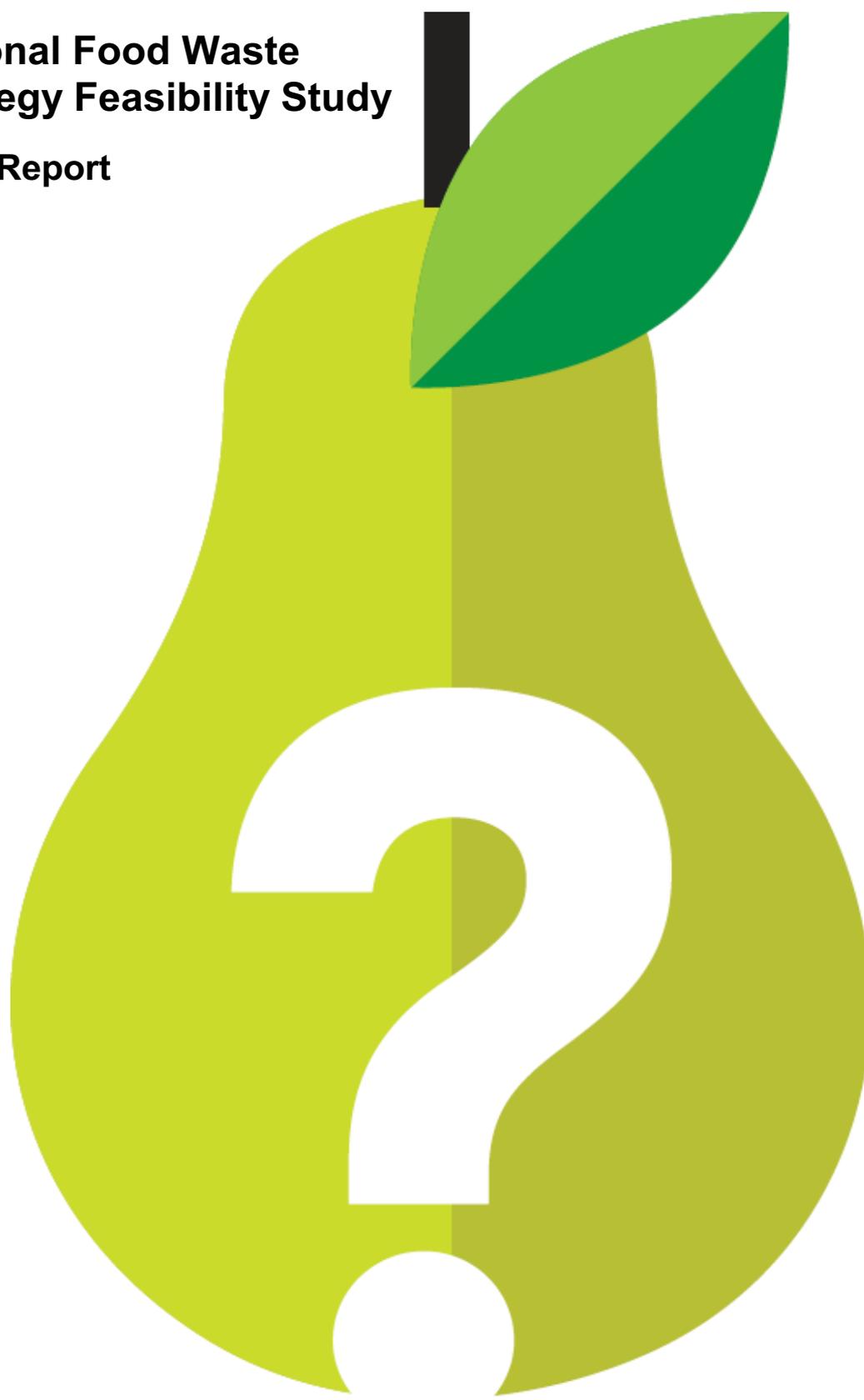


# National Food Waste Strategy Feasibility Study

Final Report  
2021



Citation: FIAL, 2021. The National Food Waste Strategy Feasibility Study – Final Report.

**Project Delivered by:**

Max Van Biene – Head of Sustainability Strategy  
Edge Environment (Consortium Lead)  
Level 5, 39 East Esplanade, Manly, NSW 2095, AUSTRALIA  
[max@edgeenvironmnet.com](mailto:max@edgeenvironmnet.com)

In collaboration with:

Tim Grant – Director  
Lifecycle Strategies  
[Tim@lifecycles.com.au](mailto:Tim@lifecycles.com.au)

Claire Kneller, Head of WRAP Asia-Pacific  
WRAP  
[Claire.Kneller@wrap.org.uk](mailto:Claire.Kneller@wrap.org.uk)

Christian Reynolds  
WRAP  
[Christian.Reynolds@wrap.org.uk](mailto:Christian.Reynolds@wrap.org.uk)

Hamish Forbes  
WRAP  
[Hamish.Forbes@wrap.org.uk](mailto:Hamish.Forbes@wrap.org.uk)

Richard Sheane, Partner  
3 Keel  
[richard.sheane@3keel.com](mailto:richard.sheane@3keel.com)

# Supporting Content

This report is part of a suite of documents and content that constitute the *National Food Waste Strategy Feasibility Study* including:

- **Graphical Executive Summary** which provides a summary of the results outlined in this report and used as a key communication tool.
- **Complete Appendices** which include the detailed methodology, assumptions and references used to compile this report.
- **Power BI Data Dashboard** which provides an interactive platform to interrogate the data that sits behind the results.

This report and the supporting content can be accessed through:

<https://www.fial.com.au/sharing-knowledge/food-waste>

# Contents

Supporting Content.....	i
<b>1 Introduction.....</b>	<b>1</b>
1.1 The National Food Waste Strategy .....	1
1.2 Objectives of this project .....	1
1.3 Methodology overview .....	2
1.4 Project scope & boundaries .....	3
1.5 The Power BI Dashboard.....	4
<b>2 Context: The food waste problem in Australia.....</b>	<b>5</b>
The unique characteristics of the Australian Food System .....	52.1
2.2 Definition of food waste.....	5
2.3 Food waste data in Australia.....	6
<b>3 Informing the food waste interventions long list.....</b>	<b>7</b>
3.1 Best practice review methodology .....	7
3.2 Desktop research results .....	7
3.3 Interview results.....	8
<b>4 The national food waste baseline .....</b>	<b>9</b>
4.1 Baseline & hotspot methodology.....	9
4.2 Baseline results .....	11
4.3 Food waste hotspots .....	16
4.4 Baseline and hotspot key findings .....	18
<b>5 High level food waste reduction scenario analysis .....</b>	<b>19</b>
5.1 Food waste reduction scenario analysis methodology .....	19
5.2 Cost benefit analysis (CBA) methodology.....	20
Food waste intervention long list and abatement assumptions .....	225.3
5.4 Results of the high-level scenario analysis.....	23
5.5 Scenario analysis key findings .....	24
<b>6 Recommended scenario .....</b>	<b>25</b>
6.1 Recommended scenario methodology.....	25
6.2 Final list of interventions in the recommended scenario .....	26
6.3 Recommended scenario abatement results.....	29
6.4 Recommended scenario costs and benefits.....	31
6.5 Impact of excluding inedible waste from the definition .....	38
6.6 Recommended scenario key findings.....	38
6.7 Milestones and measurement metrics.....	41
<b>7 Conclusion and key recommendations.....</b>	<b>43</b>
7.1 Conclusions .....	43

7.2	Recommendations for Federal Government.....	44
7.3	Recommendations for State & Local Government.....	45
7.4	Recommendations for Industry .....	46

**List of Tables & Figures**

Table 1.	Food waste baseline parameters.....	9
Table 2.	Typology of data sources used in the baseline.....	10
Table 3.	Waste arising across the supply chain. (Unit: Thousand Tonnes) .....	12
Table 4.	Absolute values aligned to hotspot indicators.....	16
Table 5.	Waste hotspots in tonnes of waste.....	17
Table 6.	Climate hotspots in tonnes of CO <sub>2</sub> -e .....	17
Table 7.	Definition of terms used in CBA model .....	21
Table 8	Intervention long list and assumed abatement figures .....	22
Table 9.	Table of high level scenario results – key results summary.....	24
Table 10	Recommended scenario interventions.....	27
Table 11.	Comparison of total and per capita food waste .....	29
Table 12.	Summary of cost-benefit analysis .....	31
Table 13	Modelled value per tonne by value chain stage .....	33
Table 14.	A breakdown of cost savings by saving type .....	35
Figure 1	National Food Waste Strategy (Commonwealth of Australia, 2017) .....	1
Figure 2	Project methodology summary .....	2
Figure 3.	The Food Waste hierarchy.....	3
Figure 4	Screenshot of power BI dashboard.....	4
Figure 5	Categories of interventions based on the best practice review.....	7
Figure 6.	Summary of two options for identifying hotspots by lifecycle.....	10
Figure 7.	Three levels of group of food for hotspot analysis.....	11
Figure 8.	Updated national food waste baseline results.....	13
Figure 9.	Distribution of waste streams across the supply chain .....	13
Figure 10.	Edible vs non-edible fractions throughout the supply chain .....	14
Figure 11.	Comparison of results across the supply chain. ....	15
Figure 12.	Household food waste by state.....	15
Figure 13.	Scope of CBA Model .....	21
Figure 14.	Waste reductions achieved by each scenario .....	23
Figure 15.	Progress to 2030 target under the Recommended Scenario.....	29
Figure 16.	The cumulative impact of the interventions .....	30
Figure 17.	Food waste by value chain stage in 2030.....	31
Figure 18	Recommended scenario investment.....	32
Figure 19	Investment across funding sources .....	32
Figure 20	New money split by funder.....	33
Figure 21.	A breakdown of cost savings by stage in the food value chain .....	34
Figure 22	Progress to 2030 reduction target excluding inedible.....	38

# 1 Introduction

## 1.1 The National Food Waste Strategy

In 2017 the Australian Federal Government published the *National Food Waste Strategy* (Commonwealth of Australia 2017) to provide a framework to support collective action towards reducing Australia's food waste. The Strategy outlined the definition of food waste and committed to a target of halving Australia's annual food waste by 2030, in line with the requirements of the United Nations Sustainable Development Goal Target 12.3 (SDG 12.3). The Food and Agribusiness Growth Centre, trading as Food Innovation Australia Limited (FIAL), was tasked with supporting the Australian Government to implement the Strategy.

In 2019 Arcadis was commissioned by the Australian Government to deliver the first *National Food Waste Baseline* (Arcadis 2019), which defined an estimated baseline of "7.3 million tonnes (MT) of food waste in 2016/17 from across the entire supply and consumption chain" or 298kg per capita. This report also highlighted several challenges associated with data quality which created some key data gaps in the baseline coverage.

In 2020 FIAL published *A Roadmap for reducing Australia's food waste by half by 2030* (FIAL 2020). This included the results of the original food waste baseline and outlined a detailed action plan of initiatives required to make progress towards the 2030 target. In addition to suggestions related to the development of a governance entity and ongoing measurement protocols, this roadmap also included a recommendation to undertake a study to fill significant gaps in the food waste baseline, provide more granularity on the feasibility of achieving the target and define the associated actions and investment required to achieve it.

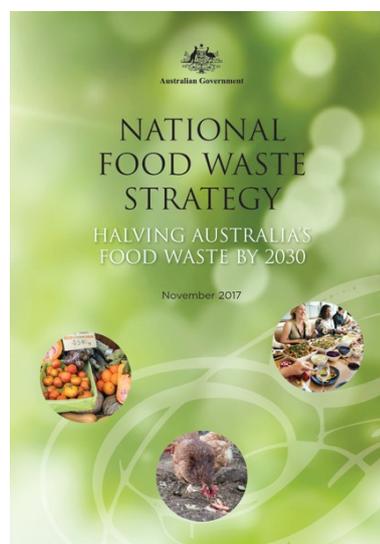
Later in 2020 FIAL subsequently commissioned the consortium led by Edge Environment to deliver this report and the associated accompanying material which constitutes the *National Food Waste Strategy Feasibility Study*.

Since commissioning of this report, the Federal Government has appointed *Stop Food Waste Australia* as the governing entity to implement the food waste roadmap and the recommendations of this project.

## 1.2 Objectives of this project

The key objectives of this project are to:

- Establish the current status of international best practice in food loss and waste (FLW), and lessons that can be learned to enable more effective delivery in the Australian context. This should include consideration of interventions, overarching frameworks, and underlying datasets.
- Update and improve the National Food Waste Baseline to ensure that it is fit for purpose, both as an evidence base for this project and future policy development, and as a tool for monitoring progress against the 2030 target.
- Test different implementation scenarios to understand whether they are feasible, including the impact of key considerations such as the definition of food waste and the treatment of different end destinations.
- Establish a delivery trajectory for the preferred scenario, including interim targets and milestones, along with key supporting actions required in each case. The technical, financial and logistical feasibility of the preferred scenario(s) must be established through technical assessment and stakeholder consultation.



**Figure 1 National Food Waste Strategy (Commonwealth of Australia, 2017)**

- Compile the information into a final report that provides a clear evidence base that can be used by policymakers and industry to underpin a rapid acceleration of action towards the 2030 target.

In addition to these core objectives, it was important that the outputs of this project:

- Enabled interaction with the baseline data so those within industry and government could use it to inform the design and measurement of ongoing projects.
- Clearly defined who would be required to fund the interventions and who would benefit from them.
- Provided further granularity on ‘what success would look like’ across the Australian food system if we were on track towards the target.

### 1.3 Methodology overview

The project methodology was broken into five key stages:



**Figure 2 Project methodology summary**

1. **Best practice review and intervention list:** The first stage of the project was used to undertake a detailed review of the best practice food waste interventions from around the globe and develop a long list of interventions that considered the unique context of the Australian food system. The consortium undertook a literature review of existing food waste policies and strategies and conducted interviews with food waste experts from various leading countries. Interventions were then broadly grouped into seven key categories. Following this, the consortium completed a literature review of existing studies on the Australian food system to determine the key unique characteristics that might impact the viability of various interventions. From this a final long list of 47 different interventions across the seven categories was drafted for further modelling.
2. **Baseline update and hotspot analysis:** The consortium utilised a mass balance approach to measure food waste and losses across the food value chain. The data used was collated from a range of existing studies compiling 2018-2019 data and supplemented by additional data sets captured through direct stakeholder engagement with industry and household food waste audits undertaken in 2020. In total, over 60 different institutions were engaged for direct data collection over three distinct phases of stakeholder engagement. Following completion of the baseline, the UN Environmental Hotspots Methodology was applied to define the food waste hotspots across the value chain and across 18 different commodity groups.
3. **High level scenario analysis:** Drawing from a long list of 47 tried and tested food waste reduction interventions, four distinct food waste reduction ‘scenarios’ were developed. The scenario analysis was designed to: i) Identify the most effective policy and industry ‘levers’ that can be pulled to maximise food waste reduction in the Australian context, ii) Identify which ‘levers’ provide the most effective financial and environmental return on investment, iii) Define if it is even technically ‘possible’ to halve food waste if we were to apply all available resources.
4. **Recommended scenario development:** Key insights from the high-level scenario analysis were used to inform the design of a recommended scenario, which consisted of 23 interventions. The recommended scenario further considered the effectiveness and cost efficiency of each intervention, where in the value chain they would deliver impact, the interrelationships between interventions, the start date and overall feasibility of implementation.

- Business case:** A cost benefit analysis was completed on the recommended scenario to define the total required investment cost (incorporating both existing spend and new spend) as well as the direct and indirect benefits that it would produce. This was broken down further to articulate who should be responsible for paying for and delivering the various interventions and where the benefits of those interventions would be experienced.

Following these key stages, a list of key recommendations and conclusions were developed, specifically guiding the required actions from Federal Government, State Government and industry in order to effectively meet the 2030 target.

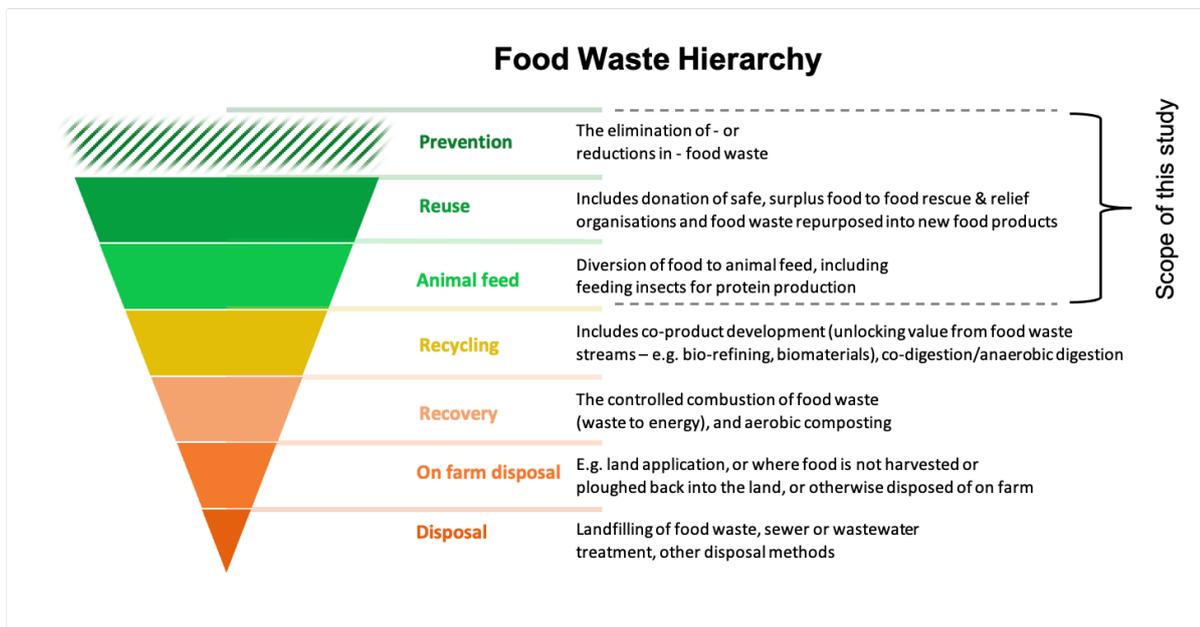
## 1.4 Project scope & boundaries

The scope of this project was designed to specifically address the feasibility of reaching the food waste target as per the criteria outlined in the *National Food Waste Strategy* (Commonwealth of Australia 2017). The Strategy outlined the definition of food waste and the destinations that would be included in calculation of the target. Furthermore, challenges associated with determining details around intervention capital and operating costs limited the possible scope of the business case development.

### 1.4.1 Focus on food waste prevention rather than recovery

Due to the definition of food waste and what constitutes progress to the target, the interventions considered in this study were limited to those that focussed on food waste prevention or those that effectively moved food waste up the food waste hierarchy. This includes interventions that address prevention and food waste and loss avoidance, reuse interventions such as food rescue, and diversion of food waste to animal feed.

Figure 3 outlines the food waste hierarchy and the interventions that were specifically considered within the scope of this project.



**Figure 3. The Food Waste hierarchy and the stages that were considered for interventions within the scope of this study**

Food waste treatments that sit lower on the hierarchy, such as recycling and recovery, play an important role in mitigating the impacts of food waste and should also be considered in any long-term policy and intervention mix. However, these treatments do not contribute to the target and therefore have not been considered in the scope of this project.

Broader interventions that might impact the wider food system but not necessarily focussed purely on food waste prevention, such as the cascading impact of increased landfill tariffs for example, were considered in relation to aspects such as potential cost savings but were not modelled directly in terms of abatement.

## 1.4.2 Costing of scenarios and interventions

A requirement of this project was to provide high-level guidance on which ‘macro’ policy and intervention levers would collectively provide the greatest feasibility of achieving the target, including the cost of implementation. The scope of the cost-benefit analysis assessed overall investment and benefits at a scenario level rather than at an individual intervention level.

While estimated costs and abatement impacts of individual interventions were considered to inform the scenario assessment (high-level estimation can be found in the supporting Power BI dashboard), data gaps and challenges regarding the current maturity of some of these interventions would make conclusions on costs and benefits on individual interventions unreliable. Instead, the CBA should be considered at a scenario level, supplemented by the consortium expertise on who would usually fund the types of initiatives put forward and who would usually benefit.

## 1.5 The Power BI Dashboard

A core objective of this project is to empower stakeholders with the appropriate insights and data to inform the design and focus of initiatives and policies. To enable this, the food waste baseline and abatement scenarios have been loaded to an online dashboard to enable stakeholders to interrogate the underlying data relevant to their sector, commodity group or stage in the value chain.

The intention of this online dashboard is to:

- Streamline future baseline updates and comparisons.
- Drive broader stakeholder engagement with the baseline by creating an engaging and simple user experience.
- Enable stakeholders to filter data relevant to them.
- Streamline future updates to the National Food Waste Baseline.

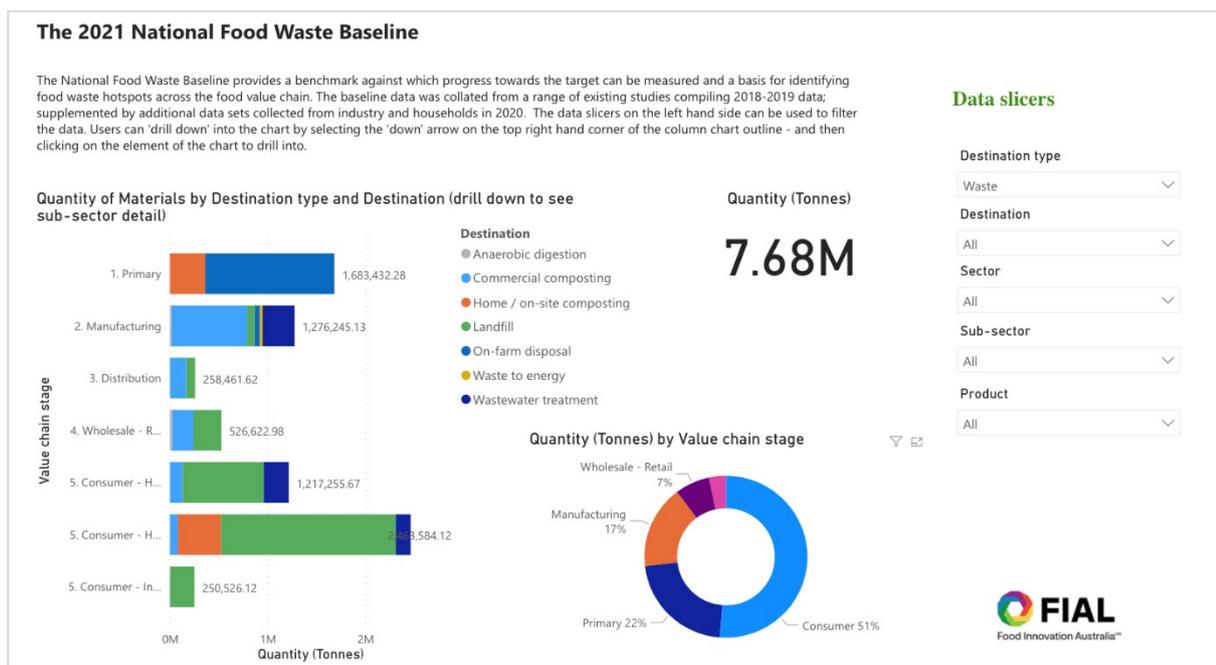


Figure 4 Screenshot of power BI dashboard

## 2 Context: The food waste problem in Australia

While many governments have committed to the United Nations' SDG Target 12.3, other countries have developed their own approach to quantifying and defining food waste. Equally, each country has its own unique food system profile which impacts the most effective pathway for them. Therefore, it is important that any pathway to reaching the 2030 target acknowledges the unique nature of the Australian food system and definition of food waste.

### 2.1 The unique characteristics of the Australian Food System

Drawing from the previous National Food Waste Baseline and existing studies from Australia and other regions, the consortium completed a desktop review to define the unique characteristic of the Australian food system and the associated food waste profile. The detailed findings are outlined in Appendix 1. Overall, the research has confirmed that Australia is atypical for an OECD country both in terms of its food systems and its food waste profile. Most notably:

- The country **produces and exports significant quantities of food per capita** – meaning that per capita food loss and waste is likely to be higher than average and that there will be more FLW in primary production and processing, compared to other countries. This will likely mean a need to have a greater focus on addressing primary production food loss and waste – and also the need to develop a strategy for engaging and influencing producers who serve overseas markets.
- There appears to be comparatively low levels of **cold storage capacity per capita** in Australia – especially considering the country's climate and size. This has a significant impact on shelf life and quality of products, post farm-gate. This suggests a greater focus on cold chain innovation and investment could be a theme to explore.
- **Market consolidation of grocery retail market is high**, meaning that there is potential for trading practices and conditions to encourage supplier behaviours that exacerbate food loss and waste. For example, suppliers could be more risk averse and over-produce to ensure they do not lose important contracts. This is a feature of many OECD grocery markets; however, Australia seems to have a more consolidated market than many. This suggests a need to understand the impact of potential 'unfair trading practices' on FLW.
- The country is exposed to **relatively high environmental stresses** given its climate risk and competition for water resources. These issues influence food loss and waste in agriculture and the wider value chain – with notable examples from the recent bush fires. This suggests that strategies for building environmental resilience are likely to be a theme to explore.
- Finally, **Australians spend a relatively small proportion of their income on food** compared to many countries. This, combined with high levels of obesity in the country, hints at the potential need to focus on consumer education on food behaviours, including food waste prevention.

### 2.2 Definition of food waste

A critical determinant of the feasibility of halving Australia's food waste is how waste is defined in the Australian Government's 2017 National Food Strategy.

The National Food Waste Strategy defines food waste as:

- 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.

The repercussions of this definition of food waste on the 'feasibility' of achieving the target are significant and have been discussed at length in the previous baseline report (Arcadis 2019). The definition of food waste (i.e., including edible and inedible parts) is consistent with Sustainable Development Goal 12.3. However, Australia's target is more ambitious than SDG 12.3 in that it specifies halving food waste *and* food loss (the SDG requires only a *reduction* in food loss). Australia's food waste is made up of a 70% edible fraction and 30% inedible fraction. Therefore, a key objective of this project was also to explore what the impact of excluding inedible waste from the definition of food waste has on the overall feasibility of achieving the target.

## 2.3 Food waste data in Australia

Food waste data globally is typically limited in quantity and quality, even among the countries that have undertaken the most work on definition and measurement. It is important that we acknowledge these significant challenges when interpreting data and using it to inform this project and future recommendations.

**Impact of drought on understanding the baseline:** Waste in primary production is tied to the productivity of the agricultural sector. Australia has a highly variable climate, and the succession of drought and wet years means there will be inherent variations in the results that are not linked to policies or behaviour but are simply a result of climatic conditions. This makes it very difficult to discern any trends when comparing baseline data between years.

**Impact of COVID on household food waste audits:** Several of the data sources used to inform the household food waste in the baseline were sourced from household waste audits undertaken in 2020. While the methodology for these audits claimed to have accounted for the impact of COVID and the associated lockdowns, the longer-term impact of the lockdowns on household food waste numbers is still unclear.

Despite any mitigation measures on utilised data sets to inform this updated baseline, it is important to acknowledge the likely significant impacts of the extended lockdown on the national food waste profile, particularly the reduced or shifted food waste from hospitality to other stages in the value chain.

**Aligning approaches across states:** Currently, each Australian state and territory has adopted their own approach to managing, measuring, and monitoring food waste. This lack of alignment creates challenges to measuring progress at a national level. Stop Food Waste Australia will provide future guidance on aligning approaches.

**Challenges of linking interventions and outcomes:** Measuring and monitoring the impact of interventions remains a significant and common challenge in addressing food waste. Many interventions can only be measured through audits and surveys while total waste volumes to disposal are measured annually but are coarse and also fluctuate from year to year. It would be valuable to collect proxy metrics such as participation in specific waste avoidance activities.

# 3 Informing the food waste interventions long list

While it is important to acknowledge the unique nature of the Australian food system and the associated food waste profile, any national strategy to address food waste should also leverage the experience and learnings from other regions more advanced on addressing FLW such as the European Union, the United Kingdom and North America.

## 3.1 Best practice review methodology

The long list of interventions for consideration in the high-level scenario analysis was informed by key insights gathered from desktop research and supplemented by key expert interviews.

The desktop research reviewed relevant literature from:

- Existing research delivered by the consortium undertaken for clients including The European Bank of Reconstruction and Development, WWF International and the European Commission
- Peer reviewed journals
- Public funded research e.g. EU Commission reports
- NGO research e.g. WRAP, ReFed

A shortlist of ten expert interviewees were curated based on their experience in the field and geographical distribution. More detail on the methodology and results can be found in Appendix 2.

## 3.2 Desktop research results

Drawing from the findings of the desktop research, a classification of best practices was developed that summarised all the main categories of intervention possible. Given the macro scale of this project, the interventions included are those that work at scale and have potential to deliver sector-level improvements. Figure 5 below details the different classifications, with examples of each. Each intervention area is described in more detail below the table. Further detail on each of these intervention groups can be found in Appendix 2.

National strategies on food waste prevention	•Overarching policy including targets, reporting, policy reviews and impact assessments
Regulations and regulatory instruments	•Regulations that directly or indirectly result in reductions (or increases) in food waste
Market-based instruments	•The use of taxes, subsidies, etc. to incentivise business and consumer behaviours
Communication & campaigns	•Consumer campaigns and provision of guidance to business on food waste
Sector voluntary agreements and platforms	•Public commitments by businesses to reduce waste made in partnership with public sector
Government projects and other measures	•Funding of research and innovation
Industry best practice and investment	•Ordering and forecasting; date labelling consistency; cold chain investment; packaging

Figure 5 Categories of interventions based on the best practice review

### 3.3 Interview results

The key insights from the ten expert interviews are as follows:

#### Global context:

- Business is thought to be **ahead of policymakers** on the topic of food loss and waste.
- Experts flagged the importance for countries to link the food waste agenda to climate change – for example, by **including FLW in Nationally Determined Contributions (NDCs)** within the UNFCCC process. This raises the topic's profile within a country.
- FLW is one issue within the food system. It is critical to assess the **wider environmental and social implications of FLW actions** and interventions to ensure there are no undesirable unintended consequences. It is also worthwhile identifying potential 'losers' so that they can be accommodated or supported. All interventions in a system will likely have those who do not benefit and they often make the most noise.

#### Priority interventions:

- There was an acknowledgement that where the topic of food waste sits within the government will heavily influence the 'tools' that are used. For instance, if it is the responsibility of the environment department then it is environmental regulations and policies that are more frequently used (e.g. separate food waste collection, etc).
- There is significant support for initial approaches to be collaborative and voluntary in nature. The benefits and approaches to developing **Voluntary Agreements (VAs)** are well known and summarised by the EU REFRESH project. VAs create space for developing guidance and eventually better regulation.
- Although some regulatory responses were highlighted by the experts, most did not see this as the first area for action and saw that approach as extremely challenging and slow.
- It is important to ensure proper interpretation of existing regulations (e.g. date labelling, donations, 'cosmetic' produce standards). This could be through industry training and communications – for example the National Resources Defence Council's (NRDC) Health Inspector Training for Food Donation.
- Public 'communications' and 'campaigns' on FLW are a common 'go to' approach for governments. However, it is important that programmes adopt new and emerging thinking on behaviour change as has been done in the Netherlands. These campaigns are generally seen as a good idea, but not a silver bullet.

#### Data and tracking:

- Tracking improvements over time will require **investment in new primary data** e.g. waste compositional surveys (households) and industry data submission (e.g. via a voluntary platform). Existing government data sources are often useful for a 'big picture' view. However, they normally **lack sufficient detail** to drive action and to properly understand waste composition which is so critical for quantifying food waste/loss. It is acknowledged that this can require significant resources to undertake – but it is necessary for properly understanding the scale of the issue over time. For this reason, it may be more appropriate to do in-depth data collection once every few years and use higher-level indicators in-between to understand the progress against the target.
- Food waste data is generally very poor in countries – only about 15 countries have data for one or more stages of the supply chain, although this is changing with SDG12.3.
- When setting targets and communicating this to industry, these need to be as granular and sector specific as possible.

These insights from the contextual review of the Australian food system, the desktop review of best practice interventions and the expert interviews were used to inform the design of a long-list of 47 different interventions that were considered in the modelling stage of this project. This list is summarised in Table 8 and details on each of the interventions can be found in Appendices 5 & 6.

## 4 The national food waste baseline

The first step of the Feasibility Study was to update the food waste baseline, taking into account new data, filling gaps in the original study, and building on it. The National Food Waste Baseline estimates how much food waste is generated in Australia annually including how much is recycled, recovered and disposed.

These headline figures establish the baseline against which performance can be measured. It was also used to define environmental impact hotspots throughout the food supply chain, as well as test the effect of a range of interventions on the production of food waste.

The revised food waste baseline takes a mass balance approach to measuring food waste and losses. Using a mass balance approach in modelling food waste in Australia means that it is possible to estimate the volume of food going to market, and the overall proportion that is lost at some point in the supply chain. Each stage of our food production system is linked within the model, so as to keep the flow of material coming in (production) and out (loss/waste) balanced.

### 4.1 Baseline & hotspot methodology

Outlined below is a summary of the key elements of the baseline and hotspot methodology as detailed in Appendix 3 and Appendix 4.

#### 4.1.1 Baseline scope

As in the Arcadis baseline, the list of parameters defining the scope of the food loss and waste inventory are sourced from the Food Loss and Waste Accounting and Reporting Standard. The definition of these parameters is reported in Table 1.

**Table 1. Food waste baseline parameters**

Parameters	
<b>Timeframe</b>	2018–19
<b>Material type</b>	Food and inedible parts
<b>Destination</b>	<ul style="list-style-type: none"> <li>• Commercial composting</li> <li>• Anaerobic digestion</li> <li>• Landfill</li> <li>• Wastewater treatment</li> <li>• Waste to energy</li> <li>• Home / on-site composting</li> <li>• On-farm disposal</li> <li>• Food rescue</li> <li>• Animal feed</li> <li>• Processing to new food</li> <li>• Processing to non-food products</li> <li>• Other recovery</li> </ul>
<b>Food category</b>	All food and beverages
<b>Life cycle stage</b>	Entire food value chain
<b>Geography</b>	Australia
<b>Organisation</b>	All sectors

#### 4.1.2 Modelling the food supply chain and pathways to waste treatment & recovery

The food supply chain is varied and complex. To simplify the modelling process, a generic supply chain was defined, splitting the food chain into four distinct areas; Primary, Processing, Wholesale / Retail, and Consumption (See Appendix 3; Figure 1). The aim was for the generic supply chain to be applicable to all primary commodities, and to link the different stages of the supply chain.

Once food loss and waste arises at a given stage of the supply chain, it can take a number of routes to its final treatment or recovery. This study defined five types of collection systems that represent the means by which a food loss or waste is transported from its place of production to its place of treatment (See Appendix 3; Figure 2). The collection systems range from kerbside collection of food

organics or residual bins, sewer system disposal, third-party collection or on-site treatment (this includes, for instance, home composting).

The mass balance approach used in modelling Australian food waste means that it is possible to estimate both the volume of food going to market and the proportion that is lost at some point in the supply chain. This method produced an estimate of 16.8 million tonnes of food product per year to market, approximately 680 kg/capita/year. The Australian Bureau of Statistics reported a figure of 430 kg/capita/year for purchased food (households only), which when uplifted to account for hospitality and institutions is estimated to total 610 kg/capita/year. The similarity of these estimates provides confidence that this model is well calibrated and aligned with national statistics.

#### 4.1.3 Data sources

A broad variety of data sources (n = 169) were used in this analysis.

**Table 2. Typology of data sources used in the baseline**

Data type	Sources	Data type	Sources
Industry data	70	International data	8
Government data	40	News outlet	4
Scientific publication results	24	Self-reported survey results	3
Official statistical data	20		

Data quality scoring of all 169 sources used in the creation of the baseline model was undertaken using a pre-defined data scoring system (see Appendix 3; Table 3). The overall score was calculated as an average of the four food supply chain stages.

#### 4.1.4 Hotspot methodology

The hotspot methodology from UN Environment Program (UNEP 2017) was applied. It defines thresholds to identify when an impact of food wastage should be considered a hotspot. is

As shown in the figure below a hotspot shall always be a percentage greater than if the impacts were evenly distributed across all life cycle stages. For example, if there are 5 life cycle stages, a hotspot is defined as any stage higher than 20% of the total impact category results. Using this approach, the number of hotspots identified may vary depending upon the number of impact categories selected.

The thresholds for warm and hotspots were adjusted to provide a reasonable distribution of hot and warm spots across the supply chain. For example, at the highest aggregation of all food assessed together warm spots were between average and 150% above the average value with hotspots being anything higher than 150% of the average value. At the 18-food group hotspot shown in Tables 5 and 6 below the threshold for warm spots was between 50% and 400% above average with hotspots being above 400% of the average value.

Hotspot	Warmspot	Cold Spot
A life cycle stage whose contribution to the impact category is greater than even distribution of that impact across the life cycle stages.	A life cycle stage whose contribution is approximately equivalent to an even distribution of the impact across the life cycle stages.	A life cycle stage whose contribution to any impact category is less than even distribution of that impact across the life cycle stages

**Figure 6. Summary of two options for identifying hotspots by lifecycle / value chain stage. Source (UNEP 2017)**

A total of 5 impact categories have been included in the hotspot assessment, as follow:

- **Climate change impacts** – using best practice international factors for global warming from the IPCC 2013 (IPCC 2013).

- **Water scarcity impact** - based on the UN Environment’s Life Cycle Initiative recommended approach for water scarcity impacts (Frischknecht and Jolliet 2016; Boulay et al. 2018).
- **Food waste wet tonnes** – based on tonnes of food waste sent to landfill, composting energy recovery or left on field.
- **Land occupation** – based on aggregated land occupation in hectare years for all non-natural land occupation.
- **Cost** – based on current value of food lost at each point of the value chain and the cost of food waste management.

To calculate food waste hotspots requires having food supply chain models that document the inputs at each stage of the supply chain and the associated level of waste and management type. In order to determine the impacts of food waste at any stage of the supply chain a Life Cycle Assessment (LCA) for a food type is run both including and excluding waste generation at that point in the chain.

For this study 18 food types across 4 food groups were modelled. The most representative products were selected for each commodity, which were then used as archetypes of the entire food group. In the choice of representative commodity, the context of Australian food systems both from the production and consumption perspective was considered. The 18 commodity categories modelled are shown in Figure 7. This study followed the first approach (hotspot - warm spot - cold spot) set out in the UN Environment hotspots analysis methodology. The exact process and categorisation is detailed in Appendix 4.

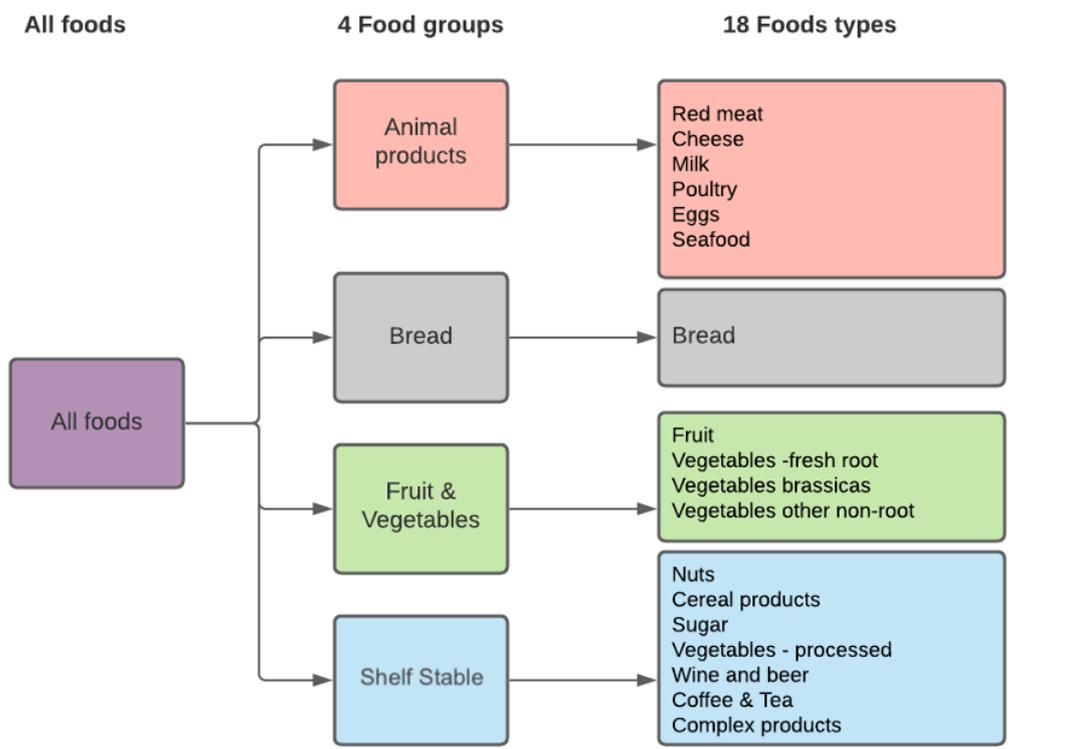


Figure 7. Three levels of group of food for hotspot analysis

## 4.2 Baseline results

### 4.2.1 Waste tonnage by destination

The overall results of the updated national food waste baseline are reported in Table 3, Figure 8 and Figure 9. The results represent the entirety of Australian food production and consumption, across all commodities and at all levels of the supply chain, based on the latest and most complete data available at the time of the analysis. This data can be further interrogated in the power BI dashboard.

**Table 3. Waste arising across the supply chain. (Unit: Thousand Tonnes)**

<b>Destination</b>	<b>Primary</b>	<b>Manufacturing</b>	<b>Distribution</b>	<b>Wholesale-Retail</b>	<b>Hospitality</b>	<b>Institutions</b>	<b>Households</b>	<b>Total</b>	<b>Total per capita (kg)</b>
Commercial composting	0	773	169	216	131	2	81	1,372	55
Home / on-site composting	363	0	0	0	0	0	443	806	33
Anaerobic digestion	0	16	0	24	0	0	0	40	2
Waste to energy	0	28	0	0	0	0	0	28	1
On-farm disposal	1,321	52	0	0	0	0	0	1,372	55
Landfill	0	79	89	286	830	249	1,788	3,322	134
Wastewater treatment	0	328	0	0	257	0	151	736	30
Recovery (new food)	0	926	0	0	0	0	0	926	37
Recovery* (non-food product)	0	2,067	0	0	0	0	0	2,067	84
Other	0	22	0	0	0	0	0	22	1
Export	0	585	0	0	0	0	0	585	24
Food rescue	0	2	0	35	0	0	0	37	1
Animal feed	4	6,253	165	68	0	0	0	6,490	262
<b>Total waste</b>	<b>1,683</b>	<b>1,276</b>	<b>258</b>	<b>527</b>	<b>1,217</b>	<b>251</b>	<b>2,464</b>	<b>7,676</b>	<b>310</b>
<b>Total recovery</b>	<b>4</b>	<b>9,854</b>	<b>165</b>	<b>103</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>10,126</b>	<b>409</b>

\*Material recovered as non-food product is excluded from the waste category for the purpose of this baseline, as discussed in Appendix 3.

It is worth noting that this analysis differentiates between waste and recovery routes. Here, we did not consider processing to non-food products as part of the waste management system, but as a 'recovery' stream.

Material processed to non-food products are overwhelmingly represented by the outputs of livestock processing, which produce a range of co-products. Livestock have always provided food and non-food products. Cattle are not typically grown to produce leather, but it has long been co-product of the slaughtering process with its own market and value. Generally, animal parts that are not directed to the market are either used for another purpose (e.g. leather) or rendered to produce a range of commodities such as fertiliser and biofuel.. These streams are considered in the baseline model to allow keeping the mass balance. However, they are not considered a food waste stream as they are

co-products which result from livestock processing but would never enter the Australian food production system.

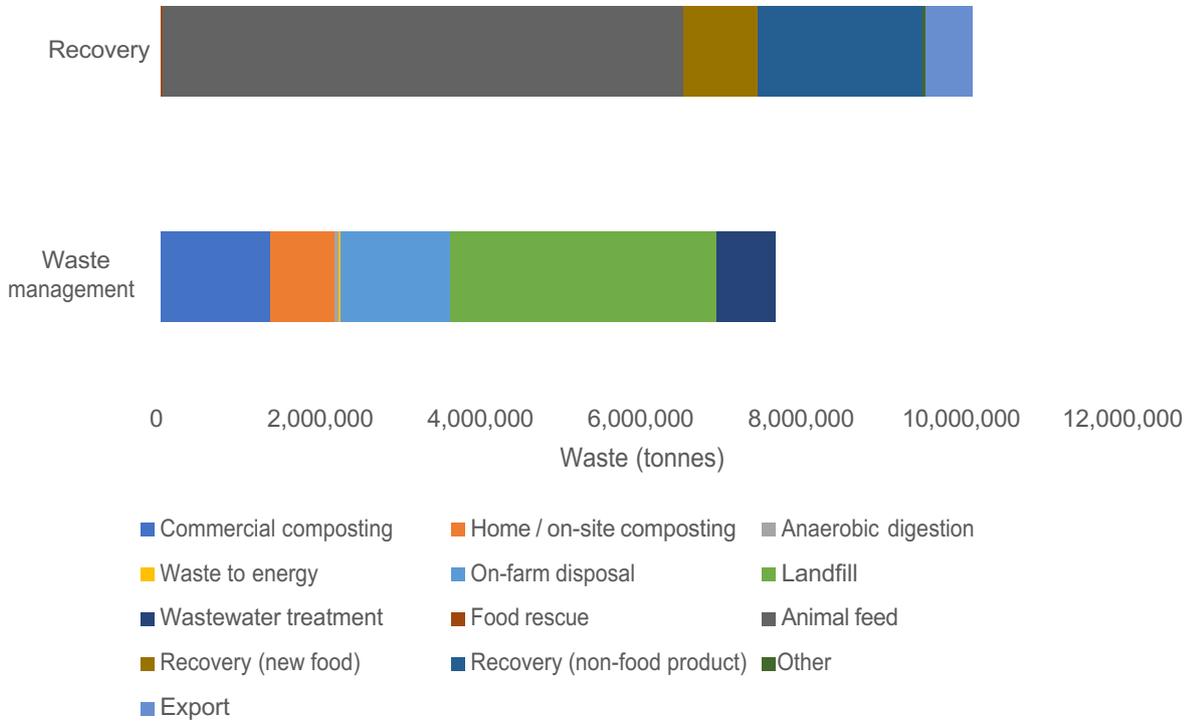


Figure 8. Updated national food waste baseline results, differentiating between waste and recovery.

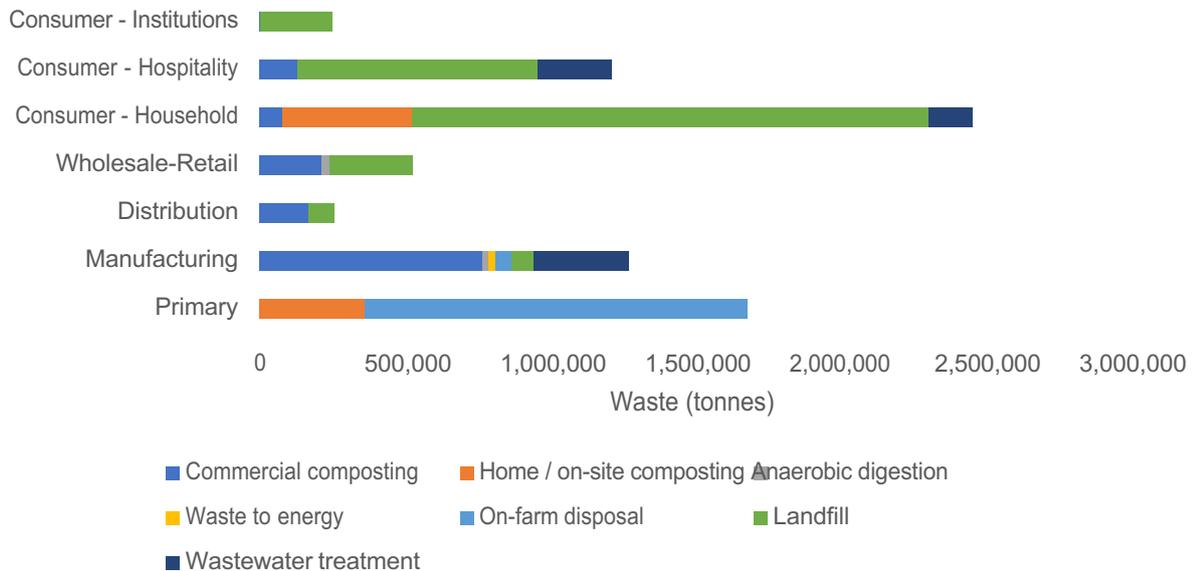
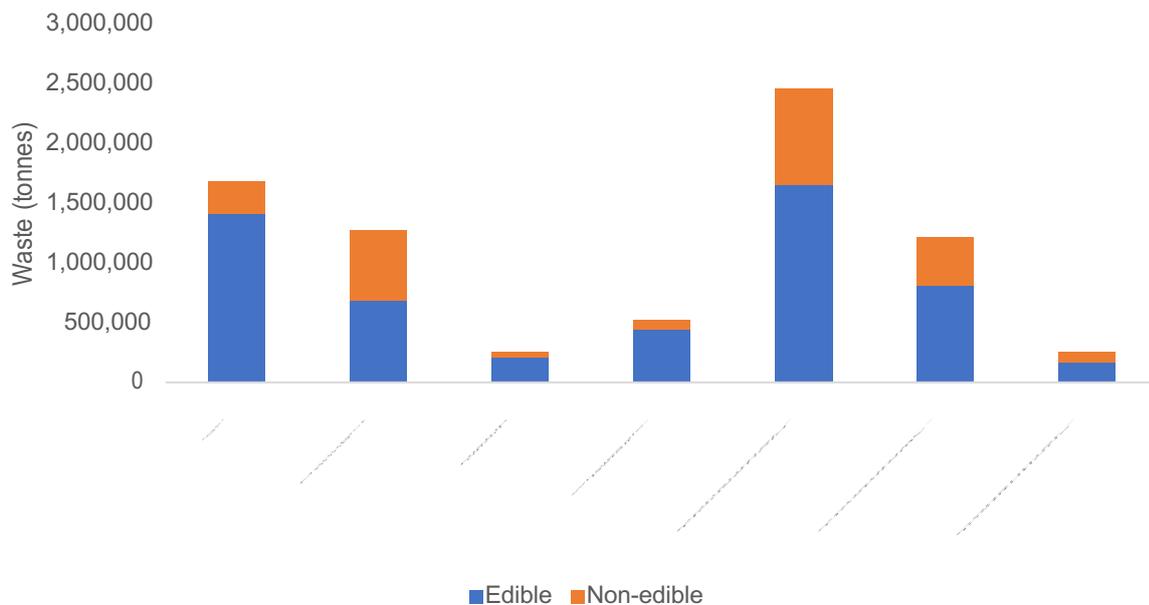


Figure 9. Distribution of waste streams across the supply chain and their destinations.

## 4.2.2 Edible vs inedible

A fraction of the food products we produce, or purchase, can be considered inedible. This may be on the basis of cultural approaches to food (e.g. the peel/cores of fruits), or simply because the part cannot be consumed, or at least not without significant processing (e.g. bones). The edible and inedible waste fractions at different stages in the food supply chain were calculated using data from Public Health England (2019), the Food Waste Index (United Nations Environment Programme 2021), and four Australian studies (Sustainability Victoria 2013, EnviroCom Australia 2019, Rawtec 2020, Instinct and Reason 2021).

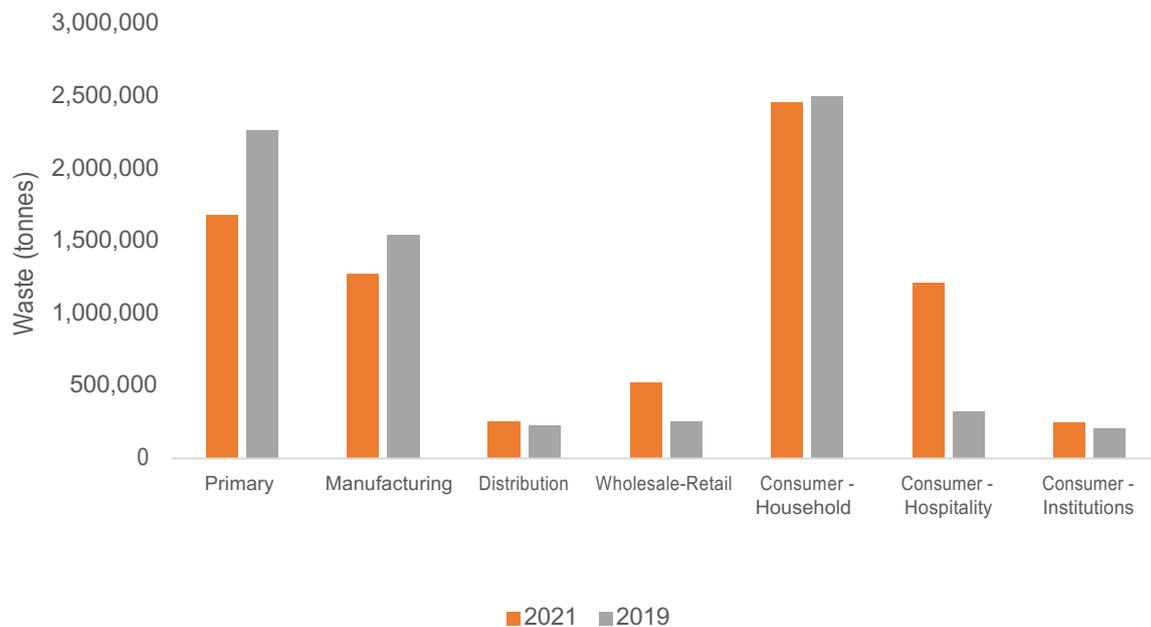


**Figure 10. Edible vs non-edible fractions throughout the supply chain.**

A comparative analysis of edible and non-edible fractions at each stage of the supply chain was performed during this update. Results are shown in Figure 10 above. The results show that a significant fraction of food lost is edible – approximately 70% overall.

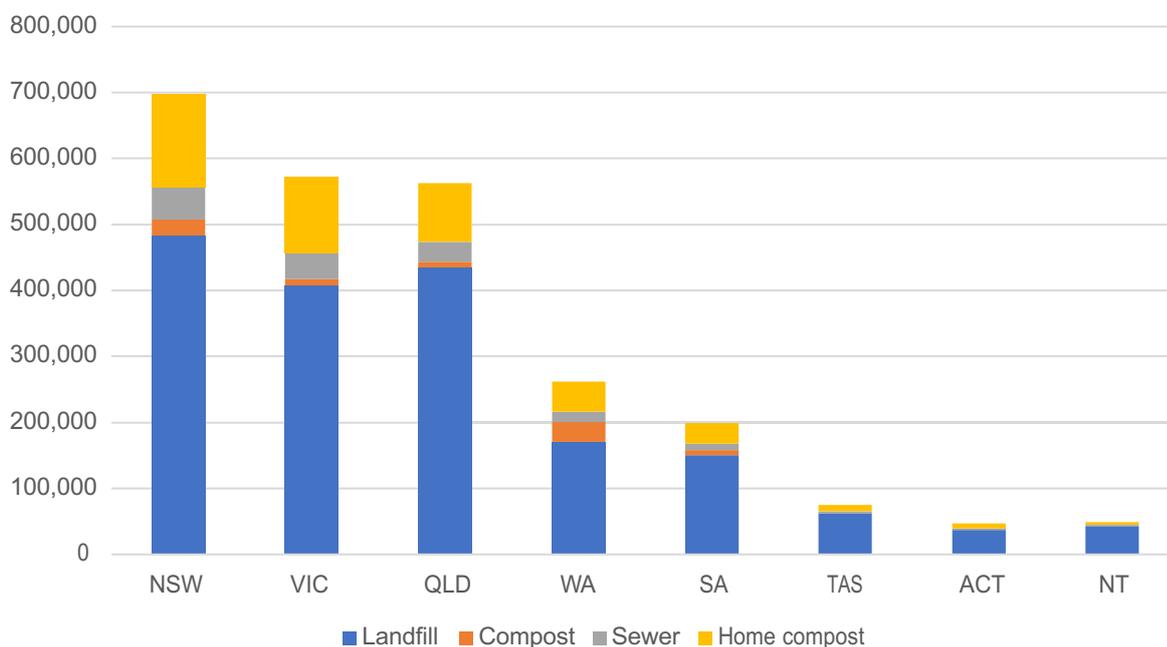
## 4.2.3 Comparison to previous baseline

The overall comparison of results between the 2019 and 2021 food waste baseline estimates shows some level of variation across the board, with primary and manufacturing waste being 26% and 17% lower in 2021 respectively, and retail and hospitality waste 104% and 275% higher in that year, respectively (Figure 11). Other aspects, such as distribution, households and institutions appear to be at a similar level. A detailed breakdown across each of the supply chain stages can be found in Appendix 3.



**Figure 11. Comparison of results across the supply chain.**

Household waste was found to constitute the largest proportion of waste across all stages of the supply chain. The estimate in this study is broadly similar to the previous assessment. The breakdown of household waste for each Australian State is provided in Figure 12, which combine to create a total of 2.46 million tonnes of household food waste produced across Australia.



**Figure 12. Household food waste by state.**

With the inclusion of home composting and sewer to the baseline, the overall waste flow arising from Australia is on par with the previous baseline, though this means that volumes going to landfill and commercial composting (via FOGO (food organics and garden organics) collection) are lower in this update. Given the short span of time between the two updates this is unlikely to be due to a change in practice. Instead, the differences between the two baselines show the high variability in reported versus calculated approaches for food waste.

## 4.3 Food waste hotspots

### 4.3.1 Hotspots across five key indicators

Table 4 outlines the high-level results of the hotspot analysis across the five key indicators.

**Table 4. Absolute values aligned to hotspot indicators - impacts of food waste per annum**

	Units	Primary	Processing	Distribution	Retail	Household consumption	Hospitality consumption	Institutional consumption	Total
<b>Waste*</b>	Kt	1700	1221	258	527	3172	1217	251	8346
<b>Climate change</b>	Kt CO <sub>2</sub> e	577	1484	681	2456	9306	2315	770	17,589
<b>Water scarcity</b>	GL e	13,865	31,497	6350	12,277	89,101	27,063	6469	186,621
<b>Land occupation</b>	Mha.years	0.345	1.146	2.272	4.784	12.884	3.435	0.867	25.733
<b>Cost</b>	\$M	1249	2881	788	4402	19,294	6455	1573	36,643

\* Note that the waste values in the hotspot analysis don't match exactly with the baseline waste values as the hotspot numbers are based on 18 representative food groups and waste is calculated as a fraction of consumption/throughput at each stage, while the baseline is based on over 100 individual food groups and waste at the retail and consumption stage is based on waste disposal statistics.

### 4.3.2 Hotspots by commodity groups

Table 5 and Table 6 highlight the hotspots of the 18 commodity groups against the key indicators of waste tonnage and climate change. Appendix 4 includes the full tables of hotspots across the other remaining three key indicators.

The hotspots analysis show that the majority of food waste impact is concentrated in the consumption stage of the food supply chain. Impacts are also higher in the later part of the life cycle because waste arising at these later stages has a compounding effect on waste production, as it creates additional need for primary, processing and retail activities. Any waste from these additional activities is allocated to the life cycle stage which causes this additional demand.

The food waste impact differs across the five different hotspot areas and for each of the 18 commodity groups within these.

- Red meat has the highest climate impact among the 18 commodity groups, and this impact is outsized compared to its waste footprint.
- While vegetables, fruit, cereals and sugar show warmspots for food waste tonnage in the primary production stage, this food waste has a relatively lower climate and land occupation impact.
- Nuts display water scarcity hotspots during both the processing and consumption stages, displaying a greater impact than their waste volume.
- The largest number of hotspots across all five impact categories are found in Institutional consumption.
- After red meat, the food commodities with the greatest number of hotspots across multiple impact categories are cheese, milk, root vegetables, fruit and complex products.
- Cheese, milk and complex products all have climate hotspots in the consumption stage, while cheese, milk, root vegetables and fruit display water scarcity hotspots during consumption.

**Table 5. Waste hotspots in tonnes of waste**

Waste hotspots in tonnes of waste							
	Primary	Processing	Distribution	Retail	Household	Hospitality	Institutional
Red meat	0	0	26,188	34,191	140,300	37,770	9,387
Poultry	0	0	16,653	35,129	138,335	37,241	9,255
Eggs	0	0	0	10	277	27	7
Cheese	0	383,827	0	14,310	152,036	11,317	12,018
Milk	0	1,549	0	27,559	552,131	41,326	43,887
Seafood	0	7,782	1,638	34,139	100,324	16,327	4,058
Bread	9,831	17,610	0	7,914	34,815	1,449	1,131
Vegetables - fresh, root	142,147	68,487	68,091	119,565	470,328	262,939	19,895
Vegetables - fresh, other non-root	318,463	100,412	49,459	29,504	189,106	174,905	13,234
Fruit	359,612	232,855	83,095	61,081	461,721	281,848	21,326
Vegetables - fresh, brassicas	88,181	7,990	7,735	7,283	150,695	38,300	2,898
Cereal products	310,456	230,003	0	6,251	157,672	11,004	0
Complex products	0	3,949	0	106,312	427,815	79,775	38,484
Vegetables - processed	117,931	5,727	0	0	58,903	54,641	4,134
Wine and beer	66,990	118,887	0	39,222	4,626	141,066	66,196
Coffee & Tea	0	0	0	-1	64,676	-1	0
Sugar	285,858	1,076	0	2,262	33,933	1,428	2,656
Nuts	1,004	40,777	4,514	1,890	34,583	25,893	1,959

**Table 6. Climate hotspots in tonnes of CO<sub>2</sub>-e**

Climate hotspots in tonnes of CO <sub>2</sub> -e							
	Primary	Processing	Distribution	Retail	Household	Hospitality	Institutional
Red meat	0	0	525,038	1,084,201	2,910,294	783,473	194,714
Poultry	0	0	48,289	161,288	449,891	121,114	30,100
Eggs	0	0	0	59	1,058	102	25
Cheese	0	0	0	115,996	1,112,351	82,645	87,766
Milk	0	2,495	0	59,045	1,231,979	92,211	97,925
Seafood	0	35,357	5,584	186,647	391,515	63,718	15,836
Bread	5,926	47,526	0	30,617	93,830	3,906	3,047
Vegetables - fresh, root	33,220	107,415	34,897	79,979	279,156	156,064	11,809
Vegetables - fresh, other non-root	57,987	22,564	19,350	18,318	106,586	98,582	7,459
Fruit	60,055	70,339	25,978	24,235	190,077	116,029	8,779
Vegetables - fresh, brassicas	50,809	5,460	5,676	6,751	122,121	31,037	2,348
Cereal products	187,148	956,080	0	5,921	103,217	7,203	0
Complex products	0	68,462	0	641,654	1,937,510	361,288	174,289
Vegetables - processed	18,972	3,779	0	0	55,913	51,867	3,925
Wine and beer	62,292	7,613	0	30,009	3,917	119,463	56,059
Coffee & Tea	0	4,445	0	-163	172,322	143,540	67,357
Sugar	100,049	5,658	0	2,344	36,120	1,520	2,828
Nuts	908	146,829	16,254	9,047	107,943	80,821	6,115

## 4.4 Baseline and hotspot key findings

The following key findings can be established from the baseline update and hotspot analysis based on the year 2018/19:

- Australia produced **7.6 million tonnes, or 312 kg per capita**, of food waste every year, and 70% of this is edible.
- This estimate represents an **increase of just 0.3 million tonnes over the previous baseline**. However, the proportions of food waste ascribed to different parts of the food value chain have changed markedly.
- The consumption stage of the food supply chain is responsible for the greatest mass of food waste, and households (2.46m tonnes) alone account for more food waste than any other sector - **almost one-third of the total**.
- Restated, 71% of food that entered the market was directed towards households, and households wasted approximately 18% of the food they purchased.
- Household food waste production around Australia is **broadly proportional to the population of each state**, i.e. no individual state is markedly outperforming others in food waste reduction.
- Primary Production creates the second largest tonnage of food waste along the food value chain, at approximately 1.68m tonnes.
- Among the 18 food commodity groups that were assessed, six commodities, **milk, root vegetables, non-root vegetables, fruit, complex products and wine & beer** showed hotspots for food waste, meaning that they were responsible for the greatest mass of food waste.
- Of these, milk and complex products were also hotspots for the climate impact of their food waste. Cheese and red meat, while only warmspots for food waste mass, were also hotspots for their climate impact.
- **AUD\$36.6bn is the estimated cost** to the economy of food wasted. AUD\$19.3bn of this comes from households. This is approximately AUD\$2,000-2,500 per household<sup>1</sup> per year.
- **17.5 million tonnes of CO<sub>2</sub>-e annually** is generated from the production and disposal of food that is wasted in Australia (excluding the emissions associated with exported food), which is equivalent to the annual emissions from Hazelwood power station<sup>2</sup> which was considered Australia's highest emitting coal fired power station. This is also equivalent to approximately 3.5% of the Nation's emissions at the time of the baseline year (2018-19)<sup>3</sup>.
- Wasted food in Australia uses 2628.3 gigalitres of water across its lifecycle, meaning that eliminating this food waste would effectively save a massive **286 litres of water, per person, per day**.
- The amount of land used to grow wasted food is also staggering, **covering in excess of 25 million hectares**, a landmass larger than the state of Victoria.

---

<sup>1</sup> <https://www.abs.gov.au/statistics/economy/finance/household-expenditure-survey-australia-summary-results/latest-release>

<sup>2</sup> <https://environmentvictoria.org.au/hazelwood-faqs/>

<sup>3</sup> This is less than the 8% of GHG emissions that are estimated to come from wasted food globally (FAO, 2015) This may be due to the higher per capita greenhouse gas emissions in Australian compared with world average (17 compared with 4.7 tons per person), which are partly due to large export industries in food production and minerals.

# 5 High level food waste reduction scenario analysis

Scenario analysis is a common tool used to assess the collective impact of various ‘groupings’ of interventions towards the attainment of a target. While this high level analysis often relies on significant assumptions, the insights it produces can provide important principles to inform the design of a more refined ‘recommended’ grouping of interventions.

In this instance, the scenario analysis was used to inform answers to the following questions:

- What progress would be made towards the target if no major changes were to occur?
- Is it technically possible to halve Australia’s FLW with the current suite of interventions available?
- What macro ‘levers’ would be most effective at reducing FLW within a ‘tolerable’ investment threshold?

The approach utilised four distinct scenarios which were fed into a food waste reduction model to estimate their progress to the 2030 target.

## 5.1 Food waste reduction scenario analysis methodology

### 5.1.1 High level scenario development

Four distinct scenarios were developed using a collaborative process between the project team and the project advisory group. These scenarios or delivery trajectories were built around four distinct macro intervention ‘levers’ that could be pulled to address the FLW issue in Australia.

The approach to selecting interventions for each scenario was practical in that the very granular interventions were grouped or clustered together. For example, product specific interventions at the retail level (such as specific planning recommendations for bakery) would be grouped together into ‘retail best practice’.

The number of interventions per scenario was not fixed but was also be determined practically to ensure that the impact modelling was feasible within the timescales and budget. The impact of each scenario was modelled against the same set of hotspots determined in the revised baselining exercise.

The four high-level scenarios modelled were:

1. **Current progress maintained (CPM):** Continuing the current trajectory including a full and successful implementation of initiatives already committed to, planned or likely to continue or increase in a ‘business as usual’ context.
2. **Policy-led (PL):** Focus on legal and regulatory tools, such as deployment of fiscal and financial incentives and development of key infrastructure.
3. **Industry-led (IL):** Focus on private sector action across the entire value chain with an increased focus on voluntary agreements and market-based changes to the waste system.
4. **Do everything (DE):** Significant but plausible investment in innovation, fiscal and financial incentives, high regulation, high impact trajectory for voluntary agreement, high citizen engagement and industry involvement.

A full list of the design features used to determine the high-level scenarios can be found in Appendix 5. Table 8 outlines what interventions were included in what scenario and the associated abatement assumptions.

### 5.1.2 Modelling impacts against the food waste baseline

In order to effectively model the impact of the various interventions out to 2030, the newly updated baseline was projected out to 2030 (henceforth, ‘the baseline projection’). This utilised a fixed per

capita projection methodology, which is in line with methodology outlined in the Food Waste Index Report<sup>4</sup>, published in March 2021 by UNEP and similar to the approach adopted by other nations.

As the updated baseline is primarily based on data gathered for the financial year 2018-19 the adjusted per capita figure using the 2018 population data for Australia, of 312kg/person was used. This approach assumes that, without any intervention or action to reduce food waste, it stays constant on a per capita level.

Utilising forecast population growth figures, the projected baseline was established. **This estimates the 2020 baseline at 7.9mt and the 2030 baseline at 9.2mt.** The impact of the initiatives in each of the scenarios was modelled against the projected baseline.

### 5.1.3 Food waste reduction model

A food waste reduction model was custom built for the purposes of modelling the impact of the high-level scenarios and the recommended scenario. Based in Excel, the model operates using the basic principles established by PathEAS 12.3 (WRAP, 2019), with adjustments to improve upon the PathEAS framework. The 47 interventions listed were considered in four different scenarios (CPM, IL, PL, DE). The model was built to accommodate every intervention being active in every scenario. This assumed a level of impact and an associated cost for each intervention, informed by desktop review and stakeholder engagement.

The details on how the model works and the calculations used in the model can be found in Appendix 5. The full table of abatement and cost assumptions used to inform the model can be found in Appendix 6.

The model is necessarily complex to account for the multiple factors requiring calculation including:

- The level of impact delivered by the interventions (which could be different in each of the scenarios).
- The time over which it delivers.
- The stage(s) of the supply chain the impacts are applied to; and/or the specific products/commodities that the intervention could apply to etc.

The Power BI model has been developed so the wealth of data in the model can be interpreted and interrogated in a user-friendly interface.

For the high-level scenario modelling, no adjustments were made to the interventions on the basis of their interaction with each other, the level of success they might have or any other criteria. This is on the basis that the high-level scenario analysis was to determine the effectiveness of the macro 'levers' only. In the recommended scenario modelling stage, the model was updated so the assumptions could be modified, to take into account 'real world' impacts and interrelationships between interventions as outlined in section 6.

The model was also updated during the project to display the impacts of both total food waste and edible only in order to determine the impacts of the interventions under both total food waste and edible only categorisations.

## 5.2 Cost benefit analysis (CBA) methodology

### 5.2.1 CBA Scope

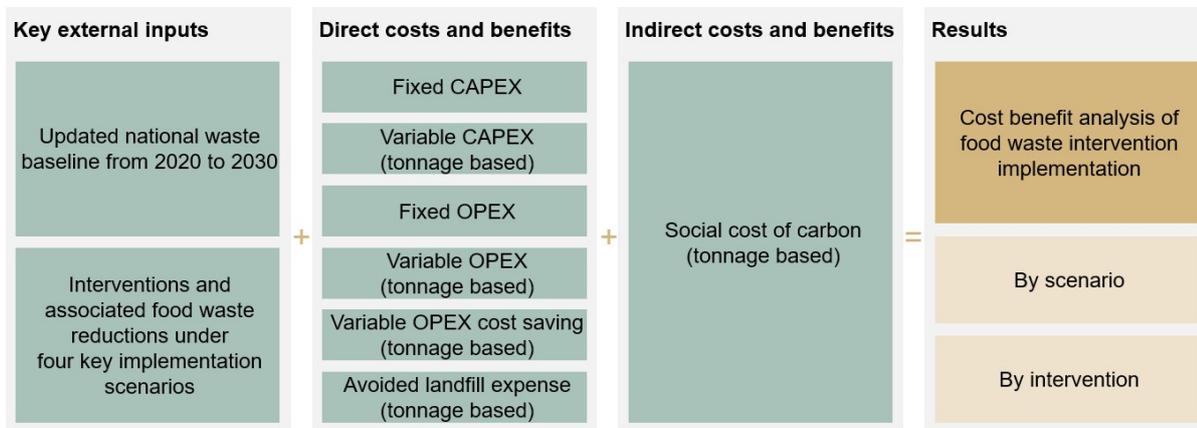
The implementation of FLW interventions has significant impacts across the economy, both directly for the stakeholders involved and for the broader community who benefit from reduced environmental impacts of food waste across the value chain. This "ripple effect" produces complex costs and benefits that affect multiple stakeholder groups.

---

<sup>4</sup> <https://www.unep.org/resources/report/unep-food-waste-index-report-2021>

A cost-benefit analysis was used to model various costs and benefits directly associated with the implementation of the interventions. Appendix 8 provides the full detail on the CBA methodology, including assumptions made about direct costs and benefits and the associated references.

The following figure outlines the scope of this CBA:



**Figure 13. Scope of CBA Model**

Each of the key inputs to the CBA model has been defined in the table below:

**Table 7. Definition of terms used in CBA model**

Term	Definition
Fixed CAPEX	Fixed capital expenses (fixed assets, equipment, etc.) associated with the implementation of the NFWS
Variable CAPEX	Variable capital expenses associated with the implementation of the NFWS, proportional to the food waste tonnage avoided
Fixed OPEX	Fixed operational expenses (wages, utilities, etc.) associated with the implementation of the NFWS
Variable OPEX	Variable operational expenses associated with the implementation of the NFWS, proportional to the food waste tonnage avoided
OPEX Cost Savings	The per tonne financial saving associated with avoided food purchases across the value chain.
Avoided Landfill Savings	The per tonne saving associated with the landfill waste avoided through the implementation of the NFWS.
Social Cost of Carbon	The quantified economic harm associated with the emissions of carbon into the atmosphere, incorporating impacts on human health, environmental quality and extreme weather events.

Based on the work undertaken in previous stages of this project, a number of interventions were identified as driving higher impact in terms of food waste reduction. Other interventions were seen as largely immaterial based on their modelled impact on national food waste reduction.

To rationalise the list of 47 interventions into high-impact interventions, Edge analysed the interventions that comprised the top 80% of reductions for each scenario, identifying 18 high-impact interventions across all scenarios. This analysis was supplemented by the modelling of 4 additional interventions to provide similar emissions reduction coverage across all 4 scenarios. While the remaining 25 interventions are important in achieving the required food waste reduction, they collectively account for less than 20% of total food waste reduction target and therefore have been considered immaterial for the purposes of this feasibility assessment.

### 5.2.2 Interpreting the results of the CBA

The interventions included in the scope of this CBA model are, in many cases, entirely new or have not been implemented at a scale where reliable data is available as the basis of the model. As a result, several key assumptions were made for each intervention based on a combination of detailed desktop research, prior studies, and industry expert interviews. A list of the key assumptions used, and the associated reference has been included in Appendix 6.

In addition, the costs and benefits at the intervention level under both the preliminary scenarios and the recommended scenario do not capture the interdependencies between interventions. Due to the complexity of these interventions, it was not considered feasible to model these interdependencies at the intervention level, and these were instead applied to the recommended scenario at the scenario level only.

Given these constraints, the results of the CBA on an intervention level have been aggregated to the scenario level across all four preliminary scenarios and under the recommended scenario. Any discussion of the results at the intervention level should therefore consider these constraints and readers should interpret the results of the CBA model at the scenario level only.

### 5.3 Food waste intervention long list and abatement assumptions

Drawing from the insights of the previous stages, a long list of 47 different food waste interventions were drafted and broadly categorised into the groupings as highlighted on the desktop review.

Table 8 below provides a full list of the 47 interventions and the assumed FLW reductions attributed to each scenario. More detail on the method used to define these figures can be found in the detailed list in Appendix 5.

Note: Cells highlighted in yellow represent the selection of interventions that form the recommended scenario, however abatement numbers were amended taking into consideration the factors outlined in 6.1.

**Table 8 Intervention long list and assumed abatement figures as tonnes saved in 2030**

Intervention	Description	CPM	Industry Led	Policy Led	Do Everything
Comms.1	Employee engagement & behaviour change	20,425	265,531	-	326,807
Comms.2	Consumer behaviour change campaigns	215,085	-	268,856	526,666
Govt.1	Infrastructure investment	34,673	-	184,924	184,924
Govt.2	Public procurement standards	3,912	-	19,558	-
Govt.3	R&D / innovation grants	156,508	-	156,508	156,508
Industry.1	Better/more consistent FLW measurement	3,130	125,207	219,112	250,414
Industry.2	Centralised and 'dark' commercial kitchens	299,698	599,396	-	599,396
Industry.3	Data, analytics & waste audits	6,260	515,503	-	515,503
Industry.4	Enable harvesting and sorting of all grades of crop at economic cost	103,821	207,641	-	207,641
Industry.5	Encourage gleaning	-	19,726	-	19,726
Industry.6	Fibre products from fruit and vegetable waste	87,416	174,832	-	262,249
Industry.7	Implement date labelling best practice	42,952	42,952	42,952	42,952
Industry.8	Improve manufacturing processes and technologies	46,074	147,438	-	147,438
Industry.9	Improve re-distribution sector storage and practices	-	-	-	-
Industry.10	Improved demand forecasting and ordering	38,774	96,935	-	96,935
Industry.11	Improved storage instructions	6,414	12,828	-	12,828
Industry.12	Increase diversion of food waste to animal feed through policy/regulatory means	113,264	-	538,575	100,044
Industry.13	Increase resale or donation of surplus food	75,981	196,661	-	438,022
Industry.14	Invest in cold storage and cold chain improvements	170,406	213,007	213,007	261,054
Industry.15	Liability law education	1,506	-	15,384	15,384
Industry.16	Menu planning	16,967	33,934	-	33,934
Industry.17	New and amended processing technologies to extend shelf life	184,811	194,048	-	198,666
Industry.18	Nutrient extraction from processing wastes	45,511	163,839	-	163,839
Industry.19	Optimise product and packaging to enable better portioning	7,069	70,687	-	70,687
Industry.20	Portioning nudges	1,354	10,835	10,835	21,669
Industry.21	Relax product standards and specifications	10,382	10,382	-	10,382
Industry.22	Retail store operational efficiency	10,760	88,946	-	142,745
Industry.23	Stabilisation of surplus food e.g. freezing, pureeing, etc	-	19,062	-	297,848

Indstry.24	Use anti-spoilage technologies in packaging	7,444	59,549	-	74,436
Indstry.25	Whole crop purchase arrangements	20,764	103,821	-	103,821
Indstry.26	Retail production planning for in-store bakery etc	307	920	-	920
Mrkt.1	Low-interest financing	4,483	22,417	22,417	44,834
Mrkt.2	Pay-as-you-throw (PAYT)	-	-	230,478	460,957
Mrkt.3	Tax credit schemes, VAT exemptions	44,834	-	224,171	448,342
NatStrat.1	Build FLW evidence base	-	-	-	-
NatStrat.2	Develop national FLW strategy	-	-	46,096	46,096
NatStrat.3	Set FLW targets aligned or exceeding SDG 12.3	-	-	9,219	9,219
Regs.1	Adjust fishery quota rules	305	-	610	1,221
Regs.2	Ensure energy policy does not promote FLW	-	-	-	-
Regs.3	Ensure product liability laws do not excessively limit food donations	20,905	-	83,620	83,620
Regs.4	Extend allowable use-by dates	155,144	310,287	156,426	310,287
Regs.5	Extended producer responsibility (EPR)	23,048	138,287	-	138,287
Regs.6	Increase residue tolerances	-	-	17,773	17,773
Regs.7	Restricted residual capacity	-	-	29,588	29,588
Regs.8	Separate food waste collection	36,877	-	68,086	73,753
Regs.9	Tackle unfair trading practices (UTPs)	45,702	-	152,341	152,341
VA.1	Introduce sector food waste voluntary agreements	92,191	387,204	387,204	1,189,269

## 5.4 Results of the high-level scenario analysis

Figure 14 below outlines the results of the high-level scenario analysis. This highlights that while the do everything scenario will reach the target at approximately the commencement of 2026, none of the other scenarios would reach the 50% reduction target.

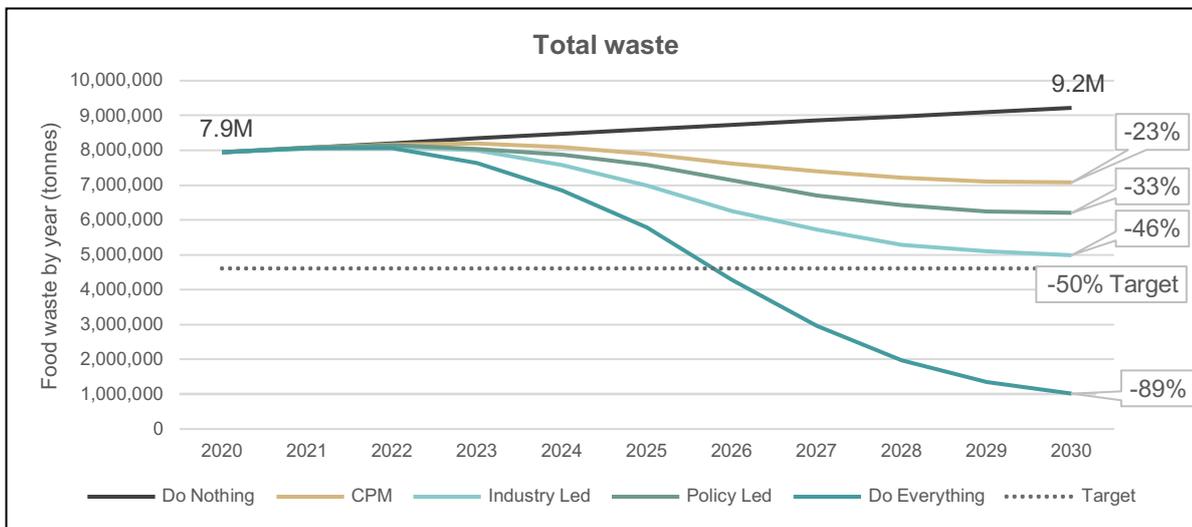


Figure 14. Waste reductions achieved by each scenario

Table 9 outlines the results of a CBA for the scenario analysis. Drawing on the sum of the estimated total cost of the interventions modelled in the CBA, these results show that the estimated total investment across these four scenarios range from \$5.5bn (current progress maintained) through to \$11.5bn for do everything (noting that an investment range has been provided to highlight the estimated range of variability).

The industry-led scenario demonstrates the lowest cost per tonne avoided (\$213/tonne). Importantly, all scenarios show a significant net benefit back to society of greater than \$2100 per tonne avoided, meaning that **in all scenarios the benefit to society of taking action will outweigh the costs.**

Table 9. Table of high level scenario results – key results summary

Scenario	% reduction from 2020 baseline	Direct Investment Cost as per CBA (NPV)*	Net benefit NPV	Direct cost per tonne avoided	Net benefit to society per tonne avoided	Coverage of waste avoided in CBA	Indicative cost at 100% coverage (if scaled)
Current progress maintained	23%	\$ 5,556,402,082	\$ 20,841,392,556	\$ 634.03	\$ 2,378.16	90.0%	\$ 5.5 - 6.5bn
Policy-led	33%	\$ 5,872,978,515	\$ 23,797,099,522	\$ 530.32	\$ 2,148.83	78.3%	\$ 7 - 8bn
Industry-led	46%	\$ 3,788,271,306	\$ 46,523,514,643	\$ 213.25	\$ 2,618.93	86.9%	\$ 4 - 5bn
Do everything	89%	\$ 9,017,145,424	\$ 78,717,922,903	\$ 285.02	\$ 2,488.16	81.9%	\$ 10.5 – 11.5bn

## 5.5 Scenario analysis key findings

The high-level scenario analysis provides the following key insights for consideration in the design of a more detailed recommended scenario:

- If we maintain the current progress, i.e., continue to roll out the programs as currently committed with no addition spend or planned resource allocation, Australia **will get approximately halfway to the target by 2030** (reduction of approximately 23%).
- Conversely, if we ‘do everything’ and progress every feasible opportunity, it is technically possible to halve Australia’s food waste within 6-7 years. However, the budget and resources to do this are likely prohibitive, requiring a total investment of in excess of \$10.5bn.
- **No single lever on its own, industry, or policy-led, will be sufficient to halve food waste by 2030.**
- Industry-led interventions provide the most cost effective approach to reducing food waste, once a supportive policy framework is in place.
- **Combining policies that support and stimulate the private sector with voluntary, industry-led initiatives produces the best chance of halving food waste by 2030 within a feasible investment range.**

# 6 Recommended scenario

## 6.1 Recommended scenario methodology

The 'recommended scenario' was designed using an iterative approach that utilised the food waste reduction model, leveraged the findings of the high-level scenario analysis, and then applied a suite of tests to the selected interventions and their modelled impacts over time. This process was split into two stages.

1. **Shortlisting interventions based on abatement potential & cost:** The first process involved defining the shortlist of interventions that would be included in the recommended scenario, considering both the modelled abatement and modelled cost of the intervention. This required exploring the interactions between policy and industry-led interventions. The outcome was optimised by strategically investing more resources than are committed in the 'current progress maintained' scenario. The process involved selecting the level of impact from the various scenarios (i.e., abatement numbers aligned to either industry-led, policy-led or do everything). The highlighted boxes in Table 8 outline which interventions were selected.
2. **Stress testing the shortlist and refining them based on 'real world' considerations:** The second stage of the process involved 'stress testing' the selected interventions and updating the abatement numbers while taking into consideration 'real world' interactions that were not considered in the high-level scenario analysis.

This was done through consultation with the Project Advisory Group and considered the combination of the interventions as a whole. Specifically, this process considered:

- The individual and cumulative impact potentially delivered by the intervention.
- What part(s) of the supply chain the impact is delivered in.
- The interrelationships with other interventions (i.e., does one intervention depend on one or more other interventions to be successfully implemented?).
- Any potential for 'double counting' (i.e., were two or more interventions reducing the same waste stream?).
- Who is responsible for delivering the intervention.
- How the selected interventions could be grouped together.
- The overall feasibility of the intervention based on the evidence from the international best practice review and the initial scenario modelling.
- The level of impact selected (where interventions appeared in more than one of the initial four scenarios, the level of impact sometimes differed depending on the nature of the scenario. For the recommended scenario, the appropriate level of impact was selected for those interventions based on the judgement of the project team.

Where the impact of interventions was not reduced to account for double counting, the project team also made a small reduction to account for the fact that the 'low hanging fruit' will only be delivered once and that, as time goes on, gains will be harder to achieve.

This iterative testing approach found the most effective scenario was neither purely industry or policy-led, nor did it require the 'do everything' scenario across all the interventions. Instead, it found **that combining policies that support and stimulate the private sector action provides the most 'feasible' opportunity to halve food waste by 2030**. This resulted in the creation of a 'recommended scenario' consisting of 23 high impact interventions that balance the opportunities, costs, risks and limitations in the national context.

Finally at this stage, the split of expenditure for each of the interventions was determined, along with an assessment of how much funding is already committed and how much 'new money' would be required to deliver the impact level. The existing expenditure (both in terms of the quantum and the split between different parties) was drawn from a range of sources, including those utilised in the CBA, published sources and drawing on the expertise of the Project Advisory Group.

Proposed sources of new funding required to uplift the selected interventions from the current progress maintained levels of impact to those required to deliver the target were nominated. In this

case, a general rule of thumb of a 'one third each' split between federal government, state and territory governments, and industry based on the existing approach used for co-funded initiatives (across many sectors, not just food waste) was applied. Where this rule of thumb was not appropriate, a more relevant split was determined based on the experience of the project team, examples of international good practice, and support and input from the Project Advisory Group.

## 6.2 Final list of interventions in the recommended scenario

Table 10 provides a summary of the interventions included in the recommended scenario. This outlines:

- Who will deliver the intervention?
- What the anticipated impacts will be and where in the supply chain they will be delivered.
- Who should fund the initiative?
- The timescales (i.e., short, medium or long term, time taken from commencement to delivery of impact) and location (i.e., activated at the federal, state or local level, primary production or other specific supply chain stages, etc.).
- Other key stakeholders.
- Governance and/or other logistical elements.
- The major elements of delivery.
- Risks and mitigation factors.
- Any trade-offs that might apply.

The 23 selected interventions can be grouped into three main categories:

1. **Policy Led interventions (GREEN)** – where government is the lead actor (even though the results may be implemented by businesses or other actors).
2. **Industry Led interventions (BLUE)** – where industry is the lead actor recognising that a supportive policy context in which to do this is crucial for success.
3. **Behaviour Change campaigns (YELLOW)** – these must involve both private and public sector actors to be successful.

Animal feed (PINK) has the potential to make a significant contribution towards the target and create new markets for wasted food. This may offset other, more environmentally impactful ingredients from being used for animal feed. The interventions and their interdependencies are driven by the waste hierarchy, with prevention at source being the most important activity. Consequently, **diverting surplus food that cannot be eaten by humans to animal feed was modelled on the remaining waste after other prevention interventions were implemented**, to ensure that true prevention at source was being prioritised.

In addition to the interventions listed, improved measurement of food loss and waste at all stages of the supply chain, and in all kinds of business, is crucial. Not only is it true that 'what gets measured, gets managed' but it is also imperative that good quality data is collected to determine progress against the target. This will support the recommended updates to the baseline data in 2024 and 2027.

Addressing food waste requires a systemic solution, designed to embed long term changes to the way businesses operate and the overarching policy context. The interventions are mutually dependent and reinforcing. For example, increasing the amount of safe and healthy food that is donated will only be possible if changes to the financial incentives for businesses to donate are implemented, alongside corresponding technical changes to products and packaging (such as improvements in date labelling and storage advice).

The recommended scenario is presented as a group of interdependent interventions. It is designed to function as a whole. Cherry picking specific interventions based on their modelled cost or impact would be self-defeating, as the impact of each intervention relies on the impact of the various other supporting interventions.

Table 10 Recommended scenario interventions

Intervention	Primary	Manufacturing	Distribution	Wholesale-Retail	Household	Hospitality	Institutions	When does it start?	Modelled Food Waste Reductions (Tonnes)	Funder				Fund Type			New funding split			
										Federal Gov.	State Gov.	Industry	Philanthropy	New	Existing	In Kind	Federal Gov.	State Gov.	Industry	Philanthropy
Food waste prevention campaign for hospitality & food service (HAFS) professionals						x	x	2022	265351	33%	33%	33%		50%		50%	33%	33%	33%	
Nationwide consumer facing campaign					x			2023	526666	25%	40%	30%	5%	60%	30%	10%	20%	65%	10%	5%
Investment in national infrastructure	x	x	x					2022	221909	100%					100%					
Grants for FLW prevention & research	x	x	x	x		x	x	2021	156508	60%	40%				100%					
Lean manufacturing	x	x				x	x	2021	184297	10%	10%	80%		30%	70%		10%	10%	80%	
Nutrient extraction from wastes	x	x						2021	187245	40%	20%	40%		15%	85%		33%	33%	33%	
Tax credits or incentives for food donation and food waste measurement technologies	x	x	x	x		x	x	2022	448342	100%				Foregone tax revenue			100%			
Tackling unfair trading practices	x	x						2023	177731	40%	30%	30%		50%		50%	50%		50%	
FLW measurement	x	x	x	x		x	x	2022		30%		70%		10%	45%	45%	10%		90%	
Measurement technology for hospitality & food service businesses						x	x	2022	515503			100%		100%					100%	
Whole crop harvesting	x							2022	207641	30%	30%	40%		20%	40%	40%	30%	40%	30%	
Stabilisation of surplus food		x	x	x				2022	297848			100%		100%					100%	
Resale and donation of surplus food	x	x		x		x	x	2021	492774	25%	25%	25%	25%	50%	25%	25%	30%	30%	30%	10%
Food cold chain improvements (from farm to fork)	x	x	x	x	x	x	x	2022	194750	20%	40%	40%		25%	75%		10%	20%	70%	
The Voluntary Agreement Program	x	x	x	x	x	x	x	2021	1189269	45%	10%	45%		30%	35%	35%	20%	20%	60%	
Extending shelf life				x	x	x	x	2022	184811			100%		30%	35%	35%			100%	
Retail operational efficiency				x		x	x	2022	142745	10%	10%	80%		30%	35%	35%	10%	10%	80%	
Extending use by dates (safely)				x	x	x	x	2022	310287	25%	25%	50%		30%	35%	35%	25%	25%	50%	
Improved date labelling				x	x	x	x	2022	49088	25%	25%	50%		30%	35%	35%	25%	25%	50%	
Menu planning for waste prevention						x	x	2022	33934	30%	30%	40%		30%	35%	35%	10%	10%	80%	
Food waste to animal feed	x	x	x	x		x	x	2021	1048397	40%	30%	30%		40%	30%	30%	20%	20%	60%	

Intervention	What is it?	Who could lead the intervention?	What the anticipated impacts will be and where in the supply chain they will be delivered.
Food waste prevention campaign for hospitality & food service (HAFS) professionals	Comms campaign, supported by consumer and behavioural science, targeted at hospitality and food service sector (HAFS) workers. Support for multiple low/no cost activities to reduce food waste in all areas of business.	Private sector - hospitality & food service companies; a new nationwide behaviour change campaign	Measurable reductions will be in HAFS sector, across all elements (e.g., storage, preparation and plate waste) and all types of business
Nationwide consumer facing campaign	A coordinated, nationwide behaviour change campaign for citizens to reduce food waste in and out of the home.	All levels of Government – Private sector, Civil society; a new nationwide behaviour change campaign	Large potential for impact with the right campaign messaging and support. Deals with hard to address consumption phase of food waste. At this stage significant emissions are embedded in products and material benefits can be construed at the individual, local and national level.
Investment in national infrastructure	Government investment in capital infrastructure incl. roads, ports, digital and comms infrastructure, waste and reprocessing capacity to support food waste reduction.	Federal & State government	Scalable impact to whole supply chain. E.g., roads & transport investment supports additional produce shipped from farms; digital & comms investment supports integration of rural communities, helping primary production and food donation; waste & reprocessing investment supports communication to citizens on home waste prevention.
Grants for FLW prevention & research	Inclusion of food loss and waste prevention into existing R&D and grants programs as strategic priority for publicly funded research.	Federal government; State government; Research sector	Scalable impact to whole supply chain. E.g., support for agri-food sector to develop new low-waste varieties; development of new food and feed products from surplus food; or digital innovation to support platforms that enable greater donation of edible food.
Lean manufacturing	Improving resource efficiency in manufacturing e.g., through new equipment, process changes or the adoption of 'lean manufacturing'	Private sector - manufacturing	Intervention focusses reducing manufacturing waste, supported by the rest of the supply chain, both upstream and downstream.
Nutrient extraction from wastes	Nutrient extraction from wastes e.g., the extraction of vitamin C from juicing residues or polyphenols from wine marc.	Research sector; Private sector - grocery retail and manufacturing	Primarily in the early stages of the supply chain, in primary production (e.g., from out of specification or surplus product) or at the processing/manufacturing stages
Tax credits or incentives for food donation and food waste measurement tech	Tax credits/GST exemptions for activities and/or tech that support food loss and waste prevention - e.g., for food donated, or for food waste measurement technology	Federal government	Whole supply chain up to retail
Tackling unfair trading practices	Tackle unfair trading practices which can have the effect of contributing to food waste (e.g., harsh penalties for not meeting quantity specifications can lead to overproduction)	Federal Government	Reductions will be delivered at the start of the supply chain, primarily in agriculture, processing and manufacturing
FLW measurement	Measurement of food loss and waste at all stages of the supply chain, using consistent methodologies and repeating at regular intervals	Stop Food Waste Australia, Federal & State Government	Measuring food waste in businesses, can prompt action on reduction, but alone does not deliver impact. Must be done to determine scale and nature of the challenge (at single site to national level) and to measure progress.
Measurement technology for hospitality & food service businesses	Technologies and systems to better understand waste streams of institutions and hospitality. Aim to track volume & cost of waste, and reasons, to encourage operational and behavioural changes in business.	Private sector – hospitality & food service	Implementation of Leanpath and Winnow software by Google and Ikea has resulted in huge savings, with up to 50% reductions on food waste. Measurement identifies opportunities for reduction, but Leanpath and Winnow are whole solution, incl. recommendations for reductions.
Whole crop harvesting	Systematic and technological solutions to help address proportion of crops not harvested as value is not sufficient to cover labour requirements.	Private sector – primary production; all retail and manufacturing	This intervention influences the waste occurring in primary production, it should ensure that the majority of the edible crop is harvested for human consumption
Stabilisation of surplus food	Stabilisation of surplus food to maximise use of by-products and surplus food in agriculture and production/processing	Private sector – manufacturing	Manufacturing through to retail
Resale and donation of surplus food	Increasing the resale and donation of surplus food, especially through use of technology platforms linking food providers with consumers or charities.	Civil society; Private sector; Federal government	Food can be donated from most stages of the supply chain, from primary production through to retail
Food cold chain improvements (from farm to fork)	Effective chilled storage, refrigeration and management techniques are critical to ensure shelf life is maximised and potential losses in supply chain are mitigated (e.g., 'first in first out') and ensuring fridges set to right temp.)	Private sector - cold food chain, all retail and manufacturing Independent entity; Citizens	Whole supply chain
The Voluntary Agreement Program	Voluntary Agreement (VA) is public private partnership for government, businesses & organisational collaboration to tackle supply chain challenges. Signatories must take action, measure their impact and report outcomes.	Stop Food Waste Australia	This impacts on every stage of the supply chain, from farm to fork (including consumers)
Extending shelf life	Implementing technology solutions to extend shelf life of food (e.g. implementation of microfiltration processes for milk can lead to 40% increase in shelf life)	Private sector – all retail and manufacturing	This would impact in the retail and service sector as well as in the home
Retail operational efficiency	Improving retail operational efficiency covering: discount policy, digital pricing & stock management, ordering processes and replenishment sizes, cold chain maintenance, on-shelf availability targets etc.	Private sector – hospitality & food service	The impacts will be delivered in the retail stage of the supply chain
Extending use by dates (safely)	Extend allowable use by dates, especially for long life, shelf stable products	Private sector – hospitality & food service; Food standards	Retail, service sector and in the home
Improved date labelling	More uniform / understandable date labelling system to communicate information to consumers (e.g. removing best before dates from products that do not require one and/or removing sell by/display until dates)	Private sector – hospitality, food service & grocery retail	The impact will be delivered at the consumption end of the supply chain, by helping consumers reduce their food waste at home
Menu planning for waste prevention	Design menus aimed at food waste reduction i.e. reduce ingredients & repurpose food, preparation trim, overproduction & portion size planning.	Private sector – hospitality & food service	Hospitality sector (with some small knock on effect to the home as potentially fewer leftovers being taken home - this has not been modelled)
Food waste to animal feed	Diversion of food to animal feed, incl. feeding insects for protein production	Whole supply chain intervention	Intervention has possibility to divert waste from all areas of the supply chain except household

### 6.3 Recommended scenario abatement results

Figure 15 outlines the food waste reduction trajectory of the recommended scenario against the 2030 50% reduction target. This shows that **if the recommended scenario is fully implemented, it is feasible to reduce total food waste by 52% by 2030.**

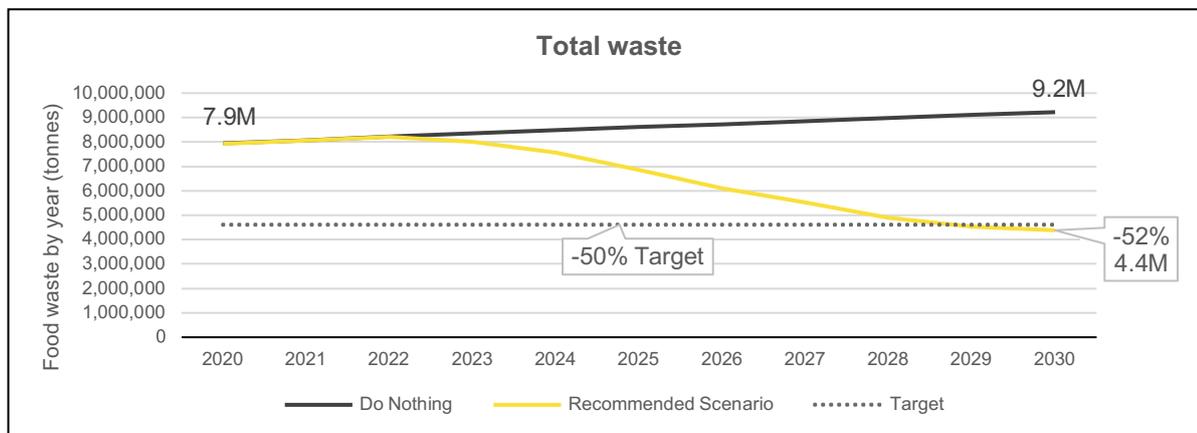


Figure 15. Progress to 2030 target under the Recommended Scenario

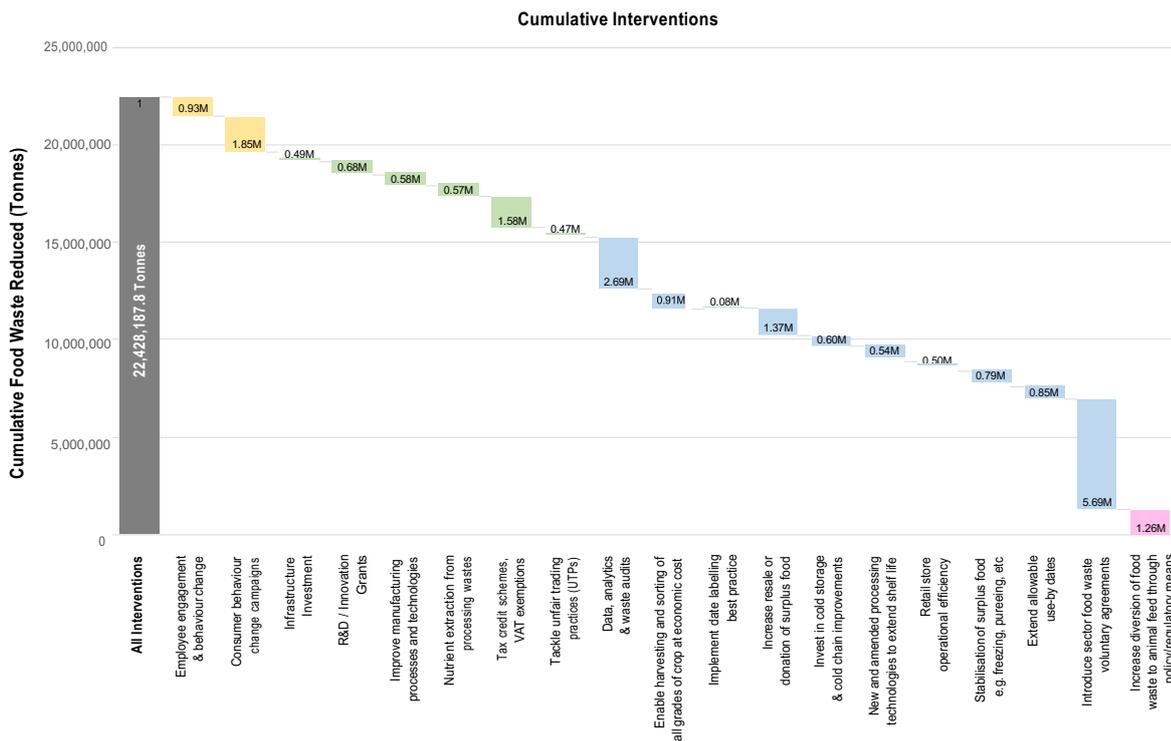
Table 11 provides the data that underlies Figure 15. This highlights that the recommended scenario will see total annual food waste in 2030 of 4.4 Mt, down from the 9.2Mt baseline Do Nothing scenario. This will see a per capita reduction in annual food waste from 312kg to 148 kg.

Table 11. Comparison of total and per capita food waste between Do Nothing and Recommended Scenarios

Scenario	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population of Australia (mil.)	25.44	25.87	26.3	26.73	27.15	27.56	27.97	28.37	28.77	29.16	29.55
Do Nothing (Mt)	7.94	8.07	8.21	8.34	8.47	8.6	8.73	8.85	8.98	9.1	9.22
Do Nothing (kg per capita)	312	312	312	312	312	312	312	312	312	312	312
Rec. Scenario (Mt)	7.94	8.07	8.21	8.01	7.56	6.86	6.1	5.52	4.91	4.52	4.38
Rec. Scenario (kg per capita)	312	312	312	300	278	249	218	195	171	155	148

Figure 16 provides a waterfall chart outlining the cumulative impact of each intervention between 2020 and 2030. Over the course of the ten years the recommended scenario will deliver approximately **22.4 Mt of food waste reduction**, if fully implemented. This highlights that from a modelled abatement perspective, the nationwide consumer campaign, an improved tax incentive for food donation, data analytics & waste audits, rapidly scaling up food donation, and the voluntary agreement are the most impactful, noting the interdependencies outlined in the previous section.

As stated previously, improved measurement techniques at all stages will be imperative in order to determine actual reductions versus the modelled reductions shown in this study. Modelled reductions are based on international experience of similar activities, best available practice, evidence from businesses and other organisations across the Australian food supply chain, and the input and recommendations of a broad range of stakeholders (details of the assumptions can be found in Appendix 7). Actual measured reductions will be crucial in not only determining the accuracy of the modelled impacts, but also supporting ongoing activity (in Australia and beyond) and determining whether the selected interventions and hotspots are delivering the best possible outcomes.



**Figure 16. The cumulative impact of the interventions in the Recommended Scenario across the 2020 - 2030 period**

Figure 17 outlines the food waste by value chain stage in 2030 under the recommended scenario, highlighting where in the value chain the chosen interventions will have an impact. Specifically, these results show:

- **A minimum 30% reduction in household food waste:** This highlights the challenges associated with achieving reductions in household food waste. This is reflected in similar reduction targets for household food waste in other countries.
- **Effective elimination of food waste in wholesale-retail:** While retail and wholesale businesses contribute a relatively small amount of the total food waste, there is extensive good practice and examples of very significant reductions in this area of the supply chain that should be replicated in Australia.
- **Greater than 50% reduction across primary, manufacturing, distribution and hospitality:** This recognises that there are significant benefits to be made by delivering material reductions in these areas, not just because of the total amount of food wasted in the early stages of the supply chain, but also the potential economic benefits that could be derived from harvesting and utilising more of the food that Australia grows.

These results will inform key milestone metrics for measurement of progress across the various stages in the food value chain.

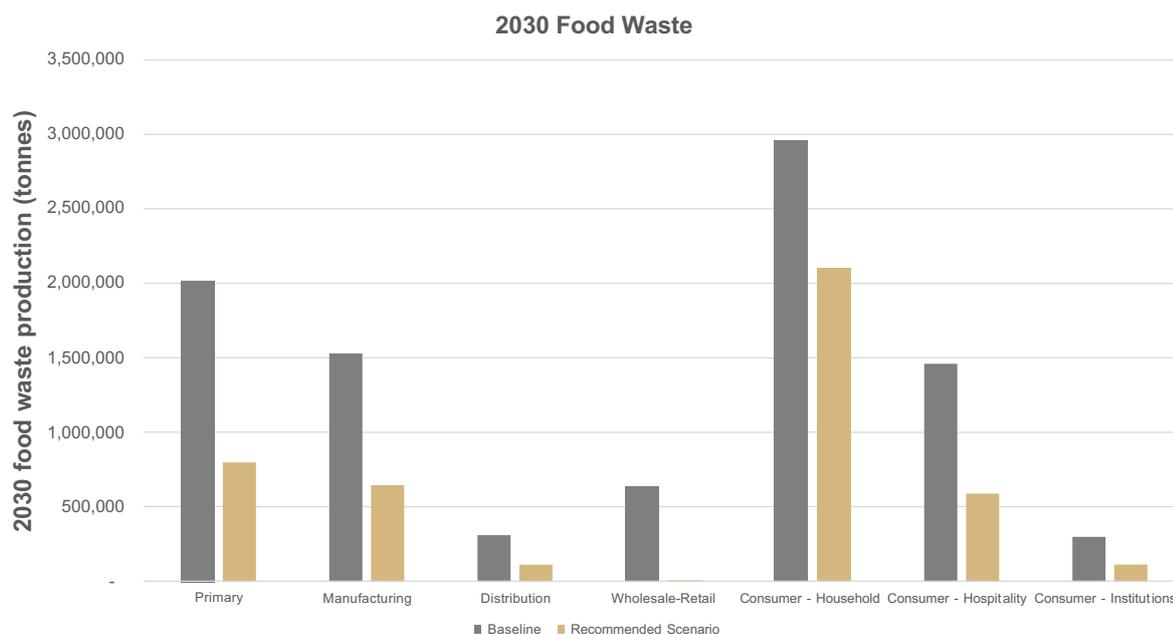


Figure 17. Food waste by value chain stage in 2030 under the Recommended Scenario vs the Baseline

## 6.4 Recommended scenario costs and benefits

Building on the cost-benefit analysis of the high-level scenarios an additional cost-benefit analysis was completed for the recommended scenario. This outlined the total CAPEX (apportioned cost) and OPEX cost of implementing the interventions, as well as the savings realised both in terms of avoided food waste and the avoided social costs of food waste.

Table 12. Summary of cost-benefit analysis

% reduction from 2020 baseline	Direct investment Cost (NPV)	Total direct benefit (NPV)	Total indirect benefits (NPV)	Net benefit NPV	Waste avoided (tonnes)	Direct cost per tonne avoided	Net benefit to society per tonne avoided	Emissions reduction (tonnes CO <sub>2</sub> -e)	\$/t CO <sub>2</sub> -e avoided
52%	\$7,061M	\$54,913M	\$3,264M	\$51,116M	22.4M	\$329.06	\$2,382.12	50.57M	140

### 6.4.1 Investment cost of recommended scenario

The cost-benefit analysis of the recommended scenario found that a total investment of between \$7-7.5bn is required over the next 10 years. This cost range has been included to reflect the necessary margin of error based on variability of the assumptions data used in the CBA methodology outlined in Appendices 8.

Figures 18-20 break this amount down by payee and new versus existing funding sources.

Of the total spend, approximately \$4.6bn has either already been committed or it is assumed it will be committed. This figure was developed through a high-level analysis of existing commitments, policies and spending forecasts across industry, state, territory and federal governments including (not an exhaustive list):

- Commitments to research and development, such as the Fight Food Waste Cooperative Research Centre.
- Commitments to new infrastructure, such as the National Economic Recovery Plan.

- Implementing the Food Cold Chain and Food Rescue Sector Action Plans (to be published in late 2021).
- State and territory government budgets for food waste reduction campaigns focussed at consumers.
- Commitment from state, territory and federal governments to Stop Food Waste Australia to deliver the voluntary agreement.

This leaves approximately \$2bn of new spending required to deliver the requirements of the recommended scenario. Of this, approximately 75% or \$1.45bn will be contributed by industry, primarily through initiatives such as the voluntary agreement, where both cash and in-kind funding serves to leverage funding from the federal government to deliver against the targets. For businesses, this might include cash funding for new collaborative projects alongside the commitment of their staff and internal budgets to deliver the projects.

The timing of the interventions suggests the sooner the funding is committed, the higher the likelihood there is of delivering the 50% reduction target. When modelling the recommended scenario, each intervention has been assigned a start date (when the activity starts) and an impact start date (when impact begins to be delivered). The delivery of the target relies on the whole suite of interventions being delivered **how and when** they have been modelled. For example, to deliver a 30% reduction in household food waste, a nationwide consumer campaign must be launched in 2022, alongside the technical changes made to products, packaging and the retail environment delivered through the voluntary agreement (launching in 2021). This means that the new funding for this must be secured early in financial year 2021/22 in order for it to be developed and launched in time.

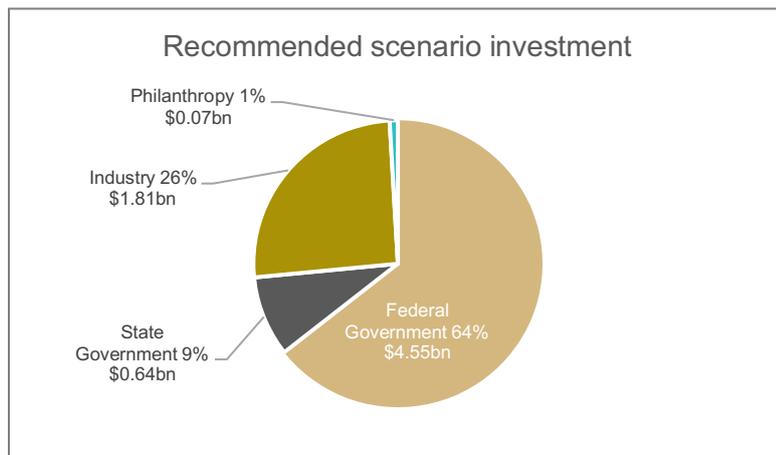


Figure 18 Recommended scenario investment

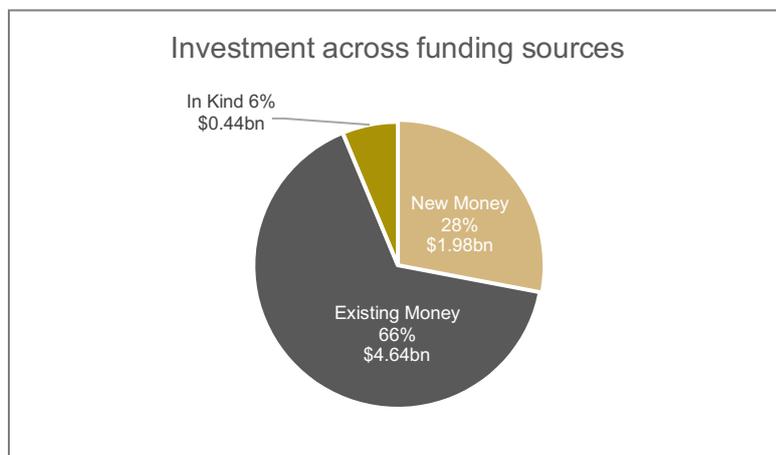


Figure 19 Investment across funding sources

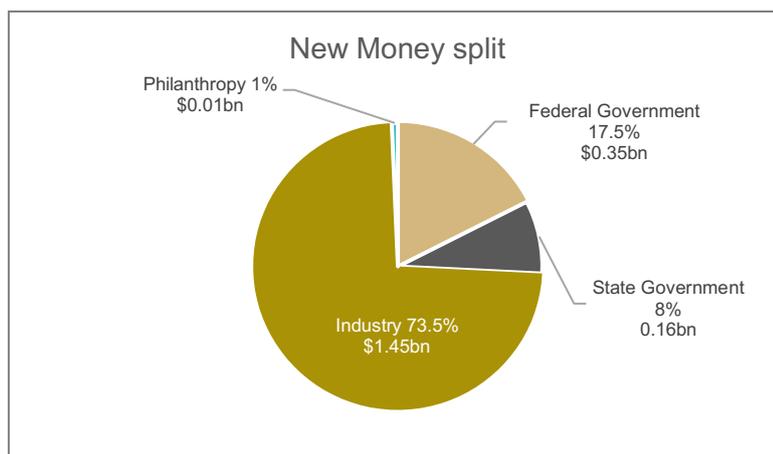


Figure 20 New money split by funder

### 6.4.2 Benefits of the Recommended Scenario

The cost-benefit analysis of the recommended scenario found that it would deliver approximately **\$58bn worth of benefit back to society**. These benefits are broadly broken into three categories:

#### 1. Operating Expenditure (OPEX) Savings:

The implementation of selected interventions results in a reduction in purchased products across the value chain. These are savings realised from the cost of avoided food waste. The savings for food waste avoided have been calculated differently depending on the point in the value chain in which the saving is accrued, with the value per tonne of waste avoided increasing as a product moves from production to consumption.

The modelled value per tonne of waste avoided at each stage in the value chain has been outlined below.

Table 13 Modelled value per tonne by value chain stage<sup>5</sup>

Year	Primary	Manufacturing	Distribution / wholesale	Consumer	Unit
2020	594.03	2,218.31	4,121.00	5,253.98	AUD/tonne avoided
2021	611.85	2,284.86	4,244.63	5,411.59	AUD/tonne avoided
2022	630.21	2,353.41	4,371.97	5,573.94	AUD/tonne avoided
2023	649.11	2,424.01	4,503.13	5,741.16	AUD/tonne avoided
2024	668.59	2,496.73	4,638.22	5,913.40	AUD/tonne avoided
2025	688.64	2,571.63	4,777.37	6,090.80	AUD/tonne avoided
2026	709.30	2,648.78	4,920.69	6,273.52	AUD/tonne avoided
2027	730.58	2,728.24	5,068.31	6,461.73	AUD/tonne avoided
2028	752.50	2,810.09	5,220.36	6,655.58	AUD/tonne avoided
2029	775.08	2,894.39	5,376.97	6,855.25	AUD/tonne avoided
2030	798.33	2,981.23	5,538.28	7,060.90	AUD/tonne avoided

<sup>5</sup> Source: <https://www.eu-fusions.org/phocadownload/Publications/Estimates%20of%20European%20food%20waste%20levels.pdf>

## 2. Avoided cost of landfill:

The disposal of food waste generates additional expenses to the economy through landfill costs of wasted food products. By avoiding food waste there is an economic benefit across the value chain associated with this avoided landfill saving.

The avoided cost of landfill calculation included in the modelling covers the private costs of landfill's (e.g. landfill establishment, operation and end of life management), as well as the cost associated with state landfill levies. The external impacts on the environment, human health or social amenity are not captured in this section of the model as the social cost of carbon calculation is assumed to largely cover these costs. The model also incorporates an assumed annual increase of 5% in these landfill costs through to 2030.

## 3. Avoided cost of the social cost of carbon:

The social cost of carbon (SCC) is a financial proxy, used to represent the quantifiable costs associated with greenhouse gas emissions. The SCC is representative of the economic harm associated with the emissions of carbon into the atmosphere, and incorporates impacts on human health, environmental quality and extreme weather events.

Figure 21 outlines where in the value chain the benefits are realised. This highlights that 95% of all benefits (\$53bn) are delivered through OPEX savings, 3.4% (\$3.2bn) are delivered through avoided social cost of carbon and 1.7% (\$1bn) delivered through avoided cost of landfill. It also highlights that households will see approximately \$15bn in savings, while the remaining \$39bn will be realised by industry.

A detailed breakdown of the methodology and assumptions used in the CBA can be found in Appendix 8.

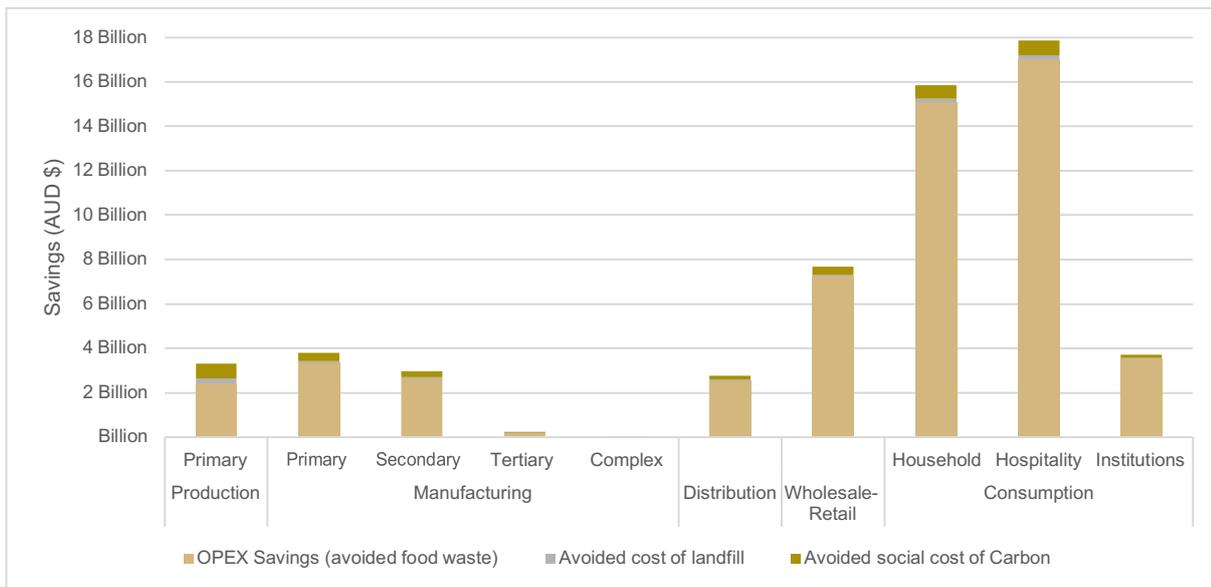


Figure 21. A breakdown of cost savings by stage in the food value chain

**Table 14. A breakdown of cost savings by saving type and stage in the food value chain**

Value Chain	OPEX Savings (avoided food waste)	Avoided cost of landfill	Avoided social cost of Carbon
Primary Production	2,413,734,184	237,232,416	677,334,769
Manufacturing - Primary	3,330,515,127	87,710,594	371,906,875
Manufacturing - Secondary	2,642,448,274	69,590,048	243,574,748
Manufacturing - Tertiary	200,432,774	5,278,486	26,809,452
Manufacturing - Complex	19,163,035	504,667	1,784,750
Distribution	2,545,442,203	36,178,657	172,014,445
Wholesale-Retail	7,212,865,703	102,393,333	363,108,802
Consumption - Household	15,075,734,642	168,096,536	594,918,304
Consumption - Hospitality	17,000,928,560	188,403,707	672,685,208
Consumption - Institutions	3,537,333,785	39,245,161	139,895,531
<b>Grand Total</b>	<b>53,978,598,289</b>	<b>934,633,606</b>	<b>3,264,032,885</b>

### 6.4.3 Business case of recommended scenario by stakeholder group

The sections above outline the financial costs and benefits of implementing the recommended scenario realised by each stakeholder group in the value chain. From assessing these figures, it is clear that the financial benefits significant outweigh the financial cost.

At the national level, the benefits are significant – **for every \$1 invested, the recommended scenario delivers \$7 back to the economy, resulting in a \$58 billion overall benefit** over the 10 years to 2030.

**Every stakeholder group in the value chain will receive a net positive financial benefit.**

Under this scenario, industry will be the greatest beneficiary. While industry will contribute most of the new investment (\$1.45bn), it will also be the stakeholder group to benefit most, realising over \$39bn estimated savings through avoided spend and efficiency gains. This suggests that for under the recommended scenario **for every \$1 that industry spends (which equates to \$1.8bn including existing spend and new spend) it will realise approximately \$21 in direct and indirect savings.** This is in line with, or even exceeds existing studies such as the ‘Business Case for Reducing Food Loss and Waste’<sup>6</sup> demonstrated an average return on investment of 14:1 for businesses who invested in food waste prevention activities of all kinds.

However, a business case should also acknowledge the broader societal, strategic, and operational benefits delivered beyond financial gains alone. While many of these benefits are hard to quantify, they play an important role in demonstrating the larger impact that food waste reduction can deliver on creating more efficient, and collaborative industry as well as a more just and equitable society. These benefits vary significantly between stakeholder groups along the supply chain.

Under the assumed spend breakdown (noting the limitation that spend has only been broken to industry at the most granular level) and estimated financial benefits as outlined above, the recommended scenario will deliver the following key benefits to stakeholders along the value chain:

Outlined below are some high-level return on investment (ROI) figures based on the total spend (new and existing) under the recommended scenario. Under the modelling approach taken, the ROI for the various industry stakeholders is based on total industry spend, while the direct and indirect financial benefits are available at for stakeholder at the various stages in the value chain level. This approach favours stakeholders at the end of the value chain, where the food waste avoided carries a higher per tonne saving due to the high value added earlier in the value chain.

<sup>6</sup> <https://champions123.org/publication/business-case-reducing-food-loss-and-waste>

## **Primary Production:**

### *Financial Benefits:*

- For every dollar spent by industry, primary industries will receive \$1.46 in direct financial benefits and a further \$0.37 in indirect financial benefits.

### *Operational & Strategic Benefits*

- Development of new markets for tertiary products, such as secondary out of specification crops.
- Improved engagement and relationship with customers along the supply chain and other primary producers.
- Improved forecasting (delivered through interventions such as whole crop purchasing) in demand which will enable more strategic long-term planning and investment on farm.
- More effective use of land resources, such as diversifying crops and/or shifting to more regenerative agricultural practices.
- More beneficial contractual terms.
- Increased availability of low-cost feed stock for livestock.

## **Manufacturing:**

### *Financial Benefits:*

- For every dollar spent by industry, manufacturing will receive \$3.51 in direct financial benefits and a further \$0.36 in indirect financial benefits.

### *Operational & Strategic Benefits:*

- Increased engagement with suppliers and retailers, delivering other co-benefits such as product innovation, emissions reduction, and logistical efficiencies.
- Supports net zero and other environmental commitments and expectations of customers and retailers.
- Increased efficiency of manufacturing processes which may deliver additional environmental benefits beyond food waste reduction and will enable greater yield of capital equipment.
- New opportunities for product diversification and vertical integration making use of new and innovative input materials, supported by increased grant funding opportunities.
- Breaking down internal silos to identify opportunities for collaboration across business units.
- Changes to packaging and labelling to support food waste reduction can also support broader packaging targets and commitments.
- Increased transparency and visibility of operations delivered through measurement.
- Social impact delivered through increased food donations.

## **Wholesale/retail:**

*Financial benefits:* For every dollar spent by industry, wholesale/retail will receive \$4.04 in direct benefits and a further \$0.20 in indirect benefits

### *Operational & Strategic Benefits:*

- Maximising the amount of product that reaches the end market, creating efficiencies in storage, refrigeration, and logistics.
- Greater control over stock inventory resulting from measurement of food waste.
- Broadening of fresh 'on-site' reuse product offerings maximising product usage.

- Promotes deeper supply chain engagement which delivers additional benefits beyond food waste reduction.
- Delivers on existing emissions reduction targets.
- Increased availability of reverse logistics services through manufacturer 'take-back' and valorisation processes.
- Alignment with consumer demands, resulting in increased customer loyalty.
- Increased shelf life will provide a bigger time window in which to sell products.
- Increased transparency and visibility of operations delivered through measurement.
- Social impact delivered through increased food donations.

### **Hospitality:**

*Financial benefits:* For every dollar spent by industry, hospitality will receive \$9.50 in direct benefits and a further \$0.37 in indirect benefits

#### *Operational & Strategic Benefits:*

- Greater efficiency of storage and refrigeration requirements.
- Opportunity for skills building of kitchen staff through more efficient use of product.
- Opportunities for engagement with customers on the topic of food waste.
- New menu offering and products that reduce food waste and create more choice for customers.

### **Government:**

#### *Economic Benefits:*

- For every dollar spent by government, \$12.78 will be realised in direct and indirect benefit back into the economy.
- Increase competitiveness of Australian business and increased availability of product for export.

#### *Environmental & Societal Benefits:*

- Delivered reduction of 50 million tonnes of CO<sub>2</sub>e emissions over the course of ten years, which will significantly support the national emissions reduction targets and commitment to the Paris Agreement.
- Increased food donation will ensure that fresh, healthy food is delivered to in-need communities, which may further reduce stress on other government funded social support programs.
- Increased fresh food available for export to high value markets.
- More efficient use of agricultural land or alternate use of this land for other objectives such as regenerative practices, carbon sequestration and biomass.
- Diversion of water use to other requirements and overall reduction in water consumption by industry.
- Reduces pressure on waste infrastructure and landfill requirements.
- Improvements in crop availability and diversification can support government goals related to the shift towards regenerative agriculture.
- Adhering to the commitment to achieving international targets, specifically UN SDG Target 12.3 and demonstrating leadership amongst the international community.

## 6.5 Impact of excluding inedible waste from the definition

One of the key requirements of the project was to assess the impact of excluding inedible food from the definition of food waste. This was achieved through amending the food waste reduction model only to consider the edible portion of food waste as defined in the baseline update.

Figure 22 shows the trajectory of the recommended scenario when inedible waste is excluded from the definition. It highlights the baseline would be amended to 5.6mt in 2020 and 6.5mt in 2030. It also shows that the target would be reached approximately 18 months ahead of schedule or deliver a 56% reduction against the baseline by 2030.

While UN SDG Target 12.3 refers to ‘food loss and waste’ and the methodology defined in the Food Waste Index includes total food waste (edible and inedible), there is a strong case to be made for focussing reduction efforts on the edible fraction. This is partly due to the challenges associated with reducing inedible food waste (i.e., this can only be reduced by changing what people view as edible or, more likely, reducing overall consumption). **The biggest environmental, social and economic gains can be made from focussing efforts on reducing edible food waste** – through true prevention activities and other options at the top of the waste hierarchy. Inedible food waste should be diverted to valorisation options, such as composting, anaerobic digestion though this does not count towards the halving food waste target. The use of novel valorisation technologies such as protein manufacture (e.g., through the use of black soldier fly larvae farming) where the products are used as a human food ingredient or an animal food ingredient, would count towards the halving target.

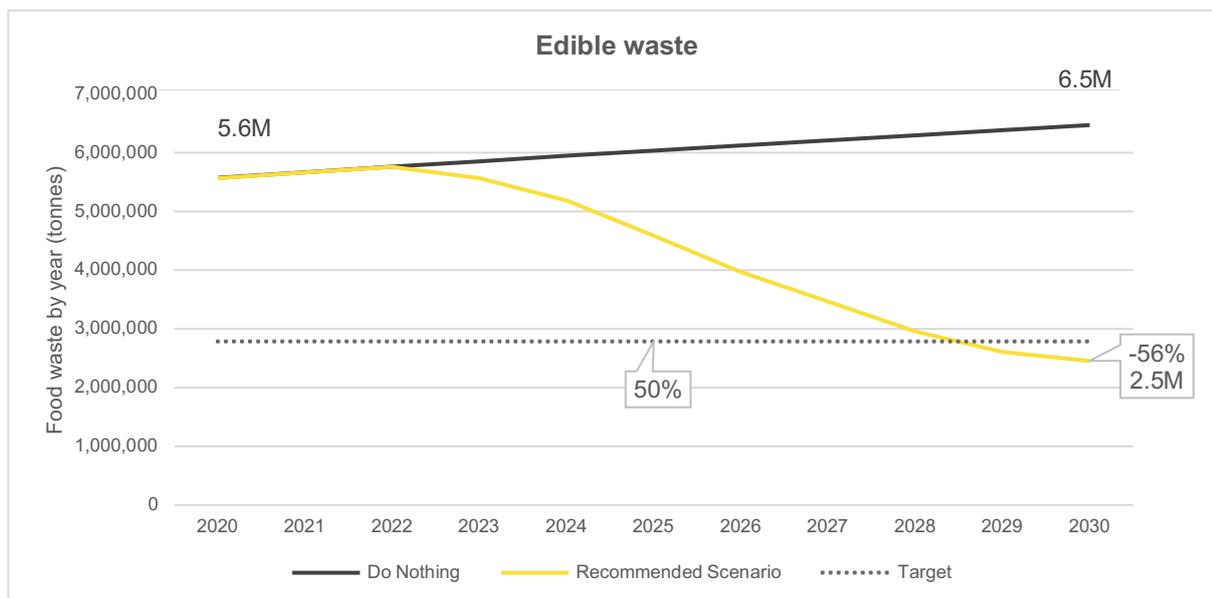


Figure 22 Progress to 2030 reduction target under the Recommended Scenario when inedible food waste is excluded

## 6.6 Recommended scenario key findings & intervention snapshots

The analysis of the recommended scenario shows that it is **feasible to deliver a 50% reduction in total food waste by the 2030 deadline**.

The results demonstrate that not only is it possible to halve Australia's food waste by 2030 **but there are very significant economic benefits, at the national, business and household level in doing so**.

The recommended scenario trajectory shows a 30% reduction in household food waste by 2030. Even this relatively modest reduction would deliver significant savings to householders, reducing the estimated \$2,000-2,500 they are wasting each year by throwing away food. The reduction in household food waste has been maintained at a relatively modest level to reflect both the difficult

nature of reducing food waste in people's homes, the complex interventions required and the time it will take to change peoples' behaviours and create new food waste saving habits.

Reducing household food waste requires interventions on two key fronts – direct to consumer communications encouraging people to change the behaviours that cause food waste, and technical changes to the products, packaging and retail environments they interact with. For example, retailers and brands should work together to standardise food date labelling and storage advice on products, but for the impact of this good practice to be fully realised, there needs to be supporting communication to consumers about how to interpret date labels. Similarly, increasing supply chain efficiency to increase the residual shelf life of products available to consumers should also be supported by communication to consumers about how to properly store these products (where to store them, refrigerator temperatures, whether a product is suitable for home freezing, etc.).

#### **Intervention Snapshot: Food labelling and storage**

A group of retailers and brands could work together with the Federal Government and food safety organisations to develop new good practice standards for consistent food date labelling and storage advice. This project would need to be cash funded by all partners. Once new good-practice has been developed, retailers and brands would then invest in changes to their packaging and instore communications, plus their marketing campaigns to customers, to ensure consumers understand the changes. This would be supported by the relevant peak industry bodies.

The 'Business Case for Reducing Food Loss and Waste'<sup>7</sup> demonstrated an average return on investment of 14:1 for businesses who invested in food waste prevention activities of all kinds. This includes participation in a voluntary agreement, one of the key interventions included in the recommended scenario (alongside a suite of other technical activities which fall under the umbrella of the VA, such as improvements in food date labelling, supply chain and retail store efficiency gains etc.).

By bringing together business and other stakeholders from across the food value chain in pre-competitive collaboration, it should be possible to make material reductions in food loss and waste along the whole supply chain. The voluntary agreement methodology relies on determining the root causes of waste through whole supply chain collaboration, recognising that the cause of waste might be happening at a different stage of the supply chain to where the waste is arising.

#### **Intervention Snapshot: Voluntary Agreement**

A grower, packer and retailer could come together to determine the root causes of losses along the value chain of a fresh commodity. By reviewing the whole supply chain in a safe, pre-competitive environment, it is possible to determine root causes of waste e.g. a retailer size specification might drive the selection of a specific varietal. This might in turn cause high losses on farm and in packing due to the delicate nature of the varietal, or it might have a high irrigation requirement or susceptibility to disease. By trialling different size specifications in the retailer, it could be possible to select a more robust varietal, improving yield and profitability on farm and reducing losses along the chain.

The voluntary agreement approach drives change at all stages of the supply chain, from farm to fork but other interventions will also be required to address the significant amount of pre-farm gate losses occurring in Australia. This will require a combination of industry and policy led interventions that will support Australian farmers in harvesting and selling more of the crops they plant. This could include a range of options including: whole crop purchasing agreements; developing new markets and products for tertiary grade products; and driving a significant uptick in food that is donated from farms to the food rescue sector.

The suite of interventions in the recommended scenario is designed to work together, each intervention supporting the others. Driving better relationships between growers and retailers through the voluntary agreement should lead in turn to improved forecasting of demand, a greater likelihood of improved contractual relationships, and improved supply chain efficiency, all resulting in reduced losses and improved profitability. Similarly, upgrading the tax incentives for donating food and

---

<sup>7</sup> <https://champions123.org/publication/business-case-reducing-food-loss-and-waste>

associated services at the policy level should lead to increased donation of good healthy food from farms.

For hospitality and food service businesses, experience in other countries suggests that implementing a large-scale program of food waste measurement will, in itself, drive initial reductions towards the impacts that are required in this sector. This could range from very simplistic methods (a luggage scale and pen and paper) right through to more complex technological systems that use AI (like Winnow Solutions<sup>8</sup> and Leanpath<sup>9</sup>). Food waste is the ‘elephant in the kitchen’, generally accepted as a cost of doing business. Measuring the scale of the problem is the first step to reducing food waste with the resulting financial benefits that can accrue.

#### **Intervention Snapshot: Food waste measurement**

A national hotel chain implements food waste measurement in its kitchens across the country, asking its staff to measure storage, preparation and plate waste for 4 weeks initially. Using this data, they calculate the potential savings that could be made from an initial suite of low or no cost interventions (for example, not peeling potatoes for fries, or changing buffet replenishment timings). Support and guidance for measurement and possible interventions is provided by the voluntary agreement technical team. Over time, the hotel chain invests in more in-depth measurement systems that integrates with their food and beverage procurement systems as well as challenging their chefs and kitchen staff to come up with new and innovative ways of reducing waste from their kitchens and restaurants, resulting in very significant savings in food waste (many kitchens have achieved over 50% reductions) and in money.

The impact of the recommended scenario cannot be realised without policy and legislative changes and investment at the federal level. Some of them will directly influence the amount of food loss and waste being generated, for example, the proposed upgrade to the tax incentive for donating food and associated services. Others are enabling factors in the broader scheme (such as the investments being made into infrastructure like roads, enabling more efficient transport of goods, including food). In some cases, the interventions identified specifically require a cash investment such as grants for research and innovation into the sector, others will target food waste prevention as part of a broader program of government activity and don’t necessarily require cash funding (such as tackling unfair trading practices).

#### **Intervention Snapshot: Grants for FLW prevention & research**

Government supports the development of new and innovative valorisation options for food waste, such as black soldier fly larvae, through specific grants for innovation. This research is additionally supported by industry and academia, through matching funds and in-kind contributions. Once the technology/process has been proven at pilot or demonstration scale, additional support could be provided by commercialisation or ‘spin out’ services alongside support from regulatory and enforcement bodies to ensure appropriate governance is applied to new technologies. Once at scale, private sector investment comes in to develop commercial scale installations.

There are significant social benefits to be reaped as well. The recommended scenario includes a strong focus on increasing the volume of surplus food that is donated through a suite of interventions, both policy and industry led. Similar activity in the UK has seen a tripling of the amount of food donated between 2015 and 2020, a 450% increase via charities and a 66% increase via the commercial sector. In this 5-year period, food worth A\$1.8 billion was saved, equivalent to 220 million meals.

---

<sup>8</sup> <https://www.winnowsolutions.com/>

<sup>9</sup> <https://www.leanpath.com/>

There are also huge environmental savings to be made. The recommended scenario, if delivered in full, would see a reduction of over 50 million tonnes of CO<sub>2</sub> equivalent emissions, equivalent to half of Australia's annual emissions from transport<sup>10</sup>. In addition, while the diversion of food waste from landfill into other, more beneficial, reprocessing technologies is not counted towards the target, it is part of the overall holistic approach to improving Australia's food system. Leveraging the shift towards household source separation of food waste can provide a significant opportunity to open the conversation with householders about food waste prevention.

## 6.7 Milestones and measurement metrics

### 6.7.1 Measurement, Monitoring & Evaluation

Section 2.3 of this report highlights issues associated with food waste data collection and monitoring. This inherently raises challenges in relation to tracking progress towards the 2030 target. These challenges, related to a lack of appropriate measurement and monitoring data sets, are not unique to Australia and reflect the importance of the Data & Analytics intervention included in the recommended scenario.

In order to provide a holistic measurement framework (such as a balanced scorecard) the amount and quality of data collected needs to vastly improve across all parts of the supply chain. Many countries (including the EU), do not have robust enough data on pre-farm gate losses to include this element in their overall programs to reduce food loss and waste. While Australia has good enough data in this area to generate a baseline, further work is needed to map losses in the field more accurately (including not just volumes but the reasons for losses as well). There is international good practice for farmers that could be adapted to the unique Australian context as well as broader programs which are investigating how to use other data sets (such as satellite mapping) to support the measurement of agricultural losses.

In the supply chain, the voluntary agreement signatories (manufacturers, retailers, hospitality and food service businesses) will aim to provide much better quality data which represents a significant proportion of the market by volume of sales. This could include food waste by volume, product, value, reason for wastage, and destination.

The Fight Food Waste CRC and Stop Food Waste Australia have both developed detailed impact models which will provide evidence of the impacts each organisation is delivering through its respective programs. This data and evidence will contribute to the recommended update of the National Food Waste Baseline, as per the methodology used in this report, in 2024 and 2027. Each program also has its own reporting timetable, publicly reporting impact on a regular basis.

It is also expected that additional funding to the waste and resources sector delivered through the Federal Government's *Food Waste to Healthy Soils Fund* will increase the available data on household food waste being collected and reprocessed, which will support any future nationwide consumer campaign's measurement metrics.

While increased volumes and better quality data are crucial to developing a balanced scorecard and to tracking progress, the time available in which to meet the target is such that interventions that improve data should be implemented at the same time as interventions targeted at reducing food loss and waste (which will, in themselves, also support improved data collection).

---

<sup>10</sup> <https://www.industry.gov.au/sites/default/files/2020-12/australias-emissions-projections-2020.pdf>

## 6.7.2 Interim Targets & Milestones

In the absence of detailed FLW data throughout the supply chain to inform a balanced scorecard, interim measurement will rely on proxy metrics to demonstrate progress. These will be important 'markers of progress' used in between the update of the baselines in 2024 and 2027.

### 2022:

- 25 signatories to the voluntary agreement
- First round of FLW grants allocated
- Cold food code for fresh produce is developed

### 2023:

- Tax exemptions for food donations implemented
- National food donation targets set

### 2024:

- **Interim target: 7.5 Mt food waste** (this would reflect a 11% reduction from the 2024 baseline adjusted for population growth) as defined on the national food waste baseline update
- 10% reduction in manufacturing and distribution
- 50 signatories to the voluntary agreement who will be reporting annual on their food waste per unit of sales
- Launch of nation-wide consumer campaign

### 2025:

- Cold food code for meat and dairy implemented
- Second round of FLW grants allocated

### 2028:

- **Interim target: 4.9 Mt food waste** (this would reflect a 45% reduction from the 2024 baseline adjusted for population growth) as defined on the national food waste baseline update including:
  - 50% reduction at primary production
  - 25% reduction at households
  - 50% reduction in hospitality and food waste services
- Nation-wide household food waste audit completed

### 2030:

- **Final target: 4.4Mtf food waste** (this would reflect a 52% reduction from the 2024 baseline adjusted for population growth) as defined on the national food waste baseline update, including:
  - 60% reduction in manufacturing, distribution, primary production and hospitality
  - 30% reduction at households
- Retailers achieving zero food waste

# 7 Conclusion and key recommendations

## 7.1 Conclusions

**Australia can reduce its food waste by 50% by 2030 if it commits to implementing the recommended scenario in full.** Some interventions are currently in development or being implemented. Others are already delivering impact but more needs to be done – either to scale up existing activity (such as the voluntary agreement) or to develop new initiatives – such as the improved tax incentive for food donation, or the nationwide consumer behaviour change campaign.

**Without the full recommended scenario being implemented at the scale and pace described, Australia will not be able to deliver against its commitments on food loss and waste.**

There is a strong element of research and innovation in the recommended scenario which underpins the tried and tested interventions that will deliver material reductions in Australia's food waste. This is a solvable problem which will deliver extremely significant environmental, social and economic benefits at a national, state, local and household level. The recommended scenario includes multiple interventions which have been demonstrated to be effective in other places, adapted to the unique Australian context.

The final recommendations set out below do not simply replicate the recommended scenario for each actor. Recalling the recommended scenario needs to be implemented in full for the target to be achieved, interventions should not be 'cherry picked' from it. Rather the extracted recommendations below draw on the interventions listed in the recommended scenario alongside the insights of the project team and broader stakeholder group that influenced the development of the project. These targeted recommendations also consider the context in which each of the interventions is being (or will be) implemented in order to draw out the most material and influential areas where actors can deliver impact. The recommendations recognise that, while there are interventions which are industry and policy led, effective implementation will require the support and participation of other actors to fully realise success. Very few of the interventions included in the recommended scenario will be possible without some sub-set of the wider group of stakeholders (from both the public and private sectors) playing their part.

### 7.1.1 Delivering at 'do everything' levels

There are three key areas where the recommended impact level is from the 'do everything' scenario, meaning that significantly more resources will be required on top of those currently planned.

These are:

1. The voluntary agreement (and the technical interventions grouped under this umbrella)
2. The nationwide consumer campaign
3. Food donation

In each case, an initial tranche of funds has already been committed to work in these areas.

The Federal Government has committed \$4 million to Stop Food Waste Australia to deliver the voluntary agreement (VA). SFWA will be further funded by contributions from signatories to the Australian Food Pact (both cash and in kind). SFWA will also be seeking additional funds from other sources, including state governments.

While the VA was modelled to deliver material savings under the CPM, policy-led and industry-led scenarios, the impacts in the 'Do Everything' scenario were significantly higher (over 1 million tonnes versus circa 400Kt in Industry & Policy Led scenarios). This forms the basis of the justification for additional funding for the VA. This new funding should be a mix of government and business, in recognition of the fact that both benefit from the activities of the VA.

Similarly, some state, territory and local governments are already running consumer facing food waste prevention campaigns, either as standalone activities or as part of their FOGO rollout messaging.

However, to deliver the target, household food waste must be reduced by at least 30% by 2030. This can only be delivered through a consistent nationwide campaign, supported by federal, State, Territory and local governments and businesses, that provides Australians with simple, consistent messages about how to reduce their food waste at home. This messaging should be consistent across their local council, their favourite retailers, the brands they buy and through social media and digital channels.

In this case, the recommendation is that new funding is sought from a range of sources including Federal, state, territory and local governments, businesses and philanthropic sources.

The consumer facing messaging will be supported by technical changes made to products, packaging and the retail environment through the voluntary agreement – for example standardising and simplifying food date labels and storage advice, increasing the number of products sold in resealable packaging or swapping ‘buy one, get one free’ offers for ‘half price’ equivalents.

Food rescue charities and other supporting organisations already divert significant quantities of food to people who need it, but this amount could be scaled up massively. There will always be surplus food in the system, even after at-source reduction. This good, healthy food should be fed to people wherever possible.

The Food Rescue Sector Action Plan lays the groundwork for this to happen alongside the other interventions in the Recommended Scenario. This includes both policy and industry-led initiatives. Improving tax incentives for donating food and other essential services to food rescue charities is a key intervention which will require cross-governmental collaboration and is not likely to take effect for some years. In the interim, other interventions, such as working with retailers and manufacturers to embed good donation practices into their business processes and supporting the food rescue sector to develop their capability and capacity to accept greater volumes and types of donations should drive the increased levels of food rescue that are required to reach the target. The Sector Action Plan also sets out actions to increase the amount of food that is rescued from primary production, not only improving the health and nutrition profile of food provided by food rescue charities but also improving the volumes of food taken off the farm instead of being left in the field or ploughed back in.

## **7.2 Recommendations for Federal Government**

As stated above, these recommendations are designed to draw out areas where the Federal Government can play a material part in delivering the target.

Australia’s Federal Government has already made significant investments in food waste prevention, through the support for FIAL, the Fight Food Waste Cooperative Research Centre and Stop Food Waste Australia. The government has also invested in its own capability and capacity, building a strong team within the Department of Agriculture, Water & the Environment but also through liaison with other departments and ministers’ offices. There is a strong commitment to food waste prevention, lacking in many other countries across the developed and developing world.

Federal Government ultimately sets the tone and context for action across the nation. There are a number of interventions, particularly those which are ‘Policy-Led’ which will need the Federal Government to take new action or to scale up existing initiatives (see table 10 for details of the policy led interventions) but the role of the Federal Government is not just about delivering on those specific interventions. A key element of the responsibility at this level lies in the expectations that are set nationally. For example, many of the interventions in the recommended scenario rely on the voluntary participation of businesses and other stakeholders. Even though these are industry led interventions, Federal Government should be ready to wholeheartedly support these initiatives, encouraging businesses to participate, but also to potentially commit to more stringent regulatory measures if the impact trajectory is not met.

Most material, in terms of financial impact and complexity, is the proposed improvement to the tax incentive scheme for donating food and other services. Given the time it will take for such an incentive to deliver impact, a key recommendation for Federal Government is to progress this, via a champion, as quickly as possible through governmental channels. It is also necessary to send a clear signal to the industry that the intention is to deliver against this recommendation so that the sector can ‘gear up’ in preparation (both in terms of businesses who will be able to increase their donations, and the capability and capacity of the redistribution sector to accept and manage these donations).

Federal Government also has a funding responsibility for some of the proposed interventions. This is in conjunction with other parties, with government funding (federal and state) leveraging cash and in-kind contributions from businesses. Some specific areas where new or increased Federal funding is recommended are:

- Tackling unfair trading practices to reduce supply chain loss and waste.
- Supporting farmers and growers to identify and reduce loss and waste in primary production.
- The nationwide consumer behaviour change campaign to tackle household food waste.
- The voluntary agreement and all the technical interventions that sit under this umbrella (e.g., standardising food date labels and storage advice to consumers, and encouraging lean manufacturing techniques).
- A communications campaign focussed specifically on the hospitality and food service sector to drive behaviour change of staff in these businesses.

### **7.3 Recommendations for State & Local Governments**

State and local governments are the powerhouse of implementation, especially when it comes to talking to consumers. Both state and local governments have a long track record of communicating with their constituents about a whole range of issues.

The nationwide behaviour change campaign to reduce household food waste should be consistent across the country in terms of both the brand and the messaging. The majority of the 'activation' of this campaign will come from state and local governments (alongside businesses). This includes the materials and collateral that people will see on busses and in civic spaces, on leaflets delivered to their homes and through state and local governments' digital channels. This is a key intervention that will be strongly influenced by state and local governments both in terms of content, activation and ultimately the levels of success that can be achieved.

The recommendation is that the nationwide consumer behaviour change campaign is co-funded by the Federal Government, state/local governments, and businesses with cash contributions to a central coordinating body and in-kind contributions stemming from existing marketing and communications budgets.

Another key area for state government involvement is through the specific hotspot focussed activity, matched to the industry and/or priorities of each state. For example, Sustainability Victoria is co-funding the development of the Dairy Sector Action Plan which will have implications for many Victorian businesses, as well as those situated in other states or territories. There is a clear opportunity for other state and local governments to follow suit, supporting specific initiatives in their state (such as other sector action plans, facilitating food rescue, supporting farmers in their region through existing agricultural support programs) as well as supporting the national level guidance and good practice that is developed, for example through the voluntary agreement. This could be funded directly to specific projects or through broader initiatives. State and local governments are also generators of food waste so they should be adopting this good practice in their own operations, as well as working with their suppliers of goods and services to embed food waste prevention activities.

Governments also have devolved powers to legislate and regulate waste and broader environmental protection. How they create laws, regulate and fund industry can have a material effect of the level of waste prevention activity in industry and in household through both carrot and stick measures. They also have a significant role in developing infrastructure which influences food loss and waste prevention. As at the national level, state and local governments have a responsibility to 'set the tone' in their region for a strong focus on food waste prevention.

Finally, state, territory and local governments should be collecting and sharing detailed waste data for food waste collections in their areas. While the diversion of food waste away from landfill into reprocessing options does not count towards the target, improved food organics and garden organics collections provide a significant opportunity to collect and collate better data on household food waste which will be crucial to determine the impacts of other interventions designed to reduce this component.

## 7.4 Recommendations for Industry

This section highlights key areas where businesses need to act to make systemic changes to the way Australia's food system operates. As for the previous sections, this does not replicate the information set out in table 10 which shows who should lead each intervention and who else needs to participate.

The food sector, from farm to retail, is where the vast majority of actual changes will need to be made. Achieving the target will only be possible if industries change the way they do business, for the long term – embedding new processes and practices ranging from new and innovative technologies to simple process and behavioural changes. Many businesses are already taking the first steps towards reducing food waste in their own operations.

The key recommendations for the business sector are:

- For businesses across the supply chain to sign up to the voluntary agreement and relevant sector action plans. This intervention and the others that sit under this umbrella are designed specifically to help businesses work together in a pre-competitive collaborative environment to address the systemic challenges of an inefficient food system.
- For brands and retailers to support the nationwide consumer behaviour change campaign with funds, and through repetition and amplification to maximise the reach and impact of the messages.
- For the hospitality and food service sector to contribute to a sector action plan to reduce food waste and improve profitability in the sector, starting with (but not limited to) implementing food waste measurement technologies and processes.
- For peak industry bodies to encourage and oversee the cascading of good practice across their sector, so that impact is scaled beyond the signatories to the voluntary agreement or the sector action plan participants.
- For businesses across the supply chain to collaborate to increase the amount of food being donated – by lobbying for the improved tax incentive, by working together with the food rescue sector to support their capability and capacity to manage donations and to embed good practice for food donation into their businesses, from the farm to the retailer.

If industry meets these expectations in how they will deliver the interventions set out in the recommended scenario, alongside the expectations set out for the Federal, state and local governments in the previous sections, Australia will have a more resilient, more efficient, less wasteful and more sustainable food system by 2030.