METROPOLITAN WASTE AND RESOURCE RECOVERY GROUP

VICTORIA State Government

Fishermans Bend Waste and Resource Recovery Strategy

April 2017

V2.1

Published April, 2017

Accessibility

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1 In brief

Planning for Fishermans Bend provides a unique opportunity to reduce waste and improve recycling through a range of new, pioneering initiatives. Fishermans Bend is Australia's largest urban renewal area and will support 80,000 residents and 60,000 jobs by 2050. Fishermans Bend will become a thriving place that is a leading example for environmental sustainability, liveability, connectivity, diversity and innovation[1].

The focus on sustainability provides an opportunity for government, councils, community and businesses to work together on increasing recycling and finding solutions to the problems caused by waste. It is a chance to rethink waste and recycling – to enhance building design, invest in new infrastructure, improve education and trial new technology.

Fishermans Bend aims to have one of the highest recycling rates in Victoria. A key target is that 70% of household waste will be recycled by 2050. Food waste is a key material, and over 50% of food waste will be recycled in Fishermans Bend by 2030.

Achieving these ambitious targets will require a range of initiatives, these are outlined in section 2.3. Key overarching objectives include:

- best-practice waste and recycling management within buildings
- reduce amenity impacts from waste collection
- manage Fishermans Bend's waste locally
- improve the local community's waste and recycling knowledge and behaviour.

Increasing recycling has a range of benefits - it reduces greenhouse gas emissions, minimises odour and pollution, creates jobs, and improves the beauty of public spaces[2].Improving the efficiency of waste services will also improve amenity by limiting truck noise and reducing traffic congestion.

2 Introduction

The purpose of this strategy is to outline targets, initiatives and actions to increase recycling and improve waste management in Fishermans Bend. This strategy informs the Fishermans Bend Framework - a statutory planning document to guide urban renewal. The Framework provides long term strategic planning for future land use and development as well as design guidelines to inform planning permit applications.

This planning is being led by the Fishermans Bend Taskforce (the Taskforce) comprising staff from the Department of Environment, Land, Water and Planning, the Cities of Melbourne and Port Phillip and other Victorian government bodies. This strategy has been developed by the Metropolitan Waste and Resource Recovery Group (MWRRG) in collaboration with the Taskforce, councils and other government departments (see Figure 1).

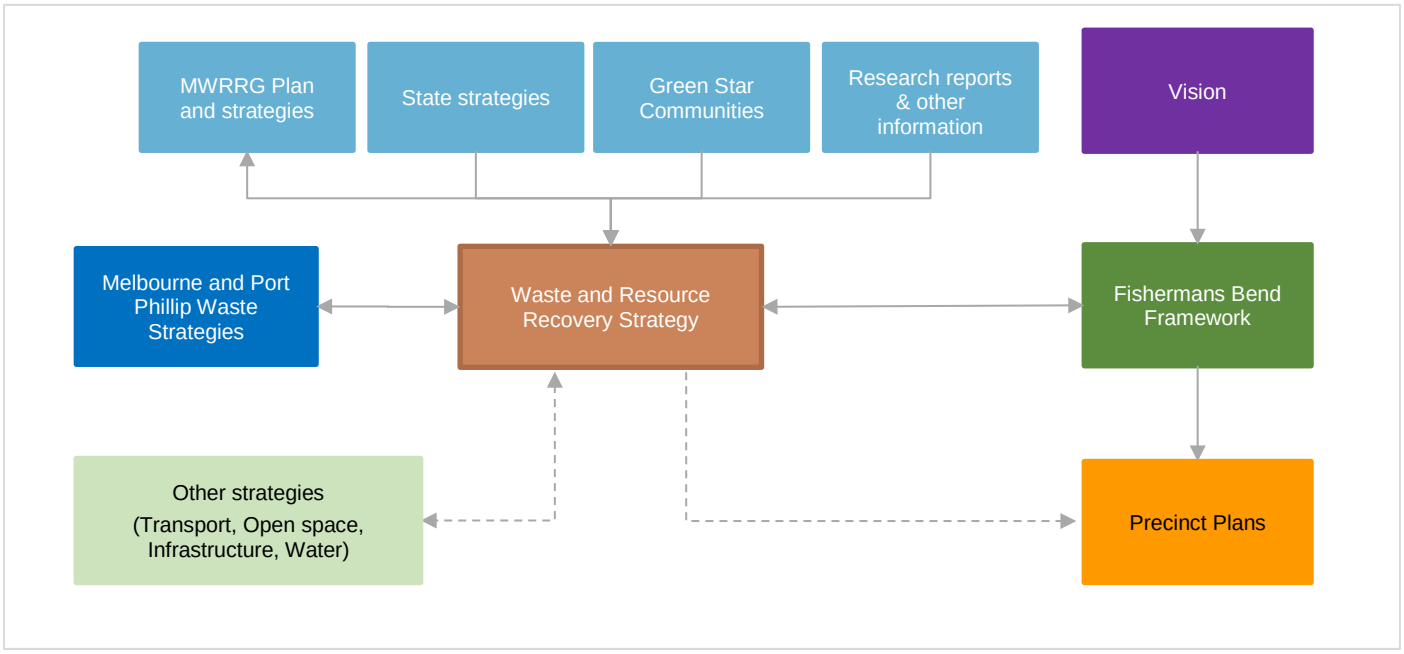


Figure 1: Relationship between this Waste and Resource Recovery Strategy and other plans, strategies and information

Fishermans Bend is currently home to 200 residents and over 300 businesses. Its predominantly industrial landscape includes large-scale warehouses, factories and low-rise office buildings covering most of the area. The area spans two councils - Lorimer and the Employment precinct are in Melbourne, while Wirraway, Sandridge and Montague precincts are in Port Phillip (see Figure 2).

Over the next 35 years, Fishermans Bend will transform into a mixed urban area, with 80,000 residents, 40,000 dwellings and 60,000 jobs. Housing will predominantly be in mid and high rise apartments. There will be a mix of knowledge and manufacturing businesses, as well as high quality retail, tourism, education, health and cultural facilities.

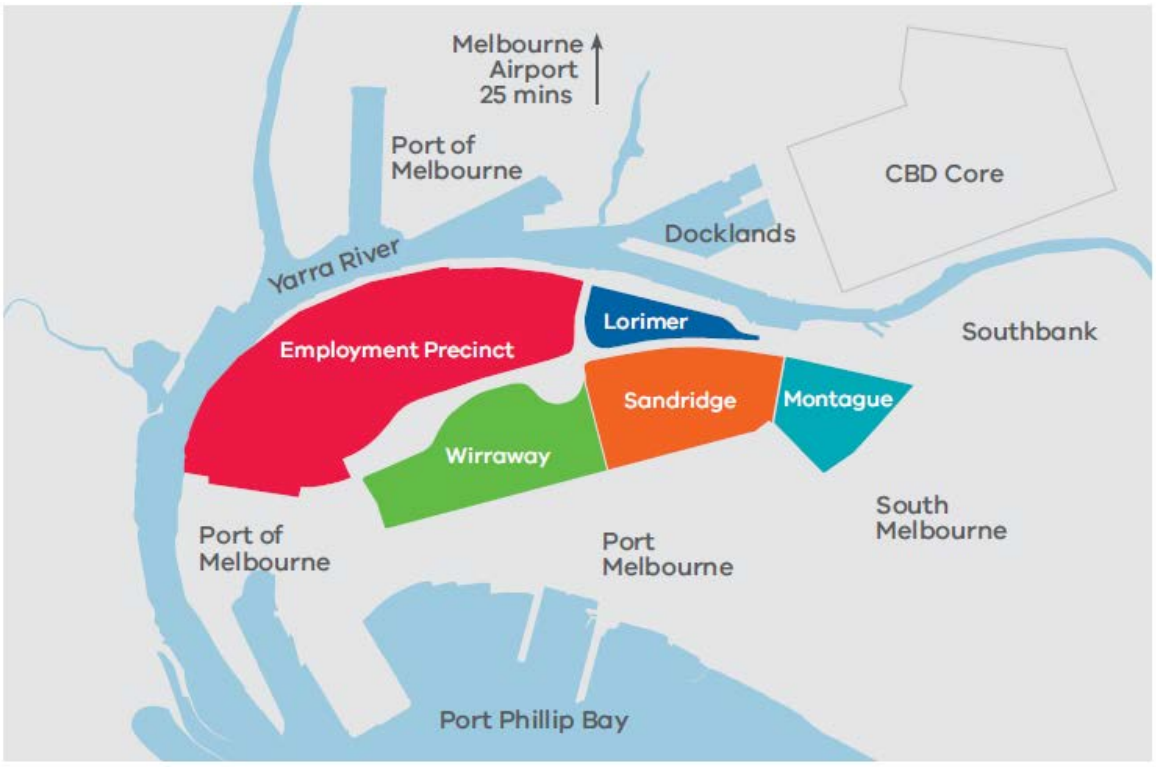


Figure 2: Fishermans Bend and its five precincts

This strategy cover all aspects of waste and recycling including: construction, building design, households and businesses, litter, council sites, transport, advanced processing facilities, and education. This strategy draws on a range of state and local government strategies and plans, Green Star guidelines, consultant reports, and other information. It will be refined and improved through engagement and as new information becomes available.

The initiatives and actions outlined are relevant to everyone in Fishermans Bend, and will require efforts by state and local government, developers, builders, waste companies, businesses and residents.

The MWRRG is currently undertaking research on many of the initiatives described in this strategy. As research becomes available some sections may be revised.

2.1 Problems and solutions

Waste management is often difficult in high density, inner city areas due to lack of space and communal bins. Recycling is often inconvenient or impossible due to missing or inadequate building infrastructure. A multitude of private and council collection trucks create noise and traffic congestion problems.

Increasing food waste recycling is crucial. In Victoria only 3% of food waste is recycled, and it makes up about 22% of waste to landfill, and 35% of household garbage (Figure 3)[2]. Producing food that ends up as waste is an incredible waste of labour, energy and natural resources. In landfill food breaks down producing odour, greenhouse gas emission and leachate. Other key materials include construction materials (concrete, bricks and asphalt), plastics and paper. There are also other difficult to recycle and hazardous materials including electronic waste, polystyrene, mattresses and hard waste.

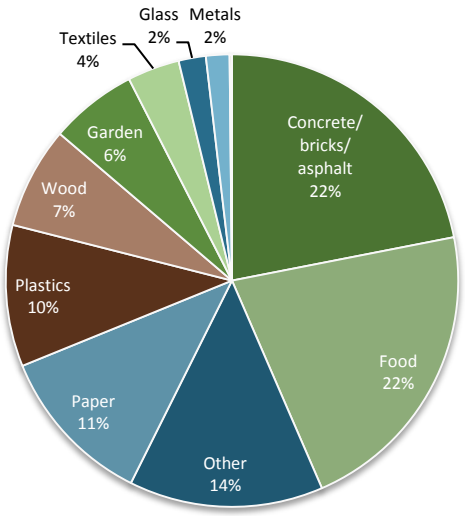


Figure 3: Waste to landfill in Victoria[2]

Fishermans Bend is a chance to try new technologies and ideas, overhaul current practices and push recycling standards higher. Table 1 outlines some of the key initiatives for Fishermans Bend, and also outlines their benefits.

Table 1: New initiatives to increasing recycling rates

Key initiatives	Waste materials	Benefits
Collecting food waste through source separation, in-sink-grinders, on-site units or vacuum systems	Food waste	• New jobs • Producing energy and heat • Creating compost • Increasing skills and knowledge • Demonstrating leadership • Reducing greenhouse gas emissions • Reducing air and water pollution • Improving traffic and local amenity
Local anaerobic digestion facility paired with a Sewer Mining plant	Food and green waste	
Local or regional Advanced Resource Recovery Technology (such as pre-sort or waste to energy facility)	Recyclables and extracts energy from garbage	
Smart technology such as sensor and transport technology to monitor bin volumes and optimise collection routes	Garbage, recycling and public litter bins	
Sustainable building design and operation (five star Green Star) to improve recycling infrastructure	All materials	
Innovative education initiatives that reduce waste generation and increase recycling	All materials	

Increasing recycling will require:

- collaboration and engagement with a variety of stakeholders
- improvement and harmonisation of waste laws, regulations and standards
- investment in new facilities and technology and procurement of better waste services
- planning to improve building design and protect facilities

2.2 Fishermans Bend waste and recycling system

This table outlines a range of *possible* components of the Fishermans Bend waste and recycling system. Feasibility studies are currently underway to determine the most effective and efficient solutions.

Source	Townhouse	Apartment	Food business	Office or retail	Manufacturing	Public bins	Construction
Main recyclable streams	Food, general recyclables	Food, general recyclables	Food, glass, paper & cardboard	Paper & cardboard, food	*Diverse material for each business*	Plastic, glass, aluminium	Concrete, bricks asphalt, timber

Storage, collection & disposal options	In sink grinders or greywater units	Storage and on-site organics units	Public bins	Precinct hubs	Vacuum systems	Trucks
	Grind most food waste and dispose into sewerage system or into on-site tanks.	Organics units process and reduce weight of food waste. Compaction units store garbage and dry recyclables. Space for hard waste and electronic waste.	May collect garbage as well as recyclables. Sensor technology will improve service delivery and efficiency.	Hubs provide communal bins used by many small businesses. Bins collect (and compact) recycling, garbage and possibly organics waste.	All waste and recycling collected and transported via vacuum tubes to central storage area.	Council-run fleet and/or regulated private fleet. Able to service all buildings. Uses telematics and smart routing to improve efficiency and amenity.

Aggregation & sorting options	Materials Recovery Facility	Sorting technology for garbage	Transfer station, Resource Recovery Centre & council depot
	Sorts dry recyclables – plastic, paper, glass, metals – these then go to processors.	Extracts recyclables and organics from garbage. Residual waste ends up in landfill, recyclables can be processed and organics can be composted or used in waste to energy facilities.	A local TS/RRC enables residents to recycle difficult materials (electronic waste, paint, hard waste, mattresses, batteries, motor oil etc.). It may also consolidate waste into larger trucks to haul to other facilities or landfills. Council depot provides street cleaning and litter services.

Processing & disposal options	ARRT facility	Anaerobic digestion	Processors	Composters	Landfills
	Either a local or regional facility built that extracts recyclables and may process garbage into energy. Residue ash can be used in a building product or will go to landfill.	Built next to Sewer Mine and can processes biosolids and food waste from apartments and businesses. Produces energy, heat and digestate (this is used in composting facilities).	Variety of processors turning recovered paper, plastic, glass and metals into new products. Depending on the commodity, processors may be in Melbourne, Victoria, interstate or overseas.	Composters on the outskirts of Melbourne, turn organic waste (food, garden, digestate etc.) into compost.	Four main landfills able to take household waste and numerous other landfills taking inert waste (such as construction waste). Landfills capture some methane for energy production.

2.3 Targets and actions

This table outlines *possible* objectives, targets and actions for Fishermans Bend. These will be refined as feasibility studies are completed. It also outlines the possible Green Star Communities points that these actions will achieve.

	Objectives	Targets	Actions	Green Star
Households and apartments	Increase households and apartments recycling rates	70% of household waste is recycled by 2050 50% of household food waste is recycled by 2030	• Dedicated food waste recycling systems in all new buildings • Improve and harmonise Waste Management Plan standards • Improve the state planning scheme • Improve monitoring and enforcement • Better education, engagement and communication	0.33 points
Commercial and industrial waste	Increase commercial and industrial recycling rates	50% of commercial and industrial food waste is recycled by 2030	• Increase food waste recycling and recovery • Install shared waste systems • Increase recycling of priority materials • Improve Waste Management Plan standards	
Construction and demolition waste	Maximise reuse and recovery of building materials	At least 90% of construction and demolition waste is recycled	• Require five star certification for large buildings • Require Infrastructure Sustainability certification for public infrastructure • Encourage TAKE2 commitments • Increase monitoring and enforcement	0.88 points
Waste collection and transport	Reduce amenity impacts from waste collection	Reduce collection truck movements by 50%	• Implement better storage and collection technology • Shared collection systems	
Transfer station, Resource Recovery Centre & depot	Residents and businesses have a broad range of recycling opportunities	The Resource Recovery Centre has a recycling rate of 60%	• A new, best-practice TS/RRC and depot • Establish a sustainability hub	0.33 points
Anaerobic digestion facility	Reduce organic waste to landfill	Explore the feasibility of a local anaerobic digestion facility by 2019	• Gain key stakeholder support and guidance • Plan and commission a feasibility study • Engage and educate government, community and businesses	*Possible innovation points*
Advanced Resource Recovery Technology	Establish an ARRT to extract more value from Fishermans Bends waste	A local or regional ARRT is operating by 2026	• Prepare an ARRT Discussion Paper • Gain stakeholder support for the ARRT procurement process • Release procurement for ARRT	
Litter	Fishermans Bend has high litter recycling rates	All litter bin waste is recycled	• Develop a local litter plan • Install a network of smart public litter bins • Send all litter bin waste to recycling facilities • Collect good data on discarded litter • Ensure regular litter enforcement activities	0.33 points
Education and engagement	Improve the local community's waste and recycling knowledge and behaviour	Increase community satisfaction with waste services	• Trial new education and engagement tools • Household, business and construction education programs • Waste facilities build a social licence to operate • All Fishermans Bend schools are 5 star Resource Smart schools • Education centre within the Sustainability Hub	
			Total Green Star points (out of a maximum 2 points)	**1.88 points**

2.4 Drivers of change

The community, councils, and the government are committed to ambitious actions to increase recycling within Fishermans Bend. Feedback from an early community consultation showed a strong public appetite for new technologies that reduce waste to landfill[3]. There are four key factors that are driving improvements in waste and recycling: sustainability, technology, economics and liveability (see Table 2)[1].

Table 2: Drivers of change for Fishermans Bend as a low waste community

Sustainability drivers
Fishermans Bend has a strong focus on sustainability and will be Australia's largest urban renewal Green Star – Community. Green Star - Communities is a tool developed by the Green Building Council of Australia to guide the development of sustainable communities and provide independent certification of outcomes. The local community and the Victorian Government want sustainable urban development with new initiatives that increase recycling and reduce waste to landfill[2].
Technology drivers
Fishermans Bend is planned to be a smart city. Smart cities use new technologies, big data, analytics and other means to improve the efficiency of government operations, delivery of public services, and improve quality of life. There are many opportunities to use new technology to improve recycling within buildings and at the precinct scale, including new processing facilities. New technologies include bin sensors, smart litter bins, and an inner city anaerobic digestion facility.
Economic drivers
State government and local councils want to improve the quality and efficiency of their services. Improving efficiency can reduce costs while improving the quality of waste and recycling services. Increasing recycling will create more jobs, and implementing new technology initiatives will increase the skills and knowledge within Victoria[2]. Businesses can benefit through improving efficiency and engaging in industrial ecology.
Liveability drivers
Melbourne is the world's most liveable city; Fishermans Bend will build on this achievement. Residents want waste and recycling services that increase recycling while also reducing traffic and amenity impacts. Litter and dumped rubbish is key concern of local residents[4].

2.5 Social, environmental and economic benefits

Improving recycling in Fishermans Bend will have benefits both within and outside the precinct. Key benefits include reducing greenhouse gas emissions from landfill, improving amenity and creating jobs. These benefits are outlined in Table 3.

Table 3: Social, environmental and economic benefits of improved waste management

Environmental	Social	Economic
Get maximum value from waste and minimise impacts on the environment	Enhance public health and wellbeing	Deliver jobs and economic benefits
Reduced greenhouse gas emissions. Waste disposal to landfill accounts for 1.15% of Victoria's total greenhouse gas emissions mainly due to food waste decomposition[5]. Reducing food waste to landfill will reduce emissions. Recycling also avoids emissions from virgin material extraction. **Less leachate**. Breakdown of organic waste in landfills produces leachate which can create odour and pollute water. **Material efficiency**. Promoting a circular economy through improving recycling and industrial ecology reduces demand for raw material and may have financial, employment and traffic benefits.	**Improved Fishermans Bend amenity and traffic**. Minimising collection truck movement will result in less congestion and noise, making Fishermans Bend a better place to live. A network of litter bins will keep public spaces clean and reduce water pollution. **Improved amenity around landfills**. Landfills can have odour and noise impacts on surrounding communities from breakdown of food waste, truck movements and dust. Reducing waste to landfill will improve the amenity of landfill-adjacent communities. **Leadership and skills.** Advanced waste initiatives will demonstrate sustainability leadership and will build the skills and knowledge within Victoria. Local solutions will also reduce traffic and create jobs.	**More jobs**. Increasing recycling will have employment benefits. It's estimated that recycling creates 9.2 jobs (per 10,000 tonnes) compared to 2.8 jobs if the waste is landfilled[6]. **Business growth**. New recycling initiatives give waste businesses opportunities to provide innovative and more efficient services. It also provides opportunities for businesses to recycle more waste. **Council savings**. Through good planning and procurement, councils can deliver social and environmental outcomes while potentially saving money (such as from disposal and clean-up costs and litter).

Planning for waste and recycling in Fishermans Bend will integrate social, environmental and economic sustainability. This means that all proposed interventions are analysed against a set of criteria to enable comparison and determine the best course of action. These criteria are outlined in table 4.

Table 4: Criteria for analysing proposed interventions

Criteria	Details	Key measures
1. Waste diversion	• Tonnes of waste diverted from landfill • Waste material types • Contamination levels	Tonnes per household per annum Diversion rate (%)
2. Financial costs and benefits	• Capital and operating costs • Who bears cost and who reaps benefits	Net present benefit
3. Greenhouse gas emissions	• Greenhouse gas emissions (scope 1, 2 and 3)	Tonnes CO_2-e per household per annum
4. Energy generation from waste facilities	• Amount of energy generated, including use before and after the meter, as well as heat and fuel generation (e.g. biogas)	kWh
5. Water	• Amount of water is saved or used	L/tonne
6. Amenity	• Estimated reduction or increase in truck movements • Safety, odour, congestion and noise issues	Km/tonne
7. Jobs	• Jobs created	FTE/tonne

2.6 Stakeholder actions

Achieving the actions in this strategy requires all stakeholders to work together because of multiple jurisdictions, roles and responsibilities (see Table 5).

Table 5: Fishermans Bend stakeholder actions

Stakeholders	Possible roles
State government (Taskforce, MWRRG and DELWP)	• Demonstrate leadership and vision by setting ambitions policy and plans • Undertake research and analysis, and collaborate with all stakeholders to develop waste strategies • Ensure sustainability is considered in all aspects of planning, construction and operations to meet Green Star or ISCA benchmarks • Procure recycled products where possible • Invest or help procure new facilities
Local government	• Undertake research and analysis and collaborate with state government to develop innovative recycling strategies • Councils collaborate to harmonise waste management delivery, regulations and land use and waste service planning • Procure recycled products where possible • Facilitate, participate and invest to procure new facilities
Community and residents	• Advocate for high quality, innovative waste and recycling services • Use waste and recycling services provided effectively • Embrace new innovations and technology and actively participate in education campaigns
Developers and the construction industry	• Use best-practice building design to provide for recycling (especially for food waste) • Minimise waste and maximise the use of recycled material in building construction by improving retention, collection, storage and disposal • Engage with government to improve recycling benchmarks
Businesses and manufacturers	• Reduce, recover and recycle organic waste • Reduce waste through improving material efficiency and adopting industrial ecology • Advocate and use placed-based collections facilities • Embrace alternatives to landfill, such as anaerobic digestion or ARRT facilities
Water authorities	• Engage with government to investigate feasibility of new food waste collection technologies through in-sink-grinders • Collaborate with government on the anaerobic digestion facility
Waste and recycling industry	• Contribute to the development of waste strategies • Invest in new technology and other innovations to improve collection services, especially to recovery more materials • Build a social licence to operate at facilities and have best practice operations
Investors	• Provide funding and advice for new facilities • Start-up or early stage capital is required for innovative technologies that have the potential recycle more materials
Schools	• Participate in the ResourceSmart schools program
Social enterprises	• Operate a resale shop at the Port Phillip Resource Recovery Centre • Develop niche opportunities to recycle materials and products
Universities and other institutions	• Assist in research to increase recycling, including technology innovations, Randomised Control Trials and behavioural economics. • Investigate options to join a micro-grid using anaerobic digestion power.

Council and state government waste strategies should support the Fishermans Bend waste targets and actions. High level targets and goals are crucial to drive recycling initiatives and focus projects. Key documents that are being prepared in the next few years include:

- City of Port Phillip Waste Strategy (2017)
- City of Melbourne Waste and Resource Recovery Plan (2018)
- MWRRG Implementation Plan review (2019)

Ensuring that all these documents align and support Fishermans Bend targets is critical to ensure coordinated and consistent actions to increase recycling. Without clear links, shared targets and purposeful engagement the Fishermans Bend initiatives will be difficult to achieve.

3 Background

3.1 Victorian Government policy and strategies

The statewide plan outlines the overarching vision and goals for Victoria over the next 30 years. The metropolitan plan details the future of waste and recycling in Melbourne over 10 years (see Table 6).

Table 6: Victorian and metropolitan waste strategies

Plan	Details
Statewide Waste and Resource Recovery Infrastructure Plan	**Vision**: Victoria has an integrated statewide waste and resource recovery system that provides an essential community service to: • protect the community, environment and public health • recover valuable resources from our waste • minimise long term costs to households, industry and governments
Metropolitan Waste and Resource Recovery Infrastructure Plan	This plan sets out how we can meet the recycling and waste needs of metropolitan Melbourne over the next 10 years, and provides a vision and strategy for moving Melbourne towards a future in which landfills are the last option. There are four strategic objectives: • Reduce waste sent to landfill • Increase organic waste recovered • Deliver community, environmental and economic benefits • Plan for Melbourne's growing population

3.1.1 Environmental Protection Act

The waste hierarchy is one of the principles for environmental protection under the *Environmental Protection Act 1970*. The hierarchy shows order of preference, with avoidance being the most preferred option and disposal being the least (Figure 4).

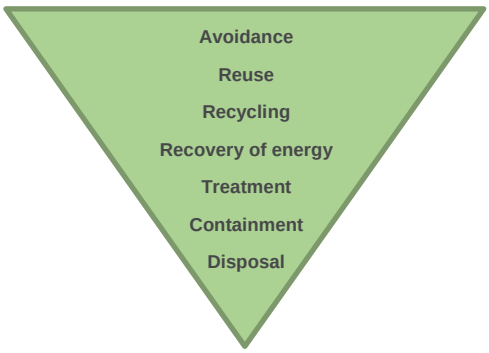


Figure 4: The Victorian waste hierarchy

3.2 Council policies and strategies

The City of Port Phillip and the City of Melbourne have many policies and strategies which articulate a desire for higher recycling rates and improved amenity. Both councils want new Advanced Resource Recovery Technologies, improved collection services, and food waste recycling..

Table 7: Council plans, strategies and policies relevent to waste management

Port Phillip	Melbourne
Waste and Resource Recovery Strategy (2009-2014)	Waste and Resource Recovery Plan (2015-18)
Port Phillip Planning Scheme	Zero Net Emissions by 2020
Towards Zero Strategy (2007-2020)	Melbourne Planning Scheme
Sustainable Design Strategy	WSUD Guidelines
Greenhouse Plan	Food City: Melbourne Food Policy
ESD guidelines	Construction Management Guidelines

4 Current waste generation and projections

There are three waste generating sectors: households and apartments (municipal solid waste), businesses (commercial and industrial waste) and construction and demolition waste. Of these sectors, households have the lowest recycling rate (Figure 5), which is why they are a key focus of this strategy. Figure 6 breaks down waste by material type, and highlights the very low recycling rate of food waste, another key focus of this strategy.

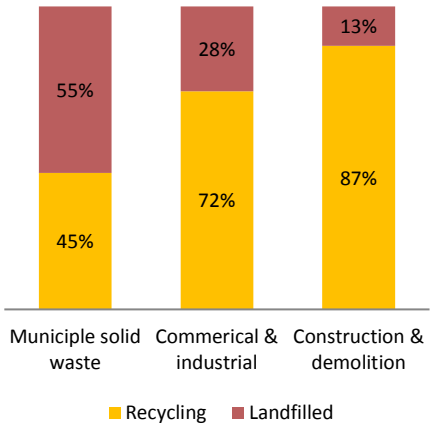


Figure 5: Recycling rates by sector for metropolitan Melbourne[7]

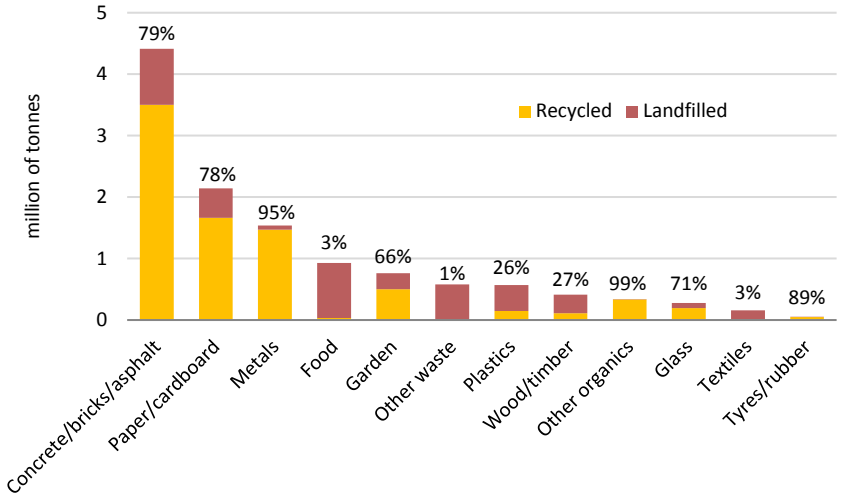


Figure 6: Recycling tonnages and rates by materials[2]

Current and projected waste generations (in tonnes per annum) are shown in Table 8. Population and employment figures have been sourced from DELWP and City of Melbourne estimates (see Figure 7). The projections have been based on residential generation of 200kg/person/year of garbage and 120kg/person/year of recycling. These estimates are based on Sustainability Victoria data for inner city apartments which often generate far less waste than suburban houses[9]. Business generation is estimated at an average of 970kg/EFTE/year of garbage and 1,030kg/EFTE/year of recycling. This varies widely by business type, with estimates using Sustainability Victoria reports by business sector[8,12].

Table 8: Waste and recycling projections (tonnes per annum)

Sector		Population	Total waste	Garbage	Recycling
Municipal solid waste	2016	<1000 residents	301	118	113
	2050	80,000 residents	25,293	15,808	9,485
Commercial and industrial waste	2016	30,520 workers	50,619	22,034	28,585
	2050	50,000 workers	86,296	43,551	42,745

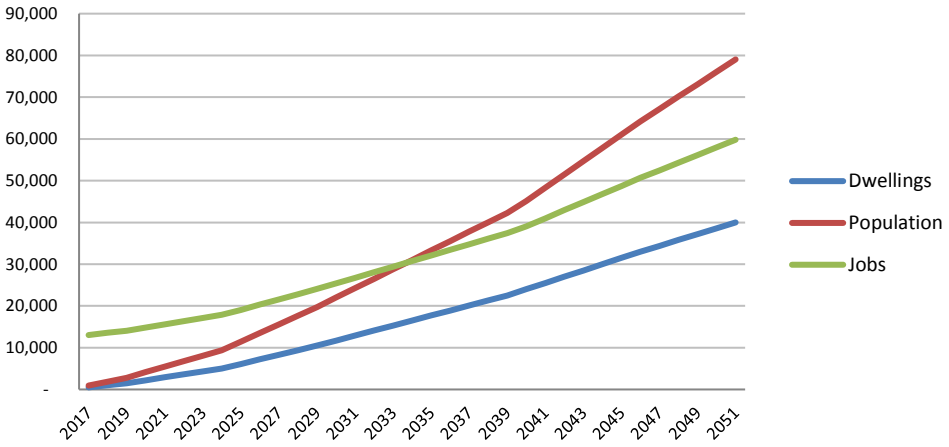


Figure 7: Population, dwelling and jobs estimates for Fishermans Bend

4.1 Municipal solid waste

Municipal solid waste (MSW) waste is generated by households and council operations. This waste includes household garbage (mostly food waste), as well as household recycling (mostly paper and plastics). Around half of waste going to Melbourne landfills is MSW, due to its low recycling rates compared to commercial and industrial (C&I) or construction and demolition (C&D) waste (Figure 5).

Inner city councils (such as Port Phillip and Melbourne), have low MSW recycling rates compared to the metropolitan Melbourne region (Figure 8). This is mainly due to the challenges of recycling in apartments due to lack of infrastructure, design constraints, inadequate planning controls and ability for council's to service buildings. A report commissioned by Port Phillip estimated business as usual residential generation of 200kg/person/year of garbage and 120kg/person/year of recycling[12]. With an average of two people per dwelling, this means 400kg/dwelling/year of garbage and 240kg/dwelling/year of recycling (Figure 8). The interventions proposed in this strategy will increase this recycling rate to over 70%.

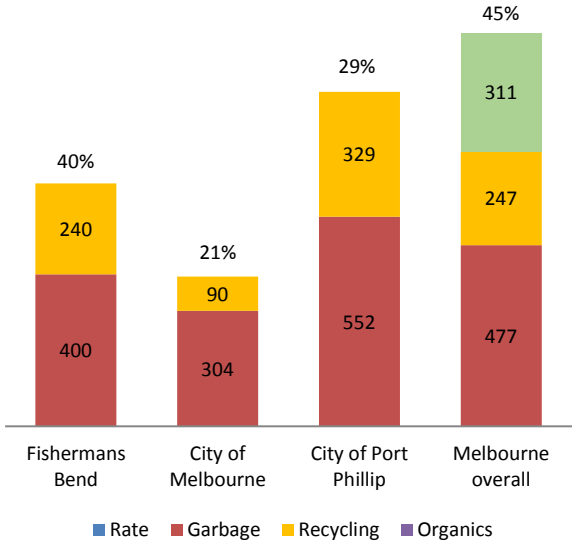


Figure 8: MSW waste generation (kg/household/year), recycling rates and estimates under business as usual[9]

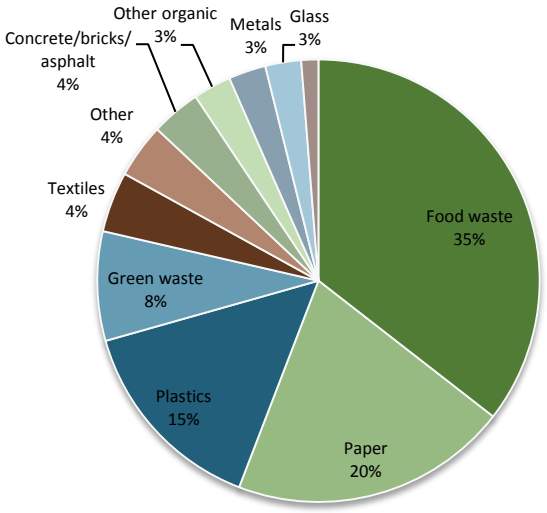


Figure 9: Composition of MSW waste to landfill[7]

Currently, Fishermans Bend comprises predominantly commercial businesses and very few residents. It is projected that without changes to waste management Fishermans Bend will generate over 25,000 tpa of waste by 2050, with 15,800 tpa of MSW garbage (to landfill) and around 9,500 tpa of recyclables (Figure 10).

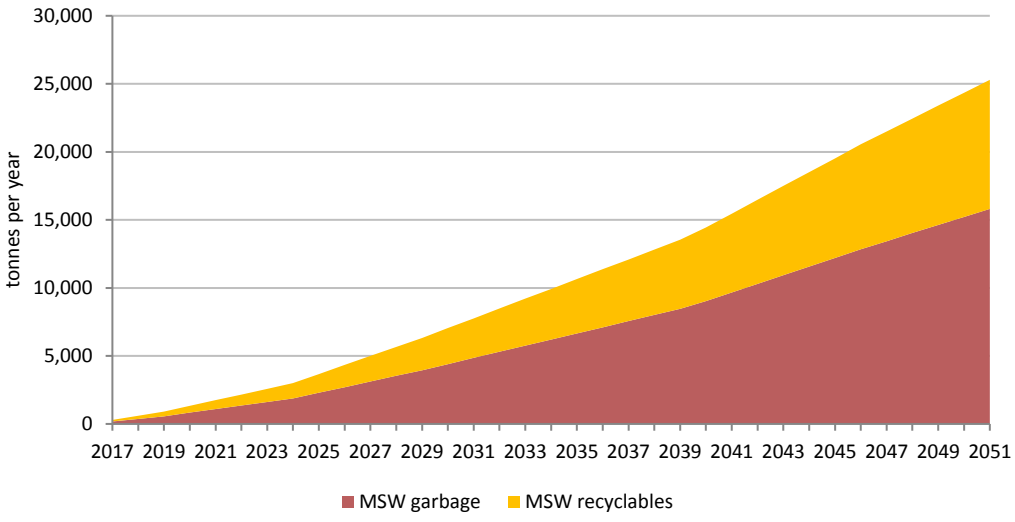


Figure 10: MSW waste and recycling projections for Fishermans Bend (business as usual)[10]

4.2 Commercial and industrial waste

Commercial and industrial (C&I) waste is waste produced by businesses and manufacturers. Each business sector generates different waste – for example paper waste in offices and food waste in restaurants (Figure 11). The majority of this waste is collected by private contractors.

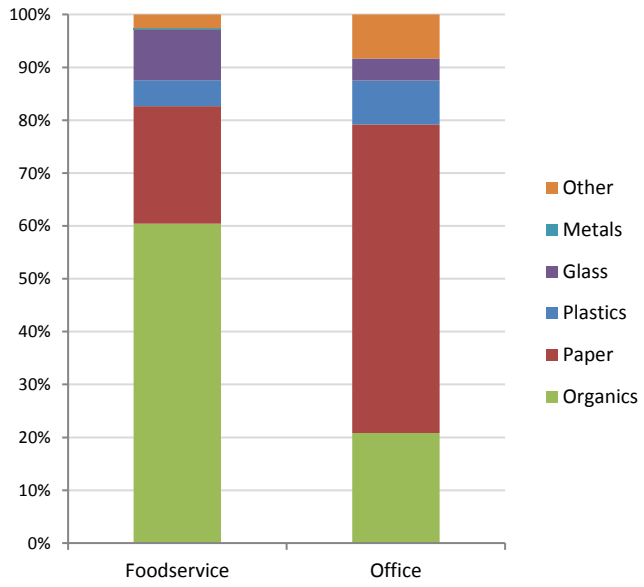


Figure 11: Waste produced by office and foodservice businesses[11]

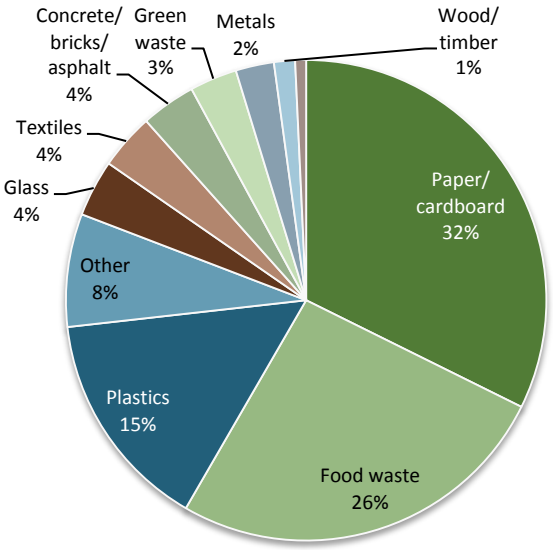


Figure 12: Composition of C&I waste to landfill[7]

Currently Fishermans Bend generates around 50,600 tpa of C&I waste, of which 22,000 tpa is garbage and 28,600 tpa is recycled. Business generation is estimated at an average of 970kg/EFTE/year of garbage and 1,030kg/EFTE/year of recycling, although this varies by business[12].

Without any change to current waste management, by 2050 it is projected that C&I waste will increase by around 35,500 tpa to over 86,000 tpa (43,551 tpa garbage and 42,745 recyclables)[12]. C&I waste composition will also change as office businesses replace manufacturing. Interventions to increase recycling will need to be accompanied by assessment of end markets for materials, as well as the capacity of the reprocessing system to deal with tonnages.

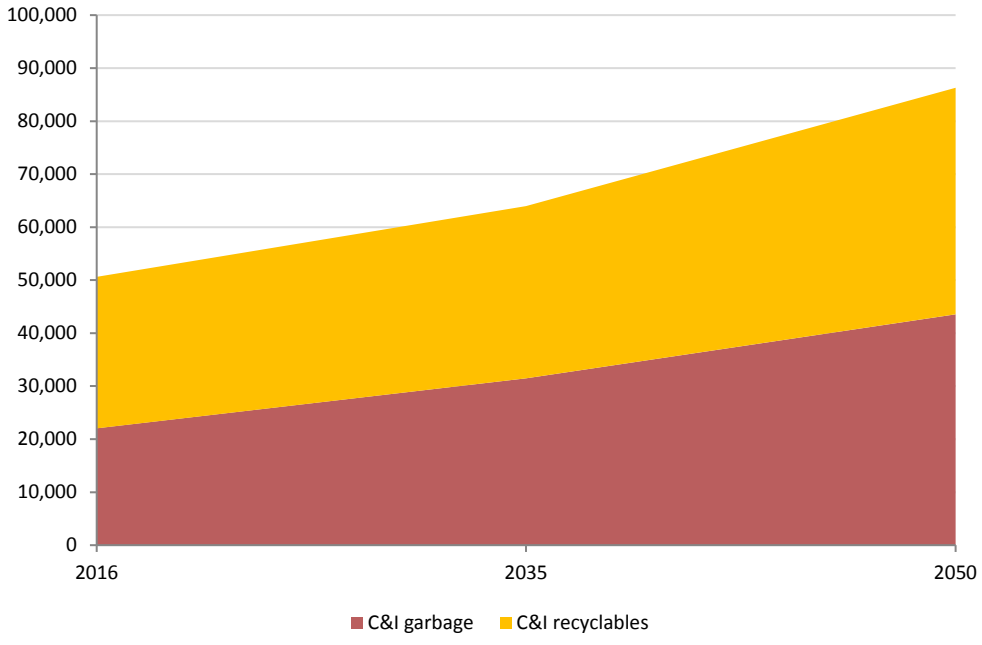


Figure 13: C&I waste and recycling projections for Fishermans Bend (business as usual)[10]

4.3 Construction and demolition waste

Construction and demolition (C&D) waste is mainly concrete, bricks and asphalt. It has the highest recycling rate (around 87%[7]), due to the ease of recycling and the high cost of disposal to landfill. New construction in Fishermans Bend will generate large amounts of C&D waste. Most of this waste will be collected and managed through private contractors. It is difficult to project C&D waste generation because of the uncertainty over building size, construction methods and timing of construction. Hazardous waste such as contaminated soils and asbestos will need to be managed as the precinct is developed.

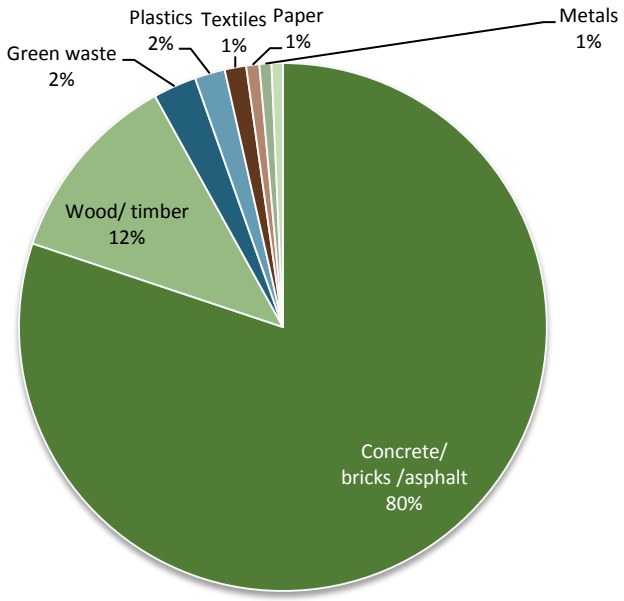


Figure 14: Composition of C&D waste to landfill[2]

5 Households and apartments

Objective	Increase households and apartments recycling rates
Targets	70% of household waste is recycled by 2050 50% of household food waste is recycled by 2030
Actions	• Dedicated food waste recycling systems in all new buildings • Improve and harmonise Waste Management Plan standards • Improve the state planning scheme • Improve monitoring and enforcement • Better education, engagement and communication

By 2050 Fishermans Bend will have around 40,000 households housing 80,000 people. Over 90% of these households will be in multi-unit developments (apartments in high or low rise buildings). The remaining households (<10%) will be townhouses, terraces or semi-detached houses. While recycling within suburban houses is well established, recycling in apartments is much more difficult.

There are three material streams from households:

1. **Food waste**: Tackling food waste is essential. Food waste makes up around 35% of the average household garbage bin; 97% of food waste ends up in landfill.
2. **Dry recyclables**: There is the opportunity to increase recycling of many other materials that still end up in the garbage bin. These include plastic, paper and cardboard, glass and metals. Best practice building design and increased education and engagement are the key to increasing recycling of these materials.
3. **Garbage**: The remaining garbage will be taken to an Advanced Resource Recovery Technology facility – such as a sorting or waste to energy facility. This will extract any remaining valuable materials and may produce energy and heat (see Chapter 11).

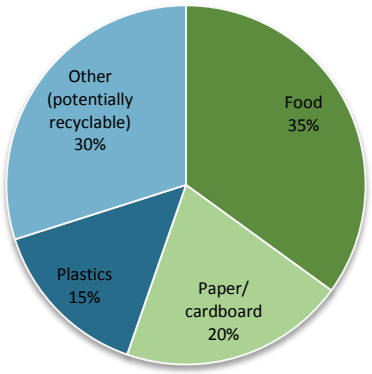


Figure 15: Average household garbage bin composition[7]

5.1 Challenges

Recycling rates in multi-unit developments (MUDs) are much lower than stand-alone houses because they lack the space and infrastructure to recycle. Melbourne's rapid growth in apartments makes it important to investigate new technology, and to significantly improve the design and operation of MUDs in order to reduce waste to landfill.

Current recycling rates in apartments are around 23%, compared to the metropolitan Melbourne average of 45% (Figure 16)[13]. Poor building design and operation affects the ability to recycling effectively. Apartments often have higher contamination rates (garbage within recycling bins) and resource loss rates (recycling within garbage bins)[14].

Common building design limitations include:

- No infrastructure to recycle food waste
- Limited chutes for recycling in high rise buildings
- Unclear signage
- Lack of space for bins - within apartments in the floor bin room, and in the basement
- Lack of hard waste storage space (for bulky items, electronic waste etc.).
- Lack of accountability because of communal bins.

An additional issue is the increase in renters over owner-occupiers. Renters are often less knowledgeable about specific council recycling systems and local recycling services.

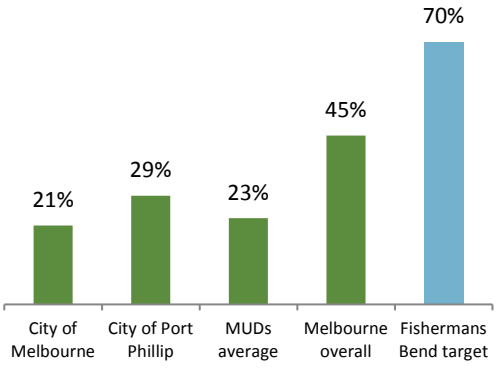


Figure 16: Current MSW recycling rates and 2050 target[9]

There are multiple reasons for poor building design including:

- Inadequate planning controls, guidelines and tools for waste management.
- Lack of monitoring and enforcement of building design.
- Limited council resources and funding for engagement or monitoring.
- Lack of consistent and high quality communication and education material for residents.
- Retrofitting existing buildings is difficult due to cost and space limitations.
- Inability for councils to access, educate and engage with high rise building residents.

5.2 Tacking food waste

Around 35% of household waste is food waste. Investigating new, cost effective methods for recycling food waste is a key target. Methods for recycling food waste in Fishermans Bend may include:

- **In sink grinders** are small units under a kitchen sink that grind and shred food waste. The waste can be put directly into the sewer where it can be treated at a sewage facility to capture biogas**.** Alternatively it can go to an on-site tank where later it can then be collected by truck for transport to a processing facility. In-sink-grinders are commonly used in other countries, but have not been widely used in apartment buildings in Australia.
- **Small-scale organics units** – There are a range of small-scale units which process organics waste within buildings. These can include Anaerobic Digesters, dehydrators, composters or worm farms[15]. Units can produce digestate, liquid or compost that can be used on gardens, processed off-site, or disposed to the sewer system.
- **Third chute** – a third chute can take food waste into a dedicated bin. It can be collected and taken to a large composting facility or anaerobic digestion facility or processed on-site in a small-scale organics unit.
- **Vacuum systems** – can transport food waste within buildings to a central storage unit, where it can be processed or taken off site.

5.3 Improving planning tools

Improving building design is critical to diverting food waste and increasing recycling of other materials. Design of waste management is influenced by a number of planning documents and guidelines (see table below). Waste Management Plans are key tools which outline how new buildings are designed, constructed and operated manage waste and recycling.

The Fishermans Bend design guidelines are a significant opportunity to improve building design beyond current best practice, implementing new initiatives to increase recycling.

Fishermans Bend built form guidelines	The guidelines were changed in September 2016 – they are currently being rewritten by the Taskforce. They guidelines specify current best practice, and will also outline new building design standards.
Better Apartments design guidelines	An incorporated document (as of March 2017) which outlines standards for waste management within residential apartments. Mentions the need for council *Waste Management Plans* and the *Best practice waste and recycling management guidelines for residential development.*
Local planning schemes	The City of Melbourne's planning scheme mandates a Waste Management Plan. The City of Port Phillip's planning scheme does not mention a Waste Management Plan.
Waste Management Plan guidelines	Both councils have guidelines which outline what is required when designing and operating a building. These guidelines are being updated in 2017.
Best practice waste and recycling management guidelines for residential development	These guidelines outline best practice waste management within buildings. They are currently being rewritten by Sustainability Victoria.

5.4 Possible solutions

There are a number of actions needed to firstly implement new and innovative initiatives and secondly to harmonise building requirements across Fishermans Bend.

Action	Detail	Lead stakeholders
Dedicated food waste recycling systems in all new buildings	Over 50% of household food waste will be recycled by 2030. A feasibility study will determine the best solution to store, collection and process food waste. In-building solutions that will be analysed: • In-sink-grinders • Third chute system • In-apartment caddies • On-site small scale organic units • Vacuum collection systems These in-building systems can connect with a variety of processing systems, including: • South East Water Sewer Mine • Anaerobic digestion facility • Other local processing facility (e.g. small MRF) • Regional composting facilities A feasibility study will analyse the food waste recycling options, comparing them against these criteria: • **Waste diversion**: tonnage, material type and contamination • **Financial**: Capital cost, ongoing costs and benefits, and how costs and benefits are distributed between stakeholders • **Environmental**: Greenhouse gas emissions, leachate, power and heat, water use, organic outputs (e.g. compost) • **Social**: Jobs created and amenity impacts (trucks, noise and odour). The feasibility study is a joint effort by MWRRG, Fishermans Bend Taskforce and Melbourne and Port Phillip councils.	South East Water Local councils MWRRG **Key project**: Feasibility study
Improve and harmonise Waste Management Plan standards	Port Phillip and Melbourne councils will have leading practice Waste Management Plan standards. This will increase recycling rates of non-food waste by mandating good recycling infrastructure and management. A Waste Management Plan (WMP) is required for every new building and is an important tool to ensure good waste services. Council do not currently have the same WMP standards; improving and harmonising WMP standards is crucial to achieving higher recycling rates. To improve and harmonise standards, MWRRG is working with local councils. By the end of 2017 both councils will have updated their WMP standards, to make them identical and best practice. This will ensure consistent waste management across Fishermans Bend. Best practice building design currently includes: • Multiple chutes for high rise buildings • Adequate space for bins in apartments, floor and basements • Use of compactors for larger developments • Space for hard waste and organics recycling • Safe and easy access for collectors • Clear and consistent signage.	Local government MWRRG **Key project**: Improving resource recovery in MUDs - MWRRG
Improve the state planning scheme	The planning scheme needs improvement so it fully supports best practice building waste management. The recent Better Apartments guidelines are an important step in strengthening the Victorian Planning Provisions. However more can be done to embed waste management within state planning policies and Port Phillip's local	MWRRG DELWP

Action	Detail	Lead stakeholders
	planning scheme. The City of Melbourne's planning scheme mandates and enables the enforcement of WMP standards (Clause 22.19). In contrast, Port Phillip's planning scheme does not mention WMPs (see Clause 22.13). Changing both the Victorian Planning Provisions and/or the Port Phillip planning scheme to set objectives and mandate WMPs is important to ensure sustainable developments in Fishermans Bend. MWRRG will work closely with councils and state planners to advocate and develop new planning provisions.	**Key project**: Improving resource recovery in MUDs - MWRRG
Improve monitoring and enforcement	Building inspectors should check that WMPs are followed in construction. Currently there are limited processes to make sure buildings contain the features specified in WMPs. MWRRG and councils will work to improve building regulations, to establish a standard compliance process for buildings. This could be incorporated into the building inspection process. This may require modification of the Building Regulations or Planning Scheme. WMPs guide the operation of a building's waste system. Any modification to WMPs should be examined and approved by council.	Local government DELWP
Better education, engagement and communication	Clear, concise and consistent signage can significantly reduce contamination and resource loss and increase recycling rates. Consistent bin colours and standards help recycling by maintaining consistency across the state[16]. Port Phillip and Melbourne WMP guidelines will mandate the Australian Bin Lid standards (AS 4123.7). They will provide clear support for signage within buildings. Signage and materials should be tailored to culturally and linguistically diverse communities[17]. Ensure that all bin signage is clear and standardised will reduce community confusion and increase recycling.	Building managers Local government Residents

6 Commercial and industrial waste

Objective	Increase commercial and industrial recycling rates
Targets	50% of commercial and industrial food waste is recycled by 2030
Actions	• Increase food waste recycling and recovery • Install shared waste systems • Increase recycling of priority materials • Improve Waste Management Plan standards

Fishermans Bend will have a range of businesses including offices, restaurants, supermarkets, retail and large manufacturers. Each business generates a range of waste, much of which is recyclable. Recycling is generally cheaper than waste disposal for landfill (depending on the material recycled[18]) which provides a financial incentive to reduce and recycle materials.

Improving management of waste materials will provide significant benefits for businesses including:

- more efficient production which will reduce materials wasted
- a circular economy and industrial ecology (one business's waste becoming another's input)
- improving the amenity of the local area through truck minimisation and good bin storage and management.

It is estimated that by 2050 Fishermans Bend will produce over 86,000 tonnes per year of garbage and recycling (see Table 9). It is estimated that much of the garbage can be recycled because it is paper, plastics or food (Figure 17).

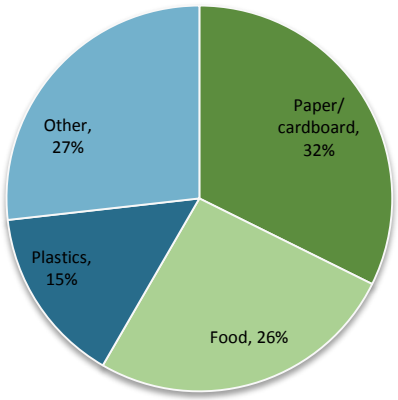


Figure 17: Average commercial garbage bin composition[7]

Table 9: C&I waste projections

	Total waste	Garbage	Recycling
2016	50,619	22,034	28,585
2050	86,296	43,551	42,745

6.1 Challenges

Many businesses already separate recyclables (such as glass and paper) however there are many more materials which could be recycled. Key materials include:

- food waste
- flexible plastics
- polystyrene
- glass
- paper and cardboard
- electronic waste.

Food waste is often not recovered due to lack of awareness of possible cost savings and environmental benefits. There may also be space limitations for multiple bins. Staff are often not aware of recycling options, or do not have the knowledge of how to separate and recycling waste.

6.2 Possible solutions

These solutions focus on food waste, improved building standards, shared waste infrastructure and priority materials.

Action	Detail	Lead stakeholders
Increase food waste recycling and recovery	**Foodservice businesses** These businesses include restaurants and cafes, supermarkets, and specialised retailers (grocers, bakeries, butchers) and other food retail businesses. Engagement and education of foodservice businesses can help reduce food waste through: • Improving measuring and monitoring of food waste • Source separation • Training of staff • Better inventory management • Installing small-scale units (dehydrators, anaerobic digesters, macerators) • Use of shared waste infrastructure (see next action) Additionally, donating food to recovery organisations could be a high priority for unsold or excess food. Food recovery organisations distribute food to those in need. Foodservice businesses could be encouraged and supported to donate excess food to food recovery organisations. **Offices** Increasing food recycling in offices can be achieved through engagement with office-based businesses and building managers, as well as changes to WMPs or design guidelines. Separately collecting food waste for either on-site or off-site processing has clear environmental benefits, and may also have financial benefits. **Manufacturers** There are many options for reducing and recovering food waste from manufacturers. These include: • Installing small-scale units (dehydrators, anaerobic digesters, macerators) • Measuring and monitoring food waste • Manufacturing line optimisation • Separation and sending to anaerobic digestion facility (possibly through shared bins) State and local government could engage with manufacturers to understand and improve their management of food waste. Sustainability Victoria runs business efficiency programs that can deliver this service.	Sustainability Victoria MWRRG
Install shared waste systems	Shared bins systems within buildings or along a shopping strip will make collection more efficient by aggregating waste and recycling volumes. This allows less frequent collection, reduces inefficient truck movement (such as half full truck trips) and improves amenity. Shared bins will also reduce bin space within buildings. This can be particularly important with small businesses in buildings where space is a premium. Shared infrastructure could include: • Shared compactors and other bins between residential and commercial users within buildings • Swipe card systems for multiple businesses accessing shared bins • Small-scale bin hubs for laneways or shopping strips. Achieving shared waste systems may require: • Changes to WMP, design guidelines and local planning laws to ensure building design allows shared systems • Engagement with building managers and tenants to support and promote shared systems • Council coordination of shared bin spaces for shopping strips. Including investment by government to set up precinct hubs • Pilot projects to test costs and benefits • Analysis of pricing and collection contracts • Sensor and compaction technology to reduce collection frequency.	Taskforce Councils MWRRG

Action	Detail	Lead stakeholders
Increase recycling of priority materials	Key priority materials for commercial waste stream include flexible plastics, polystyrene and electronic waste. Increasing the recycling of this waste may include: • Education for businesses by councils about available waste services • Supporting waste champions within businesses and building management • Providing advice about recycling options and alternatives, including purchasing of recycling materials • Promoting manufacturing optimisation and industrial ecology • Establishing shared systems which can provide large enough loads for efficiency and cost-effective recycling • Undertaking trials of new technology which can help business monitor and manage their waste	MWRRG Councils Sustainability Victoria
Improve Waste Management Plan standards	A Waste Management Plan (WMP) is the key tool to ensure good waste services within buildings. Increasing the quality of WMP standards is crucial to achieving higher recycling rates. MWRRG is currently working with councils to improve Waste Management Plan standards. Council WMP standards will be harmonised to ensure best-practice and consistency across Fishermans Bend. Best practice building design includes: • Adequate space for bins in offices in bin storage areas • Space for hard waste and organics recycling • Easy access for collectors • Good signage and education.	Local government MWRRG **Key project**: Improving resource recovery in MUDs - MWRRG

7 Construction and demolition waste

Objective	Maximise reuse and recovery of building materials
Target	At least 90% of construction and demolition waste is recycled
Actions	• Require five star certification for large buildings • Require Infrastructure Sustainability certification for public infrastructure • Encourage TAKE2 commitments • Increase monitoring and enforcement

The development of Fishermans Bend will generate large volumes of construction and demolition waste. To make Fishermans Bend a Green Star Community, construction and demolition waste recycling opportunities will be maximised through reuse and recovery of building materials. Large buildings will be certified as five star Green Star (or equivalent), and other infrastructure (roads, sewerage, electricity, trams etc.) will be certified through Infrastructure Sustainability rating tool. Additionally government projects will use recycled materials where appropriate, which will help build recycling markets and reduce environment impacts.

7.1 Challenges

The recycling rate of construction and demolition waste is high – around 87%. However a significant amount of waste continues to go to landfill - over 75% of this waste is clean excavated material, concrete, bricks and timber which could be recycled. This waste is not an inevitable part of a project but a significant opportunity to increase a project's efficiency and profitability. There will also be some hazardous waste which will need to be managed in Fishermans Bend, including contaminated soil and asbestos. Hazardous wastes need to be managed in accordance with EPA guidelines to ensure they are managed safely.

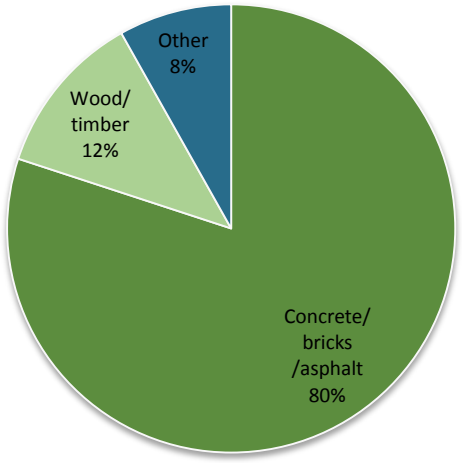


Figure 18: Average composition of C&D waste to landfill [2]

7.2 Possible solutions

There are opportunities to increase the recycling of construction and demolition waste, which will have environmental and business benefits such as minimising over-purchasing of material.

Sustainable design is a core part of the waste requirements within Green Star Community and Buildings system. Each building will follow be certified as a five star building under the Green Star Building system. The 90% recycling target is the requirement of the Green Star Buildings waste credit[19]. Public infrastructure will be certified under the Infrastructure Sustainability rating tool.

Action	Detail	Lead stakeholders
Require five star certification for large buildings	Independent certification of buildings as five star Green Star (or equivalent) is a key initiative to improve the sustainability of Fishermans Bend, and will help reach the 90% target for reducing construction waste. Waste Management Plans are an important tool to manage construction waste. Port Phillip and Melbourne councils will work together to improve and harmonise Waste Management Plan standards. WMPS will cover: • Reuse or recycling onsite • Off-site construction • Material optimisation • Procurement of recycled material • Reuse of contaminated soils • Designing for deconstruction and flexibility The Taskforce will work with other government agencies to ensure that government buildings (such as schools, libraries, utilities) are certified as five star. Further information can be found in Green Star guidelines and Sustainability Victoria's website[20].	Local government Construction industry
Require Infrastructure Sustainability certification for public infrastructure	The government will demonstrate sustainability leadership in reducing construction waste for public projects. This will include tram lines, roads, electricity infrastructure and sewerage pipes. The Taskforce will work with other government agencies to ensure that infrastructure is certified. The Infrastructure Sustainability rating tool (developed by the Infrastructure Sustainability Council of Australia) certifies the design, construction and operation aspects of projects against environmental, social, economic and governance criteria. Including procurement of recycling infrastructure will help to develop recycled product markets. For example, road surfaces may be constructed from recycled materials.	State government Local government
Encourage TAKE2 commitments	Encourage the construction industry to commit to TAKE2 - a Victorian Government initiative to reduce greenhouse gas emissions through public pledges and education. Businesses pledge to reduce their carbon footprint and articulate actions they will take. Pledging shows leadership on climate change and improves the reputation of businesses. For example, Probuild has committed to TAKE2, and undertaken education of staff to reduce bin contamination and increase recycling[21].	State government Local government Construction industry
Increase monitoring and enforcement	Increased monitoring and enforcement can ensure compliance with construction WMPs. Establishing a standard compliance process, following the requirements of Green Star Buildings.	Local government
Construction sector engagement and education	*See Education and Engagement (Chapter 13)*	

8 Waste collection and transport

Objectives	Reduce amenity impacts from waste collection
Target	Reduce collection truck movements by 50%
Actions	• Implement better storage and collection technology • Shared collection systems

Collection of waste from impacts on amenity (noise and odour) and traffic congestion. Significant efforts will be made to minimise waste truck movements through truck and bin technology, regulation and shared bins. Reducing truck movements will have improve collection service efficiency and reducing emissions and fuel use. Fishermans Bend will have 50% less truck movements compared to current truck movements in the Melbourne CBD,

8.1 Challenges

Sustainability Victoria and the Department of Transport Planning and Local Infrastructure researched the impacts of household waste and recycling collection. The cost to the Victorian economy of increased congestion caused by the movement of these streams is around $2.5 million annually[22]. This cost takes into consideration the cost to other road users for their lost time while in traffic and the cost of operating vehicles for a longer period of time due to traffic congestion. This is a tiny fraction (0.2%) of overall congestion costs in Victoria, although there are often significant impacts at the local level.

Impacts of collection services are determined by private collectors, timing and frequency. Commercial and industrial collections often have greater amenity and congestion impacts, because they are more frequent and specialised, and not coordinated or planned to limit amenity impacts.

8.1.1 Apartment collections

Apartment buildings are often services by private waste collection companies because council may not provide adequate services or because building designs are inaccessible for council trucks (small turning circles, narrow access etc.). Increase in private collection services makes coordination of truck movement difficult – many collectors may be operating at the same time, resulting in local congestion issues.

The City of Melbourne requires the use of council run services for residential collection to improve coordination and amenity. Residential buildings sometimes use a mix of council-run and private collections, for example if council collections are unavailable on weekends[23]. Residents pay for council waste collections and pay again for private collection, so using council collections saves residents money.

Noise from collection trucks has increased impacts at night or early morning. Late night or early morning collections can have a significant impact in residential area. The City of Melbourne prevents collection after 11pm and before 6am in areas with high residential populations to minimise noise problems[24]. The City of Port Phillip limits commercial waste collection hours for certain areas, as well as all household waste collection to certain times.

The frequency of bin collection within apartment buildings is determined by generation volumes and bin capacity. Buildings which generate higher waste volumes and those with smaller storage areas need more frequent collection services – collection trucks may need to visit buildings multiple times per week.

8.1.2 Commercial and industrial collections

Commercial businesses and buildings use private collections. They often have separate collection trucks for waste materials such as paper/cardboard, glass, garbage etc. Commercial buildings often have space and access limitations because of poor design. Limited space and multiple bins means that business may have many collections each day, causing local amenity and congestion issues.

8.2 Possible solutions

Action	Detail	Lead stakeholders
Implement better storage and collection technology	Designing and coordinating collection routes can reduce amenity impacts and congestion through optimising of truck movement and timing. Technology to achieve improve collection efficiency includes: • Truck telematics • Bin sensors • Software to coordinate route planning • Compactors • Dual compaction trucks Current telematics technology including real time GPS, on-board cameras and on-board diagnostic. It can improve collection fleet efficiency by optimising routes, improving driver performance and detecting maintenance issues. This improves amenity, reduces fuel costs and limits congestion. Other collection technology can identify bins through sensors, record bin weight, and monitor waste via cameras – all of which can help route planning, reduce contamination and improve service delivery.[25] Making truck location data public in real-time may allow better traffic flow through Fishermans Bend, as in-car navigation systems improve route planning. Making other data sets open to the public may generate other benefits in delivering services efficiently. Installing compactors reduces space required for waste in buildings, and allows for more efficient and less frequent collection. Collection frequency can be reduced by using waste compacters, which can reduce waste volume by over a third. Compactors can also be used by both residential and commercial users, which eliminates the need for separate bin systems. Dual compaction trucks can reduce truck movement by collecting both waste and recycling at one time. Methods to encourage new technology include Waste Management Plans – for example, requiring compactors for buildings over a certain height. Council contracts can specify the use of new technology (see below), and engagement with industry can promote gains in efficiency. Green Star certification could include innovation points for developments that use cutting edge technology.	Local government MWRRG
Shared collection systems	**Collection contracts** Councils have a key role in specifying efficiency outcomes through collection contracts. This must be linked to building design through WMP standards and Fishermans Bend building design guidelines. Waste Management Plans and council contracts should promote the use new technology to make waste collection more efficient. This may be through using: • council run services • council managed contracts • other opportunities to coordinate and optimise private waste collection services. When redrafting Waste Management Plans, councils should investigate the potential for managing waste from the whole building which would reduce truck movement and bin space. **Select collectors** It may be possible to select collectors to provide a commercial service within Fishermans Bend. This would reduce truck movement and increase collection efficiency. This may require changes to local regulations, and intervention by councils to select preferred collectors. It is unclear if this is feasible or cost effect – more research needs to be done.	Local government MWRRG

9 Transfer Station, Resource Recovery Centre & Depot

Objective	Residents and businesses have a broad range of recycling opportunities
Target	Port Phillip's Resource Recovery Centre has a recycling rate of 60%
Actions	• A new, best-practice TS/RRC and depot • Establish a sustainability hub

Transfer Stations and Resource Recovery Centres (TS/RRC) are crucial links in the waste and resource recovery infrastructure network. These facilities receive a range of waste materials from commercial and municipal waste collectors, residents and businesses, including difficult to recycle materials such as paint and e-waste. These materials are sorted into separate material streams, recovered, and compacted and consolidated to reduce the costs of transporting waste to reprocessors or landfills.

The metropolitan TS/RRC network currently manages an annual throughput of approximately 1.1 million tpa with capacity to receive approximately 1.6 million tpa, indicating that there is spare capacity to manage an additional 500,000 tonnes of waste across the network until 2026.

The Port Phillip RRC is a council-run facility established in the 1970s in the Sandridge precinct of Fishermans Bend. It receives approximately 4,500 tpa from residents and local businesses. Approximately 23% of the waste received is recycled, with 77% going to landfill (breakdown in Figure 20).

Port Phillip RRC is a small facility compared to other metropolitan RRCs. However it is important for local residents and businesses to have access to local recycling and disposal facilities or opportunities. There is an opportunity to increase recycling rates to 60%, in line with other similar facilities.

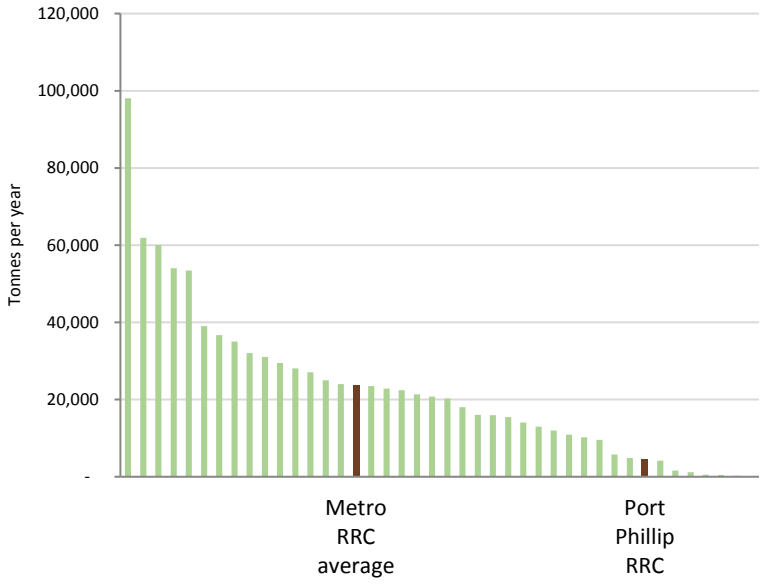


Figure 19: Throughput for RRCs in metropolitan Melbourne (2015)[26]

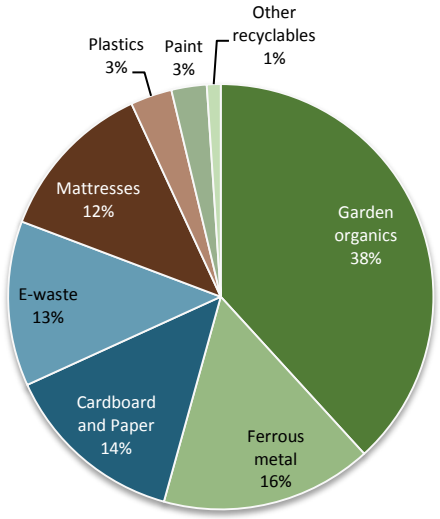


Figure 20: Materials recovered at Port Phillip RRC[26]

9.1 Challenges

The existing Port Phillip RRC will likely close in the next 5-10 years due to the encroachment of residential developments and the amenity issues that may affect the operations of the RRC. The land is also one of the few parcels of council and crown land in Fishermans Bend. The currently RRC site is designated as public open space (not its current planning zone) in the City of Port Phillips master plan for the area. However, there may be government plans to maximise the value of the land.

9.2 Possible solutions

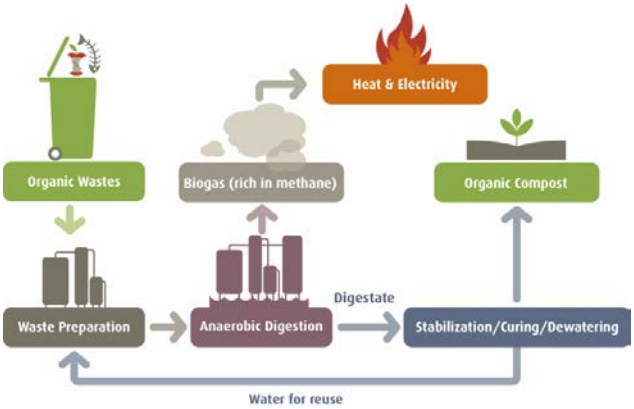
A new RRC facility will be needed to service Fishermans Bend residents and businesses current facility is closed. This creates an opportunity to build a leading practice RRC within Fishermans Bend with a higher recycling rate and opportunities to recover a range of material types[12]. To minimise the amount of waste that will be disposed of at landfill it is necessary to maximise recycling at the current RRCs. The current resource recovery rate across Melbourne's RRC/TS network is between 40-50% (Port Phillip is 23%). Achieving a significant increase in this rate will require operational improvements and upgrades to existing infrastructure, as well as investment in new infrastructure capable of effectively sorting waste to recover recyclable materials.

Actions	Details	Lead stakeholders
A new, best-practice TS/RRC and depot	A report is currently being prepared about possible options for the TS/RRC and depot. The report will help refine the ideas in this strategy. Port Phillip need to provide an easy and convenient service for businesses and residents to recycling and dispose of material, balancing social, environmental and economic costs and benefits[12]. This is a requirement of the Green Star Community certification. The current RRC provides a convenient service for residents to dispose of difficult to recycle materials such as electronic waste, mattresses and paint. It is likely that the RRC will move locations, and this presents an opportunity to improve the range of services provided and the efficiency of the facility. This can be complimented by alternatives, such as mobile collection vehicles or local drop-offs. The new site (or upgrades to the current site) should consider: • Improved layout and design (improve access, ease of use, and amenity) • Use of new technology • Recovery of priority materials (e.g. e-waste, organics, flexible plastics, rubber, mattresses) • Clear and consistent signage that aligns to best practice • Education centre • Social enterprise opportunities • Food recovery organisations (e.g. Second Bite) • Potential for a larger movement of material (e.g. bulk haul) • Co-location with other services (i.e. South East Water's sewer mining facility) MWRRG is currently developing a number of tools to support the management of TS/RRC and the effective recovery of material including - Transfer Station Growth Strategy, Local Buffer Support program and Hard Waste Services Leading Practice Guide[26]. These will help inform future options for the RRC. Sustainability Victoria is updating the *Better practice guide for resource recovery centres* which will help design and plan the new RRC[27]. Once the report commissioned by City of Port Philip is complete, a business case will be developed for the preferred option.	Port Phillip MWRRG Sustainability Victoria **Key report:** PLC Port Phillip RRC Options Paper **Opportunity** Social Impact Investment for Sustainability Program fund
Establish a sustainability hub	The development of a new TS/RRC and the sewer mine provides a fantastic opportunity to incorporate a sustainability hub. The hub could be co-located with the sewer mining plant and proposed anaerobic digestion facility. A sustainability hub can include an education centre that will help the community understand and improve their recycling behaviour. It would provide education and advice as well as coordinate precinct-wide sustainability and liveability innovations and activities. These could also include water conservation, energy efficiency, waste and recycling and climate change actions. The education centre will provide education to residents, students and businesses to promote recycling and reducing waste. Other organisations could share this space, possibly including a community garden, food recovery organisation, men's shed or a sustainable restaurant. A good example is the Banyule Rethink Centre which provides education programs for schools and community groups on recycling. Port Phillip and Melbourne should collaborate to investigate the feasibility of a sustainability hub, working with the Taskforce and other stakeholders.	Port Phillip Melbourne South East Water **Opportunity** Sustainability Victoria's Improving resource recovery in local government program[28]

10 Anaerobic digestion facility

Objective	Reduce food waste to landfill
Target	Explore the feasibility of a local anaerobic digestion facility by 2019
Actions	• Gain key stakeholder support and guidance • Plan and commission a feasibility study • Engage and educate government, community and businesses

Reducing food waste to landfill is a major goal for state and local governments. This includes food waste from households, small businesses and manufacturers. An anaerobic digestion facility in Fishermans Bend is a possible solution which turns biosolids and organic waste into energy and compost.



10.1 Challenges

In landfills organic waste breaks down releasing greenhouse gas, odour and leachate. Capturing and processing food waste through an anaerobic digestion facility will require investment, planning and environmental approvals to ensure it has a positive impact on Fishermans Bend.

10.2 Possible solutions

Anaerobic digestion facilities use biological process in which organic material is broken down by microorganisms in the absence of oxygen. It results in two end products: biogas and digestate. These can be transformed into heat and energy, and compost. There is a possibility to co-locate this facility with the South East Water Sewer Mining plant – the facility could process sewer biosolids and then provide energy back to this plant. A local facility will provide financial benefits for local waste generators through waste disposal cost savings, will generate local jobs and demonstrates environmental leadership.

Action	Detail	Lead stakeholders
Gain key stakeholder support and guidance	The first step is to gain support for exploring the possibility of an anaerobic digestion facility. We will work with many stakeholders, including industry, government, councils and the community. EPA, SV, DELWP, Melbourne councils, Port Phillip, Melbourne and the Taskforce. A reference group will be formed which will oversee and advise the initial feasibility study.	MWRRG South East Water
Plan and commission a feasibility study	The study will need to address the following issues: • Technical specifications • Cost and funding, especially compared to landfill disposal • Possible sources of suitable materials from residents and businesses • Collection and transport systems required • Uses for outputs, including digestate and biogas • Regulatory requirements (especially odour buffers) • Social licence to operate	Reference group **Key project**: Anaerobic digestion facility feasibility study
Engage and educate government, community and businesses	If built, this would be the first anaerobic digestion facility in an inner city in Australia. It is important to undertake early education and engagement of all stakeholders, including government agencies, industry, businesses and the community.	Reference group Taskforce MWRRG

11 Advanced Resource Recovery Technology

Objective	Establish Melbourne's first ARRT facility to extract more value from Fishermans Bends waste
Target	A local or regional ARRT is operating by 2026
Actions	• Prepare an ARRT Discussion Paper • Gain stakeholder support for the ARRT procurement process • Release procurement for ARRT

Diverting waste from landfill is a key goal of the Victorian Government and local councils (and Action 1 of the *Metropolitan Waste and Resource Recovery Implementation Plan*). To make full use of the household garbage, an Advanced Resource Recovery Technology (ARRT) facility will be constructed to process this waste. There are a range of advanced technologies which turning waste into a resource – separating recycling, creating energy and heat, and sending organics to composting facilities (see Appendix 4). This facility will also be able to take commercial waste, providing an alternative to landfill. The final technology type will be determined via competitive tender.

An ARRT is likely to service inner city Melbourne councils, including the Fishermans Bend area. Projections for inner Melbourne councils are in Figure 19.

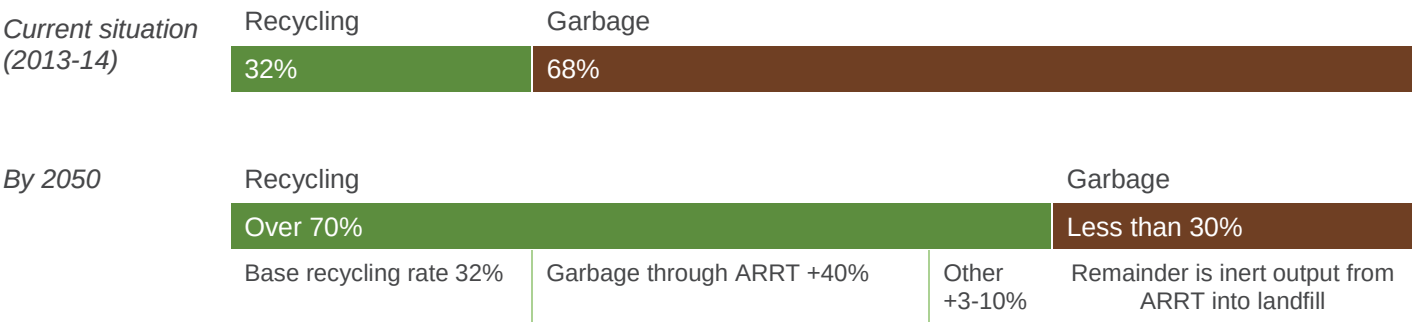


Figure 21: Inner Melbourne council projections with ARRT

11.1 Challenges

No large scale ARRT has ever been built in Melbourne. Overcoming these challenges will be difficult; however MWRRG's analysis demonstrates that an ARRT is feasible. The following conditions need to be met:

- Access to sufficient waste volumes over long time periods
- Funding for capital investment
- Facility must be competitive with landfill costs
- Long-term contracts for outputs – energy, heat, gas, organics or recyclables
- Meet regulatory requirements
- Support from councils and communities (social licence to operate).

Possible technologies include:

- Mass burn combustion
- Pre-sorting / dirty MRF
- Mechanical biological treatment
- Mechanical heat treatment
- Gasification

11.2 Next steps

Actions	Detail	Lead stakeholders
Prepare an ARRT Discussion Paper	MWRRG is preparing a Discussion Paper which will outline benefits and risks of ARRT including: • Reduce greenhouse gas emissions from landfills • Reduce odour and leachate • Reuse valuable resources • Create jobs • Establish Victoria as a leading state in ARRT	MWRRG **Key project**: MWRRG ARRT procurement project
Gain stakeholder support for the ARRT procurement process	MWRRG will gather support from a range of stakeholders, including industry, government, councils and the community. Memorandum of Understanding with councils should be signed by 2017.	MWRRG Local government
Release procurement for ARRT	MWRRG will release procurement documentation for industry to respond to with ARRT proposals in 2018- 2019.	MWRRG

12 Litter

Objectives	Fishermans Bend has high litter recycling rates
Targets	All litter bin waste is recycled
Actions	• Develop a local litter plan • Install a network of smart public litter bins • Send all litter bin waste to recycling facilities • Collect good data on discarded litter • Ensure regular litter enforcement activities

Litter affects the amenity, health and safety of public spaces, as well as impacting on biodiversity and water quality. Fishermans Bends proximity to the Yarra River and the bay makes it particularly important to manage litter in the area to reduce environmental impacts. Common discarded litter includes cigarette butts, drink containers, food wrappers, bill posters and junk mail as well as poorly secured loads carried by vehicles and illegally dumped rubbish. Public litter bins can help reduce discarded litter by making it convenient to dispose of it correctly.

To ensure that Fishermans Bend is sustainable and liveable, it is important to continue to take action to limit littering and dumping of rubbish. This requires good infrastructure, strong community education and engagement, and ongoing data collection, monitoring and enforcement. A network of smart public litter bins will ensure it is easy to recycle in public places, especially in high-use areas such as retail, recreational, sporting, tourist and transport sites. They will also reduce truck movement and waste in these bins will be sent for recycling.

As Fishermans Bend develops, litter will be generated from construction sites and fit outs, as new residents move in, and finally as it is a thriving place with 80,000 residents. Managing these changing litter sources will be a key challenge

12.1 Challenges

Loose and discarded litter has negative social, environmental and economic impacts. It limits the enjoyment and use of public spaces, and presents a health and safety risk from injuries and fires. It blocks drains and imposes significant clean-up costs for businesses and councils. Discarded litter pollutes soil and waterways, and causes harm to wildlife and aquatic biodiversity. Fishermans Bend's proximity to the Yarra River and Port Phillip Bay means it is especially important to reduce litter. Victoria has an impressive record in reducing litter, with lower volumes of litter than other state and the national average (see Figure 22) and it is important to continue this trend.

The top five statewide priority litter issues for Victoria are:

- Litter in coastal areas and waterways
- Illegal dumping
- Roadside litter
- Cigarette butts
- Plastic and microplastic litter[29].

Figure 22: Comparison of litter between Victoria and Australia[30]

12.2 Possible solutions

The Victorian Government's *Waste Education Strategy* aims to reduce litter and illegal dumping through local litter plans and by targeting illegal dumping of household and industrial waste. Reducing litter is driven by good public litter bin networks, education, and enforcement supported by good data and driven by clear plans.

Action	Detail	Lead stakeholders
Develop a local litter plan	Councils should work together to harmonise and coordinate efforts to reduce discarded litter across Fishermans Bend. This will include developing a shared vision, goals and plans for the area. Plans should include details about gathering data, education and campaigns, public recycling infrastructure, and litter enforcement. Plans should align and inform the Metropolitan Melbourne Litter Plan.	Local government MWRRG
Install a network of smart public litter bins	Well designed and located public place bins will make it convenient to dispose of waste correctly, reducing litter and improving collection efficiency. Smart litter bins compact waste, monitor fill levels and are solar powered. They are already used with the City of Melbourne, and they will be expanded across Fishermans Bend. Sensors in the smart bins monitor bin fill levels and transmit data to a central hub. This data is analysed to determine optimum collection times, and can also be combined with mapping tools to optimise truck routes. The data can also be used to detect potential illegal dumping in bins, which can help target education and enforcement efforts. It is important to undertake an early review and planning of public place recycling and waste infrastructure. This review will determine the best method to reduce litter impacts, considering: • Current public place waste and recycling bin location as well as use patterns and tonnes and types of materials collected • Predicted movement of people through Fishermans Bend precincts • Main activity centres and types of waste generated • Bin collection access • Bin design (considering waste, recycling and cigarette butts) Sustainability Victoria's Public Place Recycling Toolkit provides advice and guidance on designing and implementing infrastructure.	Local government
Send all litter bin waste to recycling facilities	The majority of litter is recyclable – paper, cardboard, glass, cans or plastics. Waste in litter bins will be processed through a Materials Recovery Facility to extract recyclables and send remaining waste to landfill.	Local government
Collect good data on litter	Good data is essential to reduce litter. Smart bins will provide excellent data to help manage the public litter bin network. Councils should also establish robust, ongoing and regular monitoring in Fishermans Bend using the Local Litter Measuring Toolkit. They should also require data collection (material, volume and location) and sharing by contractors.	Local government VLAA
Ensure regular litter enforcement activities	Litter programs with robust enforcement are more likely to succeed. Actions may include: • Funding for council enforcement officers • Clear strategies and adequate penalties • Surveillance cameras	Local government EPA
Undertake ongoing education programs	*See education section*	

13 Education and engagement

Objective	Improve the local community's waste and recycling knowledge and behaviour
Targets	Increase community satisfaction with waste services
Actions	• Trial new education and engagement tools • Household, business and construction education programs • Waste facilities build a social licence to operate • All Fishermans Bend schools are 5 star Resource Smart schools • Education centre within the Sustainability Hub

Victorians are strongly supportive of waste management initiatives such as kerbside recycling, green waste collection and litter programs. Melbourne has a great recycling system, with 99% of respondents believing it makes recycling convenient[31]. Household recycling rates have increased from 26% to 44% since 2001[9].

Education plays an import role to ensure continued commitment and enthusiasm for recycling and reducing waste sent to landfill. The Victorian Waste Education Strategy (prepared by Sustainability Victoria) is a key overarching document which drives education efforts.

Waste education and engagement programs delivered in Fishermans Bend can enhance the community's understanding of the importance of waste as a utility, increase the communities awareness of the environmental impacts of waste contamination and litter. Education underpins many other initiatives and target, for example:

- State and local government run regular litter education campaigns
- Building managers may need to understand how to engage and educate residents
- Council officers may want to know about managing difficult waste and e-waste
- The construction industry can be engaged on Green Star requirements
- Education for restaurants and cafes can reduce food waste and save money.

13.1 Challenges

Waste to landfill continues to grow due to population growth[32]. By 2042 it is projected waste volumes will grow from 10.4 million to 16.5 million tonnes each year (a 63% increase)[7]. Other broad challenges include: long-term planning for infrastructure, minimising waste generation rates, increasing recycling, reducing contamination, and improving education for residents and businesses.

For education and engagement, key challenges include:

- effective coordination and delivery of education programs
- effective and genuine engagement of communities in decision-making
- building a social licence to operate
- effective design of education interventions
- potential bans of certain waste materials (such as electronic waste).

13.2 Possible solutions

It is crucial to cultivate a widespread community knowledge and understanding of waste is an essential service and that recycling has a range of social, environmental and economic benefits.

Actions	Detail	Lead stakeholders
Trial new education and engagement tools	Fishermans Bend will test new engagement and education ideas and innovations. This may include: • behavioural economics pilot projects • interactive and targeted advertising campaigns • participatory democracy forums • citizen monitoring tools (e.g. for litter or dumped rubbish) • real time feedback and education via technology such as sensors, phone apps, live data and gamification • open data portals. These initiatives should be run by local councils with the support of MWRRG and Sustainability Victoria.	Local government, Sustainability Victoria, MWRRG
Household education and engagement	Education plays an import role to ensure continued commitment and enthusiasm for recycling and reducing waste sent to landfill. Fishermans Bend will have specific education for households and apartments. Leading practice education programs that are innovating will be implemented in Fishermans Bend for residents. These programs are often implemented through partnerships with local community groups via support and grants. It is important that local community groups feel ownership over waste initiatives and have a meaningful input into waste programs. Programs should be modified according to target audience such as CALD or young communities. Key resident education programs include: • Food waste avoidance campaigns – Love Food Hate Waste and Back to Earth • Improving resource recovery in MUDs by working with building managers and residents – Better apartment guide, MWRRG tools • Promote – e-waste recycling drop off points (Sustainability Victoria) • Promote –Detox Your Home (Sustainability Victoria) • Litter reduction campaigns	Local government, Sustainability Victoria, MWRRG
Business education and engagement	Best-practice education programs will be implemented in Fishermans Bend. These will be a collaboration between state and local governments. They will target key groups including residents, building managers, the construction industry and businesses (especially sustainability managers). These may encompass: • Food waste campaigns such as Love Food Hate Waste and Back to Earth • Working with residents, councils, businesses and building managers to install high quality education materials and signs • Promoting government advice and services to businesses (e.g. Sustainability Victoria's programs and resources) • Encouraging organisations to apply for government grants to improve waste and recycling (e.g. Victorian Litter Innovation Fund) • Establish a business network • Encouraging organisations to apply for government grants to improve waste and recycling • Food waste avoidance campaigns	Local government, Sustainability Victoria, MWRRG **Key project**: Improving resource recovery in MUDs - MWRRG
Construction sector education and engagement	Early and ongoing education and engagement with the construction industry – developers, architects, builders – is critical to increasing recycling. Key topics include construction WMPs, Green Star building criteria and the financial and environmental benefits of recycling and constructing more sustainable buildings. Councils should develop an Education and Engagement Plan which includes the construction	Local government, EPA

Actions	Detail	Lead stakeholders
	industry. This will rely on adequate council resourcing, ongoing communication and engagement activities and effective educational materials. Key construction sector education programs include: • Develop and install high quality education materials and signs at all businesses • Promote the Construction & Demolition Kit (Sustainability Victoria)[33] • Encouraging organisations to apply for government grants to improve waste and recycling • Promote the Green Star program • Promote Take 2 carbon emission reduction (Sustainability Victoria) • Work with the Illegal Dumping Strike Force Program (EPA)	
Waste facilities build a social licence to operate	Waste facilities will undertake engagement with the community. A social licence to operate is the acceptance that is continually granted to a business by the local community or other stakeholders to operate. MWRRG has developed a draft Leading Practice Community Engagement toolkit which helps facilities build a social licence to operate. Sustainability Victoria is also undertaking social research on waste perceptions[34]. There may be an opportunity for this research project to undertake surveys within Fishermans Bend.	Waste facilities, Sustainability Victoria, MWRRG **Key project:** Leading Practice Community Engagement training
All Fishermans Bend schools are 5 star Resource Smart schools	ResourceSmart schools is a Victorian Government initiative to help schools benefit from embedding sustainability in everything they do. State and local governments provide support, expertise and recognition to participating schools. All Fishermans Bend schools will participate in this program and achieve 5 star certification, demonstrating leadership in sustainability. Participating in ResourceSmart schools will help schools reduce costs, minimising their impact on the environment, reduce waste sent to landfill and litter, improve waste and recycling knowledge and behaviour and develop student leadership.	Schools, local government , Department of Education, Sustainability Victoria **Key project:** ResourceSmart schools
Education centre with the Sustainability Hub	*See discussion in the Transfer Station, Resource Recovery Centre & Depot (Chapter 9)*	Local government Sustainability Victoria

14 Limitations and next steps

There are a number of areas that need further investigation. Initiatives may not be feasible upon further investigation. No detail of costs or implementation has been provided; these will be provided through more detailed project planning.

14.1 Next steps

This strategy will be circulated through key stakeholder for comment. Further research is also being undertaken which will help refine data, targets and strategies. The Waste and Recycling Strategy will be exhibited for public comment alongside the Fishermans Bend Framework.

14.2 Further research

There are some gaps in waste and recycling data and knowledge. Further investment is needed to gather better data – there are a number of ongoing investigations on these topics. This data should be made available to the public.

	Details	Leads	Timing
Feasibility of new collection systems	Research is underway to analyse the cost and benefits of collection systems including: vacuum systems, in-sink-grinders, third chute and business as usual.	MWRRG, Taskforce, councils	2017
Feasibility of an Advanced Resource Recovery Facility (including anaerobic digestion facility)	MWRRG are progressing this research to understand the viability and feasibility of an ARRT	MWRRG	2018
Quantifying generation tonnages for multi-unit developments	There is little data on multi-unit development generation, and research should quantify links with other factors – demographics, bedrooms, occupations etc.	Councils	2017
Innovations for increasing recycling	There is a need to understand how new technologies and big data can improve waste and recycling efficiency and effectiveness. This may include in sink grinders, Smart Bins, optical sorting, apps, autonomous vehicles etc.	Councils, MWRRG	2017
Data collection for C&I waste	Little research has been done on specific C&I waste streams and generations rates and optimal solutions. This is particularly important for food waste. MWRRG is doing research to underpin a strategy to increase C&I recycling.	MWRRG	2017
Education initiatives	Understand the most effective education campaigns to increase recycling, and how they can be used to build social capital.		

15 Glossary

Term	Definition
Advanced Resource Recovery Technology	A facility that treats material that would otherwise have gone to landfill. This encompasses many different technologies including sorting and energy from waste technology.
Anaerobic digestion	Biological breakdown by microorganisms of organic matter, in the absence of oxygen, into biogas (a mixture of carbon dioxide and methane) and digestate (a nutrient rich residue).
Commercial and industrial (C&I) waste	Solid waste generated from trade, commercial and industrial activities including the government sector. It includes waste from offices, manufacturing, factories, schools, universities, and state and government operations and small to medium enterprises, e.g. food waste.
Construction and demolition (C&D) waste	Solid waste generated from residential and commercial construction and demolition activities e.g. bricks and concrete.
Department of Environment, Land, Water and Planning (DELWP)	A Victorian government department providing policy planning, preparation of legislative amendments, leadership coordination and oversight of the environment portfolio.
Electronic waste (e-waste)	E-waste comprises of electronic equipment with a plug or battery that requires a current to operate and that has reached end of life. It includes televisions, computers, monitors and whitegoods such as fridges and washing machines.
Energy from waste	The terms ‘energy recovery’ from ‘waste’, ‘waste to energy’ or ‘energy from waste’ can be used interchangeably to describe a number of treatment processes and technologies used to generate a usable form of energy from waste materials. Examples of usable forms of energy include electricity, heat and transport fuels.
Environment Protection Authority Victoria (EPA Victoria)	Established under the auspices of the Environment Protection Act 1970, EPA Victoria’s role is to be an effective environmental regulator and an influential authority on environmental impacts.
Hard waste	The term applied to household garbage that is not usually accepted into kerbside garbage bins by local governments e.g. old fridges and mattresses.
Municipal solid waste (MSW)	Solid waste generated from municipal and residential activities, and including waste collected by, or on behalf of, a municipal council.
Green Star	Green Star is a voluntary sustainability rating system for both communities and buildings.
Resource recovery centre/transfer station (RRC/TS)	Receives, sorts and/or consolidates a range of material streams (depending on the facility) including hard, organic and residual waste and commingled recyclables for transport for materials recovery, processing or disposal to landfill. Accepts materials from all sectors and can be publicly or privately owned and operated. May include a resale centre.
Social licence to operate	The concept of a ‘social licence to operate’ has evolved from broader concepts of ‘corporate social responsibility’ and is based on the idea that a business not only needs appropriate government or regulatory approval but also a ‘social licence’ from society. The social licence is the acceptance that is continually granted to industry and facility operators by the local community or other stakeholders to operate.
Sustainability Victoria	Statutory authority established in October 2005 under the Sustainability Victoria Act 2005 with the key objective of ‘facilitating and promoting environmental sustainability in the use of resources’. SV works across the areas of energy, waste and water with communities, industries and government applying the best ideas and encouraging action to enable change in environmental practices.
Randomised Control Trials	An experiment in which subjects in a population are allocated randomly into study or control groups test the effectiveness of an intervention.
Sewer Mine	Sewer mining is the process of tapping into a wastewater system, and extracting wastewater, which is then treated and used as recycled water .

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