Interim report: Economic opportunities for Queensland's waste industry

VERSION FOR PUBLIC RELEASE

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PREPARED BY QUEENSLAND TREASURY CORPORATION
Queensland Treasury Corporation (QTC) has been engaged by the Department of Environment and Science (DES) to look at the economic opportunities for Queensland’s waste industry.

The disposal of waste into landfill represents a lost opportunity. It is estimated\(^1\) that 10,000 tonnes of waste going into landfill supports 2.8 full-time equivalent (FTE) jobs. Recycling that same waste is estimated to generate 9.2 FTE jobs, in addition to reducing greenhouse gas emissions, avoiding the unproductive use of land and minimising potential environmental issues.

**Key observations**

According to the 2016 Australian National Waste Report (ANWR), Queensland’s waste recovery rate of 48 per cent is the second lowest of the eight states and territories.

Since completing the Interim Report in 2017, DES Queensland waste data for FY2017 has become available and though not detailed in this version, the updated data support the conclusions and observations detailed in the Report.

The chart depicts the performance of eight Australian jurisdictions on a per capita basis. Key issues related to Queensland’s performance include:

- **Growth in Queensland’s waste per capita has outstripped population growth by 11 per cent over the last eight years.**
- **The state’s recovery rate is virtually unchanged over the same period and is almost 30 per cent below the top performing jurisdiction (South Australia, at 77 per cent).**
- **To reach the national average recovery rate (61 per cent), Queensland would need to recover an additional 1.5 million tonnes of waste, a 38 per cent increase on the volume currently recovered.**
- **Queensland’s nominated recovery targets for 2024 would deliver an overall recovery rate of 63 per cent. This is below the recovery rates currently being achieved by the top four Australian jurisdictions.**
- **For almost every region and type of waste, Queensland’s requirement for additional waste infrastructure to meet the nominated 2024 recovery targets has been assessed as significant.**\(^2\)
- **For the nine months to March 2017, Queensland received 527,000 tonnes of waste from New South Wales. On an annualised basis, this represents a 30 percent increase on FY2016 and more than double the volume transferred in FY2015.**

**Policy framework**

The Queensland Waste Avoidance and Resource Productivity Strategy (2014-2024) sets a framework of guiding principles and objectives and priority areas which underpin the development of action plans. Its vision is for Queensland to become a national leader in waste management. Based on Queensland’s current weak position and the issues outlined previously, the vision appears unattainable without significant change.

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\(^1\) FTE estimates for types of waste were reported in a 2015 Deloitte Access Economics report, *Economic Effects of the South Australian solid waste levy*

\(^2\) Arcadis Queensland Waste and Resource Recovery Infrastructure Report, February 2017
A number of European countries, such as the Netherlands and Sweden, have recovery rates of 98 per cent or higher, with a significant proportion of that through energy recovery. South Australia’s recycling rate of 74 per cent (excludes energy recovery) puts them as a world leader in recycling.

The waste management hierarchy and principles adopted in Queensland are almost identical to those of other Australian and overseas jurisdictions. But despite the same philosophies, the outcomes achieved are dramatically different.

Instruments for effective waste management
A review of best practice in waste management shows that an overarching policy framework is required to guide behaviours, create collaborative networks, support the right investments, develop desired outcomes and report on progress, provide high quality data collection and assessment, sustain rigorous monitoring and compliance activities, clarify roles and responsibilities and promote best practice activities to government, business and the community.

To achieve results however takes time and requires government to provide a consistent policy approach to give industry certainty for investment decisions. It appears to also rely on a few key instruments to promote industry and public support.

A foundational element in any jurisdiction with a high recovery rate is a landfill levy. This instrument has a dual purpose as a:
- market signal to reduce waste generation and increase recovery, and
- source of funding for reinvestment into the waste sector.

The lack of landfill levy in Queensland has resulted in increased transfers of waste from other states. In the absence of a consistent national approach on levies, the uncertainty created for industry may be acting as a drag on lifting the recovery rate.

Five Australian jurisdictions have a landfill levy and four of them\(^3\) will collect a total of $1 billion in landfill levies in FY2017. These funds are used to support local governments, infrastructure, public education programs and innovation, and to target specific issues, such as hazardous waste, organics, litter and illegal dumping. Over nine years, New South Wales’ *Waste Less, Recycle More* program plans to invest over $800 million in improving management of the state’s waste.

The landfill levy and the funding it provides are complemented by landfill bans and product stewardship, including plastic bag bans and container refund schemes.

Based on the interim analysis to date, an optimal waste management scheme has:
- a coordinated nationally consistent approach to waste management, supported by industry
- a regional approach to planning and funding for waste infrastructure
- economic expansion and investment where necessary
- a comprehensive suite of waste management tools underpinned by a landfill levy
- high quality data to enable informed decision making
- established key performance indicators/ stretch targets, with transparent reporting and monitoring
- increased employment opportunities through waste infrastructure and program investment, and
- the ability to facilitate emerging industries using diverted waste (e.g. biofuels).

Successful jurisdictions are adaptive to changes in behaviours and unintended consequences, adjusting their policy and instruments accordingly. In some European jurisdictions, where positive waste management practices are seen as entrenched and disposal to landfill is negligible, landfill levies are being removed.

Next steps
This interim report is focused on the current performance of the industry in Queensland, the waste management outcomes being achieved in other jurisdictions, and identification of the key instruments (market based and regulatory) adopted in jurisdictions with higher recovery rates.

Building on this interim analysis, QTC will:
- assess the effectiveness of the instruments identified above
- consider whether they could be effectively adopted in Queensland, and
- recommend options to DES that should facilitate economic opportunities and improved waste management outcomes for the state.

Based on Queensland’s current disposal to landfill and the Deloitte Access Economics’ employment ratios, there is potential for the creation of 3,000 additional direct jobs from improved waste management practices.

\(^3\) NSW, Victoria, Western Australia and South Australia. The Australian Capital Territory collects a disposal fee that is not separately disclosed in its budget papers.
To test and validate its recommendations, QTC will engage with relevant Queensland departments, other jurisdictions, the waste industry and consultants, and undertake in-depth analysis and modelling based on the data available.
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1 Project parameters

1.1 Background and purpose
The Department of Environment and Science (DES) is currently undertaking a review of the Queensland Waste Avoidance and Resource Productivity Strategy 2014-2024 (the Waste Review). DES has engaged Queensland Treasury Corporation (QTC) to assist with the Waste Review, specifically looking at the economic opportunities for Queensland’s waste industry.

An Interdepartmental Committee consisting of representatives from the Department of Infrastructure, Local Government and Planning (DILGP), Department of Tourism, Major Events, Small Business and the Commonwealth Games, Department of State Development (DSD), Department of the Premier and Cabinet and Queensland Treasury (QT), have been established to provide input into the waste review.

The overarching vision of the current Queensland Waste Avoidance and Resource Productivity Strategy 2014-2024 (Queensland Waste Strategy) is for Queensland to become a national leader in avoiding unnecessary consumption and waste generation, adopting innovative resource recovery approaches, and managing all products and materials as valuable and finite resources.

The Queensland Waste Strategy is guided by a number of key principles, objectives and priorities (Appendix A provides a summary of the Queensland Waste Strategy framework). There are a number of action plans yet to be defined, which will lay the foundations for the strategy to be implemented.

1.2 Scope
QTC has been engaged to:

- Compare investment and employment levels in the waste industry in Queensland against the other mainland states and associated outcomes in recycling and resource recovery rates.

- Identify:
  - the drivers of any difference in the investment and employment, including different state-based regulatory or policy settings
  - what, if any, market based instruments are used by other states to drive investment and employment in the waste industry
  - whether and how these market based instruments contribute to higher recycling and resource recovery rates, and
  - how these market based instruments in other states contribute to interstate movement of waste into Queensland.

- Make recommendations on whether any opportunities for investment and employment in Queensland’s waste industry could be achieved through the use of market based instruments, or by amending any elements of Queensland’s existing regulatory framework.

1.3 Approach
QTC has split the work into two discrete parts, an interim report (this report), summarising the key findings of the jurisdictional review, an overview of the waste industry in Queensland and other jurisdictions based on available data, and identification of the key measures to be investigated in the final report. The final stage report (final report) will recommend the market based instruments and amendments required to Queensland’s existing regulatory framework to provide opportunities for investment and employment in Queensland’s waste industry.
1.4 Sources of information
For the interim report the sources of information were:
- Queensland waste data provided by DES
- other relevant external consultant reports provided by DES
- Queensland waste infrastructure data sourced from the Arcadis review\(^4\), and
- desktop research.

1.5 Limitations
As noted in more detail later in this report, data quality is an issue in all Australian jurisdictions. The confidence level for the accuracy, reliability and comparability of data is therefore moderate. This report focuses on trends and material differences in performance.

We also note, limited stakeholder engagement has been undertaken as part of the interim report (desktop review). In-depth stakeholder engagement will be undertaken in the next phase of the engagement (final report). Some information, particularly on the use of the levy funds will be verified for the final report.

\(^4\) Arcadis - Queensland waste and resource recovery infrastructure report (prepared 7 February 2017)
2 Definition and descriptions of key waste terms

This section provides a brief summary of the waste streams and waste infrastructure referred to in this report. An overview of the waste logistics and value chain is also provided as it provides some context with regards to the waste management touch points from waste generation to the disposal and/or recovery of waste.

To ensure consistency in terminology used within this report, the waste definitions align with the recent Waste and Resource Recovery Infrastructure Report for Queensland commissioned by DES and prepared by Arcadis Australia Pacific (Arcadis). The report provides a comprehensive assessment of waste infrastructure across Queensland.

2.1 Waste streams

There are three main waste streams referred to in this report, which are detailed below:

**Municipal Solid Waste (MSW)**

Waste that is produced primarily by households and similar properties, including recyclable and non-recyclable material, which is collected by, or on behalf of, councils. Also includes other waste collected by councils such as from public bins and council operations.

Based on definitions adopted from the DES annual survey of local governments, MSW includes:

- kerbside waste collected from households including residual waste, recycling and green waste
- waste from street bins and public places (both residual and recycling)
- litter and illegal dumping cleaned up by councils
- bulky items and hard waste collected during regular (usually annual) collections
- domestic waste that is self-hauled to transfer stations, resource recovery centres and drop-off points, including residual waste, recycling, bulky / hard waste and green waste, and
- disaster waste collected from or delivered by residents.

**Commercial and Industrial (C&I)**

Waste that is produced by institutions and businesses, including industries, restaurants and offices. C&I waste can include:

- commercial residual waste, commercial recycling and commercial green waste
- industrial organic wastes such as food processing residues, commercial food waste, forestry residues, agricultural residues and manures, grease-trap waste, abattoir waste
- other industrial wastes such as drill muds, ash, sludges, oils and other regulated wastes, and
- disaster waste from commercial sources.

**Construction and Demolition (C&D)**

C&D waste is produced by demolition and building activities, including road and rail construction. C&D waste can include:

- soils (although clean fill is reported separately)
- timber and wood waste
- particle board, plasterboard and plywood sheets
- concrete, bricks, tiles and other masonry
- asphalt
- glass and plastic, and
- packaging from construction including plastics and cardboard C&D waste is often collected from construction sites in skip bins of various types so is delivered to waste facilities as a mixture of the above materials.

C&D waste may also include asbestos, clean earthen materials (clean fill), acid sulphate soils and contaminated soils; however these are reported separately to DES.

2.2 Key waste and resource recovery infrastructure

Broad infrastructure categories:

- Transfer infrastructure: receive and consolidate waste material so they can be efficiently transferred for recovery, processing or disposal.
- Recovery infrastructure: a sorting facility that processes mixed waste streams to recover material streams that are then suitable for reprocessing, including the production of fuel.
- Reprocessing infrastructure: conversion and refinement of sorted waste streams and recovered materials into useful products or feedstock for manufacturing, including dry and liquid recyclable materials, conversion of organics wastes into products and conversion of waste into energy.
- Disposal infrastructure: disposal of waste, either to landfill or through incineration.
Further information on the specific waste management facility types under each category is provided below:

Transfer infrastructure
- **Transfer station (TS):** A facility allowing the drop-off and consolidation of waste and a wide range of recyclable materials. Most are council-owned but some are privately owned servicing commercial customers. A TS can be combined with a resource recovery centre and other facilities or a landfill site.
- **Resource recovery centre (RRC):** A facility that receives reusable and recyclable waste materials.
- **Drop-off facility:** A small facility that receives selected waste, recyclable and hazardous materials and household items dropped off by householders for recycling and reuse, or appropriate disposal. May include rural bin stations.

Recovery infrastructure
- **Materials recovery facility (MRF):** A facility that receives and sorts either source separated commingled recyclables (clean MRF) or mixed waste (dirty MRF). Materials are sorted through mechanical and manual processes, then consolidated (compacted and baled) and sent to reprocessing facilities. Residual materials are sent to landfill or for energy recovery.
- **C&D recycling facility:** A facility that typically receives and sorts mixed C&D waste (such as that collected in skip bins).
- **Mechanical biological treatment facilities (MBT):** Also known as alternate waste treatment (AWT), a facility that processes mixed putrescible waste (typically organic wastes from MSW and C&I) to separate recyclables and an organic fraction from the residual waste. The recyclables are sent to re-processors. The organic fraction is processed biologically on site (anaerobically and/or aerobically) to produce a soil improver and/or recover energy. Residual waste is sent to landfill or for energy recovery.
- **Refuse derived fuel production facility (RDF):** A facility whose primary purpose is to process mixed waste (MSW, C&I, C&D, Regulated waste) into a fuel product. The facility does not recover energy from the waste or fuel on site. Fuel products may be solid, liquid or gaseous. Residual materials are sent to landfill. A dirty MRF may also function as an RDF facility.

Reprocessing infrastructure
- **Organics Processing facilities:** A facility that changes the physical and/or chemical structure of putrescible organic materials, to add value to the material so that it can re-enter the economic cycle. Outputs are most commonly soil improver and mulch products, or in the case of digestion facilities, energy may also be produced. Organics processing facilities can typically process a range of organic wastes including food waste, green waste and timber; as well as agricultural and forestry residues.
- **Dry Reprocessing facilities:** A facility that changes the physical and/or chemical structure of dry recyclable materials, to add value to the processed material so that it can re-enter the economic cycle or become a feedstock for a manufacturing process. Reprocessing facilities typically manage single-stream materials such as paper / cardboard, glass, plastics and metals.
- **Liquid Reprocessing facilities:** A facility that changes the physical and/or chemical structure of liquid wastes to add value to the processed material so that it can re-enter the economic cycle. Materials processed may typically include waste oils and solvents.
- **Energy-from-waste facilities (EfW):** A facility that converts waste (including RDF) into energy (including heat, electricity, gas or liquid fuels) for which there is an economically viable end-use. Technologies can include, but are not limited to: anaerobic digestion, combustion, pyrolysis, gasification, and plasma gasification.

Disposal infrastructure
- **Landfill:** A facility where waste is placed into or onto the ground, usually into an engineered and lined cell, where it is then compacted and covered for long-term containment. Three broad types of classifications:
  - Putrescible waste landfills - which accept all solid wastes, including inert wastes, and excluding industrial hazardous wastes. These are the dominant landfill types and are deployed to service most cities and towns.
  - Inert waste landfills - which accept all solid wastes, excluding industrial hazardous wastes, MSW, C&I and C&D biodegradable wastes, hazardous household wastes and electronic wastes (e-waste).
  - Hazardous waste landfills - which accept hazardous industrial and household wastes.
- **Incinerator:** A facility that disposes of waste through burning in a controlled manner that does not generate a useful end product or recover energy.
2.3 Waste logistics and value creation chain

The waste management industry is central to the chain of activities triggered when waste is produced by households, businesses and government agencies. The discarded material goes through a number of processes along its journey to the final destinations being disposed to landfill, recovered for recycling or converted into energy. The waste journey is illustrated in Figure 1 below.

**FIGURE 1: WASTE LOGISTICS AND VALUE CREATION CHAIN**

Source: National waste reporting 2013
3 Current state of the waste sector in Queensland

3.1 Waste trends (generated and recovered)

3.1.1 Waste per capita trends
Data demonstrates variability in the volume of waste generated per capita in Queensland over the period FY2008 to FY2016, illustrated in Figure 2 below. It is possible this variability is driven by incomplete data, which is noted as an issue across the waste industry both within Queensland and other Australian states and territories. Overall there is a long-term trend of increasing waste per capita. The average tonnage per capita has increased from 1.7 tonnes in FY2008 to 1.9 tonnes in FY2016, representing a 10.6 per cent increase over this period, or 1.3 per cent per annum.

As illustrated in Figure 3, since FY2013 the MSW and C&I per capita on average has been slightly declining. However the C&D has increased significantly since FY2012 increasing from 0.4 to 0.8 tonnes per capita (100 per cent increase), which is the key driver of the increased waste per capita in recent years. The increase in C&D is partially driven by the increase in interstate waste flows, following the repeal of the landfill levy (further details provided in section 3.6).

3.1.2 Waste total tonnage trends
Recent data indicates that in Queensland the rate at which waste is generated outstripped the rate of population growth by almost 11 per cent. Over the period FY2008 to FY2016 total waste increased by 27 per cent (or 3.4 per cent per annum) to 9.2 million tonnes. Over the same period the population grew by 15 per cent, or 1.9 per cent per annum. This is depicted in Figure 4 and Figure 5.

In Queensland the observed growth in waste recovery of 31 per cent over the period FY2008 to FY2016 has largely matched the growth in waste generation of 27 per cent over the same period, illustrating a marginal improvement in recovery rates.

The Queensland results are in contrast with the whole of Australia results. Over the period FY2008 to FY2015 there has been an 8 per cent increase in waste generation compared with a 27 per cent increase in waste recovery. It is noted that Queensland has a similar population growth rate to the whole of Australia. Figure 4 illustrates these
different growth rates on a smoothed basis between FY08 and FY16 (year to year fluctuations are eliminated, national data only available to FY15):

Figure 4 illustrates historical waste generated by waste stream and overlays the percentage of waste recovered. Figure 5 highlights minimal progress Queensland has made with waste recovery. The current recycling rate of 44 per cent in FY2016 is slightly lower than that achieved in FY2008 (43 per cent).

3.1.3 Trends by waste streams
9.2 million tonnes of waste were generated in FY2016. This can be further broken down into three main headline waste streams:

- municipal solid waste (MSW): 2.6 million tonnes (29 per cent)
- commercial and industrial waste (C&I): 2.8 million tonnes (31 per cent), and
- construction and demolition waste (C&D): 3.7 million tonnes (40 per cent).

Municipal solid waste trends
Overall MSW waste generated has been declining, with a 15 per cent decrease since its peak in FY2009. As noted below the volume of MSW landfilled has remained fairly static over the period FY2008 to FY2016, however the volume of MSW recycled has been decreasing since FY2009.
As depicted in Figure 6:

- **MSW landfilled**
  - Approximately 1.8 million tonnes (or 67 per cent) of the 2.6 million tonnes of MSW reported in FY2016 was landfilled.
  - The long-term trend indicates modest growth in the volume of MSW being landfilled, averaging 1 per cent growth per annum over the period FY2008 to FY2016.

- **MSW recovered**
  - Approximately 0.9 million tonnes (or 33 per cent) of the 2.6 million tonnes of MSW reported in FY2016 was recovered. This is an improvement on the 31 per cent achieved in FY2015 and can be attributed to increases in the amount of green waste, and paper and packaging recovered by local governments\(^5\).

- However, there has been a diminishing long term trend in recovery rates. The average recovery rate over the period FY2008 to FY2016 was 37 per cent, indicating the current recovery rates are below the historical average performance.

- As illustrated in Figure 6 Queensland has not made any progress towards reaching the 2024 recovery target of 50 per cent. FY2016 recovery rate of 33 per cent is below the FY2008 recovery rate of 35 per cent.

**Commercial and industrial waste trends**

Overall C&I has increased by 15 per cent from FY2008 to FY2016. However the total volume of C&I generated waste has remained static since FY2012. Further analysis of C&I waste is detailed below.
C&I landfilled
- The amount of C&I being landfilled has moderately declined since FY2012. In FY2016, the total amount of C&I waste sent to landfill was 1.5 million tonnes. This was a 2.8 per cent decrease from FY2015, and is consistent with the longer term (decreasing since the peak in FY2012 of 1.7 million tonnes).

C&I recovered\(^6\)
- Approximately 1.3 million tonnes (or 47 per cent) of the 2.8 million tonnes of C&I waste reported in FY2016 was recovered. This is an improvement on the 41 per cent achieved in FY2015.
- The average recovery rate over the period FY2008 to FY2016 was 44 per cent, indicating the current recovery rate of 47 per cent in FY2016 is slightly above the historical average performance, but, still lower than in some previous years.
- As illustrated in Figure 7 Queensland has made very modest progress since 2008 towards reaching the 2024 recovery target of 55 per cent.

Construction and demolition waste trends
Overall there has been a significant increase in the volume of C&D waste reported, increasing by 59 per cent since FY2008. The C&D waste significantly increased in FY2013, which could be partly driven by the repeal of the landfill levy in FY2013.

C&D landfilled
- The increasing trend in C&D being landfilled continued in FY2016, with 1.9 million tonnes landfilled. This represents a 0.4 million tonne (26.3 per cent) increase on the amount reported in FY2015. This is largely due to doubling in the volume of C&D waste received into Queensland from interstate.

C&D recovered
- Approximately 1.9 million tonnes (or 49.7 per cent) of the 3.8 million tonnes of C&D waste reported in FY2016 was recovered. This is a decrease on the 54.8 per cent achieved in FY2015 and can be partly attributed to a 0.4 million tonne increase in the amount landfilled, corresponding to a 93 per cent increase in the amount sent from interstate sources.

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\(^6\) No recovery data was obtained by DES in 2011FY for the C&I sector, an assumption has been made to use the mid-point between 2010FY and 2012FY, for the purposes of this report.
The average recovery rate over the period FY2008 to FY2016 was 51.4 per cent, indicating the current recovery rate of 50 per cent is below the historical average performance. A downwards trend is observed since FY2013.

As illustrated in Queensland has diminished its position towards reaching the 2024 recovery target of 80 per cent with a worsening trend observed since FY2013.

Summary of current waste recovery results versus recovery targets
As noted above, the trends in waste recovery rates since FY2008 indicate Queensland has made very little progress towards meeting the 2024 recovery targets set in the current waste strategy.

Figure 9 provides a summary of the actual FY2016 recovery rates when compared to the targeted recovery rates. Key observations noted include:

- Significant improvement is required with C&D and MSW recovery. Actual recovery rates are materially below the targets of 80 and 50 per cent respectively.
- Modest improvement is required with the C&I recovery. The actual recovery rate was 47 per cent verses the target of 55 per cent.
- In reality, taking into account that Queensland’s target recovery rates are below those set by other Australian jurisdictions and well below best practice countries, current performance can be considered to be poor.

Applying these targets to data for FY2016, adjusted for the shipment of waste from NSW, the average recovery rate that Queensland is targeting in 2024 would be 63 per cent, calculated as follows:

<p>| TABLE 1: ESTIMATE OF OVERALL TARGET RECOVERY RATE FOR 2024 |
|---------------------------------|------------------|------------------|------------------|------------------|</p>
<table>
<thead>
<tr>
<th>MSW</th>
<th>C&amp;I</th>
<th>C&amp;D</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total tonnes</td>
<td>2 620 892</td>
<td>2 793 199</td>
<td>3 751 270</td>
</tr>
<tr>
<td>Transferred from NSW</td>
<td>17 105</td>
<td>40 000</td>
<td>485 000</td>
</tr>
<tr>
<td>Net tonnes</td>
<td>2 603 787</td>
<td>2 753 199</td>
<td>3 266 270</td>
</tr>
<tr>
<td>Target recovery rate</td>
<td>50%</td>
<td>55%</td>
<td>80%</td>
</tr>
<tr>
<td>Target recovered tonnes</td>
<td>1 301 894</td>
<td>1 514 259</td>
<td>2 613 016</td>
</tr>
<tr>
<td>Overall target recovery rate</td>
<td>63%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: DES data
3.1.4 Queensland regions and the waste landfilled or incinerated by region in FY2016

Figure 10 provides a breakdown of the headline waste streams disposed of in each region during FY2016. The majority of the waste sent to disposal was in South East Queensland. Landfills in South East Queensland (SEQ) received 1.2 million tonnes (70 per cent) of the MSW, 1.1 million tonnes (72 per cent) of the C&I waste and 1.7 million tonnes (89 per cent) of the C&D waste sent to disposal in the state.

**FIGURE 10: CHART OF QUEENSLAND REGIONS AND THE HEADLINE WASTE LANDFILLED OR INCINERATED BY REGION IN 2015-16**

![chart](source: Department of Environment and Heritage Protection - Recycling and waste in Queensland 2016)

Figure 11 geographically depicts where each region is located and summarises the same data detailed in Figure 10.

**FIGURE 11: VISUAL GRAPHIC OF THE QUEENSLAND REGIONS AND WASTE LANDFILLED OR INCINERATED BY REGION IN 2015-16**

![map](source: Department of Environment and Heritage Protection - Recycling and waste in Queensland 2016)
Table 2 summarises the populations and approximate land areas of each region for context. SEQ contains more than two-thirds of the population and waste generation in just 1.4 per cent of the land area. On the other hand, Remote Queensland covers a vast portion of the state (63 per cent) but has just 1.7 per cent of the population and 1.8 per cent of total waste.

TABLE 2: SUMMARY OF REGION POPULATIONS AND LAND AREAS

<table>
<thead>
<tr>
<th>Region</th>
<th>Population in 000's</th>
<th>Population % of total</th>
<th>Land area % of total</th>
<th>% of total waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE Qld</td>
<td>3,352</td>
<td>67.8%</td>
<td>1.4%</td>
<td>77.6%</td>
</tr>
<tr>
<td>Darling Downs - Maranoa</td>
<td>265</td>
<td>5.4%</td>
<td>10.2%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Wide Bay</td>
<td>300</td>
<td>6.1%</td>
<td>3.0%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Fitzroy</td>
<td>245</td>
<td>5.0%</td>
<td>7.9%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Mackay</td>
<td>193</td>
<td>3.9%</td>
<td>5.5%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Townsville</td>
<td>249</td>
<td>5.0%</td>
<td>4.9%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Cairns</td>
<td>259</td>
<td>5.2%</td>
<td>4.5%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Remote Qld</td>
<td>84</td>
<td>1.7%</td>
<td>62.8%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Total</td>
<td>4,946</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Arcadis - Queensland waste and resource recovery infrastructure report (prepared 7 February 2017)

Key observations:

1. Overall waste generation is increasing, from 7.2 million tonnes in FY2008 to 9.2 million tonnes in FY2016 (27 per cent increase).
2. C&D waste is the primary driver of Queensland’s increased waste generation.
3. Recycling rates have plateaued, overall no progress has been made with recycling rates. Annual waste recovered in FY2008 was 43 per cent versus 44 per cent in FY2016. Significant improvement is required to reach the 2024 recovery targets.
4. Taking into account that Queensland’s target recovery rates are below those set by other Australian jurisdictions and well below best practice countries, current performance is considered to be poor.
5. Landfills in SEQ received over 70 per cent of the waste landfilled in Queensland.

3.2 Current state of waste infrastructure

3.2.1 Overview of existing waste infrastructure

Arcadis Australia Pacific (Arcadis) was engaged by DES to prepare a Waste and Resource Recovery Infrastructure Report for Queensland. The report provides a comprehensive assessment of waste infrastructure across Queensland. The Report findings are summarised here.

Managing waste in Queensland presents a range of challenges, some of which are unique to Queensland or more pronounced than in other jurisdictions. Many of these challenges stem from Queensland’s large size, combined with a significant proportion of the population being located in decentralised coastal communities or vast areas of low-population regional areas inland. Queensland has a total land area that is more than double that of New South Wales.

Table 3 provides an overview of the waste and resource recovery infrastructure identified by region. As expected, it shows that the majority of recovery and reprocessing infrastructure, including organics processing, are located in South East Queensland.

TABLE 3: SUMMARY OF THE WASTE AND RESOURCE RECOVERY INFRASTRUCTURE BY REGION

<table>
<thead>
<tr>
<th>Region</th>
<th>Tfr stns/ RRCs</th>
<th>Putresci ble l'fills</th>
<th>Inert l'fills</th>
<th>MRFs</th>
<th>Organics proc'sors</th>
<th>Re-processors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE Qld</td>
<td>93</td>
<td>15</td>
<td>5</td>
<td>9</td>
<td>24</td>
<td>92</td>
<td>238</td>
</tr>
<tr>
<td>Darling Downs - Maranoa</td>
<td>47</td>
<td>53</td>
<td>0</td>
<td>1</td>
<td>12</td>
<td>13</td>
<td>126</td>
</tr>
<tr>
<td>Wide Bay</td>
<td>46</td>
<td>23</td>
<td>0</td>
<td>3</td>
<td>11</td>
<td>6</td>
<td>89</td>
</tr>
<tr>
<td>Fitzroy</td>
<td>52</td>
<td>15</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>9</td>
<td>85</td>
</tr>
<tr>
<td>Mackay</td>
<td>32</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>54</td>
</tr>
<tr>
<td>Townsville</td>
<td>11</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>34</td>
</tr>
<tr>
<td>Cairns</td>
<td>34</td>
<td>5</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>62</td>
</tr>
<tr>
<td>Remote Qld</td>
<td>19</td>
<td>77</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>101</td>
</tr>
</tbody>
</table>

7 Source: Arcadis - Queensland waste and resource recovery infrastructure report (prepared 7 February 2017)
In total, the following existing and active infrastructure has been identified:

- 789 waste facilities identified across Queensland, further broken down into:
  - 308 council transfer stations including resource recovery centres (RRCs) and drop-off facilities (242 stand-alone and 66 co-located at landfill sites)
  - 26 private transfer stations
  - 226 currently open landfills of varying sizes (19 inert only landfills)
  - 20 materials recovery facilities (MRFs)
  - 61 private organics processing facilities plus one alternate waste treatment facility and one EfW facility (for green and wood waste)
  - 29 private construction and demolition waste recycling facilities
  - 117 other reprocessing or refinement / consolidation facilities for metals, batteries, paper and cardboard, plastics, glass, tyres, oils and regulated wastes.

### Rationalisation of landfill sites across Queensland

Following the council amalgamations of 2008, there has been a trend of significant rationalisation of landfill sites across the state. As shown in Table 4, in total 87 landfill sites have either closed, converted to a transfer station or are in the process of closing or being converted to a transfer station. The majority of closures and planned closures are in the very small/remote category.

The short term implications of this rationalisation of landfill sites is the cost burden of closing and rehabilitating sites. The majority of councils have no provisions for the closure of the legacy sites.\(^8\)

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\(^8\) Source: Arcadis - Queensland waste and resource recovery infrastructure report (prepared 7 February 2017)

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### TABLE 4 STATEWIDE SUMMARY OF LANDFILL CLOSURES AND CONVERSION TO TRANSFER STATIONS

<table>
<thead>
<tr>
<th>Region</th>
<th>Closed in last 5 yrs</th>
<th>Converted to a TS last 5 yrs</th>
<th>Converted to TS within 5 yrs</th>
<th>Closing within 5 yrs</th>
<th>Total closed/closing</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE Qld</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Darling Downs - Maranoa</td>
<td>14</td>
<td>0</td>
<td>17</td>
<td>0</td>
<td>31</td>
</tr>
<tr>
<td>Wide Bay</td>
<td>1</td>
<td>9</td>
<td>2</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Fitzroy</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Mackay</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Townsville</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Cairns</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Remote Qld</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>19</td>
<td>30</td>
<td>15</td>
<td>87</td>
</tr>
</tbody>
</table>

Source: Arcadis - Queensland waste and resource recovery infrastructure report (prepared 7 February 2017)
3.2.2 Future waste recovery infrastructure requirements

The report also highlighted existing waste recovery infrastructure capacity and identifies the regions requiring additional waste recovery infrastructure to meet the recovery targets set in Queensland Waste Avoidance and Resource Productivity Strategy (2014 - 2024).

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate</td>
<td>Adequate existing waste recovery infrastructure to meet the waste recovery targets</td>
</tr>
<tr>
<td>Modest</td>
<td>Modest additional waste recovery infrastructure required to meet the waste recovery targets</td>
</tr>
<tr>
<td>Significant</td>
<td>Significant additional waste recovery infrastructure required to meet the waste recovery targets</td>
</tr>
</tbody>
</table>

TABLE 5 FUTURE WASTE RECOVERY INFRASTRUCTURE REQUIREMENTS BY WASTE TYPE AND REGION TO MEET THE RECOVERY TARGETS

<table>
<thead>
<tr>
<th>Region</th>
<th>MSW</th>
<th>C&amp;I</th>
<th>C&amp;D</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE Qld</td>
<td>Significant</td>
<td>Significant</td>
<td>Significant</td>
</tr>
<tr>
<td>Darling Downs - Maranoa</td>
<td>Significant</td>
<td>Not identified</td>
<td>Adequate</td>
</tr>
<tr>
<td>Wide Bay</td>
<td>Modest</td>
<td>Not identified</td>
<td>Modest</td>
</tr>
<tr>
<td>Fitzroy</td>
<td>Modest</td>
<td>Modest</td>
<td>Modest</td>
</tr>
<tr>
<td>Mackay</td>
<td>Significant</td>
<td>Significant</td>
<td>Adequate</td>
</tr>
<tr>
<td>Townsville</td>
<td>Significant</td>
<td>Significant</td>
<td>Modest</td>
</tr>
<tr>
<td>Cairns</td>
<td>Significant</td>
<td>Significant</td>
<td>Significant</td>
</tr>
<tr>
<td>Remote Qld</td>
<td>Not identified</td>
<td>Not identified</td>
<td>Not identified</td>
</tr>
</tbody>
</table>

Source: Arcadis - Queensland waste and resource recovery infrastructure report (prepared 7 February 2017)

Table 5 highlights that significant investment/capital expenditure is required into waste recovery infrastructure at the right locations to enable Queensland to have the recycling infrastructure capacity to meet the 2024 recycling targets. The Australian states and territories which have landfill levies have been able to use the levy funds to subsidise the waste infrastructure, further detail is provided in section 4.2.1.

Further information on the key findings from Arcadis’s review of the existing waste infrastructure and the assessed future infrastructure needs is included in Appendix B.
3.3 Current regulatory and policy framework

This section summarises the current regulatory and policy frameworks that impacts waste management in Queensland.

Commonwealth

The commonwealth have two main policy documents being:

National waste policy
- The National Waste Policy aims to provide a coherent, efficient and environmentally responsible approach to waste management in Australia. The policy, sets Australia’s waste management and resource recovery direction to 2020.
- The aims of the National Waste Policy are to:
  - avoid the generation of waste, reduce the amount of waste (including hazardous waste) for disposal
  - manage waste as a resource
  - ensure that waste treatment, disposal, recovery and re-use is undertaken in a safe, scientific and environmentally sound manner, and
  - contribute to the reduction in greenhouse gas emissions, energy conservation and production, water efficiency and the productivity of the land.
- The National Waste policy sets the key target areas and 16 priority strategies. Appendix F provides a summary of the key target areas the priority strategies.

Product Stewardship Act (Cwth)
- Provides a framework that supports the concept of ‘polluter pays’ by acknowledging that product stewards must take responsibility for the appropriate management of the products they place on the market.

State (Queensland)

In Australia’s three-tiered system of government, the eight states and territories are responsible for the legislative framework and policies around the treatment of solid waste. The section reviews the current legislation and frameworks in Queensland.

- The strategy provides a high-level direction for waste management and resource recovery in Queensland over 10 years—broadly focusing on waste from all sectors, including household, agricultural, mining, commercial and industrial waste, and solid and liquid hazardous (or regulated) waste. This 10-year strategy complements and supports The Queensland Plan.
- In line with best practice, the current waste strategy has established the waste and resource management hierarchy. As shown in Figure 12 the waste hierarchy sets the order of preference for managing waste in order to inform decision-makers. The hierarchy shapes the vision, principles, objectives and priorities in the strategy, and provides a basis for development of action plans.
- Overall the strategy appears to be consistent with other strategy documents and covers the best practice elements at a high level. A summary of the strategy framework is provided in Appendix A. The framework does lack substance and specific action plans required to achieve the waste targets, predicated on voluntary update by sectors with no incentives.
- Currently there is an ongoing review of the strategy and release of government led waste strategy, planned release in the (relatively) near future.

FIGURE 12: QUEENSLAND WASTE HIERARCHY

The Environmental Protection Act 1994 (EP Act) is the overarching legislation in Queensland that sets the framework for achieving ecologically sustainable development and managing the impacts of various activities, including disposal and management of waste.

The Waste Reduction and Recycling Act 2011 sets out a framework for prioritising waste management practices to achieve the best environmental outcome. A number of requirements were developed from the act namely:

- Local Government waste management plans: a requirement for Queensland Government agencies and local governments to prepare waste management plans.
- Product stewardship arrangements: introduction of product stewardship arrangements for any waste products that are identified as a growing problem for landfill in the future.
- Strengthened littering and illegal dumping offences.

The Sustainable Planning Act 2009 (SPA) is the key legislation that coordinates planning and development approvals within Queensland.

The State Planning Policy (SPP) sets out the principles which underpin Queensland’s planning system to guide local and state government in land use planning and development assessment.

The purpose of regional plans is to identify regional outcomes to help achieve state interests. Regional policies are used to facilitate these outcomes by addressing existing or emerging regional issues, such as competition between land uses.

Figure 13 summarises the current waste regulatory and policy framework in Queensland.

FIGURE 13: CURRENT WASTE REGULATORY AND POLICY FRAMEWORK IN QUEENSLAND
3.4 Waste management initiatives in Queensland

3.4.1 Current waste management initiatives
The following list summarises the known key waste management initiatives delivered in FY2016 in Queensland:

- Implementing a beverage container refund scheme
- Banning the supply of single-use plastic shopping bags
- Trialling the collection of power tool and emergency / exit lighting as part of Queensland’s work in leading the development of a national hand-held battery product stewardship scheme
- Conducting a comprehensive state-wide needs assessment of waste and resource recovery infrastructure (report completed by Arcadis February 2017), and
- Establishment of a Waste Industry Compliance Investigation Taskforce to deliver ‘Operation TORA’, a coordinated program to enhance compliance and stamp out unlicensed waste management operators in Queensland.

A number of other initiatives commenced in FY2016:

- Plastic pollution and litter reduction:
  - Implementation of marketing campaigns such as ‘Love Queensland. Let’s keep it clean’, which aims to create awareness of major littering and illegal dumping around the state, and
  - Sugarcane fertiliser bag collection trial was conducted in North Queensland.
- National priorities and collaboration
  - Rechargeable battery recycling trial
  - Packaging: continued participation as a signatory in the Australia Packaging Covenant a strategy to minimise the environmental impacts arising from the disposal of used packaging and to promote improved design of packaging to reduce use of resources, and
  - Turning tyres into roads: a four year research project to increase the uptake of crumbed tyre rubber in various road applications.
- Industry development
- Regulatory reform:
  - Review of the waste-related Environmentally Relevant Activities for waste disposal and recycling under the Environmental protection Regulation 2008
  - Review of the framework for managing regulated (hazardous) waste, and
  - Investigate the feasibility of introducing landfill disposal bans.
- Emerging priorities in resource recovery
  - Biofutures: undertake a review of wastes in Queensland that may be suitable for diversion from disposal to higher-order and more sustainable uses, such as the production of fuel oil, and
  - Recycling of food waste: Create a pathway for the development of new, modern infrastructure for recovery of organic waste, and creation of associated jobs in the recycling and biotechnologies sectors.

3.4.2 Opportunities for waste management initiatives in Queensland

Broad opportunities
A number of broad opportunities were identified in the Queensland Waste Strategy 2014-2024, which present good foundations for further investigation. These broad opportunity themes include:

- Organic waste: Divert materials to feed into compost or alternative waste technologies that recover materials and energy from waste.
- Partnerships: Treat waste as a valuable resource by circulating materials and resources within the economy, generating jobs and further profit.
- Regulatory initiatives: Streamline regulation and remove barriers to the development of new technologies, particularly alternative waste technologies, and provide policy direction to encourage investment, market certainty and development.
- Regional development: Improve regional access to waste technologies through appropriate planning, industry placement, infrastructure mapping and use of regulatory tools and reforms.
- New technologies: Develop an alternative waste technologies policy to facilitating the increased development of EfW.

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9 Source: Department of Environment and Heritage Protection: Waste management initiatives in Queensland 2015-16
The Strategy also identifies specific priority wastes that, as defined in the Waste Reduction and Recycling Act 2011, are those wastes with high disposal impacts on the environment or human health; social impacts; or whose recovery would present resource savings or business opportunities. The priority waste streams include:

- plastic waste and agricultural plastics
- organic waste from households (e.g., green waste and food waste) and commercial premises (e.g., hospitality and food processing)
- high volume wastes with an existing resource value (e.g., concrete, treated timber, plasterboard)
- regional impact waste (from mining and resource projects); and
- waste subject to complementary national product stewardship measures (e.g., fluorescent lights, used tyres and used oils)

Specific opportunities:
Phase two of this engagement will look into the specific items/ action plans, which if implemented could deliver the desired outcomes with regards to meeting the waste targets established in the current waste strategy.

- **Regulatory initiatives:** Based on the insight provided by the Australian jurisdiction and international review, the regulatory and policy setting does influence the waste industry. Further investigation is required to understand which specific economic instruments and waste policy will efficiently drive the desired outcomes in relation to waste prevention and recovery.

- **Regional collaboration:** Given the unique challenges associated with Queensland’s vast landscape, regional collaboration and rationalisation of infrastructure will be a key success factor. Therefore, a collaborative framework will need to be developed to assist with aligning policy, well targeted investment funding, decisions about existing and new assets, high quality planning, provision of high quality data, clear definition of roles and responsibilities, transparent reporting and the development of agreed goals.

- **Investigate waste to energy opportunities:** Review of best practice internationally indicates there could be a significant opportunity in relation to EFW technologies. In addition to the potential environmental benefits, it provides the opportunity for the EFW and waste to fuel projects to create jobs. As energy recovery from waste is typically lower on the waste management hierarchy, it should only be appropriate for residuals (e.g., wastes that have no other resource value or where resources have been recovered). Energy recovery is more favourable than disposal to landfill but less favourable than the options of avoidance, re-use and recycling.

- **Waste data:** The initial report has highlighted the need for improved data, which will assist in making informed decisions. This is primarily around the collection of waste flows from landfill and recovery sites.

- **Stakeholder engagement:** A holistic stakeholder engagement piece will be required to define roles and responsibilities across all three levels of government, understand private sector requirements and engage with local councils and communities.

- **Tailored infrastructure investment:** It was indicated in the Arcadis report that significant investment is required to increase the amount of recycling infrastructure to enable Queensland to meet its recovery targets. With limited funds, investment decisions will need to be well targeted.

3.5 Barriers to resource recovery in Queensland

A number of barriers to resource recovery were identified in the 2016 National Waste Report and are likely to remain relevant, these were:

- the cost of disposal (landfills) is relatively low in Queensland
- lack of source-separation infrastructure
- limited infrastructure to recover mixed wastes
- limited activity to recover putrescible waste from household and small to medium enterprises, and
- regional recycling in more remote areas is difficult and Queensland has large amount of pockets of industry and towns in remote areas.

A number of further restraints and issues were identified as part of Arcadis’s report on Queensland Waste and Resource Recovery Infrastructure. These include:

- **Limited infrastructure:** The reprocessing of recyclable materials in Queensland is generally limited to materials such as glass and small volumes of tyres and plastics. Most other materials are sorted and consolidated in the south east before being exported overseas or to interstate mills. There is a need for rationalisation of small facilities.

- **Policy environment:**
  - No strong policy instruments and regulatory drivers: The Waste Strategy sets ambitious targets to increase recycling of waste, yet there are no strong policy

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10Source: Waste generation and resource recovery in Australian (reporting period 2014/15)
instruments or regulatory drivers to achieve this. Queensland is the only mainland state that does not impose a levy or tax on waste disposed to landfill.

- Policy uncertainty: recent changes in waste policy and the threat of repeal with a change in government, creates an environment of uncertainty which is a barrier to infrastructure investment.
- No disincentives to landfill recoverable materials: lack of policy measures to discourage landfilling recoverable materials.
- Planning approvals: uncertainty around planning approval likelihood and timelines, and the potential for political influence, is a major risk and barrier to investing in new waste infrastructure.
- Secondary markets: the lack of established and secure markets for many recovered products is a significant barrier to investment in resource recovery infrastructure.
- Data limitations: The withholding of appropriately detailed waste flow and infrastructure data is a barrier to robust options analysis and infrastructure investment decisions.
- Local Government cost pressures:
  - Local Government funding: a general lack of funding and pressure to contain costs, limits investment in new infrastructure and favours options with the lowest short-term cash flow impacts.
  - Financial impact of increasing diversion: for councils and operators that have invested heavily in landfills and generate significant income from landfilling, the cost impact of increasing landfill diversion could be significant – revenue could be lost, and landfill savings may not be realised.
- Regional Queensland specific issues:
  - Access to markets is the primary constraint on resource recovery in regional and remote areas, particularly the high cost of transporting materials to South East Queensland.
  - Small volumes: the lack of waste volumes to support efficient processing and recovery is a barrier to resource recovery in regional areas.
  - Regional collaboration: collaboration could be increased in some regions, to establish planning regimes beyond local government boundaries, consider redesign or rationalisation of uneconomic services and develop new infrastructure. Regional aggregation of waste volumes increases the options for recovery and more efficient disposal, supports investment in new infrastructure and attracts greater competition and industry interest.

The barriers to resource recovery in Queensland noted above provide insight into potential opportunities available to enable the Queensland Government to drive change in waste prevention and recovery.

3.6 History of the landfill levy in Queensland

Original implementation of the landfill levy
Queensland implemented an industry waste levy on 1 July 2011. The levy ($35 per tonne) was applied to the C&I and C&D solid and liquid waste disposal. The intent of the levy was to send a direct price signal to the waste generator to change behaviours. C&I and C&D waste accounted for almost 60 per cent of the total waste in Queensland at the time the levy was implemented. It was viewed that recycling from these sectors had considerable potential for growth, the scope for improvements in waste avoidance, resource efficiency and recovery of material is greatest when the price signal provided by the levy is applied to these waste streams.

Repeal of the landfill levy
The Queensland Government repealed the landfill levy through amendments to the Waste Reduction and Recycling Act 2013. A number of flow-on impacts resulted from the landfill levy repeal, which are detailed below:
- Mothballing and scaling back of new facilities, predominately within the C&D recycling facilities, where facilities were no longer financially sustainable.
- Given the track record of significant changes in the policy approach, a need exists for strong stakeholder engagement and a commitment to provide policy certainty around any potential future landfill levies.11
- With no price signal on landfill, Queensland is now the only mainland state without a landfill levy.
- Increasing interstate waste flows, as illustrated in Figure 14. In FY2016 a total of 542,000 tonnes of waste was received at Queensland landfill sites from interstate sources (primarily construction and demolition waste12). This represents a 68 per cent increase from the 323,000 tonnes the prior year. The majority of the interstate

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11 Source: Arcadis - Queensland waste and resource recovery infrastructure report (prepared 7 February 2017)

12 Note a portion of the C&D waste received in FY2016 was put through a recovery process. Approximately 124,000 tonnes of the 494,000 tonnes of C&D waste was recovered.
flows went to privately run landfills in South-east Queensland\textsuperscript{13}. The trend appears to be increasing with:
- first three quarters in FY2017 reported tonnage of 527,000 tonnes, and
- impending change to ‘proximity rules’ in NSW may increase volume further (refer to 4.2.3 for further information on NSW ‘proximity rules’).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure14.png}
\caption{THREE YEAR TREND OF WASTES RECEIVED BY QUEENSLAND LANDFILL OPERATORS FROM INTERSTATE SOURCES}
\end{figure}

Extrapolating the data for the first three quarters of FY2017 to a full year, the tonnes transferred from interstate would be over 700,000 tonnes, an increase of 30 per cent on FY2016 and more than double - 117 per cent - of FY2015.

\section{3.7 Employment in the waste industry}

\textbf{Employment}

The waste industry plays a significant role in supporting local economic development and employment. Over 6,000 Queenslanders are employed in the waste sector, which includes both the private and public sector\textsuperscript{14}.

There are four key areas of activity which generate jobs in the waste industry being:
- waste collection and transfer
- sorting of waste
- recycling (eg, manufacturing of new goods) and reuse, and
- the final disposal of waste that cannot be recycled or reused.

In terms of employment opportunities resulting from the waste sector, it is estimated direct FTE employment per 10,000 tonnes of waste is 9.2FTE for recycling and 2.8FTE for landfill. The higher FTE required for recycling is due to the higher number of activities associated with the recycling process (eg, sorting, transfers and transportation of materials into new products) and the labour intensive nature of some of these processes\textsuperscript{15}.

New technologies are also generating new employment opportunities particularly in the EfW space. This will be further explored in the next phase of QTC’s work. With 5.1 million tonnes of waste disposed to landfill in FY2016, the Deloitte Access Economics data would indicate there is the potential for over 3,000 additional direct jobs in the waste management industry, assuming virtually full recovery (as achieved in some European countries).

\textbf{Private and public waste employment}

The waste management industry is comprised of private firms and government enterprises. Local Government is typically responsible for waste collection, transport and providing landfill facilities, although the frequency of these activities becoming outsourced to the private sector is increasing. Recycling is generally dominated by the private sector, and often forms just one part of a larger business\textsuperscript{16}.

\textsuperscript{13} Department of Environment and Heritage Protection: Recycling and Waste in Queensland 2016
\textsuperscript{15} Source: Access Economics - Employment in waste management and recycling
\textsuperscript{16} Source: Access Economics - Employment in waste management and recycling
The use of the private sector is particularly evident in South-East Queensland. The next section reviews the composition of landfill operators (private verses local government) and reviews the South-East Queensland region in comparison to all other Queensland regions.

**Landfill operators**

Table 6 provides a summary of the split between Council owned and private owned landfills and the respective total capacity remaining. The table highlights that the private sector plays a significant and increasing role in providing waste management infrastructure in the South-East Queensland region, more so than in other parts of the state. Further details are provided below:

- **South-East Queensland observations:**
  - Private landfill operators (both putrescible and inert) processed approximately 60 per cent of the tonnes landfilled in FY2015 and hold approximately 60 per cent of the remaining capacity of the existing landfills in South-East Queensland.
  - There are a number of very large, privately owned landfills in the Ipswich local government area, constructed in former coal mine voids. These landfills dominate the C&D waste disposal market, with increasing volumes of MSW being processed at private landfills.
  - As existing council landfills reach the end of their operating life, there is an increasing trend for council waste management requirements to be met through privately owned and operated disposal facilities.

- **All other Queensland regions observations:**
  - Private landfill operators (both putrescible and inert) processed approximately 17 per cent of the tonnes landfilled in FY2015 and hold approximately 24 per cent of the remaining capacity of the existing landfills.
  - Waste infrastructure in regional and remote areas is predominantly owned and managed by local government. The lack of opportunities to gain economies of scale and the large costs involved to move waste and recyclable materials across long distances, act as a barrier of entry for the private sector. This maintains an ongoing cost burden for councils.

<table>
<thead>
<tr>
<th>Landfill type</th>
<th>Number of sites</th>
<th>Tonnes to landfill (million tpa, FY2015)</th>
<th>Approximate total capacity remaining (million m3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South-East Queensland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Council owned - putrescible</td>
<td>13</td>
<td>1.3</td>
<td>26.5</td>
</tr>
<tr>
<td>Council owned - inert</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Private owned - putrescible</td>
<td>2</td>
<td>&gt;1</td>
<td>&gt;30</td>
</tr>
<tr>
<td>Private owned - inert</td>
<td>5</td>
<td>1.3</td>
<td>12.3</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>3.8</td>
<td>&gt;70.0</td>
</tr>
<tr>
<td>All other Queensland regions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Council owned - putrescible</td>
<td>191</td>
<td>1.0</td>
<td>40.8</td>
</tr>
<tr>
<td>Council owned - inert</td>
<td>6</td>
<td>0.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Private owned - putrescible</td>
<td>1</td>
<td>&gt;0.1</td>
<td>Not provided</td>
</tr>
<tr>
<td>Private owned - inert</td>
<td>8</td>
<td>&gt;0.1</td>
<td>13.3</td>
</tr>
<tr>
<td>Total</td>
<td>206</td>
<td>&gt;1.2</td>
<td>&gt;54.0</td>
</tr>
</tbody>
</table>

Source: Arcadis - Queensland waste and resource recovery infrastructure report (prepared 7 February 2017)
4 Australian trends in waste management

4.1 Overview of waste in Australian jurisdictions

In Australia’s three-tiered system of government, the eight states and territories are responsible for the legislative framework and policies around the treatment of solid waste, with:

- the federal focus on strategies and policy frameworks for specific types of waste (e.g., product stewardship, carbon emissions), and
- local governments responsible for waste management services as laid down by the regulatory framework for their state or territory.

The Australian Department of the Environment and Energy (DoEE) provided QTC with an advance copy of the 2016 Australian National Waste Report (ANWR). This report provides a snapshot of solid waste data in the eight jurisdictions for FY2015, focusing on waste generation, resource recovery and disposal. The previous report in 2013 was based on FY2011 data.

4.1.1 Data reliability

Before looking at the reported outcomes in the ANWR, it is important to understand some of the issues around the data used. The report identifies potential variability in the quality of the data provided, noting 'the level of uncertainty in some of the presented data is likely to be high'. The report also states that data quality is continually improving and the 2016 version provides the most accurate national data set to date.

To produce a national summary of waste, the report acknowledges that the data reported by individual states may be adjusted. Variations arise due to missing or excluded data, different classification of items and interstate transfers of waste.

We also note that the reported data (DES and ANWR) excludes waste from primary production (agriculture, mining and forestry), pre-consumer waste that is recycled as part of the production process or any waste that is reused.

Noting these data issues, the analysis of Australian jurisdictions in the remainder of this section is based on the ANWR 2016 data excluding fly ash (refer to section 4.1.3) unless otherwise specified.

4.1.2 Outcomes by jurisdiction

Australia generated 53 Mt of waste, or 2.2 tonnes per capita. On average, 61 per cent of this waste was recovered through recycling or EfW, but the outcomes are varied across the jurisdictions, with recovery rates ranging from 77 per cent in SA to 28 per cent in the NT. Figure 15 shows the performance by jurisdiction on a per capita basis:

![Figure 15: Per Capita Waste Generation and Recovery by Jurisdiction - FY2015](image)

Source: QTC using data sourced from ANWR 2016

Analysing the data in Figure 15, we note:

- The variations in waste generated per capita across the jurisdictions, which may reflect some of the data quality issues discussed previously.
- Queensland’s recovery rate is reported to be lower for FY2015 than in FY2011, when it was 52 per cent.
- To reach the national average Queensland would need to recover an additional 1.5 Mt of waste per annum, or 38 per cent more than the current volume recovered.
- EfW represents 4.5 per cent of the total 61 per cent recovery total, with Tasmania the highest performer at 5.6 per cent. Queensland’s EfW rate is 3.7 per cent. Section 4.7 presents additional information on EfW initiatives.

Figure 16 depicts the same data as Figure 15, but on a total tonnes basis to show the relative volumes of waste generated in each jurisdiction. The chart reveals that while the volume of waste generated in Queensland was two-thirds that of NSW, the amount disposed to landfill was almost the same.
While the underlying policy goals are fairly consistent across Australia, each jurisdiction has developed a regulatory framework based on its own needs and its government’s priorities. The effectiveness of these varied approaches appears to be reflected in the different performance outcomes achieved.

Key elements of the regulatory frameworks used in Australian jurisdictions include:

- the use of landfill levies as a pricing signal to alter behaviour, with different approaches for metropolitan, regional and remote areas
- provision of funding to support investment in the waste recovery industry through hypothecation of landfill levies
- landfill disposal bans
- bans on single-use plastic bags
- container refund schemes
- implementation of hazardous waste tracking systems, and

- the establishment of a separate authority to promote good waste management practices.

The use of these elements in the eight jurisdictions is summarised in Table 7, where ✔ means the regulation is in place and ✗ means it is being introduced in the next 12 months. Blank means the strategy is not applied.

### TABLE 7: REGULATORY STRATEGIES ADOPTED IN EACH JURISDICTION

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>ACT</th>
<th>Vic</th>
<th>NSW</th>
<th>Tas</th>
<th>WA</th>
<th>QLD</th>
<th>NT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill levy</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>Funding</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>Landfill bans</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>Plastic bags</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>CRS</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Data tracking</td>
<td>✓</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Separate authority</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17 Some councils in Tasmania impose a landfill levy but at a maximum of $5 per tonne, it is a negligible cost.

18 The ACT charges disposal fees, not a levy, and there is no direct link to funding of broader waste activities.
The recovery performance by waste stream and, where set, the recovery rates targeted (red lines) by each jurisdiction are depicted in Figure 17.

FIGURE 17: AUSTRALIAN RECOVERY TARGETS AND FY2015 RESULTS BY WASTE STREAM

Source: QTC using data sourced from ANWR 2016

Key issues to note from the above chart are:

- Queensland’s recovery rate on MSW at 33 per cent is the lowest in the country and is down from the 48 per cent reported for FY2011 in the 2013 ANWR.
- Queensland’s recovery rates for C&I and C&D have also decreased (from 52 and 59 per cent respectively in FY2011).
- Acknowledging there may be data issues in seeking to compare the data in the 2013 and 2016 ANWRs, it is noted that:
  - only SA C&D reported a material decline between the two reports, and
  - DES’s data does show a significant decline in MSW and C&D recovery.

- Looking at Queensland’s 2024 targets
  - MSW’s 50 per cent is significantly below the MSW recovery rate being achieved by the top four jurisdictions (SA, ACT, Vic and NSW - averaging 63 per cent)
  - C&I’s 55 per cent is significantly below the C&I recovery rate being achieved by all other jurisdictions except NT (they are currently averaging 69 per cent), and
  - The 80 per cent recovery for C&D is aligned with NSW and above that nominated by WA.

- The targets nominated by SA, ACT and WA are for 2020, while the NSW targets are for 2022. The ACT nominated an overall target rather than one per stream.
- No targets were nominated by Vic, Tas or the NT.

The 2016 ANWR states that Queensland’s current recovery rate reflects large transport distances making recovery of some waste types cost prohibitive, less developed resource recovery infrastructure in remote areas and the lack of a landfill levy.

Factors mentioned for other jurisdictions that performed better than Queensland (other than their about their investment in infrastructure and levy) include:

- a history of progressive waste management policies, including setting recovery targets, and
- government investment in infrastructure, market development and education programs.

The previous charts show that Queensland’s waste recovery rates are significantly below the national average and, comparing the outcomes to the previous ANWR, are deteriorating. The regulatory options set out in Table 7 show that the top performing jurisdictions have three elements not currently in place or proposed for Queensland:

- landfill levies
- funding to support the industry, and
- landfill bans.

How these elements are currently used in Australian jurisdictions will be analysed in Section 4.2.

Also, the top two jurisdictions based on waste recovery performance are SA and the ACT. The demographics of the ACT are very different to Queensland, and so SA has been selected for a case study (refer to Section 4.4), to get a better understanding of their regulatory framework.

4.1.3 Fly ash waste

Fly ash is a waste product produced from burning coal and has been excluded from the analysis provided in the previous section. Per the ANWR, five states produced 11Mt of this waste in FY2015, making it a significant waste stream in addition to MSW, C&I and C&D. The data for FY2015 is summarised in the following table.
TABLE 8: FLY ASH GENERATED AND RECOVERED - FY2015

<table>
<thead>
<tr>
<th>Item</th>
<th>Generated Mt</th>
<th>% of total</th>
<th>Recovered Mt</th>
<th>% recovered</th>
</tr>
</thead>
<tbody>
<tr>
<td>QLD</td>
<td>5.21</td>
<td>48%</td>
<td>0.89</td>
<td>17%</td>
</tr>
<tr>
<td>NSW</td>
<td>2.74</td>
<td>25%</td>
<td>1.94</td>
<td>71%</td>
</tr>
<tr>
<td>Vic</td>
<td>2.21</td>
<td>20%</td>
<td>1.56</td>
<td>71%</td>
</tr>
<tr>
<td>WA</td>
<td>0.55</td>
<td>5%</td>
<td>0.39</td>
<td>71%</td>
</tr>
<tr>
<td>SA</td>
<td>0.14</td>
<td>1%</td>
<td>0.14</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>10.85</td>
<td>-</td>
<td>4.92</td>
<td>45%</td>
</tr>
</tbody>
</table>

Source: QTC using data provided within Figure 5 in ANWR 2016

Noting the consistency of the proportion recovered in NSW, Vic and WA (possible data extrapolation), the 17 per cent recovery rate for Queensland appears to be extremely low. The ANWR 2016 notes that the 5.9Mt of fly ash not recovered would normally be used to backfill the void created from mining the coal. Subject to proper environmental controls, this outcome may be desirable in the broader context of Queensland’s rehabilitation standards where voids may need to be filled by the mine operator.

DES advised that fly ash is listed under Schedule 7 of the Environmental Protection Regulations as a regulated waste. Handlers of such waste are required to submit tracking information when transporting regulated waste or waste residues. Until 31 December 2018, DES has provided general approval for the use of coal combustion products (including fly ash) for beneficial use. Beneficial uses include bound applications (e.g. in cement products), unbound applications (e.g. structured and engineered fill) or as a soil ameliorant.

4.2 Regulatory tools in other Australian jurisdictions

4.2.1 Landfill levies

Landfill levies, or an equivalent, are applied in five Australian jurisdictions: SA, the ACT, Vic, NSW and WA. As mentioned previously, the levies in Tasmania are optional for councils to impose and, at a maximum of $5 per tonne, are not considered material in influencing market behaviour.

Other than for the ACT, each jurisdiction has adopted a location based approach to their levy. Different rates may apply in metropolitan areas, specified regional areas and the remainder of the state, with rules on how waste transported from one region to another is levied. Different rates may be applied for different types of waste too. Table 9 shows the standard levies by region in each jurisdiction.

TABLE 9: CURRENT LEVIES BY REGION - PRICE PER TONNE (FY2016)

<table>
<thead>
<tr>
<th></th>
<th>Metro</th>
<th>Regional</th>
<th>Remainder</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td>$135.70</td>
<td>$78.20</td>
<td>Nil</td>
</tr>
<tr>
<td>ACT</td>
<td>$90.55 - 199.20</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>SA</td>
<td>$76.00</td>
<td>N/A</td>
<td>$38.00</td>
</tr>
<tr>
<td>Vic</td>
<td>$62.03</td>
<td>$62.03</td>
<td>$31.09</td>
</tr>
<tr>
<td>WA</td>
<td>$60.00</td>
<td>N/A</td>
<td>Nil</td>
</tr>
</tbody>
</table>

Source: Each jurisdictions website

The levies are applied differently in each jurisdiction, presumably to achieve specific outcomes - for instance, the levy on asbestos waste has been discounted to encourage appropriate disposal of this hazardous waste. Figure 18 shows the standard levies applied by jurisdictions in their metropolitan areas since FY2006, showing significant increases over time.
A brief summary of how the levy operates in each of these jurisdictions, and the changes to the rate charged over the years, is provided below. The data on revenue raised from the levies in each jurisdiction is not readily identified in publicly available documents, nor how those funds were applied.

**New South Wales**

The NSW Environmental Protection Agency (EPA) states it has a range of policies to increase recycling and divert valuable resources from landfill back into the economy and that its waste levy is the key economic instrument to achieve this. NSW has had a levy since 1971, with the current system under the Protection of the Environment Operations Act 1997.

The levy applies to both EPA licensed landfills and waste facilities, such as processing, recovery and storage facilities, and the rate applied depends on where the waste was produced and received. For waste processing, recovery or storage facilities, the levy liability is extinguished when their waste is sent off-site for lawful reuse, processing or disposal.

For determining the appropriate levy amount, the state is split as follows:

- **regulated area**, comprising:
  - **metropolitan levy area (MLA)**: the Sydney, Illawarra and Hunter regions, and
  - **regional levy area (RLA)**, the central and north coast local government areas to the Queensland border as well as the Blue Mountains area, and
- **the rest of NSW**

The levy rate applicable is the highest rate applicable for the area the waste was produced or the place it was received. For instance, waste produced in the non-regulated area (no levy) but received at a facility in the MLA would pay the MLA rate ($135.70).

Indicating the types of waste EPA is seeking to influence the management of through the landfill levy, it does not apply to:

- Landfills for slags or uncontaminated soil
- Facilities licensed only for clinical, liquid or hazardous waste, and
- Facilities operating solely as composting, container reconditioning, contaminated soil treatment or paper/pulp production facilities.

Concessional levy rates are also applied to:

- Shredder floc (a by-product of metal reprocessing, primarily from recovery of vehicles and white goods) - 50% discount on applicable MLA or RLA levy.
- Uncontaminated soil to general waste facility - 10% discount on applicable MLA or RLA levy.
- Trackable liquid waste - standard rate of $72.70/tonne
- Coal washery rejects - standard rate of $14.20/tonne

Each landfill or waste facility operator must submit monthly reports to the EPA, with the levy also paid monthly.

Looking historically, the MLA was previously split into two areas, initially with Hunter and Illawarra regions getting a 10 per cent discount on the Sydney levy rate. This differential was eroded and ended in FY2014. For six years from FY2010, when the rates were $58.80/tonne for the MLA and $10.00/tonne for the RLA, the levy in both regulated areas increased by $10 per annum plus CPI. From FY2017 and going forward, it is proposed that the levy will increase by CPI. The FY2017 levies represent an increase of 130 per cent on the FY2010 rate for MLA, and 682 per cent for RLA.

There is evidence that the waste industry has responded to the NSW levy with significant investment in MBT plants and recycling infrastructure. We also note that NSW’s MSW recovery rate increased from 28 per cent in FY2000, to 44 per cent in FY2009 and to the current rate of 59 per cent. The relative impact of the levy and other policy initiatives (eg, separate MSW collections for organic waste) on recovery rates will be assessed in stage two of this review.

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19 KPMG’s Review of the NSW Waste and Environment Levy, June 2012, page 12
**Victoria**

Landfill levies are paid on all waste disposed of at licensed landfills (not waste facilities) in Victoria and have been structured to reflect the magnitude of environmental risk from the different waste streams, while accommodating regional differences.

<table>
<thead>
<tr>
<th>TABLE 10: CURRENT VICTORIAN LEVIES - PRICE PER TONNE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste stream</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Municipal (MSW)</td>
</tr>
<tr>
<td>Industrial (C&amp;I and C&amp;D)</td>
</tr>
<tr>
<td>Prescribed industrial waste - Category A</td>
</tr>
<tr>
<td>- Category B</td>
</tr>
<tr>
<td>- Category C</td>
</tr>
<tr>
<td>- Asbestos</td>
</tr>
</tbody>
</table>

Source: EPA Victoria website: Landfill and prescribed waste levies

Metro areas are ringed around Port Philip Bay, from Geelong to Mornington, with provincial capturing three other council areas: Greater Bendigo, Ballarat and Golden Plains. The rural rates are discounted by 50 per cent for municipal waste and 12.5 per cent for industrial, with no regional pricing differences for prescribed industrial waste.

The allocation of prescribed industrial waste into one of the three categories is based on defined levels of contamination (such as arsenic, lead and mercury) in the waste matter.

In addition to pricing environmental risk, EPA Victoria states that it wants the levy to provide an incentive to minimise the generation of waste and send a signal that the Government supports the development of alternatives to landfill.

In FY2011, the levy was significantly increased from $9 to $30/tonne, further increasing to $44 in FY2012, with 10 per cent per annum increases for the following three years. From FY2016, the levy has risen based on CPI rises.

Victoria charges an additional levy on the transport of prescribed industrial waste, depending on the type of waste and the weight of the load (three bands applied). For example, putrescible waste of between 1.5 and 30 tonnes would cost $547.20, and highly reactive prescribed waste of more than 30 tonnes would be $2,254.80.

**Western Australia**

In its FY2015 state budget, WA announced it would increase its landfill levy for putrescible waste from $28/tonne (rate applicable since FY2010) to $55, and a five year schedule of rates showing the levy would rise to $70/tonne in FY2019.

That budget also raised the landfill levy for inert waste from $8/tonne to $40/tonne, with future rises to reach a single rate of $70/tonne for both inert and putrescible waste from FY2019. For landfills that do not have a weighbridge, inert waste is measured by volume, based on assigned volumes per vehicle type. The rate per cubic metre is 1.5 times the rate per tonne.

The WA Department of Environment Regulation noted that the proposed rates would bring WA levy rates in line with SA and Vic, and would give industry certainty to plan and invest for the future. The proposed purpose of the levy is both to reduce waste and to generate funds for a range of waste and environmental purposes.

The landfill levy is applied to waste received at metropolitan landfills and metropolitan waste received outside the metropolitan area, which is defined in the Planning and Development Act 2005 to include the 30 local government areas arcing around the city from Wanneroo in the north to Armadale in the east and Rockingham in the south.

**South Australia**

SA charges $76/tonne for metropolitan Adelaide, and $38 (50 per cent) for the remainder of the state. Liquid waste is charged at a flat rate across the state of $35.10 per kilolitre.

The landfill levy was first introduced in SA for metropolitan landfills in 2003, and applied (at the discounted rate) to regional landfills from 2007. Retaining the 50 per cent discount for non-metropolitan areas, the government has announced significant increases in the levy as follows:

- FY2018 - $87 (14 per cent increase)
- FY2019 - $100 (15 per cent increase)
- FY2020 - $103 (approximately CPI)

SA currently offers reduced levy rates for asbestos and shredder floc, and these may be exempted from the announced increases to the levy.

Metropolitan Adelaide comprises a ring of councils around the city, from Playford in the north, Tea Tree Gully in the east and to Onkaparinga in the south.
Australian Capital Territory

The ACT does not technically charge a levy, but it owns the landfills and sets the disposal fees. The fee structure\(^{20}\) is based on a large number of waste categories, with rules around the acceptance of household waste by individuals\(^{21}\).

For commercial waste, the current charge for general waste is $146.20/tonne, rising to $164.10 for asbestos and $183.70 for special burial (animals or sewage ash) waste. Mixed C&I with more than 50 per cent recyclable material is charged at $199.20/tonne, with tyre charges ranging from $341.75 - $477.90/tonne. The ANWR states that MSW is charged at $90.55/tonne, but this appears to be a rate for residents.

In FY2006, commercial waste disposal was being charged $77/tonne, by far the highest rate in the country. Fees increased by $11 per annum for three years, to $110 in FY2009. Since then, the fee has risen at a rate slightly above CPI.

Impact of landfill levy on recovery rates

As stated above and depicted in Figure 18 landfill levies (for jurisdictions that have them) have significantly increased over last 10 years from relatively negligible levels (less than $20 per tonne).

Using the ANWR data, Figure 19 summarises the recovery rates achieved in all eight jurisdictions over the nine years to FY2015.

Only three jurisdictions have seen a significant improvement in their recovery rate: Tasmania, NT and WA. These improvements have been achieved off a very low base and in two cases (NT and Tasmania), better data collection was identified as a contributor to the reported improvement. Only one of these jurisdictions - WA - imposes a landfill levy. WA's recovery rate rose from 34 to 48 per cent over the period, a 40 per cent improvement.

Of the other five jurisdictions, only one has seen any noticeable improvement in their recovery rate (Victoria went from 59 to 69 per cent, a 17 per cent improvement). NSW, which has raised its landfill levy from $20/tonne to $135, has seen its recovery rate rise from 63 per cent to a peak of 68 per cent in FY2011, before falling back to 64 per cent in FY2015.


\(^{21}\) For instance, charges are based on whether the waste is transported in a small car, medium car with trailer, or large car with trailer with specific fees to mattresses or tyres, differentiated by condition.

Those jurisdictions with landfill levies have an average recovery rate of 67 per cent while those without have a recovery rate of 42 per cent. Having a levy would, prima facie, appear to have a positive impact on recovery rates. The two highest performers - SA and ACT - have had consistently high recovery rates but very different levies over the period: the SA levy were between $10 and $26/tonne until FY2011, while ACT was $77/tonne in FY2007. Evidence suggests that the introduction of a levy in other jurisdictions has provided a positive benefit, however is likely to form part of a broader solution to improve resource recovery and reduce waste.
4.2.2 Funding to support the waste industry
No jurisdiction provided a clear history of the quantum of levy revenue that has been collected over time and how those monies have been fully allocated. Based on the data in their budget papers, the levy collected in the four states is forecast to be around $1 billion per annum, as summarised in Table 11.

TABLE 11: SUMMARY OF LEVY REVENUE COLLECTED

<table>
<thead>
<tr>
<th></th>
<th>FY2016</th>
<th>FY2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>New South Wales</td>
<td>704</td>
<td>641</td>
</tr>
<tr>
<td>Victoria</td>
<td>191</td>
<td>200</td>
</tr>
<tr>
<td>South Australia</td>
<td>58</td>
<td>69</td>
</tr>
<tr>
<td>Western Australia</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td>Total</td>
<td>1 021</td>
<td>980</td>
</tr>
</tbody>
</table>

Source: Various budget papers

Through engagement with other jurisdictions in the next stage of the project, we will seek to clarify the application of these monies.

New South Wales
Commencing for five years in FY2013, NSW’s Waste Less, Recycle More program proposed to invest $467 million to modernise the waste sector in NSW, deliver improved waste and recycling services to the community and ensure a clean environment. In 2016 it was announced that the program would be extended for another four years, with an additional $337 million allocated.

In the first four years of the program, $296 million has been spent (63 per cent of the program budget). The money has been allocated to 822 projects, creating 845 new jobs and recycling 2.2 tonnes more waste.

Table 12 categorises the spend to date and planned spend:

TABLE 12: EXPENDITURE UNDER THE WASTE LESS, RECYCLE MORE PROGRAM

<table>
<thead>
<tr>
<th>Description</th>
<th>FY2013-2016</th>
<th>% of total</th>
<th>FY2018-2021</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funding to Councils</td>
<td>112.0</td>
<td>37</td>
<td>70.0</td>
<td>21</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>85.0</td>
<td>29</td>
<td>53.0</td>
<td>16</td>
</tr>
<tr>
<td>Problem waste</td>
<td>32.8</td>
<td>11</td>
<td>61.0</td>
<td>18</td>
</tr>
<tr>
<td>Business</td>
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Source: NSW EPA Waste Less, Recycle More scorecard and extension summary

Over the initial five years of the program, NSW will collect approximately over $2 billion from the levy, with $2.13 billion forecast to be collected in the following four years. Revenue from the levy is also forecast to drop per the FY2018 budget, which may reflect less waste generation or expected improvements in waste recovery.

Victoria
EPA Victoria states that landfill levy funds are used exclusively for environment protection activities, including promoting the sustainable use of resources and best practices in waste management.

In FY2015, EPA received an 18 per cent share of the total landfill levy revenue of $186 million, Sustainability Victoria received 12 per cent and Waste and Resource Recovery Groups (Councils) received 5 per cent. Collectively, these groups received $66 million. Of the Prescribed Industrial Waste Levy, in FY2016 EPA retained 66 per cent of the $22 million raised.

From 1 July 2015 the landfill levies are paid to the Department of Environment, Land, Water and Planning, which is responsible for distributing funds to regional waste and resource recovery groups, Sustainability Victoria and operational funding for EPA Victoria.

22 NSW Budget Statement 2017-18 - Revenue paper
24 Independent Inquiry into the Environment Protection Authority
A 2017 news article reported that the levy revenue was being used for:
- Installing solar panels on trams ($9.6M)
- Establishing a timber plantation in the Latrobe Valley ($110M)
- Upgrading Parks Victoria website ($8.1M)
- New lighting, heating and solar panels for government buildings ($20M)
- Purchase of land to establish three new parks in Melbourne ($21.5M)

Sustainability Victoria is a statutory authority charged with delivering programs on integrated waste management and resource efficiency. Its revenue for FY2016 was $32.7 million, of which $18.6 million (57 per cent) comes from the landfill levy.

South Australia
The Levy is imposed to achieve the objectives of Zero Waste SA to “enable people to improve their recycling and waste avoidance practices.” The proposed increases in the levy announced in July 2016 will raise an additional $64 million over 4 years, of which $14M will go on grants programs in consultation with LGA to support LG infrastructure, waste education programs and household hazardous waste collection, with $12.4M for grants to industry for infrastructure investment and innovation, as well as levy rebates for scrap metal recyclers.

Western Australia
Following the increase in the landfill levy from 1 January 2015, the WA government estimated the additional revenue for the following three and half years (to FY2018) would raise $202 million, of which:
- $51 million would be paid into the Waste Avoidance and Resource Recovery (WARR) Account (25 per cent is a minimum amount that must be paid to this Account under the WARR Act 2007)
- $15 million would go to the Office of EPA, and
- $137 million for other government priorities.

The WARR Account is administered by a separate statutory body - the Waste Authority - that develops strategies for the Minister for Environment to consider and work with Local Government, industry and the community to promote understanding of resource recovery. The funds this body works with are applied to programs for the management, reduction, reuse, recycling, monitoring or measurement of waste and to support the implementation of the Waste Strategy (blue print for the way in which waste issues are managed in WA).

4.2.3 Landfill disposal bans
Landfill bans are never the only instrument of waste management, but are tailored to meet a jurisdiction's needs (to reduce landfill) and goals (to increase the level of recovery). Bans can be based on the waste source (eg, MSW), the type (eg, tyres) or properties (eg, level of hazard or biodegradability).

Before implementing a ban, a jurisdiction needs to ensure alternative processes are available to handle and manage the waste. Without alternatives, stockpiling of waste and illegal dumping become more likely.

In Victoria, prescribed industrial waste intended for landfill must be classified into one of three categories - Category A (highest) to C (lowest). Untreated Category A is banned from any landfill without pre-treatment. The government is also in the process of consulting on a landfill ban for electronic-waste, possibly to be in place by early 2018.

In the ACT, computers have been banned from landfill since 2005, with televisions joining the ban in 2010. These items can be disposed of at nominated resource centres for free. Any polychlorinated biphenyls (PCB) contaminated oil or equipment must be reprocessed and recycled. The ACT also has an effective disposal ban on liquid wastes and organochlorine pesticides (OCPs) by not having disposal facility within the jurisdiction, presumably because it is uneconomical to treat them. These types of waste are transported to NSW for treatment.

SA has the most extensive list of wastes banned from landfill. Under their Environmental Protection (Waste to Resources) Regulations and with two years notice, bans were progressively rolled out over a three-year period, initially in the metropolitan area and then across the whole state.

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The current list of banned items is:

- hazardous waste
- lead acid batteries
- liquid waste
- medical waste
- oil
- whole tyres
- Plastic packaging - PVC, PS, PP or LDPE
- aggregated metals
- aggregated glass packaging
- aggregated PET or HDPE plastic packaging
- aggregated cardboard and paper
- vegetative matter collected by Councils
- Computer monitors and televisions
- Other electrical and electronic equipment
- Fluorescent lighting/lighting with mercury
- vehicles
- whitegoods

The above discusses landfill bans imposed at a state or territory level, but individual local councils can also impose their own bans. For example, the four councils covering Sydney’s northern beaches have banned e-waste from landfill.

**NSW Proximity Principle**

Whilst not a ban, to stop operators from avoiding the levy by sending their waste to Queensland (following removal of the levy in 2012), NSW EPA regulated to make it an offence to transport any waste by motor vehicle more than 150 kilometres from where it was generated in the state - the proximity principle. Introduced in 2014, fines commence at $7,500 for individuals and $15,000 for companies, with exemptions where the waste is transported to a licensed recovery facility outside of the 150km limit.

No offence is committed if waste is transferred interstate where the state border is within 150 kilometres of where the waste was generated. This exception encompasses Tweed, Byron, Ballina, Lismore council regions (within the RLA) and parts of Richmond Valley and Kyogle regions.

The principle however did not address the issue of transporting by rail and, in 2015, the EPA investigated three rail yard operators within the MLA regarding long distance transport of waste. Late in 2016, NSW EPA announced its intention to repeal the proximity principle regulation following a Federal Court challenge by a number of waste companies. To counter the repeal, the agency also advised it would introduce additional obligations on levy liable waste facilities who wish to claim a transported waste deduction and would seek to have regulations apply to the transporters of waste.

### 4.3 Industry perspective

The ANWR 2016 sought the views of four peak associations on the current status of the industry, where it would be by 2026 and what are the challenges and opportunities. The peak bodies consulted were:

- the Australian Council of Recycling
- the Australian Landfill Owners Association
- the Australian Organics Recycling Association, and
- the Waste Management Association of Australia.

There was general acknowledgement that the waste industry had progressed significantly but there was capacity for further improvement. Continued development of the industry needs to deliver a sustainable balance between resource recovery expectations and cost.

Some of the challenges and opportunities raised by the industry include:

- The waste recovery industry is undermined by bad landfill levy design. This issue encompasses Queensland’s lack of a levy as well as levies being applied to unavoidable residues from recycling and leads to ‘perverse outcomes’ such as interstate waste trafficking.
- While common in other OECD countries, Australia has only one non-voluntary extended producer responsibility scheme (National TV and Computer Recycling Scheme, with a mere 50 per cent target).
- States and territories should have a standardised approach to waste management, with a better educated public and organic waste diverted from landfill.
- Improved quality of landfills, with smaller regional ones closed.
- Secure markets are required for the outputs of the recycling industry, with agriculture a primary target.
- Government support will be required from both a policy perspective and with the capital investment required to establish the necessary recovery facilities.
- The challenge for government is the involvement of many portfolios - environment, agriculture, power generation, industry and infrastructure - with no obvious leader.

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There is an expectation that by 2026, waste will be seen as part of a circular economy where, rather than relying on the extraction of natural resources, products and components are instead reintegrated, regenerated or reused (in a circular way), to keep them at their highest utility and value at all times. This is as opposed to the linear ‘take-make-dispose’ economy. This will require cultural change to ingrained practices, but such change has been successfully achieved in Australia with seatbelt use, smoking and sun protection.

EfW will be a growing part of the industry by 2026 and there would be mandatory national product stewardship schemes for tyres, batteries and fluorescent lights, with no e-waste going to landfill.

4.4 Case study - South Australia

The ANWR 2016 highlights SA’s position as Australia’s leader in waste management, with a resource recovery rate above 75 per cent since FY2007. Its recovery rates for all but one type of material are above the national average (hazardous waste is the exception, where it is one per cent lower, on 54 per cent).

SA has been a pioneer in driving waste initiatives in Australia, through its container deposit scheme (1977) and single-use plastic bag ban (2009). As a consequence, SA’s recycling rates on plastic and glass (45 and 83 per cent respectively) are significantly above the national average (14 and 56 per cent), and an independent review found 76 per cent of shoppers did not need to purchase additional reusable bags when shopping38.

The EPA regulates the management of waste in SA through the EP Act (1993) and Regulations (2009), which establish the requirements for a waste depot levy, and the EP (Waste to Resources) Policy 2010. The Policy provides regulatory underpinning for SA’s Waste Strategy, encompassing:

- Landfill bans.
- Illegal dumping and stockpiling of waste.
- Treatment or disposal methods for medical waste.
- Defining when waste ceases to be waste.
- Mandating weekly collection of residual domestic waste for metropolitan councils.

In 2004, SA enacted the Zero Waste SA Act, establishing a statutory corporation (Zero Waste SA) with the function of reforming waste management by advancing the development of the recycling and resource recovery industry under an integrated strategy for the state.

At the time it introduced Zero Waste, SA closed its largest landfill site - Wingfields - and developed it into a 94 hectare waste and recycling centre, accommodating four complementary resource recovery specialists. The site also houses KESAB Environmental Solutions, an NGO that runs education programs and environmental audits for business. Zero Waste SA estimates the waste management industry in SA has an annual turnover of $1 billion and employs 4,800 people. The direct market value of resource recovered materials in FY2014 was $270 million, predominantly comprising metals (52%), cardboard and paper (20%) and organics (13%). Masonry, glass and plastic represented 10 percent. It also estimates that 10,000 tonnes of waste recycled creates 9.2 direct FTE jobs, whereas the same waste creates 2.8 FTE jobs29.

Over the first 10 years of Zero Waste SA, the government invested more than $80 million from the waste levy into the industry, building capacity, improving markets and developing new products and skills, with positive benefit cost ratios for all projects.

Landfill licencing conditions required regional councils to close some landfills and join with neighbouring councils, resulting in a regional planning process and the development of transfer stations, improved recovery facilities and regional landfills. Standardised kerbside collection systems have now been adopted by 39 of the 68 councils in SA, including all councils in metropolitan Adelaide.

SA drives change through five-year Waste Strategies, the third and current iteration covering 2015-2020. Having an established record of waste recovery, the strategy going forward targets more challenging issues, like reducing the amount generated on a per capital basis and looking at the economic potential from new technologies and re-manufacturing.

The current strategy includes long-term strategic objectives and specific priorities for action, including:

- Building knowledge and data on waste and recycling. This includes the continued development of the ZEUS reporting system and encouragement of its expanded use by councils to collect and analyse data.
- Reaching its recovery targets for metropolitan Adelaide by 2020 through specific measures such as promoting food organics collection and treatment, promoting sustainable procurement or ensuring planning decisions take account of waste generation and reduction. Over the next 10 to 15 years, an additional $200-350

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A million of investment is likely for MSW, and potentially double that for all streams. This is to cater for additional resource recovery infrastructure, replacement of existing facilities and the progressive closure of landfill.

- Achieving the reduction in per capita generation, including promotion of green purchasing.
- Industry development, helping businesses to reduce costs and find overseas markets for their waste management knowledge and skills.
- Encouraging and supporting research and development (no mention of direct funding).
- Realising EfW potential, through clearer regulatory framework and information on grid connection requirements. Per ANWR 2016, only 3.5 per cent of SA’s waste is recovered through EfW, with 74 per cent of recovery through recycling.

Zero Waste SA has been replaced by Green Industries SA, a statutory entity with the primary objectives of promoting:

- waste management strategies that eliminate waste or its disposal to landfill, and
- innovation and business activity in the waste management sector.

Green Industries SA is currently offering infrastructure grants of up to $300,000 to industry and local government, to fund up to 50 per cent of project costs. Eligible projects are those that:

- improve efficiency of recycling facilities
- improve the recycling of materials banned from landfill, or
- establish or upgrade a resource recovery facility.

In responding to the analysis of its data in the ANWR 2016, SA identified the following waste management challenges:

- economies of scale present challenges to remanufacturing locally as much material is exported for recovery
- waste and recyclables flow to the lowest cost management solution often leading to sub-optimal outcomes for recycled materials
- contamination of kerbside bins continues to be a problem for composters and recyclers
- use of composite materials is creating future challenges to recycling
- static or growing stockpiles of waste, and
- clean up and management of illegal dumping, on both public and private land.

### 4.5 Role of the Commonwealth

The National Waste Policy was agreed by Australian environment ministers in 2009 and sets Australia’s waste management and resource recovery direction to 2020.

The policy sets directions in six key areas, namely:

1. Taking (shared) responsibility for reducing the environmental impact of products across their lifecycle.
2. Improving the market for waste and recovered resources.
3. Pursuing sustainability.
4. Reducing hazard and risk.
5. Tailoring solutions, particularly in regional, remote and indigenous communities.
6. Providing the evidence, with meaningful, accurate and current waste data to inform decision makers and educate the community.

The policy also contains 16 strategies, of which the following are federal responsibilities:

- Product stewardship framework legislation (see below)
- Publishing a three yearly waste and resource report (the ANWR)
- Landfill emissions (covered as part of the Emissions Reduction Fund)
- International obligations, particularly on the movement of hazardous materials between nations
- Reduction of hazardous waste substances in products sold in Australia, and
- Audit of waste capabilities in indigenous communities.

Related to landfill emissions, the federal Clean Energy Finance Corporation (CEFC) works with project sponsors and co-financiers to drive investment in clean energy technologies, including EfW. Examples of CEFC investment are discussed in Section 4.7.

#### 4.5.1 Product stewardship

Product stewardship seeks to ensure that those involved in producing, selling, using and disposing of products have a shared responsibility to ensure they are managed in a way that reduces their impact throughout their lifecycle. Internationally there is an increasing trend to conserve resources used in manufacturing and reduce the harm of their disposal.
The Federal Product Stewardship Act 2011, about to undergo review, provides a framework to manage the environmental, health and safety impacts of products, particularly related to disposal. In 2012, the government introduced the National Television and Computer Recycling Scheme, which requires importers and manufacturers to join and fund industry-run, free recycling drop off points around Australia.

An example of a federally sponsored, rather than mandated, initiative is the National Tyre Product Stewardship Scheme. A voluntary scheme launched in 2014, it aims to increase domestic tyre recycling, expand the market for tyre-derived products and reduce the number of end-of-life tyres that go into landfill or are illegally dumped. The scheme is operated by Tyre Stewardship Australia (TSA), made up of representatives from across the tyre supply chain.

The TSA estimates the equivalent of 48 million passenger car tyres are discarded annually in Australia, with only 16 per cent of that number recycled. This is however up from the 5 per cent recycled in FY2014, and the TSA has a goal to increase the recycling rate to 50 per cent over five years. This requires the development of sustainable solutions for end-of-use tyres, such as road surfacing, soft fall playground surfacing and industrial flooring. In the two years to FY2016, the TSA Research Fund had invested $1.2 million in nine projects to progress the use of tyre-derived raw material.

4.6 Current and emerging challenges

Under a section titled current and emerging challenges, the ANWR 2016 highlights a number of matters that are currently faced by the waste sector, or are likely to emerge in the near future. These challenges include:

- National harmonisation of waste policy, which encompasses consistent national data and reporting.
- Establishing product stewardship obligations on a wider range of products
- Container deposit schemes, acknowledging that by 2018 Victoria, Tasmania and the ACT will be the only jurisdictions without a CDS.
- Developing approaches aligned with the concept of the circular economy, raised by industry in Section 4.3.
- Prevention of recycling failures, where operators accumulate large volumes of material that they fail to recycle. NSW and Vic are identified as jurisdictions that have adopted (different) approaches to address this issue.
- Reducing greenhouse gas emissions, linking industry with the Emissions Reduction Fund to subsidies activities that reduce landfill emissions, including EfW activities.

- Managing organic wastes, with councils managing the issue but recovery from commercial sources less well developed. A key challenge is to find end markets, including for composts and EfW ventures.
- Safe management of specific wastes, including coal seam gas waste which includes difficult to manage and sometimes contaminated brines and salts. By 2055, it is estimated the CSG industry will produce over 20Mt of waste salt. Other specific waste issues are asbestos, hazardous waste stockpiles, plastics and e-waste.
- Waste technologies are relatively basic in Australia. More sophisticated, and effective, facilities are only financially competitive where there is a shortage of landfill capacity or a large levy.
- Infrastructure planning, though assessments have been completed or are underway for the ACT, NSW, QLD, SA, Vic and WA.

4.7 Energy from Waste (EfW) examples in Australia

4.7.1 Clean Energy Finance Corporation

In 2015, the CEFC issued a report on bioenergy from waste in Australia that found the market was underdeveloped in Australia, contributing only 0.9 per cent of the country’s electricity output, compared with an OECD average of 2.4 per cent. The majority of this energy comes from burning bagasse, a residue from the production of sugar.

CEFC identified three forms of waste opportunities: urban landfill and two others (agriculture and forestry) that are outside the waste definition used in the ANWR. CEFC estimated the investment opportunity to 2020 to generate energy from urban waste between $2.2 and $3.3 billion. With carbon benefits and a cost per megawatt hour lower than new build wind or coal power, CEFC has identified EfW for urban waste as an investment option to support.

The established process is direct combustion but there are new and emerging thermal (gasification) and non-thermal (fermentation) technology options. Some examples of CEFC investment include:

- CEFC will provide up to $10 million in debt finance for a Queensland project, to enable Landfill Gas Industries to install EfW operations at six landfill sites in southern and central Queensland, selling the electricity to the grid.
- CEFC is lending $30 million to ResourceCo Group to transform selected non-recyclable waste into processed engineered fuel (PEF) at two plants - one in NSW and one in a yet to be determined state. The NSW plant, capable of processing 150,000 tonnes of waste materials per annum, is eligible for both a $5 million NSW
EPA grant and Australian carbon credit units. Through a process of shredding, screening and separating, inert content with no energy value will be extracted and the balance converted into a dry solid fuel product.

- In WA, CEFC is providing $50 million in debt finance to assist New Energy Corporation to develop the state’s first municipal EfW project in Port Hedland. Organic waste is broken down to produce a synthetic gas that will be burned to produce electricity. The plant is expected to produce 16.6MW and avoid 135,000 tonnes of carbon emissions per annum. The ash produced will be a stable, inert product that will be recycled in road pavement construction.

- CEFC is providing up to $100 million as a cornerstone investment in a new $200 million equity fund for bioenergy and EfW. The fund will be managed by the Foresight Group, a UK private equity investment manager with $3.25 billion of assets under management.

4.7.2 Case Study - Kwinana (WA) EfW Project
Phoenix Energy Australia (Phoenix) is currently developing an EfW project in Kwinana, a suburb in metropolitan Perth (just south of Fremantle and Coogee). Securing EPA and Ministerial approval in 2015 and with an estimated cost of $400 million, the project is due for completion in 2018\(^3\)\(^0\).

Phoenix will incinerate up to 400,000 tonnes of post-recycling MSW per annum. To secure feedstock, Phoenix signed 20-year waste supply agreements with the Rivers Regional Council, representing six local governments, and the City of Kwinana.

The project has a goal of zero waste to landfill through inclusion of an on-site brick plant as well as the option to use surplus ash as a construction aggregate.

An estimated 800 jobs will be created during the three-year construction phase with 60 operational jobs on completion. The plant will have the capacity to produce 32 MW of electricity per annum, which is estimated to be sufficient to power approximately 46,000 households.

Once operational, the facility will be eligible for accreditation as a large scale renewable electricity generator under the federal Renewable Energy (Electricity) Act. WA’s Waste to Energy Position Statement, from 2013, recognises EfW is a preferred outcome to landfill disposal, but that it must be achieved from residual waste that has already been subject to recovery efforts.

Nearby, in East Rockingham, another company\(^3\)\(^1\) has approval for an EfW project that proposes to use gasification from about 130,000 tonnes of waste per annum\(^3\)\(^2\).

4.7.3 Other EfW projects
- Dial-A-Dump Industries is planning a $700 million The Next General (TNG) project using moving grate thermal technology (similar to Phoenix) to produce up to 140 MW of power. This project, in Eastern Creek (Western Sydney) appears to propose using C&D non-recyclable waste as its feedstock primarily from its existing Genesis Material Processing Centre.

- EnergyAustralia is undertaking a feasibility study for a $60 million project to convert part of the Mount Piper power station near Lithgow into a purpose-built boiler to run on non-recyclable waste. A decision to proceed is due in 2018.

\(^3\)\(^0\) http://www.phoenixenergy.com.au/projects/
5 Global trends in recycling and waste

5.1 High level global trends of successful waste management

This section provides a summary of the global trends in waste management identified from the desktop review.

The waste hierarchy
The waste hierarchy underpins all good practice waste strategies and it is prominent within them. The priority of the waste hierarchy is to first stop waste being produced and then recycling or recovering value from as much of the waste as possible before final disposal. The waste hierarchy is clearly defined in the waste strategy and related policies.33

Circular economy approach
A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.33

The principles of the circular economy is gaining traction, an example is the Ellen Macarthur Foundation, which brings together 100 members from across the economy to provide unique opportunities for multi-stakeholder collaboration. Member groups include corporates, government and cities, academic institutions, emerging innovators, small and medium sizes enterprises and affiliates.

The circular economy rest on three principle, each addressing serval of the resource and system challenges that industrial economies faces. The three principles are:

- Principle 1: preserve and enhance nature capital by controlling finite stocks and balancing renewable resource flows.
- Principle 2: optimise resource yields by circulating products, components, and materials at the highest utility at all times in both technical and biological cycles.
- Principle 3: foster system effectiveness by revealing and designing out negative externalities.35

Landfill levies
- Landfill levies have been identified as effective economic instruments to provide economic price signals to generate increased investment in processing and recycling capacity through.
- Good practice indicates hypothecation of levy revenue to required waste infrastructure and programs.
- Landfill levies have been introduced and gradually increased over time to incentivise alternatives to waste disposal.
- A general trend is to combine levies with other instruments (such as landfill bans) to encourage greater waste avoidance and resource recovery.36

Landfill bans
- Many countries have adopted landfill bans for general material streams (such as biodegradable or recyclable wastes), not just hazardous or difficult materials (eg, clinical waste or tyres).37 Appendix D provides a summary of the waste categories included in landfill disposal bans in European countries.
- Bans have typically been introduced a number of years after a levy as part of a well-co-ordinated waste strategy and program.38
- In most cases, ban compliance and data provision rests with landfill operators.
- When combined with complementary instruments, bans have been highly successful in diverting waste from landfill.
- All bans have been implemented in similar ways, with the following features:
  - stakeholder consultation
  - regulations
  - transition period, and
  - enforcement.

35 https://www.ellenmacarthurfoundation.org/circular-economy/overview/principles
38 Source: Synergies Economic Consulting: Cost-benefit analysis of the implementation of landfill disposal bans in Queensland, November 2014
Management of food waste
Internationally there is a recognition that food waste is a major challenge and action is required at a legislative level. The disposal of food waste to landfill results in a significant loss of resource from the economy and therefore not aligned with the concept of a circular economy. Some jurisdictions (e.g., France) have enacted legislation to ban supermarkets from disposing of food approaching its sell-by-date to landfill, driving donations to charity or processing to become animal feed or compost. Other jurisdictions allow for the segregation of food wastes during council collection, or inclusion within green waste rather than general waste reciprocals to allow better recovery.

Product stewardship
There is an increasing trend to conserve resources used in manufacturing and of the harm of disposal of products used in manufacturing. Programs are generally influenced by political and legal factors, such as shortages of landfill capacity. In addition, the position adopted by jurisdictions is that of ‘polluter pays’. The most familiar example of product stewardship is the container-deposit schemes (CDS). However the concept of product stewardship is applied very broadly beyond bottles to items such as paint, toxic waste and tyres. In countries such as Germany, law requires attention to the comprehensive outcome of the whole extraction, production, distribution, use and waste of a product and holds those profiting from these legally responsible for the outcomes along the way.

CDS
- Most countries such as the United States and European states have had successful CDS’s in place for decades. Resulting in highly effective rates of container return under most schemes.
- Queensland’s version of the CDS is due to come into force in Queensland in July 2018.

EfW
- In Europe, EfW or otherwise known as ‘waste-to energy’ is a vital element for waste disposal, in some cases representing greater than 50% of municipal waste treatment. More than 20 million people are provided with heat and electricity generated by 420 EfW plants.

Incineration in many European countries attracts public subsidies to support the expansion of capacity.

5.2 Summary of successful policies and innovations in waste management applied in Europe
European countries are generally regarded as having higher rates of waste diversion and lower rates of waste disposal than is typically reported in most other countries. This is evident in Figure 20, which compares the MSW disposed, recycled, recovered and composted per capita in Australia against 28 Organisation for Economic Co-operation and Development (OECD) countries.

FIGURE 20: COMPARISON OF MSW GENERATION, DISPOSAL, RECYCLING, RECOVERY AND COMPOSTING PER CAPITA IN SELECTED OECD COUNTRIES

As illustrated in Figure 20 the top five countries in terms of MSW waste recovery (including energy recovery) from the selected OECD countries were all European countries, namely Switzerland, Sweden, Netherlands, Denmark and Norway.

Key success factors in European waste management

European waste and recycling policy is characterised by a supportive set of environmental and economic instruments which are, when used together, a key driver in their performance. Giroux Environment Consulting undertook a review of the State of Waste Management in Canada in 2014. As part of the review in recognition of the success many European countries have had, they reviewed their successful policies and innovations used in waste management. The findings of the report are summarised below:

Policy

- National /regional waste strategies, plans and legislation
- Explicit policy linkages made between enhanced waste diversion and resource efficiency and sustainable materials management, and
- Legislated waste diversion targets and indicators.

Elements/ instruments

- High landfill gate fees related to site availability, capacity and policy
- Landfill levies, which are designed to financially support and drive increased waste diversion
- Fewer, more regionalised and engineered disposal sites with higher environmental standards
- Widespread operation of EfW facilities with tip fees often “competitively” priced with landfill disposal, and
- Competitive Extended Producer Responsibility schemes established by policy or through engagement by competition authorities.

Support

- Dedicated authorities with broad waste reporting, research & diversion enhancement authority, often funded by landfill taxes/levies
- Regular reporting on waste diversion and waste disposal, and
- Less regulatory distinction between residential and non-residential (C&I) sources.

Table 13 provides an overview of the complementary waste management policies utilised in select European countries. The complementary waste management policies included are in addition to the various landfill disposal plans in place.

### Table 13: Overview of Complementary Waste Management Policies in European Countries

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Source: Synergies Economic Consulting: Cost-benefit analysis of the implementation of landfill disposal bans in Queensland, November 2014 & CEWEP - Confederation of European Waste-to-Energy plants

Key observations:

- A landfill tax/levy or variable landfill charge is implemented in all 13 of the European countries listed in Table 13,
- All of the selected countries (except Ireland) had some form of EfW facility (majority being incineration plants) and Ireland is currently building its first EfW plant in Dublin,
- In the Netherlands there is mandatory separate waste collection into organic waste, paper and cardboard, plastics and glass, and
- Overall the European countries with the greatest number of complementary waste management policies, namely Austria, Belgium, Germany and the Netherlands, demonstrate some of the best results for the treatment of municipal waste (refer to Figure 21).
5.3 What does international best practice look like?

In recognition of the success many European countries have had with regards to waste management, this next section provides a case study on The Netherlands waste management system. The Netherlands is one of the top performing European and OECD countries with regards to waste recovery (including energy recovery) and is highly regarded around the world.

5.3.1 Case study on Netherlands

The Netherlands’ waste management system has produced remarkable results ahead of its Government’s prediction for timing of success. The ‘system’ contains a range of elements (eg, policy settings, economic instruments, bans, planning regimes, investment, collaborations and regulations) that in combination have produced best practice outcomes.

The Netherlands has a well-defined national waste management policy with quantitative targets, along with comprehensive waste collection systems, well developed recycling systems, sufficient treatment capacity and they perform well with biodegradable waste. The Netherlands has seen significant improvement in their waste management in the past 30 years, evidenced by the volume of waste disposed of to landfill decreasing from 35 per cent in 1985 to just two per cent in 2015.

The following information has been sourced from information on waste management policy in the Netherlands produced by the Legislative Council Commission of Hong Kong in February 2014.

Planning at national level and collaboration with all levels of government

The Dutch government have clearly defined roles and responsibilities across the various levels of Government, which are detailed below:

National level

In the Netherlands, the Ministry of Infrastructure and the Environment is the government agency in charge of the overall environmental policies in the country. The ministry develops national policy and strategies on the environment in a national context, as well as ensuring the implementation of the European Union (EU) legislation in national regulations. This includes the Waste Framework Directive issued by the EU, which sets the basic concepts and definitions related to waste management, such as definitions of waste, recycling, recovery. The directive expects the waste legislation and policy of the EU Member States to apply the waste management hierarchy and introduces the ‘polluter pays principle’ and the ‘extended producer responsibility’.

Local level

The provincial governments are responsible for translating the national policy into the regional framework, granting environmental permits, inspecting waste treatment facilities and stipulating limits for noise and emissions.

The municipal governments are responsible for implementing the environmental management policy and strategy, and enforcing environmental regulation such as separation, collection, treatment, recycling and disposal of waste from households, and commercial and industrial activities in their municipalities.

Regulations

Environment Management Act

The waste management policy is primarily governed by the Environment Management Act, which stipulates an integrated approach to environmental management in the Netherlands and provides the legal framework by defining the roles of the national, provincial and municipal governments. The Act covers matters such as waste collection, disposal of hazardous waste, air quality, noise nuisance, and environmental permits for industrial and commercial activity, as well as setting out various environmental management strategies including environmental planning, environmental impact assessment, and environmental permit and reporting.

Industrial Emissions Directive issued by the EU

The Netherlands is also governed by the Industrial Emissions Directive issued by the EU which commits its member states to control and reduce the impact of industrial emissions on the environment.

National Waste Management Plan

The National Waste Management Plan takes into account the waste hierarchy model and the national environmental policy plan.

Co-ordinated policy linked to the waste hierarchy

In addition to a landfill ban and landfill tax, the Netherlands has also implemented a series of measures to prevent waste generation and promote recycling and material recovery. These include imposing strict waste treatment standards, setting up a waste charging scheme whereby households pay in proportion to the quantity of waste generated, and introducing producers’ responsibilities for the management of their products at the end-of-life stage. In addition, the Dutch government has set out a well-defined national plan for waste management in the country.
**Staged policy approach**

The National Waste Management Plan is reviewed every six years, with the aim of setting progressive targets and measures to improve the recycling rates and waste minimisation. The first National Waste Management Plan came into force at the beginning of 2003 and was reviewed in 2009, resulting in the second National Waste Management Plan. The plan is for the period 2009 to 2015, with a view to 2021. The overall objectives of the second National Waste Management Plan are as follows:

- To limit growth in waste generation (decoupling from the economic growth)
- To reduce the environmental impact of waste (optimising recovery and re-use);
- To minimize the environmental impacts from product chains (raw material extraction, production, use and waste management including reuse)
- Notification and registration of waste transports: from separate to one integral system of registration and notification of waste transports, and
- Control and enforcement.

**Introduction of landfill bans and tax (levy)**

In recent history, the ever increasing level of material consumption and the significant lack of physical space together with environmental deterioration of the land in the Netherlands forced the Dutch government to take measures to reduce the landfilling of waste which were introduced generally earlier than in other jurisdictions.

**Introduction of the waste management policy in 1994**

In 1994, the Dutch Government introduced the waste management policy, which was incorporated into the Dutch legislation. The policy is based on the waste hierarchy.

**Introduction of landfill bans and landfill tax in 1995**

In 1995 the Dutch government introduced a landfill ban for 35 waste categories and introduced a landfill tax in the same year. The purpose of these measures was to reduce waste being landfilled by making landfill disposal more expensive, whilst promoting recycling, composting and incineration as more attractive waste management options. In addition to the implementation of the waste regulations, the introduction of the landfill tax provided the incentive for waste processing companies to begin to explore other methods as they were much more attractive from a financial point of view.

**Repeal of landfill tax in 2012**

The landfill tax increased over the years to 2012 and was successful in diverting waste from landfill. The Netherlands achieved the 50 per cent recycling target stipulated by the Waste Framework directive by 2009, 11 years ahead of the target date. The landfill tax was repealed in 2012 once the amount of waste being landfilled was at such a low level (one per cent) that it was no longer practical to administer the landfill tax.

**EfW via incineration**

In addition to achieving the recycling targets, the Netherlands extensively uses thermal waste incineration plants to generate heat and electricity. Further details are provided below.

Thermal waste incineration has a long tradition in the Netherlands. The introduction of the landfill ban and landfill tax in 1995 resulted in increased use of incineration for waste treatment, which required significant investment to increase its waste incineration capacity in the mid 2000’s.

**Advances in EfW technologies**

As technology has advanced, waste incineration plants have been gradually equipped with EfW conversion and emission reduction capabilities. Energy recovery is an important source of income for incineration plants in the Netherlands. In the Netherlands, only ‘moving grate’ technology is utilised for incineration of MSW due to its reliability and robustness in accommodating variations in composition and calorific value of MSW.

**Monitoring and enforcement measures**

- An environmental permit from the provincial government is required for the installation of waste incineration plants
- Emission limit values are enforced and monitored
  - Incineration plants are required to install an automatic system to prevent waste feeding into the plan when the emissions exceed the limit values
- Annual environmental reports are submitted to the provincial government from the plant operators

**Key facts on energy recovery in the Netherlands:**

- approximately 82 per cent of electricity produced from the EfW facility is exported off site whilst the balance is used onsite
- 4,014 GWh of electricity was produced and 14.1 PJ of heat delivered by waste incineration plants in 2012
the City of Amsterdam is the showcase of the effective use of energy produced by waste incineration plants, some of the key facts are:
- two incineration facilities process 1.4 million tonnes of domestic and industrial waste
- generates 1,000 GWh of electricity
- meets the electricity demands of 285,000 households (75 per cent of all households in Amsterdam)
- 50,000 Amsterdam households use district heating, of which 25 per cent comes from heat produced by waste incineration
  > the provision of heating from waste means the city is less dependent on primary fuels such as natural gas
  > the heating solution is helping Amsterdam to meet its climate target of reducing carbon dioxide emissions by 40 per cent.

Public acceptance of waste incineration
Waste incineration is widely accepted in the Netherlands, as it provides inexpensive heat and electricity compared with fossil fuel alternatives. Additionally, it is viewed by the public as a better means compared with landfill disposal.

How do the Netherlands perform compared with their European peers?
Recovery rates
- The Netherlands is one of the top performing European countries. As illustrated in Figure 21, in 2011, approximately one per cent of MSW was landfilled with the balance being recycled, composted and incinerated for EfW.

Decreasing trends in municipal waste per capita
As illustrated in Figure 22, decreasing trends are observed in the volume of municipal waste produced per capita. The following observations can be made:
- The Netherlands have made significant improvement in reducing the volume of municipal waste produced per capita. MSW per capita has decreased from 598.3 kilograms generated per capita in 2000 to 521.3 kilograms per capita in 2015 (13 per cent decrease).
- This compares with the mean for OECD European countries which has decreased from 521.5 kilograms per capita in 2000 to 478.8 kilograms per capita in 2015 (8 per cent decrease).
Summary of the key elements of the Netherlands waste management system

There are a number of factors which have assisted the Netherlands in developing a successful waste management system, some of these key elements are summarised below:

- Implementation of the waste hierarchy
  - utilised the waste hierarchy (prevention, re-use, material recycling, energy-recovery, incineration, land filling) to inform the National Waste Management Plan.

- Stringent waste treatment standards, eg, decrees on landfill and incineration, standards for building materials, organic fertilizers, ban on landfill. Some examples listed:
  - standards for soil protection from landfilling
  - air quality standards for outputs from incinerator, and
  - a ban on landfill for 35 wastes streams (effectively a ban on all waste streams suitable for recovery or incineration are banned from landfill).

- Planning at National level and collaboration with all levels of government:
  - historically with concessions for collection and treatment, more recently via market approach and integrated national waste planning, and
  - in the context of overarching EU regulation, cooperation between the three levels of government: municipal, regional and national.

- Use of various instruments to stimulate prevention and recycling, such as:
  - economic instruments (eg, landfill tax) to steer the waste to the preferred treatment
  - education and communication to create awareness and enhance participation with separate collection schemes
  - separate waste collection, eg separate collection of organic waste, paper and cardboard, plastics and glass.

- Extended producer responsibility:
  - producers responsibility: legal as well as non-legal systems for car tyres, batteries, Waste Electrical and Electronic Equipment (WEEE), End-of-Life Vehicles (ELV), packaging.

- EfW via the use of incineration plants.
6 Summary of findings and observations

Overall

- In Australia recycling rates are improving but waste generated per capita and total volumes produced are increasing.
- In Queensland the trends since data collection began in 2008 show that increasing volumes of waste are being generated, while limited progress has been made with the overall recovery rates.
- Unlike New South Wales, South Australia and Victoria, Queensland still disposes of the majority of waste generated to landfill.
- There is significant global evidence to support that a landfill levy works to reduce the growth rates in waste being disposed of in landfill, however a levy alone is unlikely to achieve optimal results in driving broader resource recovery and efficiency.

Data

- There is a need for higher quality waste data to help make informed decisions and to monitor progress more accurately against targets in the waste strategy.

Landfill Levy

- Is a key policy tool for driving waste diversion from landfill
- Landfill levy funds can support investment in much needed infrastructure, encourage innovation and research in development, and provide education and informative tools to shape recycling behaviour
- Clarity and clear direction for use of levy funds is required, and
- A levy has been a key financial instrument used by every global best practice jurisdiction

Other reforms

- Agreed basis for policy that 'polluter pays'
- Increasing product stewardship and landfill disposal bans
- Far better collaboration and clarity of roles and responsibilities between the Commonwealth, Queensland Government, Local Government and the waste industry
- Clear and consistent policy to provide investment certainty
- High quality planning frameworks
- Consideration of EfW projects as an opportunity
- Regional planning and rationalization of existing waste infrastructure and

■ Consideration for handling rural and remote issues.
7  Key success factors and next steps

7.1  Key success factors
What does success look like?
- Coordinated national approach to waste management, supported by industry
- A regional approach to planning and funding
- Economic expansion and investment where necessary
- Reduced waste creation and increased diversion of waste from landfill
- Comprehensive suite of waste management tools underpinned by a landfill levy
- High quality data, to enable informed decision making
- Key performance indicators (KPIs) established along with transparent reporting and monitoring, and
- Increased employment opportunities through recycling, recovery and waste infrastructure investment and development of new industries.

7.2  Next steps
- Using the analysis contained in this report, engage with stakeholders to identify, assess and combine into a coordinated approach, the policy elements Queensland should consider to maximise the economic opportunities for the waste management industry in Queensland.
- This work will involve conversations/engagement with the relevant stakeholders:
  - Local Governments and the Local Government Association Queensland (LGAQ), Relevant QLD departments (eg, Department of Infrastructure, Local Government and Planning (DILGP))
  - waste industry: power, landfill, other waste operators, logistics, producers and recyclers
  - waste industry peak body organisations
  - community and education/research groups
  - other jurisdiction and industry experts, and
- QTC scope aligned to overarching review of 10-year Waste Strategy.
Appendix A: Queensland waste strategy framework

**Vision**
Queensland will become a national leader in avoiding unnecessary consumption and waste generation, adopting innovative resource recovery approaches, and managing all products and materials as valuable and finite resources.

**Key principles**
1. Protecting human health and the environment to secure our future prosperity
2. Sharing responsibility for avoiding unnecessary consumption and improving resource management
3. Recognising the economic, environmental and social costs of waste generation and disposal
4. Recognising regional differences and opportunities
5. Full lifecycle management of resources

**Objectives**
- Driving cultural change
- Avoidance and minimisation
- Reuse, recovery and recycling
- Management, treatment and disposal

**Priorities**
- Awareness and communication
- Avoidable consumption
- Partnerships, networks and programs
- Roles and responsibilities for driving change
- Education and training
- Sustainable design
- Production efficiency and cost savings to business
- Avoidable consumption
- Industrial ecology and infrastructure planning
- Green procurement
- R&D
- Improved data to highlight business opportunities
- Regional collaboration and partnerships
- Product stewardship
- Market development and appropriate incentives
- Infrastructure and planning
- Appropriate regulation and enforcement
- Full cost accounting of all disposal
- Disaster waste management
- Litter and illegal dumping
- Technology and innovation

**Figure 1: Strategy framework**

Interim report: Economic opportunities for Queensland’s waste industry
Appendix B: Arcadis report - summary of key findings of Queensland waste infrastructure needs assessment

Arcadis Australia Pacific (Arcadis) was engaged by the Queensland Department of Environment and Science (DES) to prepare a Waste and Resource Recovery Infrastructure Report for Queensland. An overview of some the key findings of the infrastructure needs assessment in each region is summarised below:

<table>
<thead>
<tr>
<th>Region</th>
<th>Key findings</th>
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</table>
| South East Queensland   | ▪ Existing putrescible landfill airspace could run out from around 2034 (under BAU) although there is potential for expansions and new facilities  
                          ▪ Existing inert landfill capacity could start to run out around 2022 (under BAU), although there is potential for expansion of some sites while other operators are seeking to develop new facilities  
                          ▪ There was limited spare MRF capacity identified and a significant future gap in the short to medium term, even under BAU recovery rates. Under higher recovery scenarios, significant new capacity will be required  
                          ▪ There is significant spare capacity in existing C&D recyclers, with potential to accommodate some future increases in recovery rates  
                          ▪ There is likely to be a short to medium term shortfall in processing capacity for green waste unless it is substituted for other recovered organics, which current market dynamics do not support  
                          ▪ Achieving the Strategy targets will require significant additional recovery capacity including 1 million tpa recovery of MSW / C&I. This could be achieved through a number of large EfW facilities. More than 850,000 tpa in additional C&D recycling capacity would also be required. |
| Cairns Region           | ▪ Inert landfill capacity should be sufficient to at least 2045 (BAU)  
                          ▪ Putrescible capacity should be sufficient to around 2041 (BAU), with good potential for further expansion  
                          ▪ MRF capacity will be stretched in the short term  
                          ▪ There is limited capacity for additional C&D recycling, constrained by local markets for secondary products  
                          ▪ There is limited capacity in the short-term for additional organics processing, constrained by a lack of product markets.  
                          ▪ Achieving the Strategy targets will require significant recovery capacity for MSW and C&I totalling almost 90,000 tpa by 2024. For C&D recycling, an additional 86,000 tpa recovery capacity is required. |
| Darling Downs – Maranoa Region | ▪ There is an abundance of putrescible landfill airspace in the region, sufficient for more than 30 years, including at one large recently approved private facility  
                          ▪ MRF capacity within the region is limited and some recyclables are already being transferred to South East Queensland for processing  
                          ▪ Significant spare C&D recycling capacity has been identified, sufficient to accommodate future growth and an increase in recovery  
                          ▪ There is substantial organics processing capacity (including significant spare capacity) in the private sector, which is currently used for commercial, industrial and agricultural wastes  
                          ▪ Councils currently process most green waste in the region  
                          ▪ Achieving the Strategy targets will require significant investment in MSW recovery infrastructure or new collection systems to utilise existing organics processing capacity; for C&D there is already sufficient processing capacity in the region to achieve the recovery target through to 2035, but not the market conditions to support recovery |

Interim report: Economic opportunities for Queensland’s waste industry

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<table>
<thead>
<tr>
<th>Region</th>
<th>Key findings</th>
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</table>
| Fitzroy Region      | - Existing putrescible landfill is modelled to run out around 2035  
- There will be a potential shortfall in MRF capacity in the future unless the existing regional MRF can be expanded to take up to 13,000 additional tonnes by 2045 (BAU)  
- Limited spare C&D recycling capacity was identified meaning that up to 25,000 tpa additional capacity will be required by 2025 to maintain BAU recovery rates, rising to 56,000 tpa by 2045  
- The data suggests significant spare organics processing capacity in the region, capable of managing future growth under BAU to 2045  
- Achieving the Strategy targets requires modest increases in recovery from BAU, with 70,000 tpa additional MSW and C&I recovery capacity, and 35,000 tpa C&D recycling |
| Mackay Region       | - Existing putrescible landfill capacity is modelled to last to at least 2045 (BAU)  
- There should be sufficient spare capacity in the existing regional MRF to accommodate BAU growth in recyclables  
- There is spare capacity within existing C&D recycling facilities sufficient to accommodate future BAU growth and a modest increase in C&D recovery  
- There is some spare capacity in existing organics processors to accommodate growth but by 2045, there may be a shortfall of around 7,000 tpa (BAU)  
- Significant additional recovery infrastructure will be required to support achieving the Strategy targets for MSW and C&I waste by 2024 including 70,000 tpa additional recovery capacity, while existing C&D capacity is sufficient |
| Townsville Region   | - There is an abundance of inert landfill capacity within one private landfill  
- Putrescible airspace is likely to be sufficient to 2045, but much of the capacity is in one site  
- Additional MRF capacity will be required to manage future BAU growth in the order of 9,000 tpa by 2025 and 17,000 tpa by 2045  
- Additional C&D recycling capacity will be required for future BAU growth of 25,000 tpa by 2025 and 57,000 tpa by 2045  
- There is limited spare organics processing capacity and managing future BAU growth in green waste will require additional 8,000 tpa by 2025 and 22,000 tpa by 2045, unless commercial feedstocks can be substituted with green waste  
- Significant additional recovery capacity will be required to achieve the Strategy recovery targets for MSW and C&I, in the order of 81,000 tpa by 2024; while for C&D an additional 36,000 tpa is required by 2024 |
| Remote Queensland   | - It is difficult to model regional capacity, given the practical limitations around sharing of infrastructure across the region  
- One single landfill (Mount Isa landfill) accounts for more than half of the putrescible landfill airspace in the region  
- Four shires were identified as potentially running short on landfill capacity within the next 5 years  
- Recycling is challenging in the region, with no existing MRFs or C&D recyclers  
- Some councils are recovering small volumes of materials at landfills and transfer stations, with some recyclables being sent to MRFs in other regions  
- Some councils and landfill sites are recovering green waste; there is potential for the one private organics processor (in Cook Shire) to process additional green waste subject to development of product markets  
- No specific recovery targets have been set for the Remote region in the Strategy |
### Appendix C: Waste categories included in landfill disposal bans in Australian jurisdiction

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Waste categories banned from landfill</th>
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<tbody>
<tr>
<td>Queensland</td>
<td>N/A</td>
</tr>
<tr>
<td>New South Wales</td>
<td>• Tyres • Medical waste</td>
</tr>
<tr>
<td>Victoria</td>
<td>• Certain hazardous wastes</td>
</tr>
<tr>
<td>South Australia</td>
<td>• Hazardous waste • Lead acid batteries • Liquid waste • Medical waste • Oil • Whole tyres • Aggregated cardboard and paper • Aggregated glass and packaging • Aggregated metals • Aggregated PET or HDPE plastic packaging • Vegetative matter collected by councils • Vehicles • PP or LDPE plastic packaging • Whitegoods • PVC or PS plastic packaging • Fluorescent lighting • Computer monitors and televisions • Whole earth mover tyres • Other electrical or electronic equipment</td>
</tr>
<tr>
<td>Western Australia</td>
<td>• Tyres</td>
</tr>
<tr>
<td>Tasmania</td>
<td>• Untreated contaminated soil</td>
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<tr>
<td>Australian Capital Territory</td>
<td>• Electronic waste • Tyres • Mattresses</td>
</tr>
</tbody>
</table>

Source: Synergies Economic Consulting: Cost-benefit analysis of the implementation of landfill disposal bans in Queensland, prepared November 2014
## Appendix D: Waste categories included in landfill disposal bans in European countries

<table>
<thead>
<tr>
<th>Jurisdictions</th>
<th>Waste categories banned from landfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>• Sludges and similar wastes • Liquid waste (except leachate) • Inflammable and explosive waste • Gasses under pressure • Infectious wastes and wastes for which the hazardous content exceeds specified limits</td>
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<tr>
<td>Belgium (Flanders)</td>
<td>• Unsorted household waste • Waste collected for the purpose of recovery or that is fit for recycling • Old and expired medication</td>
</tr>
<tr>
<td>Belgium (Wallonie)</td>
<td>• Separated household waste • Non-hazardous industrial and packaging waste • Waste from pre-treatment and sorting facilities • Non pre-treated fine residual household waste • Bulky waste</td>
</tr>
<tr>
<td>Denmark</td>
<td>• Untreated waste, including mixed municipal waste</td>
</tr>
<tr>
<td>Estonia</td>
<td>• Unsorted waste</td>
</tr>
<tr>
<td>Finland</td>
<td>• Household waste where the biodegradable component has not been separately collected • Expanded in 2011 to cover all biodegradable waste</td>
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<tr>
<td>France</td>
<td>• All waste types other than residual waste</td>
</tr>
<tr>
<td>Germany</td>
<td>• Waste with an organic component that has not been stabilised and made inert</td>
</tr>
<tr>
<td>Hungary</td>
<td>• All materials included in the EU Landfill Directive • Tyres and rubber scrap</td>
</tr>
<tr>
<td>Ireland</td>
<td>• All biodegradable waste that has not been subject to pre-treatment</td>
</tr>
<tr>
<td>Italy</td>
<td>• Waste materials prescribed under the EU Landfill Directive • Waste containing or contaminated by certain materials (e.g. PCBs, PCTs, PCDD, PCDF) • Waste containing ozone depleting substances • Waste with unknown effects on the environment and human health</td>
</tr>
<tr>
<td>Netherlands</td>
<td>• Batteries • Oil filters • Hazardous wastes • Paper and cardboard • Organic waste • Electrical and electronic equipment • Plastic waste • Tyres • Building and demolition waste • Wood waste • Contaminated soil • Household waste</td>
</tr>
<tr>
<td>Norway</td>
<td>• Biodegradable waste</td>
</tr>
<tr>
<td>Sweden</td>
<td>• Combustible waste • Organic waste</td>
</tr>
</tbody>
</table>

Source: Synergies Economic Consulting: Cost-benefit analysis of the implementation of landfill disposal bans in Queensland, prepared November 2014
Appendix E: Regional boundaries adopted in this report

The state has been divided into eight regions for the purpose of this report, which align with the regions adopted for data reporting purposes by DES. The regional boundaries are shown below.

<table>
<thead>
<tr>
<th>Region</th>
<th>Local Government Area</th>
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<tbody>
<tr>
<td>Cairns</td>
<td>Cairns Regional Council</td>
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<td>Cassowary Coast Regional Council</td>
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<td></td>
<td>Douglas Shire Council</td>
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<td>Mareeba Shire Council</td>
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<td></td>
<td>Tablelands Regional Council</td>
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<td></td>
<td>Yarrabah Aboriginal Shire Council</td>
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<tr>
<td>Darling Downs – Maranoa</td>
<td>Balonne Shire Council</td>
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<tr>
<td></td>
<td>Goondiwindi Regional Council</td>
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<td></td>
<td>Maranoa Regional Council</td>
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<td>Southern Downs Regional Council</td>
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<td></td>
<td>Toowoomba Regional Council</td>
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<td></td>
<td>Western Downs Regional Council</td>
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<tr>
<td>Fitzroy</td>
<td>Banana Shire Council</td>
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<td></td>
<td>Central Highlands Regional Council</td>
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<td></td>
<td>Gladstone Regional Council</td>
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<td></td>
<td>Livingstone Shire Council</td>
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<td>Rockhampton Regional Council</td>
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<td></td>
<td>Woorabinda Aboriginal Shire Council</td>
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<tr>
<td>Mackay</td>
<td>Isaac Regional Council</td>
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<td>Mackay Regional Council</td>
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<td>Whitsunday Regional Council</td>
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<td>Townsville</td>
<td>Burdekin Shire Council</td>
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<td>Charters Towers Regional Council</td>
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<td></td>
<td>Hinchinbrook Shire Council</td>
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<td>Palm Island Aboriginal Shire Council</td>
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| SE Qld   | Brisbane City Council  
Gold Coast City Council  
Ipswich City Council  
Lockyer Valley Regional Council  
Logan City Council  
Moreton Bay Regional Council  
Noosa Shire Council  
Redland City Council  
Scenic Rim Regional Council  
Somerset Regional Council  
Sunshine Coast Regional Council |
Appendix F: Summary of the key target areas and 16 priority strategies from the National Waste Policy

Key areas and strategies
The policy sets directions in six key areas and identifies 16 priority strategies that would benefit from a national or coordinated approach. These strategies will provide focus to the work across individual jurisdictions, build on current directions and complement existing activity. They will also provide clarity and certainty for business and the community.

The six key areas are:

1. Taking responsibility-Shared responsibility for reducing the environmental, health and safety footprint of products and materials across the manufacture-supply-consumption chain and at end-of-life.
2. Improving the market-Efficient and effective Australian markets operate for waste and recovered resources, with local technology and innovation being sought after internationally.
3. Pursuing sustainability-Less waste and improved use of waste to achieve broader environmental, social and economic benefits.
4. Reducing hazard and risk-Reduction of potentially hazardous content of wastes with consistent, safe and accountable waste recovery, handling and disposal.
5. Tailoring solutions-Increased capacity in regional, remote and Indigenous communities to manage waste and recover and re-use resources.
6. Providing the evidence-Access by decision makers to meaningful, accurate and current national waste and resource recovery data and information to measure progress and educate and inform the behaviour and the choices of the community.

The policy will also complement other government action to deliver greenhouse gas emission reductions, reduce energy and water use, support jobs and invest in future long term economic growth. It will provide the basis for collaboration between the jurisdictions to deliver effective and efficient approaches to national waste issues and ensure that waste management remains aligned with Australia’s international obligations.

Priority strategies:
The policy contains sixteen strategies and the role of relevant jurisdictions:

1. Product stewardship framework legislation to allow the impacts of a product to be responsibly managed during and at end-of-life. (Australian Government).
2. Sustainable procurement principles and practices across and within government operations. (Individual jurisdictions).
4. National definition and classification system for wastes (including hazardous and clinical wastes) that aligns with international conventions and has provision for items that have ceased to be classed as waste. (Collaboration).
6. Access to knowledge and expertise in sustainable procurement and business practices. (Collaboration).
7. Continued government focus to reduce the amount of biodegradable material sent to landfill. (States and territories individually).
8. Management of safety and health risks arising from landfill gas emissions. (States and territories individually).

10. Improvements in waste avoidance and re-use of materials in the commercial and industrial waste stream. (State and territory led collaboration).


12. Responsibility to meet international obligations; reduce hazardous materials entering the waste stream; dispose of and move trans-boundary waste in an environmentally sound manner in appropriate facilities. (Australian Government led collaboration).

13. Adoption of a system that aligns with international approaches to reduce hazardous substances in products and articles sold in Australia. (Australian Government led collaboration).

14. Identify actions to build capacity and ensure an appropriate suite of services is available to regional and remote communities. (States and territories individually).

15. Audit of existing waste infrastructure and local capability in selected remote Indigenous communities as part of essential services audit under the COAG National Indigenous Housing Partnership. (Australian Government).

16. Publish a three yearly waste and resource recovery report, underpinned by a system that provides access to integrated national core data on waste and resource recovery. (Australian Government led collaboration).
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