Government of **Western Australia**
Department of **Water and Environmental Regulation**

E-waste to landfill ban in Western Australia

Consultation Paper

January 2023

Department of Water and Environmental Regulation

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Acknowledgement

We acknowledge the Traditional Owners, the Whadjuk people of the Noongar Nation of the land upon which we live and work and pay our respects to their Elders past and present. We recognise the practice of intergenerational care for Country and its relevance to our work bringing it to life on Whadjuk Noongar Boodja*. We seek to listen, learn and genuinely engage and build strong partnerships. We aim to provide sustainable opportunities for Aboriginal people within our workforce and through our business.

Country is a term used by Aboriginal people to describe the lands, waterways and seas to which they are intrinsically linked. The wellbeing, law, place, custom, language, spiritual belief, cultural practice, material sustenance, family and identity are all interwoven as one. Working with the community, we move forward with a shared commitment to protect and conserve Country for our future generations.

* The Department of Water and Environmental Regulation's head office, Prime House, is located in Joondalup, on Whadjuk Noongar Boodja. The above Acknowledgement of Country was endorsed by the department's Aboriginal Water and Environmental Advisory Group.

Message from the Minister

E-waste is one of the fastest-growing waste streams in Australia. Electronic and electrical items are increasingly essential to the function and enjoyment of the lives of Western Australians.

Western Australians all have a responsibility to manage our waste better, including the rapidly growing stream of e-waste we produce. When we responsibly drop-off or have our e-waste collected, we expect that it is recycled and does not end up in landfill.

Nationally, in 2019 Australia generated 521,000 tonnes or about 20 kg per capita of e-waste and this is expected to increase to 674,000 tonnes or 23 kg per capita by 2030. While about half of this was collected for recycling, less than 20 per cent of the material value was recovered ($145 million out of $820 million).

In 2019, only about a quarter of the e-waste generated in Western Australia was estimated to be recycled. We believe this can be increased. Our existing e-waste recycling industry has the potential to manage more e-waste than we do currently. The introduction of an e-waste landfill ban is expected to directly increase the recovery of end-of-life materials and support increased local recovery capacity.

E-waste can contain precious metals such as gold, copper and nickel, and rare materials of strategic value such as indium and palladium. These precious metals could be recovered, recycled and used as valuable source of secondary raw materials. E-waste can also contain hazardous materials and should be collected and recycled correctly to prevent harm to the environment and human health.

The McGowan Government committed to banning e-waste from disposal to landfill by 2024. This commitment sees our state taking a step-change towards the state's Waste Strategy 2030 vision of becoming a sustainable, low-waste circular economy in which human health and the environment are protected from the impacts of waste.

The landfill ban, accompanied by financial support to help build the necessary collection and processing infrastructure, will catalyse the e-waste recycling industry in the state. This will not only generate commercial benefits and employment, but also lead to improved environmental and public health outcomes and increase Western Australia's recycling rate.

For our waste industry, the initiative complements waste management frameworks including national product stewardship schemes to ensure that pathways to recycling are available. Ensuring that viable recovery pathways exist leads to positive outcomes and reduces the risks of stockpiling and illegal dumping.

This paper provides an overview on the problem of e-waste in Western Australia and outlines how the ban will support the recovery of more value and resources from waste, while protecting the environment by managing waste responsibly.

I encourage you to contribute to this important consultation process to help design a more sustainable future for e-waste recycling in Western Australia.

Hon Reece Whitby MLA
Minister for Environment; Climate Action; Racing and Gaming

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Executive summary

The use of electronic and electrical equipment is growing each year in Australia and globally. Electronic and electrical equipment is essential to contemporary everyday life; we use it to work, communicate, control the temperature of our homes, prepare food, clean, entertain our families, get around, and much more.

The McGowan Government made an election commitment to deliver a statewide ban on e-waste disposal to landfill by 2024, to improve the management and recycling of the e-waste we produce.

This commitment builds on growing community expectations regarding how we manage end-of-life products. When Western Australians provide e-waste items for collection, it is important they are recycled and not taken to landfill. By removing landfill as an option, combined with community education and government grants to support collection and recycling infrastructure, the ban is anticipated to significantly increase the amount of e-waste being recycled by Western Australians.

E-waste to landfill ban – scope of items for initial focus

The items identified for banning from disposal to landfill will initially focus on:

electrical, electronic and battery-powered items that have been collected and aggregated purposes of recycling or recovery that:

a) are covered by effective product stewardship schemes, particularly those accredited schemes under the *Recycling and Waste Reduction Act 2020*
b) have established markets or systems for collection, recycling and processing in Western Australia that can grow with increased supply or that have access to national processing infrastructure
c) contain recoverable base materials of value, for example metals, including precious metals.

Government anticipates further consultation on additional categories of products will be required as future phases of the landfill ban are implemented.

This is expected to occur as the waste industry and market capacity increases and product stewardship arrangements are formalised to provide viable pathways for collection and recycling of additional products.

The most recent meeting of Australian Environment Ministers on 21 October 2022 confirmed the Australian Government’s intention to develop regulatory product stewardship schemes for solar panels and also for household electronics in the next few years. This builds on the previous listing of photovoltaic systems and electrical and electronic products on the Commonwealth Minister’s product stewardship priority list.

Aligning the implementation of the e-waste landfill ban in Western Australia with the implementation of these schemes will maximise recovery and minimise unintended consequences such as stockpiling or illegal disposal.

Implementation options and assessment

Analysis and research of international trends in e-waste management, emerging national policy priorities and the operation of landfill bans in other Australian jurisdictions has shaped the development of three implementation options.

Financial incentives, and community education and encouragement underpin the three implementation options that have been identified:

- Option 1: Voluntary (operational) approach
- Option 2: Regulatory approach with voluntary elements
- Option 3: Regulatory approach with extensive obligations

Qualitative assessment against ban objectives, guiding principles, and outcomes (positive and/or perverse) and quantitative assessment supported by a cost-benefit analysis was carried out for all three options.

Additional consideration was given to the following questions:

- How well does the option meet the ban objectives?
- How well does the option meet the guiding principles of the ban?
- Does the option result in positive outcomes?
- Does the option limit perverse outcomes?
- Is there a net economic benefit to Western Australia?

Identifying a preferred approach

A regulatory approach with voluntary elements (Option 2) has been identified as the preferred approach to implementing a ban on e-waste disposal to landfill. This option best met the qualitative factors (objectives, guiding principles, and positive and limits perverse outcomes) and was deemed the most suitable relative to quantitative factors (objectives, and net economic benefit). Positive outcomes anticipated for Western Australia following this option include:

- A measurable increase in the collection and capture of e-waste items, yielding material/resource recovery that would otherwise have been lost to landfill.
- An increase in capture of hazardous materials and by-products that can be emitted to the environment from landfilling e-waste.
- An increase in gross operating revenue of e-waste collection and processing industry in the state, building resilience and capacity of Western Australia.
- Stimulation of new markets for recycled and processed e-waste, due to an increase in supply of available waste product streams and material types.
- Additional job creation through the creation and development of recovery and recycling industry.
- Investment in research, innovation, and local technology through e-waste grant funding incentives.

Have your say

The State Government encourages industry and the community to provide feedback on the information presented in this paper on the ban of e-waste disposal to landfill. We look forward to considering all submissions in the design and decision-making of the ban implementation, to deliver the best outcomes for Western Australia.

About this consultation

This consultation is an opportunity for stakeholders from the community and the waste industry to provide feedback on the initial focus of an e-waste ban to landfill in Western Australia.

This paper addresses the Consultation Regulatory Impact Statement requirements by setting out the key details and potential impacts of the ban and seeking stakeholder feedback on the proposed implementation.

Consultation documents can be accessed at consult.dwer.wa.gov.au.

Questions the Department of Water and Environmental Regulation (the department) has interest in hearing comments on from stakeholders appear throughout the document. After the consultation, the department will analyse submissions and make recommendations in a report to the Minister for Environment.

Submissions and confidentiality

By making a written submission, stakeholders are consenting to the submission being treated as a public document. The person's name on the submission may be published, however, contact details will be withheld for privacy.

If consent is not given for a submission to be treated as a public document, it should be marked as confidential, or specifically identify the parts are considered confidential, and include an explanation.

The department may request that a non-confidential summary of the material is also given. It is important to note that, even if a submission is treated as confidential by the department, it may still be disclosed in accordance with the requirements of the *Freedom of Information Act 1992* or any other applicable written law.

The department reserves the right before publishing a submission to delete any content that could be regarded as racially vilifying, derogatory or defamatory to an individual or an organisation. Submissions received after the consultation closes will not be considered.

Making a submission

The consultation closes at 5pm Friday 31 March 2023.

Submissions can be lodged by email (preferred) to:
e-waste@dwer.wa.gov.au

Hard copy submissions can be mailed to:
E-waste to Landfill Ban Consultation
Department of Water and Environmental Regulation
Locked Bag 10
Joondalup DC, WA 6919

For further information on this consultation contact:
(08) 6364 7041 or e-waste@dwer.wa.gov.au

1 Introduction

1.1 The fate of e-waste

In the last decade, e-waste generation has more than doubled each year and e-waste is currently one of the fastest growing waste streams worldwide.

There are three main pathways for end of-life e-waste, namely landfill, metal scrapping and disassembly/component recycling.

Metal scrapping is considered a low-value recycling option, as products are simply shredded to recycle the metals with non-metals being sent to landfill after this process. Disassembly can lead to higher value recycling of other materials and components from source items. Separated components and materials are then able to be recycled onshore or overseas[1].

When exporting e-waste, Australia must meet the requirements under international agreements and conventions, including provisions under the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*.

1.2 An opportunity for change

The introduction of an e-waste ban to landfill can create opportunities for Western Australia to manage our waste more responsibly to:

- support the increased recovery of value from e-waste materials;
- protect the environment by better management of hazardous products;
- utilise and grow the e-waste collection network;
- increase supply to the recycling and processing networks;
- increase employment to support the people of Western Australia;
- support the state's economy through industry development; and
- see investment, innovation and technological advances in e-waste management.

1.3 International, national, and local policy alignment

A ban on the disposal of e-waste to landfill broadly aligns with key international goals, national policy, and state strategies, outlined in Table 1.

[1] Bontinck PA, Bricout J, Grant T and Legoe G (2021) *E-product stewardship in Australia: Evidence report:* www.dcceew.gov.au/sites/default/files/env/pages/d347d42b-d755-481b-bc38-71683b5d1958/files/e-stewardship-evidence-report-2021.pdf

Table 1: Alignment to global, national, and local goals, policy, and strategy

Source:	Opportunity to align with:
United Nations Sustainable Development Goals[2]	Goal 12: Responsible consumption and production Target 12.5: By 2030, substantially reduce waste generation through prevention, reduction, recycling, and reuse
National Waste Policy: Less Waste, More Resources 2018[3]	Principle 2: Improve resources recovery: • Improve material collection systems and processes for recycling. • Improve the quality of recycled material we produce.
National Waste Policy Action Plan 2019[4]	Target 3: 80 per cent average resource recovery rate from all waste streams following the waste hierarchy by 2030
Recycling Modernisation[5]	Futureproofing and resource domestic waste and recycling sectors to deliver waste reduction and recycling outcomes
WA Recovery Plan 2020[6]	Priorities of driving industry development, green jobs and environmental protection
Waste Avoidance and Resource Recovery Strategy 2030[7]	Vision: Western Australia will become a sustainable, low-waste, circular economy in which human health and the environment are protected from the impacts of waste
Foundations for a Stronger Tomorrow: State Infrastructure Strategy (2022)[8]	Vision: Western Australia is a sought-after place to live, work, study and invest, with infrastructure improving productivity and equity and unlocking industry growth that leverages Western Australia's advantages and diversifies its economic base. Strategies: • Support a strong, resilient, and diversified economy • Enable environmental sustainability and resilience • Get the most from existing infrastructure and improve maintenance
Western Australian Climate Policy (2020)[9]	Key themes: resilient cities and regions; government leadership

[2] United Nations Sustainable Development Goals: www.un.org/sustainabledevelopment/sustainable-consumption-production/
[3] Australian Government, *National Waste Policy: Less Waste, More Resources 2018*: www.dcceew.gov.au/sites/default/files/documents/national-waste-policy-2018.pdf
[4] Australian Government, *National Waste Policy Action Plan 2019*: www.dcceew.gov.au/sites/default/files/documents/national-waste-policy-action-plan-2019.pdf
[5] Australian Government, Recycling Modernisation Fund: www.dcceew.gov.au/environment/protection/waste/how-we-manage-waste/recycling-modernisation-fund
[6] WA Government, *Western Australia's Recovery Plan* (2020): www.wa.gov.au/system/files/2020-07/WA-Recovery-Plan.pdf
[7] Waste Authority, *Waste Avoidance and Resource Recovery Strategy 2030:* www.wasteauthority.wa.gov.au/images/resources/files/Strategic_Direction_Waste_Avoidance_and_Resource_Recovery_Strategy_2030.pdf
[8] Infrastructure Western Australia, *Foundations for a Stronger Tomorrow: State infrastructure strategy* (2022): www.infrastructure.wa.gov.au/sites/default/files/2022-07/2022%20Final%20SIS.pdf
[9] Department of Water and Environmental Regulation, *Western Australian Climate Policy: A plan to position Western Australia for a prosperous and resilient low-carbon future* (2020): www.wa.gov.au/system/files/2020-12/Western_Australian_Climate_Policy.pdf

1.4 Impact on community, environment and economy

In assessing the scale of the problem e-waste presents locally and globally, it is important to consider its effect on the community, environment, and economy, also known as the triple bottom line[10]. Some of the triple bottom line e-waste impacts are shown in Table 2[11,12].

Table 2: Global and local triple bottom line impacts of e-waste disposal

Human health is impacted by environmental contamination

Disproportionate human health impacts in low and mid-income countries, from high-income countries' exportation

Disposal culture resulting in missed opportunities for job creation

Missed opportunities for collaborative community connections

Environmental impacts from contamination and emissions

Disposal behaviours contribute to climate change

Environmental degradation from mining and extraction of raw materials for electronic goods manufacturing rather than using recovered materials to remanufacture

Australia landfills around $680 million worth of materials in e-waste every year

Missed opportunity for market creation and expansion in recycling, reprocessing and local manufacturing

Disposal culture resulting in fewer jobs created

Disposal culture moves away from circular economy goals

Questions

Do you support the incoming ban on e-waste from disposal to landfill in Western Australia?

What other opportunities or benefits could a ban bring to Western Australia?

What impacts does e-waste have on the community, environment, and economy and how big is the problem?

[10] The phrase '*triple bottom line*' is attributed to businessman John Elkington, who coined the term in 1994: www.economist.com/news/2009/11/17/triple-bottom-line.

[11] Forti, Balde, Kuehr, and Bel (2020), *The global e-waste monitor 2020: Quantities, flows, and the circular economy potential:*ewastemonitor.info/wp-content/uploads/2020/11/GEM_2020_def_july1_low.pdf

[12] Department of Agriculture, Water and the Environment (2021), *Stewardship for consumer and other electrical and electronic products: Discussion paper*: haveyoursay.agriculture.gov.au/74338/widgets/359784/documents

2 E-waste in Western Australia

2.1 Waste management and recycling incentives

E-waste management options in Western Australia include exporting it overseas or interstate either as a product or in a reprocessed form; repairing and re-using/selling; recycling for parts; and disposal to landfill.

In Western Australia, it is probable that a significant amount of an estimated 39,100 tonnes of e-waste generated in 2019–20 was disposed to landfill[13].

Currently, there are no legislative or regulatory restrictions governing the disposal of e-waste at all landfills. Information on legislative considerations to give effect to the ban in this state is provided in Appendix A.

State initiatives used to encourage recycling and recovery and discourage disposal to landfill include waste levy; education, communication, and community engagement; awards and recognition, and funding incentives.

Waste levy[14]

The *Waste Avoidance and Resource Recovery Levy Act 2007* (WARR Levy Act) and the Waste Avoidance and Resource Recovery Levy Regulations 2008 (WARR Levy Regulations) provide for a levy to be paid in respect to waste received at landfills in the metropolitan region and waste collected within the Perth metropolitan region that is received at landfills outside the metropolitan region.

The waste levy plays a key role in achieving the objectives of *Western Australia's Waste Avoidance and Resource Recovery Strategy 2030* (Waste Strategy 2030) by providing a disincentive to dispose of waste to landfill and by generating revenue to fund programs which support the strategy. In accordance with the *Waste Avoidance and Resource Recovery Act 2007* (WARR Act), each year the Minister for Environment must allocate not less than 25 per cent of the forecast levy amount to the Waste Avoidance and Resource Recovery Account. In turn, the funds are applied to programs for the management, reduction, re-use, recycling, monitoring, or measurement of waste and to support implementation of the waste strategy.

Education, communication, and community engagement

WasteSorted[15] is a communications toolkit developed to help local governments communicate with their residents on the importance of separating their waste and sorting it correctly to reduce contamination in their kerbside bin services. The program facilitates consistent communication across suburbs and local government areas with the aim of improving recovery, reducing disposal and increasing understanding and comprehension of how to manage household waste.

[13] Encycle Consulting (2021), *Western Australian material flows analysis*: www.wasteauthority.wa.gov.au/images/resources/files/2022/02/DWER_E-Waste_MFA_-_FINAL.pdf
[14] Department of Water and Environmental Regulation (2021), *Fact sheet: Waste levy*, www.der.wa.gov.au/images/documents/your-environment/waste/landfill-levy/Factsheet-waste-levy-general-overview.pdf
[15] Waste Authority – WasteSorted Toolkit: www.wasteauthority.wa.gov.au/programs/view/waste-sorted

Awards and recognition

The WasteSorted Awards[16] acknowledge and celebrate the outstanding achievements of Western Australians working towards a better future through improved waste practices and innovative waste solutions.

Funding incentives

Several funded waste programs are in place to support the waste objectives of the state[17]. Funding programs differ in eligibility between individuals, government organisations, commercial, industry, and charity/community groups and include:

- Better Bins Plus: Go FOGO
- Charitable recyclers rebate
- Household hazardous waste
- Roads to Reuse
- WasteSorted community education grants
- WasteSorted schools

2.2 Collection and recycling network

A recent licence infrastructure audit focusing on prescribed premises (under the *Environmental Protection Act 1986* (EP Act) Part V Division 3) identified about 167 licensed solid waste depot premises in Western Australia comprising, 88 in the Perth-Peel region; 19 in major regional centres (as identified in the Waste Strategy 2030); and 60 in regional areas.

These premises have potential to accept and collect e-waste, noting that not all of these locations may currently do so.

Currently, local governments may offer services such as:

- E-waste drop-off options at transfer stations, collection centres, community resource centres, administration buildings, libraries, and/or dedicated collection events.
- E-waste on-demand services, such as vergeside collection, for bulky and large household items (e.g. whitegoods, dishwashers, large televisions).

Some regional local governments partner with not-for-profits (e.g. Lions Clubs) to provide recycling drop-off facilities and tip shops that accept various types of e-waste for re-use and resale.

E-waste drop-off events that provide many residents from neighbouring councils/regions an opportunity for e-waste recycling can be popular and yield good collection volumes of e-waste.

Dependent on material type, some private entities and commercial retail operators provide collection options for e-waste, including scrap metal companies.

[16] Waste Authority – WasteSorted Awards: www.wasteauthority.wa.gov.au/about/view/wastesorted-awards
[17] Waste Authority – Waste Funding Opportunities: www.wasteauthority.wa.gov.au/programs/waste-funding-opportunities

Collection points

While the metropolitan area generally has good drop-off options for e-waste items, much of regional Western Australia's Urban Centres and Localities are classified as remote under the Australian Bureau of Statistics Remoteness Areas Structure. Remote areas are subject to increased waste management challenges including additional transport to processing and inflated resource costs.

Publicly available information on regional e-waste collection options is displayed on an interactive map: E-waste Collection – regional Western Australia.

Western Australian residents can typically find details of e-waste drop-off or pick-up options through first point of contact with their local government or regional council.

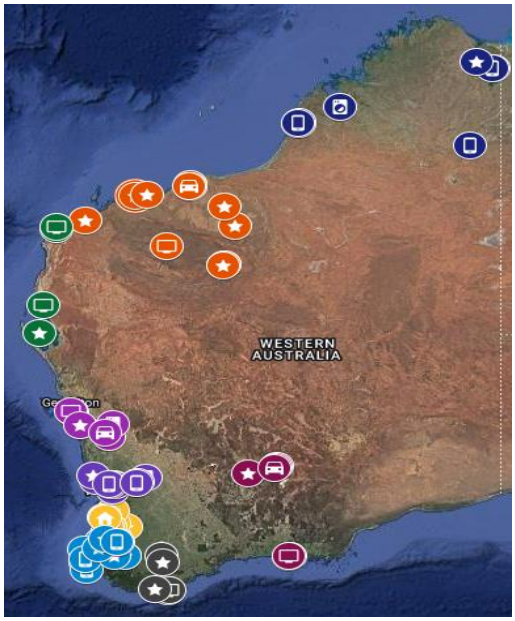


Figure 1: Regional e-waste collection network options in Western Australia

Recycling and processing

Once collected, e-waste is recycled by commercial e-waste specialist recyclers (four in Western Australia) and scrap metal recyclers (six in the state). Some e-waste is exported to other states for further processing.

The largest e-waste specialist recycler in Western Australia is located in Welshpool, and services the entire state. There is potential for more recycling to be done in our state, for example, while licensed to process 4,000 tonnes, the Welshpool facility reported processing only 2,906 tonnes of waste over the year ending April 2021[18].

2.3 Material Flows Analysis data

A material flows analysis (MFA) estimated 853,000 tonnes of e-waste will be generated in Western Australia between 2020 and 2030, with 613,100 tonnes potentially disposed of to landfill[13].

The MFA also estimated that out of the 68,663 tonnes of e-waste generated in Western Australia in 2019-20 (excluding batteries and photovoltaics [PV]) only 18,737 tonnes was estimated to have been recycled. It also noted:

- Large household appliances accounted for 34 per cent of the volume (e.g. fridges, washing machines, clothes dryers, dishwashers and cookers).
- Consumer equipment (e.g. musical instruments, speakers, cameras) yielded 17 per cent of the volume and small household (e.g. kettles, vacuum cleaners, toasters) a further 14 per cent.
- IT and telecommunication (e.g. televisions, computers, mobile phones) accounted for 10 per cent.

[18] Annual Audit Compliance Form: www.der.wa.gov.au/images/documents/our-work/licences-and-works-approvals/aacr/L9227-2019-1_01MAY20-30APR21_Redacted.pdf

2.4 Shared responsibility and product stewardship

Guiding principles underpin the Waste Strategy including the waste hierarchy, circular economy and shared responsibility. Shared responsibility is demonstrated by product stewardship which requires producers and consumers to contribute to the impacts of that consumption (such as recycling or disposal costs) which might otherwise be borne by taxpayers and the broader community.

In the past, product stewardship schemes, particularly some voluntary schemes, have failed to deliver outcomes expected by governments or the community. This is in part due to a failure of some industry sectors to commit to schemes, a failure of some schemes to establish minimum performance requirements and the absence of consistent design principles.

Western Australia has consistently confirmed its support for product stewardship because it gives effect to the principle of shared responsibility and provides for the application of the polluter pays principle, as per the EP Act.

E-waste items under national product stewardship schemes generally have more collection and drop-off options.

National Television and Computer Recycling Scheme

Televisions, computers, and peripherals are collected from a good number of regional/remote collection points, often in partnership with local governments, private operators and commercial retail organisations, via the National Television and Computer Recycling Scheme (NTCRS).

The NTCRS sets requirements for reasonable access to collection services, annual targets for recycling and material recovery targets in legislation and rules.

Currently, the NTCRS has five approved co-regulatory arrangements and a material recovery target of 90 per cent of collections has been set.

In 2020-21, the following were reported from NTCRS co-regulators:

- Australia and New Zealand Recycling Platform Limited: About 857 tonnes collected from 38 collection points statewide and the material recovery rate achieved nationally was 94 per cent[19]
- E-cycle Solutions: From 25 collection points about 22 tonnes collected from Western Australia. The material recovery rate was reported as 96.5 per cent[20]

Battery Stewardship Scheme and Household Hazardous Waste program

Batteries are accepted by a range of entities including local governments through the Household Hazardous Waste program, commercial retail organisations, private organisations such as EcoBatt and incorporated associations such as the Royal Automobile Club.

Australia's voluntary government-backed battery recycling Scheme, B-cycle, released its first performance report in October 2022 – Positive Charge[21]. It reported

[19] Australia New Zealand Recycling Platform Annual Report 2020-21: www.dcceew.gov.au/sites/default/files/documents/anz-rp-annual-report-2020-21.pdf
[20] Ecycle Solutions 2021/21 Annual Report: www.dcceew.gov.au/sites/default/files/documents/e-cycle-annual-report-2020-21.pdf
[21] *Positive Charge Report – The impact of Australia's innovative battery stewardship scheme in its first six months:* bcycle.com.au/wp-content/uploads/2022/10/bcycle_positive_charge_2022.pdf

about 316 drop-off points available in Western Australia contributed to over 900 tonnes of batteries being collected nationally for recycling.

The scheme reported 90 per cent of all battery materials reprocessed onshore for reuse and less than five per cent sent to landfill.

MobileMuster

MobileMuster provides over 3,000 drop off points nationally and in the state operates in partnership with local governments, commercial retail organisations and via a convenient free post-back service. The voluntary scheme's annual report[22] stated that of the 109 tonnes of mobile phones and components that were collected nationally, 99.3 per cent were recycled. In 2021, the scheme expanded scope and now collects other e-waste including wearables, smart home tech, home phones and modems.

Data reported under 18C of the Waste Avoidance and Resource Recovery Regulations 2008 (WARR Regulations)

Waste and recycling data in Western Australia[23] saw liable parties report around 8,500 tonnes of electronic and electric goods and batteries as recovered for the 2020-21 period, about two thirds of this from commercial sector and the remaining from residential. This was an increase of about 3,000 tonnes reported in the previous period for those categories.

Questions

What other actions can we take to manage e-waste, in Western Australia and nationally?

Are the current actions adequate and working?

[22] MobileMuster Annual Report 2021-22: www.mobilemuster.com.au/wp-content/uploads/2022/11/MM-Annual-Report-2022.pdf
[23] Waste and recycling data in Western Australia: www.wasteauthority.wa.gov.au/publications/view/waste-and-recycling-in-western-australia-2020-21

3 E-waste management analysis

3.1 International

In 2019, it was estimated the world generated 53.6 million tonnes of e-waste and this will likely increase to 74.7 million tonnes in 2030[11]. Globally, around 17.4 per cent of e-waste is collected through formal, documented, recycling systems while the remaining e-waste flows are poorly documented.

E-waste that is managed improperly, including undocumented material flows and improper recycling, may impact the natural environment and human health through contamination, emissions, and exposure.

E-waste is managed in different ways across continents, countries, and regions worldwide. The Global E-waste Monitor is a collective organisation made up of the International Telecommunication Union, United Nations University – Sustainable Cycles and the International Solid Waste Association, to address challenges and opportunities in e-waste management[11].

The latest report by the Global E-waste Monitor[11] provides key data on how e-waste is managed internationally, via formal and informal tracking, transboundary movements and legislation and regulation. Oceania (the global region Australia is a part of) is reported having an e-waste generation rate of 16.1 kilograms per capita, with an 8.8 per cent collection and recycling rate. Compared with other global regions, Oceania is the second-highest producer of e-waste per capita while being the second lowest for e-waste collection and recycling.

Table 3: Global e-waste generation and recycling by region

E-waste generation		E-waste recycling	
Europe	16.2 kg per capita	Europe	42.5%
Oceania	**16.1 kg per capita**	Asia	11.7%
Americas	13.3 kg per capita	Americas	9.4%
Asia	5.6 kg per capita	**Oceania**	**8.8%**
Africa	2.5 kg per capita	Africa	0.9%

The Global E-waste Monitor noted the growing number of countries implementing legislative and policy action on e-waste from 61 countries representing 44 per cent of the world's population in 2014, to 78 countries representing 71 per cent of the world's population in 2019. A snapshot of e-waste legislation and regulation controls by countries is shown in Figure 2.

Australia has an opportunity to increase its e-waste recycling rate and contribute to the global progress on e-waste management and sustainability outcomes seen in other regions of the world.

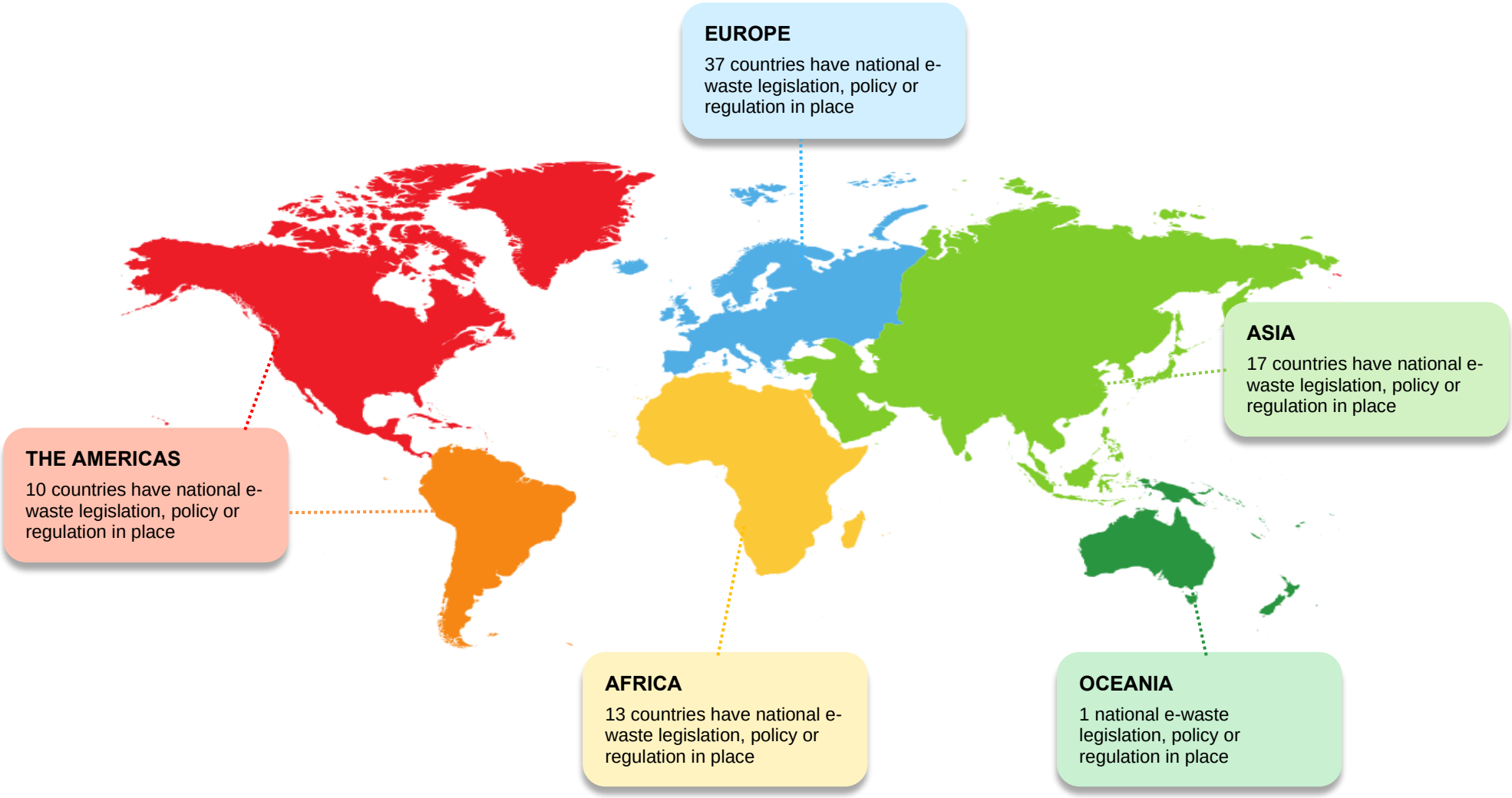


Figure 2: Snapshot of worldwide e-waste management

3.2 National context

Australia has a nationally agreed framework to support coordinated action on waste management and recycling to 2030[3].

There are also national targets and actions to guide jurisdictional efforts in managing e-waste, including product stewardship[4], as discussed above.

The Federal Minister's Priority List for 2022–23 includes actions intended and target dates for Photovoltaic Systems and Electrical and electronic products.

At the Environment Ministers Meeting in October 2022, Ministers noted the Australian Government's intention to develop a regulatory product stewardship scheme for solar panels and household electronics.

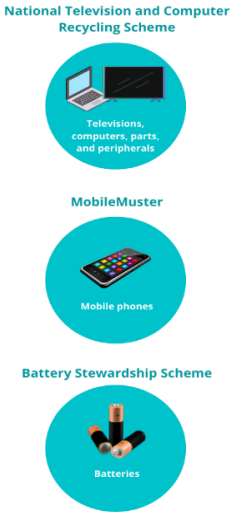


Figure 3: National E-waste Product Stewardship Schemes

3.3 Other jurisdictions, including landfill bans

E-waste management varies between states (see Figure 4) with legislated landfill bans of e-waste in force in Victoria and South Australia. Computers and televisions are banned from disposal to landfill in the Australian Capital Territory in an operational, non-legislative approach.

States without an e-waste landfill ban or restriction have either identified future action on e-waste recycling and/or are participating in nationally led product stewardship measures for e-waste materials[24].

South Australia and Victoria have had both positive and some unwanted outcomes since introducing their landfill bans. South Australia obligates all of the community (including households) against disposal of e-waste to landfill and landfill receptacles and Victoria obligates individuals and commercial entities to provide e-waste towards recycling and recovery.

Perverse outcomes in response to bans include stockpiling (i.e. leads to delayed resource recovery at best, spoilage and no recovery at worst), illegal dumping, contamination of recycling bins, solar panel stockpiling and compliance issues.

An influx of materials from household clean-outs during COVID-19 lockdowns caused a large spike in collections and as a result at one point transfer stations had to pause accepting materials Victoria.

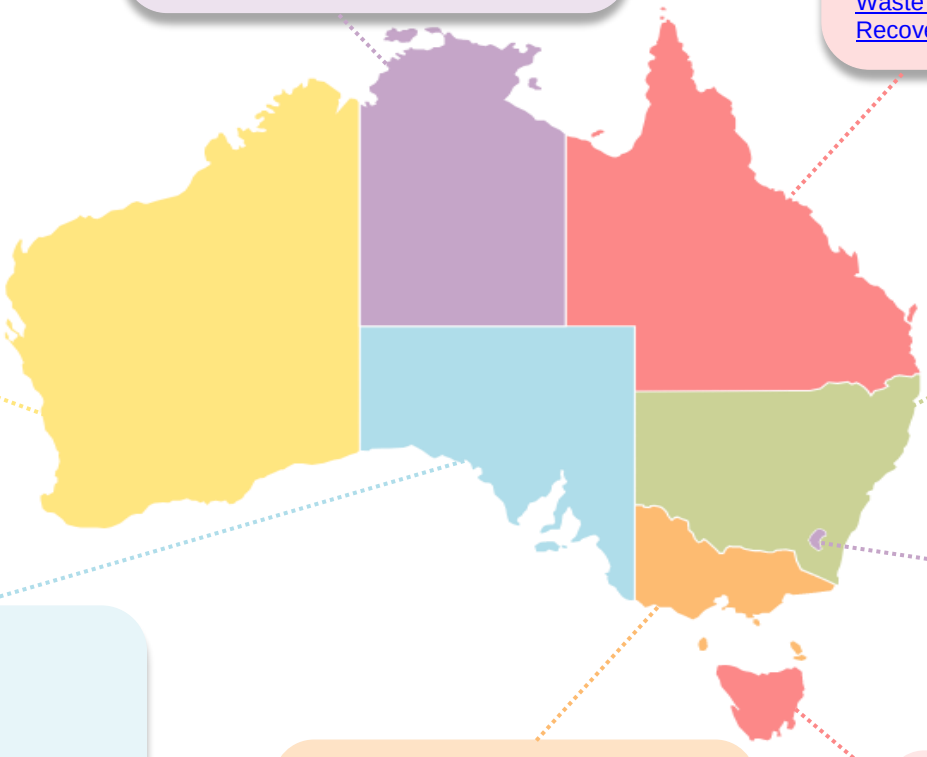
Market development of e-waste recyclers was required, and some reprocessors exited the market as a result of the ban.

Problematic e-waste items were generally those of low value and not covered under product stewardship.

Information on legislative considerations seen in these jurisdictions is available in Appendix A and a national overview is provided below.

[24] MRA Consulting Group (2016), *Hazardous waste landfill bans, conditional disposal restrictions and product stewardship: A submission to The Department of the Environment and Energy*, prepared for the Australian Department of the Environment and Energy: www.dcceew.gov.au/sites/default/files/documents/hazardous-waste-bans.pdf

Figure 4: E-waste bans by jurisdiction



NORTHERN TERRITORY

No e-waste ban in place

Product stewardship for significant waste streams (including e-waste) supported: Waste Management Strategy for the Northern Territory 2015-2022

QUEENSLAND

No e-waste ban in place

Support development of national extended producer responsibility initiatives such as e-waste: QLD Waste Management and Resource Recovery Strategy

WESTERN AUSTRALIA

E-waste to be banned from landfill by 2024

NEW SOUTH WALES

No e-waste ban in place

E-waste included as 'problem waste' in NSW Waste Avoidance and Resource Recovery Strategy 2014–21

AUSTRALIAN CAPITAL TERRITORY

Computers (2005) and televisions (2010) banned from disposal to landfill in an operational approach.

SOUTH AUSTRALIA

E-waste banned from landfill

Ban commenced: 2013

Instrument: *Environment Protection (Waste to Resources) Policy 2010*

VICTORIA

E-waste banned from landfill

Ban commenced: 2019

Instrument: *Waste Management Policy (E-waste) 2018*

TASMANIA

No e-waste ban in place

E-waste included for future action in Draft Waste Action Plan through Infrastructure plan

South Australia's landfill ban implementation

As part of a landfill ban covering a broad range of materials, South Australia initially legislated a staged ban on the disposal of e-waste to landfill between 2010 and 2013. The stages were both category/materials-based and geographical (see Figure 5).

Implementation was under the Environment Protection (Waste to Resources) Policy 2010, created under the *Environment Protection Act 1993* and was supported by non-regulatory measures:

- a South Australian Government funding program (available to councils and waste service providers), and
- a communication and education program to inform stakeholders of how to manage e-waste under the ban.

Further information on legislative considerations seen in this jurisdiction is available in Appendix A.

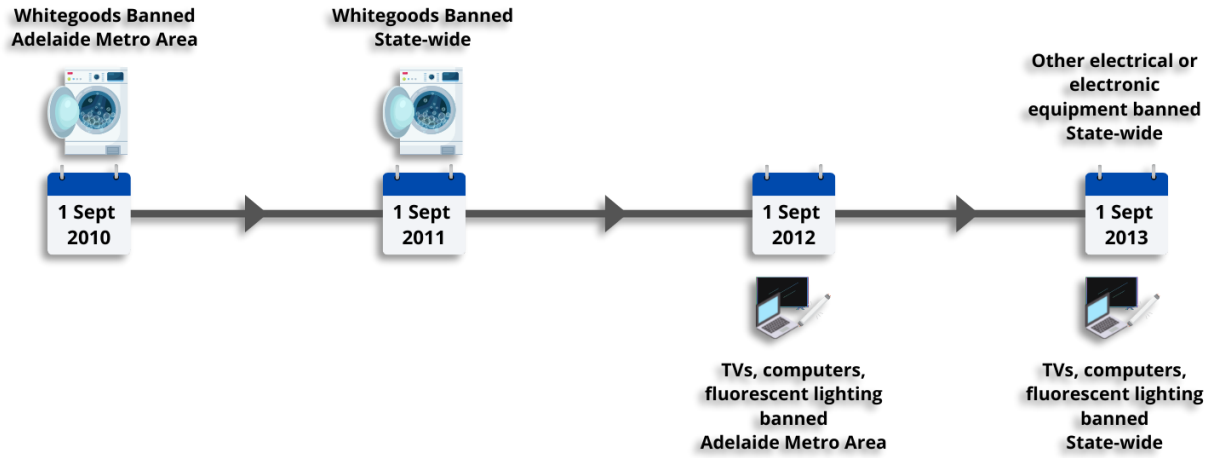


Figure 5: South Australia's staged e-waste ban rollout

Victoria's e-waste to landfill ban implementation

Victoria enacted a ban on the disposal of e-waste to landfill in 2019. The ban applied to any device that has a plug, battery or power cord that is no longer working or wanted, including the batteries[13], across all geographical areas of the state simultaneously, with a one-year transition period from commencement.

The ban was implemented under the following instruments:

- *Environment Protection Act 1970*
- Waste Management Policy (E-waste) 2018
- Environment Protection (Scheduled Premises) Regulations 2017
- Environment Protection (Industrial Waste Resource) Regulations 2009
- Waste Management Policy (Combustible Recyclable and Waste Materials)
- Waste Management Policy (Siting, Design and Management of Landfills) No. S264
- Collection, storage, transport and treatment of end-of-life electrical and electronic equipment (AS/NZS 5377: 2013).

The ban was also supported by non-regulatory measures:

- a funding program (covering infrastructure improvement, collection network improvement, and capacity and capability), and
- a communication and education program to inform stakeholders of how to manage e-waste under the ban.

Australian Capital Territory restrictions

The Australian Capital Territory restricts the disposal of hazardous wastes to landfill under the *Environment Protection Act 1997*, the Environment Protection Regulation 2005, with categories of hazardous waste defined under the Hazardous Materials Environmental Protection Policy 2010, including the defined waste category 'computers, televisions and other e-waste'.

The Australian Capital Territory Government asks householders and businesses to dispose of all televisions and computers at the Mitchell or Mugga Lane Resource Management Centres at no cost.

4 Western Australia's e-waste to landfill ban

4.1 Objectives

The objectives of the e-waste to landfill ban are as per the Waste Strategy 2030: Western Australians recover more value and resources from waste and Western Australians protect the environment by managing waste responsibly.

4.2 Scope

The items identified for banning from disposal to landfill will initially focus on:

electrical, electronic and battery-powered items that have been collected and aggregated purposes of recycling or recovery that:

a) are covered by product stewardship schemes, particularly accredited schemes under the *Recycling and Waste Reduction Act 2020* (RWR Act)
b) have established markets or systems for collection, recycling and processing in Western Australia that would benefit from increased supply and that use national processing infrastructure.
c) contain recoverable base materials of value, for example metals, including precious metals.

Government anticipates further consultation on additional categories of products will be required as future phases of the landfill ban are implemented.

This is expected to occur as the waste industry and market capacity increases and product stewardship arrangements are formalised to provide viable pathways for collection and recycling of additional products.

Unintended capture and negligible amounts of e-waste, such as items discarded in household kerbside collections or illegal dumping, are not included in the scope of the ban.

The e-waste categories and items in scope for the initial focus of the ban are discussed in Appendix B. They are:

- Screens, IT, and telecommunications
- Lighting and lamps
- Large household appliances
- Batteries
- Temperature exchange equipment
- Medical devices.

Future phases of the ban will capture:

- Photovoltaics
- Small household appliances
- Monitoring and control equipment.

Questions

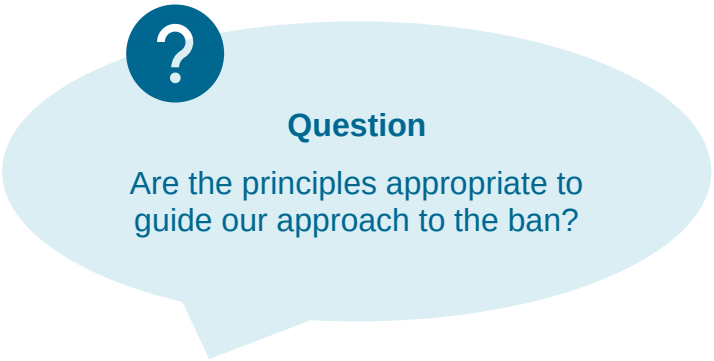
Would you change anything about the way e-waste for initial ban has been defined? Why? *(e.g. more recovery, less environmental harm, stimulate recycling/re-use industry)*

4.3 Guiding principles for ban option design

Table 4: Guiding principles and assessment measures of implementation options

Principle and description	To meet this principle, the implementation option:
Alignment and consistency • Aligns with National Waste Policy commitments and product stewardship schemes under the RWR Act. • Align, where practicable, with other jurisdictions approaches to landfill bans. • Supports State Government policy for waste and recycling principles (Waste Strategy 2030), Indigenous employment, economic development, and regional development.	• demonstrates action towards visions, targets, and goals in Table 1 • aligns with product stewardship initiatives. • considers and harmonises with other jurisdictions' e-waste landfill bans, where appropriate. • demonstrates action towards visions, strategies, targets, and goals in Table 1.
Evidence based Decisions are made with consideration of available data and projections about waste, recycling, material value and markets.	• is based on available data including national and state waste and recycling data and material flow analysis. • considers existing demand value of recyclable materials, and potential increases in supply that would affect markets.
Maximise efficiency Minimise effort and maximise recovery by complementing, utilising and supporting existing frameworks and networks in Western Australia.	• uses existing resource recovery mechanisms, and complements environmental protection legislation and regulations • demonstrates use of existing collection and processing networks.
Reasonable access Ensure reasonable access to collection and recycling services.	• demonstrates benchmarking criteria that define minimum standards for access to resource recovery opportunities in each stakeholder group, including cost, benefits, distance to facilities, features of facilities.
Shared responsibility Work collaboratively with the community, industry, and governments to improve waste management outcomes.	• demonstrates that efforts, impacts, and obligations are distributed equitably over key stakeholder groups as their role requires. • limits specific stakeholder groups from being unfairly impacted by the approach.
Future proofing The process of anticipating, or providing flexibility to safeguard for, future market directions, innovations and technological advancements and policy direction.	• considers future infrastructure and e-waste recycling market forces in the state, emerging development trends in electronics usage and other specified drivers.

Principle and description	To meet this principle, the implementation option:
Beneficial to state Support a circular economy, create economic benefits (jobs, infrastructure investment, recovering value from materials) and influence positive social and community outcomes.	• demonstrates measurable economic and social/community benefits for Western Australia. • is consistent with circular economy principles • minimise the risk of perverse outcomes



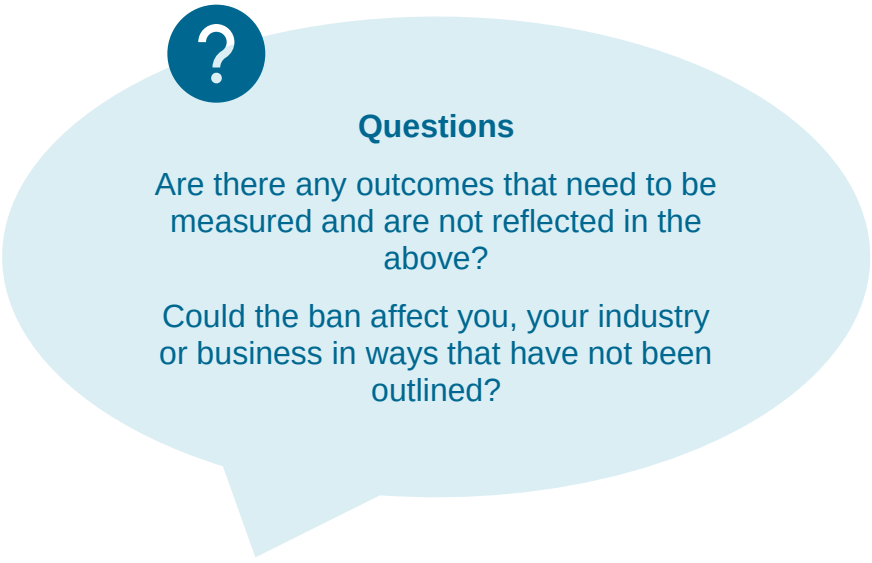
4.4 Outcomes of the ban

Beneficial outcomes of a ban are anticipated and outlined below:

- Measurable increase in the collection and capture of e-waste items, yielding material/resource recovery that would otherwise have been lost to landfill.
- Increase in capture of hazardous materials and by-products that can be emitted to the environment from landfilling e-waste.
- Increase in gross operating revenue of e-waste collection and processing industry in the state, building resilience and capacity of Western Australia.
- Stimulation of new markets for recycled and processed e-waste, because of an increase in supply of available waste product streams and material types.
- Additional job creation through the creation and development of recovery and recycling industry.
- Investment in research, innovation and local technology through e-waste grant funding incentives.

An e-waste ban also has risks of perverse outcomes occurring as seen in other jurisdictions and internationally from landfill bans, including the below:

- Increased stockpiling (non-recovery).
- Increased illegal dumping of e-waste items.
- Removal of collection services where the cost of recovery has increased because of the inability to landfill some items or materials.
- Deliberate addition of small amounts of e-waste into mixed streams to avoid higher disposal costs.
- E-waste collected is not forwarded to an accredited recycler.



5 E-waste ban implementation options

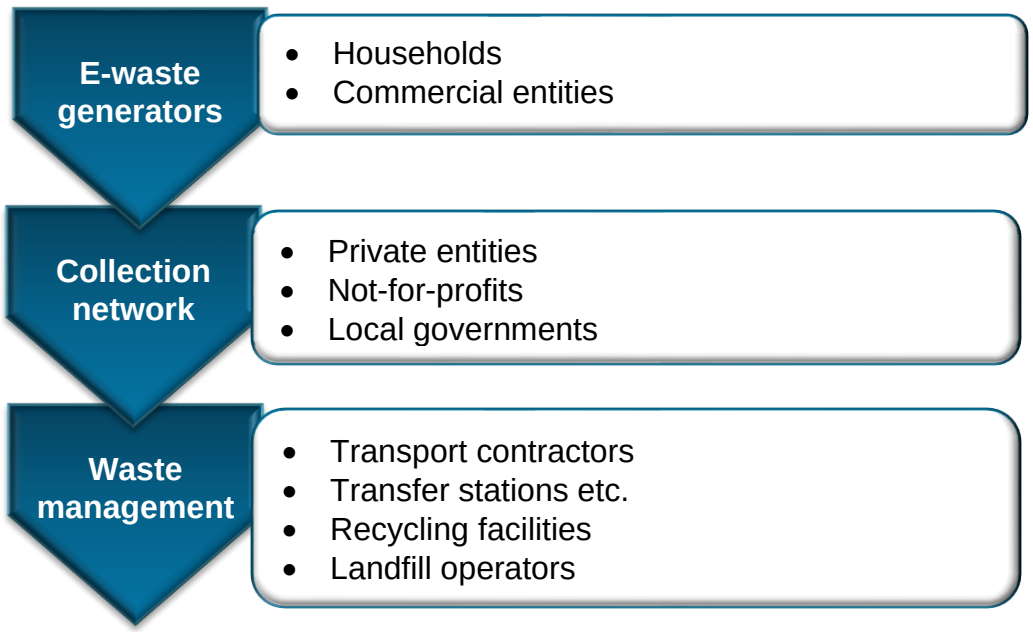
The development of the following implementation options considered the following three pillars:

Legislation and regulations	Financial incentives	Community education and encouragement
• Making legislation (regulations) • Using existing regulations • Obligations and penalties • Liable persons • Reporting and recordkeeping • Compliance regime	• Focus of grant funding to support implementation • Stakeholders' eligibility to apply for funding	• Establishing new initiatives • Using existing campaigns • Extent of stakeholder groups that would be engaged

5.1 Stakeholders

Key stakeholder groups that were identified as either influential in e-waste recovery or that would be significantly impacted by changes to e-waste disposal include:

- E-waste generators: households, commercial entities
- E-waste collectors: local government, other collectors
- Waste management: transport contractors, transfer stations, recycling facilities (including material recovery facilities and resource recovery centres) and landfill operators.



E-waste generators

- E-waste is generated via two main sources: households and commercial entities.
    - **Households** generally dispose of e-waste in small quantities when considered individually but amass significant aggregated quantities when considered collectively (e.g. all households within a local government areas).
    - Depending on the size, function, frequency of replacement and other factors, **commercial entities** may dispose of significant quantities of e-waste on a regular basis. Generally, they will dispose of more e-waste than individual households and, in some cases, more than aggregated household amounts collected by local governments.

Collection network

- E-waste items may be collected via drop-off facilities, pick-up (including take-back) and post-back services to private entities, not-for-profits and local governments.
- Private entities, such as retailers of electrical products (e.g. Officeworks, Harvey Norman and Bunnings) can serve as collection points for portable e-waste.
- Intermittent e-waste donation ‘pop-up’ collections exist at big shopping centres and supermarkets.
- Some charities and not-for-profit organisations accept working e-waste items that can be repaired and either used or resold.
- Local governments and councils have legislated responsibilities to provide waste services in specified areas, covering the majority of Western Australia.

Waste management

- Roles and responsibilities in the management of e-waste include item collection and storage, waste transport; transfer station operation; recycling and processing items into products and materials; and disposal options.
- Providers of these services and operations may have overlapping roles and multiple obligations.

5.2 Communication and education

The State Government would be responsible for providing overarching information on the ban in all implementation options.

Community and household communications will be in partnership with the collection and recycling network (including local governments) about what to do with different types of e-waste, relevant collection services and locations available in a local area.

5.3 Implementation option 1: Voluntary approach

This option sees industry, government and the community working together in an operational approach, under the following conditions:

Legislation and regulations

- No legislative amendment or creation.
- No new regulatory obligations on parties or stakeholders including penalties for damage, spoilage, and disposal of e-waste, non-compliance reporting and record keeping/performance data reporting.

Financial incentives

- Grant funding – all stakeholders and parties would be eligible to apply for grant funding, including households, commercial e-waste generators (e.g. large retailers, offices, etc), collection networks (private, not-for-profit, local government), and waste managers (transport contractors, transfer stations, recycling facilities, landfill operators).

Community education and encouragement

- Existing community education and engagement initiatives used to encourage recycling of e-waste for all stakeholders.

5.4 Implementation option 2: Regulatory approach with encouragement

This approach balances the obligations placed on stakeholders with encouragement. Grant funding will support infrastructure grants for the state's collection and recycling network to increase capacity and capability to recycle in the state.

Legislation and regulations

- Making of Regulations under the provisions of the WARR Act.
- Complementing other relevant legislation and regulations including EP Act, Environmental Protection Regulations 1987 (EP Regulations) (including Part V licensing) and WARR Regulations.
- Obligations for stakeholders demonstrated in Table 5.

Financial incentives

- Financial incentives consist of grant funding.
- Some regulated parties, liable persons and liable entities would be eligible to apply for grant funding,
- Non-regulated stakeholders and some regulated parties would not be eligible to apply for grant funding, including households, commercial e-waste generators (e.g. large retailers, offices, etc.) and transport contractors.

Community education and encouragement

- Existing community education and engagement initiatives would be used to encourage recycling of e-waste. Improvements to existing initiatives and/or the creation of new campaigns carried out where practicable and appropriate.

Table 5: Option 2 legislative, financial and community mechanisms by stakeholder group

Legend:
✓ = Yes
✘ = No

Stakeholder group	Legislative/regulatory obligations				Financial incentives	Community education
	Penalty for damage/spoilage	Penalty for disposal to landfill	Reporting non-compliance	Recordkeeping/ performance data reporting		
E-waste generators						
Households	✘	✘	✘	✘	✘	✓
Commercial entities	✓	✓	✓	✓	✘	✓
E-waste collection networks						
Private entities	✓	✓	✓	✘	✓	✓
Not-for-profit (e.g. charitable recyclers)	✓	✓	✓	✘	✓	✓
Local government collections	✓	✓	✓	✘	✓	✓
Waste management						
Transport contractors	✓	✓	✓	✘	✘	✓
Transfer stations	✓	✓	✓	✘	✓	✓
Recycling facilities	✓	✓	✓	✓	✓	✓
Landfill operators	✓	✓	✓	✘	✓	✓

5.5 Implementation option 3: Regulatory approach with extensive obligations

This approach applies obligations and grant funding availability to all stakeholders and uses existing community education and engagement.

Legislation and regulations

- Making of Regulations under the provisions of the WARR Act.
- Complementing other relevant legislation and regulations including EP Act, EP Regulations (including Part V licensing) and WARR Regulations.
- Obligations for stakeholders demonstrated in Table 6.

Financial incentives

- Financial incentives consist of grant funding.
- All regulated parties and liable persons and entities eligible to apply for grant funding, including households, commercial e-waste generators (e.g. large retailers, offices, etc.), collection networks (private, not-for-profit, local government), and waste managers (transport contractors, transfer stations, recycling facilities, landfill operators).

Community education and encouragement

- Existing community education and engagement initiatives would be used to encourage recycling of e-waste.

Table 6: Option 3 legislative, financial, and community mechanisms by stakeholder group

Legend:
✓ = Yes
✘ = No

Stakeholder Group	Legislative/regulatory obligations				Financial incentives	Community education
	Penalty for damage/spoilage	Penalty for disposal to landfill	Reporting non-compliance	Recordkeeping/ performance data reporting		
E-waste generators						
Households	✓	✓	✓	✓	✓	✓
Commercial entities	✓	✓	✓	✓	✓	✓
E-waste collection networks						
Private entities	✓	✓	✓	✓	✓	✓
Not-for-profit (e.g. charitable recyclers)	✓	✓	✓	✓	✓	✓
Local government collections	✓	✓	✓	✓	✓	✓
Waste management						
Transport contractors	✓	✓	✓	✓	✓	✓
Transfer stations	✓	✓	✓	✓	✓	✓
Recycling facilities	✓	✓	✓	✓	✓	✓
Landfill operators	✓	✓	✓	✓	✓	✓

Questions

Do you have comments on the proposed ways the ban would apply to you as an individual, business or industry?

Are there any other key stakeholder sectors, groups, or applications that we need to consider in the ban framework?

6 Option assessment and evaluation

This section presents the results of an assessment and evaluation of each implementation option. The assessment consisted of two parts: a qualitative assessment of each option against the ban objectives, guiding principles and outcomes (positive and perverse); and an independent quantitative cost-benefit analysis (CBA).

The qualitative assessment is presented in Table 7.

A summary of the results of the independent CBA is presented in Section 6.2.

6.1 Qualitative assessment

Table 7: Qualitative assessment of options against objectives, guiding principles and outcomes

	Evaluation metric	Option 1 Voluntary	Option 2 Regulatory with voluntary elements	Option 3 Regulatory with extensive obligations
Objectives	**1: increase material recovery from e-waste**	✘ Unlikely to result in a significant increase in e-waste recovery because it relies on action from stakeholders and parties without a legislative basis. This option is similar to the current situation in Western Australia where e-waste recycling options are available, but do not result in the majority of e-waste being recovered.	✓ Hyder Consulting's *Landfill ban investigation* (2011)[25] report provides evidence that the model of regulatory bans combined with complementary measures are effective in reducing waste to landfill over time.	✓ See Option 2
	2: reduce environmental impacts of e-waste in landfills	✘ Unlikely to result in a significant change to hazardous e-waste recovery as it relies on action from stakeholders and parties without a legislative basis. This option is similar to the current situation in Western Australia where e-waste recycling options are available, but do not result in the majority of e-waste being recovered.	✓ The Hyder report provides evidence that the model of regulatory bans combined with complementary measures are effective in reducing waste to landfill over time – in turn reducing the environmental impact of landfilled e-waste.	✓ See Option 2
Guiding principles	**Alignment and consistency**	✘ This option does not align with national or state waste policies, strategies, and plans. This option is also inconsistent with approaches implemented in other jurisdictions with e-waste bans.	✓ This option aligns with national and state waste policies, strategies, and plans and draws on elements in the other jurisdictional landfill ban legislation as well as national policy, as relevant for the Western Australian context.	✓ This option aligns with national and state waste policies, strategies, and plans. Approaches implemented in other jurisdictions with e-waste bans regulate households, South Australia with penalties, Victoria without.
	Evidence based	✘ Hyder concluded that juridical and financial instruments are a key inclusion for implementation of a landfill ban. Current recycling and disposal data and information show that e-waste recycling is relatively low. It is likely to continue to be low without regulatory instruments, from a data evidence perspective.	✓ The Hyder report provides evidence that the model of regulatory bans combined with complementary measures are effective in reducing waste to landfill over time and juridical and financial instruments are a key inclusion for implementation of a landfill ban. Material flows analysis data and recycling data provide evidence towards an increase in supply from a regulated landfill ban would benefit the economy.	✓ See Option 2
	Maximise efficiency	✘ This option partially meets this principle by using existing community education mechanisms. However, a non-regulatory approach to a ban does not use existing legislative instruments already in place that influence waste and recovery, such as EP Act, EP Regulations (including Part V licensing) and WARR Regulations.	✓ This option meets this principle by using existing regulatory and legislative instruments and community education mechanisms. A complementary regulatory approach would maximise efficiency by using existing legislative instruments already in place that influence waste and recovery, such as EP Act, EP Regulations (including Part V licensing) and WARR Regulations. This option also allows for the creation of new legislation and regulations to address any gaps in the existing juridical landscape.	✘ This option partially meets this principle because it uses existing regulatory and legislative instruments and community education mechanisms. However, a blanket approach to regulation of parties would mean that an onerous compliance and enforcement regime would be required to give effect to regulatory instruments.
	Reasonable access	✘ This option would be unlikely to result in significant changes to the access network (including costs, distance, capacity, features etc.) as a voluntary ban may not motivate industry and local	✓ This option would be likely to result in significant changes to the access network (including costs, distance, capacity, features) as targeted sectors of the waste management, collection, recycling,	✘ This option places regulatory liability on all stakeholders (including households, charities, not-for-profit organisations etc.), which may

[25] Hyder Consulting (2011), *Landfill ban investigation*: www.dcceew.gov.au/sites/default/files/documents/landfill-ban.pdf

Evaluation metric		Option 1 Voluntary	Option 2 Regulatory with voluntary elements	Option 3 Regulatory with extensive obligations
		government to alter services, facilities, costs and other access considerations.	and processing chain would expand to provide reasonable access and expanded services to meet regulatory obligations and community needs. Targeted application of regulation and penalties in the generation, recycling, and disposal chain also mean costs to participate with the ban will be equitable across stakeholders according to influence and impact.	increase costs to a high degree and negatively affect accessibility to e-waste management options. Pressure on waste service providers via obligations on households may result in an expansion of services and access to facilities.
	Shared responsibility	✘ This option suggests voluntary participation to stakeholders but does not place responsibility and obligation on any parties in the waste management chain.	✓ This option places regulatory obligation and legal expectations on entities in control of e-waste collection, recycling, processing and disposal while encouraging recycling and providing access to recycle to entities with less control. This model shares responsibility for e-waste recycling in an equitable manner.	✓ This option places regulatory obligation and legal expectations on all stakeholders, regardless of impact or influence. Responsibility is not equitable in this option.
	Future proofing	✘ This option is unlikely to result in an increase in recycling and recovery without legislative and regulatory mechanisms. As future electronic innovation, generation, use, and disposal behaviours emerge, this option would continue to be ineffective.	✓ This option allows for ad-hoc amendments and inclusions to the ban if national trends or technological innovations indicate. The option also allows for inclusion of new collection, processing, and recycling technologies and innovations to be incorporated into the suite of complementary measures.	✘ This option would be increasingly onerous and costly to monitor and enforce as changes occur in electronic innovation, generation, use and disposal behaviours due to the regulatory obligations on households and commercial e-waste generators. Expansion and increases in generation would result in exponential increases to required regulatory efforts and resources.
	Beneficial to state	✘ Hyder concluded that bans have the potential to deliver net benefits in environmental and financial areas. Additionally, Hyder concluded that bans can be effective to drive the development of the infrastructure to recover the waste. Without regulatory instruments to give effect to a ban, this option would be unlikely to yield net benefits to the state. This option is notionally consistent with circular economy principles but lacks the meaningful action (regulation) to achieve those principles.	✓ Hyder concluded that bans can be effective to drive the development of the infrastructure to recover waste. This option includes necessary regulatory mechanisms to increase the likelihood of improved recycling yield which would drive investment in the state. This option is consistent with circular economy principles and the inclusion of regulatory mechanisms signifies meaningful action towards achieving those principles.	✓ See Option 2
Outcomes	**Results in positive outcomes**	✓ May produce limited positive outcomes, such as voluntary community participation and awareness. Unlikely to result in: • Measurable increase in the collection and capture of e-waste items and/ or increase in capture of hazardous materials and by-products of e-waste. • Increase in gross operating revenue of e-waste collection and processing industry in the state • Stimulation of new markets for recycled and processed e-waste as supply of recovered material is unlikely to increase. • Additional job creation via development of recovery and recycling industry. • Investment in research, innovation, and local technology.	✓ Likely to produce positive outcomes because of the obligation of parties to participate in the ban at various level of influence and impact, supported by complementary measures. Likely to result in: • Measurable increase in the collection and capture of e-waste items as well as the capture of hazardous materials and by-products of e-waste. • Increase in gross operating revenue of e-waste collection and processing industry in the state, building resilience and capacity of Western Australia. • Stimulation of new markets for recycled and processed e-waste, because of an increase in supply of available waste product streams and material types. • Additional jobs generated through the creation and development of recovery and recycling industry. • Investment in research, innovation, and local technology.	✓ Likely to produce positive outcomes because of the obligation of parties to participate in the ban at all levels of influence and impact, supported by complementary measures. Likely to result in: • Measurable increase in the collection and capture of e-waste items as well as the capture of hazardous materials and by-products of e-waste. • Increase in gross operating revenue of e-waste collection and processing industry in the state, building resilience and capacity of Western Australia. • Stimulation of new markets for recycled and processed e-waste, due to an increase in supply of available waste product streams and material types. • Additional job creation through the creation and development of recovery and recycling industry. • Investment in research, innovation and local technology.

Evaluation metric	Option 1 Voluntary	Option 2 Regulatory with voluntary elements	Option 3 Regulatory with extensive obligations
Limits perverse outcomes	✘ Option may have an unfavourable outcome of increased community awareness not being supported with service expansion. May also result in deliberate addition of e-waste into mixed streams to avoid disposal costs, as there would be no enforceable penalty deterrents.	✓ This option limits the risk of perverse outcomes because it obligates influential parts of the management chain, reducing the likelihood of illegal dumping and kerbside contamination. This option also focusses funding incentives on parts of the collection and processing network that would ensure maximum gains for the e-waste recovery industry Would likely limit perverse outcomes such as: • Non-recovery stockpiling of recyclable e-waste • Illegal dumping of e-waste items • Deliberate addition of small amounts of e-waste into mixed streams to avoid disposal costs • Removal of collection services where the cost of recovery has increased due to the inability to landfill some items or materials.	✘ This option is very likely to result in perverse outcomes such as additional illegal dumping of e-waste items and increased instances of kerbside contamination by householders, community, charitable recyclers and commercial operations to avoid penalties.

6.2 Quantitative assessment

Synergies Economic Consulting conducted an independent CBA of the three ban implementation options. The analysis was conducted against a base-case option of no change to the current e-waste management arrangement in Western Australia. This section provides a summary of the analysis based on a selection of evaluation metrics. For full analysis and results, please refer to the report at: consult.dwer.wa.gov.au.

6.2.1 Economic modelling

The economic modelling was conducted using eight cost and four benefit factors.

Table 8[26] summarises modelling outcomes as well as overall net present value results for each implementation option.

Table 8: Summary of economic modelling results

Factor	Option 1	Option 2	Option 3
Benefits			
Health and environmental benefit	$1.7m	$7.0m	$9.8m
Gross margin (from scrap-metal recovery)	$2.7m	$10.6m	$13.8m
Gross margin (from high-value material recovery)	$74.8m	$121.8m	$140.8m
Avoided landfill costs	$5.8m	$23.8m	$33.3m
Costs			
Collection and transport costs	$20.2m	$71.5m	$93.3m
Stockpiling and unlawful disposal cost	$0.0m	$0.7m	$1.4m
Processing centre upgrade costs	$13.3m	$32.0m	$45.9m
Collection network upgrade costs	$2.9m	$3.4m	$4.0m
Annual industry reporting costs	$1.7m	$4.3m	$7.6m
Annual government monitoring and enforcement	$0.1m	$0.5m	$6.6m
Education and communication costs	$1.1m	$1.1m	$1.1m
Initial government administration costs	$1.7m	$1.7m	$1.7m
Totals			
Total Benefit	**$85.1m**	**$163.2m**	**$197.6m**
Total Cost	**$41.0m**	**$115.1m**	**$161.5m**
Net Benefit (NPV)	**$44.1m**	**$48.1m**	**$36.1m**
Benefit-cost ratio (BCR)	2.08	1.42	1.22

Source: Synergies Economic Consulting

[26] Data from Synergies Economic Consulting report: *Cost benefit analysis of options for an e-waste landfill ban in Western Australia*, prepared for the Department of Water and Environmental Regulation in 2022.

6.2.2 Resource recovery modelling

Projected e-waste recovery, landfill, and stockpiling/illegal disposal volumes in 2043 under three ban implementation options are shown numerically in Table 9[26] and represented graphically in Figure 6.

Table 9: Projected tonnes of e-waste recovery and disposal 2043

Scenario	Recovery	Landfill	Stockpile / illegal disposal
Base Case	85,508	89,599	0
Option 1	99,563	75,544	0
Option 2	114,770	55,959	4,378
Option 3	121,495	44,856	8,755

Source: Synergies Economic Consulting

Figure 6: Projected e-waste recovery and disposal to 2043

6.2.3 Interpretation of cost-benefit analysis

To give effect and meaning to the complex economic modelling and analysis, evaluation metrics were selected that assess whether the ban would be considered successful against its objectives and represent value for money for Western Australia:

- E-waste ban objectives
    - Increase recovery
    - Reduce environmental impacts (volumes in landfill, illegal dumping)
- Net benefit to Western Australia

A summary of each option against these factors is presented in Table 10. The table also shows a ranking of each option (1st, 2nd, 3rd) against the selected factors.

Table 10: Quantitative assessment of options against objectives and economic outcomes

Evaluation metric	Option 1 Voluntary	Option 2 Regulatory with voluntary elements	Option 3 Regulatory with extensive obligations
Material recovery (2043 projected volumes)	✓ **Rank: 3** Recovery marginally increased relative to base case.	✓ **Rank: 2** Recovery significantly increased relative to base case.	✓ **Rank: 1** Recovery significantly increased relative to base case and Option 1, but only marginally increased relative to Option 2.
Landfill (2043 projected volumes)	✓ **Rank: 3** Landfill volume marginally decreased relative to base case.	✓ **Rank: 2** Landfill volume significantly decreased relative to base case.	✓ **Rank: 1** Landfill volume almost half of base case volume.
Illegal dumping (2043 projected volumes)	✓ **Rank: 1** No change to illegal dumping volumes relative to base case.	✓ **Rank: 2** Significant increase in illegal dumping volumes relative to base case.	✓ **Rank: 3** Illegal dumping significantly increased relative to base case and almost double as compared with Option 2.
Reduce environmental impacts (economic)	✓ **Rank: 3** Projected benefit of $1.7 million compared with base case.	✓ **Rank: 2** Projected benefit of $7.0 million compared with base case.	✓ **Rank: 1** Projected benefit of $9.8 million compared with base case.
Net economic benefit to Western Australia	✓ **Rank: 2** Total benefit: $85.1 million Total cost: $41 million Net benefit: $44.1 million. Second-highest net economic benefit compared to Options 2 and 3.	✓ **Rank: 1** Total benefit: $163.2 million Total cost: $115.1 million Net benefit: $48.1 million. Highest net economic benefit compared to Options 1 and 3.	✓ **Rank: 3** Total benefit: $197.6 million Total cost: $161.5 million Net benefit: $36.1 million. Lowest net economic benefit compared to Options 1 and 2.

6.3 Preferred option identification

The three ban implementation options were assessed against qualitative and quantitative evaluation metrics to determine the preferred option.

Table 11 summarises the key factors of the assessment and ranks the options in terms of effectiveness at meeting each factor.

Table 11: Final implementation option evaluation

	Option 1 Voluntary (operational)	Option 2 Regulatory with voluntary elements	Option 3 Regulatory with extensive obligations
How well does the option meet the ban objectives – qualitative assessment	★☆☆	★★★	★★★
How well does the option meet the ban objectives – quantitative assessment	★☆☆	★★☆	★★★
How well does the option meet the guiding principles of the ban	★☆☆	★★☆	★★★
Does the option result in net positive outcomes, including material recovery	★☆☆	★★★	★★★
Does the option limit perverse outcomes, including to the environment	★☆☆	★★★	★☆☆
Net economic benefit to Western Australia	★★☆	★★★	★☆☆
Final evaluation	**Not preferred**	**PREFERRED OPTION**	**Not preferred**

Option 2: Regulatory with voluntary elements is the preferred option. The option best meets the qualitative factors (objectives, guiding principles and positive and limits perverse outcomes) and is the most suitable relative to quantitative factors (objectives and net economic benefit).

Option 1: Voluntary is not the preferred option. The option is the least effective at meeting qualitative factors (objectives, guiding principles and positive and limits perverse outcomes) and is the second-most suitable relative to quantitative factors (objectives and net economic benefit).

Option 3: Regulatory with extensive obligations is not the preferred option. The option meets most qualitative factors (objectives, guiding principles and positive outcomes) but it does not limit perverse outcomes. The option is the least suitable relative to quantitative factors (objectives and net economic benefit).

Question

Do you think the preferred option is the one most suited to Western Australia, and why?

7 Evaluation

A robust, measurable and specific evaluation framework will be of help to the department:

- understand whether implementation is resulting in progress towards the ban objectives (to increase material recovery from e-waste; and reduce environmental impacts of e-waste in landfills);
- determine whether improvements or amendments are needed; and
- ensure integrity of the ban and its processes.

Preliminary evaluation activities may include:

- Measuring e-waste recovery volumes/tonnes over time.
- Assessing ban and implementation activities against national and state policies and directions.
- Analysing disposal and recovery data before and after commencement of the ban.
- Comparing data against state waste avoidance and resource recovery targets.
- Assessing collection network efficiency including factors such as access, availability, frequency and quality.
- Examining market response, specifically changes in recyclers and increase in the turnover of the industry.
- Assessing community disposal behaviour and perceptions of the ban.
- Collecting industry, local and State Government feedback and perceptions of the ban.

Glossary

Term	Definition
Collection	Means actions, processes, and initiatives involved in, or that facilitate, the aggregation of similar types of things.
Disposal	Means to discard material.
Household hazardous waste	Products used in and around the home that have at least one hazardous characteristic (flammable, toxic, explosive or corrosive).
Illegal dumping	Premeditated littering where people go out of their way to dump waste in public places illegally, typically for commercial benefit or to avoid disposal fees.
Infrastructure	Means physical equipment that is not designed for regular movement.
Landfill	Means: (a) a licensed landfill, or (b) premises that would, if the occupier of the premises held a licence in respect of the premises as required under the EP Act, be a licensed landfill.
Levy	Means a levy imposed under the *Waste Avoidance and Resource Recovery Levy Act 2007* on the disposal of waste.
Product stewardship	An approach to managing the impacts of different products and materials. It acknowledges that those involved in producing, selling, using, and disposing of products have a shared responsibility to ensure those products or materials are managed in a way that reduces their impact, throughout their life cycle, on the environment and on public health and safety.
Processing	Means an action or series of actions performed on something to change it. This could include mechanical, chemical, or other actions.
Recovery	Recovery refers to mechanical, thermal, biological, or chemical actions that recover all or some of the materials that may otherwise be disposed to landfill.
Recycling	Refers to using recovered waste materials substituted for raw materials.
Residual waste	Waste that remains after the application of a better practice source separation process and recycling system, consistent with the waste hierarchy as described in section 5 of the *Waste Avoidance and Resource Recovery Act 2007*.

Appendices

Appendix A — Legislative considerations

The EP Act has been effective in providing a framework for protecting the environment and ensuring that the impacts of significant proposals are assessed and managed for over 30 years since its introduction.

Management of waste and recovery of materials was legislated more recently in 2007, in the making of the WARR Act. The WARR Act and its subsidiary instruments build on the foundations of the EP Act, including through reference to the waste-related definitions and applying waste activity industry regulation licensing regime.

The WARR Act directly aligns to the philosophy of the e-waste to landfill ban and:

- provides for Regulations to be made in respect of matters set out in Schedule 3: … *"Prohibiting the disposal to landfill or other waste facilities of specified waste or classes of waste (including any products that are or have been included in an extended producer responsibility scheme)";*
- includes primary themes around recycling, waste services, the Waste Strategy, waste hierarchy, circular economy, repurposing and material recovery;
- gives focus to product stewardship and e-waste types with product stewardship schemes are generally deemed suitable for inclusion in the ban;
- is complementary to and not in derogation of the provisions of any other law of the state; and
- allows for maximum penalty of $10,000.

A regulation under the WARR Act would need to consider and act in a complementary way with other waste management legislation in the state, as summarised in Figure A1.

Waste management facilities that are seeking to include appropriate authorisations under their existing licence in relation to the acceptance, collection and aggregation of E-waste may need to do so via amending their licence (section 53 of the EP Act).

Similarly, new waste facilities wishing to carry out these activities may also be subject to Part V licensing provisions. Please refer to the Industry Regulation Guide to Licensing for further guidance on the licensing framework for those proposing to construct and/or alter prescribed premises or undertake activities which are regulated by the department under Part V Division 3 of the EP Act.

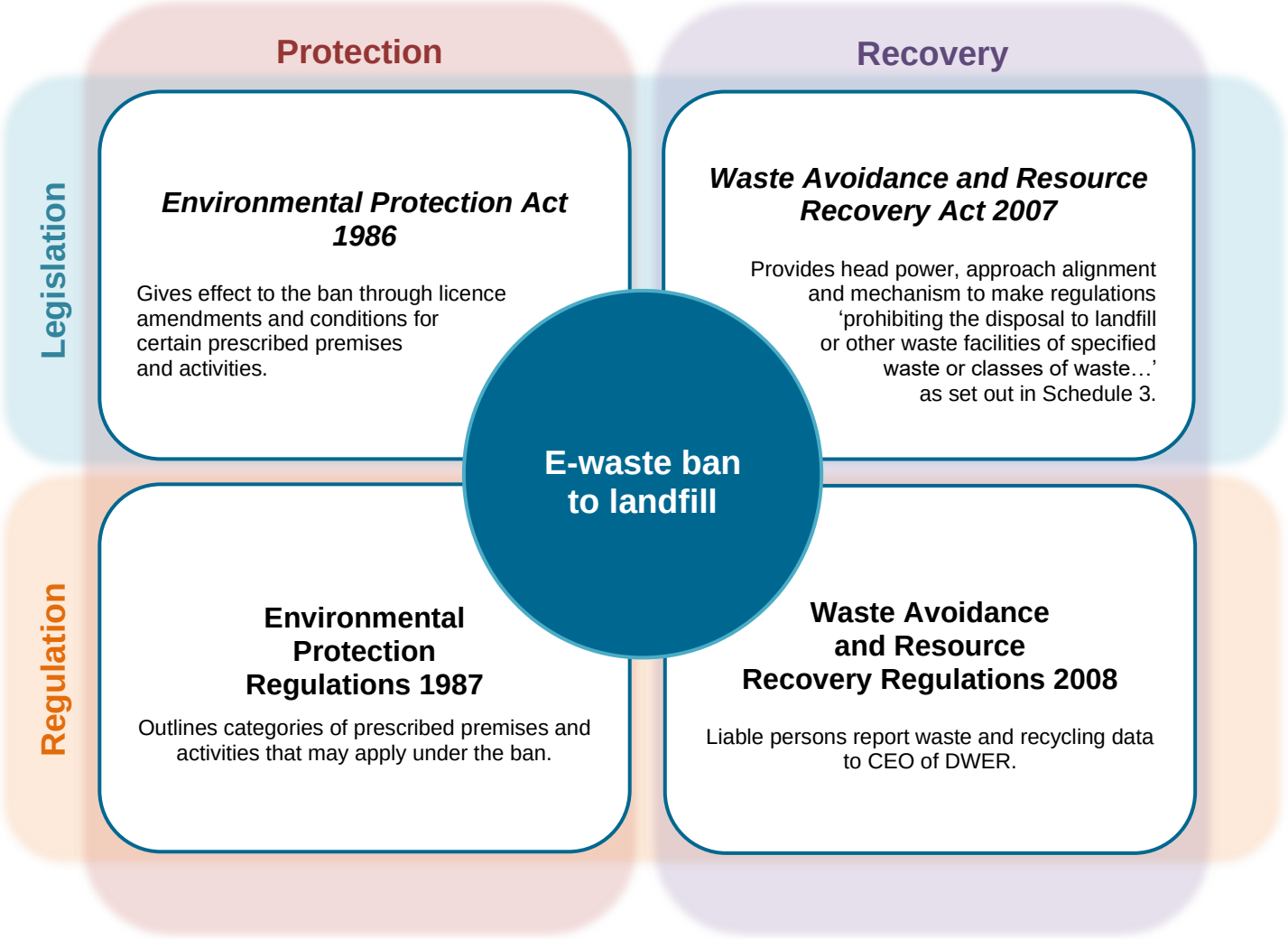


Figure A1: Legislative facets to give effect to the e-waste to landfill ban

Roles, responsibilities and obligations for preferred implementation option

E-waste generators

Households

Influencing e-waste disposal behaviour will be non-regulatory and involve targeted communications, education and behaviour change methods and established proven messaging (e.g. GREAT sorts 'Take' e-waste to a drop-off point, WasteSorted toolkit for source separation), potentially in partnership with local governments.

In Victoria, provisions without penalties apply for individuals involved in e-waste generation, collection, storage, handling; transport; or reprocessing. The instrument requires individuals to prevent breakage or spoilage of e-waste that might limit its suitability for reprocessing and provide e-waste to an e-waste-compliant service provider.

South Australia enforces a penalty up to $3,000 for individuals who dispose of banned waste to landfills, however, their EPA[27] was not aware of any prosecutions under these provisions since the ban was introduced in 2011.

Commercial entities

It is proposed that commercial entities may be subject to penalties to ensure e-waste volumes that are significant/not negligible are collected for recycling and not disposed to landfill. Additional obligations and penalties for appropriate storage and transportation to limit damage and spoilage of items that prevents recovery is recommended. Before prosecution, implementation of compliance mechanisms, such as a compliance notice to rectify inappropriate storage arrangements, are recommended. In the event of illegal dumping, existing avenues for prosecution exist under the EP Act.

Victoria requires commercial entities to prevent breakage or spoilage of e-waste that might limit its suitability for reprocessing, and that they direct e-waste to a 'compliant service provider'. Victoria does not have penalties with these obligations.

South Australia applies penalties of up to $30,000 for offences where a commercial entity disposes of e-waste at landfill depots or in landfill receptacles. However, evidence of prosecutions under these provisions is not available from discussions with their EPA or on public listings[28]. Guidance is provided to commercial businesses likely to generate and dispose prohibited waste including provision of appropriate bins; signage; training; and resources.

Collection network

A collection network that provides good access statewide to a range of e-waste is foundational to achieving the ban's objectives and limiting perverse outcomes.

Current and additional collection services and drop-off facilities may be provided by private operators, not-for-profit organisations (e.g. charities, community groups) and local governments.

Feedback from formal consultation and a state scan of metropolitan services, and confirmation of remote area services points, will be essential to inform the ban and the provision of any incentives.

Summary information on the state's collection network is outlined in Section 2.

Collection services and providers

E-waste items may be collected via drop-off facilities, pick-up (including take-back) and post-back services to private entities, not-for-profits and local governments.

Some smaller portable e-waste items can be taken to dedicated collection points, including retailers of electrical products (e.g. Officeworks, Harvey Norman and Bunnings).

Intermittent e-waste donation 'pop-up' collections exist at big shopping centres and supermarkets. Some charities accept items that can be likely repaired and resold.

[27] Synergies Economic Consulting discussion with Senior Policy Officer, EPA South Australia (February 2022)
[28] Environmental Protection Authority South Australia (2022), *Completed prosecutions & civil penalties:* www.epa.sa.gov.au/public_register/completed_prosecutions_and_civil_penalties (Accessed May 2022)

Larger items with metal parts may be collected by scrap metal recyclers or local governments. Some big household items attract payment for the materials they contain. However, difficult to recycle items, including high-risk items with hazardous contents or data management concerns, may incur a fee to cover higher-effort recycling and collection.

The Victorian Government allocated $15 million to support the upgrade of the e-waste collection network, delivered through an e-waste infrastructure support program and primarily involved funding collection and storage infrastructure upgrades across the existing collection network.

The South Australian Government also funded $1.06 million under a voluntary grants program to support the construction of collection infrastructure.

In Victoria, the ban instrument requires that an e-waste service provider:

- must only store e-waste for the purposes of transfer, recycling, or reprocessing; and
- take all reasonable steps[29] to minimise damage/spoilage to and duration of storage of e-waste under their control or in their possession.

South Australia's landfill ban instrument does not specifically list collection service providers in terms of accepting and handling waste.

Waste management entities

Roles and responsibilities in the management of e-waste include item collection, waste transport; transfer station operation; recycling and processing items into products and materials; and disposal options. Providers of these services and operations may have overlapping roles and multiple obligations.

Basel Convention principles relating to transboundary movements may also be incorporated in the obligations below.

Operational obligations (and penalties) may require that:

- e-waste is not damaged or spoiled during collection, transport, and/or storage to a degree that it is no longer suitable for recovery or recycling
- e-waste is stored only for the purposes of transfer, recycling, or reprocessing
- all reasonable steps are taken to minimise the duration of storage of e-waste under their control or in their possession (prevention of stockpiling)
- effective transportation is carried out between destinations and items collected for the purpose of recovery are not taken and disposed into landfill
- recycling businesses meet minimum standards in the segregation and recovery of e-waste materials
- landfill operators do not accept prohibited waste for disposal with prescribed conditions[30]
- recovered materials from recycling are banned from disposal into landfills

[29] Guidance on "reasonable steps" may include reference to AS/NZS 5377-2013 *Collection, storage, transport and treatment of end-of-life electrical and electronic equipment*

[30] EP Act Part V licensing conditions may have provision to give effect to this obligation

- residual[31] waste is acceptable for disposal to landfill
- non-compliance reporting is carried out.

In Western Australia, the *Landfill Waste Classification and Waste Definitions 1996* (as amended 2019) would need to be updated.

It provides guidance and criteria to be applied in determining the classification of wastes for acceptance to landfills licensed or registered in Western Australia in accordance with Part V Division 3 of the EP Act. More stringent waste acceptance criteria than those listed in that document may be imposed by landfill operators. Similarly, licence conditions may apply more stringent acceptance criteria as appropriate.

Victoria does not have penalties under its ban yet imposes obligations on e-waste service providers regarding storage purposes, storage duration, maximising recovery, and minimising residual materials.

South Australia places obligations and penalties on the unlawful disposal of waste to landfill. E-waste is banned as listed on a schedule; however, entities may dispose of wastes that result from or that have been subject to treatment for resource recovery.

South Australian provisions also prohibit (with penalty) landfill operators from accepting waste that has not been subject to resource recovery. It does allow a landfill operator to accept certain materials if the waste is from an appropriate licensed material recovery facility, waste reprocessing facility or composting works.

Reporting and recordkeeping

The proposed approach would rely on recycling and residual waste being reported. Existing data sources such as product stewardship reports, regulated waste and recycling annual reports and licence compliance reporting can provide a more general context around the ban impact.

Mandatory reporting from recycling facilities specifically regarding e-waste recycling and material recovery would assist to measure performance against the ban objectives.

Obligatory non-compliance reporting from licenced facilities (i.e., recycling facilities, landfill operators, transfer stations) under existing legislation will also provide information to measure performance of the ban.

There are gaps relating to current reporting and data procedures in Western Australia. For instance, facilities not requiring a licence under the EP Act will need further consideration.

Waste transport contractors are also not licensed under the EP Act and are important stakeholders to hold to account for activities under the ban, including the collection of e-waste items and delivering to an appropriate recycler, as well as transporting residual waste for disposal to landfill.

Victoria's e-waste ban instrument describes specific data reporting requirements for e-waste transport recordkeeping (load transported and load received) and recovery record keeping (including processing type, recovery rate calculation, output

[31] Residual waste is that which remains following the application of better practice source separation and recycling systems – WARR Strategy 2030 pp 30

materials). It does not require waste transfer stations to maintain records of receivals or dispatches.

South Australia's landfill ban instrument does not cover individual entity reporting requirements. Waste management licence holders under their *Environment Protection Act 1993* are required to provide annual reports on licensed activities and provide detailed management plans regarding waste management including recovery.

Holistically, the South Australian landfill ban objectives include effective recording, monitoring, and reporting systems with respect to the treatment, transportation, and disposal of waste and other matter in terms of effective waste management.

Appendix B — E-waste categorisation

Methodology

E-waste category groups for the ban were formed with consideration of international directives, legislation, and processes, Federal categories, other state jurisdiction categorisations and Western Australian e-waste generation, recycling and disposal data[32].

International categorisation

Legislation related to handling waste electrical and electronic equipment (WEEE) is managed by the European Commission, such as the United Nations University Keys, WEEE directives[33] (historical/obsolete and current) and Global E-waste Monitor.

The WEEE directive (2012/19/EU) and the Global E-waste monitor both provide an aligned baseline list of e-waste categories namely:

- Temperature exchange equipment.
- Screens, monitors (and equipment containing screens having a surface greater than 100 cm^2).
- Lamps.
- Large equipment (any external dimension more than 50 cm).
- Small equipment (no external dimension more than 50 cm).
- Small IT and telecommunication equipment (no external dimension more than 50 cm).

Federal categorisation

The categories used by the Department of Climate Change, Energy, the Environment and Water (formerly Department of Agriculture, Water and the Environment) Electronic Stewardship Taskforce[12] is a customised version of the international groups. Existing Federal context such as e-waste managed under the NTCRS, voluntary mobile phone product stewardship, and the Federal prioritisation of photovoltaic product stewardship framed the national categories of small appliances; televisions and computers; large appliances; temperature exchange; other large equipment (including medical equipment, and monitoring and control devices); Solar PV and storage; lighting; and mobile phones.

[32] Including data from the *Western Australia E-Waste Material Flow Analysis report* (Encycle, 2021)
[33] Directive 2012/19/EU on waste electrical and electronic equipment entered into force on 13 August 2012. A key change was the consolidation of 10 ‘product-oriented’ categories to six ‘collection-oriented’ categories, effective 2018 onwards. (European Commission)

Australian jurisdictions with e-waste bans

South Australia's categories in its landfill ban included whitegoods; computers and televisions; lighting and mercury lighting; and other e-waste. Published information indicates that South Australia considered WEEE directives in the process of creating those categories.

In Victoria, categories of e-waste are specified as large appliances; professional tools and equipment; small household tools and appliances; computers, TVs, IT; lighting and mobile phones; leisure, and PV, and were categorised based on WEEE directives and existing recovery capability and networks.

Categories of e-waste

The proposed category definitions for the Western Australian e-waste ban to landfill initial and future phases aim to be logical and simple; consider size and composition of items for collection; and reflect existing groupings. They are:

- Screens, IT, and telecommunications
- Lighting and lamps
- Large household appliances
- Batteries
- Temperature exchange equipment
- Medical devices
- Photovoltaics (anticipated for future ban phase)
- Small household appliances (anticipated for future ban phase)
- Monitoring and control equipment (anticipated for future ban phase)

Item and product examples are provided at the end of this document.

Screens, IT, and telecommunications

- The NTCRS has recovery targets, recycling pathways, and established adequate statewide collection options for a range of computers, printers, screens and peripherals. Annual recycling data and material flows analysis provide evidence that increased supply of these items would be beneficial for the state's recycling industry.
- New and innovative processing infrastructure was commissioned in Victoria[34] to support the implementation of the ban (now operated by Cleanaway) and more recently the same processing infrastructure was established in New Zealand[35].
- Mobile phones contain high-value materials and are not usually disposed to landfills. A key challenge with these items is encouraging consumers to provide them for recycling rather than storing them at home.
- Households and commercial entities may not donate mobile devices due to retaining them as back-up devices, having data safety and privacy concerns and a reluctance to give over items with high initial purchase costs.

[34] Victorian Government (2016), *Unveiling Australian-first e-Waste processing technology*: www.premier.vic.gov.au/unveiling-australian-first-e-waste-processing-technology/

[35] Radio New Zealand (2022), *Computer Recycling unveils new machine to deal with NZ's huge e-waste problem*: www.rnz.co.nz/national/programmes/checkpoint/audio/2018839006/computer-recycling-unveils-new-machine-to-deal-with-nz-s-huge-e-waste-problem#:~:text=The%20BLUBOX%20machine%20is%20aiming,in%20Penrose%20on%20Thursday%20afternoon.

- MobileMuster is an industry-led voluntary product stewardship scheme with a range of collection options and existing collection network for mobile devices. Annual reports provide collection volumes but do not provide details on recycling outcomes, recovered materials, or set recovery targets.

Lighting and lamps

- FluoroCycle is a voluntary scheme that targets users of commercial and public lighting. It aims to increase recycling of mercury-containing lighting and lamps and reduce the amount of mercury entering the environment. It is currently not an accredited scheme and provides only two drop-off points in Western Australia.
- Mercury-containing lighting and lamps are accepted by a range of entities including local governments (through the Household Hazardous Waste program) and some businesses provide drop-off points and collection options for lighting and lamps, with some charging a fee for containers and collection.
- Information on recycling options is limited for this category, however, Western Australia has an operational mercury treatment facility[36] able to divert lights containing mercury from landfill.

Large household appliances and temperature exchange equipment

- The scrap metal recycling industry provides an active market for larger e-waste items including fridges, ovens, dishwashers, stoves, washing machines and dryers that are no longer in saleable condition. This is largely due to the product metals' value including steel, aluminium, and copper. Pick-up services may be available with some companies paying for goods, due to the value of the materials recovered.
- Companies may offer take-back schemes on replacements of these categories of e-waste items, coordinated by retailers and installers as part of the sales process.
- Most items under this category generally have collection services available through local governments or recyclers, and disposal in kerbside bins is not feasible due to their size.

Batteries

- Batteries can be a fire hazard when stored, transported, and handled incorrectly. Banning batteries from disposal to landfills will help reduce this risk by providing increased appropriate collection and storage options.
- Hand-held batteries (button, AA, AAA etc.) are included in the recently accredited battery stewardship scheme[37] (B-Cycle) and the Household Hazardous Waste program, which provide an initial collection network for battery recycling in Western Australia.
- South Australia's landfill ban includes lead acid batteries and uses national markets to recycle this class of batteries.

[36] WA Government (2019), *$10 million facility to help manage mercury waste in WA*: www.mediastatements.wa.gov.au/Pages/McGowan/2019/12/10-million-dollar-facility-to-help-manage-mercury-waste-in-WA.aspx

[37] Australian Government (2021), *Battery awareness key to safer disposal:* web.archive.org/web/20220311015534/https:/minister.awe.gov.au/ley/media-releases/battery-awareness-key-safer-disposal

- Victoria's Environment Protection Authority[38] classifies most batteries as priority wastes regulated under the Environment Protection Regulations 2021.
- The demand for batteries as renewable energy storage is rising. The proposed ban presents an opportunity towards recovery of materials required in battery manufacturing[39].
- In Australia, several recyclers are expanding existing markets and creating new ones to ensure that collected batteries are properly recycled[40].

Medical equipment

- Due to the initial outlay cost and specialised nature of large medical equipment, it is not readily disposed to landfill.
- Manufacturers generally use take-back systems for obsolete large medical equipment (e.g. MRI scanners, CT scanners and X-ray machines).
- Community-run programs exist that donate working, unwanted large medical equipment e-waste, such as hospital beds for re-use in other countries[41].

Photovoltaics

- PV are part of solar energy and battery storage. There has been a steady and large rise in household PV systems in Australia, resulting in an increase of projected end-of-life PV material requiring management. As a result, PV have been identified as a national product stewardship priority and Western Australia anticipates action for these products and systems in the future.
- Due to the size, cost and installation requirements of PV, collection may be included in retailer and/or installer take-back activities.

Small household items

- Small household items can represent a substantial proportion of e-waste overall but are generally low demand and low value for recycling due to highly variable componentry and the amounts of different types of plastics in them. It is generally easier or cheaper for consumers to purchase new items than to repair due to their relatively low unit cost.
- This category has a large range of items, such as small kitchen and cleaning appliances (microwaves, toasters, food processors, coffee machines, kettles, vacuum cleaners); personal care appliances (electric toothbrushes, hairdryers, electric shavers); entertainment appliances (headphones, remote controls, MP3s, e-readers, car navigation, musical instruments, DVD and Blu-ray players, speakers, cameras, toys, gaming consoles); tools and others (irons, clocks, adapters, household saws, drills, gardening).
- Small household items are generally of a size that can be disposed in household waste collections and may be difficult to motivate consumers to donate despite bans.

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[38] Environmental Protection Authority Victoria (2018), *Storage and management of waste batteries guideline*: *www.epa.vic.gov.au/-/media/epa/files/publications/2018---storage-and-management-of-waste-batteries-guideline.pdf?la=en&hash=8547D73330930DA50152DE4E40EA4C87*

[39] WA Government (2021), *Western Australia's future battery industry*: www.wa.gov.au/organisation/department-of-jobs-tourism-science-and-innovation/western-australias-future-battery-industry

[40] Battery Stewardship Council (2022), *Creating a battery stewardship scheme for Australia: bsc.org.au/wp-content/uploads/2021/04/BSC-Fact-Sheet-000-Creating-a-BSS-for-AU-20210420.pdf*

[41] Rotary Western Australia, *Medical equipment recycling program*: rotarywestperth.org.au/stories/medical-equipment-recycling-committee-(merc)

- Currently, there is no national accredited product stewardship scheme, nor identified intention to establish a scheme, for these products in Australia.
- There are some community, retail, and charity collections available such as Big W/TerraCycle Toys for Joy toy recycling program, repair cafes and charity donations resold to the public. Some items in the small household category are collected as part of private recyclers' e-waste collections in an ad-hoc way.

Monitoring and control equipment

- Monitoring and control equipment includes difficult to recycle/hazardous items such as smoke and heat detectors, security systems, professional monitoring and control equipment, household health monitoring (e.g. small thermometers, blood pressure meters), laboratory equipment, and scales.
- Currently, there is no national accredited product stewardship scheme, or identified intention to establish a scheme, for these products in Australia.
- The generally hazardous components of these items mean they are only safe and suitable for disposal, rather than recycling, and would not result in beneficial outcomes and present a significant risk for perverse outcomes related to environmental impact.

Table B1: Categories and item examples

	Category	Item examples (sourced from UNU-Keys)
Western Australian e-waste ban initial scope	**Screens, IT, and tele - communications**	Laptops and tablets
		Cathode Ray Tube Monitors and Televisions
		Flat Display Panel Monitors (LCD, LED) Flat Display Panel Televisions (LCD, LED, PDP)
		Professional IT (servers, routers, data storage, copiers)
		Small IT (routers, mice, keyboards, external drives, accessories)
		Desktop PCs and printers (including scanners and faxes)
		Mobile Phones (including smartphones and pagers)
		Telecom (cordless phones, answering machines etc.)
	Lighting and lamps	Compact fluorescent lamps
		Straight tube fluorescent lamps
		Special (mercury, high and low pressure, sodium vapour, other professional lamps)
		LED
		Lamps (pocket, Christmas)
		Luminaires (including household incandescent fittings)
	Large household appliances	Dishwashers
		Kitchen (large furnaces, ovens, cooking equipment)
		Washing Machines (including combined dryers)
		Dryers (wash dryers, centrifuges)
		Large leisure (including large toys, exercise, large musical instruments)
		Dispenser (non-cooled vending, coffee, tickets, etc.)
	Batteries	Batteries including those in the Household Hazardous Waste program and the Commonwealth Battery Stewardship Scheme.
		Lead acid batteries
	Temperature exchange equipment	Freezers and Fridges (including combi-fridges)
		Air Conditioners (household installed and portable)
		Other Cooling (dehumidifiers, heat pump dryers)
		Professional Cooling (large air conditioners, cooling displays)
		Dispenser (cooled vending, bottles, candy, etc.)
		Heating and Ventilation (household and professional)
	Medical devices	Professional medical (hospital, dentist, diagnostics, etc.)
Future phase	**Photovoltaics**	All items listed under the future Commonwealth Photovoltaic Systems Product Stewardship Scheme (anticipated for 2022/23)
	Small household appliances	Microwaves (including combined, excluding grills)
		Other Small Household (small ventilators, irons, clocks, adapters)
		Food (toaster, grills, food processing, frying pans)
		Hot Water (coffee, tea, water cookers)
		Vacuum Cleaners (excluding professional)
		Personal Care (toothbrushes, hair dryers, razors)
		Small Consumer Electronics (headphones, remote controls)
		Portable Audio and Video (MP3, e-readers, car navigation)
		Music Instruments, Radio, HiFi (including audio sets)
		Video (video recorders, DVD, Blu-ray, set-top boxes)
		Speakers
		Cameras (camcorders, photo, and digital still cameras)
		Tools (all household saws, drills, cleaning, garden, etc.)
		Toys (small toys, vehicles, small music)
		Game Consoles (video games and consoles)
	Monitoring and control equipment	Monitoring (professional monitoring and control, garage, diagnostic, etc.)
		Monitoring (alarm, heat, smoke, security, excluding screens)
		Household health monitoring (small thermometers, blood pressure meters)