Tasmanian Waste Review

Final report

prepared for

Waste Advisory Committee

March 2014

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CONTENTS

Figures

Tables

Abbreviations & glossary

ABS	Australian Bureau of Statistics
ACOR	Australian Council of Recyclers
AD	Anaerobic digestion
BWI	Biohazard Waste Industry
C&D	Construction and demolition
C&I	Commercial and industrial
DAFF	Department of Agriculture Fisheries and Forestry (Commonwealth)
DCCEE	Department of Climate Change and Energy Efficiency (Commonwealth)
DEDTA	Department of Economic Development, Tourism and the Arts (Tasmania)
DEHP	Department of Environment and Heritage Protection (Queensland)
DEPHA	Department of Environment, Parks, Heritage and the Arts (Tasmania) (formerly DPIPWE and DTAE)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)
EPA	Environment Protection Authority
FTE	Full time employee
L	litres
MSW	Municipal solid waste
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NGER	National Greenhouse and Energy Reporting
OTER	Office of the Tasmanian Economic Regulator
ROU	Recycled Organics Unit
SIA	Sustainable Infrastructure Australia
SWSA	Southern Waste Strategy Authority
t	tonnes
WAC	Waste Advisory Committee
WMG	Waste Management Group
WRAP	Waste and Resources Action Program

Summary

The Tasmanian Waste and Resource Management Strategy (2009) established a framework for management and delivery of state-wide, regional and local waste avoidance, reduction and resource recovery initiatives, practices and services. The Waste Advisory Committee (WAC) was tasked with oversight of the strategy's implementation, and accordingly initiated this review of management of the following priority waste streams: municipal solid waste; industrial waste; clinical and quarantine waste; pit waste and sludges; and organic waste.

This report examined current management practices for each of these waste streams and considered the performance of these in relation to other jurisdictions. For each targeted waste stream the report examined the current infrastructure, services provided, resource recovery achievements, environmental impacts, governance arrangements and business and employment outcomes. Opportunities for improvement were identified on the basis of those which had strategic value, were likely to be successful based on implementation experience and community expectations in other jurisdictions, reflected waste/recycling industry realities and economics, and were likely to deliver optimum outcomes for resource recovery and best practice environmental management of waste.

The investigation found that waste management practices and achievements in Tasmania continue to lag behind most other Australian states. While some progress has been made in recycling in the municipal waste sector, there is little recovery of industrial or organic waste. The management of clinical and quarantine waste, and pit waste and sludges are generally consistent with regulatory requirements, although some anomalies have been identified. Data on Tasmanian waste practices is patchy, with large information gaps by both waste sector and geographic area. There is little information on community waste and recycling expectations, the standard of operation of waste facilities, or the scale or source of industrial waste generation.

While recycling systems are generally well-established for comingled recyclables from domestic sources, based on interstate performance there would appear to be significant under-utilisation of these systems. The low capture rate of recyclables is also reflected in other sectors, especially industrial waste (where there is little recovery of materials); consequently there is difficulty in achieving the economies of scale necessary to reduce the economic barriers to recycling in Tasmania. The feasibility of recycling is further undermined by the lack of local markets and reprocessors, and the need to transport materials to the mainland or direct to Asian markets; this adds a further cost impost to local recycling endeavours. In effect, it is more expensive in Tasmania to recycle material than it is to dispose of waste to landfill. Major improvements are unlikely without significant regulatory intervention or changes to the economics of recovery.

In other Australian states, the development of a robust recycling industry has been led by the introduction of a waste levy. This applies a charge payable by waste generators when disposing of waste to landfill; the levy is not charged (or rebates apply) when the waste material is recovered or recycled. The waste levy provides a financial incentive to recycle, which in other states has been used to fund activities such as the development of recycling infrastructure, establishing markets for recovered materials, resource efficiency assistance to industry, and various strategic waste avoidance and minimisation initiatives.

Australian Bureau of Statistics data shows that this investment has led to higher levels of employment in the private sector than the government sector. Commonwealth economic research indicates that in Tasmania around 4 times the number of jobs were created by recycling than by landfill disposal; it also found recycling businesses had an annual turnover over 700% higher per tonne than landfill organisations. Continuation of the current status of waste management in Tasmania therefore represents a missed economic opportunity, foregoing the creation of between 660-920 direct and indirect jobs and the economic output of 'value-add' recycling businesses that Tasmania could expect to see established. Continuation of the status quo also represents a risk to the Tasmanian 'green' brand important to the success of the Tasmanian tourist industry, as well as an issue for Tasmanian businesses who lack access to best practice recycling/waste disposal pathways and strategic direction on the most efficient use of resources.

This report identified a number of opportunities for improvements to waste management and resource recovery in Tasmania, however none of these are feasible without the additional funding that a levy would provide. While debate in recent years has indicated support across local government, industry and other sectors for the introduction of a waste levy in Tasmania, the policy position of the state government is unclear. For real improvement to waste management in Tasmania, the Tasmanian Government would need to support and oversee introduction of the waste levy.

A key priority for WAC is to establish the position of the Tasmanian Government in relation to a waste levy. If there is no support for the proposition, realistically the Tasmanian community can expect to see only minimalist improvements to waste and recycling. Should a waste levy be supported, there are a range of systemic and specific initiatives recommended as a result of this study; the key strategic recommendations are noted below.

- Introduce a larger price differential between recycling and landfill disposal in order to provide financial incentives for recycling. This may be achieved in part by introduction of a levy on landfilled waste, however, depending on the scale of the levy, additional price adjustments may need to be made to overcome the effect of low landfill fees that currently apply in Tasmania.
- Amend the governance arrangements of WAC and the three WMGs to better align their roles, responsibilities and reporting structure. This may be undertaken in conjunction with implementation of the proposed waste levy via enabling legislation.
- Establish a framework for cooperation and collaboration between WAC, WMGs and industry to facilitate improvements to industrial waste management and resource recovery.
- Establish a mechanism for more comprehensive collection of data on Tasmanian waste generation, contribution by source, materials recovered and recycling industry activity. Ensure information database management addresses stakeholder issues regarding access and confidentiality.
- Undertake market research on current and potential markets for recovered materials and the capacity for growth in targeted waste streams. Develop feasible market strategies and provide sufficient resources (human and financial) to oversee implementation.
- Encourage the entrance of new players in the waste/recycling industry, including large companies with international experience.

1. Introduction

Blue Environment Pty Ltd was commissioned by Southern Waste Strategy Authority on behalf of the Waste Advisory Committee (WAC) to investigate key issues and opportunities relating to management in Tasmania of the following priority waste streams:

- municipal waste
- industrial waste
- clinical and quarantine waste
- pit waste and sludges
- organics.

Blue Environment examined the current practices and management systems for each of these waste streams in Tasmania and explored opportunities and barriers for more effective management. Management practices in other jurisdictions were examined and those with potential relevance for implementation in Tasmania were identified. Opportunities and barriers in Tasmania were identified and recommendations provided on opportunities deemed most feasible. Given the integration of issues across wastes from different sources and of different types, opportunities and barriers were examined on a holistic basis.

This report was developed on the basis of a desktop review of current practices, existing studies and industry knowledge. This was supported by consultation with the following stakeholders (in alphabetical order):

- Cradle Coast Waste Management Group
- Department of Economic Development, Tourism and the Arts
- Dulverton Waste Management
- Environment Protection Authority Tasmania
- Northern Tasmanian Waste Management Group
- Southern Waste Solutions
- Southern Waste Strategy Authority
- TasWater
- Veolia Environmental Services
- Waste Advisory Committee.

A draft report was provided for review and comment to WAC prior to preparation of this final report.

2. Municipal waste

Municipal solid waste (MSW) is largely defined as waste managed by local government authorities, and includes:

- waste collected via council's kerbside collections (mostly from residential properties although it may include some retail operations and small businesses in some municipalities)[1]
- waste hauled by generators to council-operated transfer stations and landfills (mostly from domestic sources, though again it may include some small businesses at particular sites)[1]
- waste from litter and recycling bins in public places (e.g. parks, streetscapes)
- council-collected street sweepings.

While there is little data on the quantities of waste generated in these four avenues in Tasmania, it is likely the first two sources comprise most MSW generation.

2.1 Current practices

According to *Waste generation and resource recovery in Australia* (DSEWPaC 2014), over 257,000 tonnes of MSW was generated in Tasmania in 2010/11, of which:

- over 171,000 tonnes was deposited to landfill (or 67%), of which around 17,000 tonnes was recovered for generation of energy from landfill gas.
- over 86,000 tonnes was recovered for recycling (33%)

Kerbside collection services

Kerbside collected MSW generally consists of three waste streams: domestic garbage, comingled recyclables and garden organics. Garden organics is discussed separately in Chapter 6. The scope of comingled recyclables collected is generally consistent across all Tasmanian council areas and comprises:

- plastics (types 1-7)
- paper and cardboard (including liquid paperboard cartons)
- glass bottles and jars
- aluminium and steel cans.

The level of kerbside services provided by Tasmanian councils differs across the state; the services are summarised in Table 1 according to each of the three regions: Cradle Coast, Northern and Southern Tasmania.

Note this data is based on available reports that may not necessarily be up to date and/or reflect different dates. It has been assumed that the most recent data is correct. We note that some information in reports of the same date is inconsistent and it is unclear which is correct; in this case, we have provided all data and noted it accordingly.

[1] Note waste sourced from businesses should be recorded separately as commercial and industrial waste but that may not always be the case, e.g. where it is mixed with kerbside collected material or where data recording systems at transfer stations are insufficiently robust.

Table 1: Kerbside collection services

Council	Garbage	Frequency	Approx. % households serviced	Recycling	Frequency	Approx. % households serviced
CRADLE COAST						
Burnie	240 L	Weekly	N/A	240 L	Fortnightly	N/A
Central Coast[1]	120 L or 140 L	Weekly	N/A	240 L	Fortnightly	N/A
Circular Head[1]	140 L or 240 L	Fortnightly	N/A	240 L	Fortnightly	N/A
Devonport	120 L or 240 L	Weekly	N/A	240 L	Fortnightly	N/A
Kentish[1]	120 L, 140 L or 240 L	Weekly	N/A	240L	Fortnightly	N/A
King Island	240 L	Weekly	N/A	240 L	Fortnightly	N/A
Latrobe	140 L or 240 L	Fortnightly	N/A	240 L	Fortnightly	N/A
Waratah-Wynyard[1]	140 L or240 L	Weekly	N/A	240 L	Fortnightly	N/A
West Coast	140 L or 240 L	Weekly	N/A	240 L	Monthly	N/A
NORTHERN						
Break O'Day[2]	240 L	Weekly/ Fortnightly	N/A	-	-	-
Dorset[1]	120 L or 140 L	Fortnightly	N/A	240 L	Fortnightly	N/A
Flinders Island[3]	-	-	-	-	-	-
George Town	140 L	Weekly	N/A	140 L	Fortnightly	N/A
Launceston	140 L	Weekly	N/A	240 L	Fortnightly	N/A
Meander Valley[1]	80 L or 140 L	Weekly	N/A	140 L	Fortnightly	N/A
Northern Midlands	140 L or 240 L	Fortnightly	N/A	240 L	Fortnightly	N/A
West Tamar	140 L	Fortnightly	N/A	140 L	Fortnightly	N/A
SOUTHERN						
Brighton	240 L	Fortnightly	94%	240 L	Fortnightly	94%
Central Highlands	140 L or 240 L	Weekly	84%	Crate	Fortnightly	84%
Clarence	80 L, 120 L or 240 L	Weekly	100%	140 L or 240 L	Fortnightly	100%
Derwent Valley	120 L	Weekly	99%	140 L	Fortnightly	99%
Glamorgan Spring Bay[4]	140 L or 240 L	Weekly	100%	140 L or 240 L	Fortnightly	100%
Glenorchy[4]	140 L or 240 L	Weekly/ Fortnightly	100%	140 L or 240 L	Weekly/ Fortnightly	100%
Hobart	120 L	Weekly	100%	240 L	Fortnightly	100%
Huon Valley[4]	120 L or 240 L	Weekly	61%	140 L or 240 L	Fortnightly	59%
Kingborough	80 L	Weekly	86%	140 L	Fortnightly	86%
Sorrell[4]	80 L or 140 L	Weekly	100%	140 L	Fortnightly	100%
Southern Midlands[4]	120 L or 240 L	Weekly/ Fortnightly	58%	Crate	Weekly/ Fortnightly	58%
Tasman	240 L	Fortnightly	96%	120 L	Fortnightly	96%

Sources: APC Environmental Management 2011a, 2011b, 2012a, Hyder 2011, SWSA 2013

Notes:
1. Contradictory information in Hyder 2011, APC Environmental Management 2011a, 2011b
2. Only drop-off recycling services provided to Break O'Day residents
3. Only drop-off waste and recycling services provided to Flinders Island residents
4. Different sizes for households, multi-unit dwellings, commercial premises and/or different catchment areas
5. N/A = not available

There are also collections of hard waste in some council areas, as detailed in Table 2.

Table 2: Hard waste collection services

Council	Collection service provided	Frequency
CRADLE COAST		
Information not available for councils in this region		
NORTHERN		
Break O'Day	No	
Dorset	No	
Flinders Island	No	
George Town	Yes	Annual
Launceston	Yes	Annual
Meander Valley	Yes	Annual
Northern Midlands	Yes (pensioners only)	Annual
West Tamar	Yes	Annual
SOUTHERN		
Brighton	Yes	Every 2 months
Central Highlands	Yes	Annual
Clarence	Yes (booked)	Annual
Derwent Valley	No	
Glamorgan Spring Bay	No	
Glenorchy	No	
Hobart	Yes (to $2m^3$)	Annual
Huon Valley	No	
Kingborough	No	
Sorrell	Yes	Quarterly
Southern Midlands	No	
Tasman	No	

Sources: APC Environmental Management 2011b, SWSA 2011

Infrastructure

Domestic garbage, hard waste and other self-hauled waste is deposited at various waste transfer stations and landfills across Tasmania. The current disposal infrastructure available is outlined in Table 3. Note that some facilities also accept commercial and industrial (C&I) waste and construction and demolition (C&D) waste.

Table 3: MSW disposal infrastructure

Region	Council	Transfer stations	Landfills
Cradle Coast	Burnie	Burnie	Burnie
	Central Coast	Castra, Preston, South Riana, Ulverstone	Ulverstone
	Circular Head	White Hills	Port Latta
	Devonport	Spreyton	
	Kentish	Sheffield, Wilmot	
	King Island	-	Parenna
	Latrobe	Port Sorrell	Dulverton[1]
	Waratah-Wynyard	Waratah, Wynyard	
	West Coast	Gormanston, Queenstown, Rosebery, Strahan, Tullah, Zeehan	Zeehan
Northern	Break O'Day	Ansons Bay, Fingal, Pyengana, Scamander, St Marys, St Helens, Weldborough	St Helens
	Dorset	Branxholm, Gladstone, Scottsdale	
	Flinders Island	Killiecrankie, Lady Baron, Whitemark	Whitemark
	George Town	George Town, Pipers River	
	Launceston	Launceston, Lilydale, Nunamara	Launceston
	Meander Valley	Deloraine, Meander, Mole Creek, Westbury	Deloraine, Westbury
	Northern Midlands	Avoca, Campbell Town, Evandale, Longford	
	West Tamar	Beaconsfield, Exeter	
Southern	Brighton	Bridgewater	
	Central Highlands	Arthurs Lake, Bothwell, Bronte Park, Miena	Hamilton
	Clarence	Mornington Park	
	Derwent Valley	National Park	Peppermint Hill
	Glamorgan Spring Bay	Bicheno, Coles Bay, Orford, Swansea	
	Glenorchy	-	Glenorchy
	Hobart	Hobart	Hobart
	Huon Valley	Cygnet, Dover, Geeveston, Southbridge	
	Kingborough	Baretta, Bruny Island	
	Sorrell	-	Copping[2]
	Southern Midlands	Campania, Dysart, Oatlands	
	Tasman	Nubeena	

Notes:

1. Dulverton landfill is jointly owned by Central Coast, Devonport, Kentish & Latrobe Councils

2. Copping landfill site and operations are part-owned by Clarence, Sorrell & Tasman Councils; Kingborough Council is a part-owner of the operations.

The scope of operations at each facility is uncertain, although 2006/07 data examined during development of the *Tasmanian Waste and Resource Management Strategy* (DEPHA 2009) indicates that landfills at Burnie, Copping, Dulverton, Glenorchy, Hobart and Launceston accounted for over 83% of waste disposal in Tasmania.

Additionally there are privately owned facilities including a transfer station at Wayatinah (in Central Highlands council) and Heybridge and Treloar Transport landfills in the Cradle Coast region. While throughput figures are not known, it is unlikely that large amounts of MSW (if any) are managed at these facilities.

There are also a number of resale or 'tip shops' at various facilities in Table 3; the location of all of these is not recorded, but includes Burnie, Glenorchy, Hobart and Launceston.

The recovery services provided at transfer stations and landfills differ according to individual circumstances. While the actual recycling services provided at each facility are not documented, it is believed that recovery of the following materials generally occurs at most facilities:

- batteries (lead acid)
- comingled recyclables
- e-waste
- garden organics
- gas cylinders
- metal (ferrous and non-ferrous)
- motor oil (and empty oil containers)
- timber.

While less common, large and selected sites may recover additional materials such as:

- batteries (household)
- clean soil
- concrete, bricks and tiles
- cooking oil
- drumMUSTER agricultural chemical containers
- hard plastics
- light globes
- mattresses
- mobile phones
- paint
- textiles and clothing
- toner cartridges
- tyres.

2.2 Performance

The performance of current municipal waste practices can be assessed in terms of their effectiveness across a range of parameters including:

- providing a sustainable service that meets the needs of the community
- protecting the health and safety of sector employees, the community and the environment
- optimising recovery of resources and the sustainable use of waste infrastructure.

Community service needs differ according to the nature of each community. There is little information on specific requirements and it has therefore been generally assumed that Tasmanian councils are reactive to local demand and provide a cost-effective service that matches ratepayer needs.

The provision of regular waste collections helps to protect public health and safety, as does operation and management of a safe waste disposal facility. The level of health and safety risk arising from practices at existing facilities is not known; performance at each facility has not been benchmarked (although it is understood this will be undertaken for transfer stations in the Cradle Coast region shortly). Anecdotal evidence suggests that a number of transfer stations have closed in recent years as a response to WorkSafe Tasmania concerns; this would suggest that the facilities remaining open are not high risk facilities. EPA is responsible for monitoring and enforcing compliance with the *Landfill Sustainability Guide* (DPIWE 2004). There is currently no best practice guideline for transfer stations in Tasmania (although a guide is currently under development by Cradle Coast WMG and Northern Tasmanian WMG). The extent to which existing landfills or transfer stations in Tasmania meet relevant best practice standards is not known.

Waste generation and resource recovery in Australia (DSEWPaC 2014) benchmarks the performance of waste and recycling in each state/territory for 2010/11, including that for MSW. Sustainability Victoria and NSW Environment Protection Authority (EPA) have also collated datasets on council waste and recycling services for around 10 and 6 years respectively; consequently there is a significant database on municipal waste outcomes in those states. Information is also gathered in some other states but is either less comprehensive (Qld) or not publicly available (SA). Tasmanian performance across a range of parameters is compared in Table 4 with other states where information is available.

Table 4: Comparative municipal waste outcomes

Parameter	Tasmania	Victoria	NSW	Qld	SA[4]
% of councils providing collection services					
- Garbage	97%	100%	99%	-	-
- Recyclables	93%	100%	86%	-	-
- Hard waste	-	53%	62%	-	-
% of total households serviced					
- Garbage	-	97%	96%	97%[2]	-
- Recyclables	-	96%	94%	87%	-
MSW generation per capita	0.51 t	0.62 t	0.66 t	0.63 t	0.48 t
Predominant garbage bin size & collection frequency	240 L weekly	120 L weekly	240L weekly	-	-
Recycling generation per capita	0.17 t	0.28 t	0.34 t	0.23 t	0.27 t
Contamination rate	7.3%[1]	8.3%	-	-	-
Predominant recycling bin size & collection frequency	240 L fortnightly	240 L fortnightly	240 L fortnightly	-	-
Total recovery rate	33%	45%	52%	36%	56%
No. council-owned transfer stations/resource recovery centres	68	275	-	-	-
No. council-owned landfills	15	84	-	-	-

Sources: DSEWPaC 2014, Sustainability Victoria 2013, NSW EPA 2013a, DEHP 2013

Notes:

1. Comingled recycling contamination only
2. Estimate based on DEHP 2013 data
3. Some NSW & Qld figures for 2011/12, all other figures for 2010/11

4. SA data provided by Zero Waste SA does not differentiate between MSW, C&I and C&D sectors; split for MSW is based solely on DSEWPaC estimates and incorporates some inaccuracy. For comparison purposes, total generation per capita in SA is 4th largest of all Australian states.

Some trends are clear:

- The level of service provided in Tasmania may be marginally less than other states, although the gaps in Tasmanian data on households serviced prevents definitive conclusions. Table 1 shows that 97% of Tasmanian councils have a kerbside collection service in place for garbage and 93% have a recycling collection service, however the extent to which this covers all households is unclear. Figures are available only for the Southern region; SWSA (2013) indicates that around 94% of Southern households have access to kerbside garbage and recycling services. This figure is likely to be lower in the Cradle Coast and Northern regions given lower population density rates.
- MSW generation per capita is mid-range compared to other states, however the recycling rate per capita is much lower and the total recovery rate is significantly lower. This may be due to a number of reasons including lower utilisation of recycling collection services and an under-developed resource recovery industry. DSEWPaC (2014) notes that the bulk of reported material recovered was paper and cardboard; organics and glass were also well-represented. However the proportion of plastics, metal and other materials recovered was much lower than the national average. Glass was the only material for which the rate of recovery was not well below the national average.
- Garden organics generally experience high levels of contamination. Tasmanian contamination figures (which do not include organics) are high in comparison to Victoria (whose figures do include organics). This may be an indicator that further education of the community is required on the correct segregation and presentation of comingled recyclables. It is believed that some attention has been given to this issue in recent years (e.g. the Rethink Waste initiative) but any improvements would be evident only in data subsequent to 2010/11.

While the size of the predominant garbage bin used in Tasmania is the same as that for NSW (240 L), it is double the size of the average bin size in Victoria. Analysis of long-term trends of Victorian councils by Sustainability Victoria (2013) shows that the amount of waste presented for kerbside collections increases with the bin size utilised; similar findings have been reported in NSW (NSW EPA 2013). Sustainability Victoria data (2013) also shows that the use of 240 L comingled recycling bins results in 29 kg of recyclables more per household per year than 120 L bins. The highest average diversion rates are delivered by an 80 L garbage bin in conjunction with 240 L recycling bin. Table 1 shows that this is not a common configuration among Tasmanian councils.

No conclusions can be drawn regarding the number of waste and recycling facilities in Tasmania compared to other states; other performance issues are more important, such as the facility's location within the catchment population, the scope of recycling opportunities presented, the facility's ease of usability and compliance with environmental protection requirements. These are site-specific issues. At a broader level, compliance with best practice can indicate the standard of operation of waste facilities.

One key difference between Tasmania and most other Australian states has been the establishment of targets for waste reduction and recovery. Table 5 outlines targets incorporated in relevant state waste policies or strategies for MSW and other waste streams, as well as generic targets in some cases.

Table 5: State targets & objectives

	MSW	C&I	C&D	Other
Tasmania	-	-	-	• Set targets by 2012 • Reduce waste generation per capita • Increase waste diversion plus other non-specific performance measures
Victoria	65% recovery rate by 2014	80% recovery rate by 2014	80% recovery rate by 2014	• Reduction of 1.5 million tonnes in waste generated by 2014 • 75% recovery rate by 2014 • 25% improvement in littering by 2014
NSW	Increase recycling rates from 52% (2010/11) to 70% by 2021/22	Increase recycling rates from 57% (2010/11) to 70% by 2021/22	Increase recycling rates from 75% (2010/11) to 80% by 2021/22	By 2021/22 • Reduce waste generation per capita • Increase waste diversion from 63% to 75% • Establish/upgrade 86 drop-off facilities or services for managing household problem wastes By 2016/17 • Reduce litter items by 40% • Reduce illegal dumping by 30%
SA	Increase diversion to 70% by 2015	Increase diversion to 75% by 2015	Increase diversion to 90% by 2015	-

Sources: DEPHA 2009, Victorian Government 2005, NSW EPA 2013b, Zero Waste 2011

In Victoria, a *draft Statewide Waste and Resource Recovery Infrastructure Plan 2013-2043* (Sustainability Victoria 2013b) has also been prepared. The plan assesses handling capacities of existing infrastructure, models future requirements and identifies infrastructure gaps, opportunities and priorities.

The specificity of targets in other states in Table 5 is a reflection of (among other things) the status of their waste data recording and management systems, the length of their involvement in waste strategy and planning, and degree of commitment and funding of waste issues. In these areas, Tasmania lags behind other states.

3. Industrial waste

In this report, 'industrial waste' refers to C&I and C&D waste. This excludes controlled waste and waste from forestry, agricultural and mining operations.

Industrial waste represents a major portion of the solid waste generated in Tasmania. Unlike municipal waste, however, there is little routine collection of data on quantities and management pathways, making the presentation of detailed and accurate information difficult. C&I waste delivered to transfer stations from smaller sources (e.g. tradespeople) is likely to be reported as MSW in some cases; in others, MSW transported by commercial waste contractors to landfill is recorded as C&I waste (SWSA 2011).

As far as is possible in this section, different materials and fractions of the industrial waste stream are addressed separately. Organic wastes from industrial sources are covered mainly in Chapter 6, which focuses on organic wastes from all sources.

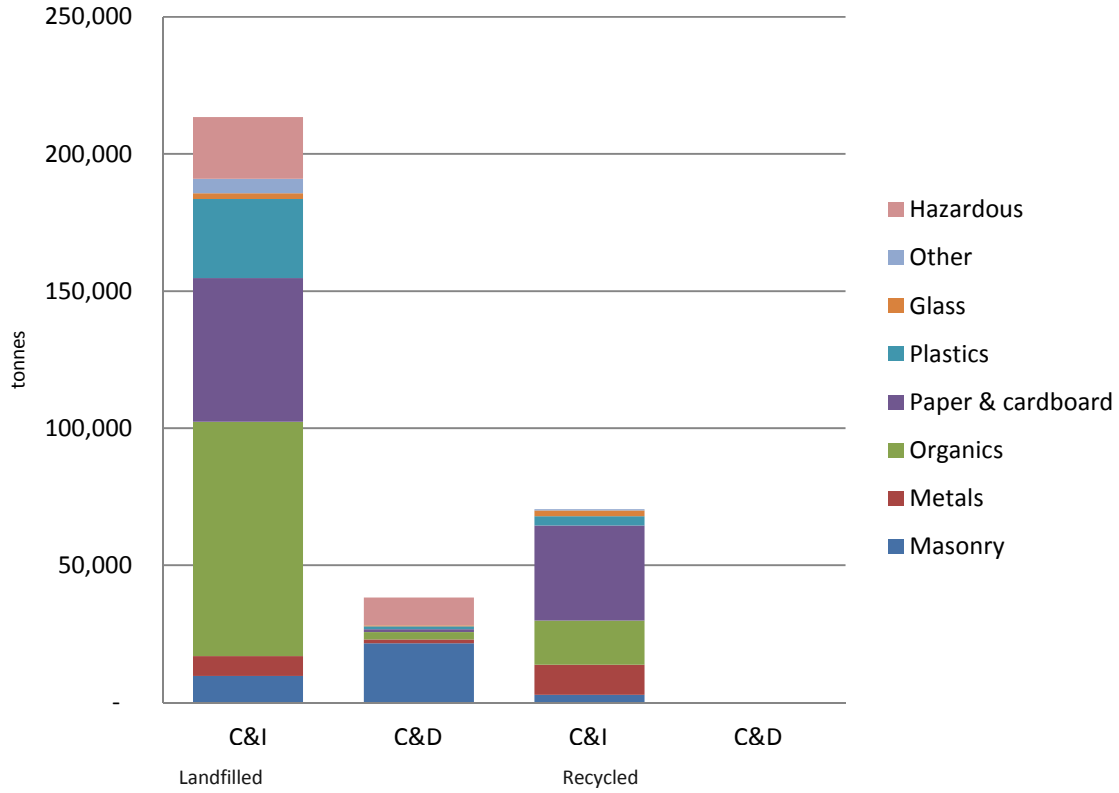
Clinical and quarantine wastes are discussed in Chapter 4. No other controlled wastes are discussed in this report, other than to note that:

- management of low-level contaminated soil remains a key unresolved issue for the Tasmanian waste sector
- much controlled waste is exported, including about 80,000 tonnes per year of zinc smelter waste from Nyrstar, which is sent to Port Pirie in South Australia for processing.

3.1 Current practices

According to data from DSEWPaC (2014), the amount of C&I and C&D waste generated in Tasmania in 2010/11 was much higher than MSW. Over 345,000 tonnes of industrial waste was generated in 2010/11, of which the majority (around 73%) was landfilled (as shown in Figure 1). Note around 35% (119,000 tonnes) of this was organic waste, which is discussed separately in Chapter 6.

Figure 1: Tasmanian industrial waste 2010/11



Industrial wastes are mostly collected and managed under private arrangements. A few local governments collect recyclables or waste from smaller commercial premises. Management variously comprises: landfilling, recycling or stockpiling in Tasmania; or export for recycling, mostly via Melbourne.

The largest commercial operator is Veolia Environmental Services, which collects and manages a wide variety of industrial wastes through their material recovery facilities at Derwent Perk and Invermay and a paper and cardboard recycling facility at Spreyton. There are various other smaller operators, many of which focus on particular materials or sectors.

While industrial waste may be disposed of at various facilities, significant amounts are deposited at large landfills at Copping, Dulverton, Glenorchy, Hobart and Launceston. It is understood that Copping landfill has established long-term contracts with a number of large industrial waste sources.

A number of companies have established or are developing on-site waste treatment facilities to process waste into a reusable resource; to date this has mostly dealt with organic waste (e.g. fish morts from fish farms) and is discussed as relevant in Chapter 6.

Waste management performance and resource recovery rates at large businesses, particularly those with a significant public profile, are understood to be similar to those on the mainland. Recycling rates drop off for smaller businesses, which send most waste materials to landfill.

Current management practices are outlined in Table 6.

Table 6: Industrial waste management practices

Material type	Current management
Cardboard & paper	Material from large producers is mostly exported for recycling. General commercial collections occur on a relatively small scale. Cardboard and paper waste from most sources is landfilled.
Plastics	Some waste from large producers such as Coles and Woolworths is exported for recycling. There are also some niche onshore recycling operations such as Envorinex's uPVC operation in Launceston. The rest is landfilled.
Metals	Reasonable recovery rates because of high value. Mostly sent to the mainland for recycling.
Glass	Waste container glass from major sources (e.g. breweries) is often recycled via the mainland. Mixed coloured material is crushed as a sand substitute to go into asphalt and concrete. The rest is landfilled.
E-waste	Some waste from large producers such as banks and schools is recycled via export to the mainland. The rest is landfilled.
C&D waste	Mostly landfilled. Recovery occurs on a small scale, mostly for reuse. There is no significant reprocessing. Inert rubble is often included with clean fill in un-regulated landfilling.
Soil	Used as clean fill or landfill cover.
Tyres	Generally shredded and landfilled, but some onshore recycling occurs. Tyres have been combusted in the Railton cement kiln. Tyre Recycle Tasmania plans to develop a pyrolysis process in Longford to generate energy and recover steel and carbon black.
Residual waste	Sent to landfill
Organic waste	See Chapter 6

3.2 Performance

Tasmania generates much less industrial waste than other states (refer Figure 2). This may be due to a number of reasons, including:

- the lower industrial base and population in Tasmania
- the nature of industrial sectors present in Tasmania and the type of waste generated (e.g. forestry and agricultural waste left on-site is not classified as waste).

There is also belief among some stakeholders that not all industrial waste is reported or is stockpiled pending some (unknown) future management pathway, however the truth of this is not easily tested.

Figure 2: Industrial waste generation 2010/11 by state

Of the industrial waste that is generated, however, Tasmania's recovery rate is significantly lower than other states, as shown in Table 7. The recovery rate of C&D waste is reportedly negligible. DSEWPaC (2014) attributes this partly to the definition of 'clean fill', which in Tasmanian regulations is much broader than other Australian jurisdictions. This allows some C&D waste such as brick and concrete rubble to be categorised as 'clean fill' rather than waste, and disposed to 'clean fill' sites rather than recycled and reused. It is also likely that some recovery remains unreported.

Table 7: Industrial waste recovery rates 2010/11 by state

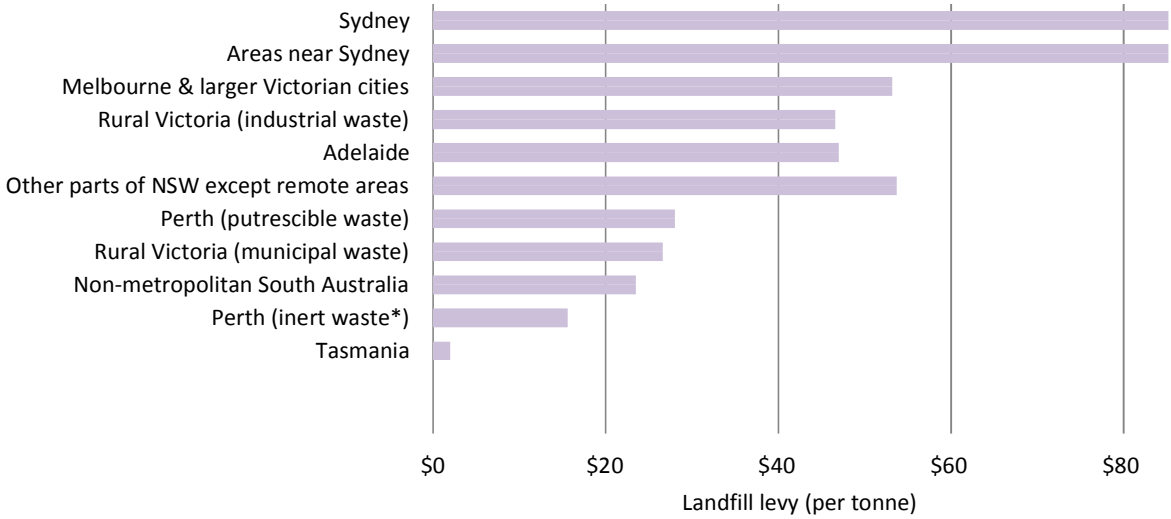
State	Recovery rate (%)
Tasmania	27%
Victoria	66%
NSW	68%
Qld	46%
SA	81%

Table 5 shows that Victoria, NSW and SA have established significant targets in current state waste strategies for recycling of C&I and C&D wastes, varying between 70% and 90%. These targets are within the reach of existing performance (refer Table 7) and reflect the attention given to industrial waste in these states over a number of years. This is not the case in Tasmania, where waste initiatives to date have largely been driven by council-based WMGs concentrating on MSW. Consultation with stakeholders suggests there is a current lack of understanding and historic lack of attention given to industrial waste in Tasmania.

Industrial waste management is particularly price-sensitive, as businesses seek to reduce costs and maximise profitability. Landfill disposal fees in most mainland states are much higher than Tasmania, with prices in NSW, Victoria and SA ranging between $130-250/tonne for mixed industrial waste (compared to

Tasmanian fees of less than $60/tonne). Much of this price is driven by state landfill levies. Levies across all jurisdictions are shown in Figure 3, including the notional $2-5 per tonne contribution applied by Tasmanian WMGs (although, unlike other states, this is not communicated to waste generators and does not act as a price incentive for recovery). Figure 3 shows the notional Tasmanian levy is significantly lower than levies applied in other jurisdictions.

Figure 3: Australian landfill levies 2013/14



Notes:
1. Graph shows figure of $2/tonne for Tasmania; in some areas this has recently increased to $5/tonne.
2. Perth inert waste volumetric levy adjusted to weight basis

Among other things, the interstate landfill levies are often expended on waste minimisation initiatives, including industrial waste avoidance and recovery. Some of the C&I and C&D initiatives include:

- Sustainability Victoria has provided dedicated funding to market development and recycling infrastructure for C&I and C&D waste over a number of years. Two infrastructure funding rounds (2004 and 2007) provided grant recipients up to $500,000 for recovery systems either at the premises of the waste generator, or waste managers processing C&I and C&D waste. Over $7 million was distributed to 40 organisations, and estimated to result in recovery of around 560,000 tonnes/year of material (Sustainability Victoria 2010).
- NSW EPA has begun a five-year *Waste Less, Recycle More* program of funding in excess of $465 million, which includes over $11 million for the Business Advisory Services Grants program, over $3 million for the Industrial Ecology Business Support Grants program, over $41 million for organics infrastructure and over $43 million for major resource recovery infrastructure (NSW EPA 2014). These programs target cleaner production, resource efficiency and industrial ecology initiatives for businesses, as well as recycling infrastructure for C&I and C&D wastes.
- Zero Waste SA's Industry Program encourages SA business and industries to adopt sustainable practices, with particular focus on the manufacturing, food, wine, tourism, retail, aged care, restaurants and catering sectors. Zero Waste SA provides assistance with resource-efficiency advice, as well as funding for businesses to access specialist industry services (Zero Waste SA 2014).

This kind of support is not available to Tasmanian businesses and cannot be financially supported by the $2-5/tonne levy that currently applies. At the relatively low landfill fees that apply in Tasmania, there is also little financial incentive for businesses to reduce or recycle waste.

4. Clinical and quarantine waste

Wastes classified as clinical waste include sharps, pharmaceuticals, chemical and radioactive waste, cytotoxic waste, pathology and sampling waste, anatomical waste and body fluids, animal tissue and carcasses and other infectious or potentially infectious waste. Clinical waste derives from medical, dental, aged care, animal health and research facilities (NEPM codes R100 and R120).

Quarantine waste is waste derived from international shipping and aircraft, as well as waste repatriated from the Australian Antarctic Territory (NEPM code Q100).

4.1 Current practices

Clinical waste and quarantine waste are classified as Controlled Wastes under the *Environmental Management and Pollution Control (Waste Management) Regulations 2010.* The regulations prescribe the responsibilities of waste managers, provide guidelines on waste management and define the penalties for non-compliance. Under the *Environmental Management and Pollution Control (Controlled Waste Tracking) Regulations 2010*, controlled wastes are subject to a waste tracking system from generation to disposal, however we understand it is not operational.

Controlled wastes can be landfilled only in a category C (secure) site or, with EPA approval, a nominated category B site (DPIWE 2004). Requirements for category C sites include advanced liner systems, sub-liner leachate detection, advanced drainage systems, large buffers, and high-level security and access restrictions. There is currently no category C site in Tasmania, although a cell is currently under development at the Copping landfill.

Clinical waste

Since 2008, clinical waste must be disposed of:

- at an approved landfill with prior treatment through autoclave or disinfection
- by high temperature incineration (body parts)
- to sewer, with approval (blood and body fluids).

Detailed management specifications are set out in an Approved Management Method (DTAE 2007), which is empowered by the *Environmental Management and Pollution Control (Waste Management) Regulations 2010*. National guidelines for the management of clinical and related waste were developed in 2012 by the National Health and Medical Research Council, however the guidelines have since been rescinded.

An inventory compiled for 2004/05 found clinical waste to make up approximately 18% of controlled waste transported, 89% of which was destined for landfill (DTAE 2005). Four landfills were approved to accept some types of clinical waste, but it is understood that this number has declined.

NEPC (2013) reports that in 2012/13, 44 tonnes of clinical and pharmaceutical waste were exported to Victoria and South Australia. It is understood that this material was pharmaceutical only.

Apart from an additional small amount of incineration at hospital incinerators (and export to the mainland), the major pathway for disposal of remaining clinical waste is through the transfer station at Derwent Park Road, Lutana, which has a clinical waste treatment facility. The site is operated by Southern Waste Solutions, who also operate the Copping landfill. Clinical waste is shredded, disinfected with lime, compacted with general waste and transported to Copping landfill for disposal. When the shredder is not

operational, with EPA approval, we understand untreated clinical waste is buried in an excavated hole in the waste body at Copping.

Quarantine waste

DTAE (2005) found quarantine waste made up 9% of controlled wastes transported. The bulk of this was from the Australian Antarctic Division (Hyder 2012). Most quarantine waste is disposed of by deep burial, mainly at the McRobies Gully landfill in Hobart (SIA 2008). Smaller amounts are landfilled at Launceston and Dulverton, or incinerated by TasPorts.

It is understood some legacy waste from Antarctica is scheduled for transport to Hobart when the Copping landfill category C cell is operational. No further detail is yet available.

4.2 Performance

Clinical waste

The Biohazard Waste Industry, a division of the Waste Management Association of Australia, publishes a national *Industry code of practice for the management of clinical and related wastes* (BWI 2010). The code is the primary reference for state guidelines, including those of Tasmania, for the management for clinical wastes. The code provides guidance on a wide range of matters including responsibilities and waste minimisation, containment, storage, treatment and disposal.

When they are fully functional, the methods for treatment and disposal of clinical waste in Tasmania appear to be generally consistent with BWI (2010). However, BWI (2010) "does not support the use of landfill disposal for untreated clinical and related waste." The current practice of deep burial when the shredder is not functional is therefore inconsistent with the standard.

Quarantine waste

The standard for management of quarantine waste is DAFF (2013). This specifies requirements for reporting, record keeping, storage and treatment of quarantine waste. The permitted treatment types are high temperature incineration, autoclave, gamma irradiation, heat treatment, methyl bromide fumigation and deep burial.

The methods for treatment and disposal of quarantine waste used in Tasmania appear to be generally consistent with DAFF (2013). SIA (2008) found that the management of quarantine waste did not meet best practice or provide "adequate protection to human health, the environment, or industries such as agriculture". Blue Environment was unable to validate this claim.

Stakeholder consultation identified an opportunity for increasing the number of cruise ships stopping in Tasmania by providing increased capacity for approved disposal of quarantine waste; it is thought the increase in cruise ship visitations may add to the local economy. However the likelihood of increased waste disposal capacity equating to increased visitation cannot be determined. There are likely to be competing priorities for visitation to various Australian and Pacific ports, and the relative importance of waste disposal versus tourism opportunities, harbour capacity, port fees and other priorities is unknown.

5. Pit waste & sludges

Pit waste and sludges refers to a generic category of controlled wastes that are pumped from pits or other containers where they accumulate as a by-product of an industrial or commercial activity. As well as grease trap (NEPM code K110) and septic tank sludges (K130), this category includes residues from on-site wastewater treatment at commercial and industrial facilities and waste contaminated with hydrocarbons from the automotive industry, laboratories etc. These last two groups are variously categorised under the NEPM as N120 (soils contaminated with a controlled waste) and J120 (waste oil/hydrocarbons mixtures/ emulsions in water).

This excludes biosolids derived from sewage treatment plants (these are managed separately by TasWater).

5.1 Current practices

Most sludge types are typically collected in approved trucks and transported for disposal in wastewater treatment plants. Composting has been trialled for some pit wastes and sludges. Hydrocarbon contaminated sludges are often processed through 'land farming', which comprises deposition onto land and aeration to promote contaminant degradation and evaporation.

In the absence of an operational controlled waste tracking system, not much data is available on the quantities of these materials generated or disposed of. No grease trap or septic tank was exported in 2012/13, but 365 tonnes in the J and N categories was exported to NSW, Victoria or Queensland (NEPC 2013). It is unclear whether these were pit waste or sludges. An assessment of liquid waste management in Australia (DSEWPaC 2012) likewise identified little data for Tasmania.

5.2 Performance

Land farming

Land farming is a relatively inexpensive remediation measure for soils and sludges contaminated with hydrocarbons. It entails risks to the local amenity and environment if not carefully managed. In Tasmania, similar to other Australian jurisdictions, it needs to be carried out subject to careful environmental management. The *Environmental Management and Pollution Control (Waste Management) Regulations 2010* require EPA approval for a land farming operation. Applications must be submitted together with a plan demonstrating how environmental risks are to be managed. The relevant local government must be notified. There are no records of enforcement action in relation to these requirements in the last five EPA annual reports.

Wastewater treatment

Wastewater treatment systems in Tasmania have struggled to meet their compliance targets. The most recent 'state of the industry' report states that in 2011/12, the regional water and sewerage corporations (since amalgamated into TasWater) did not comply with their EPA discharge limits between 8% and 15% of the time on a flow-weighted basis (OTER 2013). The Campania treatment facility was unable to comply 66% of the time. The failure to comply is partly due to low quality infrastructure. Flow-weighted non-compliance with accepted modern technology standards ranged from 30-39% across the companies, with a high of 97% at St Mary's (OTER 2013).

It appears that the industry is seeking to improve its standards, and that this may affect the management of pit wastes and sludges. Richards (pers. comm.) reports that a compliance strategy is under

development by TasWater to improve performance, and is expected to be implemented over a timeframe of three to five years. It will include:

- requiring a greater degree of pre-treatment including for grease trap and oily wastes
- restricting waste acceptance, including of tankered wastes, to types that facilities are capable of treating to standard
- increasing prices to ensure cost recovery for treatment to standard and to encourage diversion of some wastes to more appropriate alternatives
- greater levels of auditing and compliance reporting, including identification and tracking of uncontrolled disposal points.

There is some concern among stakeholders that more stringent policing of, and charging for, wastewater contaminants by TasWater will substantially impact on the financial viability of key Tasmanian industries. It is thought this will particularly affect organisations that produce wastewater streams high in organic content (e.g. dairy and food manufacturers). However these organic-rich wastewater streams are attractive sources of feedstock for organic processing and compost facilities. There are opportunities for matching waste generators with organic processors for 'win-win' solutions.

Composting

Composting of some pit wastes and sludges has been trialled at Dulverton, but is believed to have caused odour problems. It is understood that EPA disallowed composting of these materials, based on the view that the operator was not adequately managing the quality control processes. Improved processing technologies offers potential to increase the capture of these sludges and wastes (discussed further in Section 8.2).

6. Organics

Organic waste is generated by a range of domestic and industrial processes and include garden waste, food waste, timber, paper and cardboard, textiles, biosolids, organic sludges and various other mixed organics.

The estimated proportion of different organic waste streams and sources is shown in Table 8. Although these are national defaults developed for National Greenhouse and Energy Reporting (NGER) purposes, they are consistent with a number of compositional audits conducted in the Cradle Coast and Northern Tasmanian regions.

Table 8: Indicative contribution of organics in landfilled waste (% by weight)

Contribution of materials to waste stream composition by weight	Source of waste			
	MSW	C&I	C&D	Total landfilled waste
Food organics	35%	22%	0	27%
Garden organics	17%	4%	3%	11%
Wood/timber	1%	13%	6%	5%
Paper/cardboard	13%	16%	3%	13%
Textiles	2%	4%	0	2%
Other organics	5%	4%	0	4%

Source: DCCEE 2013

Table 8 shows that by weight:

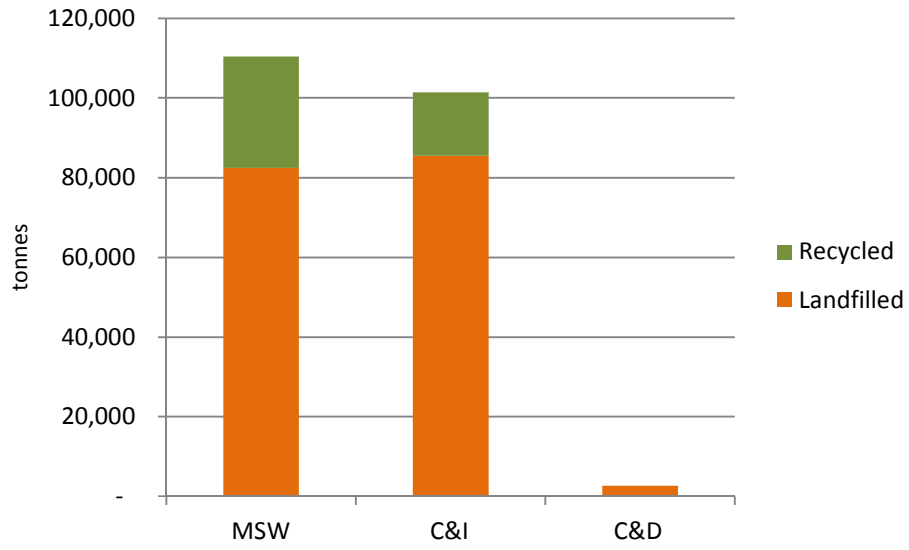
- food organics contribute in the order of 35% of MSW, 22% of C&I waste and 27% of total landfilled waste
- garden organics contribute around 17% of landfilled MSW, 4% of C&I waste, 3% of C&D waste and 11% of total landfilled waste.

6.1 Current practices

According to DSEWPaC (2014), over 244,000 tonnes of organic waste was generated in Tasmania in 2010/11. Estimates by source and disposal/recovery pathway are shown in Figure 4. This indicates organic waste was generated in almost equal quantities by households and industry.

Note these figures exclude some industrial organic wastes such as agricultural, forestry and mining wastes, which are traditionally left in-situ and accordingly not counted as waste needing to be disposed at landfill or recovered for recycling.

Figure 4: Organic waste generation & disposal in Tasmania 2010/11



Municipal organics

There are a number of gaps in information on the current management of organic waste in Tasmania. It is understood that no council collects food organics for recovery, and that garden organics kerbside collection services are provided only by Clarence, Hobart and Sorrell councils (all in the Southern region) and Meander Valley (in the Northern region). A trial collection of food and garden organics was undertaken at Launceston in 2011/12, but it is not yet clear whether this will lead to a permanent collection service being implemented in the future. Most recovered garden organics is dropped off at council transfer stations and landfills.

Table 9 shows the garden organics management practices used by councils at their facilities (where information is available).

Table 9: Current municipal garden organics management practices

Council	Current management
CRADLE COAST	
Burnie	Shredded/mulched for composting at Dulverton regional facility
Central Coast	Shredded/mulched for composting, sometimes at Dulverton regional facility
Circular Head	Shredded/mulched for composting
Devonport	Shredded/mulched for composting, sometimes at Dulverton regional facility
Kentish	Shredded/mulched for composting, sometimes at Dulverton regional facility
King Island	Shredded/mulched for reuse
Latrobe	Composted at Dulverton regional facility
Waratah-Wynyard	Shredded/mulched for reuse
West Coast	Shredded/mulched for reuse
NORTHERN	
Break O'Day	Shredded/mulched for reuse
Dorset	Shredded/mulched for reuse
George Town	Shredded/mulched for reuse
Flinders	Limited recovery
Launceston	Mulched for low-grade composting and sold or used by council operations
Meander Valley	Shredded/mulched for reuse
Northern Midlands	Shredded/mulched for reuse
West Tamar	Shredded/mulched for reuse
SOUTHERN	
Brighton	To landfill
Central Highlands	N/A
Clarence	Composted
Derwent Valley	Shredded & used for landfill rehabilitation or cover
Glamorgan/Spring Bay	N/A
Glenorchy	Mulched & used for landfill rehabilitation or cover
Hobart	Composted
Huon Valley	Mulched and sold (Southbridge), mulched for landfill rehabilitation (Cygnet, Geeveston, Dover)
Kingborough	Mulched
Sorell	N/A
Southern Midlands	Natural decay
Tasman	Chipped & given to residents at no cost as mulch

Note: N/A – information not available

In most instances these operations consist of stockpiling areas with periodic shredding of stockpiles to produce lower-grade undifferentiated mulch. This is either used by councils or contractors for landfill cover or rehabilitation, or in other council operations (e.g. parks and gardens), or is sold or given away as a mulch product. The infrastructure available for such operations is generally basic, consisting of drop-off areas and use of mobile shredding/chipping equipment.

Industrial organics

There is a lack of information on the management pathways of industrial organics, although anecdotal evidence from stakeholders suggests some of the following pathways occur in Tasmania:

- food manufacturing and abattoir waste is recovered in rendering plants
- paunch waste and fish waste is directed to anaerobic digestion plants for energy recovery
- sawmill residues are pelletised for energy recovery or landfilled
- fish waste is composted or recovered in rendering plants
- fibrous waste from paper and pulp manufacturing has been trialled as a soil additive
- organic sludges from dairy and food manufacturing have been shandied and disposed of via sewer and/or stormwater management systems
- biosolids are landfilled, composted and/or spread on land.

It is also believed that some industrial waste is under-reported or exported to the mainland for treatment and/or disposal, however the extent of organics as a component of this industrial waste is not known. As shown in Figure 4, the majority of industrial organics is landfilled and like MSW (refer Section 2.1) most of this is directed to Burnie, Copping, Dulverton, Glenorchy, Hobart and Launceston landfills. There is some 'recovery' of organic waste where landfill gas is collected and used to generate energy.

Infrastructure

Organic processing infrastructure includes the following facilities:

- Dulverton composting facility: processes approximately 12,000-15,000 tonnes/year of garden organics, biosolids, fish morts and abattoir waste
- Dulverton mushroom composting facility
- Grovers Gully compost facility: an open windrow composting facility which process garden organics, food waste and fish morts
- Hobart compost facility: located at the Hobart landfill at McRobies Gully, it processes garden organics
- Huon Aquaculture: small scale composting of fish morts
- Oatlands compost facility: operated by Pure Living Soil, processes fish morts, milk products and garden organics (including garden organics transported from Mornington transfer station)
- Plenty compost facility (near New Norfolk): operated by Microbial, processes approximately 50,000 tonnes/year of filtercake (which is land-spread), is trialling around 1,000 tonnes each of fish morts and biosolids.

Groundswell composting technology was trialled at Kingborough but this has ceased operation. There are also plans to develop a new compost facility at Launceston but it is not yet established.

Additionally there are a number of private small-scale anaerobic digesters as part of on-site organic waste treatment at various sites.

6.2 Performance

Assessment of Tasmania's performance in organic waste management is hampered generally by a lack of Tasmanian data. To the extent that information is available, trends in Tasmania are compared to other key states in Table 10.

Table 10: Comparative organic waste outcomes

	Tasmania	Victoria	NSW	Qld	SA
% of households with kerbside organics collection service	30%	48%	57%	-	-
Average municipal organics collected per capita (kg)	N/A	71	98	-	-
Recovered (kt/year):					
- food	44	22	183	-	4
- garden	N/A	570	844	819	230
- timber	N/A	234	153	-	280
- mixed garden & food	-	-	55	-	-
- other MSW organics fraction	-	-	192	26	-
- paper & cardboard	77	1,011	892	571	211
- biosolids	N/A	109	437	271	70
Biogas energy recovery from landfill (kt/year of degraded material)	39	322	454	153	77
Total recovery per capita (kg/year)	31	49	54	54	79

Sources: DSEWPaC 2014, Sustainability Victoria 2013, NSW EPA 2013a

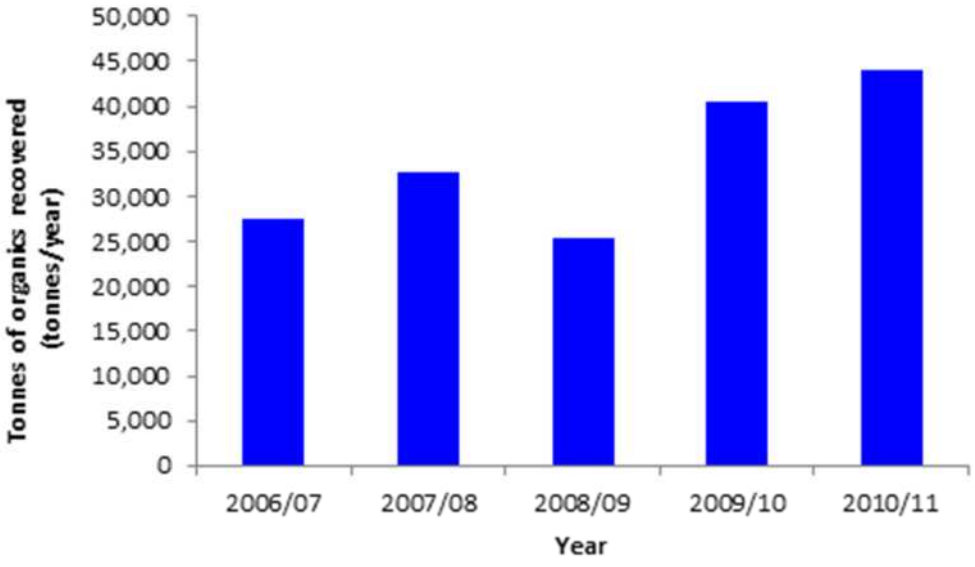
Notes:

1. NSW municipal figures for 2011/12; all other figures for 2010/11

Figures in Table 10 show that Tasmania lags behind other states in terms of the service provided to households and the amount recovered, both in absolute and per capita figures.

Some improvement in organics recovery in Tasmania is apparent in recent years. Data supplied by EPA Tasmania indicates a trend of increasing amounts of organics recovered (refer Figure 5). However industry estimates suggest that overall as little as 18% of available organic waste is currently recovered, excluding energy recovery from landfill gas. This is consistent with DSEWPaC data in Figure 4.

Figure 5: Trends in organics recovery in Tasmania



7. Discussion

The subject of this report is a range of priority wastes from different sources and with varying treatment and recovery systems. However many of the governance arrangements, environmental impacts, market and industry issues, and opportunities and barriers for future improvements to management and recovery are common to these waste types. Improving performance requires integrated planning. The following discussion therefore identifies these issues holistically and explores potential synergies between the targeted waste streams.

7.1 Governance arrangements

As MSW is a council responsibility, it is managed by individual councils, although some strategic coordination is undertaken by the relevant regional body, viz. Cradle Coast Waste Management Group (WMG), Northern Tasmanian WMG or Southern Waste Strategy Authority (SWSA). Collection services for MSW, comingled recycling and garden organics from domestic sources are the responsibility of councils; some councils extend similar collection services to businesses but this is not currently widespread. These kerbside services are provided by a mixture of private contractors and council labour, and in some cases collection arrangements may incorporate more than one council area (e.g. where councils combine services to achieve economies of scale). In most cases, waste infrastructure (landfills and transfer stations) is owned by single councils, although larger facilities at Copping and Dulverton involve cooperative ownership and operational arrangements.

Industrial waste, clinical and quarantine waste, pit waste and sludges, and organic waste is seen to be the responsibility of local government only where it enters facilities they own and operate; there is little upstream involvement of local councils. Some pit waste and sludges are currently disposed of via sewer systems, where it is the responsibility of TasWater to manage and treat these. However with the proposed tightening of trade waste parameters, the role of TasWater will diminish as more sludges will need to be disposed of at alternate facilities (such as council-owned landfills).

The three WMGs generally have a common purpose however their governance arrangements differ; for example, the Northern Tasmanian WMG is a sub-committee of a sub-committee of a company owned by eight northern councils, whereas SWSA is established directly as a joint authority under the Local Government Act. These differences are reflected in their relevant structure and reporting framework. Their approach also differs: SWSA could be seen to have a more strategic role in waste planning in its region, while Cradle Coast and Northern Tasmania work together closely in a more practical implementation role.

EPA Tasmania (a division of the Department of Primary Industries, Parks, Water and Environment) has overarching responsibility for regulation and enforcement regarding waste and wastewater management under the *Environmental Management and Pollution Control Act 1994*. Its purpose is to regulate developments and activities that may impact on environmental quality and to promote best practice sustainable environmental management. The WAC was established as a sub-committee of the EPA, tasked with oversight of implementation of the *Tasmanian Waste and Resource Management Strategy*. With resources provided by the EPA, WAC has the capacity to provide advice to the Tasmanian Government although it has no structural ability for decision-making on waste issues in Tasmania in its own right.

In other Australian jurisdictions there are similar agencies and responsibilities at the state level. EPAs are responsible for regulation and enforcement of environmental legislation in most other states. Departmental responsibilities for strategic planning for resource recovery issues have been delegated in

some states to organisations such as Sustainability Victoria, Zero Waste SA and the WA Waste Authority. In some respects these are similar to WAC, although the interstate organisations generally have their own resources, guaranteed funding (sourced from the relevant landfill levy) and some decision-making delegation[2].

Interstate regional waste groups generally have a common structure and common objectives within each jurisdiction. In some cases this may established in law as a state responsibility, establishing the waste groups as a state government rather than local government entity. Generally, there is flow-through of guaranteed funding from state bodies, in return for a coordinated approach to waste and resource recovery planning and a structure for annual reporting.

While the Tasmanian WMGs have demonstrated progress on MSW recycling, the current structure does not facilitate significant progress to be made regarding industrial waste, industrial organics or any of the other non-MSW streams targeted in this report. There is currently no requirement for liaison with industry on waste issues, and there is limited funding available to the WMGs to undertake this even if the framework was in place. Outside the WAC, the existing structure of WMGs has also seen some 'silo-ing' at the implementation level. There is capacity for greater coordination and a more strategic focus with changes to the existing governance arrangements.

7.2 Environmental sustainability

The predominant environmental impact of waste arises from the use of landfills. The degree of impact depends on site-specific factors but is likely to include impacts arising from:

- the use of land which may otherwise have been productive for other purposes
- potential off-site contamination and pollution of surrounding land and water (including groundwater)
- the generation of greenhouse gas emissions
- potential loss of community amenity (particularly on surrounding land users)
- potential litter, odour, noise, dust, vermin and fire impacts
- the access and use of infrastructure on public health and safety
- disposal of hazardous wastes (e.g. clinical waste, asbestos) without appropriate safeguards.

The disposal of some wastes in unlined landfill sites represents a major environmental risk. The extent to which this currently happens is not known (although it is believed to occur frequently for some C&D wastes), however it is likely this has happened in the past and the environmental legacy of such practices may be long and significant. The *Landfill Sustainability Guide* (DPIWE 2004) establishes best practice requirements for landfills, but the implementation and enforcement of this is subject to EPA resourcing capabilities; industry stakeholders suggest such resources may be limited.

Landfills are not the only infrastructure delivering waste management services in Tasmania: transfer stations also play an important role. Many of the potential impacts listed above may also arise from transfer station operations, but there are no regulatory requirements on transfer station management and operation. Most organics diversion is carried out using windrow composting and a number have a history of off-site odour complaints. Open windrow composting typically has high odour risks, especially when food and other non-garden organic waste is processed.

Conversely, recycling can deliver benefits in terms of avoided emissions of greenhouse gases, energy and water savings, and avoided use of non-renewable resources (including land for landfill development, fossil

[2] This will soon change in South Australia, given the SA Government's announcement of the future privatisation of Zero Waste SA.

fuels and virgin materials). Many of these benefits are measured in other jurisdictions (e.g. Victoria, NSW, SA, WA) when quantifying the amount of recycling carried out in the state each year; this is not undertaken in Tasmania.

In general, it can be expected that low recycling rates correspond to higher environmental impacts. Life cycle assessments generally show improvements in most environmental indicators when recycling rates for standard recyclables increase (Carlsson Reich 2005, ACOR 2008, WRAP 2010). Importantly for Tasmania, transport is not usually a major component of the environmental impacts. Typically, high recycling rates correspond to less use of energy, less air pollution, less water use, fewer greenhouse gas emissions and less demand for landfill space. Recycling of metals is particularly beneficial, as is recovery of organic wastes from landfills lacking excellent gas capture systems. 'Downcycling' – for example turning glass into sand or concrete into road base – does not provide significant environmental benefits on a per tonne basis.

7.3 Markets

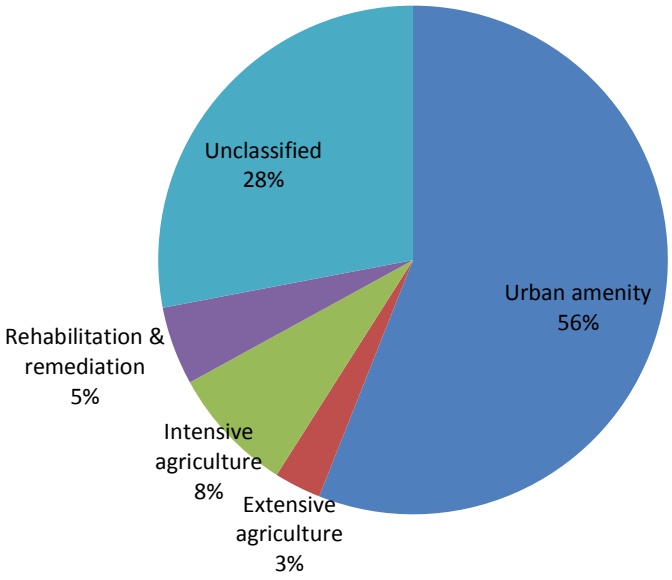
Like other waste issues in Tasmania, there is a lack of data on markets for recovered material. While Victoria, NSW, SA and WA conduct annual recycling activity studies which quantify the amount of material recovered by type and provide commentary on the state of the market for each, this is not undertaken in Tasmania. Similarly the Recycled Organics Unit (ROU) at the University of New South Wales undertakes an annual assessment of the various markets for recovered organics for Victoria, NSW, Qld, SA and WA, but this does not include Tasmania.

Market issues for Tasmania include the following:

- Like other states, Tasmania's recycling endeavours are subject to the state of re-processing industries in Australia. Generally there are few Australian re-processors for materials such as plastics, glass, aluminium, tyres and metals. Most material must be transported to Asian markets for re-processing, and market prices can vary according to global financial conditions, currency exchange rates, the supply of material from other sources (including Europe), and various other unpredictable factors. These have flow-on effects on the local viability of recovery programs.
- Veolia manages most of Tasmania's comingled recyclables through its MRF operations. SWSA (2011) estimated around 48,000 tonnes/year of material was recovered in Tasmania by Veolia, of which around 63% was exported directly to Asia and the remaining 37% sent to outlets on the mainland. Given the distance from re-processing markets (both in Asia and mainland Australia), the cost of transport is a major consideration. Hence the viability of comingled recycling can be volatile depending on external factors (as above), as well as the capacity and cost of local shippers. Transport routes to/from Tasmania are often serviced by a sole organisation; consequently the withdrawal of service by a single entity can substantially affect the viability of recycling in Tasmania.
- There is a sustainable market for recovered goods via 'tip shops', as evidenced by the long-established and continued operation of these shops at various locations across Tasmania. While the rate of stock turnover is not known, and the viability is often predicated on low labour costs from partnerships with socially disadvantaged groups, 'tip shops' have proven to be a long-standing (if minor) market for selected recovered resources.
- Nationally, recovered organics are usually sold into one of the following market classifications:
  - intensive agriculture (e.g. nurseries, market gardens, fruit/flower/turf growers, viticulture)
  - extensive agriculture (e.g. broadacre farming, pasture, forestry)
  - urban amenity (e.g. landscaping, sport & recreation, parks & gardens)
  - rehabilitation & remediation (e.g. landfill cover, erosion stabilisation, biofiltration, contaminated sites).

The ROU estimated the national breakdown of these markets (as shown in Figure 6) based on product sales; note this includes a component of 28% which could not be classified. Due to lack of data, is not clear whether Tasmanian recycled organics markets reflect the national position; however if this is the case, the use of organics products by local councils for urban amenity projects may be the largest current market in Tasmania. This may potentially point to a lack of private sector involvement in the recycled organics industry generally.

Figure 6: National market composition for recycled organic products



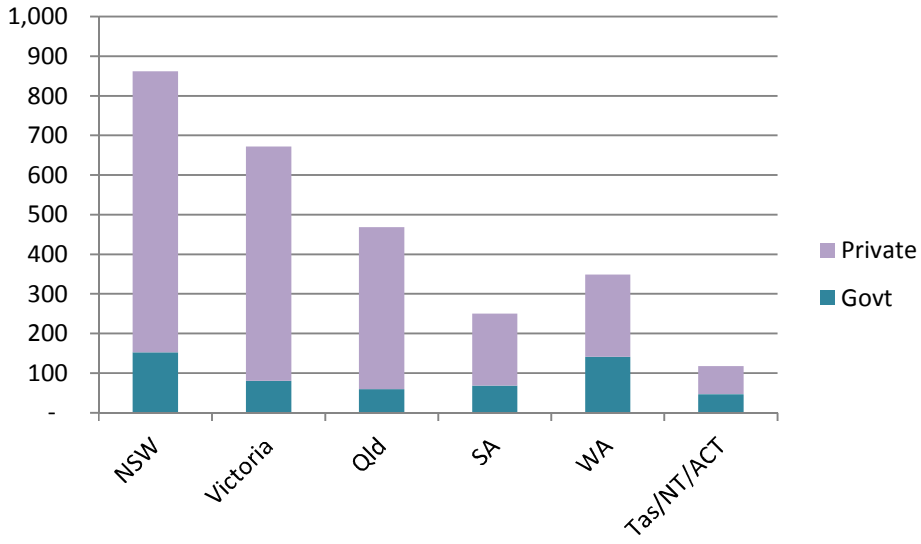
Conversely, all of these factors encourage a local recycling solution in Tasmania and there is potential to grow local markets significantly. This is especially the case for recycled organics markets given the relatively large presence of niche fruit and vegetable growers.

7.4 State of the industry

There is limited information available publicly on the current state or future potential of the waste and recycling industry in Tasmania. The Australian Bureau of Statistics (ABS 2011) examined the state of waste management services across Australia in 2009/10. This study aggregated Tasmanian statistics with that of the Northern Territory and Australian Capital Territory. Given the relative level of population and infrastructure it is likely that Tasmania accounts for around half of the combined figures.

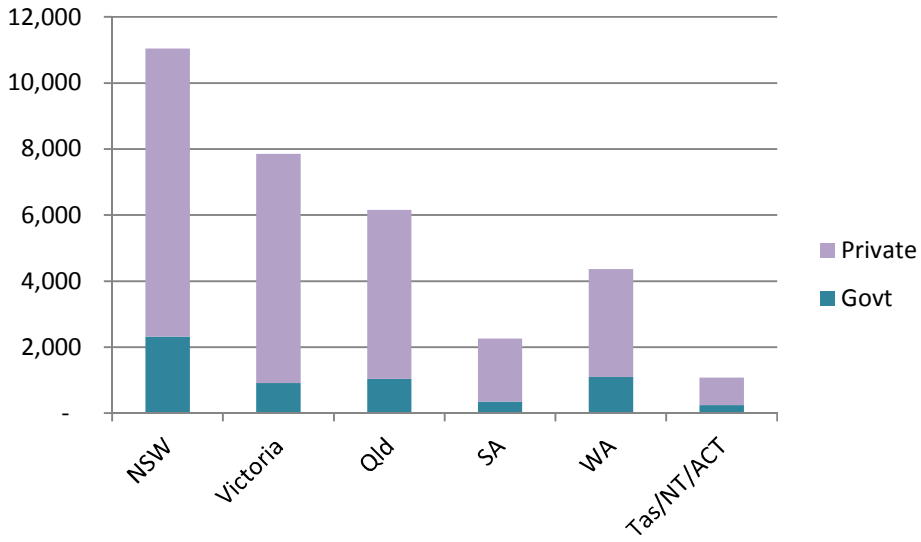
The ABS study benchmarked the number of government and private sector organisations involved in the industry (Figure 7) and the number of employees involved (Figure 8). Both figures reflect the lower population and business base in Tasmania compared to mainland states.

Figure 7: Number of organisations in waste/recycling sector 2009/10



Source: ABS 2011

Figure 8: Number of employees in waste/recycling sector 2009/10



Source: ABS 2011

If it is assumed that Tasmania accounts for around half of the aggregated Tas/NT/ACT figures, this would indicate around 35 private and government-owned organisations operated in the Tasmanian waste/recycling sector in 2009/10, employing around 400 people. Any change since 2009/10 is likely to have been incremental.

Similar assumptions on ABS financial data would indicate the sector accounted for around $75 million in gross income in Tasmania per year, of which around $11 million was generated by revenue from sale of recovered resources. This ratio (of around 1:7) is much lower than reported for other states, with Victoria, NSW, Qld and SA ranging between 1:3 – 1:4. This is consistent with low recovery rates, indicating

that most economic activity in Tasmania derived from waste collection and servicing, rather than recovering value from the material collected.

Note these figures relate to organisations directly active in the waste sector and do not include those with an indirect involvement, such as equipment and fuel suppliers, service companies, engineers, media, etc. Incorporating these, the contribution of the waste sector to the Tasmanian economy and employment levels may be much greater than the ABS data suggests.

The ABS data also indicates that private sector employment from waste activities is much higher than government despite the profile of councils in waste management. This suggests that growth in local recycling industries may lead to relatively high private sector employment, regardless of the constraints of local government budgets.

The ABS study also canvassed organisations on factors that significantly hampered their ability to increase resource recovery. National results are shown in Table 11; it is assumed that this would generally be reflective of Tasmanian opinions as well.

Table 11: Reported factors hampering resource recovery

Factors	Government %	Private sector %
Lack of access to additional funds	19.5	10.4
Cost of development or introduction/implementation	18.2	13.3
Lack of facilities or infrastructure	19.0	11.3
Lack of sites for storage or stockpiling	6.6	10.0
Lack of inputs (i.e. supply shortage)	3.6	5.1
Lack of customer demand for goods or services	8.5	11.8
Lack of skilled persons within the business or labour market	5.2	3.7
Government regulations and compliance	6.3	10.3
Competition from unlicensed or illegal operators	0.9	6.8
Other factors hampering resource recovery	4.6	1.3
Not significantly hampered	7.6	15.8
Total	100%	100%

Source: ABS 2011

Table 11 shows that government organisations report higher barriers arising from funding, infrastructure and development/implementation costs issues, whereas private organisations (while a significant proportion believe they are not hampered) report a range of barriers of almost equal importance including funding, infrastructure, development/implementation costs, storage and stockpiling sites, customer demand and government regulations.

A unique feature of Tasmania's waste management industry compared to other states is the relatively low level of private sector involvement. Nearly all waste infrastructure is owned (and often operated) by local government; a few recycling facilities owned by Veolia are almost the only significant exceptions. As shown in Figures 7 and 8, the states with consistently high recovery results (Victoria and NSW) have a much higher ratio of private sector involvement both by the number of organisations and the number of people employed in the industry.

There is also, with the exception of Veolia, a scarcity of the large multinational waste management and recycling contractors that operate in other Australian states (e.g. SITA, Transpacific Industries, Remondis, etc.). On the mainland these large companies have helped to drive recovery through competition for feedstock, market identification and growth, proven international experience of alternative technologies and access to large amounts of capital for infrastructure investment.

Alternatively in Tasmania there has been an emphasis on local solutions, and the success of small-scale 'tip shops' at council-owned landfills has helped to drive achievements in MSW recovery to date. This approach has been less successful in targeting C&I and C&D waste; it is likely a more interventionist approach at the source of generation will be needed to improve industrial waste recovery efforts. This is unlikely to be achieved by 'tip shops' which deliver an 'end-of-pipe' waste solution.

There are significant economic and job creation opportunities from a strategic approach which builds an enhanced recycling industry. Access Economics (2009) undertook research for the Commonwealth Government which found:

- On a national basis, for each 10,000 tonnes of waste around 9.2 full-time employees (FTE) were directly employed for recycling, compared to 2.8 FTE for landfilling the same amount of waste. In Tasmania this equated to a ratio of nearly 4 times the number of jobs created by recycling compared to landfill disposal.
- An indirect employment multiple for the waste and recycling industry of approximately 0.84. For Tasmania, this equated to around 750 direct and 630 indirect jobs reliant on the waste and recycling sector in 2008.
- The average wage of recycling employees across Australia in 2008 was $112,000, compared to $82,000 for waste employees.
- The annual turnover of recycling organisations was around $530 per tonne, compared to landfilling activities which equated to around $73 per tonne.

These findings indicate that if Tasmania was to achieve diversion figures similar to the targets in Victoria, NSW and SA (ranging between 65-90%), an additional 360-500 direct and 300-420 indirect jobs would be created. Given the differentiation between waste and recycling salary and turnover, the "value-add" of recycling activities is also likely to improve the outcomes for the Tasmanian economy.

8. Opportunities & barriers

Australian governments have driven improved waste outcomes by a mix of:

- policy initiatives, including the establishment of diversion or recovery targets by sector or material type, and supported by relevant regulations
- financial incentives and disincentives, including the establishment of a levy on landfilled waste, rebates for material recovered, and funding assistance for services and infrastructure
- market research to identify needs and provide support (sometimes financial support) for further development of relevant markets
- organisational drivers of change (particularly the establishment of bodies such as Sustainability Victoria, Zero Waste SA, etc.) to collaborate with stakeholders across the waste and recycling sector and take responsibility for initiating action.

There are opportunities to build on these in the Tasmanian context.

Opportunities were to have been identified on the basis of those which were readily achievable, met community expectations, were environmentally significant, economically sustainable and had strategic value; however some adjustment to the criteria was needed due to significant data gaps and local circumstances. There is little information available on the expectations of the Tasmanian community on waste and recycling. Improvement to existing programs is also subject to additional funding, as the current $2-5/tonne notional levy will not support the introduction of any programs which provide significant strategic value. Hence the identified opportunities will only be economically sustainable with guaranteed on-going government funding or the introduction of a waste levy. As the latter is more likely, and its introduction has a number of hurdles yet to overcome, none of the opportunities could be deemed to be readily achievable.

The opportunities discussed below have therefore been selected on the basis of those which have strategic value, are likely to be successful based on implementation experience and community expectations in other jurisdictions, reflect waste/recycling industry realities and economics, and are likely to deliver optimum outcomes for resource recovery and best practice environmental management of waste.

8.1 Systemic reform

The Tasmanian Waste and Resource Management Strategy (DEPHA 2009) established a vision for future waste management in Tasmania and outlined a number of strategic actions. However delivery of the strategy has been hampered by a lack of resources (both financial and human resources) and gaps in data collection systems (which in turn hampers monitoring of performance). The strategy has overseen improved collaboration among stakeholders and improved communication channels (particularly through WAC), but implementation of actions on the ground has been slow. Implementation of the strategy's actions is likely to remain sluggish until legislation establishing a waste levy or other funding mechanism is enacted.

Based on interstate experience, improvements to all of the waste streams targeted in this project are likely to be realised with implementation of strategies related to the following fundamental issues.

Financial incentives

Recycling is relatively expensive in Tasmania because most materials need to be exported and economies of scale are lacking[3]. Conversely, the alternative to recycling – landfill – is cheaper than other states because there is no levy on waste disposal. Landfill levies have been utilised in other Australian jurisdictions to establish a price differential between landfilling and recycling, which is communicated publicly to waste generators to incentivise recycling behaviours. These financial incentives do not currently exist in Tasmania.

There has been much debate in Tasmania in recent years regarding the establishment of a state-based mandatory hypothecated waste levy. There would now appear to be overall support by most stakeholders for the introduction of a levy, however it is yet to be established through legislation. Given the current election cycle, any government moves in this direction are likely to be delayed until at least 2015. However additional funding for waste minimisation and recycling initiatives is critical for any improvement on the status quo to be achieved. This is most equitably provided on a 'user-pays' basis as proposed by landfill levy arrangements, and its timely introduction should be supported.

Interstate levy funds have facilitated substantial diversion of MSW, industrial waste and organics through funding support for development of recycling infrastructure (at both the municipal and industrial level), market development initiatives, investigations of appropriate technologies, resource efficiency advice, coordination and promotion activities. The levies have also provided the price signals needed to establish recycling in preference to landfill disposal. This has been important to attract large volumes of material to recycling facilities and establish the economies of scale that help to make recycling viable.

We note that while there appears to be bi-partisan support for a levy, a lengthy process of negotiation, preparation and enactment of regulations, and system development still needs to be undertaken. This process may raise a number of barriers including stakeholder factionalism, lack of public and industry support, economic impacts, etc. These and other barriers have been overcome in other Australian jurisdictions which introduced a levy and Tasmania can learn from these experiences.

Coordination

Regulatory arrangements establishing a waste levy are likely to involve strengthening the objectives, outlining clearer roles and reporting structure, and providing additional resources for the WMGs – all are important in establishing the framework for implementation of the *Tasmanian Waste and Resource Management Strategy,* as well as improving management of the targeted waste streams.

The three WMGs provide an important conduit for coordination of waste and resource issues between state government regulation and local government implementation. However with changes to the existing governance arrangements, there is a range of opportunities for WAC to engage with WMGs to provide a more strategic approach to the following:

- development of industry sector-based approaches to provide guidance on waste and recovery issues
- working with industry sectors to encourage resource efficiency and innovation in product design to avoid waste generation
- cooperative market development strategies for recovered materials
- research projects to establish feasible options for regional and municipal waste initiatives
- information-sharing networks which build waste/recycling knowledge and capacity
- coordination of infrastructure development (particularly in industrial waste recycling)

[3] The cost of exporting a container of waste paper from Tasmania is currently about $1,500 per tonne, compared with about $450 from Melbourne (Beard, pers. comm.).

- coordination of communication and education programs.

The major barrier to establishing the enhanced role and responsibilities of WAC and WMGs is financial and resource support. There are also issues of negotiation and consensus around the re-structure necessary to align the governance arrangements of the WMGs.

Information database

As evident in previous discussion in this report, there are a large number of gaps in information on waste generation and recycling in Tasmania. While the *Tasmanian Solid Waste Classification System* is used for EPA landfill reporting purposes, many transfer stations do not record data at all or do not collect data on recovered material. There is also a lack of understanding on the scale and focus of recycling markets.

The establishment of future minimisation targets (as proposed in the *Tasmanian Waste and Resource Management Strategy*) is constrained by a lack of information on the current performance of waste management systems. Development of optimum strategic approaches is also inhibited by a lack of knowledge of the relative contribution of specific waste and material types, and the capacity of recycling markets.

There is a need for a more comprehensive database of waste and recycling information that can establish current performance, identify key areas where improvement can be made and measure performance. A framework for data collection should be established widely across all waste and recycling facilities in Tasmania. This could be built on the *Tasmanian Solid Waste Classification System* and expanded as necessary. Regular surveys of the Tasmanian recycling industry could also be carried out to ensure the database encompasses recycling market information as well as waste generation information.

The cost of establishing data collection systems at all waste facilities can sometimes be a cost impost on councils, particularly small councils with limited resources. However there is also acknowledgement by councils of the management advantages of understanding their waste stream. Cost barriers can usually be overcome with a mixture of levy funding support (e.g. establishing an on-line database system) and regulatory reporting responsibilities.

Some stakeholders (especially commercial recyclers) express reservations about providing data without assurances about the data repository, provisions of access and use to which it would be put. This can especially be the case where data vests with the EPA, as there may be concern information provided could be used against them by the environmental regulators. For this reason, WAC may need to initiate receipt of the information and management of the database, with organisational 'walls' between WAC and EPA access. There would also need to be assurances given around commercial confidentiality of the information and limitations on access by competitors.

Market development

Successful recycling programs depend not just on supply of material, but demand for finished products. More information is needed on the current markets for end-products, potential markets and their relative capacity for growth. Material and industry-specific market strategies need to be developed for the options which show greatest potential.

The development of detailed market strategies rely on the level of information available; the database discussed above will be important in this regard. Equally important is the responsibility for implementing strategic market actions. In some other jurisdictions this has been undertaken by a dedicated resource, e.g. a market and industry development officer has overseen growth of the recycled organics market. The

latter has variously been funded by a state-based resource recovery authority (e.g. Sustainability Victoria) or at a national level by the Waste Management Association of Australia.

Each market is different for different products; development opportunities for specific waste types are discussed in Section 8.2 where applicable.

There is also potential to grow local markets by furthering competition among industry players. As opportunities arise, government stakeholders could encourage the participation of large waste companies not currently in the Tasmanian marketplace. Subject to success in normal tender processes, this could see new entrants contributing to local economies, employment opportunities, industry skill-base and recycling viability in Tasmania.

8.2 Waste types

In addition to structural and funding reform, there are opportunities for improvement in management of each of the targeted waste streams as discussed below.

We note there are currently fundamental resourcing barriers to their implementation (including a lack of both human and financial resources). A funding support system (e.g. levy) would need to be established prior to execution.

MSW

Opportunities for future MSW initiatives include:

1. Councils could be encouraged (and potentially subsidised) to change collection systems to those which optimise resource recovery. This would include reducing the size of garbage bins and the phasing out of all recycling crates, and moving over time to a standard combination of 80 L or 120 L garbage bins and 240 L recycling bins to maximise diversion rates.
2. While Tasmanian recycling service capabilities are on par with other jurisdictions, performance is not. This indicates there is potential to improve the recovery rate through additional diversion. This can only be achieved with enhanced community education and promotion of recycling. Increased cooperation and coordination of recycling awareness programs between WAC, WMGs and local councils will assist in this area. Community education programs should also address contaminants and the impact the current high level of contamination has on recycling activities. Note the viability of MSW recycling is likely to improve with greater economies of scale. This may be achieved as a result of increased diversion, both in the MSW and industrial waste streams.
3. The standard of operation and management of existing waste facilities should be assessed against best practice and opportunities for improved management systems considered. This would identify the scope of any infrastructure upgrades needed and may see potential for rationalisation of waste facilities in some cases. While there can be reluctance at community and council level to reduce the number and availability of waste disposal points, the establishment of regional and/or sub-regional facilities could deliver a number of financial, best practice and feasibility advantages.

Industrial waste

Potential opportunities for increasing recovery of industrial waste are discussed below.

1. It should be possible to cheaply recover some materials from industrial sources at landfill sites using manually operated plant. Metals, timber, cardboard, plasterboard and concrete would be candidates, as would garden organics. Loads potentially containing high proportions of recyclable material could be asked to unload in a designated area close to the tip face where the material could be readily examined and sorted.

2. Local government recycling collections could be extended to commercial premises. It is understood that some councils collect recyclables from commercial premises but many do not. Councils could potentially offer businesses a service identical to that provided to residents. Typically this would have a net cost. Equilibrium (2013) indicates that the cost of collecting recyclables in Tasmania ranges from $150 to $400 per tonne and averages about $215 per tonne, whereas the average value is $90 per tonne. This money would have to be recouped through the rates or a direct charge.
3. Facilities that produce large quantities of waste that is not sorted for recycling could be identified in coordination with waste companies, and provided with technical advice on the potential for improved recycling. It is understood, for example, that a chicken business produces large quantities of plastic that is unsuited to recycling due to contamination. Advice and assistance to identify the reasons for the contamination and means to prevent it would enable that material to be recycled.
4. Mobile equipment for crushing and baling at smaller facilities may be able to reduce the economic viability threshold for recovering some materials. Mobile C&D waste screening and crushing is occurring at some locations and could potentially be expanded, taking into account experience to date.
5. Recycling planning, contracting and infrastructure undertaken by all levels of government in Tasmania focuses on municipal sources and gives little consideration of industrial waste. Key waste infrastructure consequently tends to provide for municipal waste only. For example, the Veolia materials recovery facility in Derwent Park is not well geared to deal with materials from commercial sources, even if those are comingled in much the same way as municipal waste collections – the cardboard pieces, for example, tend to be too large (Mika, pers. comm.). Increased consideration of industrial waste at the planning stages could allow for increased recovery and better economies of scale.
6. Energy recovery at Cement Australia's Railton kiln may be an option for some streams of clean high-calorific value materials such as plastics, cardboard or some controlled wastes. It is understood that the company is actively seeking sources of alternative fuel. Potential waste streams would need to be identified in consultation with the owners and local waste management companies.
7. Procurement policies and standards for road base materials at state and local level should provide for use of recycled concrete as an alternative to virgin gravel, as a means of stimulating demand.
8. Plasterboard could be recovered and recycled in composting operations. Plasterboard is potentially damaging in landfill as it is primarily gypsum, which attacks clay liners.

Clinical & quarantine waste

Contingency arrangements are needed so that untreated clinical wastes do not need to be disposed of in landfill, which is inconsistent with BWI (2010) guidance. The contingency could be a back-up shredding system or refrigerated storage at the Lutana transfer station, or establishment of an additional treatment facility, potentially in Northern Tasmania.

Pit waste & sludges

A key barrier to improved management of pit waste and sludges is regulatory uncertainty. Water servicing and transport companies should be required to improve performance or face enforcement action. Waste companies need to be confident that competitors are meeting the required standards. The authors received anecdotal reports of companies losing business in relation to controlled waste on prices believed to be inconsistent with appropriate management. Tracking of controlled wastes in most jurisdictions grew from a history of incidents of substandard management and dumping. Those risks remain.

There are opportunities for composting of organic controlled wastes. If managed appropriately, this approach can be environmentally benign or beneficial, and can provide a good income stream to composters.

Organics

Opportunities for improved organics management include:

1. Investment in new and upgraded composting facilities: This is needed to create capacity to process recovered garden and food organics as well as C&I and controlled waste organics. Although the Hobart area has a number of composting operations capable of processing these materials, the Northern and Cradle Coast areas have limited capacity for the recovery of such materials, with only the Dulverton organics recycling facility having capacity to process a larger and diverse range of organics. Existing facilities have limited capacity for expansion using open windrow technology due to odour risk, and investment is required in more controlled technologies to allow processing of more organics and organics with higher odour risk such as food, sludges, grease trap waste, wastewaters and other organic controlled waste.

   The main barriers to such investment are likely to include:

   - Appropriate siting and community acceptance of new facilities. Organics processing facilities have inherent odour risks, and in many instances existing sites have a history of odour incidents; proposed sites may be opposed by neighbouring communities. Sites need to have appropriate systems for the management of odour risks as well as appropriate buffer distances in case of system failure. This can limit the availability of sites and also require higher levels of investment in land, technologies and odour management systems.
   - Economies of scale. Higher investment in processing infrastructure can increase the required throughput of organics needed to make facilities financially viable. It may also necessitate higher gate fees for the receival of organics, which would act as a disincentive to greater recovery of organics. This can in part be overcome by councils consolidating organics streams (and increasing organics recovery rates) and sending materials to central regional or sub-regional facilities. The economies of scale of new facilities can also be improved if the technologies used reduce labour and fuel costs and/or produce higher value organic outputs.
   - Logistical support. A move to more controlled organics processing and larger regional/sub-regional facilities will require investment in systems for consolidating waste for transport to the central facilities. Investment may be required in upgrades of transfer stations for more efficient transfer of organics to central sites. Investment in organics recovery systems, including kerbside organics recovery systems will also be required.

2. Energy recovery from organic wastes and other biomass: There is potential to recovery energy from organic waste. Possible technologies include anaerobic digestion (AD) to produce bio-gas or thermal energy recovery. AD technologies are best suited to processing organic-rich wastewaters, sludges and pulverised food waste. Although there are a number of AD technologies designed to process solid waste, they generally have limited capacity to process woody garden organics or organics containing physical contaminants. Thermal technologies range from basic incineration, to fluidised bed gasifiers, to more advanced gasification and pyrolysis systems. These technologies are generally best suited to processing drier and woodier materials and perform best with consistent organic input streams. Although higher moisture streams can be processed, these will reduce the energy yield of facilities. High calorific food wastes containing fats and oils can be processed through such technologies. There may be potential to co-locate energy recovery facilities with industries or institutions with a need for heat or power.

The main barriers to the establishment of such facilities are likely to be cost and economies of scale, appropriate sites and community license to operate, and the securing of C&I and controlled waste feedstocks.

3. Market development to develop and promote recycled organics products to viable markets: At present, most recovered organics are apparently sold into the urban amenity (home garden and landscaping) markets, with some sales into agriculture and horticulture. At smaller facilities, low grade mulches from transfer stations are used for council operations or in landfill management and rehabilitation, and therefore not 'marketed'. In the event recovery rates are increased, there may be need to develop new markets for recycled organic outputs. Further work is needed to identify the potential for urban amenity and agricultural/horticultural markets to absorb additional outputs.
4. Increasing organics diversion through the introduction of kerbside organics recovery services for garden and food organics as well as the promotion of waste reduction and on-site composting. A number of Tasmanian councils have trialled or are considering the introduction of regular kerbside organics collection services for garden organics or garden and food organics. Recovery services for garden organics only can be effective in reducing organics in garbage bins, but also typically attract significant volumes of 'additional' garden organics that are not currently disposed via kerbside garbage. Garden and food organics recovery services can have a more significant impact in reducing organic waste to landfill, but typically require higher levels of investment in processing technologies to manage contamination and odour risks. It is suggested WAC promote the introduction of kerbside organics recovery services that have capacity to divert food organics.

9. Conclusions

The outcomes of current waste management practices in Tasmania are mixed. While some progress has been made in recycling in the MSW sector, little headway has been made to improve recovery of C&I, C&D or organic waste. The management of clinical and quarantine waste, and pit waste and sludges are generally consistent with regulatory requirements, although some anomalies have been identified.

Information on Tasmanian waste practices is patchy, with large gaps in data by both waste sector and geographic area. There is little information on community waste and recycling expectations, the standard of operation of waste facilities, or the scale or source of industrial waste generation.

While recycling systems are generally well-established for comingled recyclables from domestic sources, based on interstate performance there would appear to be significant under-utilisation of these systems. The low capture rate of recyclables is also reflected in other sectors (including C&I and C&D waste), impeding the economies of scale necessary to reduce the economic barriers to recycling in Tasmania. The feasibility of recycling is further undermined by the lack of local markets and re-processors, and the need to transport materials to the mainland or direct to Asian markets. This adds a further cost impost to local recycling endeavours. Major improvements are unlikely without significant regulatory intervention or changes to the economics of recovery.

A number of opportunities have been identified according to systemic reforms required and potential initiatives according to each of the targeted waste streams. Relevant recommendations are detailed below and incorporate a ranking in priority. However we note that all of these initiatives are dependent on the injection of funding additional to the current WMG contribution, which is likely to come only with the introduction of a state-based waste levy.

Recommendations

Systemic reforms:

	Action	Priority
1	Introduce a larger price differential between recycling and landfill disposal in order to provide financial incentives for recycling. This may be achieved in part by introduction of a levy on landfilled waste, however, depending on the scale of the levy, additional price adjustments may need to be made to overcome the effect of low landfill fees that currently apply in Tasmania.	High
2	Amend the governance arrangements of WAC and the three WMGs to better align their roles, responsibilities and reporting structure. This may be undertaken in conjunction with implementation of the proposed waste levy via enabling legislation.	High
3	Establish a framework for cooperation and collaboration between WAC, WMGs and industry to facilitate improvements to C&I and C&D waste management and resource recovery.	High
4	Establish a mechanism for more comprehensive collection of data on Tasmanian waste generation, contribution by source, materials recovered and recycling industry activity. Ensure information database management addresses stakeholder issues regarding access and confidentiality.	High
5	Undertake market research on current and potential markets for recovered materials and the capacity for growth in targeted waste streams. Develop feasible market strategies and provide sufficient resources (human and financial) to oversee implementation.	High
6	Encourage the entrance of new players in the waste/recycling industry, including large companies with international experience.	Medium

Targeted waste stream:

	Action	Priority
	MSW	
7	Encourage the introduction by councils of garbage and recycling bin configurations which optimise resource recovery (i.e. 80 L or 120 L garbage bins and 240 L recycling bins).	Medium
8	Improve community participation in recycling and reduce contamination through enhanced education and awareness programs.	Medium
9	Assess the standard of management and operation at existing waste facilities in order to identify any necessary upgrades or potential rationalisation opportunities.	Medium
	Industrial waste	
10	Establish diversion programs for industrial waste at existing landfill sites.	High
11	Encourage councils to extend household kerbside recycling collection services to commercial premises where appropriate.	Medium
12	Liaise with industry participants to identify and overcome any barriers to recycling.	Medium
13	Consider supply of mobile equipment to allow smaller waste facilities to process C&D waste.	Medium
14	Consider opportunities for industrial waste recovery when planning for waste/recycling infrastructure.	Medium
15	Explore the potential for energy recovery from industrial waste streams, particularly at Cement Australia's Railton kiln.	Medium
16	Work with state transport authorities to ensure procurement policies and standards do not inhibit the use of recycled materials as road base.	Medium
17	Establish recovery and recycling programs for plasterboard.	Medium
	Clinical & quarantine waste	
18	Ensure contingency arrangements are in place that manage clinical waste appropriately when existing systems fail.	Medium
	Pit waste & sludges	
19	Ensure regulations on approved management methods for pit waste and sludges are enforced.	High
	Organic waste	
20	Encourage investment in new and upgraded composting facilities and alternative technologies (including energy from waste facilities) which allow processing of organics with higher odour risk, including food organics, pit waste, sludges, industrial waste, wastewater and other organic controlled waste.	Medium
21	Work with stakeholders to develop products and markets for bio-mass energy and recycled organic outputs from organics recovery operations.	Medium
22	Promote reduction in the production of wasted organics through strategies such as low waste food use and low waste gardening by households, and eco-efficiency by businesses.	Medium

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