most of which is carpet recycling. The recovery rate is a much higher 13% because of collection and use of landfill gas generated from decaying textile wastes. A revised method for calculating this fraction has resulted in a lower value than reported in the NWR 2022 ([/environment/protection/waste/national-waste-reports/2022](#)).

Import records show clothing is the largest component of this waste category at more than a third.

Tyres

In 2022–23 about 495 kt, or 19 kg per capita, of end-of-life tyres were generated, up from 412 kt in 2016–17. The resource recovery rate is estimated to have been 56%, comprising 40% energy recovery and 16% recycling. These values differ from those reported in the NWR 2022 ([/environment/protection/waste/national-waste-reports/2022](#)) due to updated and improved data from Tyre Stewardship Australia.

About 38% of the tonnes of end-of-life tyres are from passenger vehicles, 32% from trucks and 30% from off-road applications, especially mining.

Nearly all of the energy recovery was in export markets. The Australian Government regulated the export of end-of-life whole tyres in December 2021 to improve environmental and human health outcomes. Exports now comprise shredded tyre-derived fuels that meet a specification, whole tyres for reuse, large tyres for retreading or processed tyre material for recycling. Some illegal export of whole tyres persists and prosecutions have occurred (see Strong action on illegal waste tyre exports ([/about/news/strong-action-illegal-waste-tyre-export](#))). Onshore processing of tyres is mostly for recycling. Markets include road construction additives, playground flooring, sports surfaces and retaining walls.

Next: International comparisons and exports (</environment/protection/waste/publications/national-waste-resource-recovery-reporting/international-comparisons-exports-2024>)