



VALUING OUR FOOD WASTE

South Australia's strategy to reduce and
divert household and business food waste
2020-2025



Government of South Australia
Green Industries SA



SOUTH
AUSTRALIA



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 Islander people have to Country.

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

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Foreword from the Minister



Food waste is an environmental and economic challenge globally. But it also represents a great opportunity for harnessing the potential as a valuable resource.

An estimated 7.3 million tonnes of food waste is generated each year in Australia, costing the Australian economy \$20 billion annually. The volume and value of wasted food in Australia is high: each year, Australian households discard about 2.5 million tonnes of food, which has been valued at \$10 billion. There are many opportunities for us to introduce food waste prevention measures and divert more food waste from landfill to make better use of this resource, contributing to a circular economy within South Australia.

The Australian Government's *National Food Waste Strategy* aims to achieve a 50% reduction in food waste by 2030, aligning 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.'*

We are proud of the action that South Australia has taken to recover and process food waste since the first South Australian Waste Strategy was developed in 2005. Our previous investment in infrastructure and the systems to collect and process organic waste, including food waste, gives us a valuable platform to take additional significant steps to increase the capture and recovery of this material to feed those in need, for processing to replenish soils, and to create new food. It will be vital that we continue

to harness the full value of edible food and to recover any remaining food waste for ongoing input into our local food production.

Preventing food wastage reduces household and business expenditure. Diverting organics from landfill lowers landfill costs to councils and, in turn households; supports local industry and jobs; and reduces greenhouse gas emissions. The application of composted organics to farmland and horticulture increases the viability of farmland by reducing fertiliser needs, increasing productivity, reducing water and herbicide requirements, and improving soil structure and soil micro biota.

Valuing our Food Waste: South Australia's strategy to reduce and divert household and business food waste integrates policy measures, behavioural change actions and support for industry to address the estimated 200,000 tonnes of food waste sent to landfill each year in South Australia and contribute to national and global targets.

Themes within this Strategy, to be led by Green Industries SA, complement existing policy measures, including developing a circular economy, eliminating single-use plastics, working within the waste management hierarchy, and supporting the South Australian resource recovery industry.

In recent challenging times, food-buying behaviours altered supply chains at local and global levels. Taking action to reduce wasted food and establish resource-recovery systems improves the resilience of community and industry sectors to maintain continuity in times of disruption.

State and local governments, business and the South Australian community all have roles to play in delivering these objectives to reduce food waste sent to landfill, and ultimately improving environmental and economic outcomes for our state.

A handwritten signature in dark ink, appearing to read 'David Speirs'.

Hon David Speirs MP

Minister for Environment and Water



Introduction: Reducing food waste and creating economic opportunity

South Australia understands the benefits of shifting to a circular economy – a system in which materials are never discarded but are reused or recycled into new products and reintegrated into the market. *The potential benefits of a Circular Economy in South Australia* report¹ conservatively estimates that by 2030, a circular economy could create an additional 25,700 jobs (mostly through actioning material efficiency gains) and reduce greenhouse gas emissions by 27% compared to a ‘business as usual’ scenario in South Australia.

Managing the state’s resources more effectively will benefit South Australians, the environment and the economy. It will help the state limit the impacts of climate change. It will also help achieve the vision, objectives and targets set out in *South Australia’s Waste Strategy 2020-25*² – including the Strategy’s objective of developing a circular economy that realises the best or full value from products and materials produced, consumed and recovered in South Australia.

Addressing food waste is a large part of a biological circular economy. In a linear economy, on the other hand, large volumes of food and organic resources are wasted, with few opportunities or incentives to prevent waste before it occurs. Food waste is a billion-dollar and growing problem, in Australia and across the world. Analysis by the Food and Agriculture Organization (FAO) of the United Nations puts the value of food loss and waste globally at around US\$940 billion annually³. Boston Consulting Group suggests this will increase to \$1.5 trillion by 2030⁴.

There are two main effects of food loss and waste. First, food insecurity and hunger: the extent of food loss and waste that exists while more than 800 million people suffer from hunger around the world

indicates that food systems do not function as they should⁵. Food security in a developed country such as Australia has been defined as the “ability of individuals, households and communities to acquire appropriate and nutritious food on a regular and reliable basis, and using socially acceptable means”⁶. The not-for-profit food rescue organisation Foodbank reports that more than 815,000 Australians are provided with food relief each month⁷. The demand for food relief services significantly increased in 2020 as a result of the pandemic with long term projections on this increased need uncertain.

The second aspect is the impact of food loss and waste on natural resources and the environment. Food waste contributes significant amounts of greenhouse gas emissions both at the end of its life cycle, when it produces methane in landfill, and through lost embodied resources in the production, manufacturing, processing, packaging, transport and preparation stages. The generation of methane, a greenhouse gas 28 times more potent than carbon dioxide, contributes to the overall emissions resulting from food waste. If global food loss and waste was a country, it would be the third-largest emitter of carbon dioxide equivalent, after the United States and China⁸.

The South Australian Government has an aim to reduce emissions by more than 50% from 2005 levels by 2030, and for net zero emissions by 2050. Taking action to address the generation of food waste and divert this material away from landfill helps implement the government’s policy directions under *Directions for a Climate Smart SA*⁹ and the across agency *Climate Change Action Plan 2021-2025*.

Agricultural water use in Australia is highly dependent on rainfall and crops grown in any given year. In South Australia, around 60% of total water consumption is used for agricultural production¹⁰. The water inputs associated with food production are high: throwing away 100g of uncooked rice wastes the equivalent of a person's average daily water use¹¹, while producing 100g of beef uses four times that amount¹².

Australian Government's *National Food Waste Strategy*, released in November 2017, recognises that addressing food waste represents a significant opportunity to protect Australia's environment, prevent economic losses, and help relieve food insecurity.

Food bought by households and businesses and is ultimately unused, uneaten or otherwise discarded has financial costs including the purchase price and disposal costs. In Australia, the value of food wasted by households is estimated at \$2,200 to \$3,800 for each household a year¹³.

In South Australia, food waste makes up approximately 22% by weight of total household waste collected at kerbside and up to 40% of material presented in residual waste bins¹⁴. About 26% of commercial and industrial waste streams is food waste.

Food waste prevention and the redistribution of surplus food are important goals. However, there will always be a component of unused or discarded food that is not suitable for human or animal consumption. Where unavoidable food waste is generated, diverting it away from landfill to processes such as composting helps recover and return nutrients to the soil, avoiding losses throughout the food value chain.

When food organics are blended with green organic material, the quality and nutrient value of the

processed compost improve. Composts applied to soils increase plant growth and improve aspects of soil quality – including its structure, carbon content and moisture retention – particularly for degraded soils.

Anaerobic digestion operating alongside composting further utilises feedstock materials. Due to its high moisture content, food waste is an ideal ingredient in the anaerobic digestion process (where naturally occurring micro-organisms and bacteria from the organic material generates biogas, which can be used to produce renewable energy). The residual nutrient-rich digestate can be used as a fertiliser or compost feedstock.

Consideration of all aspects of the food lifecycle, from production to disposal, is required to reduce consumer food waste. These may include:

- prevention activities
- understanding impacts on commercial and contractual arrangements
- addressing supply and over-purchasing
- implementing segregated bin systems and collection.

It also means ensuring appropriate processing capacity and product quality [e.g., contamination removal] infrastructure is in place to recycle the material into compost and other soil improvement products.

The Government of South Australia is committed to addressing food waste and in doing so contribute to national and global efforts. South Australians have a history of leading the nation in waste management. This strategy demonstrates the state's ongoing national leadership in recycling, resource recovery efforts and working towards a circular economy.



What is food waste?

Australia's National Food Waste Strategy¹⁵ adopts a broad and inclusive definition of 'food waste' that covers:

- solid or liquid food that is intended for human consumption and is generated across the entire supply and consumption chain
- food that does not reach the consumer, or reaches the consumer but is thrown away. This includes edible food [the parts of food that can be consumed but are disposed of] and inedible food [the parts of food that are not consumed because they are either unable to be consumed or are considered undesirable, such as seeds, bones, coffee grounds, skins, or peels]
- food that is imported into, and disposed of, in Australia
- food that is produced or manufactured for export but does not leave Australia.

In adopting the above definition, 'food waste' excludes food that is produced or manufactured in Australia and is exported and becomes waste in another country.

This definition acknowledges that there are opportunities across the entire fresh and processed food systems to achieve improved environmental, economic and social outcomes.

In addition to capturing and diverting food waste, this document discusses strategies and actions to increase food waste prevention by targeting edible food waste, as defined above. Widely classed as 'avoidable', edible food waste is the component of food that was, at some point before disposal, edible and therefore can be considered preventable. After

purchase the food may have passed its use-by date or deteriorated to a level that it became inedible.

Slight variations in the definition of 'edible food' exist within households and businesses as a result of what some people choose to eat and others choose not to, such as bread crusts and vegetable peels.



The global response

Internationally, it is estimated that one-third of all food is wasted between production and disposal¹⁶.

In its publication *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*, the World Bank states:

Food loss and waste represents wastage of resources, including the land, water, labour, and energy used to produce food. It strongly contributes to climate change because greenhouse gases are emitted during food production and distribution activities, and methane is released during the decay of wasted food¹⁷.

On 25 September 2015, countries around the world, including Australia, adopted a set of goals aiming to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable-development agenda. The Sustainable Development Goals are the blueprint for achieving a more sustainable future. They address global challenges related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice.

United Nations Sustainable Development Goal (UN SDG) 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.

Internationally, countries are taking action aligned to this goal. The *National Food Waste Strategy* notes a number of major international initiatives to reduce food waste across the supply chain in accordance with UN SDG 12.3, in particular:

- Food and Agriculture Organization (FAO) of the United Nations' *Save Food Initiative*¹⁸
- the World Resources Institute *Food Loss and Waste Protocol*¹⁹, a global accounting and reporting standard for quantifying food waste
- United Kingdom Waste and Resources Action Programme (WRAP), which delivers consumer campaigns and voluntary industry commitments under their *Courtauld Commitment 2025*
- US ReFED Roadmap to Reduce U.S. Food Waste²⁰.

Other measures include:

- the Japanese Government's target to halve household food waste by 2030 compared to a 2000 baseline. Supporting Japan's *Promotion of Utilization of Recyclable Food Waste Act*²¹, the target encourages businesses to turn their waste into compost or animal feed and to buy crops grown by farmers using waste-derived products to create Recycling Loops
- the launch of the UK *Food Waste Reduction Roadmap*²² in September 2018, an industry-wide roadmap and toolkit
- Zero Waste Scotland's release of the *Food Waste Reduction Action Plan*²³ in April 2019 to reduce Scotland's food waste by 33% by 2025.

Working within a national framework

To support actions at a national level, The Australian Government has allocated funding to the *National Food Waste Strategy*²⁴ for:

- determining a national food waste baseline to monitor and track progress. This was released in March 2019, setting the National Food Waste Baseline²⁵ for Australia at 7.3 million tonnes of food waste generated annually across all sectors.
- Food Innovation Australia Limited to develop an implementation plan and a monitoring and evaluation framework for the Strategy and coordinate priority areas of work. A *Roadmap for reducing Australia's food waste by half by 2030*²⁶ was released in March 2020 and highlights steps and features of the proposed voluntary commitment program.
- establishing an independent, long-term governance entity to deliver the National Food Waste Strategy, including implementing a voluntary commitment program to engage businesses and industries to commit to actions that reduce food waste.

Australia's *2018 National Waste Policy*²⁷ also emphasises the need to address food waste, noting that, on average, an Australian household reports throwing out \$2,200 to \$3,800 worth of food each year. Strategy 12 under Principle 4 of the 2018 National Waste Policy – *Better manage material flows to benefit human health, the environment and the economy* – targets not only a reduction in the generation of organic waste but also the diversion of material from landfill into soils and other uses, supported by appropriate infrastructure. The National Waste Policy Action Plan presents targets and actions to implement the 2018 National Waste Policy²⁸, which includes Target 6: *Halve the amount of organic waste sent to landfill for disposal by 2030*.

The Fight Food Waste Cooperative Research Centre [Fight Food Waste CRC] was launched in July 2018 with a \$30 million Australian Government CRC grant to support research addressing food waste generated throughout the supply chain. Based in Adelaide, the Fight Food Waste CRC involves 59 industry, government and research participants from across Australia – including

15 based in South Australia – contributing an additional \$33 million funding and \$57 million in-kind value. The 10-year research program is examining measures across three program areas to reduce food waste generation, transform unavoidable wastes into innovative high-value products, and engage with industry and consumers to change behaviours. The South Australian Government is participating in the Fight Food Waste CRC through Primary Industries and Regions SA and Green Industries SA.

Continued participation in national activities and programs to address food waste is essential given the extensive industry sectors that operate across state borders. Several key actions must be addressed at a national level, possibly through the proposed national voluntary commitment program. These national actions include reviewing specifications for fresh fruit and vegetables, offering more 'second grade' produce ranges to increase the volume that reaches stores, industry actions to support food relief and reduce food waste generated within national transport logistics chains.

Valuing our Food Waste: South Australia's strategy to reduce and divert household and business food waste centres on specific actions to address food waste generated at the consumer level within business and household sectors – material that is most likely to enter the formal waste management system in South Australia – while supporting wider activities that are being led at a national level by relevant parties.

Delivering on these actions by 2025 will:

- support the National Food Waste Strategy 50% reduction target by 2030 by promoting food waste prevention measures
- provide all households in metropolitan Adelaide with access to an organics collection system by 2025
- halve the volume of food waste presented in household residual waste bins by 2025
- encourage the uptake of segregated organics recycling systems in businesses, including potential for legislative reform to increase the recovery of this material for processing into soil improvement products.

The waste management hierarchy

South Australia's Waste Strategy 2020-2025 is underpinned by the internationally recognised waste management hierarchy, which is mandated in the *Environment Protection Act 1993*. Its efforts focus on the highest level of the hierarchy, considering social, environmental and economic practicalities. This extends to the management of food waste in

South Australia, focusing efforts and programs to prevent, capture and use food waste at its highest 'values'. Retaining materials and nutrients in circulation, redirecting suitable food for consumption, and processing other streams into products to support regeneration of natural systems reflects the circular economy approach.

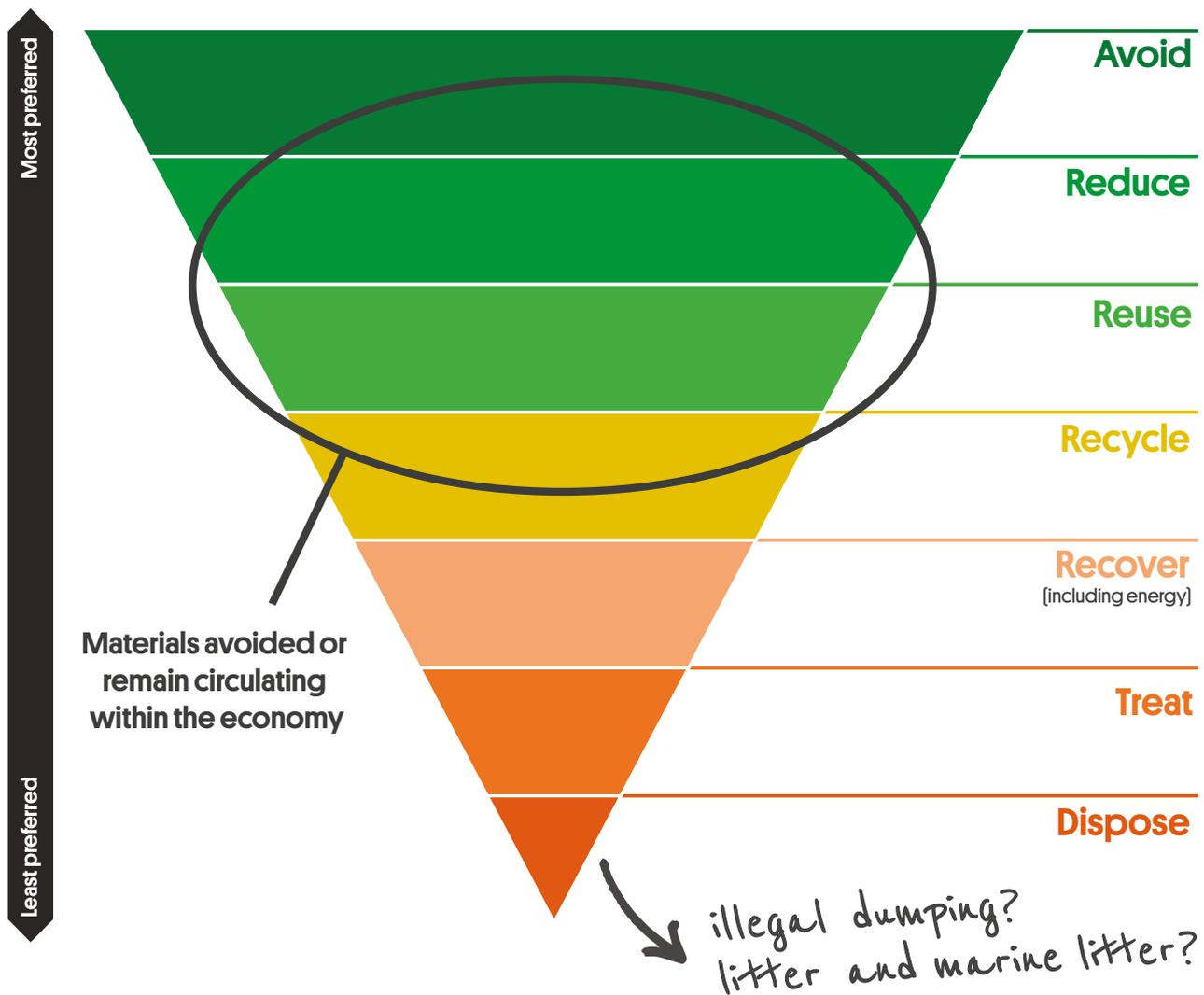


Figure 1

The waste management hierarchy (Green Industries SA, 2019)

The destination of food waste

In South Australia, food waste arising from the residential sector, municipal (council) bin collection services, and commercial and industrial sources, is managed in various ways.

Reuse

Food rescue organisations and charities (typically commercial and industrial sources)

Food rescue organisations reduce the amount of wasted food that is suitable for human consumption. In rescuing food that would otherwise be thrown away, these organisations provide those in need with meals, partly addressing food insecurity²⁹.

Food relief charities provide services across Australia, with supermarkets partnering with three major organisations to donate excess food items³⁰. Redistribution alone is not a long-term solution to food insecurity, but food rescue and redistribution organisations are central to retaining the high-value of quality surplus food to provide to those in need.

Animal feedstock (commercial and industrial sources)

The volume of food waste diverted to animal feed (e.g., piggeries) is unknown. It is often an informal arrangement between the primary producer and business with transport costs and quantities negotiated as required. It is critical that food waste sent for animal feed is uncontaminated and any feeding of material to animals must conform to the *Livestock Act 1997*. Material fed to animals generally comes from consistent, less mixed sources such as food manufacturing and business sites. This arrangement is often undertaken outside any formal contract and the business or primary producer may alter the arrangement to suit their needs with short notice and without consequence.

Recycle

Valorisation and rendering (commercial and industrial sources)

A growing sector is the use of surplus food and by-products, often generated early in the supply chain, as feedstocks into new commercial applications and products. Many materials present 'valorisation' opportunities – that is, opportunities to convert the waste material into a useable product. Transforming waste citrus and grape marc material to produce secondary high value products is already underway and a number of research projects are currently looking at opportunities for potatoes and other produce grown in large volumes in the state.

Rendering, the recycling of protein by-products from the food industry, is one example of this. Collected off-cuts and by-products from butchers, supermarkets, smallgoods manufacturers, abattoir and boning operators, and seafood and poultry processors are sent to large commercial rendering plants where they are processed into tallow, meat meal and manufactured animal feed products for local and export markets.

Commercial composting (municipal and commercial and industrial sources)

The commercial compost sector is an important part of South Australia's resource recovery efforts and of the economy. Composting is a high-value production process that combines various types of organic waste streams as feedstock – such as organic waste from kerbside council collected green bins and commercial food waste collections – and recycles these to form products that meet specific requirements for the end user.

Compost and soil enhancement products are applied to agricultural, viticultural and horticultural processes to increase yields, improve plant and soil health, and conserve soil moisture, in addition to being sold to the landscape industry sector and retail garden centres.

Increasingly, the compost sector is entering the broader agricultural market through the conversion of compost products into forms (such as pellets) that can be spread by conventional machinery to apply fertiliser or seeds to soils.

Benefits of compost application

In South Australia, composted products are used to improve soils, plant growth and the environment. It has long been known that the use of such products can reduce the need for fertilisers, watering and herbicides; improve soil health and structure; reduce erosion; and improve plant growth. However, these benefits have been difficult to quantify or calculate.

A 2006 study commissioned by the NSW Department of Environment and Conservation³¹ provides a comprehensive Life Cycle Inventory (LCI) for commercial composting systems in Australia and uses rigorous Life Cycle Assessment (LCA) modelling to demonstrate the environmental impacts of commercial composting systems. It was the first time in the world that LCI data was developed for the post-application impacts of composting systems in any significant or comprehensive manner. The study has been extensively reviewed by relevant technical experts in LCA, and by relevant agricultural and environmental scientists in NSW Agriculture and the CSIRO.

The study assessed the environmental benefits of source-separated collection, composting, and the application of the resulting recycled product to the environment, and clearly demonstrated that this approach offers substantial advantages – especially when high-quality composted products are applied to soils to enhance soil health, fertility and productivity.

The results indicate significant environmental gains, including net greenhouse benefits, emerge from the commercial composting system, even where composts are transported significant distances (in this study 600 km) for agricultural application.

A study by the European Compost Network found that '[t]he provision of "recycling" fertilisers from closed-loop waste management, like composts, becomes more and more important because the costs for commercial fertilisers were steadily increasing during the last years, and will increase further in future caused by increasing energy costs (e.g. for nitrogen production) and shortage of natural resources [primarily phosphate]'³².

Anaerobic digestion (municipal and commercial and industrial sources)

Anaerobic digestion of food waste involves the conversion of biodegradable organic matter to energy by microbiological organisms in the absence of oxygen. The biogas produced is a mixture of methane and carbon dioxide, and the former can be used as fuel. The treatment of waste through an anaerobic digestion process results in residues called digestate, generally in a semi-solid or liquid form that can be used as bio-fertiliser with solid fractions incorporated into a commercial composting process. Energy generation from segregated organics sources allows for the outputs to return to the recycling process. They are often suitable for land application.

Home and community-based activities (household)

Many South Australians manage food scraps within their own backyards through home composting and worm farms or by feeding to backyard poultry. The output material may be used to regenerate soils in the location it was generated, avoiding additional transport and processing emissions. The prevalence and volumes of food waste diverted from landfill through home-based approaches is unknown. With increasing densification of housing, the potential for home-based approaches becomes more limited.

Recover

Energy recovery at wastewater treatment plants (commercial and industrial sources)

Some streams of food waste are sent to wastewater treatment plants, either through authorised trade waste discharge to the sewer network or trucked from commercial sites. There are limits on trade waste discharges through the sewer network, because large volumes of organic loads increase the risk of blockages and network degradation, and can result in higher wastewater processing costs.

Biogas is recovered to reduce the amount of electricity drawn from the grid needed to operate the site. As well as the recovery of biogas, bio-solids from wastewater processing may be recovered. Bio-solids have limited applications and restrict the opportunities to maintain the circularity of valuable nutrients within higher-value uses.

Dispose

Disposed to landfill sites (municipal and commercial and industrial sources)

As food waste breaks down in landfill it emits methane, which has a greenhouse gas impact more than 28 times greater than carbon dioxide. Landfills with gas extraction systems recover up to 70% of generated methane; this could be captured and used for energy production on site. However, methane captured in landfills is often flared – i.e., burned and converted to carbon dioxide that is released to the atmosphere.

Disposal to landfill sites also includes material that has been through a process to mechanically separate organic material from waste disposed in general waste bins. This material is considered contaminated and so is unsuitable for land application or composting. Limited quantities may be used for site operational works, including landfill cover.

Under the Australian Government's *National Greenhouse Accounts Factors*, the conversion factor for food waste is 1.9 tonnes carbon dioxide equivalent for every tonne of food waste disposed to landfill³³.



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A Food Waste Strategy for South Australia

Context

Since the release of its first state-wide waste strategy in 2005, South Australia has been proactive in its attempts to prevent, reduce and recycle food waste. Its initiatives have included financial incentives, an environment protection legislative framework, education and awareness efforts.

Measures in South Australia to support food waste prevention and diversion from landfill include:

- the application of the solid waste levy for all waste (including food waste) disposed to landfill – a financial disincentive to dispose to landfill
- dedicated facilities, infrastructure and businesses that process food waste into compost and other soil improvement products
- the roll-out of the three-bin kerbside system to all metropolitan councils, with many councils promoting food waste diversion through household organics bins
- Green Industries SA's kerbside food waste diversion incentives to councils; i.e., grant payments to implement infrastructure and education activities
- support for research and development activities to increase markets for output products
- the three-year Australian Research Council Linkage Project *Zeroing in on Food Waste: Measuring, understanding and reducing food waste*, which focused on understanding social and behavioural aspects of food waste
- provision of customised resources to all South Australian councils to help householders plan meals and food purchases
- segregated commercial food waste collection services available across metropolitan Adelaide

- support for food recovery organisations to divert fresh and non-perishable surplus food to people in need
- the *Which Bin?* state-wide recycling education program.

South Australia's Waste Strategy 2020-25 has diversion targets of 75% for metropolitan municipal solid waste and 90% from the commercial and industrial sector. To achieve these targets, measures are needed to reduce food waste generation and increase uptake and use of diversion systems in households and commercial settings. As such, addressing food waste is a key pillar in *South Australia's Waste Strategy 2020-2025* and Green Industries SA's Strategic Plan.

Diverting food waste also contributes to South Australia's transition to a circular economy. A circular economy is one that aims to keep materials at their highest utility and value while in use before recovery and reuse, reducing the depletion of natural resources and impacts on the environment. The circular economy model distinguishes between technical and biological cycles. In the biological cycle, where organic waste is not able to be prevented, materials are used as much as possible before processing for the regeneration of natural systems.

When it is impossible to avoid food waste, it is imperative to divert the waste from landfill and use it productively. Effective segregated collection systems must be in place to minimise contamination and enable the material to be used at its highest level. The Ellen MacArthur Foundation highlights the role that collection systems have in both the technical and biological cycles of the circular economy, noting in the *Cities and Circular Economy for Food* document that 'a fundamental prerequisite for nutrient looping is effective collection systems'³⁴.

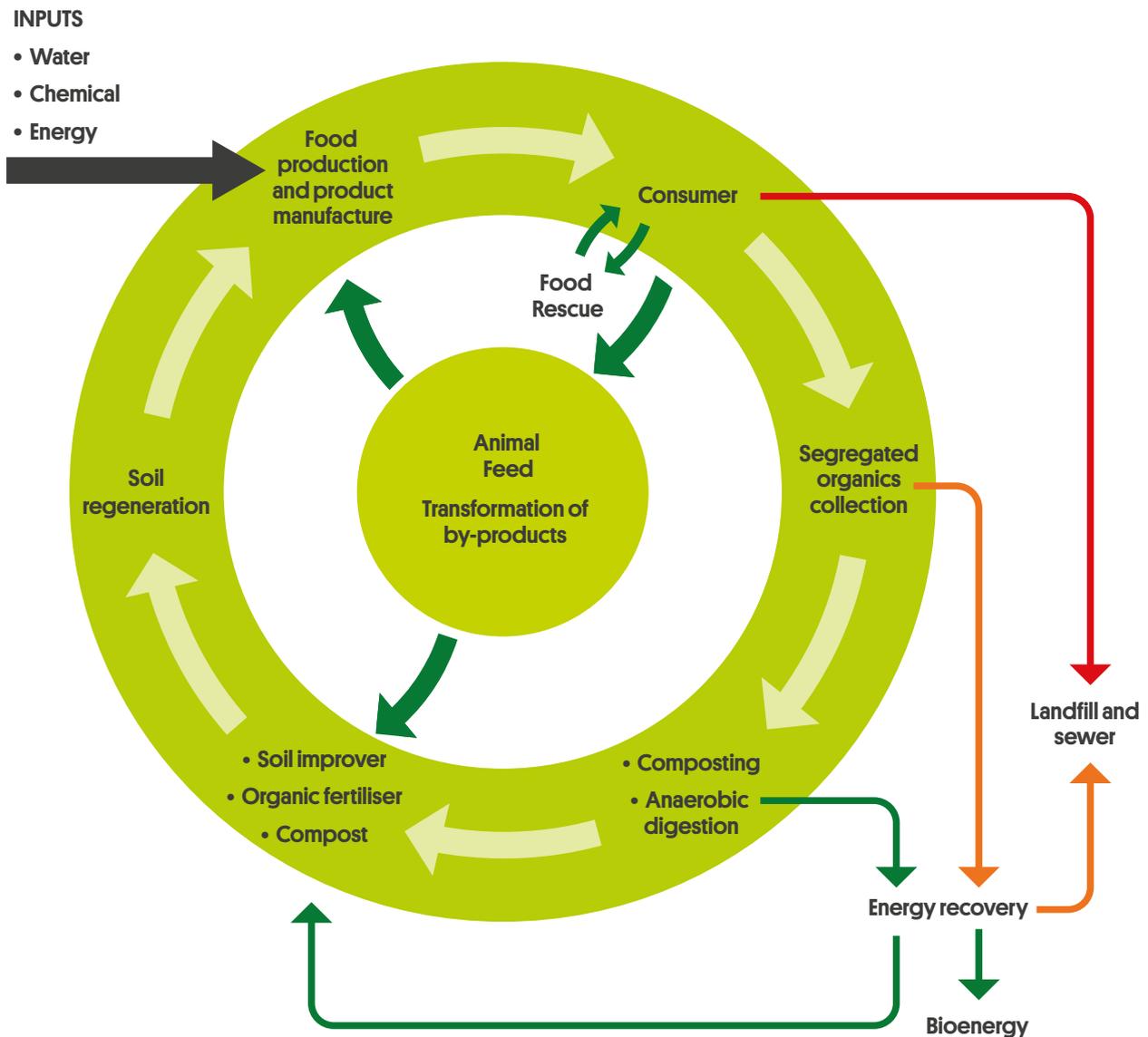


Figure 2 Flow of materials within a biological circular economy

Compostable bags and food service products are important in increasing the capture and diversion of food waste. Combined with effective collection systems, compostable bags to contain food waste generated by households and businesses have been demonstrated to increase diversion³⁵. Use of compostable food service ware supports the diversion of any remaining food waste, and the service ware, especially where food is consumed at events or away from home.

South Australia does not have any specific regulations, industry standards, or policy instruments in place aimed at preventing the generation of food waste.

Regulatory instruments that target a reduction in disposal to landfill include application of a solid waste levy (landfill levy) to all waste disposed to landfill which, when combined with operating and other costs imposed by landfill operators, comprises the landfill 'gate fee'. On 1 July 2020 the solid waste levy for metropolitan-generated waste sent to landfill

increased to \$143 a tonne, with the solid waste levy for regional areas set at \$71.50 a tonne. The *Environment Protection (Waste to Resources) Policy 2010* prohibits vegetative matter aggregated for resource recovery and collected by a council by a kerbside waste collection being disposed at landfill. Food waste segregated by householders and placed in the green organics bin is in effect included in this.

Food waste is heavy due to moisture content, so disposal to landfill can be costly. While the landfill levy alone is insufficient to deter disposal of food waste from landfill, primarily because waste is not charged to households or most businesses on a weight basis, it does provide a strong market signal. It is also expected to encourage the establishment of price competitive and responsible diversion systems and infrastructure, consistent with the waste hierarchy.

Pilot projects, data evaluation, policy development and legislative measures will be required that together stimulate action to reduce the environmental impacts of food waste diverted to landfill.

Central to this strategy are objectives to:

- reduce the generation of food waste
- capture and distribute edible surplus food to feed people, so preventing waste at the highest level
- improve food waste collection and processing systems for beneficial resource use
- apply the waste management hierarchy consistently with the principles of ecologically sustainable development
- work towards a biological circular economy
- realise economic benefits
- reduce greenhouse gas emissions.

By diverting inedible food waste from landfill, disposal costs for businesses, local government (and therefore residents) can be minimised. However, these costs represent only a small portion of the savings that are possible through preventing food waste in the first instance.

Reducing the generation of consumer food waste, and increasing the recovery of what waste does occur for higher-value uses, will return economic benefits for businesses, residents and industry.

Framework and principles

INTERNATIONAL

United Nations Sustainable Development Goals

European Commission Circular Economy Framework - circular bio-economy

United Nations Framework Convention on Climate Change

NATIONAL

National Waste Policy and Action Plan

National Food Waste Strategy and National Food Waste Baseline

APCO National Packaging Targets

SOUTH AUSTRALIA

Green Industries SA

Green Industries SA Act 2004

Guiding principles:

The circular economy

Waste management hierarchy

Ecologically sustainable development

South Australia's Waste Strategy 2020-2025

Turning the Tide on Single-use Plastics Products

Environment Protection Authority

Environment Protection Act 1993

Objects:

Ecologically sustainable development

The management of waste

Promoting resource recovery

Environment Protection (Waste to Resources) Policy 2010

Key features:

Sustainable waste management objective

Resource recovery processing requirements for most metropolitan Adelaide waste

Landfill bans

Plastic Shopping Bags (Waste Avoidance) Act 2008

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





Food waste arising from the residential sector

When food is brought into a household setting, it has almost reached the maximum level of its resource and economic inputs.

Whatever the source – whether the food is fresh produce or has been delivered as a prepared meal via an app – resources have been invested in a food's production, harvest, packaging, transport, storage and preparation. Even produce grown at home or locally has water, nutrient and time inputs.

Preventing food waste at the consumer level is critical. However, there will typically be some component of inedible food waste associated with food preparation and consumption. Often referred to as 'unavoidable' waste, this segment is highly variable but estimated to be between 30 and 50%³⁶ of household food waste, much of it going to landfill. Diverting this material at its highest value within the food waste hierarchy helps retain its embodied carbon and nutrients, minimising losses through the food value chain.

The environmental benefits of a three-bin system to divert household waste away from landfill are well established. The 19 local government councils servicing metropolitan Adelaide residents have offered three-bin systems for a number of years. Since 2005, funding has been available to local government to help implement improved kerbside collection systems for residents.

In low-density residential areas the three-bin system typically consists of mobile bins comprising a 140-litre residual waste bin, a 240-litre commingled recyclables bin and a 240-litre organics bin. Bin configurations for high-density or multi-unit dwellings may vary from standard offerings.

There is inconsistency between councils in how the three-bin system is provided. All metropolitan Adelaide councils provide a residual waste bin collected weekly and a recycling bin collected fortnightly, but

the organics service and support to divert food waste is variable. Metropolitan councils collect organics fortnightly; however, in some councils organics bins are optional or must be purchased by residents. Fortunately, this situation is changing.

The message to residents about what should go into each bin also alters between councils. Consistency in messaging and options to make the systems straightforward for residents are critical to increasing uptake and use.

The average kerbside bin-based landfill diversion rate across metropolitan Adelaide councils was 50% in 2016-17³⁷. Top performing councils – some achieving nearly 60% diversion – were those that provided all households with a weekly residual waste collection, fortnightly recyclables collection, fortnightly organics collection and food waste caddies. A full roll-out of food waste diversion systems across metropolitan Adelaide is expected to lift the recovery rate significantly.

Food waste makes up 40% of material by weight in household residual waste bins and up to 22% of total household kerbside collected material³⁸. At around 3.3kg per household of food waste presented for kerbside collection each week, it is one of the largest components of collected household refuse in metropolitan Adelaide, impacting on councils' landfill costs.

Since 2005, the State Government has provided more than \$8.3 million towards establishing consistent, best-practice household kerbside systems. Since 2010, funding to local government has been directed towards the roll-out of high-performing food waste diversion systems – typically comprising a kitchen caddy, compostable bag liners and educational material – to encourage the placement of food in the kerbside organics stream. For more detail see the section [High-performing council food waste collection systems](#).

In 2020, kerbside organics collection within the metropolitan Adelaide area have increased consistency, with fortnightly kerbside organics collections rolled out across metropolitan Adelaide.

While all metropolitan Adelaide councils allow food waste to be placed in residents' kerbside organics bins, in the absence of fit-for-purpose infrastructure in the form of a kitchen-based food waste caddy, and

sustained education and awareness efforts, the efficacy of this approach is questioned.

Increasing the uptake of food waste diversion systems in 'opt-in' council areas – where residents must contact the council to collect or purchase a kitchen caddy – is a key step in increasing the performance of kerbside collection systems, narrowing the gap between council diversion rates and making progress towards State waste targets.

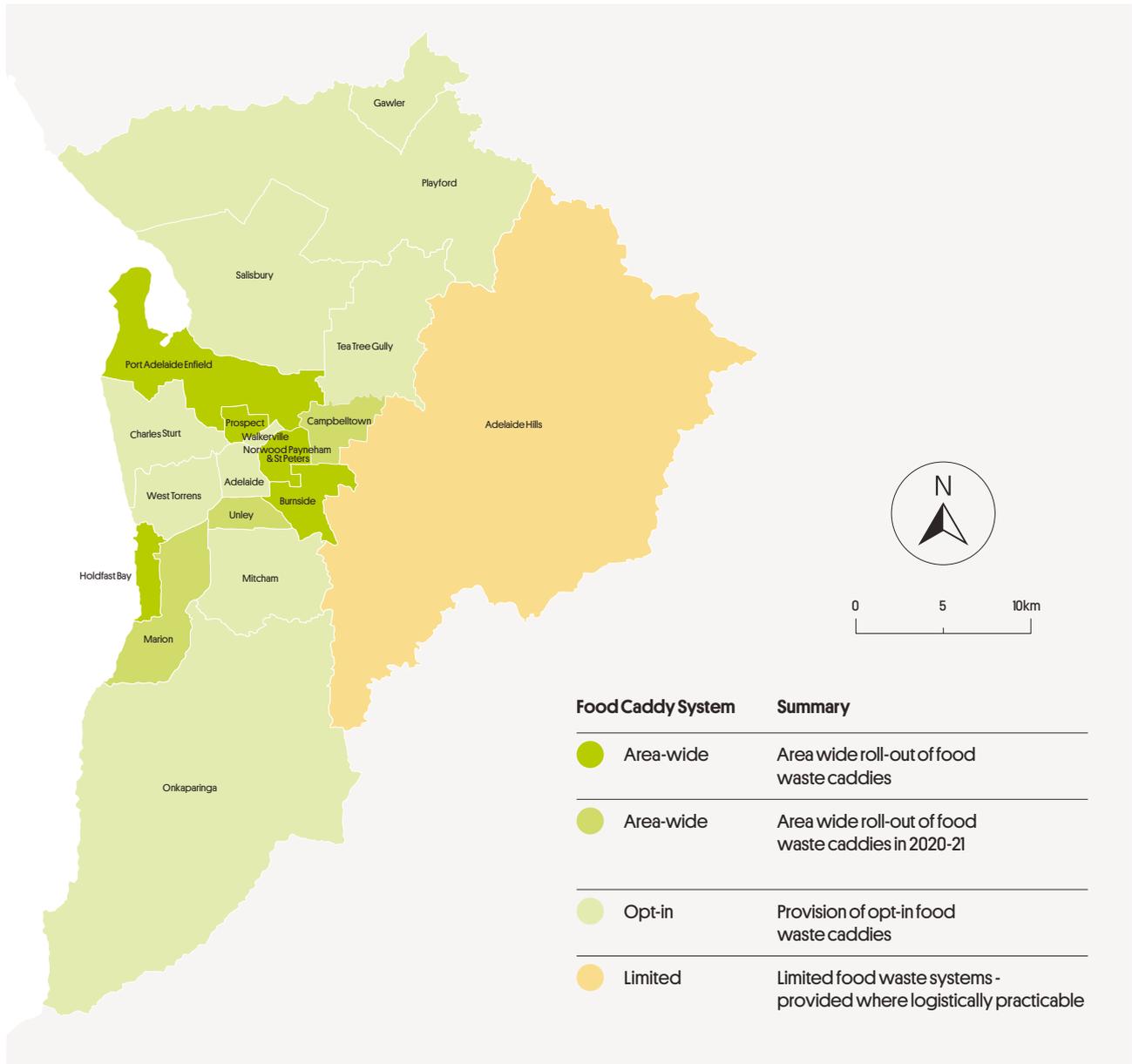


Figure 3 Metropolitan Adelaide Council Food Collection Systems, 2020-21

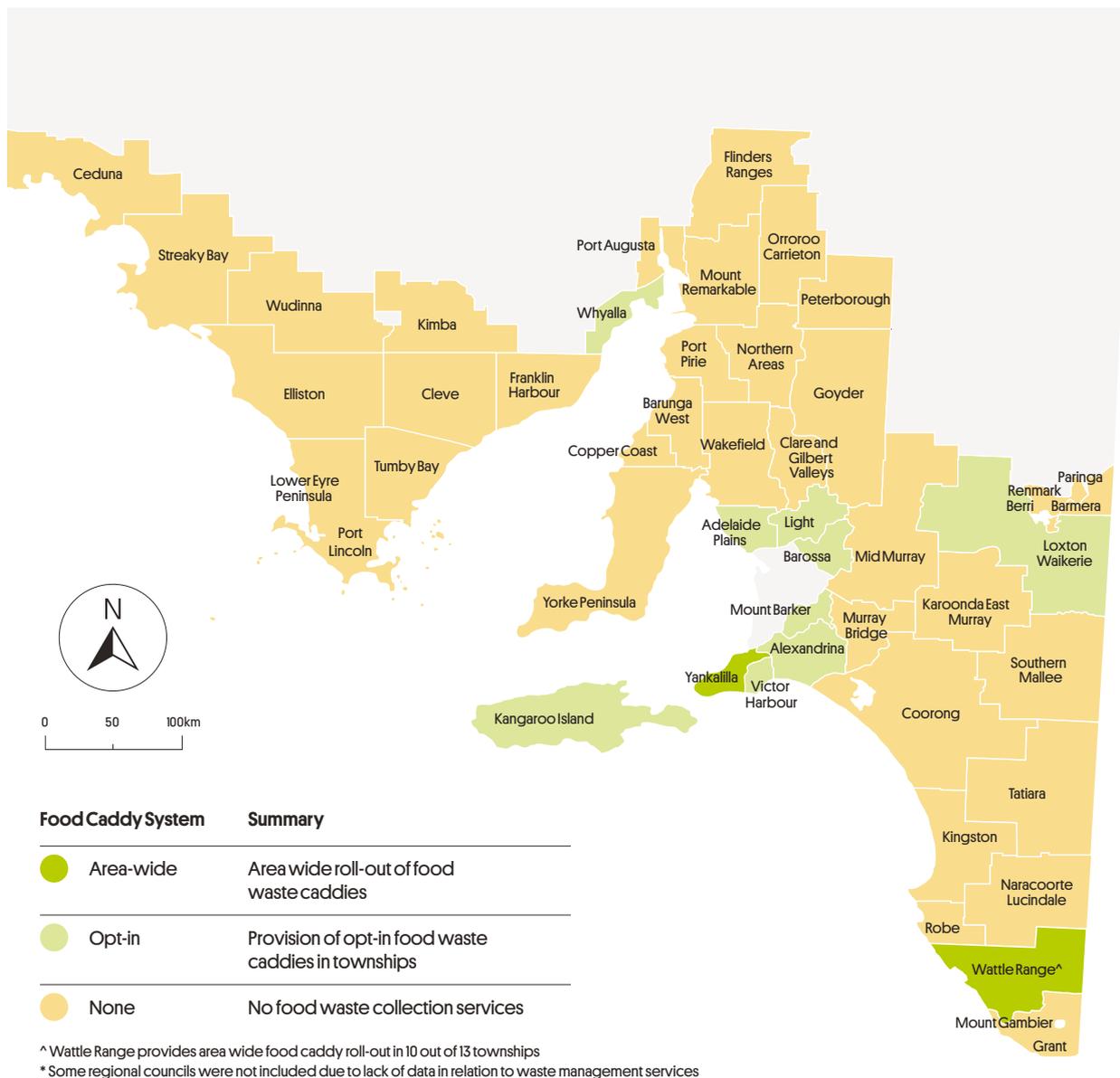


Figure 4 Regional South Australia Council Food Collection Systems, 2020-21

In addition to diverting food waste through council organics collections, home-based approaches such as composting, worm farms and feeding to backyard poultry contribute to the diversion of food waste from landfill, reducing the costs of collection and processing to councils and, in turn, to ratepayers.

Avoiding household food wastage is a long-term goal. It can be achieved by better supply chain management, purchasing decisions, improved knowledge of food preparation and storage of foodstuffs, adopting root-to-stem cooking and meal

planning. Investment in education and awareness programs will be needed to effect lasting behavioural change by individuals and communities.

Further investment in behavioural research will aid the development of programs to educate households and businesses about food waste-prevention actions. Tailoring food waste prevention and diversion communication messages to meet the needs of specific audiences may create peer learning opportunities through community groups or at local government level.

Actions for change

High-performing council food waste collection systems

In 2009-10, more than 17,000 households in 10 South Australian councils (metropolitan and regional) participated in a pilot program to divert food organics from the kerbside residual waste bin to the green organics bin for collection for commercial composting. At the time, it was the largest pilot of its type in Australia.

The program was designed to identify which factors contribute most to the diversion of household food waste from landfill. It included a cross-section of South Australian home locations and household types and tested:

- the collection of food waste as part of a fortnightly garden organics service
- responses to organic waste collection frequency
- the behaviour and volumes of food waste diverted from landfill if households had a ventilated kitchen caddy lined with compostable bags compared with an unlined, enclosed kitchen caddy.

The pilot incorporated a comprehensive community education campaign that included an information brochure, container and street bin-lid stickers, a collection calendar, written materials for local websites, newsletters and media releases.

The results were evaluated using market research, quantitative kerbside audits and odour monitoring. They demonstrated that the program was successful, with a high level of community acceptance and improved diversion rates³⁹.

The pilot provided evidence that enabled the development of State Government incentive schemes to encourage the uptake of food waste systems by local government; in 2020-21 the incentive operates as the *Green Industries SA Kerbside Performance Plus Food Waste Incentives* program.

As at June 2020, five councils had rolled out area-wide food waste collection systems and another 15 across the state have received financial support to implement a type of opt-in food waste collection system.

Despite the incentives, increasing landfill costs and documented greenhouse gas benefits, it is estimated that in 2020 only one in five households in metropolitan Adelaide has a kitchen caddy. This figure is based on data provided to Green Industries SA from the five councils that have implemented area-wide roll-outs of kitchen caddies (**Figures 2 and 3**), totalling 101,000 households, and data reported by other councils with opt-in food waste collection systems on the number of households that have requested kitchen caddies through their council.

Cost savings for local government

At 1 July 2020, the solid waste levy is set at \$143 for each tonne of waste sent to landfill in metropolitan Adelaide and \$71.50 for non-metropolitan Adelaide.

In 2018-19, 498,241 households in metropolitan Adelaide sent 250,900 tonnes of material to landfill⁴⁰. It is conservatively estimated that 35% of this material is food waste.

If only half of this material was diverted to composting operations through green organics bins, the average percentage recovery rate from metropolitan kerbside collections – currently 48.7% – would rise by approximately nine percentage points and collective landfill gate fee savings for metropolitan Adelaide councils would be in the order of \$6.8 million.

All metropolitan Adelaide councils allow food waste in the green organics bin, although there are differences in approach that contribute to highly variable participation and performance.

A full roll-out of food waste diversion systems across metropolitan Adelaide is expected to lift the recovery rate significantly and reduce the amount of materials presented in the kerbside general waste bin. Councils with opt-in organics collections have recovery rates up to 10 percentage points lower than those areas where area-wide roll-out of kitchen caddies have been implemented. The positive impact on household waste diversion rates from area-wide roll-out of food waste diversion systems has been demonstrated in other locations including Italy [see case study A], Germany and San Francisco.

Economic analysis⁴¹ undertaken in 2018 assessed a range of key potential food waste recycling initiatives in South Australia and the associated economic and greenhouse gas impacts of their implementation. The economic impact of the expansion of the kerbside food waste recycling program was estimated to be \$2.0 million in Gross State Product (GSP) in 2017-18 and increasing to \$2.9 million in 2020-21 before remaining steady at \$1.6 million from 2021-22 to 2026-27. Total employment (direct and indirect) was estimated at between 10 and 20 Full Time Equivalent (FTE) a year from 2017-18 to 2026-27. It would reduce greenhouse gas emissions by 23.6 kilotonnes carbon dioxide equivalent by 2026-27.

If this were to include the provision of compostable produce bags, the result would be \$3.7 million in GSP in 2017-18, increasing to \$7.2 million in 2020-21. Total employment would increase to 26 FTE jobs, peaking at an additional 50 jobs in 2020-21, and greenhouse gas emissions would decrease by 32.7 kilotonnes carbon dioxide equivalent by 2026-27.

In addition to diverting food waste, a kerbside green organics bin combined with a kitchen caddy or similar supports the diversion of non-food organic materials such as paper towels, tissues, serviettes and cut flowers.

Removing food waste and other organic material from the general waste bin largely reduces the odour as well as the volume of this waste stream, transferring both to the organics stream.

Provision of fortnightly collected kerbside organics bins to all households in low-density dwellings in metropolitan Adelaide council areas has been realised in 2020, enabling these households to divert food waste as well as garden and other organics. However, the implementation of food waste diversion systems in regional areas depends largely on the processing infrastructure available in the specific region. Green Industries SA continues to provide funding to increase regional processing capacity and the acceptance of food waste streams from regional kerbside organics bins.

Since July 2016, Alexandrina Council has provided fortnightly collections for all kerbside bins to reduce the amount of waste that goes to landfill and increase the rate of recycling. After an initial waste audit revealed that 69% of material in the general waste bin was recyclable or compostable, the Fleurieu Regional Waste Authority undertook several region-wide bin audits in 2012 to 2014, increased public consultation, and introduced a pilot program to reduce the waste sent to landfill. Its model included reducing general waste collection from weekly to fortnightly, offering residents more recycling and organic bin capacity, and enabling households with exceptional circumstances to apply for an additional general waste bin. In one year, this service model increased landfill diversion by 20%. In July 2019, the model was introduced to the adjacent City of Victor Harbor.

Various councils outside capital cities around Australia – including Bass Coast Council in Victoria and NSW's Byron Shire Council, Bega Valley Shire Council and Lake Macquarie – have successfully implemented kerbside collection models that incorporate fortnightly general waste and weekly organics collection services.

Support is being provided for metropolitan Adelaide councils to investigate how to increase the frequency of kerbside organic collections, particularly as the composition of the waste in household general waste bins changes. In 2020, Green Industries SA is supporting three councils to trial weekly organics collections in line with current legislation to examine the impacts of weekly collection on food waste diversion and community responses.

Monitoring and reporting on the trials' results in 2021-22 will help determine the required education and behaviour change measures to encourage diversion and address potential contamination issues that may arise, particularly with altered general waste collection arrangements.

These trials are a fundamental step in establishing the benefits in collection efficiencies, costs, diversion and community satisfaction associated with increased organics collection frequency, and potential approaches for extended application.

Case Study A

Area-wide household food waste diversion systems

Italy is home to more than 62 million people and food and wine plays an important part in its culture. However, food waste costs Italy's business and households more than €12bn (A\$18.5 billion) a year.

In 2016, the Italian government passed legislation to encourage the redirection of food to people or organisations in need, to prevent food from becoming 'waste' and enabling cities and towns of varying sizes to achieve high food waste diversion rates, sometimes very quickly.

Now, a balanced system of incentives and financial instruments exists for both municipalities and individual households in Italy to divert food waste from landfill. Households are offered choice in collection frequencies and services, and a segregated organics system (including new bins, kitchen caddies and free supplies of compostable liners) is provided. In addition, plastic bags for fruits, vegetable and bakery items have been banned nationwide and a mandatory small fee introduced for compostable alternatives.

Over four years, the northern city of Parma has increased food waste diversion to about 90% and achieves a low contamination rate (3-4%). The new organic waste collection system also brings economic benefits in terms of jobs and cost reductions for municipal waste collection services.

Other cities, such as Treviso and Milan, have experienced the benefits of an effective food waste collection system. In Treviso, the average household pays a reduced annual collection fee and experiences smaller increases in collection fees than the national average. In Milan, data indicates that separate food waste collection has had a positive influence on other segregated recycling streams⁴².

Moreover, the ban on non-compostable bags has shown significant environmental and social effects. At the same time, it supports the agriculture and bio-based sector.



Proposed actions

- 1** Continued financial support for the roll-out of universal, area-wide 'high-performing food waste collection systems' incorporating a kitchen caddy and compostable bags for diversion through kerbside green organics bins.
- 2** Research into the retention and use of kitchen caddy systems in council areas where area-wide food waste systems have been implemented, to evaluate behaviour and influence the design of financial support programs to enhance or maintain systems.
- 3** Work with councils to pilot more frequent collection of household organics bins and monitor and report on the results of changes and community responses.
- 4** 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)*.

Outcomes

- » Increased diversion of food waste from landfill to more beneficial uses.
- » Consistent messaging and systems to achieve diversion from household bin-based systems, as established in South Australia's Waste Strategy 2020-2025.
- » Opportunities for collaborative council procurement (e.g., bin infrastructure) leading to potential savings.

Partners

- » Residents
- » Waste and recycling industry
- » State and local government
- » Regulators

Links to other actions or strategies

- » [Action 5](#) – Bin and collection systems for high-density dwellings
- » [Action 8](#) – Provision of compostable bags
- » South Australia's Waste Strategy 2020-2025

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

Medium and high-density collections

Housing density is increasing in many areas of metropolitan Adelaide. Designing for three-bin collection (or equivalent high-performing diversion systems) for all residential sites is critical to enable food waste diversion, particularly as medium to high-density sites typically have fewer options for diversion of food waste through home-based approaches.

In higher-density housing, such as multi-unit high-rise apartments and townhouse developments, the profile of occupants and size of dwellings often mean standard residential three-bin offerings are not well suited to either the volumes of generated waste or allocated bin space. Increased housing density requires additional design considerations relating to waste management to provide effective systems and ensure collections do not present long-term amenity or safety issues that residents and local government must later address.

It is imperative that building and development designs allow adequate space for at least three segregated waste streams. Infrastructure such as large collection bins (often located in unit basements), waste chutes and vacuum collection systems for recycling and organics streams are suitable for consideration as a system response to manage waste from high-density developments. Development approvals should ensure systems are designed so residents can safely and conveniently move segregated waste and recycling to the bins, and so bin collection vehicles can easily access and empty them, including overhead clearance.

Where allowances have not previously been made for organics bins in existing housing due to small or no gardens, there should be assessment on a case-by-case basis to determine workable alternatives. Options include larger, communal mobile bins (660-1,100 litre) that may require collection arrangements outside standard contracts.

With a large proportion of medium and high-density housing, the City of Adelaide has been working with individual sites to establish food and organic recycling services in more than 50 residential and mixed-use development sites. Some have worked

with the City of Adelaide to develop system and infrastructure solutions during their design and development approval stages, but a number are existing sites where the standard three-bin service offerings are not suited. Large-scale medium to high-density developments within the City of Charles Sturt, City of Marion and City of Port Adelaide Enfield have also required working with developers to provide alternative bin collection systems and arrangements for residents to easily access and use.

In 2014, Zero Waste SA, Renewal SA and Property Council Australia released the *Better Practice Guide for Waste Management in Residential and Mixed Use Developments*⁴³. The guide is available for developers, architects, planning authorities, waste consultants and strata and community corporations as a basis for providing waste and recycling services in higher-density urban living. Formal adoption of the guide and its key elements continues to be promoted to introduce into the planning system guidelines, so residents in medium and high-density sites can easily recycle and divert food and organic waste for collection and processing. A planned update of the Better Practice Guide will consider development of online tools and training for stakeholders.



Proposed actions

- 5** *Pilot and evaluate models of alternative bin and collection systems for medium and high-density dwellings, often where little or no garden waste is generated.*

- 6** *Update the Better Practice Guide for Waste Management in Residential and Mixed Use Developments in consultation with state government agencies and local governments that reference the guidelines when considering and providing feedback on development applications in relation to waste management.*

- 7** *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.*

Outcome

- » By 2025, all residential properties in metropolitan Adelaide have access to an organics collection system.

Partners

- » Residents and businesses
- » Property developers and management
- » Regulators
- » Waste and recycling industry
- » State and local government

Links to other actions or strategies

- » [Action 1](#) – Financial support for roll-out of food waste collection systems
- » [Action 2](#) – Research into the use of kitchen caddy systems
- » [Action 8](#) – Provision of compostable bags
- » South Australia's Waste Strategy 2020-2025
- » State Planning and Design Code and policies

Compostable bag supply

Efforts by State Government to encourage the diversion of food waste from households to more beneficial uses, such as composting, have been in place since 2010. The approach, informed by an extensive pilot (refer [High-performing council food waste collection systems](#)), has been largely based on the use of kitchen caddies and compostable liners, along with education and awareness campaigns. Importantly, the compostable liner meets Australian Standard 4736-2006 (Biodegradable plastics—Biodegradable plastics suitable for composting and other microbial treatment) or Australian Standard 5810-2010 (Biodegradable plastics—Biodegradable plastics suitable for home composting), including appropriate labelling of bags.

Although food waste may be placed directly into the green organics bin, and enclosed kitchen caddies are available, this process can be a barrier for some households. Provision of compostable bags to households to line ventilated kitchen caddies has been demonstrated to significantly increase the uptake and ongoing use of these systems. Research has shown ventilated kitchen caddy systems had a significantly higher percentage of food waste captured, at 28.0%, compared to 9.3% with enclosed caddies⁴⁴. A 2019 bin audit across East Waste member council areas showed compostable bags were the preferred method of disposal, being used for three-quarters of the food waste disposed in green organic bins⁴⁵.

Residents and commercial employees are accustomed to placing waste in lined caddies or bins that are taken to the bigger collection bin when full. When rolling out a food waste diversion system, householder acceptance increases when a kitchen caddy with a compostable liner option is offered. Compostable bags in a ventilated caddy contain the food waste while allowing ventilation, reducing build up of moisture in the caddy and the potential for odours when subsequently placed in an outside organics collection bin.

Since July 2010, the State Government has provided funding for the provision of compostable bags to households through local government channels, either at no cost or at a discounted price. In addition, many

supermarket, home supply and hardware stores now stock compostable bags.

However, compostable bags come at a cost, whether it is borne by the householder, local or State Government. A July 2018 study commissioned by Green Industries SA indicated that the compostable bags cost \$0.054 each whereas the traditional plastic bags provided by supermarkets cost \$0.01 each⁴⁶. Although the cost of compostable bags has decreased significantly in the last few years as demand for the product increases and new manufacturers enter the market (including one in Adelaide), they remain more expensive than traditional thin plastic barrier bags.

In 2018, the State Government funded the City of Holdfast Bay to conduct a 12-month trial of providing compostable bags for loose fruit and vegetables in two supermarkets. Compostable bags replaced plastic barrier bag rolls and customers were asked to reuse the bags to collect food scraps for placement in council-collected green organics bins.

The trial resulted in 117% more food being diverted from landfill to green organics bins – the equivalent of 0.48kg⁴⁷ more food waste for each household each week. Expanding this figure across the council area would divert an estimated 308 tonnes more food waste from landfill and save tens of thousands of dollars in annual landfill levies alone.

Two large supermarkets introduced compostable barrier bags for all fresh produce, meat and bakery areas on an ongoing basis in 2020. Trials are being undertaken at an independent supermarket and a major supermarket chain, initially in areas where food waste collection systems have been rolled out to all households – removing the single-use nature of the bags.

In conjunction with monitoring retail introduction of compostable barrier bags and continuing to support the roll-out of kitchen caddies, measures to include plastic barrier bags as a prohibited product under the *Single-use and Other Plastic Products (Waste Avoidance) Act 2020* will be progressed to expand the availability of compostable bags.



Proposed actions

- 8 *Improve householders' access to a supply of compostable bags through councils and retail.*
- 9 *Monitor retail trials and roll-out of compostable barrier bags, including community response and acceptance.*
- 10 *Progress inclusion of polyethylene plastic barrier bags (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.*

Outcome

- » Households have access to a supply of labelled compostable bags (AS 4736-2006 or AS 5810-2010) from supermarkets and retail outlets, prompting householders to divert food waste in their home.

Partners

- » Residents
- » Retail sector
- » Regulators
- » State and local government

Links to other actions or strategies

- » [Action 1](#) – Financial support for roll-out of food waste collection systems
- » South Australia's Waste Strategy 2020-2025
- » Turning the Tide on Single-Use Plastics: Discussion Paper and Next Steps, 2019
- » *Single-use and Other Plastic Products (Waste Avoidance) Act 2020*

Behaviour change, education and awareness

Most people do not buy food with the intention of wasting it. Food purchasing decisions, preparation and storage behaviour, and the value placed on food, are highly individual. Changing household circumstances or emergency situations, such as natural disasters or pandemics, also significantly affect food purchasing and management, both short and long term. In addition, how food waste is defined and the perception of any health risks associated with food can differ between households, individuals and settings.

Communication, education and awareness will be important in making people aware of the value of food while shopping and preparing food, and in building a culture of food waste avoidance and diversion behaviour.

In April 2018, the Commonwealth, state and territory environment ministers agreed to align their community education efforts to cut food waste and to encourage residual food waste to be composted. Additional investment in household behavioural research and actions to encourage changes in household food management practices will be explored through the Fight Food Waste CRC. Partnering with participants from across industry, government and the not-for-profit sector, Green Industries SA is participating in the Fight Food Waste CRC project “Designing effective interventions to reduce household food waste”. Green Industries SA is also participating in a research project with East Waste and the University of Adelaide through the Fight Food Waste CRC to examine South Australian food waste disposal behaviour in greater detail and ultimately support the design of programs to reduce household food waste from entering landfill. Alongside research undertaken through the *Zeroing in on food waste: Measuring, understanding and reducing food waste* Australian Research Council project, this work will inform community education efforts.

Implementing best-practice collection systems is critical. However, these must be underpinned with education and awareness campaigns. In May 2019, the state-wide *Which Bin?* community recycling education campaign was launched. The integrated campaign aims to educate householders to maximise diversion and minimise contamination in yellow comingled and green organics bins.

Following extensive market research and a nationwide review of local and interstate recycling education messages, the ‘which bin?’ phrase formed the cornerstone of a new brand and state-wide integrated marketing campaign. Delivered through platforms including television, press and social media, it is supported by a website,

telephone hotline and online contact. Follow up research has demonstrated cut-through with target audiences, high public engagement with ‘Vin’ and his family members, and support for the simple campaign messages⁴⁸. Working closely with councils, *Which Bin?* will continue to be delivered as the state government-led education and awareness campaign to provide clear, consistent messaging to effect change in household recycling behaviour.

There is a continued need for education on what food waste and other compostable material can go in the green organics bin and that the material is processed at an industrial composting facility, capable of processing bones, egg shells, pizza boxes, paper towels and tissues as well as the more commonly accepted vegetable tops and peelings.

Council-specific *Which Bin?* communications, complemented by kitchen caddies and compostable bags, supports the diversion of food waste and increasing awareness about how best to manage inedible food waste or food that is no longer suitable for consumption. There are opportunities to expand the format of this campaign to incorporate food waste avoidance messaging.

The act of separating food waste for diversion through the household green organics bin is an awareness-raising exercise in itself. However, whether this measure alone prompts people to take steps to avoid generating food waste is not clear.

Programs such as *Love Food Hate Waste*, *Fight Food Waste* and *Foodwise* target food waste prevention activities, reaching the highest level of the waste hierarchy. With 34%⁴⁹ of food waste in Australia generated in homes and about half of this considered to be preventable, broader community understanding of households’ impact is needed, aided by information to respond and take action.

Love Food Hate Waste was developed by WRAP in the UK and has contributed to a 23% reduction in household food waste (excluding inedible parts) in the UK over eight years⁵⁰. In Australia, *Love Food Hate Waste* has been rolled out and further developed since 2009 by the NSW and Victorian governments, Brisbane City Council and, recently, Australian Capital Territory.

To support householders to take action, tips and supporting resources are provided for shopping routines, storage, and recipes to use remaining ingredients and different parts of produce which may have been considered waste. In NSW and Victoria, grants are offered to councils, businesses and community organisations to expand the program through local or societal networks.



OzHarvest launched the *Fight Food Waste* campaign in 2018 with a graphic representation of the amount of food waste generated in Australia. It urges consumers to undertake four practical actions: look, buy, store, cook. The UK's *Trifocal* is another food waste campaign that explores how prevention and diversion messaging (as well as healthy eating) may help residents change their habits.

An approach to delivery of a campaign, incorporating research from the Fight Food Waste CRC projects relating to household behaviour, existing research, and learnings from implementation of programs elsewhere, will be developed to support the prevention of household food waste. Adapted to the South Australian context, a campaign and extension activities will raise awareness, offer solutions and prompt food purchasing and preparation decisions.

Proposed actions

- 11 *Continue the state-wide recycling campaign Which Bin? to increase and improve three-bin system recycling, including food waste diversion through the green organics bin and home composting.*
- 12 *Working alongside government, not-for-profit and industry partners through the Fight Food Waste CRC, collaborate on research projects to develop effective behaviour change interventions.*
- 13 *Determine and implement an integrated education and awareness program that supports food waste prevention in the residential sector.*
- 14 *Partner with community programs and groups to extend food waste prevention messages.*

Outcome

- » 50% reduction of food waste in household residual waste bins by 2025.

Partners

- » Residents
- » Community organisations
- » Waste and recycling industry
- » All levels of government

Links to other actions or strategies

- » [Action 1](#) – Financial support for roll-out of food waste collection systems
- » [Action 2](#) – Research into the use of kitchen caddy systems
- » [Action 8](#) – Provision of compostable bags
- » South Australia's Waste Strategy 2020-2025

Home-based approaches

Home-based approaches to diverting food waste include composting, worm farms, bokashi buckets, and feeding backyard poultry. These practices contribute to diversion from landfill and complement the broader uptake of kerbside collection systems.

It is estimated that between 30 and 40% of households undertake composting or other measures to manage at least a portion of their food waste at home. There is more limited data available on the volume of food waste directed to these approaches. In practice, less waste should be presented at kerbside for collection.

Recycling food waste at home or locally, to be used for household or community applications, is one of its highest value uses. The transport of the organic waste is eliminated, and the nutrient-rich soil outputs are reintegrated into soils, often nurturing home-grown fruits and vegetables and contributing to a circular food cycle within the home and backyard.

Home-grown produce is inherently local, seasonal and able to be consumed at its freshest without any packaging, transport or processing. Sharing any surplus produce or participating in a local food-swap program within the local community avoids waste while generating social interaction and knowledge sharing.

Home-based composting does not reach the same high temperatures that are achieved at commercial composting operations so there are some materials better suited to commercial processing after collection in the kerbside green organics bin. For example, many of the compostable food service items are only certified for commercial composting [AS 4739-2006] although there is also an Australian Standard for products suited to home composting [AS 5810-2010].

Bones, shellfish waste and meat products are often not included by householders in their home systems due to not breaking down at lower temperatures or concerns about attracting vermin. Worm farms can manage food waste in small spaces, producing high-potency liquid and solid fertiliser for gardens and lawns. However, worms will only accept certain items. Kerbside organics bins complement these systems as receptacles for any food waste that households would rather not incorporate into home systems or that is not suitable for backyard poultry or the like.

Written and online information on home-based systems can encourage residents who have space at home, or in nearby community gardens, to manage their food waste locally and benefit from the outputs.



Proposed actions

- 15** *Encourage home-based approaches for diverting food waste, including home composting, worm farms and backyard poultry.*

- 16** *Provide guidance and education to encourage home and community (including school) food growing, using compost to improve plant vigour and yield while returning nutrients to the soil.*

- 17** *Promote the sharing of produce within local communities.*

Outcome

- » More residents manage their food waste onsite, using output to grow food for themselves and their neighbours.

Partners

- » Residents
- » Schools and community organisations
- » State and local government

Links to other actions or strategies

- » South Australia's Waste Strategy 2020-2025



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what can be placed in your food recycling bin?

- vegetables
- fruit
- bread
- rice
- spices
- herbs
- tea
- coffee
- eggshells
- bones
- meat scraps
- cheese
- nuts
- peanut butter
- oil
- liquids

what can't be placed in your food recycling bin?

- plastic
- metal
- glass
- styrofoam
- cardboard
- paper
- textiles
- hazardous materials
- chemicals
- pesticides
- paint
- solvents
- bleach
- antibiotics
- antifreeze
- oil
- grease
- motor oil
- car oil
- antifreeze
- bleach
- antibiotics
- antifreeze
- oil
- grease
- motor oil
- car oil

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food organics
recycling

Commercial and industrial food waste

In South Australia, waste audits have revealed that food waste is the largest component of the commercial and industrial (C&I) waste stream, comprising 26% of the total waste by weight⁵¹. Similar composition ratios were found at a national level⁵² with food organics making up about 22% of total waste. The National Food Waste Baseline estimates that 768,000 tonnes of food waste goes to landfill from the commercial and industrial sector each year.

Preventing this waste can provide significant financial returns for businesses. Champions 12.3 is an international coalition of executives aiming to achieve the United Nations' SDG 12.3 targets. Its *Business Case for Reducing Food Loss and Waste*⁵³ presents a strong case for industry to invest in food waste prevention activities. International data from 1,200 sites indicated that nearly every site had a positive return on investment, with more than half recouping \$14 or greater for every \$1 invested.

As with the residential sector, there is a significant component of inedible food waste associated with food preparation across business, institutional and other organisational sites.

Waste collection services for commercial premises may be provided by a paid private contractor, the landlord or local council. If a waste management system that suits their waste quantities and composition is available to businesses via their council rates or tenancy, businesses will generally use these options as the costs are generally integrated or immaterial.⁵⁴

The collection of commercial waste and recycling streams is primarily undertaken by private-sector waste collection companies that charge businesses a fee for each service provided. Fees include bin rental, collection and associated operational costs, plus a profit margin. Many of the collection costs – such as driver, truck maintenance, fuel and waste destination costs (that

is, gate fees charged by transfer stations, landfills and composting operations] – are relatively fixed, whereas bin rental and collection frequency can vary.

Establishments ranging from restaurants and retailers to office buildings, universities and hospitals rely on private waste-collection companies to collect their waste on a regular basis with minimal inconvenience. In most areas, council waste collection services extend to select commercial businesses, generally at the small to medium enterprise (SME) level for general waste and comingled recycling.

Commercial, mobile organics bin collections were introduced into Adelaide in 2008. The State Government provided eligible business services with incentive programs from 2008 to 2015 to increase the amount of food and other organic waste collected from businesses that could be processed into soil improvement products and to improve collection densities for greater economies of scale.

Increasing organic waste collection densities (number of bin lifts per kilometre) should lead to more efficient and cost-effective collections by reducing the truck movements required per customer. Passing on any savings from the waste collection companies may reduce the waste management fees and charges for businesses. If food waste is removed from the general waste bin, leading to less frequent bin collections, businesses may save money on their waste management contracts. It is important that businesses review their waste service agreements and negotiate changes with their waste service provider to reflect a reduction in the general waste stream and frequency of collections.

Businesses across metropolitan Adelaide that have engaged food waste collection services include supermarkets, shopping centres, hospitals, aged care facilities, food manufacturers, restaurants and facilities management services.



A 2015 pilot project across two precincts⁵⁵ showed it is possible to save money on waste disposal costs by introducing a commercial food waste service, but only if the number of privately contracted general waste bins is reduced. Smaller businesses generally do not produce enough food waste to reduce the number, size or collection frequency of their general waste bins and have less power to influence collection companies to alter their collection arrangements. As a result, they are more likely than large sites to have increased waste disposal costs by diverting food waste through an additional collection service.

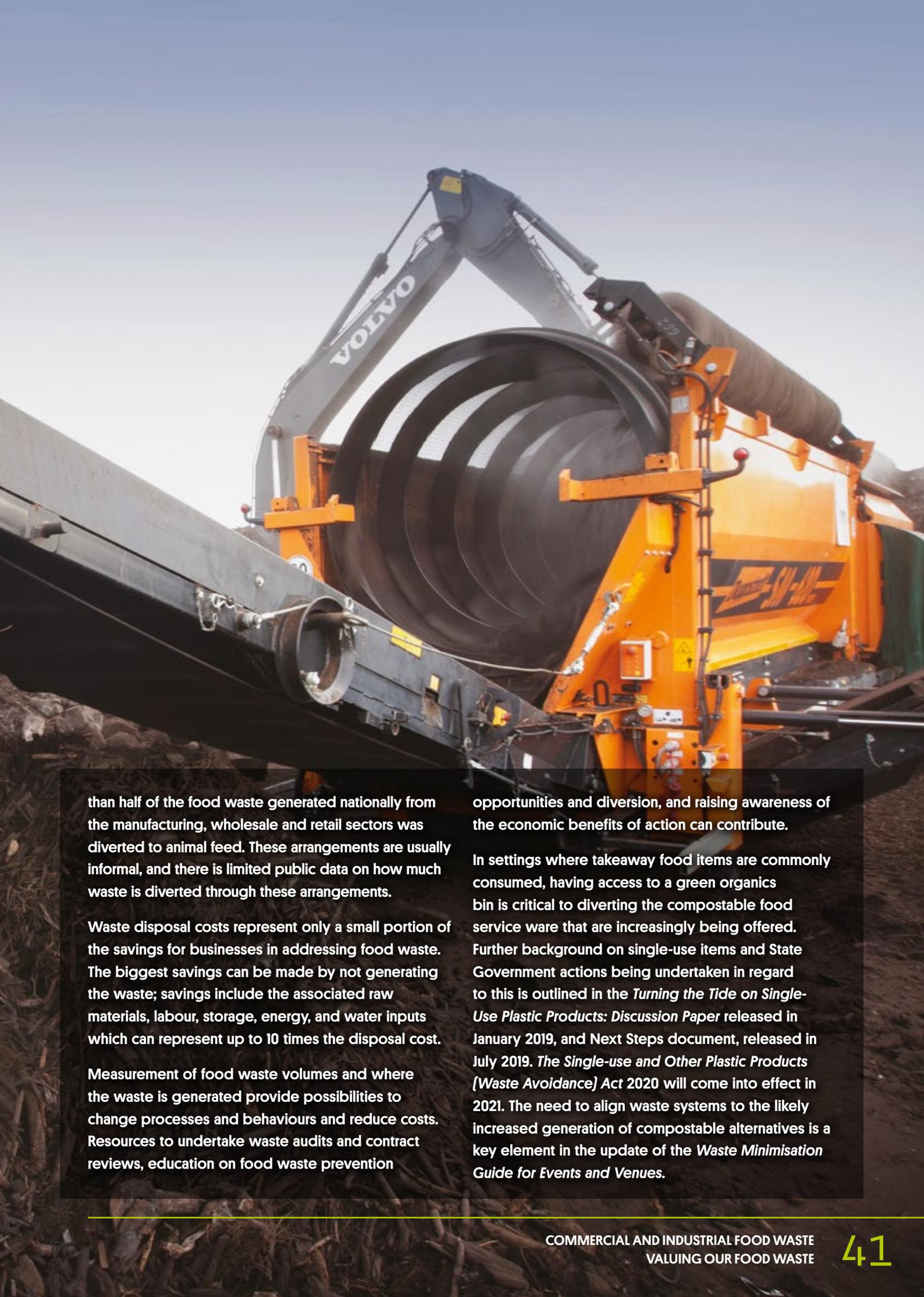
Businesses are most likely to be able to reduce the overall cost of waste management services when introducing a food waste collection if:

- They are a large site or a site where multiple businesses share bins serviced through a waste contract. This includes buildings where a landlord manages the waste contracts on behalf of the tenancies.
- There is a significant amount of food waste being diverted through a food waste collection service, resulting in reduced general waste collection servicing fewer bins and/or reduced frequency of lifts.
- They have accurately assessed the requirements for their sites and are able to negotiate their waste contracts.

Commercial waste collection contractors typically charge customers on a per bin-lift basis, regardless of the weight of the material picked up or how full the bin is when presented for collection. The per-lift cost of commercial food waste bin collection is slightly higher than that of a general waste bin, primarily due to collection densities. However, this is changing. Putrescible material such as food organics also requires more frequent collection than non-putrescible residual waste. Mobile food waste bins are limited in size, from 600 litres to 1,100 litres depending on the weight of the material and access arrangements; this means some businesses need to contract multiple bins.

If waste and recycling were to be collected on a per tonne basis, the cost of a food waste bin collection and disposal is likely to be lower than that of the collection of a general waste bin. This is because food waste is heavy due to its high moisture content and when disposed to landfill will be charged a gate fee that includes a weight based (per tonne) landfill levy. Food waste sent to a compost operation will be charged a gate fee only (excluding the landfill levy).

In addition to privately contracted waste collection services, some food manufacturers and retailers have an arrangement with farmers to divert appropriate food waste to animal feed (such as piggeries). Where arrangements are in place, the material must be appropriate and be allowed under the *Livestock Act 1997*. The National Food Waste Baseline found that more



than half of the food waste generated nationally from the manufacturing, wholesale and retail sectors was diverted to animal feed. These arrangements are usually informal, and there is limited public data on how much waste is diverted through these arrangements.

Waste disposal costs represent only a small portion of the savings for businesses in addressing food waste. The biggest savings can be made by not generating the waste; savings include the associated raw materials, labour, storage, energy, and water inputs which can represent up to 10 times the disposal cost.

Measurement of food waste volumes and where the waste is generated provide possibilities to change processes and behaviours and reduce costs. Resources to undertake waste audits and contract reviews, education on food waste prevention

opportunities and diversion, and raising awareness of the economic benefits of action can contribute.

In settings where takeaway food items are commonly consumed, having access to a green organics bin is critical to diverting the compostable food service ware that are increasingly being offered. Further background on single-use items and State Government actions being undertaken in regard to this is outlined in the *Turning the Tide on Single-Use Plastic Products: Discussion Paper* released in January 2019, and Next Steps document, released in July 2019. *The Single-use and Other Plastic Products (Waste Avoidance) Act 2020* will come into effect in 2021. The need to align waste systems to the likely increased generation of compostable alternatives is a key element in the update of the *Waste Minimisation Guide for Events and Venues*.

Actions for change

Precinct organics recycling opportunities

Any business that exceeds residential quantities of general waste and comingled recycling requires a commercial waste collection arrangement. While some councils offer a residual and comingled recycling bin, very few commercial premises have access to a council-operated organics service or collection at the frequency required. As such, organic waste collections need to be arranged through a private waste contractor.

Collection or transport businesses that collect solid (including food) waste from commercial or industrial premises for fee or reward require a license under the *Environment Protection Act 1993*.

There are several large, private-sector waste collection companies operating in metropolitan Adelaide, each managing vehicles to collect their customers' general waste bins and comingled recycling.

The fundamental service that commercial collection companies offer is similar, with their routes largely based on customer contracts and preferences.

Individual companies plan their own routes; as they compete with each other there will be different companies servicing the same suburbs and commercial precincts on any given day, leading to inefficient and possibly unnecessary truck movements. The effective and economic collection of this waste requires more efficient collection routes.

Since 2008, commercial organics collections have worked within the private waste-contracting sector, with one collection service predominantly responsible for organics waste across the metropolitan area through sub-contracting arrangements. This model increases the collection densities and reduces truck movements within an area.

Mapping food waste generators could help provide useful market information to contractors and collectors and potentially improve their collection efficiencies should the density of pick-up locations increase. Alternatively, opportunities for aggregating segregated organic waste from a precinct for processing on-site or as a collection point may be identified.



Proposed actions

- 18** *Map food waste generation to identify potential improvements in collection density and efficiencies or opportunities for alternative recycling processes, including on-site processing.*
- 19** *If mapping and other evidence supports the potential for services improvements to be made, develop and trial an appropriate precinct recycling model.*

Outcome

- » A food waste generation map identifies areas where more commercial food waste services may be introduced to increase the volumes of collected waste.

Partners

- » Businesses and industry
- » Regulators
- » Property and facility managers
- » Waste and recycling industry
- » State Government

Links to other actions or strategies

- » [Action 22](#) – Design approach for phase-in of mandatory food waste recycling
- » South Australia's Waste Strategy 2020-2025

Business food waste prevention

Since the release of its *Business Case for Reducing Food Loss and Waste*, the coalition Champions 12.3 has released international, industry-specific business cases for hotels, catering and restaurant services. The business cases indicate that food-waste prevention activities in these sectors can bring returns of \$6 to \$7 for each \$1 invested, with expenditure largely recouped within two years.

When the amount of waste and its origins were considered, the greatest returns were possible through prevention measures introduced close to the point of consumption, due to the high level of inputs – including materials, staff time, energy and water – invested at that stage. Engaging staff across the business influences ordering processes, storage practices, preparation, and food waste from customer plates, and enables them to consider opportunities for prevention or recovery.

At a national level, a proposed voluntary commitment program⁵⁶ to engage with industry sectors within the supply chain, and move food waste up the food recovery hierarchy, will be progressed through the National Food Waste governance entity, Stop Food Waste Australia. Raising awareness of where the volumes of food waste arise and opportunities to influence food wasted upstream and downstream within the food supply chain will be an important element.

Food waste reduction programs for the food service sector, such as *Your Business is Food* developed by the NSW Government and WRAP UK's *Guardian's of Grub*, provide resources and tools to help businesses examine and quantify where waste is occurring and encourage staff to reduce waste and the associated costs.

In 2010, Green Industries SA created a *What can we do about food waste?* video to motivate the restaurant, catering and hospitality industry to divert food waste from landfill. There is the potential to expand the reach of its valuable message by developing case studies to showcase best-practice waste management and internal and external diversion systems.

Industry associations will be engaged to help develop a pilot prevention program and education materials for businesses, including resources such as waste-contracting information and a set of resources to help management and staff make simple, low-cost changes to the way food is purchased, managed, prepared and served.

With established relationships with food businesses and understanding of business food waste management, existing council business networks and Environmental Health Officers can also support disseminating resources and information to businesses.

As businesses undertake food waste prevention measures, it is important that existing waste services are aligned to waste volumes and materials. Green Industries SA's Circular Economy Business Support Program helps businesses audit and manage their waste and provides funding for industry associations to deliver avoidance and diversion programs to businesses in the food sector.



Proposed actions

- 20** *Develop toolkits and resource packs for business, incorporating:*
- » *avoidance and lean-production messaging*
 - » *tools to measure and report food waste at key generation points (spoilage, preparation, plate scraping)*
 - » *waste contracting information and guidelines*
 - » *menu design tips*
 - » *information on compostable food service ware, including disposal information*
 - » *resources to measure, prevent and divert food waste*
 - » *best-practice case studies.*

- 21** *Pilot the promotion and roll-out of a business resource tool kit to relevant industry bodies and establish a dedicated contact to support businesses to introduce avoidance and reduction measures through the Circular Economy Business Support Program.*

Outcome

- » Businesses can measure their food waste and identify opportunities to prevent its generation and divert remaining surplus food and preparation waste.

Partners

- » Businesses and industry
- » Food manufacturers and distributors, including retailers
- » Waste and recycling industry
- » State Government

Links to other actions or strategies

- » [Action 18](#) – Precinct commercial organics recycling
- » [Action 22](#) – Design approach for phase-in of mandatory food waste recycling
- » South Australia's Waste Strategy 2020-2025



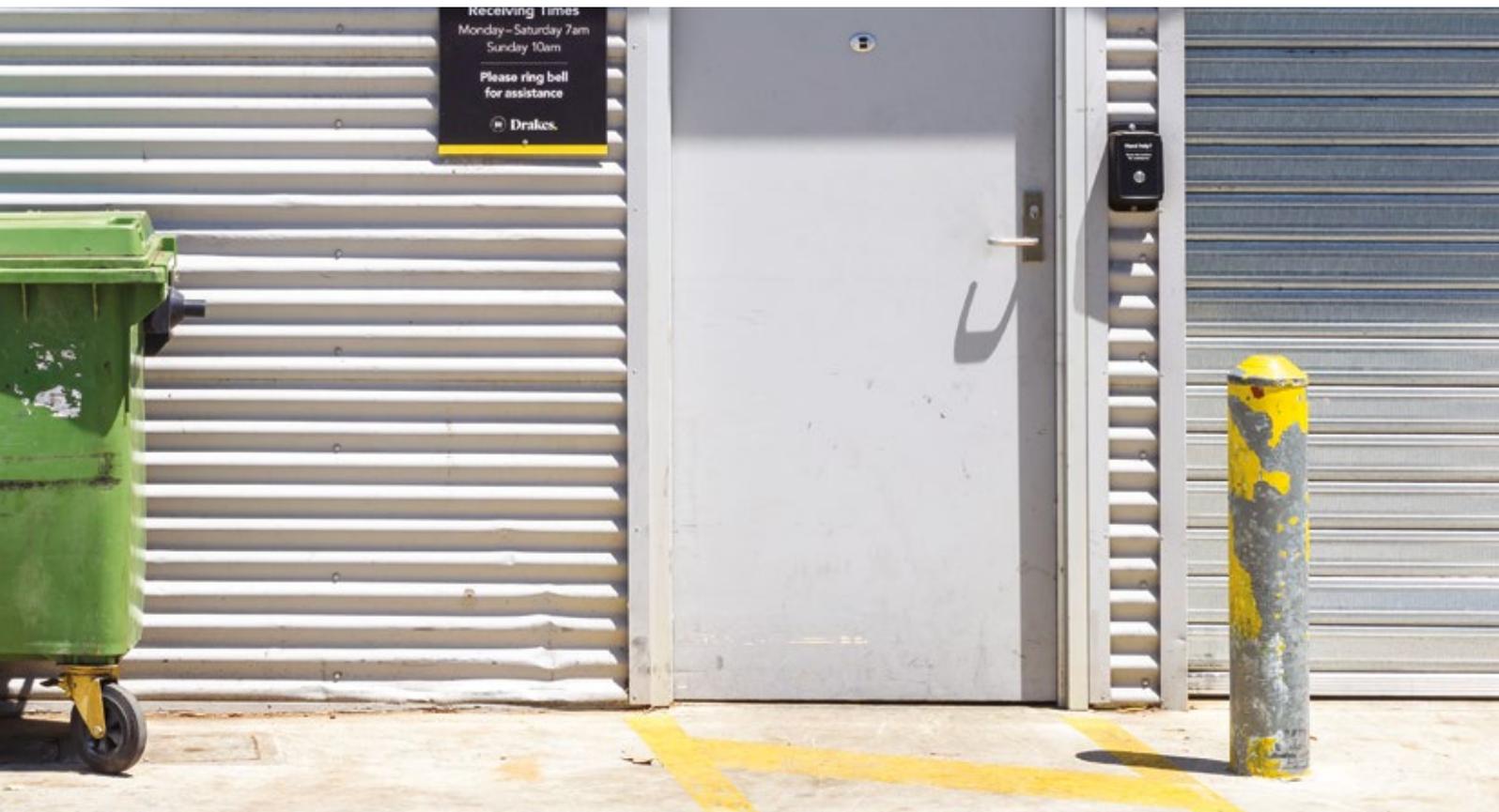
Mandatory food waste recycling for large generating sites

While food waste recycling measures are increasingly being introduced internationally, as at 2020, there are no mandatory measures in Australia.

Many countries are well advanced in implementing restrictions sending organic material to landfill. In Massachusetts, a disposal ban on commercial organic material is significantly decreasing the amount of food waste diverted from landfill⁵⁷. Five other states and a number of municipalities across the United States have also introduced organic waste bans or passed mandatory recycling laws⁵⁸. Other countries with requirements to redirect commercial food waste from landfill include France, Scotland, Ireland, Germany, Italy, Singapore, the Philippines and South Korea⁵⁹. Legislative measures have led to benefits including collection efficiencies, job creation, and investment in food waste recycling facilities and processing infrastructure.

Commercial waste programs in NSW and the Gold Coast have found food waste represents 50 to 60% of total waste by weight⁶⁰ from hospitality and food retail sites. Food processing and manufacturers at the start of the supply chain often have high levels of unavoidable food waste components such as peels, bones and shells. Generally unpackaged, these streams are largely uncontaminated and easily diverted for animal feed or rendering, or to commercial composting operations.

The successful introduction of mandatory measures usually requires a phased-in approach with appropriate support for affected businesses and waste generators, starting with collected segregated loads and large generating sites and then gradually reducing permissible volumes of waste.



It is critical that suitable segregated waste and recycling services, or alternative recycling pathways for food waste, are available and used correctly. The waste and recycling services provided at large sites, shopping centres and office buildings may be contracted and managed by the landlord, facilities manager or cleaning contractor. Once food waste recycling is introduced, general waste collections can often be reduced so overall waste costs do not increase.

Sites for which mandatory food waste recycling requirements could apply include universities and schools, residential care facilities, student accommodation, correctional facilities, manufacturers of food products, food courts, buildings over a certain size, supermarkets and airports. Sites such as these generate large volumes of organic waste and require privately contracted waste and recycling services. They are likely to achieve costs benefits in

introducing segregated organics collection services, which many have actioned, or present opportunities for alternative technologies to recycle food waste on site or within a precinct.

Economic and greenhouse analysis undertaken in 2018 to investigate the potential benefits of implementing a ban on commercial food waste to landfill in metropolitan Adelaide indicated a net benefit of \$56.2 million over a 20-year period, alongside a potential 40% reduction in greenhouse gases⁶¹ over the base case.

A staged introduction period complemented by a business support program with dedicated resources is critical to the success of mandatory measures and a key component of international legislation. Resources can include waste audits, contract reviews, education on food waste avoidance and diversion, and information on reasons for implementation measures and available assistance.

Tailored to the metropolitan Adelaide area, a phased-in approach to mandatory recycling of food waste could be developed with consideration to:

- collection and processing systems and infrastructure, including alternative recycling pathways
- waste generators included
- appropriate staged timing for implementation
- supporting mechanisms for facilities and sites
- compliance and enforcement measures.

Consultation with industry and stakeholder representatives about generation, collection and processing options is the necessary first step in planning and introducing restrictions to the disposal of commercial organics to landfill.

A cohesive package of business support services specific to food businesses and the property management sector should support any mandatory measures. In addition to programs to reduce generation of food waste, information explaining how to donate surplus food or sell it at considerable discounts at the end of the day's trading, and how to divert unavoidable food waste and other compostable materials, is also required.

Case Study B

Commercial food waste disposal ban

Massachusetts has almost seven million residents. Food and other organic material represents more than 25% of the waste stream. The Massachusetts Solid Waste Master Plan 2010-2020 set a target to divert at least 35% of source separated organics from landfill by 2020.

Since 1 October 2014 the Commercial Food Materials Disposal Ban has required all businesses and institutions producing one tonne or more of commercial organic wastes a week to have diversion or recycling systems in place. The policy covers about 1,700 hospitals, colleges, supermarkets, hotels, nursing homes, prisons and other facilities. Systems may include donating edible food or diverting it to composting, animal feed or anaerobic digestion facilities.

Programs and resources to help industry meet the requirement include:

- the recycling assistance program RecyclingWorks
- grants and loans to help develop composting and anaerobic digestion facilities
- a map of food waste generators to facilitate collection and processing efficiencies.

The ban has laid a foundation for a robust organic waste diversion industry and has encouraged businesses and institutions to adopt better food waste practices. According to an ICF⁶² report, it has helped drive a growth in employment and investment, creating 900 jobs and \$175 million in economic activity in Massachusetts.



Proposed actions

- 22** *Examine models enabling the phase-in of mandatory food waste recycling for metropolitan Adelaide businesses and major centres based on the size of their operations and/or food waste generation volumes and the availability of appropriate processing options.*
- 23** *Undertake analysis of potential intervention models and appropriate thresholds to inform regulatory pathways and possible outcomes.*
- 24** *Develop new and expand existing information resources for businesses to support the implementation of mandatory measures [refer [Action 20](#)].*
- 25** *Develop minimum standards for segregated waste and recycling systems for South Australian Government sites, including organics recycling where available, and work with agencies to implement.*
- 26** *Pursue regulatory interventions to ensure that all organic materials that have been aggregated for recycling are prohibited for direct disposal to landfill*.*
- a** *Restrict use for operational purposes at landfills, organic materials that have been aggregated for recycling.*
- b** *Restrict use for operational purposes at landfills, organic materials that have been aggregated for recycling.*
- 27** *Encourage consideration of alternative business models for waste contractor servicing and charging to recognise the reduced weight and composition of collections as a result of increased food waste diversion.*

Outcomes

- » Potential progression to mandatory measures that ban the diversion of organic waste to landfill.
- » Businesses benefit from cost-effective food waste prevention and collection processes.

Partners

- » Businesses and industry
- » Property and facilities managers
- » Regulators
- » Waste and recycling industry
- » State Government

Links to other actions or strategies

- » [Action 8](#) – Provision of compostable bags
- » [Action 20](#) – Food waste prevention resource packs for business
- » South Australia's Waste Strategy 2020-2025

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

Food rescue

Food growers, manufacturers and processors produce some food that is safe to consume but for commercial reasons cannot be sold. The products may be incorrectly labelled, have faulty packaging, be close to the 'best before' or 'use by' date, be part of a trial run, or are not produced to exact specifications.

Food rescue services collect excess food and redistribute it through agencies that feed hungry people. The average time that some vulnerable Australians experience food insecurity is seven years⁶³, with associated impacts on their long-term health and nutrition. Following a co-design process with the food relief sector, the Department for Health and Wellbeing and the Department of Human Services, the *South Australian Food Relief Charter* and the *Nutrition Guidelines for the Food Relief Sector in South Australia* were released in November 2019 to improve the availability of a nutritious food supply to food relief recipients.

While food rescue services and distribution agencies play key roles in providing quality food to people in need, food rescue alone is not the solution to food insecurity in South Australia.

Redirecting food at its highest value – to feed hungry people – provides charity organisations greater access to fresh, nutritious food, thereby reducing their expenditure on food stuffs and allowing redirection of their budgets to other resources or to the expansion of meals programs. It also has environmental impacts in preventing good food going to waste.

There are several food rescue organisations operating in South Australia.

- Foodbank South Australia is the largest hunger relief organisation in South Australia. It works with 580 agencies and almost 500 schools each year to provide food to those in need. In 2018, it provided enough food for more than 5,186,000 meals⁶⁴.
- OzHarvest is a national food rescue organisation that has been operating in South Australia since 2011. It collects excess food suitable for distribution from commercial outlets and delivers it to more than 1,300 charities supporting Australians in need. Nationally, OzHarvest rescues more than 180 tonnes of perishable food each week from over 3,500 supermarkets, hotels, wholesalers, farmers, corporate events, catering companies and restaurants.
- SecondBite collects large volumes of surplus food donated by farmers, wholesalers, markets, supermarkets and caterers and distributes it to community food programs around Australia.

- Smaller food rescue organisations also operate in South Australia to collect and redistribute meals and groceries.

Despite this reach, there remain areas where emergency food relief is not being distributed equally and the charitable and not-for-profit sector continually cite increasing demand⁶⁵. In an emergency or disaster event that has severe economic impacts, demand for food relief increases. In 2020, bushfires and the COVID-19 pandemic have contributed to a doubling of the number of South Australians seeking food relief from charities at least once a week⁶⁶. In an emergency event, an increase in demand may coincide with a reduction in donations or the availability of common food items as a result of disruption to supply and distribution chains.

State Government support for the sector is provided through the Department of Human Services and Green Industries SA. The Department of Human Services administers Grants SA, a program for not-for-profit community organisations to improve community participation, wellbeing and quality of life for people living and working in South Australia.

Green Industries SA's Infrastructure Grants Program provides support to address storage or logistics infrastructure barriers to food rescue operations. Recent support has improved cold store and freezer facilities to increase the organisation's capacity to accept fresh produce, meat, prepared meals and other perishable foods. Green Industries SA is also supporting a project to trial an app-based service to collect small quantities of surplus food from independent retailers.

Awareness of South Australian legislation⁶⁷ that protects them from liability when donating food in good faith, when the food is safe to consume at the time of donation, encourages businesses to donate. Ensuring food is prepared, handled and stored safely is the responsibility of the food retailers, rescue organisations and not-for-profit operators, with requirements set out in the *South Australian Food Act 2001*. Perishable food is accepted from providers such as farmers, supermarkets, restaurants, catering companies and events. Education and awareness activities must include information on food suitable for redirection to ensure responsibility for discarding unfit products is not shifted to food rescue organisations.

Businesses that donate surplus food appreciate that the time and money invested in purchase and preparation is not wasted, and that their food is benefiting those in need, which increases local connections.



Proposed actions

- 28** *Expand the grants available to food-rescue organisations for collection and distribution infrastructure to support redirection of suitable food to those in need.*
- 29** *Review the funding available through government agencies to support the diversion and redistribution of surplus food.*
- 30** *Identify opportunities for and barriers to recovering and distributing surplus food through food rescue organisations, including where supply chains may be impacted (e.g., during emergency or disaster events).*

Outcome

- » Increased diversion of suitable food through food rescue organisations to those in need, in line with national targets.

Partners

- » Businesses and industry
- » Food rescue and redistribution organisations
- » Regulators
- » All levels of government

Links to other actions or strategies

- » [Action 20](#) – Food waste prevention resource packs for business
- » [Action 35](#) – Infrastructure funding
- » *Improving Individual and Household Food Security Outcomes in South Australia*
- » *South Australian Food Relief Charter*

Events and away-from-home consumption

Food is often an integral part of events and many businesses exist solely to cater for these events. Opportunities to avoid waste or store uneaten or partially eaten meals are limited and this food is generally discarded. Within the waste management hierarchy, reusable service ware is the preferred option, however, may rely on a take-back and/or refund systems to be effective.

The use of compostable food service ware and providing organics bins at events and venues contributes to diversion of both the food and the packaging materials. Working with vendors to ensure compostable ware is used, clear bin signage is provided, and monitoring at bin stations occurs, improves outcomes and reduces the contamination of recycling and organic streams.

Only the most dedicated patrons of public events clean food scraps from their recyclable containers to enable them to go into yellow recycling bins, resulting in containers and remaining food waste being discarded in landfill bins or heavily contaminating the recycling bins, restricting the ability to recycle materials in these collections.

Deposit-bearing beverage containers are less likely to contain contaminants. If included in the comingled or 10c refund recycling streams, liquids generally do not result in significant contamination compared with food. Event organisers are increasingly encouraging patrons to bring reusable or refillable drink containers, or are making these available at events, and are providing water refill stations.

Councils can demand within their event licensing agreements that food and beverage vendors only use compostable service ware and beverage containers that attract a 10-cent refund, and also require that there are segregated bins to support these measures.

In November 2018, the City of Adelaide endorsed a Sustainable Events Guide that includes six areas of action to deliver more environmentally sustainable events. The State Government is developing a statewide guide and toolkit for waste minimisation and management at events and venues, promoting three-bin systems at events, and the use of reusable and compostable service ware by vendors.

Single-use service ware is used extensively outside event and venue settings. The increase in takeaway purchases and rapid rise in home delivery services from cafes and restaurants result in large volumes of food consumed in homes, workplaces and food courts that is transported in single-use packaging. The benefits of compostable food service ware in these situations is that any residual food and the service ware can be disposed of in organics bins at home, work or events. South Australia is pursuing measures to phase out single-use plastics (including some service ware items) through the *Single-use and Other Plastic Products (Waste Avoidance) Act 2020*.

As this legislation and additional measures come into effect, an increase in the use and disposal of compostable materials in public areas is likely. There are challenges in managing contamination in public bin systems, but the increased use of compostable food service ware presents opportunities to trial segregated public-place systems to align with waste and recycling systems at home and in workplaces.



Proposed actions

- 31** Update the Waste Minimisation Guide for Events and Venues, including standardised signage and tools for event managers and retailers to maximise waste and recycling performance, and additional guidance on food service ware to increase food waste recovery.
- 32** Encourage councils to adopt segregated bin systems for council-run events and require minimum three-bin systems event permits.
- 33** Through legislative measures, phase out specified single-use plastic service items and replace with reusable or compostable alternatives.
- 34** With the support of councils, investigate and pilot public-place organics recycling technologies and systems.

Outcome

- » By 2025, all events use three-bin front-of-house systems and compostable food service ware, when reusable options are not feasible.

Partners

- » Businesses and industry
- » Residents
- » Waste and recycling industry
- » Regulators
- » State and local government

Links to other actions or strategies

- » Turning the Tide on Single-Use Plastics: Discussion Paper and Next Steps, 2019
- » *Single-use and Other Plastic Products (Waste Avoidance) Act 2020*
- » South Australia's Waste Strategy 2020-2025



Attracting and supporting investment and markets

Diverting segregated organics from households and businesses for composting is an example of the circular economy in action. Food waste is an important feedstock 'ingredient' for South Australian commercial composting operations to process into high-quality soil improvement products: composts, mulches and pelletised fertilisers. Products are sold locally for use in home gardens, food and viticulture production, and, increasingly, broad-acre applications.

There are economic opportunities to expand these and introduce new ways to capture and process food waste.

Segregating by-products from the meat, poultry and seafood industries for processing into new products at meat rendering plants diverts about 230,000 tonnes of these materials annually. Processed for both domestic and overseas secondary markets, the products have a market value of approximately \$88 million⁶⁸.

South Australia has well-established commercial composting companies. The compost industry is a significant employer and investor, directly employing about 300 people across the state. In 2017-18, products produced from recovered garden, food and timber organics had a market value of about \$13.2 million⁶⁹.

Composting is a suitable destination for the broad range of organic material collected from homes, businesses and events. In addition to all food waste, compostable service ware and bags, paper towel and soiled cardboard are accepted and composted – materials that would otherwise present limitations for some technologies.

In commercial composting operations, food and other organic materials are processed over a number of weeks and reach temperatures high enough to kill plant and animal pathogens as well as weed propagules or seeds. Materials composted according to relevant Australian Standards become matured, stabilised products ready for use.

Compost is ideal for helping to re-build soil fertility and replenish soil carbon and nutrient stocks, at the same time helping mitigate climate change. Trials⁷⁰ in Australia and overseas have demonstrated that ongoing compost use increases soil carbon levels and, in turn, boosts plant growth and crop yields.

The production of mineral fertilisers, and particularly nitrogenous fertilisers, is energy and greenhouse gas-intensive. The supply of plant nutrients through compost use reduces both the amount of mineral fertiliser that is needed and the greenhouse gas emissions caused by its production.

Other input cost reductions, greenhouse gas savings and environmental benefits resulting from compost application include:

- less energy needed for irrigation, due to improved water storage and use efficiency
- less need for biocides (chemical substances including insecticides, disinfectants and pesticides used to control organisms that are harmful to health), which reduces the greenhouse gas emissions associated with biocide production
- less use of diesel for soil cultivation due to improved tillage
- increased carbon sequestration from higher biomass production, due to improved soil productivity
- reduced nitrogen loss that cause secondary nitrous oxide emissions, due to lower nitrogen surplus and leaching
- improved soil quality and structure to support plant growth, in turn reducing erosion and the loss of nutrients and organic matter.

In addition to the emission benefits of diverting this material from landfill, application of composts and other recycled organics to soils provides stable long-term carbon to improve water retention and soil structure, building resilience to the impacts of drought and climate change while keeping nutrients in circulation.

Compost and other recycled organic products can be blended to address specific soil deficiencies and to increase resilience to plant diseases. Many soil types in South Australia are inherently low in organic carbon, especially where conditions are dry and hot during the summer months, requiring more water and nutrients and increasing production risks. Limitations and risks for South Australian soils can be reduced by increasing soil organic matter levels, including through the application of processed recycled organics⁷¹.

The South Australian Environment Protection Authority (EPA) regulates large-scale licensed composting operations and works with operators to ensure that the composting process has minimum impact on the environment and produces quality compost outputs.

South Australia's Waste and Resource Recovery Infrastructure Plan (SAWRRIP) provides a clear guide for future waste and resource recovery infrastructure needs across South Australia. It explains how these measures can support State waste targets and objectives. Based on waste-flow projections, the SAWRRIP maps 2017 infrastructure and identifies future needs, investment opportunities and risks.

Continued investment in infrastructure is necessary to ensure processing operations have capacity, as more food waste is diverted from kerbside and commercial collections. Funding for contaminant-removal technology to meet market demand and quality standards for compost products is also required.

Alongside the composting sector, local business opportunities and jobs are expanding as a result of increased food waste diversion, including local design and manufacture of items such as kitchen caddies and compostable food packaging alternatives.

Actions for change

Infrastructure funding

The SAWRRIP modelling is based on collecting and processing increased amounts of food organics across South Australia. It aims to circulate materials at the highest possible values, expanding the sector to generate energy in addition to recovery of nutrients. The digestate or residual material following energy extraction from the anaerobic digestion process can be incorporated into the composting process.

Other opportunities for the organics processing sector to make high-value compost and fertiliser products include investment in grinding, classification, blending and pelletising equipment; increased automation of contaminant-removal equipment; and equipment to produce fuels from sludges and grease trap wastes.

Most food and garden organics collected from Adelaide kerbsides have low contamination levels (about 2% for the metropolitan Adelaide area). However, any contaminants can be present in final products, so they must be removed to meet relevant quality standards and farmers and landscaping suppliers' criteria.

Metropolitan Adelaide has the infrastructure to process anticipated increases in food waste over the next three years. More infrastructure is needed in regional areas to increase processing capacity and expand the range of materials that can be processed at some facilities.

Enclosed composting includes techniques such as covered windrow composting, composting tunnels, covered composting bays and composting halls. As South Australian land uses change, these techniques should be considered; they are common in overseas sites where population densities require industry and households to be close together or energy-recovery operations are integrated within the sites.

There are opportunities to recover organics from the estimated 2,800 tonnes of packaged food waste (such as plastics, cardboard and metal) that reach landfill in South Australia each year and that require de-packaging technology. Packaged organics should be collected separately from unpackaged, clean organics streams. In addition to increased processing costs for packaged material, there is the risk of contamination that can potentially lower the value of output products.

The Green Industries SA Recycling Infrastructure Grants program helps private sector, local government and not-for-profit organisations invest in infrastructure to increase capacity to recover resources, apply better processing technologies, manufacture new products, and return materials to markets. Infrastructure funding has included support for the local production of Australian Standard compostable bags, promoting food waste diversion and reducing shipping of products. Funding creates local jobs and regional processing capacity; projects must demonstrate economic, environmental and social benefits.

As with other waste and recycling streams, vehicles for kerbside and commercial food waste collection should be included as business operating expenses; they are not usually supported through financial infrastructure incentive programs. This does not exclude investment in up-to-date weighing technologies to provide data for planning and to maximise collection efficiency and recovery.



Proposed actions

- 35** *Maintain the provision of grants and loans to encourage the establishment and improvement of resource recovery infrastructure, processes and technologies that divert food waste in line with the waste management hierarchy for both metropolitan and regional areas.*
- 36** *Provide infrastructure support for anaerobic digestion and incorporate bioenergy recovery into processes where residual outputs are diverted into composting processes or applied to land following energy extraction.*

Outcomes

- » More material is recovered and capacity is increased in regional areas.
- » The capacity of South Australian industry to process segregated organic materials to relevant standards is maintained as volumes increase.

Partners

- » Businesses and industry
- » Waste and recycling industry
- » State and local government

Links to other actions or strategies

- » [Action 1](#) – Financial support for roll-out of food waste collection systems
- » [Action 22](#) – Design approach for phase-in of mandatory food waste recycling
- » South Australia's Waste Strategy 2020-2025

Market support

Creating market demand that moves in step with increased volumes of segregated organics is critical to moving towards a circular economy in South Australia.

Soils are traditionally rich in carbon. However, modern agricultural practice has reduced the organic content of Australian soils over decades. As a result, the application of synthetic fertiliser has increased. Five million tonnes of fertiliser was applied to agricultural land in Australia in 2016-17⁷².

Organic matter and nutrients that have been removed from soils must be replaced. Altering farming practices, such as less tillage of soil, often combined with the application of synthetic or organic fertilisers helps rebuild soil structure to enable productive plant growth.

Compost has a high carbon content and contains beneficial microbes that help soil regain its organic content, increasing soil fertility and reducing the reliance on synthetic fertilisers. This allows soils to sequester more carbon, reducing carbon dioxide in the atmosphere.

South Australia has an advanced commercial composting industry that produces quality products for the horticulture, viticulture and broad-acre agricultural sectors as well as for landscaping works and household garden applications. Demand for recycled organics product is high and currently exceeds supply. Commercially produced composts certified as complying with the Australian Standard

for *Composts, Soil Conditioners and Mulches* [AS4454] include high levels of organic matter and nutrients and are free from pests and disease. Freshcare, a certification program for the Australian fresh produce industry, provides guidelines for the use of recycled organics in horticulture. All AS4454-certified composts can be applied without restriction. Non-certified composts must be independently verified to avoid any impact on a grower's food safety assurance program⁷³.

There is opportunity to develop and produce higher-value and more specialised compost products within the existing market in South Australia. Green Industries SA provides funds to stimulate increases in the quality of and demand for products, and to create opportunities for new products, expand market-related activities for existing recycled-content products, and educate and inform users about how compost can be used to support land and crop management.

Customising products to crop or soil conditions and manufacturing composts in pellets have increased the uptake of recycled organic products for various uses.

Investment in activities such as research and market intelligence, fostering buyer awareness, and developing market-focused products will support and expand local markets for composts and recycled organic products, increasing the resilience of South Australia's compost industry and returning this material to the agricultural sector, to land rehabilitation and urban development.



Proposed actions

- 37** *Maintain and expand viable and sustainable markets for products and outputs arising from the recovery of food and other organic wastes, including through standards, specifications and guidelines for application.*
-
- 38** *Ensure that the regulatory environment is best-practice and supports the development of local markets for organic recycled content products.*

Outcome

- » More soil improvement products are sold in South Australia.

Partners

- » Businesses and industry
- » Waste and recycling industry
- » Regulators
- » State and local government

Links to other actions or strategies

- » [Action 1](#) – Financial support for roll-out of food waste collection systems
- » [Action 8](#) – Provision of compostable bags
- » [Action 22](#) – Design approach for phase-in of mandatory food waste recycling
- » South Australia's Waste Strategy 2020-2025

Actions for change framework

Proposed actions		Timeline				
		Existing and ongoing	2021	2022	2023	2024
HOUSEHOLD	Harmonising and maximising kerbside systems					
	1. Continued financial support for the roll-out of universal, area-wide 'high-performing food waste collection systems' incorporating a kitchen caddy and compostable bags for diversion through kerbside green organics bins.					
	2. Research into the retention and use of kitchen caddy systems in council areas where area-wide food waste systems have been implemented, to evaluate behaviour and influence the design of financial support programs to enhance or maintain systems.					
	3. Work with councils to pilot more frequent collection of household organics bins and monitor and report on the results of changes and community responses.					
	4. 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)*.					
	High-density collection					
	5. Pilot and evaluate models of alternative bin and collection systems for medium and high-density dwellings, often where little or no garden waste is generated.					
6. Update the <i>Better Practice Guide for Waste Management in Residential and Mixed Use Developments</i> in consultation with state government agencies and local governments that reference the guidelines when considering and providing feedback on development applications in relation to waste management.						
7. 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.						

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

Proposed actions		Timeline				
		Existing and ongoing	2021	2022	2023	2024
HOUSEHOLD	Compostable bags to support diversion					
	8. Improve householders' access to a supply of compostable bags both through council and retail.					
	9. Monitor retail trials and roll-out of compostable barrier bags, including community response and acceptance.					
	10. Progress inclusion of polyethylene plastic barrier bags (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.					
	Behaviour change, education and awareness					
	11. Continue the state-wide recycling campaign <i>Which Bin?</i> to increase and improve three-bin system recycling, including food waste diversion through the green organics bin and home composting.					
	12. Working alongside government, not-for-profit and industry partners through the Fight Food Waste CRC, collaborate on a research project to develop effective behaviour change interventions.					
	13. Determine and implement an integrated education and awareness program that supports food waste prevention in the residential sector.					
	14. Partner with community programs and groups to extend food waste prevention messages.					
	Home-based approaches					
	15. Encourage home-based approaches for diverting food waste, including home composting, worm farms and backyard poultry.					
	16. Provide guidance and education to encourage home and community (including school) food growing, using compost to improve plant vigour and yield while returning nutrients to the soil.					
	17. Promote the sharing of produce within local communities.					

Proposed actions		Timeline					
		Existing and ongoing	2021	2022	2023	2024	2025
COMMERCIAL	Precinct organics recycling opportunities						
	18.	Map food waste generation to identify potential improvements in collection density and more efficient collection or opportunities for alternative recycling processes, including on-site processing.					
	19.	If mapping and other evidence supports the potential for services improvements to be made, develop and trial an appropriate precinct recycling model.					
	Business food waste prevention						
	20.	Develop tool kits and resource packs for business, incorporating: <ul style="list-style-type: none"> avoidance and lean-production messaging tools to measure and report food waste at key generation points (spoilage, preparation, plate scraping) waste contracting information and guidelines menu design tips information on compostable food service ware, including disposal information resources to measure, prevent and divert food waste best-practice case studies. 					
	21.	Pilot the promotion and roll-out of a business resource tool kit to relevant industry bodies and establish a dedicated contact to support businesses to introduce avoidance and reduction measures through the Circular Economy Business Support Program.					
	Mandatory commercial food waste recycling						
	22.	Examine models enabling the phase-in of mandatory food waste collections for metropolitan Adelaide businesses and major centres based on the size of their business operations and/or food waste generation volumes and the availability of appropriate processing options.					
	23.	Undertake analysis of potential intervention models and appropriate thresholds to inform regulatory pathways and possible outcomes.					
	24.	Develop new and expand existing information resources for businesses to support the implementation of mandatory measures (refer Action 20).					
25.	Develop minimum standards for segregated waste and recycling systems for South Australian Government sites, including organics recycling where available, and work with agencies to implement.						
26.	Pursue regulatory interventions to ensure that all organic <ul style="list-style-type: none"> a materials that have been aggregated for recycling are prohibited for direct disposal to landfill*. b 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.

Proposed actions		Timeline				
		Existing and ongoing	2021	2022	2023	2024
COMMERCIAL	27. Encourage the consideration of alternative business models for waste contractor servicing and charging to recognise the reduced weight and composition of collections as a result of increased food waste diversion.					
	Food rescue					
	28. Expand the grants available to food-rescue organisations for collection and distribution infrastructure to increase volumes of food redistributed to those in need.					
	29. Review funding available through government agencies to support the diversion and redistribution of surplus food.					
	30. Identify opportunities for and barriers to recovering and distributing surplus food through food rescue organisations, including where supply chains may be affected [e.g., during emergency or disaster events].					
	Events and venues					
	31. Update the <i>Waste Minimisation Guide for Events and Venues</i> including standardised signage and tools for event managers and retailers to maximise waste and recycling performance, and provide additional guidance on food service ware to increase food waste recovery.					
	32. Encourage councils to adopt segregated bin systems for council- run events and require minimum three-bin systems for event permits.					
	33. Through legislative measures, phase out specified single-use plastic service items and replace with reusable or compostable alternatives.					
	34. With the support of councils, investigate and pilot public-place organics recycling technologies and systems.					
SUPPORTING INFRASTRUCTURE AND MARKETS	Infrastructure funding support					
	35. Maintain the provision of grants and loans to encourage the establishment and improvement of resource recovery infrastructure, processes and technologies that divert food waste in line with the waste management hierarchy for both metropolitan and regional areas.					
	36. Provide infrastructure support for anaerobic digestion and incorporate bioenergy recovery into processes where residual outputs are diverted into composting processes or applied to land following energy extraction.					
	Expanding markets					
	37. Develop and expand viable and sustainable markets for products and outputs arising from the recovery of food and other organic wastes, including through standards, specifications and guidelines for application.					
	38. Ensure that the regulatory environment is best-practice and supports the development of local markets for organic recycled content products.					

Glossary

Circular economy – an alternative to the traditional ‘linear’ economy based on ‘take, make, use and dispose’. A circular economy is a self-sustaining system driven by renewable energy with an imperative to keep material resources in use, or ‘circulating’, for as long as possible. It extracts the maximum value from these resources while in use, then recovers and regenerates products and materials. In a circular economy there are two types of material flows:

- biological cycle – food and biologically based materials re-enter and regenerate the environment safely; for example, as compost
- technical cycle – materials such as metals, paper and plastic are designed to circulate for as long as possible through repair and reuse, without entering the environment for disposal.

Compost – a product created by the breakdown of organic matter, such as garden and food waste, by bacteria and other micro-organisms into a nutrient-rich natural fertiliser. Compost improves soil structure, providing nutrients for plant growth and increases water and nutrient retention in the soil.

Compostable – a product is ‘compostable’ if it can disintegrate into natural elements and is able to be processed into soil improvement products (meeting Australian Standard 4454-2012, 4419-2018 or 3743-2003) in a commercial compost environment within 90 days.

Compostable bags and food service ware – in this document, discussion on compostable bags and food service ware refers to products that meet Australian Standard 4736-2006 and Australian Standard 5810-2010, or by nature are made solely of fibre materials for which the Australian Standard is not applicable (such as wooden cutlery, serviettes or pizza boxes).

Composting facilities – commercial facilities where source-separated organics are composted to produce soil improvement products that meet Australian Standards 4454-2012, 4419-2018 or 3743-2003.

Contamination – any material found in the organics bin that is not considered compostable by the processing facilities.

Food caddy – a kitchen benchtop food container for the collection of household food waste that will later be placed in the organics bin. The container may be ventilated (requiring a compostable bag liner) or enclosed for direct disposal into the green organics bin.

Food organics – organic waste derived from food preparation and/or surplus food: all food scraps including meat and seafood scraps, vegetable and fruit peelings, seeds/husks and dairy products.

Kerbside collection – the collection of household waste and recyclable material (specifically residual waste, comingled recycling, and organic waste) left at the kerbside for collection by local council collection services.

Opt-in food waste systems – fortnightly organics kerbside bin collections are rolled out area-wide, then residents elect whether to divert food waste through the organics bins. They may collect or pay for a kitchen caddy and compostable bags.

Organics – material derived from garden sources, such as grass clippings, tree prunings, food waste and paper (tissues, napkins), as well as teabags and coffee grinds.

Recovered material – material that would otherwise have been disposed of as waste into landfill, but has been collected and reclaimed as a material input, in lieu of a new primary material, for recycling or a manufacturing process.

Residual waste – the waste that remains after materials have been separated for recycling and composting; that is, all the remaining waste.

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