SUPPORTING THE CIRCULAR ECONOMY

SOUTH AUSTRALIA'S WASTE STRATEGY 2020-2025

Government of South Australia
Green Industries SA

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Acknowledgement of country

We acknowledge and respect the Traditional Custodians whose ancestral lands we live and work upon and we pay our respects to their Elders past and present. We acknowledge and respect their deep spiritual connection and the relationship that Aboriginal and Torres Strait Islanders people have to Country.

We also pay our respects to the cultural authority of Aboriginal people and their nations in South Australia, as well as those across Australia.

Contents

A message from the Minister

Our state has rightly earned a reputation as a global leader in recycling and resource recovery and for building a resilient resource recovery sector.

I am pleased to release *South Australia's Waste Strategy 2020-2025*, which reflects our ambition to protect our environment and the quality of life we all value, while creating prosperity through resource efficiency, resilience and productivity.

This Strategy sets priority actions that will guide activity over five years. We want to see these build on the resilience and capabilities of our local industry through strategic infrastructure investment, market development, education, and innovation that will boost resource efficiency and create business opportunities locally, around Australia and overseas.

Our objective is to support South Australia's growing transition to a 'circular economy' – an economy that is prosperous and regenerative by design. We are already taking steps to facilitate this shift but it will require continued effort to keep materials and resources in use, or 'circulating', for as long as possible.

The Strategy provides a measurable and evidence-based framework to realise our vision to make South Australia a national centre-point for reuse, remanufacturing, recycling and composting. These efforts will be underpinned by strong, coordinated leadership and action at national and global levels to support market development, investment and policy directions.

We recognise that the release of this Strategy occurs during continued global disruptions and uncertainty. For the waste and recycling sector, many of these disruptions have been exacerbated by the coronavirus pandemic, South Australia's 2019-20 bushfires, and global and domestic policy changes affecting markets for recyclables. They have tested our State's resilience but at the same time highlight a need to recognise effective waste management as an essential service to all. The significance of work to improve our infrastructure and ensure the local recovery of our resources is vital to ensure continuity of this service, boost our markets for our recyclables, and work to support our community's knowledge of how to increase recycling within households.

South Australia's nation-leading response in clean-up activities following the 2019-20 bushfires demonstrated the extraordinary capacity of individuals, organisations and communities to respond together under challenging conditions and I thank everyone who has been involved.

I am excited by the incredible opportunities that exist to boost our developing circular economy. The inspired support and action of business, industry, the community and all levels of government will be needed to achieve long-term change. I thank everyone involved in developing the Strategy and look forward to its implementation as the foundation of our 'circular' future.

Hon David Speirs MP
Minister for Environment and Water

A message from the Presiding Member

South Australia's Waste Strategy 2020-2025 is a major step in the transition to a circular economy and to achieving environmental gains while boosting the South Australian economy.

We can be proud of the State's achievements in waste management: we are diverting more than 80 per cent of all waste generated from landfill disposal to better purposes through recycling (Rawtec, 2020).

This has been underpinned by the delivery of three consecutive waste strategies spanning 2005 to 2020 and by the efforts of all South Australians.

However, it is clear that there remains untapped potential in ensuring our resources circulate more within the local economy – by encouraging innovation and best practice in resource recovery and remanufacturing.

Through the Waste Strategy, we will continue to promote innovation and business activity in the waste management, resource recovery and green industry sectors because we recognise that these areas present a valuable opportunity to contribute to the State's economic growth.

The Strategy will ensure high-impact and specific action in new directions including food waste and single-use plastics, regulatory waste reforms, education and behaviour change, and, importantly, supporting market development and remanufacturing. Central to ongoing action will be the continued support of and collaboration between governments, research and education institutions, industry and business, within South Australia, nationally and internationally.

Our aim is to help South Australian businesses become more resource efficient, resilient and competitive, which will secure economic advantage while protecting the environment. This is particularly important as we support the State's recovery from the coronavirus pandemic and respond to global and domestic changes relating to the export of recyclables. I would also like to acknowledge the remarkable disaster waste management response under Green Industries SA's leadership following the South Australian 2019-20 bushfires.

This Strategy reflects the input of many partners and others determined that South Australia be better at managing waste, so that South Australians and the environment may benefit. Through its implementation, I look forward to building on our achievements and firm reputation as a global leader in recycling, resource recovery and transitioning to a circular economy.

Kevin McGuinness
Presiding Member
Board of Green Industries SA

Purpose

Under Green Industries SA's leadership, South Australia's Waste Strategy 2020-2025 forms a framework of policies, strategies and plans meeting South Australia's priorities for economic growth[1].

About Green Industries SA

Green Industries SA is an enabler and driver of change, supporting the development of the circular economy through diverse collaborations which improve productivity, resilience, resource efficiency and the environment.

It aims to transform how South Australians use and value resources. Its objectives under the *Green Industries SA Act 2004* are to:

- promote waste management practices that, as far as possible, eliminate waste or its consignment to landfill; and
- promote innovation and business activity in the waste management, resource recovery and green industry sectors, recognising these areas present valuable opportunities to contribute to the state's economic growth.

Green Industries SA is funded from the solid waste component of the waste depot levy, collected under the Fees and Levies regulations of the *Environment Protection Act 1993*. Fifty per cent of the levy is transferred to the Green Industry Fund and Green Industries SA uses a proportion of that fund as provided for in the *Green Industries SA Act 2004*. Additional funds are allocated through the State Government's budget process.

The circular economy

The circular economy is a prominent focus for Green Industries SA. The *Green Industries SA Act 2004* incorporates the concept of circular economy as a guiding principle.

The potential benefits of a circular economy in South Australia have been measured (Green Industries SA, 2017), which describes gains to be achieved in local job creation and reductions in greenhouse gas emissions by 2030.

> "*South Australia's Waste Strategy 2020-2025* forms a framework of policies, strategies and plans meeting **South Australia's priorities** for **economic growth.**"

1 South Australian Government 'Growth State. Our Plan for Prosperity' <www.growthstate.sa.gov.au/>

Waste Strategy Objective

South Australia's Waste Strategy 2020-2025 outlines actions that can contribute to the development of a circular economy – that is, an economy that realises the best or full value from products and materials produced, consumed and recovered in South Australia through:

- a clearly articulated policy and legislative framework that gives a solid platform for investment decisions and a stable and efficient market
- supporting innovation and commercialisation
- education, advocacy and awareness to support behaviour change in the way waste and resources are managed
- applying the waste management hierarchy consistently with the principles of ecologically sustainable development.

The Waste Strategy's objectives highlight that if we act in response to the global and domestic challenges facing waste management, we can:

- increase market confidence for investments in the circular economy, resource recovery and waste management
- encourage local innovation and investment, boost certainty and build resilient businesses
- increase South Australia's use of secondary materials and reduce the demand on raw material
- improve material efficiency and utility
- reduce greenhouse gases
- create jobs
- foster an environment where the South Australian community, businesses and institutions can thrive while reducing their impact on the environment
- maintain South Australia's leading position in waste management and resource recovery.

Waste Strategy 2020-2025
A snapshot

Zero avoidable waste to landfill by 2030

Per capita waste generation:
5% reduction on a 2020 baseline

2025 TARGETS BY WASTE SECTOR

METROPOLITAN

Municipal solid waste	Commercial and industrial	Construction and demolition
75% diversion	**90%** diversion	**95%** diversion

NON-METROPOLITAN (ALL WASTE SECTORS)

BY 2023

Regional Waste Management Plans are in place for all South Australian regional local government areas and/or regional city clusters and set regionally appropriate and progressive waste diversion targets

Broader quantitative actions have been further identified to support these targets

Refer further to Targets 2020-2025

Priorities for action: Areas with the potential for greatest impact

1. Transitioning to a circular economy
2. Market development
3. Infrastructure capability and capacity
4. Food waste
5. Plastics and packaging

Refer to Priorities for Action

Framework and principles

INTERNATIONAL

United Nations Sustainable Development Goals

Montreal Protocol

European Commission Circular Economy Framework

United Nations Framework Convention on Climate Change

Basel Convention

NATIONAL

National Waste Policy and Action Plan

Product Stewardship Act 2011 extended producer responsibility schemes

Recycling and Waste Reduction Bill 2020 (Cth)

National Food Waste Strategy

STATE

Green Industries SA Act 2004

Guiding principles:

Waste management hierarchy (refer **Figure 1**)

The circular economy (refer **Figure 2**)

Ecologically sustainable development

Best practice methods and standards

Policy development through open dialogue and consultation

No new landfills servicing metropolitan Adelaide

Source separation of waste

Environment Protection Act 1993

Objects

Promote the principles of ecologically sustainable development.

Protect, restore and enhance the environment.

Regulate waste management.

Promoting the waste management hierarchy and a strong market for recovered resources.

Environment Protection (Waste to Resources) Policy 2010

Key features:

Sustainable waste management objective

Resource recovery processing requirements for most metropolitan Adelaide waste

Landfill bans

Illegal dumping offence

Beverage Container Act 1975

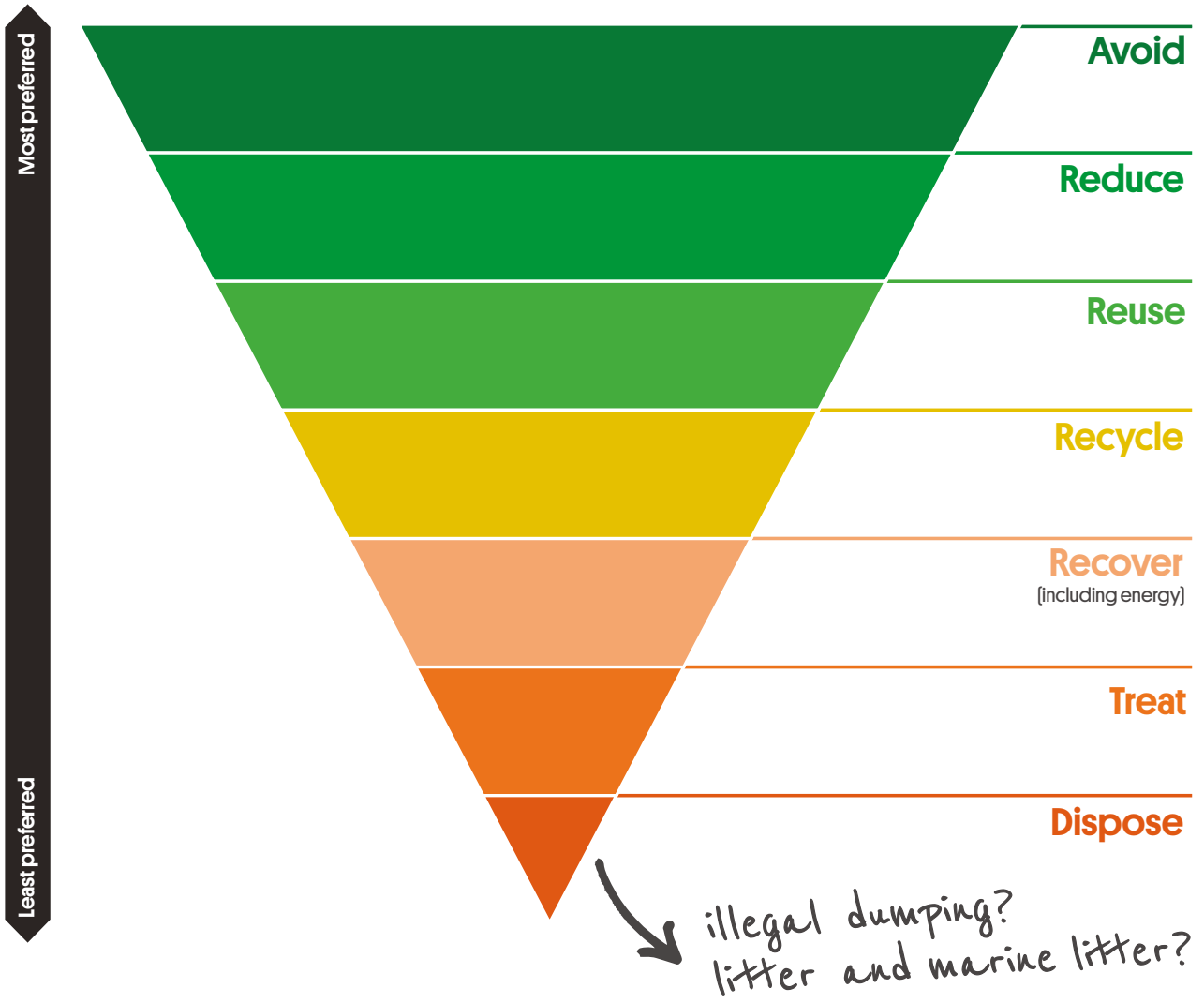
Plastic Shopping Bags (Waste Avoidance) Act 2008

Single-use and Other Plastic Products (Waste Avoidance) Act 2020

Key guiding principles for waste management in South Australia

The waste management hierarchy

Figure 1. The waste management hierarchy

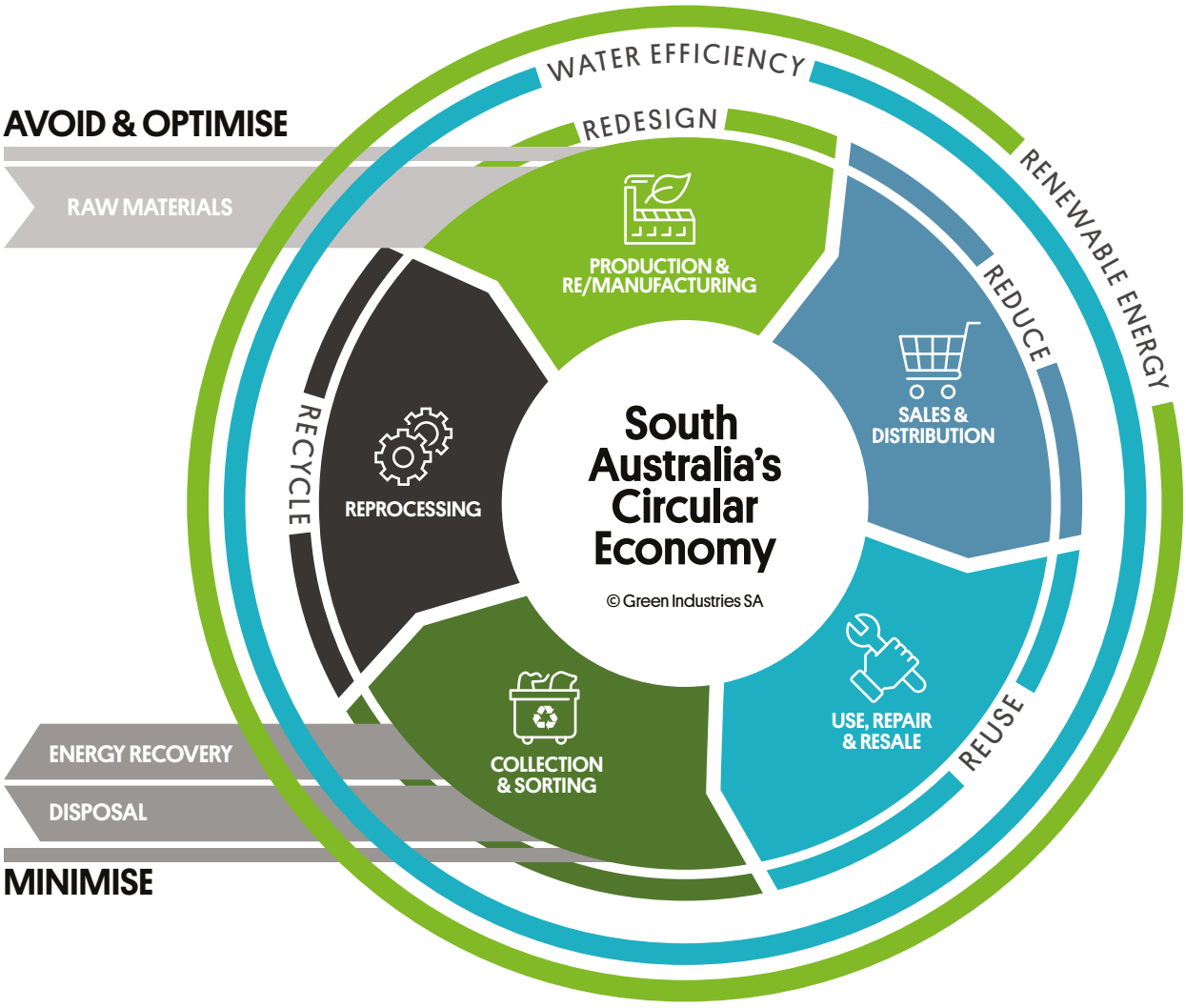


The waste management hierarchy is recognised internationally as an aspirational framework for sustainability. It implies a closed system where waste is ultimately dealt with, but it does not indicate how to manage 'leakage' from the system or the fugitive waste that may escape as litter or marine debris.

The possibility of leakage is recognised by policies and actions such as South Australia's direction on single-use plastics. The policy highlights that the hierarchy recognises litter and marine debris as being the least preferable options in waste management – that is, waste disposed of on land or into aquatic environments, whether deliberately or otherwise.

The circular economy

Figure 2. South Australia's Circular Economy, Green Industries SA



Ecologically sustainable development

> *Australia's National Strategy for Ecologically Sustainable Development defines ecologically sustainable development as 'using, conserving, and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.'*

[Australian Department of Agriculture, Water and the Environment, 1992]

According to *South Australia's Environment Protection Act 1993*, ecoloogically sustainable development may be achieved if we:

- use, develop and protect the environment in ways that allow people and communities to provide for their health, safety, and economic, social and physical wellbeing
- sustain the potential of natural and physical resources to meet the needs of future generations
- safeguard the life-supporting capacity of air, water, land and ecosystem
- avoid, remedy or mitigate adverse effects of activities on the environment
- give proper weight to long-term and short-term economic, environmental, social and equity considerations in deciding matters that relate to environmental protection, restoration and enhancement.

[Adapted from South Australia's Environment Protection Act 1993]

Climate action

The South Australian Government aims to reduce emissions by more than 50 per cent from 2005 levels by 2030 and for net zero emissions by 2050 [Department for Environment and Water [SA], 2020a and 2020b].

This Waste Strategy outlines how to reduce waste and greenhouse gas emissions, and so contribute to the transition to a circular economy.

United Nations Climate Change recognises that the world can maximise chances of avoiding climate change by moving to a circular economy:

> *'Governments' climate change strategies have focused on renewable energy, energy efficiency and avoiding deforestation but they have overlooked the vast potential of the circular economy. They should re-engineer supply chains all the way back to the wells, fields, mines and quarries where our resources originate so that we consume fewer raw materials. This will not only reduce emissions but also boost growth by making economies more efficient.'*

[United Nations Climate Change, 2019]

Further, it has been highlighted that approximately 45 per cent of greenhouse gas emissions globally arise from how products are made and how we use our land, including for food production [Ellen MacArthur Foundation, 2019a].

Progressing priority actions within this Strategy will support a transition to a more circular economy while implementing the State Government's Directions for a Climate Smart South Australia.

The global landscape

Exploring opportunities and addressing the challenges in managing resources and waste more sustainably require a holistic understanding of relevant issues of global concern. The Waste Strategy reflects the need to conserve resources and reduce pollution and carbon emissions while reducing poverty and maintaining human wellbeing within a supportive economy. Key opportunities and challenges facing waste management and the circular economy are summarised here.

Population growth

By 2050, world population will have reached 9.7 billion people.

United Nations, Department of Economic and Social Affairs, Population Division, 2019

Raw material demand

The demand for global material resources was estimated at 92.1 billion tonnes in 2017 which grew fourfold compared with 27 billion tonnes of global resource extraction in 1970.

International Resource Panel, 2019

Growing waste

Global waste is expected to grow by 70% on current levels by 2050: from 2.01 billion tonnes in 2016 to 3.4 billion tonnes by 2050.

Kaza, S. et al. 2018

Climate change

Greenhouse gases are at their highest point since pre-industrial levels. Globally averaged concentrations of carbon dioxide reached 407.8 parts per million in 2018.

World Meteorological Organization, 2019

Food security

With world population rising, the world is facing about a 70% increase in food demands by 2050.

Food and Agriculture Organisation of the United Nations, 2017

Growing unemployment and under-employment

The number of unemployed persons globally is estimated to be approximately 188 million in 2019. 165 million persons globally are additionally in employment but are underutilised.

International Labour Office, 2020

Global infrastructure

Total global investment in required infrastructure is forecast to be $94 trillion by 2040. A $15 trillion gap has also been forecast in the investment required to meet the world's needs.

Global Infrastructure Hub, 2018

Emerging technologies

Emerging technologies evaluated by experts as having the ability to disrupt and alter the way we operate our daily lives include bioplastics for a circular economy, social robots, smart fertilisers to reduce environmental contamination, advanced food tracking and packaging, collaborative telepresence, and utility-scale storage of renewable energy.

World Economic Forum, 2019

Global risks and disruptions

Global risks such as natural disasters, extreme weather, and international market pressures and other disruptions such as COVID-19, can cause significant environmental, social and economic impacts.

World Economic Forum, 2020; World Health Organization, 2020

Targets for 2020-2025

A target of **zero avoidable waste to landfill by 2030** will guide action during and beyond the lifespan of *South Australia's Waste Strategy 2020-2025*.

This target aims to stimulate action towards a circular economy. In meeting this target, principles and requirements of the *Green Industries SA Act 2004*, the *Environment Protection Act 1993* and its subordinate legislation, including the Environment Protection (Waste to Resources) Policy 2010 should be upheld, including:

- As outlined in the **waste management hierarchy**, ensuring that materials are separated as close as possible to their point of generation and safely used for their highest order purpose. Some materials, including asbestos, certain toxic and quarantine waste, once generated, should be removed from circulation as soon as possible, noting that some of these wastes may be suitable for processes that are higher than landfill on the waste management hierarchy, such as energy from waste.
- Ensuring that principles of **ecologically sustainable development** and avoiding environmental harm are upheld as new mechanisms for design, use and recovery are promoted and pursued.
- Ensuring that the use of **waste-derived materials** is beneficial and genuine, not posing a risk of environmental harm or undermining resource recovery markets.
- Ensuring efforts to reduce impacts of **greenhouse gas emissons.**

South Australia's Waste Strategy 2020-2025 also prescribes quantitative targets for municipal solid waste (MSW), commercial and industrial (C&I), construction and demolition (C&D) waste streams, and per waste capita reduction.

Broader quantitative key actions essential to achieving these targets are also defined.

South Australia's Waste Strategy 2020-2025 targets

OVERALL TARGETS	Zero avoidable waste to landfill by 2030[1]	Per capita waste generation 5% reduction from a 2020 baseline
TARGETS BY SECTOR: METROPOLITAN		
MUNICIPAL SOLID WASTE (MSW)	**MSW 2025 TARGET: 75% DIVERSION****	
	TARGETS	
	Household bin systems[2]	**All MSW waste[3]***
2023	60%	65%
2025	70%	75%
BASELINE		
2015-2020 Waste Strategy targets by 2020	**60%**	**70%**
Actual diversion achieved (2018-19)	**48.7% (average)**	**57%**
COMMERCIAL AND INDUSTRIAL (C&I)	**C&I 2025 TARGET: 90% DIVERSION****	
	TARGET	
2023	85%	
2025	90%	
BASELINE		
2015-2020 Waste Strategy targets by 2020	**80%**	
Actual diversion achieved (2018-19)*	**88.2%**	
CONSTRUCTION AND DEMOLITION (C&D)	**C&D 2025 TARGET: 95% DIVERSION****	
	TARGET	
2023	90%	
2025	95%	
BASELINE		
2015-2020 Waste Strategy targets by 2020	**90%**	
Actual diversion achieved (2018-19)*	**91.4%**	
TARGET: NON-METROPOLITAN (ALL WASTE SECTORS)		
2023	Regional Waste Management Plans are in place for all South Australian regional local government areas and/or regional city clusters and set regionally appropriate and progressive waste diversion targets[4]	
2015-2020 Waste Strategy targets by 2020	**Maximise diversion to the extent practically and economically achievable**	
BASELINE (all sectors)	**71.2%**	

1 Zero avoidable waste to landfill equates to the diversion of all waste from landfill where it is technologically, environmentally and economically practicable to do so. 'Unavoidable' waste therefore refers to wastes for which no other current treatment is available including (but not limited to) asbestos, toxic and quarantine waste.

2 Diversion only from MSW household bin systems. Actual diversion measured from kerbside reporting to Green Industries SA from all 19 Adelaide metropolitan councils.

3 Quantities arising from total MSW waste comprising household bin systems, hard waste services, street sweepings, council-operated parks and gardens, public place locations, waste collected at drop-off facilities, and council-operated commercial services.

4 Regional Waste Management Plans to be provided to Green Industries SA.

* *Total state-wide diversion as reported in South Australia's Recycling Activity Survey 2018-19 Report (Rawtec, 2020)*

** *Diversion refers to material that would have otherwise been disposed of as waste to landfill, but has instead been recovered for beneficial use, recycled, or reused in accordance with the waste management hierarchy.*

Broader quantitative actions to achieve proposed targets

Actions relevant to all waste sectors (MSW, C&I and C&D)

Plastics and packaging

- 100% of packaging in South Australia is recyclable, compostable or reusable by 2025, in support of the Australian Government commitment to Australian Packaging Covenant Organisation target.

Food waste

- Implement South Australia's Food Waste Strategy.

Product stewardship

- South Australia to support effective product stewardship schemes.

Procurement

- Increase procurement of secondary materials and recycled content products.
- Increase local remanufacturing.
- Implement standards for recycled content products.

Waste levy

- Continued application of the levy.

Additional actions relevant to MSW targets:

Household bin systems

- By 2025, South Australia to adopt kerbside bin systems that optimise diversion of organics and recyclables and enable delivery of the MSW 75% waste diversion target.
- Ensure a standard three-bin system is adopted across all metropolitan councils, including a minimum service to all households: **a.** fortnightly collection of co-mingled recyclables **b.** fortnightly collection of organics, including food waste.
- Increase the recovery of recyclables in the yellow bin.
- Increase the recovery of organics and food waste in the green bin and processed in accordance with Australian *Standard Composts, Soil Conditioners and Mulches – 4454.*
- All kerbside bins to be compliant with Australian Standard AS 4123.5-2008 Mobile waste containers as soon as practicable (through replacement and in-field bin maintenance) before 2030, with a review to be undertaken by 2025.

Additional actions relevant to MSW targets:

Hard waste collection

- Implement best-practice hard waste collection and treatment to maximise material recovery.

Community engagement

- Reduce contamination in kerbside collected bins.
- Support greater participation by households in food waste systems.
- Evaluate the effectiveness of the Which Bin? and other householder education campaigns undertaken by councils and others.
- Ensure common and consistent messaging.

See further priority actions and areas to support detailed interventions for each sector:

Municipal solid waste [MSW]

Construction and demolition [C&D]

Commercial and industrial [C&I]

Measuring progress

State-wide recycling diversion, including the performance of each waste sector, will be reviewed through Green Industries SA's review of recycling activity in South Australia which is undertaken each year to guide the agency's activities and programs.

This will be an important benchmark upon which to monitor progress against targets in South Australia's Waste Strategy 2020-2025. The most recent recycling activity survey data for 2018-19 is provided at **Appendix 1**. Full reports are made available on the Green Industries SA website.

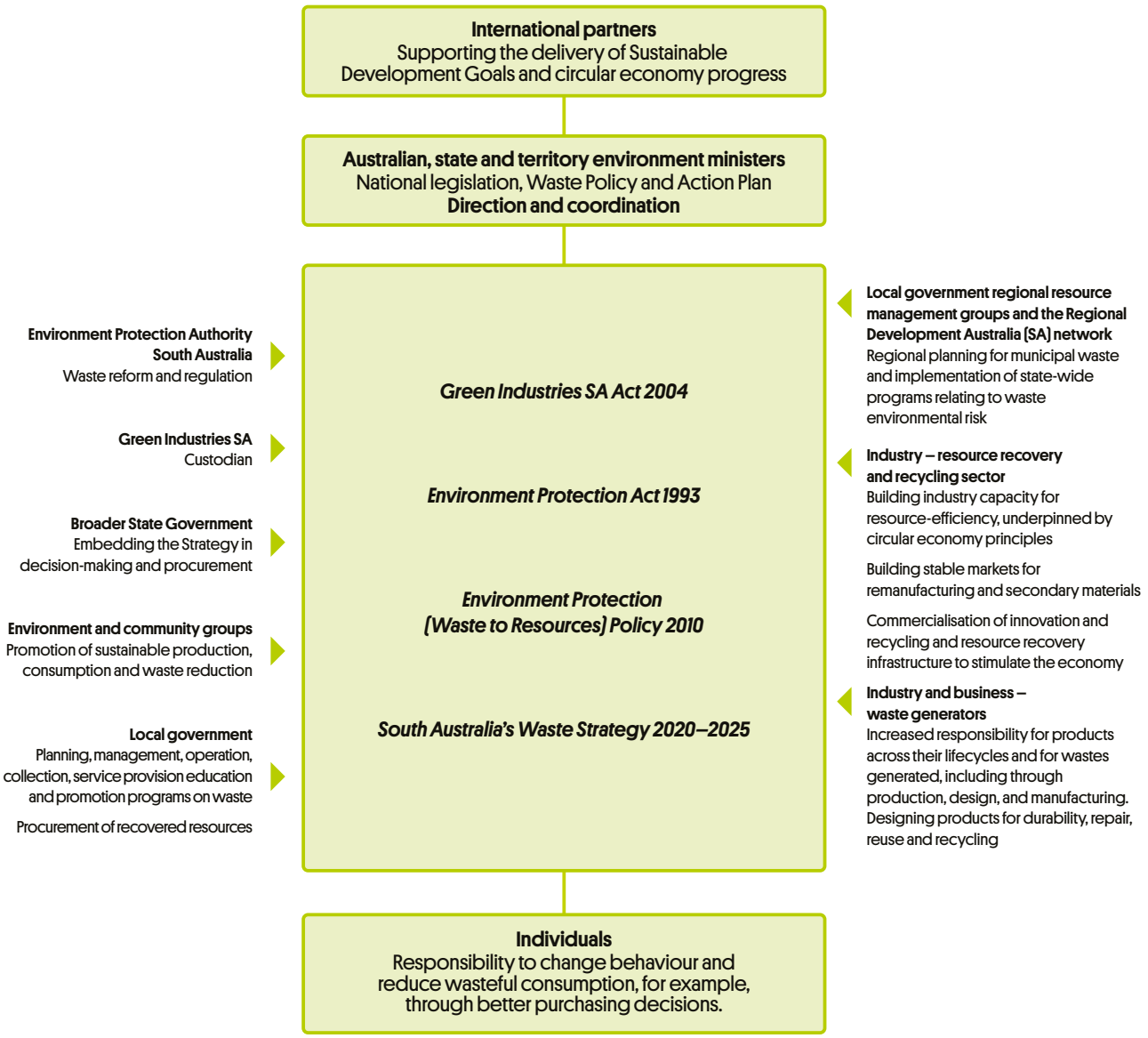
The performance of South Austraia's kerbside bin-based collection will also form the basis of measuring progress for household-bin based kerbside systems. This is reported in annual South Australia's Kerbside Waste Performance Reports which presents data on kerbside waste and recycling collection services in South Australia provided by the 19 Adelaide metropolitan and 49 regional councils for each financial year.

These focus on waste material collected in kerbside bins provided specifically for residual waste (landfill), co-mingled recyclables and green organics, including food waste and compostable material. Hard waste, street sweepings, Container Deposit Scheme returns and waste collected at drop-off facilities and council-operated commercial services are not included in this report.

Partnerships

To achieve the Strategy's objective, targets and priorities for action will require commitment, focus and appropriate resourcing from all sectors. The Strategy's responsibility for implementation will be shared across governments, business, industry and the community. These responsibilities are defined in **Figure 3**. The Strategy has whole-of-government endorsement and strong alignment to other government activities including the South Australian Government's goals and agenda for economic development, trade and investment, emergency services (supporting disaster waste management), health, climate change, environment protection and regulation, procurement, planning and development, and developing the food, wine and agriculture sectors.

Figure 3. Roles and relationships in delivering South Australia's waste strategy



Priorities for action

Areas with the potential for greatest impact

Transitioning to a Circular Economy

Market development

Infrastructure capability and capacity

Food waste

Plastics and packaging

1 Transitioning to a Circular Economy

A transition to the circular economy is a priority and guiding focus for South Australia's Waste Strategy 2020-2025.

The *Green Industries SA Act 2004* includes the concept of circular economy as a guiding principle for an economic model that contemplates the production of goods and services:

- by a reduced reliance on virgin materials
- on the basis of continuously functioning utility and an extended lifecycle
- in a manner that eliminates, as far as is reasonably practicable, waste or pollution, or harm to the environment.

'Circular economy' is a generic term for an industrial economy that is producing no waste and pollution, by design or intention. It refers to the better use of materials within the economy and involves more remanufacturing, repair and reprocessing than the linear 'make, use, dispose' mode of traditional economies.

As the Ellen MacArthur Foundation points out (2015), the existing economic model:

> *'...gives rise to chronically high levels of waste and creates dependence between economic development and inputs of new virgin materials. In a world of finite resources, this model cannot work in the long run, and there are indications that it is reaching its limits.'*

A truly circular economy is driven by renewable flows, rather than finite stocks. Better processes and product design help capture the full benefit of resources, and less materials and energy are used to manufacture the goods and services. Within such an economy, goods are designed to last longer and be easily repaired, upgraded or used differently.

During the term of the 2020-2025 waste strategy, South Australia's work towards a circular economy will build upon current policy initiatives and activities designed to reduce waste, improve material and energy efficiency, and reduce greenhouse gas emissions.

This work will support the National Waste Policy and Action Plan (Australian Department of Agriculture Water and the Environment, 2019) circular economy principles:

1. *Avoid waste:*
   - *Prioritise waste avoidance, encourage efficient use, reuse and repair.*
   - *Design products so waste is minimised, they are made to last and we can more easily recover materials.*
2. *Improve resource recovery:*
   - *Improve material collection systems and processes for recycling.*
   - *Improve the quality of recycled material we produce.*
3. *Increase use of recycled material and build demand and markets for recycled products.*
4. *Better manage material flows to benefit human health, the environment and the economy.*
5. *Improve information to support innovation, guide investment and enable informed consumer decisions.*

Commodity pricing and markets

A key challenge facing waste management, resource recovery and green industry sectors in South Australia, Australia and globally is in their vulnerability to sharp drops in commodity prices, demand for resource types, and available finance. While South Australia's resource recovery industry is well established, with around 86% of all recovered material reprocessed locally and about 7% exported overseas (Rawtec, 2020), global restrictive measures that affect the trading of recycled commodities can impact the viability of South Australian recycling businesses that depend on those markets.

Ultimately, a circular economy offers the opportunity to gain additional value from products and materials but also helps mitigate exposure to material price volatility and material supply (Ellen MacArthur Foundation, 2015).

It has been found that in many developed countries, a reduction in the volume of waste generated is an indication of a development towards less material-intensive production and consumption patterns, particularly as the economy moves from a heavy industry base to a more service base.

Per capita waste generation

To truly reflect the personal impact that South Australians can make in reducing their waste impact and shifting focus towards a circular economy, the Waste Strategy includes a waste generation reduction target of 5% per capita by 2025. This will require continued efforts to decouple the generation of waste from economic activity, as is the key focus globally in seeking a transition to a circular economy.

Transitioning to a Circular Economy

What happens if we don't take action?

- Opportunities for a less material intensive production and consumption model are not progressed and the state continues to rely on and create demand for finite raw materials for economic development.
- South Australia's active leadership in resource recovery and the circular economy is not advanced or optimised within the state or at a national level.
- Lost opportunities for new circular innovations, technologies and business models within the State.
- Lost opportunities in growing South Australia's economy and building jobs in innovative areas.
- The state is vulnerable or reliant on other markets regarding the demand for or processing resources.
- Opportunities to ensure stronger producer responsibility that encourage circular flows are not leveraged.
- The South Australian community does not understand the full benefits of transitioning to a circular economy.

Transitioning to a Circular Economy

What is possible through action?

- ✓ A resilient South Australian economy that produces little waste and pollution by design or intention.
- ✓ South Australia maintains its leadership role in resource recovery and the circular economy.
- ✓ A circular economy is understood to have clear economic, social and environmental value for the state economy and for all South Australians, and so underpins government, industry and community decision-making in South Australia.
- ✓ Significant innovation in the circular economy, including in innovative business models that support economic growth and jobs.
- ✓ Action links to the global circular economy agenda and international aims through the Sustainable Development Goals and taking action on climate change.
- ✓ Support for the National Waste Policy and Action Plan and its principles relating to the circular economy and South Australia is in a firmer position to advocate national change.
- ✓ The benefits of the circular economy in contributing to reduced greenhouse gas emissions are understood and reported.

"South Australia's work towards a circular economy will build upon current policy initiatives and activities designed to reduce waste, improve material and energy efficiency, and reduce greenhouse gas emissions."

Transitioning to a Circular Economy

Priority actions

Avoid waste:

- Encourage businesses and start-ups to adopt business models that support waste avoidance and a transition to the circular economy, for example in sharing, hire and leasing, products service systems, and incentivised return asset management.
- Promote design of products and components to increase reparability, durability, upgradability and recyclability to design out waste.
- Support reuse and repair for further waste avoidance.
- Advocate for product labelling standards to enable better dismantling, reuse and recycling of products and information relating to recycled content.

Improve resource recovery:

- Invest in infrastructure that supports circular economy material flows, either as:
  - organic material, designed to re-enter and regenerate the environment safely (such as compost)
  - materials (such as metals, paper and plastic) that are designed to circulate for as long as possible through repair, reuse and, as a last resort, recycling, without entering the environment for disposal.

Increase use of recycled material and build demand and markets for recycled products.

- Promote manufacturing of products and components that replace virgin materials with sustainably produced materials.

Better manage material flows to benefit human health and well being, the environment and the economy.

- Advocate for extended producer responsibility schemes that deliver recycling outcomes and achieve higher outcomes on the waste hierarchy (such as through better product design).

Improve information to support innovation, guide investment and enable informed consumer decisions.

- Encourage research and development, commercialisation and innovation in new technologies, including big data analytics, social media, trace and return systems, 3D printing and modular design technologies.
- Identify key sectors, materials and regions to benefit from the circular economy and seek to support practical consideration and actions.
- Support knowledge management and metrics for waste and resource recovery in a circular economy.

2 Market development

Increased domestic demand for local recyclable materials and recycled-content products can play a vital role in attracting investment in local remanufacturing and supporting longer-term structural adjustment of the waste sector to a circular economy business model.

The success of this Waste Strategy requires an increase in the quality and market demand for recyclable materials and recycled content products. This is especially vital as the impacts of global and national policy focuses attention on creating market opportunities for new, sustainable products made from recycled materials.

Nationally, environment ministers have agreed on a number of actions to reduce waste generation, improve recyclability of waste, and increase domestic recycling capacity and demand for recycled products. For example, the National Cabinet (Australia) committed to banning the export of recyclable material including waste plastic, paper, glass and tyres and introducing legislation to support this (National Cabinet, 2019).

South Australia should expand market-related activities for existing recycled-content products, improve the quality and supply of waste feedstock used in manufacturing recycled-content products, and improve market confidence in the recycled materials and recycled-content products. This will generate confidence in and demand for quality recycled products.

Sustainable procurement

A nationally consistent standardised methodology for requiring supply agreements to incorporate recycled content products will increase the market for recycled products.

This aligns with the intention of the National Waste Policy to advocate for increased use of recycled materials in the goods that government and industry buy, such as paper, road materials and construction materials, and to collaborate on creating new markets for recycled materials[2].

Longer-term measures can be managed through a staged approach. For example, selected materials such as glass fines in civil construction applications or sector-based circular economy policy and case studies.

Market development

What happens if we don't take action?

- Poor demand and local market development for recycled content products.
- Sustainable products are not used as much as possible.
- Lost opportunities to drive innovation and market development in products.
- Continued demand on raw materials with a higher environmental footprint, contributing to higher greenhouse gas emissions, water and energy use; greater impacts to agriculture and deforestation; and more waste production.
- An uneven playing field for market development of sustainable products.

2 Seventh meeting of Environment Ministers, Agreed Statement – 27 April 2018, Melbourne

Market development

What is possible through action?

- ✓ Boosts to local market demand and local employment.
- ✓ Reduced demand on raw materials.
- ✓ Increased demand for recycled products.
- ✓ Increased diversion from landfill.
- ✓ 'Closing the loop' on products entering the recycling stream by generating demand for recycled products.
- ✓ Increased environmental benefits.
- ✓ Potential lifecycle benefits (value for money) compared to using virgin materials.
- ✓ South Australia continues to perform as, and is perceived as, a leader in circular economy activity.
- ✓ Development of new markets and contribution to the resilience and stability of existing markets.

Priority actions

- » Investigate barriers for sustainable procurement (in state and local governments and industry) and identify measures to overcome these, including through legislation and policy.
- » Investigate financial instruments, policies and other measures that would aid in providing a level playing field for local manufacturing of recycled content products.
- » Advocate for State Government and local government adoption of a sustainable procurement and 'buy-back' policies, including setting targets.
- » Identify and recommend priority recovered materials and recycled-content products to be mandated for use in the government and industry procurement system, in the short and medium term.
- » Develop successful procurement case studies demonstrating benefits of using recycled-content products to government and industry.
- » Identify relevant training needs for procurement practitioners and developing tools for capacity building in sustainable procurement.
- » Collaborate in and advocate for nationally consistent standards and/or frameworks for the requirement of recycled-content products in government procurement.
- » Support the development of accredited testing for product standards and performance to increase confidence in the quality of remanufactured products.
- » Develop government fit-out requirements to support increased resource recovery and material reuse and repurpose.
- » Ensure a robust regulatory environment that supports local market development for remanufactured products.
- » Include recycled content measures in government infrastructure projects.
- » Develop monitoring and reporting mechanisms for sustainable procurement.
- » Develop strategies to develop economically viable products from recycled products.

"Increased domestic demand for local recyclable materials and recycled-content products can play a vital role in attracting investment in local remanufacturing and supporting longer-term structural adjustment of the waste sector to a circular economy business model domestically."

3 Infrastructure capability and capacity

This Strategy includes a long-term strategic objective of increasing and maintaining the capacity of South Australia's recycling systems and reprocessing infrastructure. South Australia has established integrated waste management infrastructure throughout the state, with the State Government generating much of this infrastructure through support programs and co-investment. Waste and resource recovery infrastructure planning and investment will play critical roles in supporting future industry development and economic growth.

In February 2018, following stakeholder consultation, Green Industries SA released its 'Waste and Resource Recovery Infrastructure Plan' (Green Industries SA, 2018c). The plan projects investment needs for waste management and resource recovery infrastructure over the next 10-30 years. It models scenarios for waste flow projections, corresponding infrastructure needs and economic impact assessments:

- moderate additional diversion – slightly more than business as usual) over a 10-year period
- high additional diversion – aspirational goal of zero waste across metropolitan Adelaide and high diversion rates in regional areas) over a 30-year period.

This supports the *20-Year State Infrastructure Strategy* which identifies the significant role that planning and investment in South Australia's waste and resource recovery infrastructure plays in building industry capacity to manage new and emerging waste streams and contributing to economic growth (Infrastructure SA, 2020).

Green Industries SA's Infrastructure Grants Program helps private sector, local government and not-for-profit organisations to invest in infrastructure and find innovative approaches to increasing the resource recovery and reducing the amount of waste sent to landfill.

"Waste and resource recovery infrastructure planning and investment will play critical roles in supporting future industry development and economic growth."

Infrastructure capability and capacity

What happens if we don't take action?

- Reliance on volatile and contracting overseas markets for recovered recyclable commodities.
- Missed opportunities for local resource recovery capacity and to stimulate economic activity and job creation.
- Infrastructure capability does not meet waste generation requirements.
- Illegal activity and stockpiling of materials.

What is possible through action?

- ✓ Support for South Australian industry development and economic growth.
- ✓ South Australia's world-class recycling performance is maintained.
- ✓ Accelerated transition to a resource-efficient circular economy.
- ✓ Continued resource recovery infrastructure investment, avoided landfill costs; reduced use of virgin materials, energy and water; reduced greenhouse gas emissions; and boost economic development.
- ✓ Help for the South Australian recycling industry and local government to respond to global policy changes affecting the markets for recyclable materials.
- ✓ Support for the processing of materials banned from landfill under the E*nvironment Protection (Waste to Resources) Policy 2010*.
- ✓ Prioritising local processing of materials.
- ✓ South Australia becomes a waste management training destination for Australian and overseas professionals (such as in behaviour change, systems design and deployment, regulation, and alternative technology and policy).

Priority actions

- » Encourage innovation by tackling new and or problematic waste streams, assisting improvements to efficiency and targeting new market segments.
- » Continue investment in high performing resource recovery infrastructure.
- » Improve knowledge and awareness of resource recovery infrastructure as being essential infrastructure for the functioning of society and the economy.
- » Improve knowledge and opportunities in relation to the potential return on investment in the resource recovery sector.
- » Support soft infrastructure investment in workforce planning, training and talent retention in the resource recovery industry.
- » Set best practice standards for recovered resources and ensure regulatory compliance in the sector.
- » Ensure planning and investment in waste and resource recovery infrastructure to provide adequate waste management resilience and continuity in response to disaster and other significant disruptive events.

4 Food waste

The volume and value of wasted food present opportunities to further divert food waste from landfill and minimise losses throughout the food value chain.

A number of initiatives in South Australia currently contribute to food waste reduction and diversion from landfill, including:

- the application of the solid waste levy for all waste (including food waste) disposed to landfill
- dedicated facilities and infrastructure to process food waste into compost and other soil improvement products
- provision of kerbside food waste diversion incentives to councils
- segregated commercial food waste collection services available across metropolitan Adelaide
- anaerobic digestion for energy recovery and subsequent composting
- support for food recovery organisations such as Foodbank and Oz Harvest to divert fresh and non-perishable surplus food to charities.

Nationally, the Australian Government's National Food Waste Strategy requires each Australian state and territory to achieve a 50% reduction in food waste by 2030. This aligns with the United Nations Sustainable Development Goal 12.3:

> *'By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses'.*

In addition to diverting food waste from households, action will be required in the agricultural and commercial and industrial sectors to reduce food waste. Over-production, food spoilage (for example, due to logistical, storage or marketing and commercialisation factors), and wastage at point of sale all contribute to the problem. Collection systems, education, and possible legislative measures to reduce the amount of food waste disposed to landfill should be explored. In Massachusetts, a ban on the disposal of food waste is having significant effects on the amount of food waste diverted from landfill (Commonwealth of Massachusetts, 2018).

A Fight Food Waste Cooperative Research Centre (CRC) has been established to examine how to reduce food waste throughout the supply chain, transform unavoidable waste into innovative high-value co-products, and engage with industry and consumers to change behaviours.

Food waste

What happens if we don't take action?

- Food waste continues to create significant greenhouse gas emissions, both at the end of its lifecycle when it produces methane if disposed to landfill and through lost embodied resources.
- Internationally, it is estimated that one-third of all food is wasted between production and disposal.
- Energy, water, money and resources used to produce, process and transport the food continue to be lost in avoidable food waste.
- Costs to consumers: estimated food waste costs the Australian economy $20 billion annually (Australian Government, 2017).
- Opportunities to reduce food insecurity are lost.
- Continued over-production, food spoilage (for example, due to logistical, storage or marketing and commercialisation factors), and wastage at point of sale.

Food waste

What is possible through action?

- ✓ Preventing organic material from going to landfill will preserve organic carbon and nutrients for more valuable uses in land management and food production.
- ✓ Diverting food waste to composting helps soil fertility and replenishes soil carbon and nutrient stocks, while mitigating climate change.
- ✓ Greenhouse gas savings and environmental benefits resulting from composting, including:
  - » less energy needed for irrigation, due to improved water storage and water use efficiency
  - » reduced demand for biocides (chemical substances including insecticides, disinfectants and pesticides used to control organisms that are harmful to health) will result in reduced greenhouse gas emissions associated with biocide production, due to improved soil and plant health
  - » reduced diesel use for soil cultivation due to improved tilth
  - » increased carbon sequestration from higher biomass production, due to improved soil productivity
  - » reduced nitrogen loss that cause secondary nitrous oxide (N2O) emissions, due to lower nitrogen surplus and leaching
  - » reduced erosion that causes loss of nutrients and organic matter and results in secondary N2O emission and those associated with replacing lost nutrients.
- ✓ Less food insecurity and demand on natural resources.
- ✓ Social benefits, including support for welfare agencies.

Priority actions

Legislative and policy actions:

- » Pursue regulatory interventions to ensure segregated food and organic waste collection systems exist for residential, commercial and industrial premises in the Adelaide metropolitan area (as relevant to areas prescribed in the Environment Protection (Waste to Resources) Policy 2010)*.
- » Pursue regulatory interventions to ensure that all organic materials that have been aggregated for recycling are prohibited for direct disposal to landfill*.
- » Restrict use for operational purposes at landfills, organic materials that have been aggregated for recycling.

* *Subject to the completion of consultation, a Regulatory Impact Statement and consideration by government.*

Food waste

Priority actions

Kerbside food waste diversion systems

- Provide continued financial support for roll out of area-wide, high-performing food waste collection systems.
- Pilot and evaluate models of alternative bin and collection systems (including medium and high-density dwellings) where little or no garden waste is generated.
- Work with councils to pilot more frequent collection of household organics bins.
- Research the effectiveness of kitchen caddy systems to support organic recycling.
- Require new or significant developments (including medium and high-density) to allocate sufficient area to store and access three-bin segregated waste and recycling services and/or vacuum technologies provided by council or private contractors.

Behaviour change

- Work with government and industry partners to research interventions that change behaviours to promote waste avoidance.
- Introduce a state-wide campaign to promote the three-bin system, including use of the green organics bin for food waste and home composting systems.
- Encourage home-based approaches for diverting food waste, including home composting, worm farms and feeding to poultry.
- Develop education and awareness tools for South Australian householders that support food waste prevention and recycling.

Precinct collections

- Identify opportunities for procurement of precinct organics collections from business premises within significant food retail areas.
- Evaluate precinct collection trials and broader application of the model.
- Progress legislative options to:
  - restrict the disposal of organics from businesses to landfill
  - enforce segregated organics collection from food waste generating businesses.

Events and out of home

- Adopt the minimum three-bin system for council-run venues/facilities or sponsored events and as a requirement for event permits.
- Trial public place recycling using fit for purpose collection technologies and systems – for example, 'smart bins'.

Food rescue

- Identify opportunities for and barriers to increased collection and distribution of surplus food through food rescue organisations, including where supply chains may be impacted (e.g. during natural disasters or other disruptive environmental, social and/or economic events).
- Support infrastructure to increase the recovery of high-quality surplus food for redistribution to those in need.

Food waste

Priority actions

Infrastructure funding

- Provide financial incentives such as grants and loans to encourage the establishment and enhancement of resource recovery infrastructure, processes and technologies that divert food waste into productive use.
- Provide infrastructure support for anaerobic digestion and incorporating bioenergy recovery into processes where residual outputs are diverted to composting processes or applied to land following energy recovery.

Market support

- Support infrastructure investment in locally produced compostable Australian Standard-certified items.
- Support the development and expansion of viable and sustainable markets for compost products and outputs arising from the increased recovery of food and other organic wastes, including through standards, specifications and guidelines.
- Procurement of compost for public parks and gardens.

5 Plastics and packaging

The use of plastics has increased twenty-fold in the past half-century and is expected to double again in the next 20 years (World Economic Forum and the Ellen MacArthur Foundation and McKinsey & Company, 2016). Due to their many functions and low cost, plastics have become ubiquitous and play an important role in our daily lives. For example, plastic packaging can assist in food safety and sometimes reduce food waste; bio-compatible plastics combined with 3D printing can support medical innovation; and light plastic materials used in the design of cars or planes can save fuel (Green Industries SA, 2019).

While they can deliver these benefits, the way plastics are currently produced, used and discarded has many drawbacks.

- Plastics production uses the same volumes of fossil fuels as the aviation sector, representing around 6% of global oil consumption.
- The amount of marine litter is increasing and affecting ecosystems, biodiversity and potentially human health (United Nations Environment Programme, 2016). Studies in the European Union (EU) have found plastic to be the main source of marine litter as it is almost non-biodegradable. It also has toxic and other harmful impacts.
- About 80% of marine debris arises from land-based sources (UNEP, 2016). Common marine litter items include glass and plastic bottles, cans, bags, balloons, rubber, metal, fibreglass, cigarettes and other manufactured materials, fishing gear such as line, ropes, hooks, buoys (CSIRO, 2016).
- Single-use plastics, and in particular plastic packaging, are widely available, persistent, and may enter the environment, and ultimately the marine environment, through littering.

These impacts are increasing each year as Australians generate more plastic waste.

The need to reduce the environmental, economic and social harm associated with plastics is widely recognised. Under target 14 of the United Nations Sustainable Development Goal, 'Conserve and sustainably use the oceans, seas and marine resources' (United Nations, 2015b), international governments have agreed to prevent and significantly reduce marine pollution from land-based activities by 2025. The EU announced in late 2018 its intention to ban single-use plastic items such as plates, cutlery, straws, balloon sticks and cotton buds; for several other single-use items for which no current alternative exists, and which are not banned outright, it intends to impose reduction targets and associated timeframes (European Parliament, 2018).

The New Plastics Economy – Rethinking the future of plastics provides a vision for a system in which plastics never become waste (World Economic Forum and the Ellen MacArthur Foundation and McKinsey & Company, 2016).

In early 2019, the South Australian Government released two discussion papers, *Turning the tide on single-use plastic products* (Green Industries SA, 2019) and *Improving South Australia's recycling makes cents* (Environment Protection Authority, 2019). These papers sought ideas about measures to protect the environment from impacts associated with single-use plastic products and to improve the effectiveness of South Australia's container deposit scheme.

Respondents strongly supported more measures to address single-use plastic products and government intervention. A report summarising feedback on the discussion paper is available on the YourSay and Green Industries SA websites.

There are policy options that could tackle problematic single-use plastic products, ranging from voluntary industry-led approaches to restricting market access for single-use plastic products for which suitable, lower-impact alternatives exist.

Legislation has been used successfully in South Australia to introduce the container deposit scheme and ban light-weight plastic bags. Similar legislation is being implemented within South Australia to provide a flexible and long-term framework that enables market restrictions on various single-use plastic products.

Consultation – through a stakeholder working group of industry, business, local government and interest group stakeholders – has informed associated impacts and the development of the Single-use and Other Plastic Products (Waste Avoidance) Act 2020. The Act, operational from March 2021, phases-out certain single-use plastic products.

Work will continue to:

- create plastic-free precincts, venues and sites
- prohibit the sale, supply and distribution of plastic straws, cutlery and beverage stirrers following commencement of the legislation
- prohibit single-use expanded polystyrene food service products detailed within the legislation, as well as oxo-degradable plastic, 12 months following commencement of the legislation from March 2022
- progress inclusion of polyethylene plastic barrier bags[3] (currently used for produce and available at retail outlets) as a prohibited product under South Australia's legislation on Single-use and Other Plastic Products to encourage the adoption of barrier bags compliant with relevant standards, and that are suitable for composting.

"Single-use plastics, and in particular plastic packaging, is widely available, persistent, and at best prone to disposal to landfill rather than recycling and at worst prone to littering where it may enter the environment, and ultimately the marine environment."

3 Barrier bags refer to bags used in retail outlets for meat, fish, fruit, vegetables and other produce and are usually dispensed from a roll.

Plastics and packaging

What happens if we don't take action?

- The potential economic and environmental benefits of a more resource-efficient and circular approach are not realised and the wasteful take-make-dispose economic model is sustained.
- Single-use plastics and plastic packaging continue to enter the environment, including the marine environment, through littering.
- If current trends continue, the ocean is expected to contain one tonne of plastic for every three tonnes of fish by 2025, and by 2050 more plastics than fish by weight. In addition to harming the environment (particularly wildlife impacts), marine litter damages activities such as tourism, fisheries and shipping (Green Industries SA, 2019).
- Continued use of fossil feedstocks to produce plastics and packaging.
- Innovative opportunities in alternatives to single-use plastics remain unrealised.

What is possible through action?

- ✓ Less use of fossil feedstocks, which has a significant carbon impact.
- ✓ Reduced waste and litter on land and in waterways.
- ✓ Innovation opportunities in South Australia for market development and manufacturing alternatives to single-use plastics.
- ✓ Support for South Australia's more resource-efficient and circular approach, moving away from the wasteful take-make-dispose economic model.

Priority actions

- » Implement the phase-out of single-use and other plastic products in South Australia.
- » Progress the inclusion of polyethylene plastic barrier bags as a prohibited product under South Australia's legislation on Single-Use and Other Plastic Products to encourage the adoption of barrier bags compliant with relevant standards, and that are suitable for composting.
- » Investigate opportunities to reduce, minimise or eliminate single-use plastic products.
- » Support Australian Government target of 100% Australian packaging to be recyclable, compostable or reusable by 2025, to be delivered by the Australian Packaging Covenant Organisation.
- » Advocate for packaging to be covered by a regulated extended producer responsibility scheme under the Australian government's product stewardship legislation.
- » Introduce strategies to find replacements for single-use plastic products, including increasing South Australia's remanufacturing of these products.
- » Maximise the effectiveness and performance of South Australia's container deposit scheme (CDS) in SA, including:
  - » identifying beverage containers whereby product stewardship obligations and beverage manufacturer responsibilities are not being met
  - » where inclusion within the CDS will maximise the amount and value of the recovered resources.
- » Advocate and support initiatives whereby CDS containers are processed and/or recycled locally or nationally.

Priority actions by waste stream

Municipal solid waste

This Strategy encourages action to recapture South Australia's leadership in municipal solid waste (MSW) resource recovery, including through actions detailed within 'Broader Quantitative Actions to achieve targets' to support high-performing kerbside household bin systems.

Continued and consistent effort in educating householders and making producers responsible for their waste are also needed.

Standardising efforts across metropolitan council areas will be important to increase collaboration and maximise resources in technology and realise operational savings, better collection and sorting systems, and consistent education messaging.

The State Government will continue to provide significant support for MSW diversion through:

- incentives to increase the uptake of food waste systems within councils
- co-investment in infrastructure to support the recovery of recyclables and problematic wastes
- ongoing and consistent state-wide messaging to support householder education and behaviour change
- support for the standardisation and reporting of waste management and recycling collection data to help councils improve their collection and sorting systems, identify areas needing education and behaviour change, and understand potential cost savings
- providing the latest international evidence-based guidance on issues such as multi-unit dwellings and hard rubbish collections
- implementing legislative reform in relation to plastics and packaging
- implementing 'South Australia's Food Waste Strategy', including legislative reform to encourage the collection and diversion of food waste
- advocating for action on national product stewardship schemes to diversify materials captured for recycling, including household items.

To enable delivery of the Municipal Solid Waste 75% waste diversion target by 2025, it will be vital that South Australia has adopted kerbside bin systems that optimise diversion of organics and recyclables.

To underpin this, councils are encouraged to seek support from their communities for adopting changes to kerbside bin-based systems – for example, in offering weekly organics collections or allowing households to change frequencies of collections – through the implementation of trials aligned to legislative frameworks.

Green Industries SA has supported council trials of this nature through the Council Modernisation Grants Program.

To progress this, councils are strongly encouraged to:

- consult with their communities to identify how they can encourage changes such as offering weekly organics collections
- identify approaches to education and behaviour change relevant to their communities to encourage diversion and reduce bin contamination
- examine how to implement changes progressively to address potential contamination issues
- monitor and report on the results of changes and trials – including in collection efficiencies, costs and benefits, diversion and community satisfaction – to the community and to Green Industries SA.

Regional areas, including Aboriginal land holdings and outback areas

Many regional and rural communities are encouraging councils to provide opportunities for recycling. Dispersed population centres, with fewer people (low rate base), and considerable transport distances however, create additional difficulties for achieving viable recycling outcomes. This difficulty can be exacerbated by community priorities and expectations, and limited funds or resources.

To ensure continued progressive improvement in regional areas, this Waste Strategy includes a new quantitative target for regional areas:

> *By 2023: Regional Waste Management Plans are in place for all South Australian regional local government areas and/or regional city clusters and set regionally appropriate and progressive waste diversion targets.*

Regional Waste Management Plans may be progressed at the regional local government area or to leverage and optimise syneries across major regional centres where more practicable. These plans should be provided to Green Industries SA by 2023.

The 20-Year State Infrastructure Strategy identifies opportunities for development in regional areas, including in investment in:

- equipment and facilities for waste compaction and bulk hauling to reduce costs of transporting waste to end markets
- expanding or developing commercial composting organics from MSW and industries such as vineyards, orchards and other agriculture
- developing high-value organics products.

Green Industries SA will provide funding, advice and support to assist regions to progressively implement waste reforms and improve the recovery of materials from country areas through the update or development of Regional Waste Management Plans.

In relation to remote and outback areas, two key reports prepared by Green Industries SA outline the issues in Aboriginal land holdings and outback areas: the 2011 *Waste Management in the Anangu Pitjantjatjara Yankunytjatjara (or APY) Lands, Past, Present and Future*, known as 'The Rubbish Report', and *The Outback Waste Management Report'* (2012). Both reports provided recommendations for a strategic approach to reducing waste (including beverage containers, white goods and car bodies), increasing resource recovery, improving landfill management and promoting awareness of recycling practices across the APY Lands and in outback areas.

The success of any waste management or related initiative in these regions will require ongoing management and funding.

Municipal solid waste

What happens if we don't take action?

- Lost opportunities to improve diversion of materials including green organics and food organics.
- Existing kerbside diversion systems underused.
- Inconsistent collection services across metropolitan Adelaide.
- Contamination of separated materials in kerbside bins.
- Poor upfront planning in waste and recycling services.
- Minimal community awareness and adoption of required behaviour changes.
- Potential savings unrealised.

What is possible through action?

- ✓ Adoption of kerbside bin systems that optimise diversion of organics and recyclables.
- ✓ More material recovered from residual bins in existing systems, including food waste.
- ✓ Progress in meeting National Food Waste Strategy targets.
- ✓ Less contamination of source-separated recycling, enabling a better recycling stream.
- ✓ Community is more aware of wasteful consumption and effective recycling and able to reduce waste and divert more material from the kerbside.
- ✓ Better waste-management planning for waste and recycling services in developments.
- ✓ Diversifying the type of materials capable of being diverted from households through the kerbside recycling bin.

Priority actions

Systems and technology

- » Increase material diversion rates through provision of the three bin system, including a minimum service to all households: **a.** fortnightly collection of co-mingled recyclables **b.** fortnightly collection of organics, including food waste.
- » Reduce the amount of recyclables and organics (including food) in red/blue bins.
- » Increase the recovery of recyclables in yellow bins.
- » Increase the recovery of organics and food waste in the green bin and processed in accordance with Australian Standard *Composts, Soil Conditioners and Mulches – 4454*.
- » Ensure all kerbside bins are compliant with Australian Standard AS 4123.5-2008 Mobile waste containers as soon as practicable (through replacement and in-field bin maintenance) before 2030, with a review to be undertaken by 2025.

Municipal solid waste

Priority actions

Systems and technology (continued)

- Encourage councils to seek support from their communities for changes to kerbside bin-based systems (for example, in offering weekly organics collections) through trials aligned to legislative frameworks, effective education and behaviour change campaigns, and evidence of the benefits in collection efficiencies, costs, diversion and community satisfaction.
- Monitor and review kerbside collection systems to ensure maximum performance.
- Improve flexibility for councils relating to variable price charging for residual household waste.
- Promote reduced contamination of source-separated systems.
- Encourage diversion of materials arising from hard waste services, street sweepings, waste collected at drop-off facilities, and council-operated commercial services.
- Support new technology for residential and mixed-use developments (for example, vacuum systems and cross-development and precinct infrastructure).
- Support innovative public place infrastructure and systems that support improved recycling in public place areas.
- Implement better contracting and monitoring for household collection services, including application of technology such as Radio Frequency Identification (RFID) and communication technologies for wheelie bins and truck monitoring systems, and website applications which provide data to households.
- Encourage planning in response to disaster and other disruptive events to ensure continuity of waste management services and/or adapting to changed waste management requirements.

Network-based community recycling hubs

- Support the development or expansion of network-based community recycling hubs to provide convenient drop-off for a wide range of materials.
- Support establishing onsite salvage and save facilities, men's sheds, and maker spaces, to provide hubs for innovative reuse and redesign of materials.
- Encourage councils and charities to identify opportunities to direct suitable materials and goods donated or collected via transfer stations or hard rubbish collections, for reuse, redesign or recycling.

Food waste

- Support the National Food Waste Strategy 50% reduction target by 2030 by promoting food-waste prevention measures.
- Encourage the uptake of segregated organics collection systems, including potential for legislative reform to increase the recovery of this material for processing into soil improvement products.

Planning

- Review best-practice waste management guidance for residential and mixed-use developments.
- Investigate legislative and policy reform that would support the implementation of the 'Better Practice Guide Waste Management in Residential and Mixed Use Development' (Green Industries SA, 2014) as part of the planning and design process.
- Progress the development of Regional Waste Management Plans for all South Australian regional local government areas and/or regional city clusters which set regionally appropriate and progressive waste diversion targets and ensure these are reported to Green Industries SA.

Municipal solid waste

Priority actions

Material recovery

- Introduce measures to capture and process more materials for recycling, such as soft film plastics, packaging, batteries and electronic waste.
- Advocate for national solutions to problematic wastes such as packaging and hazardous wastes and consider state-based solutions if required.

Legislative reform

- Support the continued implementation of the Environment Protection (Waste to Resources) Policy and the *Environment Protection (Waste Reform) Amendment Act 2017.*
- Develop and implement waste-reform initiatives such as mass balance reporting, waste levy collection, assessment of waste-derived materials, stockpile management controls, product bans, and landfill bans.
- Maximise recycling efficiency at all stages (collection, preprocessing – including separation and sorting – and end processing) to reduce material losses.
- Maximise the effectiveness of South Australia's container deposit scheme (CDS) in SA by identifying new items to be included in the CDS and ensuring all containers are recycled locally or nationally.
- Identify, assess and implement initiatives, policies, infrastructure or further legislative mechanisms that seek to optimise the sorting, recovery and remanufacture of glass containers and reduce breakage and contamination of other recyclables and provide more viable recycling opportunities.

Regional areas, Aboriginal land holdings and outback areas

- Advocate for ongoing action and responsibility to enable coordinated and integrated waste management in regional areas, Aboriginal land holdings and outback areas.
- Encourage systems to reduce litter and improve waste management in regional areas, Aboriginal land holdings and outback areas, including the recovery of resources such as beverage containers, white goods and car bodies.
- Support awareness activities for sustainable waste management practices within the APY Lands.

Waste generation reduction: behaviour change

- Support and deliver coordinated and integrated householder recycling education campaigns and use innovative approaches to inform households and increase awareness of wasteful consumption, effective recycling and reducing contamination.
- Engage the community and business in opportunities involving collaborative consumption, industrial symbiosis, re localisation, re-manufacturing and re-making to work towards a circular economy.
- Develop online platforms to map waste avoidance and collaborative consumption and production activities.
- Engage policy makers, community leaders and businesses looking to develop strategies to incorporate circular economy thinking into their practices.

"'To enable delivery of the Municipal Solid Waste 75% waste diversion target by 2025, it will be vital that South Australia has adopted kerbside bin systems that optimise diversion of organics and recyclables.'"

Commercial and industrial waste

The commercial and industrial (C&I) sector is dispersed, diverse and competitive. Limitations on resources, staff and expertise can be barriers to introducing changes and managing waste, while markets for materials may be underdeveloped.

The greatest opportunities for change in the C&I sector are increasing the recovery of food waste and local remanufacturing of secondary materials and products.

Encouraging the use of recycling systems, resources and tools for workplaces to assist with ongoing awareness in resource recovery will also be important.

Supporting this Strategy's objectives in Sustainable Procurement, particularly within government, will be crucial, as will continued support to priority industries and sectors requiring business sustainability assistance.

Commercial and industrial waste

What happens if we don't take action?

- Markets for materials underdeveloped.
- Dispersed and highly varied collection arrangements and processing infrastructure.
- Opportunities to divert food waste not addressed.

What is possible through action?

- ✓ Improved separation of materials.
- ✓ Increased diversion of food waste.
- ✓ Sustainable procurement actions supported.
- ✓ Improved economies of scale in collections.

Priority actions

- » Improve source separation, collection systems (including weight-based charging and precinct based collection routes) and sorting infrastructure.
- » Implement Food Waste priority actions.
- » Reduce barriers to industry and government use of recycled materials in projects or products.
- » Encourage all levels of government to consider adopting Sustainable Procurement practices and policies that increase the use of re-manufactured products and coordinate procurement efforts to achieve economies of scale and strengthen recycling markets.
- » Develop a waste strategy to increase waste diversion within the South Australian Government.
- » Identify how to increase diversion in regional areas.
- » Support the continued implementation of the Environment Protection (Waste to Resources) Policy.
- » Develop and implement legislative waste reform initiatives such as mass balance reporting, waste levy collection, assessment of waste-derived materials, stockpile management controls, product bans, and landfill bans.
- » Encourage the use of recycling systems, resources and tools for workplaces to promote awareness.

Commercial and industrial waste

Priority actions

- Ensure economic development agencies support sustainable activity in key sectors and new business opportunities to build a circular economy.
- Embed waste reduction and management practices in tertiary, vocational education and training courses.
- Mandate compliance with waste minimisation guidelines for State Government-managed or funded events.
- Promote procurement of sustainable and re-manufactured materials and products, especially in the government sector.
- Identify and support priority industries and sectors requiring business sustainability assistance.
- Encourage improved processes during commercial 'strip-outs' and refurbishments to support increased resource recovery and material reuse.
- Encourage consolidation of waste and recycling collection and infrastructure development in precincts.
- Investigate opportunities to increase food waste recovery, including consideration of possible legislative measures.
- Encourage planning in response to disaster and other disruptive events to ensure continuity of waste management services and/or adapting to changed waste management requirements.

"The greatest area to encourage step change in the Commercial and Industrial sector is through investigating opportunities to increase the recovery of food waste."

Construction and demolition waste

The segregation of materials on building and construction sites to increase waste diversion and material quality will require continued efforts. The removal of barriers to market, such as the development of specifications, will also be important.

Poor procurement practices and poor design unfortunately also contribute unnecessarily to waste on construction sites, and add costs to projects.

A key challenge relates to the increasing use of composite and non-recyclable materials during construction. Further application of innovative circular economy practices will be required to support durability, adaptability and recycling along the value chain, particularly through building design and manufacturing (European Commission, 2020; and Ellen Macarthur Foundation and ARUP, 2019).

Deconstruction as an alternative to demolition will also be an area of focus to enable materials to be kept intact and separated to maximise the amount that can be reused and recycled.

NSW has adopted requirements for house deconstruction and has shown the economic benefits possible through income generation and the reduced costs associated with deconstruction and landfill disposal (NSW Environment Protection Authority, 2010).

US case studies have also demonstrated benefits including significant job creation, better employment conditions and educational opportunities (Ellen MacArthur Foundation, 2013). In Japan, a new deconstruction technique enabled the recovery of 99% of the steel and 92% of the concrete from a building (Ellen MacArthur Foundation, 2013).

In the first part of 2020, South Australia's construction and demolition waste industry has been a significant contributor in ensuring the safe and efficient removal of waste debris following the 2019-20 bushfires experienced in areas across the state. The learnings from this event will assist informing an update to South Australia's Disaster Waste Management Capability Plan and Guidelines.

Construction and demolition

What happens if we don't take action?

- Continued barriers to market for secondary and processed materials.
- Poor operating standards regarding source-separation materials on site, resulting in contaminated, mixed or 'unclean' waste streams and fewer opportunities for diversion or reuse.
- Poor planning and management of waste and recovery during building demolition.
- Poor understanding of new materials used during construction, including how these can be recovered at their end-of-life.
- Material savings and cost savings in construction.

Construction and demolition

What is possible through action?

- ✓ Better practice standards for the built environment.
- ✓ Increased use of sustainable building materials.
- ✓ Better planning for circular flows in construction materials.
- ✓ Reduced need for new construction and demand on global resource consumption.
- ✓ Better training around materials procurement, project design and management.
- ✓ Better segregation of materials on site.
- ✓ Using sustainable procurement to create market opportunities for construction and demolition materials.
- ✓ Effective and efficient safe removal of waste debris resulting from disaster events.

Priority actions

- » Ensure segregation of materials on build sites to increase waste diversion of uncontaminated materials.
- » Undertake research into the increasing uptake of 'prefabricated' and new material components in the construction of commercial and residential projects will impact on waste recycling.
- » Include deconstruction requirements into planning processes and decisions, including ensuring site surveys are undertaken and approved by councils before deconstruction.
- » Require disposal plans for the demolition of buildings to provide evidence of destinations of waste and excavated materials (e.g. reporting and visual evidence of volumes and percentages of waste materials; and disposal receipts) and reported to the Environment Protection Authority and relevant council.
- » Embed waste management and deconstruction practices in design, construction and deconstruction into tertiary, vocational education and training courses.
- » Encourage the responsible use of secondary materials such as concrete, aggregates, and fill materials.
- » Support the continued implementation of the Environment Protection (Waste to Resources) Policy.
- » Develop and implement legislative waste-reform initiatives including mass balance reporting, waste levy collection, assessment of waste derived materials, stockpile management controls, product bans, and landfill bans.
- » Develop standards for 'design of the built environment' practices and the adoption of sustainable building materials.
- » Support adaptive reuse and retrofitting of existing building stock where possible.
- » Develop operating standards to encourage better salvaging and reuse of building materials.
- » Update South Australia's Disaster Waste Management Capability Plan and Guidelines informed by learnings of the 2019-20 bushfires clean-up response.
- » Encourage planning in response to disaster and other disruptive events to ensure continuity of waste management services and/or adapting to changed waste management requirements.

Other priority actions (relevant to all streams)

Evaluation, evidence and reporting

Evaluation, evidence and reporting are important in building knowledge about resource recovery, waste and the circular economy, to assess the effectiveness of projects and programs and to inform state, national and international reporting obligations. It is important to understand economic and environmental costs and benefits, infrastructure needs, future waste streams for attention and areas needing regulatory underpinning.

Focus areas include demonstrating the benefits of transitioning to a circular economy, including the full economic and environmental benefits (including greenhouse gas emissions reductions arising), measuring material flows, and understanding areas needing further regulatory interventions.

Other areas include improving data methodology and capture of municipal solid waste diversion (including bin audit methodology) and continuining to evolve South Australia's annual Recycling Activity Survey to incorporate material flows, economic activity and other benefits.

Evaluation, evidence and reporting

What happens if we don't take action?

- Limited understanding of:
  - priority action areas and how we are tracking against targets within the waste strategy
  - economic, environmental and social costs and benefits of activities and projects in waste and recycling
  - areas needing regulatory underpinning
  - the full range of benefits of South Australia's transition to a circular economy.
- Poor, inconsistent or duplicated collection and reporting of important data across the state.
- Relying on a poor evidence base to support long-term behaviour change in waste management and the circular economy.

What is possible through action?

- ✓ Clearly demonstrating the full benefits of taking action to support implementation of the waste strategy and South Australia's transition to a circular economy.
- ✓ Building our knowledge and data on waste and recycling to support targets and assess the adequacy of waste strategy.
- ✓ Better understanding of recycling performance, including performance of sectors, waste streams, and across South Australia.
- ✓ Understanding of litter impacts, volumes and items.
- ✓ Understanding of the economic value of the waste and recycling sector.
- ✓ Understanding of areas needing additional support to help a transition to a circular economy.

Evaluation, evidence and reporting

Priority actions

- Develop a monitoring framework to measure the state's progress towards waste management and resource recovery in a circular economy.
- Measure greenhouse gas emissions, carbon, water, materials intensity and other outcomes and benefits arising from South Australia's transition to a circular economy.
- Measure outcomes as these relate to greenhouse gas emissions, carbon, water, and materials intensity.
- Investigate new and emerging opportunities to improve and reform South Australia's environmental performance in relation to waste management and the circular economy.
- Measure recycling activity, material flows and reuse activity.
- Measure demand on raw materials.
- Increase transparency in reporting of materials and mass flows from industry, to enable evidence-based targets relating to specific materials.
- Encourage and advocate for national action in relation to product traceability.
- Collect and analyse litter data.
- Undertake audits of transfer stations and Material Recovery Facilities.
- Capture and report industry and business experiences for use by others.
- Monitor community attitudes and behaviours.
- Monitor infrastructure and identify gaps.
- Monitor industry investment, change in perceptions and importance of environmental issues.
- Progress the introduction of a mass balance reporting system for licensed waste facilities.
- Advocate for reporting on the use of recycled content in Government infrastructure projects.
- Develop appropriate monitoring and reporting mechanisms for sustainable procurement.
- Develop a consistent reporting framework for all waste streams to be adopted by all councils for kerbside waste and recycling.
- Improve the capture of kerbside performance information in council areas, including relating to kerbside bin performance audits, uptake of food waste systems within councils and other quantities of materials arising from hard waste services, street sweepings, waste collected at drop-off facilities, and council operated commercial services.
- Continue to evolve the annual Recycling Activity Survey to incorporate material flows, economic activity and other benefits.

Natural disasters and other disruptive events

Natural disasters, and particularly large-scale natural disasters, can generate quantities of waste that vastly exceed the capacity of the affected area to manage the impacts, and which threaten public health, hinder reconstruction and impact the environment. Disaster waste management affects almost every aspect of an emergency response as well as the long-term recovery of a disaster-affected area. If planned in advance and managed effectively, the risk to the environment and health of such disasters can be prevented or minimised. At the same time, generated waste can contribute to the disaster recovery and rebuilding process, and may have a positive effect on social and economic recovery.

In 2016, Green Industries SA completed a Stage 1 Disaster Waste Management Scoping Study with funding support from the Australian Government (Green Industries SA, 2016). The study examined whether South Australia had in place disaster waste management practices and an associated regulatory framework, and developed waste profiles for selected flood, severe storm, earthquake and bushfire scenarios. It found that there is no framework for managing disaster waste in South Australia, and that disaster waste management practices have been largely reactive with little pre-planning.

With the support of Australian Government Natural Disaster Resilience Program funding, Green Industries SA commenced Stage 2 work in 2017-18 (Green Industries SA, 2018a). This resulted in the development of a Disaster Waste Management Capability Plan and associated practical guidelines and an implementation plan (Green Industries SA, 2018b). The project is the first of its kind in Australia. This Plan formed the basis of South Australia's response to the clean-up response following the South Australian 2019-20 bushfires.

Other disruptive events, such as significant changes to international markets and global pandemics, also have the ability to interrupt or change waste requirements and services.

On 30 January 2020, the World Health Organization declared the Coronavirus disease (COVID-19) outbreak a Public Health Emergency of International Concern (World Health Organization, 2020). For many parts of South Australia and globally, this impacted the waste system in various ways. A recognition that waste management is (or at least should be) designated as an essential service alongside the likes of power and water supply has emerged strongly. In response to the pandemic, the sector initiated business continuity measures, including risk mitigation and prevention for its workforce to ensure waste and recyclables continue to be collected and responsibly managed. While the response is regularly changing, some of the impacts have included:

- Operational and logistical adjustments to maintain services.
- Closure of or reduced operations of waste and resource recovery management facilities, sites and transportation.
- Increased waste volumes generated in some sectors (including supermarkets, health care services and households) requiring changed or increased waste requirements.
- Changed practices in handling of waste resulting from COVID-19 in hospitals and within households.
- Decreased waste volumes in some sectors where facilities or services are closed or limited. This affected parts of the commercial and industrial sector, including offices, restaurants and cafes, schools and child care services, and events and venues.
- On demand services provided by local government may be reduced (for example, hard waste collections; street sweepings).
- Limited availability of personal protective equipment for those delivering waste services.
- Reduced or changed supply chains for food rescue organisations due to increased customer demand of groceries and perishables, reducing the availability of items for food donation.

This highlights a need to ensure the appropriate framework, tools and support measures are in place to ensure continuity of service delivery in waste management, ensuring compliance with public health and safety and ensuring flexibility in responding to changed waste generation volumes of patterns and available services and infrastructure.

Retaining waste management as a core focus for disaster preparedness and planning will remain as a priority area.

Natural disasters and other disruptive events

What happens if we don't take action?

- Inadequate preparedness, response and recovery following disaster situations, including in responding to increased or changed waste generation volumes or patterns and available services and infrastructure.
- Recovery and reconstruction efforts threatened.
- Impacts on the environment.
- Lack of clear roles and responsibilities in disaster waste management.
- Closure of or reduction in essential waste management services.
- Poor public health and safety outcomes.

What is possible through action?

- ✓ Capabilities for disaster resilience are built through clear responsibilities, more accessible information and greater understanding of disaster waste management issues.
- ✓ Improve outcomes by building capacity within individuals and organisations to undertake waste management activities.
- ✓ Provide local employment opportunities after a disaster.
- ✓ Innovation in delivering new or changed business models, products and services associated with waste management services and infrastructure in response to disasters and emergency events.
- ✓ Prevention of or reduction in impacts of waste management in natural disasters, including through saving lives, alleviating suffering, facilitating rescue operations and minimising harm to the environment and human health.
- ✓ Waste becomes a useful resource in rebuilding and a positive effect on local employment, social and economic recovery.
- ✓ Decision-making processes, roles and responsibilities are clear and defined, including the activities to responsibly manage the waste, and the level of support the State Government can provide to help affected communities and stakeholders.
- ✓ The scale of waste impacts following a disaster is understood.

Priority actions

- ✓ Encourage waste management to be included as part of disaster preparedness and planning, including natural disasters and other events which have the ability to disrupt normal waste services.
- ✓ Develop framework and tools to support responding to changes caused by any emergency event having the ability to disrupt or change essential waste services.
- ✓ Encourage opportunities for recycled products to rebuild infrastructure in affected communities.
- ✓ Develop a framework and tools to gather and measure data and the intelligence to estimate debris volumes or changed waste generation patterns.
- ✓ Encourage new or changed business models, products and services in delivering essential waste management services and infrastructure for affected communities.
- ✓ Make available more information about disaster or emergency event waste management issues.
- ✓ Establish community education and engagement activities to support responsible waste management following emergency events.
- ✓ Update South Australia's Disaster Waste Management Capability Plan and Guidelines, informed by learnings of the 2019-20 bushfires clean-up response.

Finding solutions for emerging and problematic wastes

> *'Like many of the background systems we take for granted, such as the supply of water, electricity and gas to our homes and the weekly rubbish collection, along with the roadways that enable our car-based commute to and from work, we seem to be able to focus only on the "consumption phase" in the life cycle of any particular domain. Everything outside the parameters of what we now take for granted becomes "somebody else's problem", something perhaps "they" should do something about sooner or later.'*
>
> *(Lehmann and Crocker, 2012)*

Technology change and its rapid rate of obsolescence – which, at its heart, may involve intentionally designing products with limited life spans – presents challenges. Additionally, the supply of household solid waste grows proportionally with populations (van Beukering et al., 2014). There are changes to patterns of waste generation, as there are to the types of chemicals and materials used to make the products we are buying. Increasing material complexity (bio-composites, conductive polymers, nanotechnology, electronics and more) adds to these challenges as existing recycling processes cannot extract all the components from purchased products.

Over the past decade, there has been a growth in electronic waste, largely due to the significant growth curve of new electronic technologies combined with planned obsolescence. Under the Australian Government's *Product Stewardship Act 2011,* televisions, computers and computer peripherals became the first products to have their disposal regulated. The National Television and Computer Recycling Scheme involves a combination of government regulation and industry action to take responsibility for the collection and recycling of these items.

More recently, an observed increased uptake in photovoltaic cells (PV), has led the Australian Government to list PV as a priority product under consideration for a product stewardship approach.

While product stewardship provides a framework to manage the environmental, health and safety impacts of products, it alone cannot shift society from the linear 'take, make and dispose' model. Solutions are needed for future waste streams at the point of design and before a product reaches the consumer market.

This Strategy's targets and actions reflect that we must recognise that the products and their components being made and used today will become the waste of the future.

For example, global consumption of and waste associated with textiles and clothing are growing, predominantly due to increased clothing production and decreased clothing utility (Ellen MacArthur Foundation, 2017). Opportunities within this industry should be investigated to ensure that clothing, textiles and fibres are kept at their highest value and utility.

In other areas, the focus must shift to potential waste streams at the design phase, in the construction of our homes and workplaces, construction of our vehicles, and manufacture of other products we use daily, including single-use items such as plastics and packaging, and our clothes. It has been estimated that products and systems arising globally from industries including fashion, plastics and packaging are designed in a way that approximately 80% of the related material flows are destined for landfill, incernation or potentially leaked into the environment (Ellen MacArthur Foundation, 2019b).

In a circular economy, products are designed for repair, reuse, disassembly, and eventually recycling. This goes beyond traditional approaches to product stewardship within Australia, which have historically focussed on end-of-life product management. It requires a shift in the producer responsibility further up the waste management hierarchy to consider the environmental consequences of making, using and disposing of a product, and for a value to be placed on the product when it has reached its end of life.

Problematic wastes

Under the National Waste Policy, the Australian Government leads a national approach to product stewardship. The *Product Stewardship Act 2011* provides the framework to effectively manage the environmental, health and safety impacts of products, and in particular those impacts associated with the disposal of products. The framework includes voluntary, co-regulatory and mandatory product stewardship.

The Recycling and Waste Reduction Bill 2020 (Cth) currently before the Commonwealth Parliament, replicates the same provisions in the existing *Product Stewardship Act 2011,* which will be repealed when this new Bill passes Parliament. However, a number of improvements to the product stewardship regime have been made, in response to the first statutory review of the 2011 Act.

The Australian Government is continuing to work with state and territory governments and industry to consider possible product stewardship approaches for products. National solutions are in place for a range of products including paint, mercury containing lamps, computers and televisions, and tyres. Solutions should also be identified for products such as batteries (including electric vehicle batteries and stationary batteries), wastes associated with renewable technologies (such as photovoltaic systems and fibreglass from wind turbines), electrical and electronic products, and plastic oil containers.

The Environment Protection Authority has started work relating to the banning in South Australia of hazardous materials such as certain perfluorinated chemicals and of substances such as firefighting foams containing 'PFOS' and 'PFOA' to eliminate contamination risks to waterways and groundwater.

Green Industries SA has invested in four permanent facilities in metropolitan Adelaide and will support priority actions within this Strategy to support the recovery of hazardous waste.

Finding solutions for emerging and problematic wastes

What happens if we don't take action?

- Responsibility for environmental impacts involved in the production, handling, purchasing, use and end-of-life management of products is not defined.
- Poor planning and understanding of future waste materials at the point of design.
- Lost opportunities to encourage products to be designed applying circular economy principles for repair, reuse, and disassembly, and eventually recycling.
- The potential economic and environmental benefits of a more resource-efficient and circular approach are not realised and the wasteful take-make-dispose economic model is sustained.
- Consumers are not provided with convenient and accessible disposal options for a range of materials.
- Valuable material that could be brought back into the economy is lost.
- Continued disposal of problematic waste materials to landfill or more frequently disposed through drainage systems or directly to the environment (such as paint or oils) or devaluing the collection of other recycling streams through contamination.
- Estimated five-fold growth in clothing sales by 2050 will have significant economic, environmental and social costs (Ellen MacArthur Foundation, 2017).

Finding solutions for emerging and problematic wastes

What is possible through action?

- ✓ Manufacturers, importers, governments and consumers share responsibility for managing the impacts of a product.
- ✓ Product management of end-of-life disposal considered in all stages of product research and development.
- ✓ Easier access to convenient and safe collection and disposal for problematic waste materials.
- ✓ Fewer hazards, injuries and health impacts because less toxic alternatives are used.
- ✓ Management and remediation of waste fill and intermediate level contaminated soils.
- ✓ Rare and valuable materials are recovered.
- ✓ Easier access to convenient and safe collection and disposal of problematic waste materials.
- ✓ Waste fill and soil contamination are minimised, managed and remediated.
- ✓ Better understanding of design needs for products and market development.

Priority actions

Product stewardship

- » Advocate for further product stewardship frameworks to be in place for a broader ranger of items including (but not limited to):
  - » household items: white goods, furnishings, furniture, gas bottles, batteries (including from electric vehicles), tyres, hazardous wastes, and mattresses
  - » wastes associated with renewable technologies including photovoltaic systems and fibreglass from wind turbines
  - » rare earth elements and compounds.
- » Advocate for packaging to be a regulated extended producer responsibility scheme under national legislation.
- » Advocate for the adoption of stronger extended producer responsibilities regulations, not voluntary targets, on manufacturers and packaging producers.
- » Advocate for upfront costs associated with end-of-life waste and recycling management to be incorporated into the cost of products.
- » Promote the adoption of extended producer responsibility, including state-based approaches where considered necessary.
- » Encourage continuous improvement in existing producer responsibility and related schemes, for example in relation to televisions and computers (e-waste).
- » Increase beyond traditional approaches to managing disposal to those that encourage design for repair, reuse, disassembly, and eventually recycling.

Finding solutions for emerging and problematic wastes

Priority actions

Textiles

- » Support investment in textile recovery technology.
- » Research opportunities that may reduce the generation of textile waste and increase the recovery of textiles.
- » Advocate for approaches that motivate individuals to dispose of unwanted textiles in a responsible manner.

Problematic wastes

- ✓ Provide convenient drop-off facilities for unwanted and hazardous household and farm materials.
- ✓ Encourage the recovery and treatment of oils, solvents and other valuable materials for reuse.
- ✓ Reduce hazards through hazardous waste collection, recycling and appropriate disposal.
- ✓ Encourage reuse of waste fill and intermediate level contaminated soils where appropriate as a priority and remediate low level and high level contaminated soils for reuse.
- ✓ Reduce hazards through waste collection, recycling and appropriate disposal.

"This Strategy's targets and actions reflect that the products and their components being made and used today will become the waste of the future."

Waste reform, litter and illegal dumping

In South Australia, significant work has been undertaken through reforming the regulatory settings for the waste management and resource recovery industry to achieve industry certainty and improved environmental outcomes (Environment Protection Authority, 2015).

The *Environment Protection (Waste Reform) Amendment Act 2017* (Waste Reform Act), for example, took effect in November 2017; it provides strengthened powers under the *Environment Protection Act 1993* (EP Act) through:

- explicit powers to regulate material flow and stockpiling through amendments to the Objects of the EP Act and new powers regarding stockpiling conditions
- expanding the circumstances in which financial assurances (including insurance) can be used to protect against environmental, abandonment and distortion risks while supporting innovation
- improving the processes and evidentiary requirements to assess materials as approved recovered resources, to support innovative and safe resource recovery
- improving powers for tackling breaches of licence conditions
- strengthened powers for the Environment Protection Authority to prosecute illegal dumping cases.

The Waste Reform Act's amendments are considered the necessary first legislative step to empower the Environment Protection Authority to address further pressing waste reform issues, including mass balance reporting, stockpile management controls and the assessment of waste-derived materials.

The waste levy is an important economic tool for managing waste, encouraging recycling and funding environmental initiatives. The levy provides an incentive to reduce the amount of waste sent to landfill and is critical to ensuring resource recovery activities remain viable. It also provides a financial incentive for industry to seek alternatives for the disposal of waste and to facilitate investment into future technologies, processes and resource recovery systems in South Australia.

Defined incremental increases to the levies have been pursued to improve waste management practices and encourage resource recovery and reuse.

In South Australia, there is no longer a levy on the disposal of packaged asbestos and a reduced levy applies to the disposal of waste from donations to charitable recyclers. Important areas for consideration include the optimal use of the waste levy to address materials including clean fill, shredder floc, the use of materials for landfill operational uses (for example, for 'organic' material where it does not meet the Australian Standard for Composts, Soil Conditioners and Mulches – 4454) and waste diverted to waste to energy facilities.

Waste reform, litter and illegal dumping

What happens if we don't take action?

- Uncertainty and an unfair playing field.
- Continued issues including:
  - » static or growing stockpiles
  - » potentially reusable 'fill materials' ending up at landfill due to development pressures
  - » illegal dumping
  - » waste promoted as 'product' and waste levy avoidance
  - » issues around ensuring environmental risks not properly tested
  - » problematic wastes not managed appropriately.
- Poor amenity and potential for decreasing land and property values.

What is possible through action?

- ✓ A framework to provide the right settings to protect the environment, balanced with supporting the economic potential from the waste and resource recovery sector.
- ✓ A level playing field.
- ✓ Optimal operation of the waste levy, reflecting real costs.
- ✓ Continued focus to encourage greater resource recovery, rather than disposal of recoverable resources to landfill.

Priority actions

- » Review financial instruments, penalties and on-the-spot fines to reflect real costs and impacts.
- » Support the continued implementation of the Environment Protection (Waste to Resources) Policy.
- » Continued development and implementation of waste reform initiatives including in relation to mass balance reporting, waste levy collection, assessment of waste derived materials, stockpile management controls, product bans and landfill bans.
- » Implement litter reduction strategies and public place recycling.
- » Prevent the development of new landfills to service metropolitan Adelaide.
- » Apply financial instruments to drive change.
- » Provide education, enforcement action and disincentives for dumping.
- » Encourage councils to work with the Environment Protection Authority on measures to support illegal dumping prevention and prosecution and enforcement of clean-up costs.
- » Ban from landfill materials that could be disposed of through strongly performing markets, having regard to metropolitan and non-metropolitan contexts.
- » Identify and maximise opportunities to increase awareness and link environmental values with reduced litter, illegal dumping and associated impacts.
- » Continue work through the Australian Government under the National Waste Policy and *Product Stewardship Act 2011* to advocate for better national systems in relation to e-waste, hazardous materials and product stewardship.

"Green Industries SA provides investment support... to facilitate the growth and establishment of globally relevant technologies and innovations."

Competitiveness and innovation

South Australia aims to be internationally recognised as a leader in green industry development, the circular economy, and recycling and resource recovery. Supporting innovation and business are vital to achieving this vision.

Green Industries SA's Commercialisation of Innovation Program facilitates investment in globally relevant technologies and innovations, particularly in waste, resource recovery and circular economy. These areas have been recognised as having global relevance that could generate economic growth in South Australia. More information about technologies being fast-tracked for business development is available on Innovyz's website: www.innovyz.com/waste-recycling-companies.

Business opportunities are emerging as communities seek solutions to problems relating to traditional activities such as construction and demolition, as well as growth in new waste streams such as electronic waste, plastics, packaging and tyres. Many businesses in areas such as landfill and landfill gas extraction, and energy production to composting and consulting services, are yet to realise their export potential. Many are small family businesses.

Developing opportunities for South Australian businesses to export their expertise and develop solutions that are fit-for-purpose in other jurisdictions will contribute to growth in green industries sectors.

South Australia also has the potential to be a training destination for overseas governments looking to improve management of their waste. Leadership training and certification in the waste management sector will also be a continued focus area.

An example is Green Industries SA's Global Leadership Program on the Circular Economy, which was launched at the Eighth Regional 3R Forum in Asia and Pacific, in Indore, India, in April 2018. The program facilitates business-to-business introductions to influential Asia Pacific decision-makers in environmental sectors.

It capitalises on South Australia's global reputation for leadership in water, waste and energy and facilitates business-to-business introductions with representatives and experts from leading companies and organisations to stimulate the export of the state's leading-edge 'know how' and technologies.

Competitiveness and innovation

What happens if we don't take action?

- Missed opportunities to:
  - drive innovation, technologies and research into long-standing waste issues, which could contribute to a circular economy
  - drive potential economic benefits for South Australia in commercialising this growth.

Competitiveness and innovation

What is possible through action?

- ✓ Build on South Australia's leadership and global reputation in green industry and resource recovery.
- ✓ Waste and resource recovery sector growth through innovation, investment in technologies, and market support.
- ✓ Helping businesses find markets for their technologies and services.
- ✓ Reducing South Australia's dependence on overseas exports of recyclable materials and import of technologies.
- ✓ Building knowledge and upskilling industry professionals.

Priority actions

- » Encourage and promote the development of sustainable local, national and international markets for re-manufactured and recycled products.
- » Help businesses find markets for their waste management knowledge and skills.
- » Identify support opportunities for business, such as national and state-based initiatives and grants that can assist businesses in relation to waste and resource efficiency.
- » Help businesses reduce their costs through more efficient use of raw materials, water, energy and reduced trade waste disposal.
- » Promote innovation in business sustainability and encourage industry-to-industry links, collaborative consumption (for example shared access/monetisation of underused assets) and supply chain initiatives for local benefits, including job creation.
- » Identify business leaders who can assist with industry education and generate change across sectors and through supply chains.
- » Attract and encourage business to develop and grow new, high value-added re-manufacturing enterprises.
- » Investigate the potential for web-based platforms and/or mobile applications and processing technology to foster progress in generating a circular economy through improved waste management and resource recovery.
- » Reduce South Australia's dependence on overseas exports of recyclable materials through enhanced reprocessing and re-manufacturing into new products for domestic consumption.
- » Support the commercialisation of technologies and innovations in the waste management and resource recovery sector.
- » Encourage collaborative platforms that bring together researchers, sector case studies and pilot industry projects that support progress towards a circular economy through improved waste management and resource recovery.
- » Support the development of soft infrastructure, skills and capabilities to attract infrastructure investment and growth in waste management and resource recovery.
- » Support the development of programs for the waste and resource management industry to build knowledge and upskill industry professionals.

Research and development

As we extend our knowledge and focus on transitioning to the circular economy, we begin to extend beyond known approaches to recycling and reuse. Research will underpin and inform how we address the challenges of wasteful consumption, change behaviours, and develop new technologies to address emerging challenges. Research priorities will be evaluated over time.

Building on the achievements of the Global Leadership Program on the Circular Economy, new activities will be undertaken to grow the awareness and capacity for the transition to a circular economy.

Through the term of this Strategy, new activities will accelerate adoption of the circular economy through public and private partnerships by advancing circular economy theory and science, including:

- waste management, resource recovery and circular economy metrics
- linking stakeholders worldwide
- providing thought leadership and educational resources to build capacity
- supporting innovation through research, development and commercialisation
- supporting high impact circular economy projects, through advocacy and funding to demonstrate whole of supply chain outcomes that are truly circular
- supporting tertiary education for the circular economy.

This recognises the considerable interest from international organisations in partnering with Green Industries SA to advance practical policy responses to the opportunities inherent in the circular economy, including in research and development.

Research and development

What happens if we don't take action?

- Missed opportunities to develop and introduce evidence-based technologies to change waste management and resource recovery and reuse processes.
- Inadequate planning for tertiary and training needs to build knowledge and capacity to perform future roles, particularly in the circular economy.
- Missed opportunities to connect elements of waste management and progressing a circular economy to other research disciplines.
- Loss of talent to other jurisdictions.

Research and development

What is possible through action?

- ✓ Build an evidence base to support positive, long-term behaviour change, innovation and policy responses to support a transition to a circular economy in waste manegment and resource recovery.
- ✓ Establish collaborative research projects to bring together knowledge about elements of waste management, progressing a circular economy and behaviour change from a multitude of academic disciplines, from architecture to childhood development, while considering social, environmental and economic aspects.
- ✓ Build development, training and tertiary qualification opportunities and graduate capacity in circular economy, waste management and resource recovery.
- ✓ Encourage collaboration in research projects across tertiary institutions, nationally and internationally.
- ✓ Encourage local businesses to find solutions and opportunities.

Priority actions

- » Identify changes within a product's lifecycle with major effects on energy, waste and materials use and greenhouse gas production.
- » Attract funding partners, such as the Australian Research Council, universities, and the public and private sector for research projects.
- » Foster relationships between industry and government, capitalising on government research and innovation capabilities.
- » Encourage the development of graduate and post-graduate capacity and accredited training.
- » Research sustainable behaviour change and apply findings to advancing the circular economy.
- » Support research into durable products or components that encourage reuse and refurbishment.
- » Support research into new economic and business models in the circular economy.
- » Encourage industry to analyse the flow of materials and other resources in a product's lifecycle.
- » Encourage research into emerging waste streams.
- » Encourage application of the research into new innovations.
- » Identify, recognise and adopt testing, research and standards developed in other jurisdictions in relation to sustainability, waste issues and the circular economy.
- » Commercialise research solutions, technologies and designs that improve sustainable outcomes.

Energy from waste

'Energy from waste' (or 'waste to energy') is a method of treating waste to recover energy from its components, and can significantly reduce the volume of materials that require landfill disposal.

The technology comes in different forms, the most common being mass burn incineration, gasification, anaerobic digestion, biogas, refuse-derived fuel and pyrolysis. A range of these technologies are used widely overseas and to a limited degree in Australia.

A diverse range of waste streams is being targeted to produce energy. Calorific material that would otherwise be recycled (often over several or more cycles) may be burned or processed for a one-off energy dividend. Recycling and reuse are placed higher on the waste management hierarchy than energy recovery.

Avoiding methane emissions through diversion of landfill and livestock waste to energy generation provides greenhouse gas emissions abatement opportunities.

Under the Emissions Reduction Fund, some activities to manage landfill and alternative waste streams are eligible to generate carbon credits which improves the business case of such initiatives and their environmental impact.

The efficiency of energy conversion greatly depends on the composition of the input feedstock and the specific type of energy from waste technology employed. In general, this energy conversion efficiency is lower than for typical facilities generating energy from fossil fuels.

For some 'energy from waste' processes, the business case is focussed on the fee for receiving and processing the waste (known as the 'gate fee') rather than on-selling energy into the grid. These processes can also generate by-products such as fly ash, char, slag and residues that need to be disposed of, in some cases through specialised hazardous waste facilities.

Due to high capital and operating costs, technologies such as thermal combustion plants typically require long-term (20 years or more) contracts that 'lock in' a secure supply of feedstock material. Locking-in feedstock materials over such a long period of time prevents the adoption of new tools or technologies that may emerge during the term of the contract.

The South Australian Environment Protection Authority released a Thermal energy from waste activities Position Statement (EPA, 2020) in April 2020 which provides clarity and certainty for industry on the regulation of energy from waste applications. This followed consultation in 2019 on a draft Statement which attracted feedback from industry, local government and peak bodies.

A National Waste Working group representing the Heads of EPA Australia and New Zealand (HEPA) also plays a role in supporting the development of 'energy from waste' national principles.

This Waste Strategy advocates for continued work to ensure 'energy from waste' activity and targets align with the waste hierarchy and are framed within a long-term circular economy perspective that prioritises the prevention, reuse and recycling of waste materials.

Green Industries SA maintains there are considerable employment and economic benefits associated with resource recovery, if there is source separation of materials and where materials are circulated in the economy through reuse and remanufacturing.

As noted by Circle Economy (2017), technologies and processes such as landfill disposal and energy from waste can provide the foundation for linear consumption patterns, whereas contemporary waste management approaches such as reuse, remanufacturing, refurbishment and material recycling promote higher-value loops and promote a more circular economy.

The *Creating Value, the Potential Benefits of a Circular Economy in South Australia* (Green Industries SA, 2017) paper recommends more source separation of biogenic materials (organics) from other anthropogenic materials such as metals, paper, and plastics in order to maximise reuse. However, it is acknowledged that there will be a percentage of unrecoverable mixed residuals remaining within a transitioning or even an established circular economy.

The State Government will continue to promote the evidence-based view that 'energy from waste' should support viable options for higher-order beneficial uses while considering the impacts on businesses and supply chains that compete for the same feedstock materials. This Waste Strategy continues to support the efficient recovery of energy from residual waste and niche waste streams through the use of the best available technologies for local conditions. This may include small-scale anaerobic digestion plants and regional bio-gas facilities. The result will be environmental benefits and job and economic opportunities.

Additionally, in support of the Waste Strategy's 'zero avoidable waste to landfill' target, the waste management hierarchy identifies landfill as the least preferred option. It is recognised that should there be no viable options for higher-order beneficial uses for materials, that landfill sites with bioenergy recovery should be utilised where possible.

Energy from waste

What happens if we don't take action?

- Potential economic losses by industry due to investments in waste treatment assets not aligned with a long-term circular economy perspective.
- Potential for materials to not be used in ways that maximise their value in the waste management hierarchy (for example: avoid, reduce, reuse and recycle).
- South Australia's position on source separation and recirculating materials back into the economy will be challenged.

What is possible through action?

- ✓ Certainty and clarity on the regulatory framework within South Australia, supporting better investment decisions.
- ✓ South Australia's leadership in specific and broader waste management policies retained.
- ✓ Maximising the value of materials according to the waste management hierarchy and circular economy principles.
- ✓ Further reductions in greenhouse gas emissions from the waste sector.

Priority actions

- » Consistent with the waste hierarchy, continue to review resource-recovery businesses that source waste materials for energy recovery to ensure optimal outcomes within the circular economy.
- » Environment Protection Authority to consider and regulate energy from waste in line with the Environment Protection Authority's 'Thermal energy from waste activities' position statement.
- » Make available information on the environmental and health implications of 'energy from waste' technologies to support understanding and evidence-based evaluation.
- » Energy sector to outline planning and grid connection requirements and processes for 'energy from waste' development.
- » Support and encourage anaerobic digestion and other 'energy from waste' technology demonstration programs at precinct/clusters level, based on feasibility assessments.
- » Consider how the waste levy and other financial tools can help develop or encourage 'energy from waste' technology development and adoption.

Acknowledgements

Stakeholder feedback

Green Industries SA acknowledges the input received from industry, businesses and the community on a consultation draft South Australia's Waste Strategy 2020-2025 during 2020. In total, more than 100 businesses, industry associations and members of the community participated in engagement activities and 66 formal submissions were received. This feedback was critical in developing this final Strategy.

International leadership

Green Industries SA also wishes to acknowledge recent international moves in the direction of sustainable development and the circular economy, which have been vital to understanding opportunities for South Australia.

International work that has provided the foundation for South Australia's direction in these areas includes:

- the United Nations Sustainable Development Goals (United Nations, 2015)
- the Ellen MacArthur Foundation knowledge and resources
- the European Commission's Circular Economy package (2015)
- *Wales and the Circular Economy. Favourable system conditions and economic opportunities* (2013)
- China's progress, including the *China Circular Economy Promotion Law (2009)* and its national strategy for achieving a Circular Economy (2015) (summarised at: Ellen MacArthur Foundation, 2018)
- Scotland's circular economy strategy *Making Things Last* (2016) and *A Manufacturing Future for Scotland - Scotland's Manufacturing Action Plan* (2016)
- *A Circular Economy in the Netherlands by 2050* (2016)
- Japan's *Basic Act on Establishing a Sound Material-Cycle Society* (2000) and its 4th Fundamental Plan for Establishing a Sound Material-Cycle Society (2018)
- the Flanders' Materials Programme (2011), which supports a holistic approach to sustainable materials management within the economy.

Many of these documents outline similar findings to that estimated in South Australia's 'Creating Value' report. Wales, Scotland and the European Commission, for example, confirm the opportunities the circular economy provides. Major global businesses such as Google, Unilever, Nike, Cisco and Renault are investing heavily in the circular economy, with their actions having the capacity to influence supply chains worldwide[4]. Significantly, the World Resources Forum Asia Pacific held in Sydney in 2016 estimated the value of a circular economy to Australia at A$26 billion a year by 2025 (Florin, et al, 2015).

4 Refer: https://www.ellenmacarthurfoundation.org/our-story/partners

Appendix 1
Recycling activity

MEASURE	2018-19 reported activity
State-wide diversion	83.8%
Total resource recovery	4.34 million tonnes
Resource recovery per gross state product	47.9 tonnes per $1 million
Total 'direct' market value of resource recovered materials	$348 million
Total (all materials) waste generated	5.18 million tonnes
Total landfill disposal	0.840 million tonnes
Recovered materials reprocessed in South Australia	86% by tonnage 7% reprocessed interstate and the remainder sent overseas[5]
Employment in the SA Resource Recovery Sector*	4,800 full time equivalent jobs[6]
Per capita waste generation rate (Standard Reporting Materials)	2,170 kg/person/year
Environmental benefits from South Australia's resource recovery activities	Reduction in greenhouse gas emissions of 1.31 million tonnes of CO_2-e

* Broader benefits for job creation have also been identified for the resource recovery industry. For every 10,000 tonnes of waste recycled, 9.2 direct full time equivalent (FTE) jobs are created compared with 2.8 direct FTE jobs created for each 10,000 tonnes of material sent to landfill (Access Economics, 2009)

Total diversion by sector

South Australia's metropolitan total diversion (to resource recovery) by source sector is summarised in the table below:

Source Sector	2018-19 Diversion Achieved	Metro Diversion Target (2015-20 Waste Strategy)		Metro Diversion Target (2020-25 Waste Strategy)	
		By 2015	By 2020	By 2023	By 2025
Municipal Solid Waste (MSW)	**57.0%**	70%	70%	65%	75%
Commercial and Industrial (C&I)	**88.2%**	75%	80%	85%	90%
Construction and Demolition (C&D) - excluding Separately Reported Materials	**93.4%**	90%	90%	90%	95%
C&D - Total	**91.4%**				

5 Material reprocessed in SA includes heavy C&D and organics streams whereas material sent overseas includes lightweight materials such as paper/cardboard and plastics.

6 Estimates have been obtained from employment figures provided by the surveyed companies. The companies who responded employ 1,638 full time employees, some part time and casual employees, and 212 contractors. From this sub-set, it is estimated that the sector employs 4,800 people across a wide spectrum of waste industry jobs (direct and indirect).

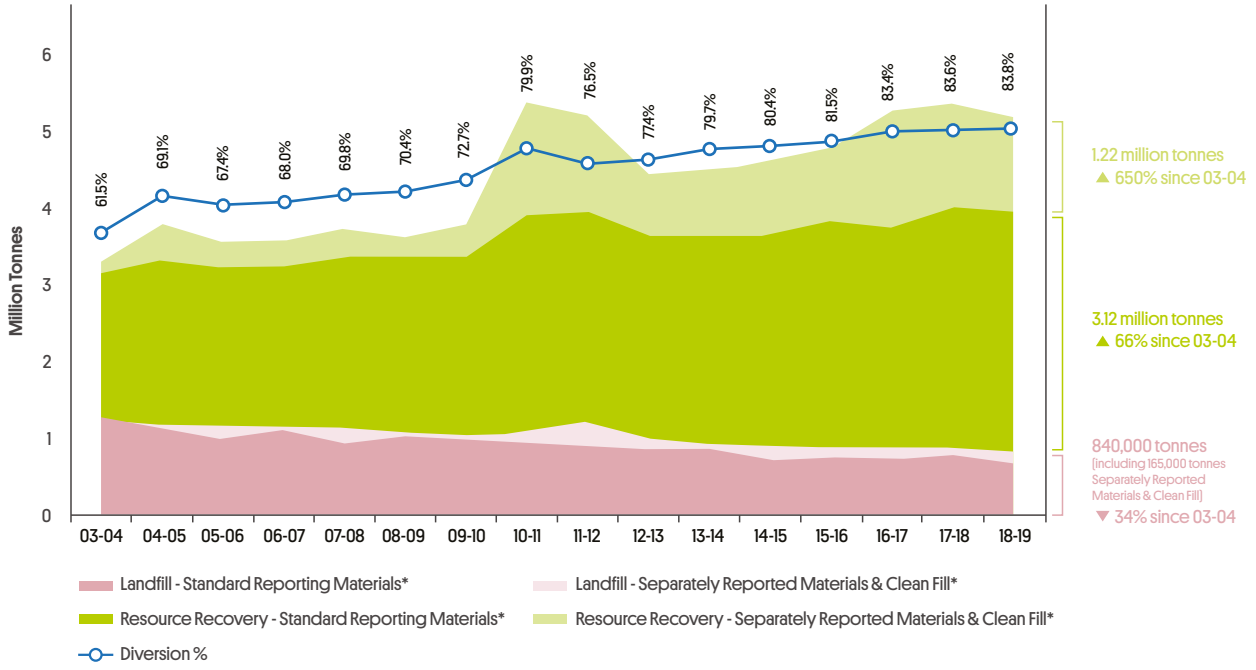
South Australia's diversion rate and materials recovered since 2003-04

Figure 4 below shows the increase in diversion rate and materials recovered over time, as well as the change in landfill disposal. Percentage changes from the 2003-04 financial year are stated.

Changes from 2003-04 to 2018-19 include:

- the quantity of material sent to landfill has decreased by 34% from 2003-04.

Figure 4. Trend in resource recovery and landfill disposal in South Australia since 2003-04.



*Reporting of both resource recovery and landfill disposal is divided into Standard Reporting Materials and Separately Reported Materials & Clean Fill categories.

Sourced from Rawtec, South Australia's Recycling Activity Survey 2018-19 Report (Adelaide, 2020).

For further information, this report is available on the Green Industries SA webiste: www.greenindustries.sa.gov.au

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