Economic opportunities for the Queensland waste industry: final report

PRESENTED TO: DEPARTMENT OF ENVIRONMENT AND SCIENCE

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PREPARED BY QUEENSLAND TREASURY CORPORATION
Opportunity for transformation

In its recent Directions Paper, *Transforming Queensland’s Recycling and Waste Industry*, the Queensland Government acknowledged that the state will progressively move toward a circular economy. Under such a model, products and materials are kept circulating at their highest value for as long as possible through sharing, repairing, re-use, remanufacture and recycling.

Under the current linear economy model, goods are produced from virgin materials, used and then disposed of. South Australia, which already has a mature recycling industry and a current recovery rate of over 80 per cent, has estimated that moving to a circular economy could create an additional 25,700 jobs within the state by 2030.

In 2017, Queensland disposed of 5.5 million tonnes of material. While the circular economy model is much broader than just waste management and resource recovery, Queensland’s current low rate of resource recovery means the transition from linear to circular is both a formidable challenge and a significant opportunity.

While 100 per cent recovery is not currently possible, for Queensland, with a recovery rate of just 44 per cent, the 5.5 million tonnes of material currently being disposed of represents a significant resource that can be used to create economic value and jobs for the state.

Enabling change

Queensland Treasury Corporation (QTC) has identified 11 enablers necessary to realise economic opportunities for Queensland’s waste industry, and start the transition toward a circular economy. These enablers are highly interdependent. Failure to effectively deliver change in any one area will diminish the overall effectiveness of the transition.

On the adjacent infographic (Figure 1), the outer ring represents the *foundational* enablers, which are core functions of the State. The middle ring comprises *universal* enablers, which in turn sustain the six *targeted* enablers of the inner section.

An integral feature of all enablers is the need for collaboration between stakeholders. The complex material flows in the lifecycle of any resource means no one party can accomplish change on its own.

Governments, business, the waste industry and the community need to work together under a clear, long-term plan that has stakeholder support and commitment. Much of the change will be driven by the market. Government’s role will be to provide clear direction and certainty, appropriate support and the removal of barriers, and to define and enforce the standards required.

![Figure 1: Market Enablers](source: QTC)

The Government’s announcement that it will introduce a levy on disposal to landfill in the first quarter of 2019 provides both an incentive for change and the fiscal capacity to help facilitate that change. The levy will be part of a broader Waste Strategy currently being developed by Government.
Key recommendations

Based on detailed analysis, market research and extensive stakeholder consultation, QTC has provided recommendations for each of the 11 enablers for Government consideration.

The Government must clearly specify its aims for waste management and resource recovery, and identify key performance indicators against which success will be measured. Those measures should include clear economic indicators, such as value of recycled product sold and number of jobs created. Following development of a policy on the circular economy, the Government will need to review its waste strategy and legislation, and all associated regulations to ensure they are fully aligned.

Waste and the recovery of materials involves a broad range of stakeholders. Collaboration between all parties – governments, business, the waste industry and the community – will be critical. With no party able to deliver change alone, the State must facilitate the process by committing to jointly develop all enablers with key stakeholders, and to ensure they have a genuine voice in decision-making.

The landfill disposal levy will generate significant revenue, providing Government with a substantial funding pool and the opportunity to move Queensland’s economy towards a more circular model. However, policy success will see the amount of material being landfilled - and therefore the amount of levy revenue – diminish over time. Government should be transparent and efficient in how it applies the levy funds to deliver long-term sustainable solutions.

The development of end markets must be ‘pulled’ by market need, not ‘pushed’ to achieve waste diversion and risking long-term damage to the industry’s reputation. The State should select priority materials to accelerate their development and assist in establishing industry-led quality assurance systems to provide consumer confidence. Governments at all levels must lead by example in their procurement practices, potentially mandating at least minimum quantities of recycled materials.

Certainty is a key concern for stakeholders, and the Government can provide this by developing a 30-year state-wide waste and resource recovery infrastructure plan, giving a rolling forecast of the levy price and a minimum of three years’ notice for the introduction of any landfill bans.

Aligning Queensland processes to other states and any national frameworks and having an effective compliance regime will also provide confidence in the direction being taken.

The universal and targeted enablers depicted in Figure 1 are all about working in partnership with stakeholders, and are different in nature to the foundational enablers, focused on setting policy and achieving compliance. QTC recommends that the potential conflicts between these competing roles be addressed through the creation of a new entity to take on the nine industry development enablers, with the core responsibilities for policy and compliance to remain with the Department of Environment and Science.

Led by an independent Chair and overseen by an expertise-based board, this new entity should bring skills from a diverse range of backgrounds: government, business, the waste and resource recovery industry, education, planning and procurement.

Creation of a new entity will not in itself alter outcomes. The leadership and staff must be carefully chosen to ensure they can work effectively with all stakeholders to deliver real outcomes and real change.

Data and information sharing is critical. All stakeholders must be able to make decisions with confidence based on access to current and forecast data from industry and local governments on material flows and available resources.

Education is the other universal enabler, and is vital to changing entrenched linear economy habits. It is recommended that standardised messages be delivered at the highest possible level to ensure a consistent, dynamic and broad-reaching campaign, and that existing networks are leveraged to achieve maximum effect.

The recommendations provide a pathway for a fundamental shift in the Queensland economy. While some steps can commence immediately, other elements will take time. There is significant risk if ‘fast-tracking’ means change is not properly planned or managed.

Next steps

With 34 strategic recommendations in total, the above summary focusses on the key elements only. The enablers are highly interdependent. For any recommendations not adopted, the Government should consider appropriate alternative measures.

QTC has developed an implementation roadmap (see Appendix A), setting out the steps required to progress the changes described in the report recommendations. Each step identifies actions required, who is responsible, who needs to lead and participate, and the timing of deliverables.

Because of innovation and the rapidly evolving nature of this sector, regular review of the Waste Strategy and all elements supporting it will be critical.
1 Scope and approach

1.1 Context
Out of necessity, developing economies produce goods that are used, reused and recycled until all value has been exhausted. As economies grow richer, the life cycle of those goods typically changes to reflect a linear model of consumption, where goods are produced, used and disposed of.

This linear approach is not sustainable in a world of finite resources. Importantly, the linear system leaves economies increasingly vulnerable to risk, including higher commodity prices and supply disruptions. With these considerations and imperatives in mind, advanced economies are beginning to adopt and integrate the principles underpinning the historical restorative model, referred to as the circular economy.

A fundamental principle of the circular economy is that resources are kept in use for as long as possible to extract maximum value, with products and materials recovered and regenerated at the end of their service lives. The productive management of the resources contained in waste is a core feature of the circular economy.

What is currently regarded as waste in Australia actually represents valuable resources that can be used for economic benefit. The effort put into managing the resources in waste will determine the amount of economic opportunity that can be realised.

As the Department of Environment and Science (DES) observed in its recent Directions Paper on the waste industry, Queensland is a major underperformer in resource recovery, both by national and international standards. While transformational changes in resource recovery and re-use are already well advanced among many of its global and domestic peers, Queensland’s economy remains predominantly linear.

The state is now at a crossroads. With the introduction of a waste disposal levy, the Queensland Government is delivering a foundational measure to help facilitate change in waste management and resource recovery behaviour and practices in the state.

However, without accompanying, comprehensive step-changes in its policy architecture, Queensland is at risk of becoming an outlier. The economic opportunities and the risks of inaction are too great to continue on the same linear trajectory. Setting Queensland on the path towards a circular economy will be vital for securing the state’s economic and environmental sustainability.

1.2 Scope of work
As part of an inter-departmental project, QTC was engaged by DES to examine the economic opportunities for Queensland’s waste industry. The drivers for the project were to improve Queensland’s resource recovery rate and, in doing so, maximise the economic benefits to the economy. Queensland’s current waste strategy is to be replaced and this report has been prepared as an input into the new waste strategy being developed by DES.

The key deliverable for QTC is to 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.

The work has been completed in two stages:

- an interim report that examined current and historical performance in Queensland and other jurisdictions, and identified the key elements present in those that had high resource recovery rates, and
- this final report, identifying the enablers required for Queensland to realise economic benefits through improved resource recovery activities, with an implementation plan for the next steps required.

The interim report was completed in July 2017 and a public version published on the DES website

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1.3 Project context

There have been a number of significant developments and policy announcements since QTC completed its interim report:

- The Honourable Peter Lyons QC led an independent investigation into the transport of waste from other states into Queensland. The findings of that investigation, completed in November 2017, included a recommendation that the Government should consider implementing a general waste levy on all waste disposed of to landfill in Queensland^4.

- As part of its National Sword policy, the People’s Republic of China (PRC) reduced the amount of acceptable contamination in specific recyclable materials, with effect from 1 January 2018^5. As a consequence, there have been significant reductions in the amount of recyclables that can be exported to the PRC, as well as a reduction in the commodity price of some recyclables on global markets.

- On 20 March 2018, the Premier of Queensland announced that the State would be developing a new Waste Strategy, underpinned by a levy on the disposal of waste to landfill. The announcement also provided that the waste levy would have no direct cost impact on households^6.

- A Recycling and Waste Management Stakeholder Advisory Group (AG) was established to co-design Queensland’s waste management strategy^7.

- On 18 April 2018, Ipswich City Council announced that, due to high contamination rates in its 'yellow top' recycling kerbside collections, it had commenced landfiling these materials (a practice that subsequently ceased).

- Queensland’s Deputy Premier issued a statement on 19 April 2018 confirming that, in response to Ipswich City Council’s decision to send recyclables to landfill, the State would fast-track the introduction of the levy, incentivise the recycling industry, and encourage waste to energy (WtE) enterprises to be part of the solution^8.

- The national Meeting of Environment Ministers announced on 27 April 2018 that all packaging would be reusable, recyclable or compostable by 2025. To deliver this target, governments will work with the Australian Packaging Covenant Organisation (APCO), which represents over 900 companies.

- The Local Government Association of Queensland (LGAQ) announced on 27 April 2018 that Queensland councils were committed to a zero waste to landfill target by 2028, underpinned by WtE solutions^9.

- On 1 June 2018, DES released a Directions Paper, Transforming Queensland’s Recycling and Waste Industry^10. The paper proposed that a waste disposal levy of $70 per tonne would commence in the first quarter of the 2019 calendar year. The Directions Paper also stated that Queensland will progressively move toward a circular economy.

- The 2018-19 State Budget, released on 12 June 2018, set out the forecast revenue generated by the levy, and committed an initial $100 million over three years for a new Resource Recovery Industry Development Program, designed to support innovation and investment in recycling and assist new industries that manufacture products using recycled waste and create future jobs^11.

- On 26 June 2018, the Senate Environment and Communications Reference Committee released its final report on the Australian waste and recycling industry^12.

- A number of local governments in Queensland have announced bans on the use of certain single-use plastics at council events.

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^8 Jackie Trad, Deputy Premier, Treasurer and Minister for Aboriginal and Torres Strait Islander Partnerships, ‘Queensland to act now on waste’ (Media Release, 19 April 2018).


^10 Department of Environment and Science (Qld), Transforming Queensland’s Recycling and Waste Industry: Directions Paper, above n 2.


Some significant national companies have announced changes in business practices around food waste, product packaging and the diversion of waste to landfill.

In addition to the foregoing, DES introduced a ban on single-use, lightweight plastic shopping bags from 1 July 2018, and from 1 November 2018, will implement a container refund scheme (CRS). DES has also established a Waste Levy Taskforce to work on the legislative, process and compliance requirements for the introduction of a levy in the first quarter of 2019.

It is within this very dynamic context that QTC has completed this report, and that the Government will need to implement its new waste strategy. It is therefore critical the strategy provide certainty regarding long-term objectives and the policy measures to support Government’s goals, while allowing the flexibility to adapt to changing circumstances and new initiatives.

1.4 Approach

QTC’s approach for this project was to identify the enablers required to realise economic opportunities from better resource recovery, recycling and management of Queensland’s waste. This was developed through:

- a structured approach to identify the enablers required to deliver better waste management outcomes for specific waste types, and
- extensive stakeholder engagement.

Analysis of waste types

To assist in validating the range of enablers required to deliver better waste management outcomes, QTC selected specific waste types, analysed their current treatment and identified options to achieve more optimal outcomes.

Higher-order outcomes are based on the waste hierarchy (Figure 2), the widely-accepted guide for prioritising waste management practices, as recognised in the Waste Reduction and Recycling Act 2011 (Qld) (‘Waste Act’)\(^1\). The optimal outcome is to avoid, or design out, the creation of waste. **Reuse, recycle and recover** each have processes to regain value from materials following their initial use.

Using the framework adopted in the Australian National Waste Report (ANWR), the selection of waste types used a prioritisation process that considered the volume of waste disposed to landfill, the current recovery rate and environmental impact. Based on this approach, the following waste types were selected:

- Concrete, as part of the broader category of Masonry and the Construction and Development stream
- Food Organics, expanded to also consider Garden Organics
- Tyres, a regulated waste under the Hazardous category
- All types of Plastics, and
- Paper and Newspapers, and Cardboard, part of the Paper/Cardboard category.

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\(^1\) Waste Reduction and Recycling Act 2011 (Qld) s 9 (‘Waste Act’).
The findings on specific waste types are discussed in Section 6.

As identified in the interim report, data integrity continued to be an issue, with challenges in its completeness, timeliness, consistency and reliability. This was overcome by seeking data from a variety of sources and, where necessary, making reasonable assumptions or extrapolations based on the available information.

**Stakeholder engagement**

During the three months taken to complete this report, QTC engaged directly with over 65 individual stakeholders, and many more through various fora and conferences. These stakeholders represented business, the waste industry, subject matter experts and research bodies, federal, state and local governments, funding bodies and the community (see Appendix B).

Many gave significant time and assistance to identify issues and emerging trends, provide examples of best practice, and offer feedback on the concepts and recommendations contained in this report.

The QTC project team was also provided with extensive support from DES and Arup, appointed as technical advisors. Additional assistance was provided by McKinsey & Co, AgileDirect and Arcadis Australia Pacific (Arcadis).

Stakeholders also invited the review team to visit waste management and resource recovery facilities across Queensland and inter-state, ranging from landfills through to cutting-edge manufacturers using resources taken from waste streams.

QTC wishes to express its sincere gratitude to all stakeholders and advisors for their assistance in developing this report.
2 Current state

According to the most recent ANWR\textsuperscript{14}, Queensland’s waste recovery rate of 48 per cent\textsuperscript{15} was the second lowest among the states and territories as at 30 June 2015 (see Figure 3).

The disposal of waste into landfill represents a lost opportunity. It is estimated that 10,000 tonnes of waste sent to landfill supports 2.8 full-time equivalent (FTE) jobs\textsuperscript{16}. In contrast, recycling that same waste is estimated to generate 9.2 FTE jobs, as well as increasing resource recovery, reducing the need for virgin materials, avoiding the unproductive use of land, and reducing greenhouse gas emissions.

2.1 A snapshot of Queensland’s performance

Queensland’s waste recovery rate is virtually unchanged since FY2008, and is almost 30 per cent below the top performing Australian jurisdiction (see Figure 3).

In FY2017, 9.8 million tonnes of headline waste was generated, with a recovery rate of just 44 per cent (4.4 million tonnes)\textsuperscript{17}. Over the nine years to FY2017, growth in waste has outstripped population growth by 19 per cent.

The contributions by individual waste stream are shown in Figure 4 and Figure 5. Of the total headline waste landfilled and/or incinerated in Queensland, SEQ accounted for around 80 per cent (4.3 million tonnes).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure4.png}
\caption{FIGURE 4: HEADLINE WASTE IN QUEENSLAND (FY2017)}
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\textsuperscript{15} The 48% recovery rate reported in the ANWR includes a reclassification of landfill waste due to energy recovery. This reclassification results in a higher recovery rate than that reported by DES.


FIGURE 5: HISTORICAL TRENDS IN HEADLINE WASTE IN QUEENSLAND

Source: QTC, using data from Department of Environment and Science (Qld): Recycling and Waste in Queensland 2017

Of note, Queensland received an estimated 912,000 tonnes of waste from interstate sources (primarily New South Wales) in FY2017. This represents a 61 percent increase on FY2016 and more than double the quantity transferred in FY2015.

2.2 Current issues and challenges to resource recovery

There is a range of factors contributing to Queensland’s poor record of waste management and resource recovery.

Limited recovery infrastructure

Across almost every region and type of waste, Queensland’s requirement for additional waste infrastructure to meet the 2024 recovery targets has been assessed as significant18. Based on current volumes of waste generation, DES estimates that an additional 1.5 million tonnes of waste would need to be diverted from landfill each year to reach the national average recovery rate19.

The latest ANWR identified a lack of source-separation infrastructure, limited infrastructure to recover mixed wastes, and limited activity to recover putrescible waste from households and small to medium enterprises20. There is also a need for rationalisation of small facilities21.

The reprocessing of recyclable materials in Queensland is generally limited to materials such as glass, paper and small volumes of tyres and plastics. Most other materials are being sorted and consolidated in the south east before being exported overseas or to interstate mills.

In addition, the cost of disposal to landfills in Queensland (mainly SEQ) is relatively low22.

Undeveloped end markets

The lack of established and secure markets for many recovered products is a significant barrier to investment in resource recovery infrastructure23.

The risk inherent in over-reliance on export markets for materials recovery was highlighted most recently by the PRC’s change in policy on the import of recyclables - a policy measure consistent with the wider trend of sovereign protectionism.

This trend is expanding beyond the PRC, with Malaysia and Vietnam also moving to apply more stringent restrictions on imported recycled materials.

These measures, and the broader isolationist drift of international trade policy, underscore the need for secondary markets and appropriate recovery facilities to be developed domestically.

Policy consistency

By domestic and international standards, the policy environment governing waste recovery and recycling in Queensland is comparatively immature. This can be attributed to a range of factors, including the lack of bipartisan consensus on key policy measures and objectives, and the lack of clear alignment of views on priorities across key stakeholder groups, including local governments and industry peak bodies.

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19 Department of Environment and Science (Qld), Transforming Queensland’s Recycling and Waste Industry: Directions Paper, above n 2.
20 ANWR, above n 14.
21 Arcadis, above n 18.
22 ANWR, above n 14.
23 Arcadis, above n 18.
While Queensland’s current waste strategy sets targets to increase the recycling of waste, there are no strong policy instruments or regulatory drivers to achieve the State’s objectives. Importantly, Queensland is the only mainland state that does not currently apply a levy on waste sent to landfill. While a levy is set to be implemented in the first quarter of 2019, stakeholders cited the removal of the previous levy regime in 2012 as creating an environment of policy uncertainty - a disincentive to investment.

As well as the lack of a waste levy, there are no other strong policy measures to discourage landfilling recoverable materials and limited capacity to deal with illegal dumping. Furthermore, stakeholders have highlighted uncertainty around planning approval processes and timelines as a deterrent to investment in new waste infrastructure. A recent example is the Temporary Local Planning Instrument (TLPI) gazetted by the State Government to introduce regulatory requirements for waste-related developments in the Swanbank / New Chum industrial area in Ipswich, applying new buffer zones and other safeguards following the encroachment of residential development.

Industry stakeholders have voiced concerns about the lack of consultation on the TLPI before its promulgation.

**Data limitations**

Deficiencies in current data collection and the availability of suitably detailed waste flow and infrastructure information are barriers to robust options analysis and infrastructure investment decisions.

This primarily relates to the collection of information on waste flows from landfill and recovery sites, including the details of individual facilities and infrastructure characteristics, as well as the composition of waste streams across the state.

**Local government cost pressures**

Local government plays a critical role in waste management across the state. Some council stakeholders have highlighted that budget constraints and pressure to limit the impost on ratepayers have inhibited investment in new infrastructure and create an inevitable bias towards options with the least short-term cash flow impacts. For those councils and operators that have invested heavily in landfills and need to recover the costs, the financial impact of increasing landfill diversion is potentially significant; revenue could be lost, and landfill savings may not be realised. The Queensland Audit Office has also highlighted that a number of local governments have no provision for the rehabilitation of existing landfills.

If the incidence of illegal dumping increases following the implementation of the landfill levy (reflecting the experience in other jurisdictions), councils and State Government agencies will likely bear increased costs to collect the waste.

**Regional Queensland**

Access to markets is the primary limitation on resource recovery in regional and remote areas, particularly given the high cost of transporting materials to manufacturing facilities or ports. The lack of volumes for some waste streams in certain locations restricts efficient processing and thus recovery in regional areas.

While Queensland has pockets of industry and towns in remote areas, recycling in more remote areas is challenging. Collaboration could be enhanced in some regions to establish planning regimes that reach beyond local government boundaries, consider the redesign or rationalisation of uneconomic services, and the development of new infrastructure. In some areas, regional aggregation of waste volumes has increased the options for recovery and more efficient disposal, supported investment in new infrastructure, and attracted greater competition and industry interest.

**Illegal and unlicensed operators**

Illegal and unlicensed operators create an uneven playing field for licenced operators. The feedback from the waste industry is that this is likely to become more acute following the implementation of the landfill levy in Queensland.

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

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25 Temporary Local Planning Instrument No.1 of 2018 (Waste Activity Regulation) (Qld).


27 Arcadis, above n 18.
2.3 Current initiatives and positive trends

As noted at section 1.3, there are a number of positive trends and current initiatives underway which will assist in enabling better waste outcomes.

Some of these are highlighted below:

- The Queensland Government is implementing a CRS from 1 November 2018.
- The supply of single-use, lightweight plastic shopping bags has been banned with effect from 1 July 2018.
- DES commissioned the first comprehensive state-wide needs assessment of waste and resource recovery infrastructure, delivered to the department by Arcadis in February 2017. The report will be followed by a more detailed study focussing on North Queensland.
- A Waste Industry Compliance Investigation Taskforce has been established to deliver ‘Operation TORA’, a coordinated program to enhance compliance and stamp out unlicensed waste management operators in Queensland.

Within the broader community and among key stakeholder groups, there are encouraging signs of a new focus and commitment to changing longstanding waste management behaviours and practices.

The ABC’s War on Waste series28 and a 2017 Four Corners investigation into the waste industry29 have heightened public awareness about the environmental and economic sustainability dimensions of consumers’ waste disposal habits and practices within the industry.

Particular attention has focussed recently on the impact of plastic pollution on the marine environment30, including recognition of the problem at an international level by the United Nations31 and at the G7 2018 Summit32.

At a national level, the Senate Environment and Communications Reference Committee released its final report on the Australian waste and recycling industry on 26 June 2018.33 Among other things, the Committee recommended that the Australian Government prioritise the establishment of a circular economy, and that the Australian and state and territory governments agree to a phase-out of petroleum-based single-use plastics by 2023. The Committee Chair described the inquiry as a ‘rare display of political consensus’34.

There is also greater general awareness of the benefits of regional collaboration in waste management. This is evident by the cooperation between members of the Local Authority Waste Management Advisory Committee (LAWMAC)

At a local government level, the Policy Executive Committee of Queensland’s peak body, the LGAQ, has committed to a zero waste to landfill strategy by 202835, and commissioned a preliminary technical study on WtE options for Queensland.

In addition, following the local government amalgamations of 2008, there has been a trend of significant consolidation of landfill sites across the state.

In Queensland, 70 landfills were closed or converted to transfer stations in the last five years and another 15 landfills are earmarked for closure/conversion within the next five years. The majority of closures and planned closures are in the very small/remote category.

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33 Senate Environment and Communications Reference Committee, ‘Never waste a crisis, above n 12.
3 Proposed state

While Queensland has a poor record when it comes to resource recovery, and policy and regulatory settings that lag behind its domestic and international peers, there is an unmistakable and broad-based groundswell of community and stakeholder support for change. The challenges of the current state outlined in the previous section present a rare opportunity for policymakers to materially alter the shape of the state’s waste landscape. To paraphrase the exhortation delivered by the Senate Reference Committee, the convergence of recent events represents a crisis that should not be wasted.

The economic benefits of transitioning economies from linear models towards more circular approaches can be profound. Across the European Union, it has been estimated that mainstreaming circular economy principles and practices will drive billions of dollars in GDP growth and materials cost savings, and deliver hundreds of thousands of jobs in coming years.\(^\text{36}\)

Closer to home, a recent report commissioned by the South Australian government conservatively estimates that an additional 25,700 jobs could be created within the state by 2030 compared to a business-as-usual scenario, and that a circular economy could reduce the state’s greenhouse gas emissions by 27% over the same timeframe.\(^\text{37}\)

Within Queensland, effective examples of circularity are already emerging. However, material flows are notoriously complex – starting from the use of raw materials through to product and packaging design, transport considerations, options for re-use and repair and recycling, and consideration of how to dispose of or treat unwanted goods. As a result, opportunities for resource minimisation and recovery are not always easy to identify or implement.

To transition to a circular economy, Queensland needs to fundamentally re-conceptualise the way resources flow through the economy. While this shift will require significant, ongoing commitment from Government, the transition could deliver a radical and enduring transformation of Queensland’s economy, with opportunities to increase economic output and jobs across the state.

The move to a zero waste future has strong community and industry support and momentum continues to grow,\(^\text{38}\), notwithstanding some inevitable resistance to adjusting longstanding consumer habits.\(^\text{39}\)

To facilitate the changes required, Queensland needs a waste strategy which:

- drives us towards the economic, social and environmental benefits associated with a circular economy approach
- enables individuals and the market to take action
- recognises the need to embrace new waste and resource recovery technologies
- incentivises action through appropriate economic tools and regulatory measures (including pricing, bans, procurement policies and extended producer responsibilities) and
- embeds accountability across all stakeholders, including Government.

The strategy should explain how Queensland can promote better resource recovery and recycling practices, and ultimately move to a circular economy (see Figure 6) through a targeted focus on relevant enablers. These enablers are discussed in detail in Section 4.

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3.1 What does Queensland’s proposed state look like?

The move towards a future circular economy will require substantial infrastructure investment and behavioural transformation, supported by an appropriate enabling policy environment. However, achieving the necessary change has the potential to materially improve economic, social and environmental outcomes. So what does Queensland’s proposed state look like?

Appropriate infrastructure

The State will have facilitated the significant expansion of new waste and resource recovery infrastructure, which will be scaled up over time, and considered from a holistic perspective in order to develop economies of scale and market access. This will be considered from both an SEQ and regional perspective – one size will not fit all. Regional areas will have bespoke solutions where appropriate to deal with complexities such as scale and transport trade-offs.

Better behaviour

Consumers (households and industry) will be informed and incentivised to make better use of resources, recycle content more effectively and consider alternative uses for products, where these are required. To maximise the economic value of recyclates in international or national markets, collection systems will be designed with the goals of end-use and recycling in mind. Illegal dumping and litter will be minimised through effective behaviour change initiatives and prompt compliance action.

Improved economic, social and environmental outcomes

The transition towards a circular economy will drive significant jobs growth and development of new industries. The economy will expand over time, and as resource use is optimised and new markets and technologies are developed.

Despite population growth, environmental impacts will be significantly improved as Queensland avoids the adverse outcomes that can be associated with high levels of landfilling and other unsustainable waste management practices.

Communities, businesses and the resource recovery, recycling and waste industry will be engaged to support the State and the broader good through better waste management behaviours and practices.

3.2 How do we get there?

Get the foundations right

Government needs to focus on getting the right frameworks, strategies and policies in place to support the move towards a circular economy. Among other things, this will involve:

- **Effective governance**: The State should review its current governance arrangements and structures to ensure these are best designed to deliver the desired waste management outcomes. In better-performing jurisdictions, this has involved a structural reconfiguration of policy, compliance, and strategy development and delivery functions.

- **Policy and legislative frameworks**: These need to provide a clear and consistent message to the market about the State’s priorities. This includes developing a more cohesive planning regime relating to land use for waste management and resource recovery, and the development of clear policies relating to the circular economy, WtE and landfill rationalisation and restoration. Ongoing harmonisation of policies and legislation across jurisdictions should be more actively promoted to ensure Queensland is able to access the most efficient market outcomes.

- **Monitoring and compliance activities**: Illegal activity (such as illegal dumping) puts individual gain ahead of the social good. Effective compliance and monitoring – including the strategic prioritisation and targeting of offences and offenders – will
reduce incentives for this behaviour and provide certainty to the market that good behaviours are rewarded and opportunities for individual gain from illegal activities are reduced.

Universal enablers

Education

Community and industry awareness and motivation to drive better waste outcomes is already high. This appetite for change should be harnessed and encouraged by Government.

Consumers and industry need clear and consistent messages, including what can and cannot be recycled, the options available for reuse and repair, and how consumption can be reduced. To support this, the State will need to develop a holistic education strategy which can accommodate evolving needs as infrastructure is developed and new technologies and opportunities emerge.

Data and information

A large volume of data is currently collected across a range of disparate sources. Government will need to carefully target its data collection and communication activities to allow information to be interrogated holistically and used by all stakeholders to drive accountability and enhanced decision-making.

This includes ensuring the State has the ability to leverage existing and emerging technology and industry and community experience.

Partnering and collaboration

Enduring change in consumer behaviours and industry practices will not be achieved without private sector and community support. Partnering and collaboration provides opportunities for shared learning, greater economies of scale, and synergies from leveraging stakeholder knowledge, experience and infrastructure. This also ensures duplication of effort is minimised, and cost savings maximised (including through collaborative procurement).

Specific enablers

Landfill levy and bans

The State needs to send clear, credible, long-term market signals, including through price signals such as the landfill levy. Stakeholders have expressed a strong desire for policy stability, citing a historical lack of bipartisanship and record of policy reversal.

In future, price signals (including subsidies) could be used across broader areas such as transport and product pricing. The State is also likely to provide signals to the community and industry via the use of bans on products with alternative end of life uses. While these may be implemented over the longer term, a clear indication of Government’s intent should be provided with sufficient time for the market to prepare.

Product stewardship

Many larger producers are already looking for ways to operate more sustainably. However, there are opportunities for this to be encouraged. This includes implementation of take-back policy schemes where practical and consideration of requirements for problematic waste types. Diversion of valuable waste types (such as e-Waste) should be prioritised.

Land-use planning

The State needs to remove unintended barriers to private sector investment. This includes greater land-use planning certainty - an issue raised by multiple stakeholders. To support this, waste management should be considered holistically, and afforded greater priority by treating it as an essential service. This includes addressing how waste is managed in high density residential areas and multi-unit dwellings.

Considering planning from a whole-of-state perspective would deliver economies of scale and allow the strategic identification of waste and resource recovery precincts. The identification and development of such precincts was strongly advocated by stakeholders.

Market development, including procurement

Recycling activity should occur based on demand for a specific material by an end market.

Domestic markets for recycled products (particularly in Queensland) remain in their infancy. The State will need to find ways to support the development of the Queensland market that drive higher levels of recycling activity.

This includes the development of standards for materials, as well as specifications for particular products and end markets.
It will also include changes to procurement practices to incentivise and encourage (or mandate, as appropriate) the use of recycled content where it is available, and consideration of improved land planning to encourage co-location of facilities where synergies exist (eg, development of waste precincts).

**Principles driving success**

A number of core principles will underpin success in “shifting the dial” across all market enablers:

- Provide holistic, outcomes-focussed vision
- Send clear and consistent market signals
- Push for harmonisation
- Provide certainty
- Be agile
- Drive accountability
- Lead by example.

These principles are supported by industry experience and best practice examples from other jurisdictions.
This section examines each of the 11 market enablers identified in Section 3, focusing on current challenges, opportunities and associated considerations for decision-makers, as well as recommendations for next steps.

Each enabler is critical to realising economic opportunities in Queensland’s waste industry, and generating the momentum required to mainstream circular economy principles in the state.

The outer ring at Figure 7 shows the foundational enablers, which are core functions of the State. The inner ring is made up of universal enablers, which in turn support the six targeted enablers of the inner section.

All of the enablers are highly interdependent. If one enabler is excluded, consideration must be given to the impact on the other enablers and additional actions may be required. Failure to effectively deliver change in any one area will detract from the overall endeavour to transition Queensland to a circular economy.

To achieve the necessary changes, governments, business, the waste industry and the community need to work together.

While much of the change will be driven by the market, the Government has a critical role in providing clear direction and certainty, appropriate support and the removal of barriers, and defining and enforcing the standards required.
4.1 Policy and legislative framework

Vision
Legislative and policy settings that support an integrated, state-wide approach to waste and resource recovery, promote regulatory efficiency and investment certainty, and, where possible, achieve consistency with other jurisdictions to promote a harmonised national approach.

Current state
Within Australia, the waste and resource recovery industry operates in a complex and evolving economic and regulatory environment, made more challenging by a patchwork of policy and legislation\(^4\), and inconsistencies across jurisdictions.

FIGURE 8: LEGISLATIVE FRAMEWORK IN QUEENSLAND

In Queensland, the existing legislative and policy settings have proven inadequate to achieve the outcomes articulated in the current Waste Strategy.

The issue of interstate waste transfer from New South Wales has also highlighted the unintended consequences of disharmony across jurisdictional policy settings.

QTC's interim report summarised the current regulatory and policy framework at the Commonwealth and State Government levels\(^4\).

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

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\(^{40}\) Senate Environment and Communications Reference Committee, *Never waste a crisis*, above n 12, 23 [2.74].

\(^{41}\) Queensland Treasury Corporation, above n 3, 20-21.
The Waste Act sets out a framework for prioritising waste management practices to achieve the best environmental outcome. Among other things, the Act also provides for the preparation of a comprehensive long-term strategy for achieving Government’s core waste management objectives, including waste avoidance, sustainable consumption, industry investment in innovation and new infrastructure, strategic regional infrastructure planning, and product stewardship.

Consistent with statutory requirements, a review of the current Queensland Waste Avoidance and Resource Productivity Strategy 2014-2024 has recently been undertaken. The present report will inform the development of a new Waste Strategy.

In the context of broader industry developments, Government has a unique opportunity to communicate the fundamental policy settings and parameters for resource recovery and waste management over the near to medium term.

As well as the development of a new Waste Strategy, a number of legislative and regulatory reviews currently planned or underway present an opportunity to set the direction for waste management going forward:

- To provide for the new levy and support its implementation, amendments to the Waste Act are being prepared. This includes provisions dealing with levy coverage and exemptions, and the process for fixing the levy amount. Where possible, definitions should be simple by design to limit any unintended consequences.

- Considerable work has been undertaken on revising regulations to improve resource recovery and recycling rates, remove barriers, and provide policy direction to encourage investment, market certainty and development. Finalising these revisions will require immediate action, preferably before the levy comes into effect:
  - review of the Environmentally Relevant Activities (ERAs) for waste disposal and recycling under the Environmentally Relevant Activities Regulation 2008 (Qld), and
  - review of the framework for managing regulated (hazardous) waste.

The current intention is for some elements to come into effect prior to implementation of the landfill levy, while others (some ERAs) may take effect later under transitional arrangements.

- The End of Waste (EOW) framework under the Waste Act provides for when, and under what circumstances, a waste ceases to be classified as waste and is considered a resource, and is essential for the development of end markets. The EOW framework replaces the beneficial use approval (BUA) framework. While the transition process is underway, in the context of broader departmental priorities and resourcing pressures, stakeholders have expressed a concern that opportunities to modernise the framework to reflect a broader range of reuse options may be missed.

- The regulations relating to the management of waste by local governments were set to expire on 1 July 2018. The State has recently removed the expiry date to allow for a broader review and consultation with key stakeholders.

While these developments present an opportunity for Government to align its policy settings, the number of “moving parts” adds to the uncertainty for stakeholders.

Stakeholder views

Stakeholders emphasised bipartisanship on policy settings and direction as vital to securing industry confidence. In this regard, a number of stakeholders highlighted the mothballing of infrastructure following the removal of the previous levy regime in 2012 as evidence of the consequences of past policy reversals.

There was also strong industry and local government support for treating waste management and resource recovery as an essential service. While no single legislative or policy measure will accomplish this, the planning and development regimes should be designed to better align with the approach to managing other essential services (eg, electricity and water). Among other things, this elevation in its priority would help give the industry the social license it currently lacks.

Stakeholders also highlighted the importance of integrating the principles of the waste hierarchy into waste management policy-making.

Another common theme emerging from industry fora and stakeholder consultation was the importance of the Commonwealth Government adopting a more proactive leadership role.


43 Waste Act ch 8.

Opportunities

Legislative and regulatory framework
Immediate attention should be given to finalising existing legislative and regulatory reviews, and addressing any issues with transitional arrangements. This should provide waste and resource recovery providers with operational certainty and provide direction for the market.

The State should then consider addressing some of the opportunities to enhance its policy and legislative settings:

- **Circular Economy policy and framework**: Most advanced jurisdictions have already established or are considering a policy framework that promotes the Circular Economy. While the new Waste Strategy should incorporate principles that set a path to the Circular Economy, a standalone policy statement on the Circular Economy should be developed as a priority to signal to industry where Queensland is heading and to guide infrastructure and investment planning during the transitional period and over the longer-term.

- **Waste to Energy** is an appropriate option where avoidance, reduction, reuse or recycling options are not feasible. Accordingly, the State will need to have a clear policy position on WtE to encourage further investment and to avoid sub-optimal outcomes such as the cannibalisation of resources that have higher-order alternative uses. While there are some WtE plants operating in Queensland, the LGAQ is investigating significant expansion of this sector, which will be essential for its members to achieve their goal of zero waste to landfill. Government policy work should guide and inform the market on acceptable solutions as WtE refers to a broad spectrum of technologies, not all of which are consistent with circular economy principles. Careful planning will be required to avoid potential WtE asset stranding as the state transitions to a circular economy framework.

- **State and local government planning**: The planning development and approval process can be complex given the plethora of policies, legislation and regulations governing waste and resource recovery. The industry has been asking for a more streamlined approach akin to other essential services. There is an opportunity to review the current arrangements to ensure the planning regime does not hinder efficient investment.

- **Landfill rationalisation and restoration**: The new Waste Strategy will aim to improve diversion rates in Queensland. As such, it is expected that the use of landfill will diminish over time. The State will need to work closely with local governments and other stakeholders to consider the implications of these developments, particularly around rehabilitation requirements.

New Waste Strategy – performance measures and targets
The new Waste Strategy and supporting policies should have clear performance measures, timelines and targets that are clearly linked to the objectives of the Waste Strategy. The targets should be ambitious but achievable.

Where reliable data is available, the State should consider calibrating performance measures with reference to waste groups or types. If data is not available, the State should develop its requirements on the basis that enhancing data collection will be the focus in the meantime. Table 1 sets out examples of performance measures adopted in other jurisdictions.

<table>
<thead>
<tr>
<th>Measures</th>
<th>Indicators</th>
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</thead>
<tbody>
<tr>
<td><strong>Reduced waste generation</strong></td>
<td>Waste generation per capita</td>
</tr>
<tr>
<td><strong>Landfill diversion</strong></td>
<td>Landfill diversion rate</td>
</tr>
<tr>
<td><strong>Resource recovery</strong></td>
<td>Recovery rate</td>
</tr>
<tr>
<td><strong>Investment</strong></td>
<td>Infrastructure investment (capital) over a set period</td>
</tr>
<tr>
<td><strong>Economic opportunities</strong></td>
<td>Direct jobs</td>
</tr>
<tr>
<td><strong>Environmental benefits</strong></td>
<td>Greenhouse emission reduction rate</td>
</tr>
</tbody>
</table>

Table 1: Examples of Performance Measures
Economic opportunities for the Queensland waste industry: final report

Ability to adapt to change

The State should regularly review strategy and performance, with corrective measures adopted to address any emerging issues, unintended consequences or underperformance by stakeholders.

As required by the Waste Act, a comprehensive review of the Waste Strategy will be undertaken every three years\(^46\). In the interests of transparency and to promote stakeholder confidence, there would be benefit in the reviews being undertaken by an independent third party, with the outcomes made publicly available.

The reviews should be informed by an annual performance reporting process. A similar approach is undertaken by the Waste and Resource Action Programme (WRAP), a government-funded body established in the United Kingdom in 2007 to promote sustainable waste management\(^46\).

Establish a funding program

Government will need to develop a robust funding program underpinned by a set of criteria to support the achievement of targets under the Waste Strategy. In addition, the criteria should consider providing incentive mechanisms to promote better collaboration, support market development and strengthen compliance initiatives in Queensland.

Levy revenue should be applied to support the funding program, with allocations based on merit and the contribution to achieving performance measures and targets.

To provide budget certainty and clear guidance to industry stakeholders, the funding program should be aligned with the forward estimates period (ie, four years) and complement a longer-range infrastructure program, as discussed at Sections 4.9 and 4.10.

Recognising waste management and resource recovery as an essential service

As noted above, stakeholders have advocated strongly for waste management to be recognised as an ‘essential service’. The review team has been unable to identify any term in relevant Queensland legislation that neatly corresponds with this concept.

While there is no clear and straightforward legislative solution, the recurrence of this theme in discussions with stakeholders highlights a widely-held perception that waste management and resource recovery infrastructure is not afforded a level of priority commensurate with other core public utilities (eg, water and electricity).

Stakeholders are seeking appropriate recognition of waste management and resource recovery in any development or land-use planning, both in order to support operators’ social license and to help overcome adverse community perceptions about the placement of facilities, but also to ensure adequate protection in any future development planning. This issue is discussed further Section 4.9.

Recommendations

Because of the volume of work to be undertaken, summarised below, it is recommended DES develop a work plan showing the timing and resourcing required to undertake, consult and deliver this significant program of work.

TABLE 2 POLICY AND LEGISLATIVE FRAMEWORK – RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Short-term</th>
<th>Medium to long-term</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Develop and publish a new waste strategy under the Waste Act, with accompanying implementation plan and performance measures and targets.</td>
<td>- Develop a Circular Economy policy.</td>
</tr>
<tr>
<td>- Finalise the review of Regulated Waste Classification and waste-related Environmentally Relevant Activities and implement the new regulatory frameworks.</td>
<td>- Develop a Waste to Energy policy.</td>
</tr>
<tr>
<td>- Amend the Waste Act to implement the new landfill levy.</td>
<td>- Conduct a full review of the Waste Act, having regard to industry developments following the implementation of the new waste management strategy, the landfill levy, and regulatory best practice.</td>
</tr>
<tr>
<td>- Continue the rollout of the End of Waste Code with stakeholders to refine the implementation process.</td>
<td></td>
</tr>
<tr>
<td>- Develop a priority funding program that supports the new Waste Strategy, using revenue from the waste levy to fund the key enabling measures described in this report.</td>
<td></td>
</tr>
</tbody>
</table>

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\(^46\) Waste and Resource Action Programme, Annual Review 2016-17 <http://www.wrap.org.uk/content/annual-review-2016-17-o>.
- Work closely with the federal government and other states and territories to harmonise waste and resource recovery policy, legislation and regulations.
- Work with local governments and other stakeholders on the implications of the new waste strategy on existing landfill sites, including potential closure/change of purpose.
- Using an independent third party, undertake the statutory, three-yearly review of the waste strategy.
- Develop process for annual performance reporting based on set measures and targets.
4.2 Governance and compliance management

Vision
To ensure governance arrangements are designed to achieve optimal waste management outcomes, and can deliver thought-leadership, agility and empowered partnership with industry and local government.

<table>
<thead>
<tr>
<th>TABLE 3: GOVERNANCE AND COMPLIANCE MANAGEMENT OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agile and empowered governance arrangements</strong></td>
</tr>
<tr>
<td>To be effective in overseeing the significant policy coordination and planning required to deliver the strategy</td>
</tr>
<tr>
<td><strong>Robust regulatory and compliance capacity</strong></td>
</tr>
<tr>
<td>To ensure Government has an appropriately-resourced and proactive regulatory and compliance capability</td>
</tr>
</tbody>
</table>

Current state

The waste and resource recovery industry has myriad touchpoints with different agencies and levels of government (see Figure 9), and operates within a complex and evolving legislative and policy environment.

In relation to waste management, DES is the key responsible agency, with functions encompassing policy and strategy development, regulation and compliance, intervention programs, and strategy delivery.

As outlined below, a common theme among external stakeholders is that the span of the department’s functions can lead to perceived conflicts of interest, inconsistent approaches across different parts of the organisation, and a dilution of agency focus and expertise.

Regulation and compliance management

Within DES, the Environmental Services Regulation and Conservation and Sustainability Services divisions are responsible for waste regulation and compliance management under the EP Act and the Waste Act. However, the scope of the department’s responsibilities extends far beyond waste management, and encompasses roles in relation to mining and gas, among other things.

In relation to waste management, major work recently undertaken by DES includes:

- investigating over 200 waste management facility operators between FY2015 and FY2017 as part of Operation TORA, resulting in 40 warning notices, 22 penalty infringement notices, five direction notices, one clean-up notice and one prosecution
- investigations into reports of littering and illegal dumping offences, resulting in 2,411 penalty infringement notices issued in FY2017
- operation of the Litter and Illegal Dumping Online Reporting System (LIDORS) for members of the public to report incidents of littering and illegal dumping

FIGURE 9: INTERACTIONS BETWEEN INDUSTRY AND GOVERNMENT AGENCIES

Source: QTC

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Stakeholder views

Stakeholders have expressed a view that more transparent governance, with a clear delineation of roles and responsibilities, is essential to drive behavioural change and deliver outcomes. There is significant concern that centralising policy development, regulation and compliance, and strategy delivery within one agency creates perceived conflicts of interest, and leads to a dilution of agency focus and expertise. There is strong support for adoption of the South Australian and Victorian models, which have a separate entity responsible for market support.

In addition, stakeholders have emphasised the need for more rigorous monitoring and compliance controls of unlicensed and illegal activities once the levy is implemented, with a commensurate commitment to agency resourcing. They have observed that illegal activities (e.g., illegal dumping and stockpiling) occur in other states to “game” the system and derive unfair commercial advantage.

Stakeholders have also voiced the concern that Government’s regulatory focus is weighted too heavily towards enforcement at the expense of industry support and education. There is a strong view that Government should work more closely with industry and local governments to achieve waste management objectives.

Opportunities

Alternative governance model

The development of the new Waste Strategy presents an opportunity to review Queensland’s existing governance framework.

Governance structures vary across Australian jurisdictions (see Figure 10):

- In New South Wales, the governance framework is broadly consistent with the arrangements in Queensland, where a range of policy, regulatory and strategic functions reside within a single agency. The NSW EPA is the state’s principal environmental regulator, and is also responsible for the development and implementation of waste management and mitigation policies (e.g., Container Deposit Scheme).

- In Victoria, separate entities are responsible for: (1) policy, legislation and strategy development, (2) regulation and compliance management, and (3) strategy delivery and market support. While functionally independent, these separate entities report to a single portfolio Minister.

- South Australia is similar to Victoria, having separate entities for compliance and market support, with policy development undertaken by one of those two entities depending on the nature of the policy.

- In Western Australia, the policy role resides with the Waste Authority, a statutory authority that comprises a five-member independent board. The Department of Waste and Environmental Regulation (DWER) supports the Waste Authority with policy development and undertakes the market support role. The regulation and compliance roles sit with a separate EPA.

**FIGURE 10: ALTERNATIVE GOVERNANCE MODELS IN AUSTRALIA**

<table>
<thead>
<tr>
<th>Policy</th>
<th>Compliance/Enforcement</th>
<th>Market Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queensland</td>
<td>DES</td>
<td></td>
</tr>
<tr>
<td>New South Wales</td>
<td>EPA</td>
<td></td>
</tr>
<tr>
<td>Victoria</td>
<td>DELWP</td>
<td>SV</td>
</tr>
<tr>
<td>South Australia</td>
<td>GISA</td>
<td>EPA</td>
</tr>
<tr>
<td>Western Australia</td>
<td>Waste Authority</td>
<td>EPA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DWER</td>
</tr>
</tbody>
</table>

Source: QTC

CASE STUDY 1: GREEN INDUSTRIES SA

GISA is an independent statutory body established under the *Green Industries SA Act 2004* (SA) and accountable to the Minister for Environment and Water. The authority is overseen by an independent, expertise-based board, with appointments made on the basis of members’ experience in waste management, resource recovery, ecological sustainability and business development, among other things.

GISA’s core statutory objectives are to promote waste management practices that, as far as possible, eliminate waste or its consignment to landfill, and to promote innovation and business activity in the waste management, resource recovery and green industry

49 *Green Industries SA Act 2004* (SA) s 9(6).
In assessing the optimal governance framework for Queensland, there are a number of management institutional focus remains firmly on strategic development and support for waste Environment and Water, as well as the Environmental Protection Authority (EPA), its programs industry development, community education and local government assistance. While the authority works in close collaboration with the state’s Department of As well as advising the Minister on strategic policy goals, GISA administers a range of compliance and enforcement are funded by the levy and would represent an insignificant percentage of the total funds raised.

Planning responsibilities
As discussed in Section 4.9, a specific state-wide waste and resource recovery plan for Queensland should be established to provide guidance to the sector on the State’s vision and intent. In the event that Government resolves to establish a separate body responsible for strategy and delivery (as recommended below), that entity should be assigned a long-term planning role similar to that of SV and GISA.

In Victoria, SV has prepared the 30-year Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP), supported the development of regional plans, and serves as the vehicle to facilitate a state-wide approach in tackling key planning issues (eg, land-use, transport, aggregate materials and infrastructure).

In South Australia, GISA has also developed a 30-year Waste and Resource Recovery Infrastructure Plan to provide guidance on future waste and resource recovery infrastructure needs across the state and to support a resource-efficient economy in South Australia.

Compliance and enforcement
Effective compliance and enforcement are fundamental to the success of any regulatory regime. The intent of legislation and regulation is to shape behaviour and sanction breaches where necessary. When this does not occur, it can signal a failure in regulatory policy and practice.

50 Ibid s 5(1).
51 Ibid s 3A(2)(a).
54 Victoria, Parliamentary Debates, Legislative Assembly, 20 April 2005, 576 (John Thwaites, Deputy Premier, Minister for Environment, Minister for Water and Minister for Victorian Communities).

In other states, the introduction of, or any significant increase in, a waste levy has generally been the precursor to an escalation in illegal dumping and stockpiling activities.

Moreover, the levy differential between metro and regional areas in NSW has resulted in the long-distance transport of waste, including into Queensland. It would therefore be prudent to anticipate a heightened incidence of similar activities in Queensland.

There are various reasons and motives for non-compliance: economic drivers, lack of enforcement (which could be related to lack of data on illegal activities) and ignorance. Non-compliant activities can include:

- stockpiling to avoid levy liability
- the use of unlicensed facilities
- the illegal deposit of waste onto land, particularly where there is no licence to accept waste
- exploitation of waste levy exemptions or concessions by mixing exempt waste with levyable waste, and
- inappropriate treatment of waste at licensed facilities, including the misclassification of wastes, both deliberate and inadvertent.

The Recycling and Waste in Queensland 2017 report indicated that it cost local governments around $18 million to deal with and clean up 8,500 tonnes of litter and illegally-disposed waste in FY2017, though further work indicates the true cost could be significantly higher.\(^{57}\)

In order for the State to tackle these non-compliant activities (or address the unintended consequences), a range of targeted programs will need to be considered to address the different motivations. Some of these considerations are discussed below.

**Enforcement activities**

The first line of defence is the enforcement capability of the regulator. While appropriate resourcing is required to be both responsive and proactive in engaging with industry and the community, the data required to strategically prioritise resource allocation is vital.

The role of the regulator will need to be clear and focussed. To mitigate any perceived conflicts of interest, there should be no blurring of the lines between approver (ie, strategic or policy focus), program delivery and regulator (compliance)\(^{58}\).

The role and powers of the environmental regulator were the focus of an independent inquiry commissioned by the Victorian Government in 2015 (refer to Case Study 2).

**CASE STUDY 2: VICTORIAN GOVERNMENT REVIEW OF ENVIRONMENTAL PROTECTION AUTHORITY**

In 2015, the Victorian Government commissioned an independent inquiry into the role and responsibilities of the state’s EPA.

The final report was released in 2016, with a number of recommendations on how to equip the EPA to meet current and future environmental and health challenges\(^{59}\).

The Victorian Government supported the majority of the recommendations, and committed to overhauling the Environment Protection Act 1970 (Vic) to deliver:

- a proactive and strategic EPA focussed on preventing harm to human health and the environment
- increased clarity and guidance for industry about their responsibilities
- greater responsiveness to local issues that matter to communities
- strengthened EPA governance, providing independence and accountability and
- a trusted and authoritative source of scientific and technical knowledge and advice\(^{60}\).

The Environment Protection Act 2017 (Vic) took effect on July 2018, establishing the EPA as an independent statutory authority and legislating the role of a Governing Board, Chief Executive Officer and Chief Environmental Scientist.

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57 Department of Environment and Science (Qld), Recycling and Waste in Queensland 2017, above n 17. Note that DES has advised that a recent, preliminary review across a sample of councils indicated that the clean-up costs could be as much as four times the reported figure. As a result, the department has commissioned an economic study into the direct cost of litter and illegal dumping to Queensland local governments, with results expected to be released in FY2019.

58 In relation to conflicts of interest arising when an agency performs more than one role (eg, policy making and regulatory enforcement), see, eg, Productivity Commission, Australian Government, Waste Management, Report No 38 (October 2006) 336.


In addition, enforcement activities will need to be tailored to the nature of the operations:

- for licensed operations, enforcement activities can be supplemented with different compliance instruments, as discussed below. As these operations are already “in the system”, data collection and analysis and targeted audit activities will be vital
- for unlicensed waste operations and illegal activities, it will be necessary to ensure processes are in place to identify non-compliant behaviours, and respond swiftly (noting the “fly-by-night” nature of some operations). Police and compliance officers (DES and other agencies) will need to be equipped with powers to apprehend these operators and issue fines. This may include penalties recognising the net economic cost of their illegal activities, as discussed in the next section.

In both cases, it will be necessary to distinguish between minor one-off and more significant offences, and the relative scale of the operations involved, to ensure that compliance action is prioritised and resourcing strategically allocated.

**Different regulatory and compliance instruments**

There needs to be a suite of monitoring and compliance controls and instruments developed or applied to support the effectiveness of regulation and compliance. Data will play a crucial role. Without the right data, it will be difficult to understand the effectiveness of regulations, and gaps that may allow non-compliance activities.

In 2015, the South Australian Government completed a comprehensive options review (including economic assessments) to identify optimal approaches to manage underlying issues in waste management. This highlighted the need to be proactive, given the complexity of the waste management and resource recovery system.

The South Australian review showed that a portfolio of instruments is required to tackle a range of waste management issues. Some of these tools are more effective than others, depending on the situation.

For example, the assessment showed that upfront liability, stockpiling controls and monitoring tools, and use of final assurance are effective in managing static or growing stockpiles.

In addition, the recovery of illegally-obtained financial and other benefits may be an effective measure for addressing stockpile issues, illegal dumping and misclassification of wastes.

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**CASE STUDY 3: EPA SOUTH AUSTRALIA – RECOVERY OF ILLEGALLY-OBTAINED BENEFITS**

In the waste and resource recovery sector, there is potential for the benefits derived from non-compliant activities (for example, avoided lawful disposal costs) to significantly outweigh the associated sanctions.

The South Australian EPA (EPA SA) has the ability to seek an order from the Environment, Resources and Development Court that a person who has contravened the Act pay a penalty that has regard to any financial savings or other benefit they stood to gain on account of the contravention, in addition to the standard penalty applied.

A similar approach is being undertaken in New South Wales. The economic modelling underpinning this approach aims to estimate the marginal or incremental benefits that a business may obtain from avoided or delayed expenditure, or non-compliant activities. Financial benefits are estimated based on the cash flows over the period in which the business is taken to have gained monetary benefits from non-compliance.

**Education program**

To improve regulation and compliance awareness, the Government can roll out a fit-for-purpose education program, with target audiences ranging from waste producers to waste and recycling facility operators.

This will be particularly important when introducing new or amended regulations or licensing requirements.

**Considerations for policy-makers**

**Structural separation of responsibilities**

As noted previously, the arrangements adopted in South Australia and Victoria are frequently cited by industry as best-practice models, insofar as they promote enhanced agency focus, expertise, transparency and accountability.

It is recommended that the Government consider a model for institutional separation in Queensland based on:

1. DES retaining responsibility for the Government’s policy and legislative framework and compliance management (the dark blue foundational enablers shown in Figure 11). A variation on this approach would see those functions allocated between separate agencies under the umbrella of the broader environment portfolio, in line with the models in Victorian and South Australian. In those jurisdictions, independent regulatory agencies are responsible for regulation and compliance.
management, while the relevant portfolio departments are responsible for the policy and legislation.

2. A new statutory body (with features similar to GISA and SV) being established with responsibility for strategy delivery and implementation. The entity should report to the portfolio Minister responsible for environment policy and regulation and be responsible for the inner (universal and targeted) enablers shown in Figure 11.

**FIGURE 11: ENABLERS**

To ensure the necessary industry experience and expertise, and to foster collaboration with industry stakeholders, the design of the new statutory body should mirror key governance features of SV and GISA, including:

- an independent, expertise-based board, with members appointed by the Governor in Council. Relevant experience and background should be among the key statutory criteria for appointment to the board, covering business, the community, local government and the waste and resource recovery industry
- a chief executive officer with relevant experience and respect among key stakeholders
- staff with a mix of skills and backgrounds (government and non-government) relevant to each of the enablers identified in this report
- clearly-defined statutory functions and objectives, and
- a well-established accountability and reporting framework.

It is important to recognise that, while structural separation can promote enhanced agency focus, transparency and accountability, it will be critical for separate agencies to work collaboratively.

Under any model, a “silo” approach to the delivery of functions will fail to realise the desired waste management outcomes.

**Resourcing**

The implementation of the waste levy will introduce new complexities and an added dimension of regulatory engagement for DES; in particular, identifying and addressing levy avoidance breaches (e.g., illegal dumping and misclassification of waste), with associated data, training and education needs.

The new regulatory role is expected to coincide with the rollout of a revised framework of waste-related environmentally relevant activities under the EP Act, and the related transition to new environmental authorisations.

In combination with its business-as-usual regulatory responsibilities, these policy developments are expected to put considerable strain on organisational capability unless there is a corresponding investment or reallocation of resources, which could be new personnel or additional technology.

**Assessment of regulatory instruments to support compliance control**

With the introduction of the waste levy, Government will need to assess whether the existing regulatory framework under the Waste Act and other legislation gives the administering agency the repertoire of compliance and enforcement tools necessary to effectively perform its role.

Any analysis of additional legislative compliance mechanisms will need to be undertaken according to the usual regulatory impact assessment framework.
## Recommendations

### TABLE 4: GOVERNANCE AND COMPLIANCE MANAGEMENT – RECOMMENDATIONS

| Short-term | ▪ Consider the model for delivery of the new waste strategy, which could be based on a combination of:  
  – policy development remaining with DES  
  – waste regulation and compliance management functions transferred to a new, independent regulatory authority within the environment portfolio (e.g., Environmental Protection Authority), and  
  – strategy delivery and implementation (market-support) functions transferred to a new body, overseen by an independent board and CEO.  
  ▪ Provide additional resources (personnel and/or technology) to support compliance management. |
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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Medium to long-term</td>
<td>▪ Review the efficacy of existing compliance and enforcement powers, tools and instruments, including undertaking an assessment of regulatory instruments to bolster compliance control.</td>
</tr>
</tbody>
</table>
4.3 Data and information sharing

Vision
Effective decision-making by governments, business, industry and the community, supported by reliable, timely and relevant information, including data on material composition, volumes, consumption streams, locations, movements and ultimate fate.

To support the better use of resources and resource recovery, Government needs to collect and communicate enough information to support investment, inspire public confidence, prevent levy avoidance and facilitate continuous improvement through research and development (R&D) and innovation.

**TABLE 5: OBJECTIVES**

<table>
<thead>
<tr>
<th>Informed markets</th>
<th>Information needs to be collected in time to support efficient compliance and monitoring activities.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimised investment</td>
<td>Investors require enough information to support significant investment decisions.</td>
</tr>
<tr>
<td>Continuous improvement</td>
<td>Datasets, cases studies and ideas need to be shared openly to foster a culture of innovation, transparency, continuous improvement and resource optimisation.</td>
</tr>
</tbody>
</table>

**Current state**
Information is crucial to effective decision-making and the allocation of scarce resources. While individual operators collect a significant amount of data for their operational purposes, there is limited aggregation or visibility of flows at a whole-of-system level, with data disconnected or difficult to locate.

This is the result of a combination of factors:
- the notorious complexity of tracking material flows
- the broad perception that current landfill waste is a residual loss with no real value, and
- a reluctance to mandate the collection of data from all waste players.

Investment in waste data has historically focussed on summarising information required for compliance activities, including tonnes processed by landfill operators and recyclers (split by stream and, in some cases, by category and type).

Some ad hoc information is also collected on activities such as littering, illegal dumping and street sweeping.

While a significant amount of data is collected from individual waste management facilities (including materials recovery facilities, transfer stations, landfills and recycling plants), this is not all aggregated and analysed at a state level.

Currently, Government focusses on collecting information required to inform:
- the annual National Waste Report, and

Data is shared via the DES website and the State’s open data platform.

**Challenges**
There are key challenges in the consistency, completeness and communication of data across government and industry.

There are currently inconsistencies between source data (ie, data collected by operators), Queensland data and national data, as well as across State agencies. These variances are predominantly a result of:
- the lack of harmonisation between definitions of waste types, and
- operators’ interpretation of these definitions when entering data.

Gaps in data collection will likely present major challenges in effectively implementing the waste levy.

Local governments – particularly regional councils - have commented that estimates of illegal dumping are likely to be significantly understated at present. This is due in part to the high cost of collection and disposal of illegally dumped materials. Such activities can cost in the order of $2,000/tonne62. As a result, budget-constrained councils are

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62 Department of Environment and Science (Qld), Recycling and waste in Queensland 2017, above n 17. See also above n 57.
incentivised to delay collection of known volumes in an effort to reduce short-term expenditure.

The integrity and currency of data is also compromised by manual data entry at the operator level, the frequency of data collection, and by delays in Government’s collation and release of data.

Moreover, waste data, case studies and best practice guidance on what does and does not work for households, businesses and communities is only available on an ad hoc basis across a range of sources.

This makes it difficult for stakeholders to learn from mistakes or understand where to look for key statistics, practical examples and partnering and collaboration opportunities. Given the number of strong examples of innovation and best practice in terms of resource recovery in Queensland and other jurisdictions, this represents a missed opportunity.

Classification of data

Extracting and comparing data from different sources is complicated in two key respects. First, different definitions are used to classify similar items, and second, users do not always understand how to classify or assess what they are seeking to interpret.

Data on material flows

Transfer stations, landfill operators and resource recovery facilities generally measure volumes of waste moving through their facilities. Measurement depends on specific operators’ classification of waste types, and the level of training of individuals responsible for manually entering data.

As different data definitions are adopted for the Queensland and National Waste reports, operators’ source data may be adjusted in various ways to match the operative definition for each. This makes comparability and interpretation across different sources problematic.

National Waste Report

Data definitions and terminology varies widely across states and territories. For example:

- Queensland applied 82 waste codes in 2015-16, with 109 codes recognised in its historical datasets. At the time, only 66 codes were prescribed in State guidance.

These codes do not always correspond with National Environmental Protection Measure waste codes (used for interstate waste), nor align with codes applied in other jurisdictions. For example, N120 (for contaminated soil) does not exist in Queensland, but interstate waste typically comes in under N120.

- MSW includes self-haul in some jurisdictions but not others.
- Use of recovery versus recycling, landfill as opposed to disposal and waste versus resources.

The type and level of data collected varies across states (eg, not all states perform or collect data on council bin audits).

The information currently available at a consolidated level will not be sufficient to support compliance, investment and the innovation required to move Queensland towards a circular economy.

Stakeholder views

Stakeholders expressed strong support for the objective of better data and information sharing.

Stakeholders were particularly interested in opportunities to understand and easily adopt best practice examples from other jurisdictions – both within Australia and abroad.

The concept of using data to drive accountability was also regarded as critical. As expected, different stakeholder groups prioritised different types of information.

There was also a strong preference that any enhanced data collection limit the administrative burden on industry.

Opportunities

Short term opportunities

Develop framework to deliver enhanced data and information sharing

The Government should develop a coordinated approach to data and information sharing for resource flows and waste management.
Given the significant requirements for increased data in future, Government will need to augment its data collection and management capability. Appropriate funding support will be necessary to ensure the associated data and information sharing strategy can be delivered going forward.

Government will also need to ensure a funding framework exists to support and encourage appropriate investment where it is needed. This framework should consider how activities support Waste Strategy objectives, along with key features required (ie, collaboration or partnering).

**Make better use of data to enforce compliance**

Stakeholders are concerned illegal activity will escalate when the levy is introduced in 2019. These concerns are discussed further in Section 4.2.

From a policy perspective, the State will need to consider a range of responses and tools to deter illegal behaviour and to ensure the levy is appropriately administered. The collection of timely, relevant data will be vital to support this.

**Landfill data**

Queensland has over two hundred operating landfills in total, of which more than half fall within the proposed levy zone. The vast majority of these are smaller-scale facilities operating without weighbridges, Closed Circuit Television (CCTV), or restricted entry and exit points. At present, landfill data is provided to Government via a manual data entry portal (a number of months after the event). However, most operators collect much more detailed data in order to assess gate fees.

Going forward, the Government will need to start collecting better data to support effective levy administration and compliance. The State should require direct access to an agreed data set from operators for all landfills within and adjacent to the levy zone. This will require consideration of the scale and location of facilities. The rationalisation of smaller facilities (which is already underway in some areas) may be more effective than investment in data collection infrastructure. However, any changes to existing infrastructure will take time to implement.

While data collection from smaller landfills will involve various considerations, arrangements for larger landfills should be much easier to facilitate. Queensland’s four largest landfills - all based in SEQ - account for almost 50% of the State’s waste. The remaining 10 to 15 landfills in SEQ process a further 25%. Collecting live data from these facilities alone would allow 75% of the State’s landfill data to be captured in real time.

**Waste management data**

Data from other waste management operators (eg, material recycling facilities (MRFs)) is not currently provided to Government. However, residuals from legitimate waste management activities will be subject to either a discount or an exemption under the levy framework. As a result, there will be significant incentive for fraud through higher levels of contamination, or the use of illegitimate operations.

Other Australian jurisdictions have cautioned that this behaviour will occur, and should not be underestimated. In order to monitor and control such activities, at a minimum, the State will need to ensure it is collecting adequate data from each operator. In many cases, similar infrastructure and technology exists (as for landfills).

The Government will need to consider how to procure access to this information where it exists, including:

- the best way to obtain the data (ie, via mandated or voluntary collection). Anecdotal evidence from other Australian jurisdictions suggests that voluntary data collection is ineffective. Moreover, data needs should be determined in consultation with industry, local governments and the community, and built up progressively using operators’ own data systems, with Government requirements mandated. The process should be reviewed regularly to ensure data collection adapts to emerging needs, and that the collection of superfluous data is avoided wherever possible.
- the investment trade-off between real-time compliance data (received via a direct link to operators’ systems) and the weighbridge and IT technology required to supply this.

**Leveraging existing technology**

Waste operators currently measure and record a large volume of detailed data to support their business activities. Medium to large-scale facilities usually invest in weighbridges, CCTV and supporting IT systems to ensure vehicle movements are appropriately tracked and measured.

This data is used by waste operators to ensure they can charge appropriate gate fees. Smaller sites do not always necessarily operate to the same environmental standards as large sites, or accept all types of waste, and therefore often charge significantly lower

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64 Over 70 landfills were closed or converted to transfer stations in Queensland in the last five years. Another 15 landfills are earmarked for closure/conversion within the next five years.

65 The required infrastructure and IT will be expensive for smaller sites but may, ultimately, be required in order to ensure volumes are not inappropriately diverted.
gate fees. These sites are also unlikely to invest in costly weighbridge infrastructure or CCTV.

As a result, data collected from these sites is often more reliant on the data entry of individual staff, and therefore more prone to the risk of human error.

While operators track detailed data on all weighbridge movements, the State currently only requests data at an aggregate level.

Technology currently exists that would allow the State to request real-time data from operators. For larger sites, this would include weighbridge weight movements of materials by type, linked to vehicle registration. This data could be aggregated in real-time and used to feed into the levy system to monitor obligations.

Collecting real-time data on waste activities by vehicle type would provide the State (and stakeholders) with a powerful data source to mine for patterns in customer behaviour. This could be used to support compliance monitoring, and also allow for more sophisticated benchmarking and comparison across sites.

Requesting this data would require:

- the State to define a consistent data model (ie, terminology/classification). This could initially align to the Queensland waste data model and be refined over time.
- a decision to mandate the direct provision of data, supported through incentives (eg, tied funding for infrastructure upgrades) to encourage provision of data uploads.

A key challenge with this approach will be the lack of infrastructure across some landfills. This issue can be mitigated by providing a transitional window to resolve the issues, either through upgrade or closure of facilities. There may also be opportunities for consolidation across smaller sites (with appropriate funding incentives).

Overall, collection of more detailed and timely waste data across the state is currently possible for the majority of waste volumes. Mandating collection of this data would allow for a more comprehensive understanding of current waste movements, and provide a platform for future innovation and development.

For example, predictive analytics could be used to understand high compliance risk vehicles by monitoring vehicle movement patterns across the state in terms of waste activity. This would more effectively target compliance activities towards high risk areas.

The State should obtain this data from all landfill operators within and adjacent to the levy zone (subject to infrastructure considerations and relevant bridging periods for some). Funding this request is estimated to be in the range of $1 million to $5 million per annum.\(^6^7\)

### FIGURE 12: ILLUSTRATIVE EXAMPLE OF FUTURE DATA PLATFORM

![Future Data Platform Diagram](source: QTC)

CASE STUDY 4: LEVERAGE EXISTING DATA – NATIONAL HEAVY VEHICLE REGULATOR

The National Heavy Vehicle Regulator (NHVR) recently established a national database of all heavy vehicles (ie, those over 4.5 tonnes). Using this database, the NHVR has the capacity to track a significant proportion of heavy vehicle movements nationally, through a combination of number plate recognition, connected road infrastructure (including safety cameras and in-road sensors) and in some cases, in-cab devices (although access to the latter data is voluntary, with low uptake).

There is an opportunity for the State to collaborate with NHVR to identify and monitor vehicles exhibiting behaviour patterns associated with illegal dumping and inappropriate long distance transport of waste, resulting in more effective compliance and monitoring of waste transport vehicles.

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66 Note that the State would not need direct access to all data. For example, it would not need access to pricing data.

67 Stakeholder consultations.
Longer term opportunities

Communicate information more effectively

Government currently shares information via the DES website, the State’s open source data platform, and through the ANWR. This includes some basic information on waste data, various announcements, and some example programs.

However, datasets, R&D and best practice examples remain disconnected and difficult to locate. Furthermore, no data is published on projected waste flows or progress against strategic targets. Other, high-performing jurisdictions (including London, South Australia and Victoria) use a single web-based knowledge platform to bring together news, data, case studies and opportunities to discuss ideas and shares learnings.

An advanced knowledge platform for Queensland could assist in providing a single source of information on waste and resource management across the state.

CASE STUDY 5: MODERN WEB-BASED KNOWLEDGE PLATFORMS – VICTORIA, LONDON AND EUROPEAN COMMISSION

SV, the United Kingdom’s WRAP and the European Commission all provide good examples of modern web-based knowledge platforms.

These resources share a number of key features:

- Content is grouped logically and in clear, easy-to-follow format. It is also targeted to specific stakeholder groups and aggregated by topic area.
- Core content includes:
  - practical case studies showing what does and does not work (targeted at specific stakeholder groups)
  - relevant news and upcoming events and showcases
  - a platform for communication, with the ability for people to share thoughts/ideas or provide feedback
  - simply synthesized data for those looking to understand issues and opportunities. This could include forecasts, location-specific information, comparison of actuals to targets, infographics and waste ‘scorecards’, and source datasets (aggregated for confidentiality where required) for those seeking more detailed information.

Identify and resolve key data gaps

Illegal dumping

The Government needs to gain a better understanding of current and emerging illegal dumping volumes in order to assess any unintended consequences from introduction of the Levy.

Forecasting

- The Government should develop waste flow forecasts, with commentary on how actions identified under the strategy have influenced these.
- Queensland will require significant investment in waste infrastructure in coming years. This investment should be supported by strong evidence. To this end, the Government should perform infrastructure needs assessments on a more regular basis.

Measuring success and driving accountability

- The current Waste Strategy is not conducive to promoting accountability. The Government could develop a simple scorecard to measure success on an ongoing basis.
- Data needs to be collected to measure program outcomes and changes in behaviour over time. For example, some states invest in regular council waste audits. This has provided a useful benchmark to compare against data following the introduction of targeted interventions.
- Programs and investment should be reviewed on a regular basis to ensure funding is targeted towards high impact investment. This assessment should be evidence-based.

Tracking waste flow data

- Queensland does not have good data on material flows by type across the state. This information is necessary to inform investment decisions and targeted interventions. Mapping material flows will be critical to identifying potential opportunities and feedstocks for future use by business. The State needs to improve data on material flows (for example, by performing material flow assessments across selected waste types). Technology-based solutions could also be adopted in the longer term.
- Understanding total material flows will also help Government to understand the potential for waste streams to feed future recovery infrastructure, including the potential long-term feedstocks for WtE.
CASE STUDY 6: USING TECHNOLOGY TO LINK WASTE GENERATION TO WASTE DISPOSAL

Ultimately, data should be used to track material flows from the point of raw material production through to end-of-life disposal. This would allow a more sophisticated understanding of material flows and support effective identification and tracking of materials. While this may not be possible in the short term, examples are emerging. For instance, Mandalay Technologies have produced and are piloting a range of technology solutions that link waste generation activities to waste disposal and separation. Current functionality allows for multiple products within a single load to be weighed as a vehicle moves between locations across a single facility eg, a recycle centre, a resource recovery area, a specific stockpile or landfill.

Mandalay have also completed a pilot program that monitored movements of licenced vehicles within and across geo-fenced locations for waste pick-up and disposal, flagging when vehicles entered and exited locations and tracking the supply chain of a load, providing immediate, auditable transparency to stakeholders.

A current pilot is of resident-based applications that track real-time residential waste generation from source to destination, with a focus on the local government to resident relationship.

Queensland could consider mandating this type of technology as part of a future registered waste transport licencing regime.

Harmonise data definitions and terminology

The Government needs to encourage harmonisation of data definitions and terminology – in line with that used nationally, where possible. Work is already underway to improve national waste data and reporting. Queensland should continue to support this alignment and seek to have consistent data definitions, collection and reporting.

There would also be benefit in developing accreditation arrangements for data entry officers. In some cases, data quality is impacted by the level of training provided to data entry officers. The State should consider introducing an accreditation process for data entry officers at waste management facilities. This would improve the accuracy and quality of data collected and provide opportunities for staff to be recognised for specialist skills and competence.

In some cases, a tailored approach may be required (for example in remote or regional areas with reduced technology capabilities). However, this should be the exception rather than the rule.

Foster a culture of innovation and R&D

The circular economy approach presents many opportunities to grow jobs and support industry growth within Queensland. In order to support the move towards a zero waste economy, it will be necessary to raise awareness of opportunities, and build capacity for innovation and resource optimisation within Queensland.

In other States and internationally, evidence suggests this can be supported by:

- Development of waste precincts and associated innovation hubs (Section 4.9),
- Partnerships and proactive industry engagement (Section 4.4), and
- Targeted collection and communication of success stories and practical case studies.

CASE STUDY 7: INNOVATION IN PRACTICE – WINNOW SOLUTIONS

Each year, it is estimated that tens of billions of dollars are wasted in the hospitality industry globally due to overproduction. Winnow Solutions is a technology company established in the UK, founded on the premise that ‘food is far too valuable to waste, and that technology can transform the way we use food’.

Winnow developed a simple process for collecting and measuring food waste in commercial kitchens. Using weighing scales combined with data recording software on bins, Winnow collects basic information about what food is being disposed of and when.

For the first few weeks clients are encouraged not to change behaviours while a baseline dataset is developed. Following this, data insights collected can be used to change practices.

Clients have been found to reduce food waste by 40-70% using this technology (an estimated 50% on average).

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## Recommendations

### TABLE 6: DATA AND INFORMATION SHARING – RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Short-term</th>
<th>Medium to long-term</th>
</tr>
</thead>
</table>
| - Establish a forum for the development of a fit-for-purpose data and information sharing platform.  
- Develop a targeted data and information sharing strategy. This strategy should drive the expansion of data collection and information sharing (for relevant data). Better use of technology should also be a priority. Specific areas for consideration should include:  
  - mandating direct real-time access to specified datasets from particular operators (including consideration of bridging requirements for those without appropriate systems or operator training)  
  - identifying data gaps and prioritising resolution including in relation to:  
    - illegal dumping  
    - stockpile management  
    - forecasting (e.g., using waste diversion targets combined with assessment of the impact of identified options under the strategy)  
    - measuring success (e.g., development of a targeted scorecard/KPIs etc.)  
    - tracking waste flows (e.g., using technology and through investment in material flow assessments).  
  - better communication of data and information, including through development of a data and information-sharing platform.  
  - improve data quality:  
    - develop consistency in data terminology  
    - develop accreditation for waste management data entry officers. | - Continually improve and refine strategy through regular evidence-based assessment of its effectiveness over time. |
4.4 Partnering and collaboration

Vision
A consistent approach to waste management and resource recovery across the economy to enable sharing of the benefits of effective waste practices.

Optimal outcomes will be achieved through collaboration between State agencies, local governments, waste industry participants and representative bodies, waste generators (businesses and consumers), the Federal Government, other Australian jurisdictions, research bodies (including universities), funding bodies and co-regulatory bodies such as the Australian Packaging Covenant Organisation (APCO).

TABLE 7: PARTNERING AND COLLABORATION OBJECTIVES

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aligning waste management and resource recovery interests across stakeholder groups</td>
<td>Collaboration is best achieved when stakeholders have a shared interest in delivering a common goal. This can occur organically through market forces, or commercially through formal agreements to deliver waste outcomes</td>
</tr>
<tr>
<td>Increasing the frequency of contact between stakeholder groups</td>
<td>Provide a regular platform for all stakeholders to have input into resource recovery strategy</td>
</tr>
<tr>
<td>Development of a dynamic approach to appropriating levy revenue to support market development</td>
<td>Supporting initiatives that improve collaboration practices between stakeholders</td>
</tr>
<tr>
<td>Communicating transparent and consistent goals and expectations</td>
<td>Improving waste and resource practices across the supply chain through improved contracting and planning processes</td>
</tr>
<tr>
<td>The promotion of equitable relationships and greater efficiencies in the market</td>
<td>Ensuring all stakeholders are treated equitably across the supply chain</td>
</tr>
</tbody>
</table>

Current state

Current landscape
Stakeholders currently connect through a range of industry bodies and regional waste management fora.

In Queensland, peak industry and advisory bodies such as Waste Recycling Industry Queensland (WRIQ), the Waste Management Association of Australia (WMAA) and LAWMAC present opportunities for stakeholders to collaborate and share learnings on waste management practices.

At a national level, regular meetings of Environment Ministers provide a forum for cross-jurisdictional collaboration, while industry bodies can coordinate via WMAA.

However, while there is some collaboration across regions at the industry and council level, there is no systemic or institutionalised arrangement to facilitate whole-of-state or regional collaboration between all stakeholders – both government and private sector.

Challenges
Aligning the interests and common needs of stakeholders will be challenging in the Queensland context.

The vast distances between population centres in regional Queensland present difficulties in terms of transportation and the costs associated with generating economies of scale.

This also has implications for investment in shared services and infrastructure, as well as presenting practical barriers to facilitating regular and meaningful opportunities for stakeholders to network and share waste management experiences, notwithstanding the availability of communication technologies to bridge these distances.

Engaging at the community level on the importance of viewing waste management as an essential service will also be vital to facilitating meaningful partnerships and collaboration across stakeholder groups.

In relation to Government engagement, there is often no clear point of contact for State and local government agencies and industry.

Opportunities
Collaboration across the supply chain allows stakeholders to combine and unlock synergies, innovate, and deliver more efficient outcomes. Individual stakeholders are often too small to go it alone, but collectively, can be far more effective in delivering...
high quality waste outcomes. With limited vertical integration in the industry, the requirement for collaboration is vital; no one entity controls all elements of the process.

Recognising partnerships between platforms and government

Recognising priority partnerships can enable Government to understand the opportunities and challenges facing the waste management and resource recovery sector.

Formal recognition of a partnership can also create a platform to provide meaningful feedback for Government that is outcomes-driven, rather than collaborating without a pathway for change.

Queensland should consider a recognition model similar to the UK, where there is a formal platform or pathway for capturing industry and community opinions for consideration in higher order planning. This would help ensure that increased collaboration is outcomes-focussed and provides tangible solutions.

In the UK, Governments recognise WRAP, a Government-funded entity, as an official partner, and trust its research to deliver positive economic and environmental action. Priority partnerships can represent platforms to set the agenda and ensure purposeful collaboration between stakeholders.

Stakeholders have observed that in other states, government looks to partner and build longstanding relationships with a small number of key industry bodies.

Feedback from stakeholders has found this to be a positive model in terms of developing consistency of messaging. The Government will need to work with stakeholders to develop an efficient and effective partnership model, which may require some consolidation or partnering among similar groups.

Identifying common needs

Identifying stakeholders with common needs can assist in achieving more effective collaboration that can, in turn, identify partnership opportunities that improve economic outcomes. This is achieved through more efficient allocation of capital, labour and improved security of service.

Common needs can range from guiding social change, avoiding waste, and providing security of service for regions.

Initiatives that can provide consistency of approach across the relevant sector or region include:

- regional networking between local governments to align joint procurement objectives and investment in infrastructure and services\(^{29}\)
- identifying duplication of services in regions where waste management assets could be better utilised
- leveraging community engagement to improve waste recovery by improving recycling education programs
- supporting research and development partnerships that focus on developing new end markets for recovered resources
- partnering with industry groups and local governments to integrate regional and local knowledge into state-wide resource recovery strategies
- supporting forums to allow stakeholders to regularly share knowledge and waste management experiences between levels of government and other industry participants, and
- identifying partnership opportunities with organisations which offer waste management programs in indigenous communities.

It is acknowledged that collaborative sharing in forums has a risk of being classified as anti-competitive behaviour under section 45 of the *Competition and Consumer Act 2010* (Cth) (‘CCA’). To mitigate such risks, legal support may be required to ensure any agreements are not deemed to be ‘concerted practices’ or anti-competitive under the CCA.

Targeted support for collaborative initiatives

Building capability and providing support to develop more efficient and effective engagement can foster an environment of more collaborative, interlinked and purposeful networking between stakeholders.

A review of other jurisdictions shows that funding can be targeted to encourage and reward collaboration. For instance, grants for local governments and industry groups can be allocated to support initiatives that provide a platform for collaboration.

In South Australia, GISA provides funding for local governments and WMMA to support dedicated resources for knowledge building and collaboration initiatives.

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There is also scope to support collaboration by providing resources or accommodation to facilitate meetings and events between stakeholders. This includes funding for FTEs charged with delivering collaboration objectives.

Support can also be provided by offering mediation between parties to help facilitate equitable negotiations between stakeholders.

**CASE STUDY: NEW SOUTH WALES AND VICTORIA - FUNDING FOR COLLABORATION**

“Waste Less, Recycle More” in New South Wales supports collaboration among regional stakeholders through a grants program. To date, $7 million in funding has been provided to councils to develop regional waste strategies and fund regional waste coordinators.

In 2016, Victoria’s Department of Environment, Land, Water and Planning provided funding to local governments under a Sustainability Fund program. The program allocated funding for councils that work together to develop sustainable projects and initiatives across council boundaries.

The funds can be applied to prepare business cases or feasibility studies to develop innovative solutions that deliver positive environmental outcomes and improve councils’ financial sustainability.

Better utilise contracting practices

Contracting is an opportunity for stakeholders to align interests and share in the benefits of more efficient waste management and resource recovery practices.

Contracting best practice in the United States provides examples of wide-ranging strategies that can be designed in contracting to advance towards a circular economy.  

Best practice that could be implemented in Queensland include:

- risk sharing
- innovation clauses, and
- outcomes-based incentives.

Developing templates for risk-sharing agreements is an area where governments can assist in facilitating stakeholders’ switch to recovered resource products. This involves governments providing assurance against potential perverse outcomes from waste and resource recovery activities.

Templates could be developed to outline standards for agreements on who shares the risk across the waste hierarchy. This covers a range of waste management practices from the risks taken by MRFs accepting contaminated waste, through to supporting TMR and councils in managing any risks of perverse outcomes from constructing roads using recovered products.

An innovation clause provides the benefit of flexibility to address issues and change service terms in the event of new technology or changed operating environment. This allows contractors to take advantage of innovation without having to renegotiate the entire agreement.

Outcomes-based, KPI-linked contracts can provide financial incentives to align interests and goals between stakeholders. The major benefit of outcome-based contracting is that it allows local governments to incentivise performance and equitable negotiations through contract extensions as a reward for strong waste management practices.

Outcomes-based penalties for failing to meet diversion targets can also be applied to promote waste reduction. The disadvantage of incentive-based contracting primarily relate to compliance and enforcement.

**Efficiency gains from collaborative procurement and shared infrastructure investment**

Collaboration between stakeholders can inform the state-wide guidance required to better plan for the needs of regions and the required infrastructure. Cross-regional solutions arising from collaborative procurement can then provide a platform for efficiency gains occurring from a better utilisation of resources.

Victoria have approached collaborative planning through their 10 year resource recovery plans. These plans provide clear objectives for stakeholders to partner and collaborate. Recovery plans can include:

- collaborative procurement of waste resource facilities
- collaborative procurement of recovery services, and
- planning for future needs for waste resource infrastructure.

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Planning can be linked with targeted funding.

The preparation of long-term (10-30 year) plans can allow regions to identify and prioritise infrastructure needs and the services required so that all regions can have access to security of service.

Recommendations

**TABLE 8: PARTNERING AND COLLABORATION – RECOMMENDATIONS**

| **Short-term** | ▪ Establish formal partnership arrangements with key organisations to achieve waste and resource recovery targets.  
▪ Identify collaboration opportunities through identification of common needs that align with the State’s and priority partners’ objectives. |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| **Medium to long-term** | ▪ Provide targeted support that builds capacity and supports key stakeholders identified as partners.  
▪ Design contracting practices to facilitate an alignment of interests, frequency of contact and clearly communicated waste management objectives and goals  
  – includes developing templates for risk-sharing agreements to assist in facilitating stakeholders’ switch to recovered resource products.  
▪ Collaborate on planning to ensure the waste management needs can be addressed on a whole-of-region basis. |
4.5 Education

Vision
Targeted education that ensures the community, business and industry stakeholders understand how to avoid and minimise waste and reduce contamination, and recognise the value of reused and recycled products. All people, including key decision makers, recognise waste management as an essential service and support its place within the local environment.

<table>
<thead>
<tr>
<th>TABLE 9: OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Raise awareness</strong></td>
</tr>
<tr>
<td>The opportunities presented by a circular economy (ie, significantly better economic growth, jobs, social engagement and environmental outcomes) are understood by consumers, industry and government in Queensland.</td>
</tr>
<tr>
<td><strong>Inform people of required actions</strong></td>
</tr>
<tr>
<td>People know what actions they can take to make positive change (eg, better understanding of recycling, involvement in community re-use/repair drives, business coaching on how to improve product/packaging design for recycling or reduce material use in production).</td>
</tr>
<tr>
<td><strong>Communicate incentives and penalties</strong></td>
</tr>
<tr>
<td>People understand the impact of their actions and how and why they may be rewarded (eg, CRS approach) or penalised (eg, levy, bans, significant fines for illegal activity).</td>
</tr>
</tbody>
</table>

The case for change
In recent decades, there has been increasing awareness of the impact of waste on the environment, and the need to adopt more sustainable habits and practices of production, consumption and disposal.

However, there are still multiple barriers to change in Queensland:
- awareness remains low (particularly in a practical, day-to-day sense)

- for those who are aware, there is uncertainty about what action to take – a situation made more acute by inconsistent approaches to recycling between states and across local government areas
- people are not incentivised to do the right thing, except in terms of social conscience, and
- there is uncertainty about the reliability of the end to end process. For instance, individuals doing ‘the right thing’ (eg, using their yellow top recycling bin) do not have confidence that their actions ultimately lead to the materials being recycled.

To overcome these barriers, a cohesive, high-impact education strategy is required at a whole-of-state level.

This will require collaboration across all levels of government, informed by community and industry input. Roles and responsibilities for education should be clearly articulated in a Government education strategy, with funding and incentives linked to education outcomes and objectives.

An approach along these lines has been adopted in Victoria, where SV released its 10-year Waste Education Strategy in 2016.73 The strategy is a key element in delivering the state’s SWRRIP.

Current state
There are currently a broad range of messages communicated across multiple disparate sources. Some examples are set out below.

Recycled packaging
- In early 2018, the national Meeting of Environment Ministers announced that all packaging will need to be reusable, recyclable or compostable by 2025.

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- APCO is currently focusing on encouraging members to design-out waste, educating consumers to understand recycling options for packing and developing end markets.

**Plastic pollution reduction**
- As part of its plastic pollution reduction plan, the Government introduced a ban on lightweight single-use plastic shopping bags with effect from 1 July 2018. DES has provided education on this ban via its website and through broadcast media.
- The State will be introducing the CRS from November 2018, and plans to run an education program on the scheme ahead of its implementation.
- As noted at section 2.3, the media continues to play an important role in raising awareness of the environmental impact of waste, with particular attention given recently to the impact of plastics.
- Public support is driving behaviour change in large organisations. For example, Woolworths recently announced it is planning to discontinue the sale of single-use plastic straws.

**Food waste avoidance and reduction**
- Brisbane City Council has become a subscriber to WRAP’s ‘Love Food Hate Waste’ education program in an effort to reduce food waste. The program is also being used by the New South Wales and Victorian governments (see Case Study 10).
- In addition to its core business of trying to save and repurpose potential food waste for those in need, OzHarvest recently released the *Food Fighter* documentary and launched a new ‘Fight Food Waste’ campaign to be run across Australia.

- There are many other examples of public education campaigns by not-for-profit organisations (NFPs) designed to educate the public about the impact of, and practical options to reduce, food waste (although marketing activities are often budget constrained).

**Awareness of circular economy opportunities**
- Various NFPs try to educate and inform the public on the opportunities presented by circular economy approaches. For example, the Ellen MacArthur Foundation in the United Kingdom works with business, government and academia globally to build a framework for an economy that is restorative and regenerative by design. It also provides practical case studies on its website.

**Anti-littering awareness**
- DES’s Litter and Illegal Dumping Programs team supports and works closely with various stakeholders in addressing litter and illegal dumping impacts through targeted education, engagement and behaviour change intervention. A number of local governments also undertake anti-littering campaigns.
- Clean Up Australia raises awareness of the impacts of consumption (eg, one in ten items collected during Clean Up Australia Day are related to plastic drinking bottles), and supports communities to actively participate in clean-up activities.

**Contamination reduction**
- Local governments run individual campaigns to reduce contamination in recycling bins. However investment in education varies significantly across councils, as does the message about what is and is not acceptable for recycling.

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74 To support this, APCO has developed an online tool to help businesses understand whether their packaging content is recyclable or not. This tool is already being used and will continue to be refined over time. As it is used across Australia (which has varied recycling capabilities), APCO has defined recycling as being possible when over 80% of people have access to yellow bin recycling for the specified product.

75 APCO has developed a national labelling program to which members can voluntarily subscribe. The program involves stating what can and cannot be recycled on the packaging material itself. This program achieved three times the expected annual uptake in its first month. An external proponent has been engaged to develop a supporting education campaign.

76 APCO is considering how to support members better understand demand and what people want rather than just focussing on developing capacity and/or technology to recycle.


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The key challenge for Government will be to deliver a clear and consistent message in this dynamic environment. Consistency is even more important given increasing population mobility.

An effective education strategy would allow the State to harness existing community interest.

**Stakeholder views**

Stakeholders advocated strongly for significant and sustained investment in education, noting a strong correlation between the de-prioritisation of education programs and increased rates of contamination in “yellow-top bin” waste.

The waste management industry and recyclers were particularly keen to see education used to inform key government decision-makers on the industry being an essential service, and support market development activities, critical to the development of domestic recycling markets.

Stakeholders also highlighted the history of inconsistent and confusing public messaging, and the need for continuing reinforcement of key messages.

**Opportunities**

**Short term opportunities**

**Establish a framework for delivery**

The Government needs to establish and maintain a dedicated team responsible for developing and implementing a coordinated approach to waste and resource recovery education. This will need to be addressed in the near term in order to develop and implement a high-impact education strategy. This should be supported by the allocation of appropriate resourcing.

A funding framework should be developed to support and encourage appropriate education where it is required. This framework must link education activities to the delivery of strategy objectives, along with identifying the key features required (i.e., collaboration or partnering).

**Establish State’s capacity to lead and co-ordinate (define roles and timing)**

**Develop a focussed education strategy**

- Education takes time and consistency to achieve enduring change. The Government needs to develop a strategy that can provide the necessary consistency in messaging and also adapt to changing educational needs (e.g., as infrastructure is developed or innovations are implemented).

- Duplication of investment and effort should be avoided where activities which can be performed at a scale. To do this, education should occur at the highest aggregate level where possible. For example, the State Government could focus on raising awareness of issues such as littering or illegal dumping (which are relatively consistent across Australia) rather than educating consumers on what can and cannot be recycled (until consistency on recycling can be achieved across local government areas). The funding framework developed for education activities should reflect this objective.

- The strategy should clearly articulate linkages between education activities and behaviour change (and ultimately, improved resource utilisation). Investment should be targeted towards programs aligned to key strategy objectives (which will require an understanding of education gaps by region and material type; for example, by looking at varied contamination rates and material flow assessments). Note that Queensland regions have challenges associated with available infrastructure and distance. As a result, tailored solutions should be considered for these areas.

- Roles and responsibilities need to be clearly defined (across different levels of government, industry, educational institutions and schools, individuals, communities and businesses). Potential partnership opportunities should also be identified and actively targeted.

- The education program should be tailored to address short, medium and longer-term objectives, and should focus specific needs across relevant enablers, in addition to broader objectives. Consideration should be given to the most effective mechanisms for content delivery across different stakeholder groups.

- Mechanisms for evidence-based measurement and review of the strategy need to be included to ensure mistakes are identified and corrected, and investment in education continues to be optimised over time.

**Develop Government education program**

- As noted at Section 4.8, the Queensland Government is the single largest employer and purchaser of goods and services in the state. However, in many cases, Government and its employees may not be aware of the issues and opportunities associated with better waste management practices.

- The Government should develop a targeted induction/education program to ensure a consistent message with regard to focusing on opportunities for better procurement practices, waste management and resource optimisation. Additionally, such a program could consider development of an advertising toolkit for use.
throughout agencies and an ally or champion network which identifies specific individuals who are motivated to drive outcomes.

**Develop coordinated education tools for stakeholders**

- Where possible, the State should develop a program to provide access to education support and existing tools to a wide variety of stakeholders. For example, making consistent content available to all regional councils would ensure councils are not forced to re-create existing content. This includes in relation to knowledge sharing around emerging opportunities and practical success stories. This is discussed further in Section 4.3.

**FIGURE 13: AMPLIFY EDUCATION THROUGH STATE AND NATIONAL HARMONISATION**

![Figure 13](image)

The State should push for messages to be amplified at the most aggregate level.

Source: QTIC

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**CASE STUDY 9: INVEST IN HIGH IMPACT EDUCATION - NSW ORGANICS COLLECTION**

The NSW EPA has allocated $27 million over eight years for local governments to implement organics diversion programs, with almost $20 million expended as at 30 June 2018. However, the success of these programs relies on community education to achieve high uptake and low contamination. Case studies and knowledge sharing showcase various education strategies and emphasise the use of grant funding for community education.

The NSW EPA has compared the varied approaches and relative success of different councils implementing kerbside organics collection and concluded that at least four months of community education prior to rolling out new systems is an essential precondition for success.

Published case studies consistently highlight the education strategies used to promote each program, placing them prominently before any discussion of physical bin configuration or program results.

Community engagement actions used to promote new kerbside organics collection services included:

- distribution physical materials including collection calendars, bin lid stickers, fridge magnets, kitchen caddy liners and information packs,
- a positive program slogan,
- advertising via local TV, radio, newspapers, social media and council newsletters and websites,
- promotion stalls at shopping centres and community events,
- education programs in schools,
- setting up a phone line to respond to queries, and
- competitions to name the new program, or new collection vehicles.

A review of bin audits across 26 New South Wales councils with kerbside organics collection services found that established services divert an average of 45% of food waste, and concluded that varying levels of effort and success in community education contribute significantly to the performance of FOGO services.

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Leverage existing work in the short term

There are many examples of successful education programs in Queensland and across other states and countries. Rather than re-inventing these, Government should look to prioritise tried and tested programs and adopt these where appropriate.

CASE STUDY 10: LEVERAGE EXISTING PROGRAMS – ‘LOVE FOOD HATE WASTE’

Australian households throw away 3.1 million tonnes of edible food each year, costing the average Australian family over $2,000 and making up 30-35% of household waste. Effective community education is crucial to behavioural change.

The ‘Love Food Hate Waste’ campaign was originally developed in the UK by the government-funded charity, WRAP. The program raises awareness about food waste and promotes positive waste avoidance behaviours for households and businesses, including planning meals, making shopping lists, storing food correctly and using leftovers.

WRAP has built up a significant body of experience and material including campaign posters, tips for businesses and households, recipes, research data, case studies and food waste audit methodologies.

These resources can be adapted for use by other governments and local councils, under a licensing arrangement. In 2018, participating organisations in Australia included the NSW EPA, SV and the Brisbane City Council, each of which partner with community organisations to spread food waste avoidance messages.

The ‘Love Food Hate Waste’ licensing arrangements also include a knowledge-sharing component in which partners around the world share issues, successes and learning from their experience with the program.

By becoming a ‘Love Food Hate Waste’ program partner, organisations can reduce the effort required to develop educational materials and learn for the experience of previous campaigns to maximise the impact of their food waste avoidance education efforts. Given its use by significant jurisdictions in Australia, its application across Queensland would assist in the goal of delivery consistent messaging.

CASE STUDY 11: EXPAND WHAT WORKS - ECOBIZ

The ecoBiz program was developed and launched by the Queensland Government in 2005, with the objective of assisting Queensland businesses to compete, invest and profit through eco-efficiency initiatives that reduce their operating costs, whilst also improving their environmental performance.

Since its inception, ecoBiz has continued to evolve. In 2012, program delivery was outsourced to the Chamber of Commerce and Industry Queensland (CCIQ). CCIQ has focussed on educating small and medium enterprises on how to reduce energy and water consumption and reduce waste generation.

EcoBiz focusses on delivering practical training, coaching and operating advice to businesses. Current program funding has supported over 700 businesses to receive personalised one-on-one support, while 3,600 businesses participated through an online webinar series. Additionally, over 1,000 people attended 100 workshops held across the state.

A review of the CCIQ program in July 2017 showed that ecoBiz had helped participating organisations cut their energy, water and waste bills by an average of 16%.

Additional funding to expand programs like ecoBiz may allow a higher number of businesses to benefit from the program, while positively impacting waste reduction across the state.

Longer term opportunities

National harmonisation

Consistency is a challenge, as different infrastructure (eg, MSW bin configurations) and economic instruments (eg, levies and bans) lead to different education requirements across regions and states.

Going forward, Queensland needs to push for harmonisation where possible, to allow a consistent message to be delivered on a broad scale. Encouraging partnering and collaboration, particularly across local government areas, will also limit duplication of effort and investment.

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**Recommendations**

**TABLE 10: EDUCATION – RECOMMENDATIONS**

<table>
<thead>
<tr>
<th>Short-term</th>
<th>Medium to long-term</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Establish a framework (or leverage an existing platform) for delivery of a cohesive education program, including appropriate funding.</td>
<td></td>
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<tr>
<td>- Develop a targeted education strategy, including:</td>
<td></td>
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<tr>
<td>-- clearly-defined roles (including partnerships and collaboration opportunities)</td>
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<tr>
<td>-- evidence-based mechanisms to review and measure success over time, and</td>
<td></td>
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<tr>
<td>-- the foundations to deliver high impact outcomes by ensuring different stakeholders are educated on how to avoid, reuse and recycle materials. Specific opportunities should also be pursued in relation to:</td>
<td></td>
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<tr>
<td>&gt; development of a Government education program</td>
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<tr>
<td>&gt; introduction/expansion of circular economy and waste avoidance education in state schools (eg, ResourceSmart Schools in Victoria)</td>
<td></td>
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<tr>
<td>&gt; development of a coordinated education toolkit for local delivery (including at community, business and local government level)</td>
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</tr>
<tr>
<td>&gt; implementation of existing successful education programs to achieve change in the short term (eg, LFHW)</td>
<td></td>
</tr>
<tr>
<td>&gt; expansion of successful business education programs such as ecoBiz to provide additional support for the business community (and potentially across State agencies).</td>
<td></td>
</tr>
<tr>
<td>- Continually improve and refine education strategy through regular evidence based assessment of its effectiveness over time.</td>
<td></td>
</tr>
<tr>
<td>- Seek national harmonisation of messaging based on harmonised practices, to enable broader delivery of consistent education programs</td>
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</tbody>
</table>
4.6 Levy and landfill disposal bans

Vision
A landfill levy that provides the appropriate economic/price signals to the market to divert materials from landfill through waste avoidance, reuse, recycling, and resource recovery, with levy revenue used to support investment in infrastructure, encourage innovation, and assist Queensland to move towards a circular economy model.

Current state

Current landfill levy design
The Queensland Government has announced it will introduce a waste disposal levy in the first quarter of 2019. While amending legislation to give effect to the levy is still being drafted, the key design features outlined in the DES Directions Paper, *Transforming Queensland’s Recycling and Waste Industry*, are broadly as follows:

- The levy will be applied to a levy zone that covers the populated areas of Queensland, as shown at Figure 14.
- The levy will apply to all general waste streams (MSW, C&I and C&D), with a rebate to those local councils that dispose of household MSW in the levy zone.
- The FY2019 levy rate will depend on the class of waste:
  - Regulated waste (Category 1) - $150 per tonne
  - Regulated waste (Category 2) - $100 per tonne
  - General waste (C&D, C&I and MSW) - $70 per tonne.
- The general waste levy will increase by increments of $5 per year for four years. No detail was provided on increases in the levy for regulated waste.
- A range of exemptions will apply:
  - waste resulting from a declared natural disaster such as cyclone, bushfire or flood,
  - wastes where disposal is required by regulation, such as asbestos, quarantine waste or fire-ant infested material,
  - litter and illegally dumped waste collected by a local council, community group or other organised participant involved in an initiative such as Clean Up Australia Day, and
  - waste that has been received by charities as part of donations or that has been left in and around donation bins and stores.
- A concessional levy rate will be applied to residual waste resulting from legitimate recycling activities.

FIGURE 14: LEVY ZONE BY LOCAL GOVERNMENT AREA

Source: DES, *Transforming Queensland’s Recycling and Waste Industry Directions Paper (June 2018)*
Possible unintended consequences of a landfill levy

Increase in illegal dumping

The general consensus from industry consultation is that the implementation of the landfill levy will introduce an added incentive to illegally dump waste. This is supported by experience in other jurisdictions.\(^{87}\)

In FY2017, the estimated cost to local governments of dealing with 8,500 tonnes of illegally disposed waste was around $18 million.\(^{88}\) Any increase in the incidence of illegal dumping could have significant cost implications for local government and the State.

The Queensland Government should consider the following courses of action to mitigate this risk:

- incentives for recycling
- targeted education, awareness and behavioural change campaigns
- increased capacity for interventions and compliance through education and training
  - higher penalties for illegal dumping
  - increased monitoring and surveillance, particularly focusing on the fringe areas of the levy free zones, and
- identification of the key wastes being dumped illegally and ensure there are alternative processes for them (if viable) or implement targeted monitoring.

Shifting waste to other states and non-levy zones in Queensland

There is no nationally-consistent approach to landfill levies. Different jurisdictions have implemented different levies, which can create the incentive to transport waste from one area to another. Interstate waste has been increasing in Queensland. In FY2017, over 900,000 tonnes of interstate waste was recorded as entering Queensland, primarily from New South Wales.

The implementation of the landfill levy in Queensland is expected to reduce the transfer of interstate waste to the levy zone regions. However, there is a credible risk of waste being transferred from levy areas into regional and rural non-levy zones, subject to the capacity of landfills. Queensland proposes to mitigate this risk by applying the levy on the waste if it is generated within a levy zone, regardless of where it is disposed. Nonetheless, it will likely be challenging in practice to enforce this. Experience in other Australian states suggests it can be difficult to determine the source of waste.

To mitigate this risk, the Queensland Government should:

- review the options for more advanced and accurate waste tracking mechanisms. The ERAs due to be implemented in late 2018 should assist in this regard, and
- work on a national approach to determine whether a solution to intra and interstate waste transfers can be developed based on the application of the proximity principle.\(^{89}\)

Risk of stockpiling waste

The implementation of a landfill levy may provide an increased incentive for the stockpiling of waste.

Stockpiling refers to the collection of materials either by the waste producer or by resource recovery facilities under the guise of resource recovery. The perverse outcome occurs when materials are stockpiled to avoid or delay paying a landfill levy. This has the result of distorting markets and has a negative financial impact on legitimate operators.\(^{90}\)

This risk can be mitigated by increased regulation, monitoring and compliance efforts on resource recovery sites. New South Wales, for example, imposes additional reporting requirements. Additionally, waste received by the recovery sites incurs a liability which is then extinguished once the waste is lawfully removed from the site for resource recovery, reuse or disposal.

There are certain events that trigger the liability to pay the levy (eg, stockpiling of waste longer than the prescribed period of time). Queensland is not currently proposing to adopt this approach.

Inability for waste types to respond to price signals

There may be an inability for some waste types to respond to price signals from the levy due to limited or no alternative treatments (eg, some regulated wastes). A potential perverse outcome is the increase in illegal dumping of these regulated wastes.

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\(^{88}\) Department of Environment and Science (Qld), Recycling and waste in Queensland 2017, above n 17.

\(^{89}\) The Waste Act defines the ‘proximity principle’ as the principle that waste and recovered resources should be managed as close to the source of generation as possible (s 12).

\(^{90}\) Environmental Protection Authority (NSW), Changes to the NSW waste levy for resource recovery facilities (March 2015).
Opportunities

Principles of good levy design

Pricing mechanisms are used internationally and in most Australian states to achieve targets for diverting waste from landfill, as well as to help fund waste reduction activities. In their allocation of capital and resources, and their focus on innovation, markets respond to price signals. The application of a landfill levy is widely held to be the most effective financial lever to divert waste from landfills into resource recovery activities.

The following list summarises principles of good levy design, based on industry and other stakeholder feedback:

- Introduce a landfill levy at an appropriate price, with gradual increases over time until the desired opportunity cost level is achieved.
- Provide sufficient lead time and phasing of the levy to allow the market to respond and transition to the new regulatory environment.
- Levy pricing should be forward-looking and provide clear and credible projections, providing industry with certainty and informing investment decision-making.
- Levies are applied as broadly and consistently as possible to limit the risk of intentional reclassification of wastes, reducing the effectiveness of the levy.
- Exemptions are kept to a minimum, and granted only in exceptional circumstances in accordance with clear, statutorily-defined criteria.
- It is not uncommon to apply differential levy structures, having regard to the relative capacity of regions to divert waste to recycling and other facilities, and taking into account socio-economic differences, lack of alternative waste recovery infrastructure, limited options for the development of secondary markets, lower population density, and the vast distances (and associated higher transportation costs) in rural and regional areas. There is precedent for this approach in Australia, as shown in Table 11. All states have differential levies for metro and regional/rural areas.

- Provide clear direction on the application of levy revenue. To promote stakeholder acceptance of the need for a levy, the proceeds should be used to fund initiatives in areas such as increased compliance and enforcement, the mitigation and management of illegal dumping, education, waste infrastructure, market development, and promoting regional collaboration. Given the scale and scope of the reforms required to improve Queensland’s waste management and resource recovery performance, the short- to medium-term needs will be significant.
- A common approach is to combine levies with other complementary measures (such as landfill bans) to target specific waste avoidance and encourage greater resource recovery.

**FIGURE 15: FORECAST LEVIES BY REGION (PRICE PER TONNE)**

Source: Each jurisdiction’s website

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91 PEAK Services, Viability Assessment of an Energy from Waste Industry in Queensland (June 2018).
93 In Victoria, Metro areas are ringed around Port Phillip Bay, from Geelong to Mornington, with provincial capturing three other council areas: Greater Bendigo, Ballarat and Golden Plains. The remaining regional rates are discounted by 50 per cent for municipal waste. ACT does not have a landfill levy, but waste disposal facilities (which are all government owned) set disposal charges (landfill gate fees) to influence the market and dis incentive waste disposal. Tasmania does not have a legislated state-wide waste levy, but three regional waste authorities currently charge their member councils a voluntary levy between $2 and $5 per tonne.
### TABLE 11: GENERAL WASTE LEVIES BY REGION - PRICE PER TONNE (FY2019)

<table>
<thead>
<tr>
<th>Region</th>
<th>Metro</th>
<th>Regional</th>
<th>Remainder</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td>$141.20</td>
<td>$81.30</td>
<td>Nil</td>
</tr>
<tr>
<td>QLD</td>
<td>$70.00</td>
<td>$70.00</td>
<td>Nil</td>
</tr>
<tr>
<td>SA</td>
<td>$100.00*</td>
<td>$50.00</td>
<td>$50.00</td>
</tr>
<tr>
<td>Victoria</td>
<td>$64.30</td>
<td>$64.30</td>
<td>$32.22</td>
</tr>
<tr>
<td>WA</td>
<td>$70.00</td>
<td>Nil</td>
<td>Nil</td>
</tr>
</tbody>
</table>

Source: Each jurisdiction’s website; * SA levy gazetted to rise to $103/tonne by 2020.

### CASE STUDY 12: SOUTH AUSTRALIA - BENEFICIAL OUTCOMES OF A LEVY

In South Australia, the landfill levy has progressively increased since its initial introduction. The outcomes in resource recovery rates over time are as follows:

- Resource recovery has increased significantly from around 2 million tonnes (or 60 per cent recovery) in FY2004 to almost 4 million tonnes (81.5 per cent recovery) in FY2016, and
- The total volume of waste sent to landfill reduced by 29 per cent from FY2004 to FY2016.

#### Effectiveness of a landfill levy

The effectiveness of the levy depends on the price elasticity of demand for landfill. Price elasticity refers to the sensitivity of demand in relation to the price of landfill (eg, the levy). The higher the price elasticity, the more sensitive demand is to a change in price.

One of the key determinants of price elasticity is the availability and price of substitutes. In the context of demand for landfill, substitutes include waste avoidance and resource recovery.

It therefore follows that, where possible, waste generators will switch to cheaper waste avoidance and resource recovery options to avoid sending waste to landfill and incurring the levy.\(^97\)

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\(^96\) South Australian Government, Submission No 36 to Senate Environment and Communications Reference Committee, Inquiry into the waste and recycling industry in Australia, October 2017.

\(^97\) KPMG, Review of the NSW waste and environment levy: Final Report (June 2012).
### TABLE 12: SELECTED WASTE RECOVERY FACILITIES AND GATE FEES

<table>
<thead>
<tr>
<th>Facility type</th>
<th>Brief description of facility</th>
<th>Summary of waste streams and types that can be processed</th>
<th>Indicative capacity per facility</th>
<th>Indicative gate fees ($/tonne)(^a)</th>
<th>Regional solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Composting – open windrow</strong></td>
<td>Aerobic degradation in rows (windrows) of organic waste to breakdown organic matter and produce a stable, nutrient rich compost product which can be sold.</td>
<td>Garden waste</td>
<td>Small/ medium (1 to 100,000 tpa)</td>
<td>$20 - $50 (garden waste only) $50-$100 (FOGO)</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Composting – in-vessel</strong></td>
<td>Aerobic degradation of organic waste in an enclosed, controlled environment to breakdown organic matter, destroy pathogens and produce a stable, nutrient rich compost product which can be sold.</td>
<td>Food waste, Garden waste</td>
<td>Small/ medium (10,000 tpa to 100,000 tpa)</td>
<td>$80-$200</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Anaerobic Digestion</strong></td>
<td>Biological process which is carried out in sealed vessel in the absence of oxygen. Energy is recovered from the waste in the form of methane, which is captured and can be used for renewable electricity generation – this is the main advantage of the process compared to aerobic decomposition (composting).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Food waste, Garden waste</td>
<td>Small/ medium/large (10,000 tpa to 200,000 tpa)</td>
<td>$200-$250</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>C&amp;D MRF</strong></td>
<td>Sorting and separation of mixed C&amp;D waste to recover recyclable components including masonry, metals and wood. Masonry may be crushed prior to being sold to market.</td>
<td>Mixed C&amp;D waste</td>
<td>Small/ medium/large (&gt;5,000 tpa)</td>
<td>$50-$100</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>C&amp;I / MSW MRF</strong></td>
<td>Sorting and separation of mixed C&amp;I and/or MSW co-mingled recycling to recover recyclable components including metals, plastics, paper/card and glass.</td>
<td>Mixed C&amp;I and MSW recycling</td>
<td>Medium/large (10,000 tpa to 500,000 tpa)</td>
<td>$50-$100</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>MBT (Mechanical Biological Treatment)</strong></td>
<td>Mixed residual waste is mechanically sorted to extract organics and other recoverable materials. Organics are then biologically processed to recover nutrient and/or energy value.</td>
<td>Mixed residual waste (MSW and C&amp;I).</td>
<td>Medium/large (20,000 tpa to 200,000 tpa)</td>
<td>$175 - $250</td>
<td>No (may be appropriate for larger regional centres)</td>
</tr>
<tr>
<td><strong>Thermal WtE (incineration)</strong></td>
<td>Mixed residual waste or RDF (Refuse Derived Fuel) can undergo thermal treatment (combustion) to recover energy (power and/or heat) via raising steam in a boiler and directing this through a turbine.</td>
<td>Mixed residual waste (MSW and C&amp;I) RDF</td>
<td>Large (&gt;100,000 tpa)</td>
<td>$150-$350(^b)</td>
<td>No, cost effectiveness is driven by scale.</td>
</tr>
</tbody>
</table>

\(^a\) Indicative gate fees are based on industry intelligence and benchmarks. Gate fees are affected by many factors including competition in the market place, capital and operational costs, the price obtained for applicable revenue streams (including generated electricity and sale of recovered materials) and other regulatory and policy measures such as landfill bans. Furthermore, gate fees can benefit from economies of scale and decrease as facility capacity increases.

\(^b\) Assuming bottom ash is exempt from the landfill levy. If bottom ash is not exempt from the landfill levy this could increase the required gate fee.
Figure 16 illustrates the indicative gate fees for landfills, inclusive of a landfill levy at various rates, compared to alternative waste recovery options. It indicates that based on the proposed levy, some technologies – anaerobic digestion, MBT and thermal WtE – may not be viable without additional support.

**FIGURE 16: INDICATIVE WASTE DISPOSAL COSTS VS ALTERNATIVE RECOVERY OPTIONS**

![Graph showing waste disposal costs vs alternative recovery options](image_url)

*Source: ARUP based on industry intelligence and industry benchmarks*  

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100 The indicative gate fees are based on what would be achievable from the large, privately-owned landfills in SEQ, which offer lower gate fees by quotation and negotiation (on average, the gate fee per tonne for large amounts of unregulated waste is between $35 to $60 in private SEQ landfills). In SEQ, the local government-owned landfills generally charge higher rates. The current published gate fees for commercial general or mixed waste are between $98.80 and $140 per tonne.

101 Increased collection costs (e.g., for additional bin collections) for higher levy scenarios are not considered, and once an alternative technology option is cost-equivalent to the total landfill disposal cost (which is an assumed landfill gate free of $50/tonne for SEQ, as well as the prevailing landfill levy rate), it is assumed that capacity develops to treat all waste. Additionally, MBT has not been modelled as an alternative waste treatment technology under these scenarios as it does not complement FOGO collection.

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102 Energy recovery from landfill gas has been classed as disposal to landfill. Hazardous waste has been excluded for the purposes of this comparison.
Landfill disposal bans

In addition to a landfill levy, a number of jurisdictions 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).103 Bans have typically been introduced a number of years after a levy as part of a co-ordinated waste strategy and program.104

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, unsorted MSW), 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 or there is sufficient time to devise alternatives. Without these alternatives, the risk of waste stockpiling and illegal dumping is exacerbated. Special consideration will need to be given to the application of bans in regional areas to ensure there is access to alternative processes.


Most Australian jurisdictions now have some form of landfill disposal bans. South Australia has the most extensive list of wastes banned from landfill. Under the state’s environmental protection regulations, and with two years notice, bans were progressively rolled out over a three-year period, initially in the metropolitan area and subsequently across the entire state (see Table 13).

<table>
<thead>
<tr>
<th>Table 13: List of banned items in South Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>hazardous waste</td>
</tr>
<tr>
<td>medical waste</td>
</tr>
<tr>
<td>plastic packaging (PVC, PS, PP or LDPE)</td>
</tr>
<tr>
<td>aggregated PET or HDPE plastic packaging</td>
</tr>
<tr>
<td>computer monitors and televisions</td>
</tr>
<tr>
<td>vehicles</td>
</tr>
</tbody>
</table>

In its recent Directions Paper, DES has noted preliminary work undertaken to identify waste streams that may be suitable for future landfill disposal bans, including tyres, e-waste and agvet chemical containers.105

105 Department of Environment and Science (Qld), Transforming Queensland’s Recycling and Waste Industry, above n 2, 6.
## Recommendations

### TABLE 14: LEVY AND BANS – RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Short-term</th>
<th>Medium to long-term</th>
</tr>
</thead>
</table>
| ▪ The levy should be forward looking and provide clear direction on the levy price path (aligned with the State Budget forward estimates horizon).  
▪ Government to establish a process to monitor and manage loopholes and unintended consequences from the implementation of a landfill levy. | ▪ Identify clear KPIs to monitor the performance of the landfill levy and provide transparent reporting on the link between the money raised, monies invested and outcomes achieved.  
▪ Government to provide clear signals to the market on any additional landfill bans and allow sufficient time for local government and industry to make alternative arrangements for the recovery/treatment of the banned materials. |
4.7 Market development

Vision

The vision for market development in Queensland is for the State to foster an approach where industry seeks to source its raw materials from recycled, rather than virgin, materials. These inputs will be provided to standards specified by industry. Through this approach, the State will be able to harness the desire of Queenslanders to improve resource recovery rates and create demand for new products that will support job creation.

**TABLE 15: MARKET DEVELOPMENT OBJECTIVES**

<table>
<thead>
<tr>
<th>Identify market needs</th>
<th>Identify and prioritise end use markets, considering interest in market readiness, existing government initiatives (eg, bio futures) and cultivating market demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure viable feedstock</td>
<td>Develop and implement quality standards and specifications, supported by effective End of Waste (EOW) codes and improved feedstock through education and effective management of the waste</td>
</tr>
<tr>
<td>Facilitate development</td>
<td>Planning and regulation readiness to manage new trials and businesses, providing support as required</td>
</tr>
</tbody>
</table>

Current State

**Current landscape**

The absence of the necessary price signals, high contamination rates, and the tyranny of distance have restricted the growth in end-use markets in the state. To date, landfill has been a cheaper or easier alternative than many forms of resource recovery. The implementation of the levy will assist with the economics of diverting from landfill, providing funding for Government support to encourage new and expanded markets.

**Challenges**

The restrictions on imports under the PRC’s National Sword policy have highlighted the vulnerability inherent in reliance on a single market or provider for recycling solutions. While the export of recyclates remains a legitimate option for some materials, it should not be overly relied on.

There are a number of challenges in developing viable local markets:

- investment needs to be underwritten by security of feedstock quantity and quality,
- lack of acceptance within the market for recovered resource products resulting in negative perceptions,
- lack of market demand for recovered products, resulting in significant market price fluctuations when supply of recovered materials rises,
- an over-supply of recovered resources or materials can lead to perverse outcomes such as stockpiling and illegal dumping,
- regulatory gaps in the standards for recovered resource products and end of waste (EOW) codes, and
- processing capacity gaps for more advanced resource recovery.

At the product design and production end, many products are designed for single use, and are either not suitable for disassembly for repurposing, or there is significant cost to reprocess low margin materials.

**Stakeholders views**

Stakeholders were very keen that market development occur through the ‘pull’ of product by end users rather than the ‘push’ of product to avoid the levy. The concern is that if the driver is waste diversion, the end product may be poor quality, impacting on the reputation and long term viability of market for recycled materials.

Concern was also expressed about the economics of developing end markets in regional economies, requiring support from governments through direct assistance or supportive procurement practices.

**Opportunities**

Identification of common market development challenges and prioritisation of materials for end-use markets

For long-term viability, market forces need to determine the products required and the specification. The State should seek to facilitate and support the market in that process by working with industry to identify priority end-use markets and provide targeted assistance.
Once a market is established, the State should only intervene where there are significant supply and demand barriers that limit its expansion, or where there are challenges that could result in perverse outcomes without action.

**CASE STUDY 13: IDENTIFICATION AND CULTIVATION OF MARKET DEMAND – RECOLOGY INC**

In order to cultivate a market for compost, Recology engaged with end users to understand their specific requirements and then worked with the waste industry to design products and locate infrastructure to meet the market’s needs.

This strategy enabled Recology to identify a market need that has resulted in it delivering compost it derives from San Francisco waste to over 200 vineyards in Napa and Sonoma counties. By securing its market prior to production, Recology was able to recoup the costs of their initial facilities in the early stages while they grew their customer base.

Napa County’s Chateau Montelena Winery was one of the earliest to use Recology’s compost the late 1990s and has found that even though the product was more expensive than chemical fertilisers, the better balance in the soil ultimately resulted in a better product.

In order to ensure product quality, many vintners hire soil scientists to conduct tests to see what chemicals are deficient and need to be added through the compost. Recology then makes the necessary changes to its inputs to ensure it meets the customer’s standards.

EPA market analysis of the New South Wales agricultural sector also found that there is a willingness to pay for quality compost in Australia, but that farmers need showcasing that the quality standards are met.

The State should seek to assist by:

- identifying markets that could be assisted by improvements to regulations,
- providing data on the likely long-term supply of materials,
- working with industry to determine the pricing point at which opportunities become viable or non-viable, and
- working with regional Queensland to overcome the specific challenges relating to long distances and transport costs.


**CASE STUDY 14: SUSTAINABILITY VICTORIA PRIORITISATION APPROACH**

SV identified seven priority waste types as part of its 30-year SWRRIP: organics (including timber), e-waste, plastics, tyres, glass fines, concrete and aggregates.

The criteria for selection as a priority required that:
- it is economically viable
- there is a viable market for end products, and
- it results in better community, environment and public health outcomes.

In South Australia, GISA announced a $500,000 Regional Transport Relief Fund as part of its response to the challenges presented by the PRC’s National Sword policy. The temporary fund is for regional councils that support continued recycling efforts and need assistance in offsetting some of the extra costs associated with processing and transporting collected recyclables.

**Education and recycling programs**

Education and recycling programs are highly correlated with the quality of feedstock available for reprocessing. This is because education strategy is critical for communities’ understanding of the purpose, goals and outcomes of the recycling programs, and can influence presentation quality and participation.

Reducing contamination rates has direct benefits across end-use markets. Better quality feedstock provides cost savings for manufacturing and helps improve the confidence and thus commerciality of producing recovered resource products.

Education programs will also be critical if there is any change to existing collection processes, in order to deliver less contaminated material.

**Quality standards**

End-use markets rely on consumer confidence in the quality of recovered resource products and enforcement of recognised industry quality standards. An effective, independent and auditable system for standards will build trust within the market to attain the consumer confidence required to expand the market for recovered resource products.

Once standards are proven fit for purpose, the State can incorporate new products into its own procurement practices, creating additional demand and expanding end-use markets.

Development of quality standards can be implemented through research and development partnerships with key Government agencies, local governments, universities, communities and industry. Queensland should seek to leverage the work of other jurisdictions that have developed processes to test new products to fast track these products to market.

CASE STUDY 15: C&D END USE MARKETS – THE VIRTUAL QUARRY

Suez-ResourceCo has a one-stop shop site in Melbourne\(^\text{108}\) that accepts both clean and mixed C&D waste, which is processed to remove the soil, aggregates, metal, timber, plastic and other material for re-use. The materials produced at this facility meet VicRoads specifications.

Independent tests by a National Association of Testing Authorities-accredited laboratory were undertaken to ensure the products consistently meet the standard for Class 2, Class 3 and Class 4 Recycled Crushed Concrete.

The facility is accredited by VicRoads, unlocking a key market for recycled products in procurement for transport projects.

End of waste codes

Queensland’s EOW framework under the Waste Act promotes resource recovery opportunities by changing the classification of a waste to a resource if it meets specified quality criteria. Ceasing to be classified as a waste reduces the level of regulation and may increase the value of the material.

The EOW framework replaced the beneficial use framework in late 2016, but there have been issues and delays with its rollout. Government should undertake a process to engage with the business and waste industries to review and, as appropriate, amend or accelerate the rollout of the EOW.

Building markets through coordinated planning

Coordinated planning enables the co-location of resource recovery precinct developments that could position major remanufacturing facilities next to processors of recovered resources. Government can facilitate such opportunities by maintaining an inventory of materials generated throughout the region and recruiting businesses and industries to use these locally generated resources.

In places such as the Netherlands, this has been successful in allowing firms to leverage off by-product synergies where discarded products from one firm can be used by another.

In regional Queensland centralised planning and collaboration will be critical to ensuring any economies of scale can be captured. However, achieving centralised end of use markets will not be possible without adequate planning and land use policies.

Recommendations

<table>
<thead>
<tr>
<th>TABLE 16 MARKET DEVELOPMENT – RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short-term</strong></td>
</tr>
<tr>
<td>▪ Deliver market development strategy for recovered resources.</td>
</tr>
<tr>
<td>▪ Identify significant challenges facing end use markets and prioritise end use markets that can support an increase in supply of recovered resources most effectively, and</td>
</tr>
<tr>
<td>▪ Undertake separate studies for specific waste streams</td>
</tr>
<tr>
<td><strong>Medium to long-term</strong></td>
</tr>
<tr>
<td>▪ Rollout of EoW codes, working with the market to ensure it meets their needs.</td>
</tr>
<tr>
<td>▪ Align education programs with improving recycling feedstock quality</td>
</tr>
<tr>
<td>▪ Develop standards for recovered products that build trust for end-use markets through standards</td>
</tr>
<tr>
<td>▪ This includes adoption by TMR of road specifications for the inclusion of recovered materials (tyres and glass)</td>
</tr>
<tr>
<td>▪ Ensure planning supports the creation of precincts that can create synergies through the use of by-products by firms within the precinct.</td>
</tr>
</tbody>
</table>

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4.8 Procurement

Vision

Procurement practices prioritise the use of recycled inputs, and consider the issue of waste produced at time of purchase and at end of life.

TABLE 17: PROCUREMENT OBJECTIVES

<table>
<thead>
<tr>
<th>Life cycle impacts of products when procuring</th>
<th>Entities (government, business and individuals) consider the whole-of-life costs of the products they use. Procurement practices reward innovative circular economy businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leverage Government’s purchasing power</td>
<td>Adopting a procurement framework for State agencies that leverages government’s significant purchasing to encourage sustainable business practices</td>
</tr>
<tr>
<td>Facilitate collaborative procurement between State and local governments</td>
<td>Aligning procurement strategies across tiers of government to help secure feedstocks for long term investments</td>
</tr>
</tbody>
</table>

Current state

Challenges

The Queensland Government is both the largest employer and the largest purchaser of goods and services in the state. Its dominant position in the economy gives it significant scope to influence economic outcomes in Queensland.

The Government mandates procurement principles for State departments, statutory bodies and Government-owned corporations through the Queensland Procurement Policy (QPP).109

While the QPP prioritises value-for-money principles, the Government does seek to advance specific social and economic objectives through its procurement practices. However, there is currently no requirement to consider the sustainable business practices of suppliers as part of the State procurement process.

Value-for-money is a core consideration in procurement practices both across the public sector and for private sector entities. Where sustainable procurement increases costs, it becomes more difficult to promote. Governments will need to provide clear guidance on their approach to sustainable procurement where there is a negative impacts on value for money. Such guidance could be in the form of acknowledging and, within limits, funding any additional cost or the addition of criteria for calculating value for money.

At the federal level, the Commonwealth Government has produced a Sustainable Procurement Guide, designed to leverage its role as a large procurer of goods to encourage good practices by its suppliers to achieve environmental and social benefits.110 Sustainable procurement aims to reduce the adverse environmental, social and economic impacts of purchased products and services throughout their life.111

As well as developing an approach to procurement that considers the entire life cycle of goods and services, another key challenge is creating product standards that the market trusts. A related consideration is negotiating appropriate risk-sharing for the use of new recycled products.

To encourage a broad-based voluntary adoption of sustainable procurement practices, it will be vital to engage at the community and industry level.


111 Ibid 7.
Stakeholder views

A common theme in stakeholder consultations was that the use of recycled inputs (and sustainable business practices more broadly) is rarely considered in procurement processes.

However, stakeholders also emphasised that knowledgeable consumers have the power to drive more sustainable procurement practices.

While consumers have a part to play, governments at all levels have a responsibility to lead by example and act as model purchasers, given the scale of their procurement activities. It was noted that while the use of recovered materials may increase costs in some instances, there were also examples of where such materials provided improved solutions and delivered better value for money.

A common example given for how government procurement practices could materially impact resource recovery rates is mandating the use of minimum quantities of crumbled rubber and glass fines in roads.

Opportunities

Procurement standards

Procurement policies can incorporate provisions that mandate or favour procurement of goods and services from companies that adopt sustainable business practices.

For instance, procurement policies can designate minimum standards of recovered resource content in products and total resource recovery guidelines for services provided.

This can challenge procurers to reward new innovative circular economy business models in order to maintain business relationships.

A review of practices in other Australian jurisdictions reveals opportunities for Government to consider, including adopting minimum standards for recovered resources in procured products.

CASE STUDY 16: PROCUREMENT STANDARDS – C&D WASTE IN ROAD BASE

Since 2008, the City of Canning in Western Australian has used recycled construction and demolition products almost exclusively for road base.112

The diversion of waste from landfill reduces the environmental impact of civil works, and is cheaper than virgin material due to the avoided transport costs associated with delivering new materials from the nearest quarry.

The Department of Transport and Main Roads and local governments in Queensland have trialled recovered materials in the construction of roads on council sites.

A key risk regarding the introduction of new materials, whether recycled or other, is who bears the financial cost of failure. Addressing this issue will increase the willingness of entities to use recycled materials.

Procurement collaboration across government departments

There is currently no clearly defined pathway to maximise the value of recovered resources in Government procurement.

As noted above, the procurement framework set out in the QPP does not currently recognise sustainable business practices among the factors for State agencies in making procurement decisions. However, a key principle underpinning the Policy is the advancement of Government’s economic, environmental and social objectives.

The objectives and commitments explicitly articulated in the QPP include:

- requiring the use of local contractors and manufacturers in significant Queensland Government infrastructure projects wherever possible
- increase Government procurement with Aboriginal and Torres Strait Islander businesses to three per cent of addressable spend by 2022
- achieve zero net emissions by 2050.

Consistent with its role as a model purchaser, Government should consider incorporating objectives on the use of recovered resources or procurement from suppliers with sustainable business practices. Credible and meaningful targets should be developed in consultation with DES, the procuring agency/agencies and relevant industry players.

As a complementary measure, the Queensland Government should consider developing guidance material similar to the Commonwealth Government’s Sustainable Procurement Guide discussed above.

Key concepts from the Sustainable Procurement Guide that could be incorporated in guidance for State agencies include:

- **Life-cycle thinking:** this approach considers the whole life cycle of a good or service, and includes the principle of whole-of-life costing, which seeks to capture the cost to the organisation of acquiring a product, installing and commissioning it, repair and maintenance, and disposing of it at the end of its life.
- **Social benefits:** considering the social factors of a good or service, and
- **Adopting strategies to avoid unnecessary consumption and manage demand.**

By adopting a procurement framework that prioritises sustainable procurement principles, Government has the opportunity to leverage its purchasing to deliver significant changes in the behaviour of suppliers, including maximum value extraction over the life cycle of resources and materials.

**Targeting voluntary adoption of sustainable procurement policies**

As consumers become more aware of the environmental impact of their waste management practices, changes in their purchasing decisions can motivate producers towards more sustainable business practices and products.

WRAP data confirms this shift among consumers, indicating that around 50% of customers in the UK are willing to buy quality used products from major retailers.

However, changed consumer behaviour will be heavily reliant on the success of education programs.

**CASE STUDY 17: VOLUNTARY ADOPTION OF SUSTAINABLE PROCUREMENT POLICIES - QANTAS**

In Australia, changes in consumer attitudes and behaviour have led to firms such as Qantas seeking to become global environmental sustainability leaders in their industries.

Qantas has incorporated sustainable procurement into its environmental sustainability commitments. Qantas uses this platform to encourage suppliers to deliver more sustainable products and packaging.

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113 Department of Sustainability, Environment, Water, Population and Communities (Cth), Sustainable Procurement Guide, 8-12.


Changes in consumer behaviour can also lead to other positive developments across the supply chain, including:

- increased availability of goods and services produced using the circular economy model, leading to more competitive prices
- expanded market opportunities for firms that can differentiate their products through sustainable business practices
- supporting and encouraging innovation by encouraging firms to preference innovative circular economy business models
- expanding the capacity of the market to divert materials from landfill
- at a regional level, encourage collaboration to secure the long-term supply of feedstocks and build markets.

**Support programs for voluntary procurement practices**

Market forces cannot be the sole driver of voluntary support for sustainable procurement practices. Programs that support sustainable procurement practices require support in the interim to encourage uptake. Examples of these programs include:

- standard contract terms for the effective management of waste and the use of recycled materials
- risk sharing between government and stakeholders if a trial of a recycled product fails, and
- the introduction of a ‘green badging’ scheme for companies that adopt sustainable procurement practices. This would allow procurers to easily identify businesses that comply with specified standards.
## Recommendations

### TABLE 18: PROCUREMENT – RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Short-term</th>
<th>Medium to long-term</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Government should incorporate into the <em>Queensland Procurement Policy</em> objectives for the use of recovered resources or procurement from suppliers with sustainable business practices. Credible and meaningful targets should be developed in consultation with DES and industry.</td>
<td></td>
</tr>
<tr>
<td>- Leverage changing consumer preferences to encourage greater rates of voluntary sustainable procurement practices.</td>
<td></td>
</tr>
<tr>
<td>- Provide support for sustainable procurement initiatives through risk-sharing agreements, classification schemes that allow consumers to identify sustainable businesses practices, and development of standard contracting terms.</td>
<td></td>
</tr>
</tbody>
</table>
4.9 Land-use planning

Vision
To integrate land-use and transport planning with waste and resource recovery planning and create precincts for synergetic resource recovery.

TABLE 19: LAND-USE PLANNING OBJECTIVES

<table>
<thead>
<tr>
<th>Objective</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term planning</td>
<td>To ensure waste is considered in all long-term planning decisions, including brownfield and greenfield planning schemes</td>
</tr>
<tr>
<td>Clear signal to market</td>
<td>To provide clear guidance to key stakeholders in the planning process</td>
</tr>
<tr>
<td>Regional development</td>
<td>To enable development of resource recovery hubs or precincts in Queensland, particularly outside of SEQ, to create scale, viable industries and job creation</td>
</tr>
<tr>
<td>Cohesive protection of the system</td>
<td>To concurrently protect the community, environment and waste and resource recovery system</td>
</tr>
</tbody>
</table>

Current state
The waste and resource recovery system encompasses infrastructure and activities to collect, handle, transport, recover, process and, for residuals, dispose of waste. Because the infrastructure and activities can affect community amenity and health through the effects of noise, odour, dust, gas emissions and the release of pollutants into surface and groundwater, careful development planning and management is critical, including the protection of existing allocated areas for waste management activities.

Noting that the new waste strategy is designed to stimulate investment in infrastructure to deliver improved waste management objectives, effective land-use planning will be key in managing the optimal design and placement of this infrastructure. This could range from establishing precincts for synergetic co-location of manufacturing, resource recovery and waste management activities, to ensuring multi-unit dwellings incorporate the infrastructure required to enable residents to appropriately sort their waste.

FIGURE 18: PLANNING APPLICATION AND APPROVAL PROCESS

Source: State Planning Policy

Regulatory environment
The regulatory environment for waste-related development spans a patchwork of primary and delegated legislation and policies, with the relevant planning regime contingent on the nature of the development, its environmental impact, the scale and complexity of the project, and its significance to the locality, region or the state. It has in common with the legal frameworks governing land-use and development planning in other Australian jurisdictions a preponderance of soft law, generated at all levels of government.  

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The Planning Act 2016 (Qld) (‘Planning Act’) sets the overarching legislative and policy framework for land-use planning in Queensland. The Act provides for the preparation of documents that guide all strategic planning in the state.

While local governments are responsible for developing planning schemes for their local areas, the State Government is responsible for identifying and articulating the relevant state and regional interests that must be integrated into any scheme.

The concept of State interest is a key organising feature of the Planning Act and broader planning framework. The Act defines ‘State interest’ as an interest which the Minister considers affects an economic or environmental interest of the State or a part of the State, or materially affects the achievement of the Act’s purpose.116 State interests must be taken into account in the preparation of regional plans and local planning schemes.

While the State Planning Policy (SPP)117 sets out a number of State interests for key infrastructure (eg, energy and water supply, airports and aviation facilities and ports), waste management and resource recovery infrastructure is not separately identified as a focus area.

It is included as part of emissions and hazardous activities, with the following interest: Protect the existing and approved land uses or areas from encroachment by development that would compromise the ability of the land use to function safely and effectively ...118

Industrial land uses are generally separated from sensitive land-use zones, such as residential areas, based on the expected impacts from industrial activity.

In accordance with the definitions at schedule 24 of the Planning Regulation 2017 (Qld), waste management facilities can be classified as low, medium or high impact industry, depending on throughput thresholds defined under the operative planning schemes.

Planning for waste management facilities is mostly undertaken according to local planning arrangements, which can limit opportunities to achieve scale and scope within the industry.

Moreover, planning at a local level can lead to tensions with local communities about the placement of waste management infrastructure, including in situations where residential developments have encroached upon industrial land zones.

This has recently been highlighted in Ipswich, as discussed in Case Study 18 below.

CASE STUDY 18: TEMPORARY LAND PLANNING INSTRUMENT – WASTE MANAGEMENT FACILITIES AT IPSWICH

A Temporary Local Planning Instrument (TLPI) is a statutory instrument made under the provisions of the Planning Act, which may suspend or otherwise affect the operation of another planning instrument for a period of up to two years from its effective date.

In April 2018, the Minister for State Development, Manufacturing, Infrastructure and Planning exercised reserve powers under that Act to issue Temporary Local Planning Instrument No. 1 of 2018 (Waste Activity Regulation) (TLPI No.1/2018), regulating development applications for new or expanded waste facilities in the Swanbank / New Chum industrial area at Ipswich.119

What prompted this? Over recent decades, residential development has been encroaching towards the Swanbank / New Chum industrial area, which has resulted in tensions between the waste industry and local community. The local community has expressed concerns about social and environmental impacts being experienced from existing landfills and raised further concerns that proposed new landfills will exacerbate these impacts.

The Ipswich City Council (the Council) also wrote to the Minister for State Development, Manufacturing, Infrastructure and Planning seeking the State’s assistance with strengthening existing planning controls around landfills.

What is the purpose of the TLPI? TLPI No. 1/2018 provides an interim policy response to emerging social and environmental conditions occurring in the Swanbank and New Chum industrial area, and seeks to balance the management of these impacts with the key economic role this location has in south east Queensland.

What are the protections afforded under the TLPI? The TLPI introduces a new buffer area from existing, approved or planned residential areas where landfill activities will not be supported. In addition, TLPI No. 1/2018 does not support new or expanded compost manufacturing operations that will be open to the air in Swanbank / New Chum industrial area.

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116 Planning Act 2016 (Qld) sch 2 (definition of ‘State interest’).
118 Ibid 49.
119 Cameron Dick, Minister for State Development, Manufacturing, Infrastructure and Planning, ‘New protections for Ipswich residents regarding waste facilities’ (Media Release, 4 April 2018).
What is the way forward? TLPI No.1/2018 was made on 6 April 2018 and will be in effect for two years. It is anticipated that the Council will use this time to consider, consult on, and make amendments to its planning scheme, taking the views of the community and industry into consideration. The Government will work with the Council as it progresses amendments to its planning scheme.

Stakeholder views

Consistent themes emerging from discussions with stakeholders include the need to:

- streamline the development application and approval process
- afford waste management the status of an ‘essential service’ under the State’s planning regime, similar to water and energy supply
- ensure alignment between local government planning schemes and policies and the State’s overarching Waste Strategy made under the Waste Act, and
- facilitate a coherent, whole-of-state or whole-of-region approach to infrastructure planning and coordination to ensure the most efficient and effective deployment of capital, and to achieve the economies of scale required to attract investment in essential waste services.

As noted at Section 4.1, the review team’s analysis of relevant Queensland legislation and discussions with Government stakeholders have failed to reveal any term that neatly corresponds with the concept of ‘essential service’. However, the recurrence of this theme in stakeholder meetings reflects a widely-held view that waste management and resource recovery infrastructure is not given a level of priority consistent with other core public utilities (eg, water and electricity). Without the necessary waste and resource recovery infrastructure, alternatives to landfill disposal are not available and the levy becomes an unavoidable tax or an incentive for illegal dumping.

In this regard, it is relevant to note that the treatment of waste as an essential service is entrenched in the approach of Sustainability Victoria.220

What stakeholders are seeking is appropriate recognition of waste management and resource recovery in any development or land-use planning, both in order to support operators’ social license and to overcome adverse community perceptions about the placement of facilities, but also to ensure adequate protection in any future development planning.

Opportunities

Integrated land-use planning – best practice

A concern expressed by many stakeholders is that waste and resource recovery infrastructure planning is unclear, because it is not necessarily categorised as a priority in most State and local planning schemes.

This could be addressed by classifying waste and resource recovery as a State interest, providing for a more centralised and integrated approach, and allowing for the realisation of benefits that come with greater scale and scope. Elevating it to be a State Interest may also assist in attracting investment into infrastructure.

Effective land-use planning should ensure adequate buffers (greenfield and brownfield areas) and planning mechanisms are in place to protect communities and the environment, and to deliver certainty for private and local government providers of waste management and disposal facilities. DES, DSDMIP and local government should collaborate on standardised planning approval conditions for waste and resource recovery activities, to provide industry and the community with greater certainty.

Appropriate zoning, creating adequate separation between industrial and sensitive uses, and using planning overlays are some of the mechanisms used to establish these buffers.

Land-use planning plays an important role in preventing incompatible land uses being established near waste and resource recovery facilities, which could affect the operating life and functionality of a site. Therefore, it is crucial that waste and resource recovery infrastructure is properly integrated with planning schemes.

A robust planning framework will also take account of long-term regional development needs, including the infrastructure required to service a growing population, and to transition the state to more sustainable waste management practices.

State-wide waste and resource recovery infrastructure planning

Giving greater priority to waste and resource recovery will also highlight the need for dedicated infrastructure planning. This is not uncommon in other jurisdictions (eg, Victoria) or for other asset and utility classes (eg, bulk water supply planning in SEQ.

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and in regional and rural Queensland), where separate infrastructure plans have been developed to govern long-term planning.

Given the new direction that Queensland is taking and the potential for economic development, there is an opportunity for the State to consider streamlining the planning regime to remove investment barriers without compromising environmental, social and health responsibilities.

By doing this, the State and local governments can systematically plan for waste and resource recovery as currently done for other essential services. This approach has the potential to provide greater transparency and certainty for investors in terms of planning application and approval process. This is further discussed in section 4.10.

Once a state-wide infrastructure plan is established, this can inform the development of regional or local waste and resource recovery plans. Regional or local plans would focus on identifying options and solutions for their relevant planning footprints. These plans must be aligned, clear and relevant.

Ownership of the waste and resource recovery infrastructure plan should rest with the proposed new waste management entity. This will promote enhanced transparency and accountability. The new entity will be able to better coordinate across different agencies. Finally, the plan should be reviewed periodically to ensure it remains relevant and current.

Land-use and transport planning

Transport costs can be a significant factor in the viability of waste and resource recovery infrastructure. Regional areas which are more sparsely populated, with fewer recovery facilities and greater geographic distances, can be at a disadvantage compared to more densely populated areas and areas with lower associated transport costs.

Transport planning and land-use planning must be considered concurrently in the decision-making process. Planning assessments need to consider any relevant transport plans and strategies that may affect transport routes of the waste and resource recovery sector.

Partnering and collaboration across government and industry will be required. This can assist in establishment timing, cost-sharing for necessary infrastructure, and in zoning decisions that limit the risk of encroachment of residential development.

Waste and resource recovery hubs or precincts

Well-located and well-functioning waste and resource recovery hubs or precincts will help facilitate the aggregation of individual waste material streams to achieve the tonnages needed to maximise resource recovery.

Effective land-use planning should recognise the strategic importance of hubs in providing the essential services required to support communities, business and industry. Holistic and integrated forward planning for future hubs will help ensure that appropriate buffers and protection are in place, and that adequate land is available for required infrastructure investment.

The SWRRIP and associated Regional Implementation Plans in Victoria have identified the importance of creating and maintaining hubs. Hubs can provide economic opportunities but also will need to overcome some barriers. These are summarised in the following table.

<table>
<thead>
<tr>
<th>TABLE 20: OPPORTUNITIES AND POTENTIAL BARRIERS TO DEVELOPING HUBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunities</td>
</tr>
<tr>
<td>Co-locate industries that operate in synergy</td>
</tr>
<tr>
<td>Facilitate economies of scale to create viable and sustainable industry</td>
</tr>
<tr>
<td>Co-locate industry in current hubs to make use of existing infrastructure and established buffers</td>
</tr>
<tr>
<td>Create job and investment opportunities and facilitate growth of employment centres</td>
</tr>
<tr>
<td>Reduce transport costs</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Co-location</td>
</tr>
<tr>
<td>Use existing transport nodes</td>
</tr>
<tr>
<td>Integrated land-use and transport planning</td>
</tr>
<tr>
<td>Opportunities</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Increase volume of materials covered</td>
</tr>
</tbody>
</table>

Recommendations

**TABLE 21: LAND-USE PLANNING – RECOMMENDATIONS**

**Short-term**
- Consider including waste and resource recovery as a ‘state interest’ under the Planning Act, elevating its priority in state and local government planning schemes.
- Establish a forum with DES, DSDMIP and local government to provide certainty and a coordinated approach to planning and approval of waste and resource recovery project.

**Medium term**
- Establish a state-wide planning framework for waste and resource recovery infrastructure to ensure whole-of-state planning considerations are achieved on land-use, transport, data, infrastructure requirements and improving recovery of materials
  - Develop regional or local waste and resource recovery plans
  - Identify potential waste and resource recovery hub or precincts.
4.10 Infrastructure

Vision
For Queensland to have the required waste infrastructure in place that supports viable resource recovery, diverts waste from landfill and maximises the economic value from the use of non-virgin materials in line with the principles of the waste hierarchy and the circular economy.

Current state

Waste logistics and value creation chain
The Queensland waste and resource recovery system is a complex mix of infrastructure, transportation networks, services and stakeholders that manage wastes and materials. Current trends indicate that, as the population grows, so too will the amount of waste generated.

The waste management industry is central to the chain of activities triggered when waste is produced by households, businesses and Government agencies. Discarded material goes through a number of processes along the journey to its final fate: disposal to landfill, recovery for recycling or conversion into energy. The waste journey and associated waste infrastructure is illustrated in Figure 19.

Overview of existing waste infrastructure
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 geographic footprint, combined with a significant proportion of the population being located in decentralised coastal communities or vast areas of low-population regional areas. Queensland has a total land area more than double that of New South Wales and seven times that of Victoria.

In late 2016, 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 the state, identifying almost 800 waste and resource recovery facilities.

Such a statistic does not necessarily address the issue of scale. For instance, south-east Queensland, which accounts for 79 per cent of the State’s disposed waste, has around 20 landfills (putrescible and inert), while remote Queensland, with less than two per cent of disposed waste, and has almost 80 landfills across a vast area.

Stakeholder views
The 2017 Arcadis report sets out a number of key issues and constraints identified through consultations with waste and resource recovery industry stakeholders.

<table>
<thead>
<tr>
<th>Key areas</th>
<th>Summary of issue/ barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy and regulation</td>
<td>■ Policy uncertainty</td>
</tr>
<tr>
<td></td>
<td>■ Lack of enforcement and regulation</td>
</tr>
<tr>
<td></td>
<td>■ Lack of availability of waste data</td>
</tr>
<tr>
<td>Market conditions</td>
<td>■ Cheap landfill (particularly in SEQ)</td>
</tr>
<tr>
<td></td>
<td>■ Lack of domestic secondary markets for resource recovered materials</td>
</tr>
<tr>
<td></td>
<td>■ Under-developed markets for high-quality recovered organics</td>
</tr>
<tr>
<td></td>
<td>■ Lack of long-term waste and resource contracts</td>
</tr>
<tr>
<td>Planning</td>
<td>■ Uncertainty around planning approvals</td>
</tr>
</tbody>
</table>
Economic opportunities for the Queensland waste industry: final report

Key areas | Summary of issue/ barrier
---|---
| Encroachment into buffers around waste and resource recovery facilities

Local government issues and constraints | Lack of funding and pressure to contain costs
| Financial impact of increasing diversion
| Whole-of-life costing landfills not well understood
| Education required
| Regional collaboration could be improved
| Cost of legacy landfills

Regional issues and constraints | Lack of access to markets
| Small volumes of waste streams
| Large distances to transport waste
| LGA collaboration needed for larger scale infrastructure investment

Source: Stakeholder meetings and Arcadis 2017

In consultations informing the present report, stakeholder concerns were focussed on planning issues (see Section 4.9) and the cost to local governments of legacy landfills. Stakeholders were also concerned about the market’s capacity to sustain large-scale thermal WtE facilities, while industry still recalled the cost of plant that became redundant following removal of the landfill levy in 2012.

Waste to Energy

The Government has announced its intention to encourage WtE enterprises to set up in Queensland. WtE is often used to describe treatment technologies or processes undertaken for the primary purpose of generating and maximising the production of a usable form of energy, including heat, electricity or fuel from waste. WMAA defines WtE as ‘the process of creating energy - usually in the form of electricity or heat – from the thermal and biological treatment of a waste source. Technologies include, but are not limited to, Direct Combustion, Anaerobic Digestion, Gasification and Pyrolysis.’

It should be noted here that processes such as Anaerobic Digestion are regarded under European Union waste legislation as recycling operations, while the other forms listed above (thermal WtE) are regarded as recovery of energy, which represents a lower-order outcome on the waste hierarchy.

Internationally, and particularly across Europe, WtE is a vital element of waste disposal, in some cases representing over 50% of municipal waste treatment. More than 20 million people are provided with heat and electricity generated by 420 WtE plants. Within Australia, it is generally accepted that WtE is a viable option to manage residual waste if no higher order resource recovery opportunities are available (assuming that appropriate environmental controls are in place). Based on known recovery processes using current technologies, WtE will need to play a role if Queensland is to achieve minimal disposal to landfill.

The recent Senate Committee report on Australia’s waste and recycling industry observed that WtE is next-to-last on the waste hierarchy, and that energy from waste ‘incineration’ is particularly problematic. The Committee noted that incinerators only make use of materials for their calorific value, and are not compatible with the objectives of a circular economy.

When considering the role of WtE as part of the waste management system in Queensland, there are a number of matters to be addressed, including:

- What is the future composition and availability of feedstocks for WtE?
- What are the best technologies and opportunities for WtE in Queensland?
- How to best safeguard the consistency and security of existing material recovery facilities in accordance with the waste management hierarchy?
- Does the current proposed landfill levy adequately encourage waste avoidance and the reuse and recycling of materials when considering WtE?

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121 Jackie Trad, Deputy Premier, Treasurer and Minister for Aboriginal and Torres Strait Islander Partnerships, ‘Queensland to act now on waste’ (Media Release, 19 April 2018).


124 Senate Environment and Communications Reference Committee, Never waste a crisis, above n 12, 133.
Waste recovery infrastructure requirements

The 2017 Arcadis report highlighted existing waste recovery infrastructure capacity and identified the regions requiring additional infrastructure to meet the recovery targets set in the *Queensland Waste Avoidance and Resource Productivity Strategy (2014–2024)*.

Based on the three headline waste streams and assessing seven regions in the state (21 assessments in total), 11 assessments concluded that significant additional waste infrastructure was required to meet the current 2024 recycling targets (see Table 23).

**TABLE 23: FUTURE WASTE RECOVERY INFRASTRUCTURE REQUIREMENTS BY WASTE TYPE AND REGION TO MEET THE RECOVERY AND REDUCTION 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>SEQ</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>Adequate</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 2017*

*Adequate = Adequate existing waste recovery infrastructure to meet the waste recovery targets; Modest = Modest additional waste recovery infrastructure required to meet the waste recovery targets; Significant = Significant additional waste recovery infrastructure required to meet the waste recovery targets.*

Opportunities

**Future infrastructure needs and prioritisation**

New and improved infrastructure will be required to provide alternatives to landfill. While the market should develop those alternatives, the Queensland Government has announced it will provide a $100 million financial assistance package over three years to support accelerated investment in new waste collection, recovery and reprocessing infrastructure.

It is not the role of Government to design or deliver the infrastructure solutions. However, it can identify gaps and provide guidance and support. For instance, contamination is a key issue confronting the industry, and potential solutions could include a mix of source separation of materials, changes to collection processes or improved sorting.

As it is difficult to predict how industry will respond and what solutions will be proposed, it is recommended that the financial assistance package be non-prescriptive in terms of waste streams and technologies and instead focus on outcomes to stimulate innovation.

The investment framework should also be sufficiently agile to adapt to changing needs and environmental demands.

**Need for good data**

As discussed previously in this report, the need for good data underpins all planning and investment decisions. The significant capital investment needed to support the future waste infrastructure needs will demand certainty and evidence of current and future supply, composition and supporting infrastructure to underpin investment.

**Principles of good infrastructure planning**

A number of other Australian jurisdictions have prepared comprehensive state-wide waste and resource recovery infrastructure plans to provide strategic direction for the management of waste and resource recovery infrastructure to achieve an integrated system.

Queensland does not currently have such a plan. In line with the approach in other best-practice jurisdictions, Government should develop a long-term infrastructure plan for the state, guided by the elements of good infrastructure planning enumerated in Table 24.
TABLE 24: ELEMENTS OF GOOD INFRASTRUCTURE PLANNING

- Plan for growth and effectively manage the expected changes in waste generation, composition, collection and treatment technology
- Long-term planning and vision (up to 30 years)
- Develop and agree a prioritisation framework of investment in waste and resource recovery infrastructure aligned to the goals of the waste strategy
- Co-ordination and alignment at local and regional level (including development of regional plans typically between 5-10 years)
- Supports viable resource recovery industry, incorporating the principles of the waste hierarchy
- Integration at state level with State Infrastructure Plan, which currently has limited reference to waste and waste recovery infrastructure
- Incorporate a consultative approach; many stakeholders will be involved in implementing a waste and resource recovery infrastructure plan
- Support with strong education and market development policies and programs
- Establish the right governance framework to allow infrastructure planning to be agile and adaptable to a changing environment

DES has made the first step in this journey by engaging Arcadis to prepare a Waste and Resource Recovery Infrastructure Report for the state.

As noted at Section 4.9 of this report, a number of stakeholders have expressed the view that waste management and associated infrastructure should be recognised as an ‘essential service’.

Consistent with this view, it is important that waste infrastructure needs are not only identified within waste infrastructure planning, but considered more holistically as part of the State Infrastructure Plan, which outlines the Government’s strategic direction for infrastructure planning, investment and delivery in Queensland.125

This would help give waste infrastructure a level of recognition that comports with its status as an ‘essential service’.

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**Recommendations**

**TABLE 25: INFRASTRUCTURE – RECOMMENDATIONS**

<table>
<thead>
<tr>
<th>Short-term</th>
<th>Medium-term</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Through the financial assistance package, the Government should signal to the market the criteria it considers important in determining what infrastructure to support</td>
<td></td>
</tr>
<tr>
<td>- Develop a long-term waste and waste recovery infrastructure plan (30 year plan), incorporating regional implementation plans (5-10 year plans) and governance framework for periodic review and update.</td>
<td></td>
</tr>
<tr>
<td>- Future waste infrastructure needs should be reflected in the State Infrastructure Plan</td>
<td></td>
</tr>
<tr>
<td>- Improve data accuracy and availability to allow industry and Government to make informed investment decisions.</td>
<td></td>
</tr>
<tr>
<td>- Ensure that infrastructure planning is aligned with the Waste Strategy, market development strategy and any other future regulatory decisions (eg, additional landfill bans).</td>
<td></td>
</tr>
</tbody>
</table>
4.11 Product stewardship

Vision
A national approach to product stewardship that ensures shared responsibility across the supply chain to minimise the negative environmental and economic externalities that occur throughout products and packaging lifecycles. Product stewardship can occur through a formal scheme or through informed procurement by consumers.

Current state

Background
End users ultimately bear the whole-of-life cost of the goods and services they use. The core objective of product stewardship is to establish standards, either mandatory or voluntary, to incentivise the market to minimise those lifecycle costs by identifying the costs and requiring that they be borne by a specific segment of the market.

Extended producer responsibility (EPR) is a type of product stewardship that is founded on the premise that primary responsibility for recovering and recycling end of life products should be borne by the producer, importer or seller.

It needs to be acknowledged that manufacturers that can design products and specify packaging for their products have the greatest influence, and therefore the greatest responsibility, to incorporate the full lifecycle costs into the cost of doing business.

Current landscape
Given the relatively small size of the Australian market, the most effective and efficient way to deliver a product stewardship scheme is generally on a national basis. The Product Stewardship Act 2011 (Cth) (‘PS Act’) provides the authority for the federal government to establish such schemes.

There are seven schemes currently operating under the PS Act including:
- the National Tyre Product Stewardship Scheme, administered by Tyre Stewardship Australia, and
- the Australian Packaging Covenant, administered by APCO.

These schemes are voluntary, with the administering bodies run by independent boards and funded through member contributions. These schemes require ongoing funding support to ensure they continue to achieve their product stewardship objectives.

In 2017-18, the following classes of products are under consideration:
- Plastic microbeads and products containing them
- Batteries
- Photovoltaic systems
- Electrical and electronic products, and
- Plastic oil containers.

The PS Act is presently under review by the Department of the Environment and Energy. Consultation concluded on 29 June 2018, and a report is due in late 2018.

Each state has the ability to implement its own product stewardship schemes. In Queensland, the approach includes:
- the CRS, due to commence from 1 November 2018
- leadership role in a national scheme for handheld rechargeable batteries, and
- a pilot program for fertiliser bags.

The Directions Paper recently published by DES states that Queensland will only consider state-based product stewardship schemes where there is evidence the community demands action, and there is neither a case for, nor the prospect of, a national solution.

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128 The other schemes are for paint, mobile phones, lamps, televisions and computers, and oil.
Stakeholder views

Most stakeholders were strongly of the view that product stewardship schemes should be mandatory and operate on a national basis. EPR should be adopted where products are designed for obsolescence and unable to be re-used in end markets, or product specifications are not mature enough to incorporate the use of recovered resources, forcing producers to use alternate materials.

Opportunities

Product stewardship can provide economic benefits by minimising the negative externalities associated with the linear economy; specifically, the environmental and financial cost of disposing of problematic waste types, and encouraging the transition to a circular model. The opportunities in this report focus on what actions can be taken to mitigate these negative externalities and encourage the voluntary uptake of lifecycle thinking into business models.

Continuing to promote initiatives at the national level

Product stewardship has been most successful at a national level. Given that most products are generally sold Australia-wide, it is the logical place for initiating schemes. National programs provide a stronger platform to enforce compliance and enact change.

In consultation with business, the waste management industry and the community, the Government should develop a list of the key products that should be subject to a product stewardship scheme. The list should be made public and discussions held with other Australian jurisdictions to identify any common interests.

Where common interests exist, those jurisdictions should establish a forum to commence the initial development of a scheme. Following preliminary due diligence, a formal proposal should be presented at a national forum to advocate for it to be taken up as a national scheme under the PS Act.

The State should also analyse the outcomes from the review of the PS Act and encourage the Federal Government to adopt a more active and stronger role in this area.

CASE STUDY 19: PRODUCT STEWARDSHIP AT THE NATIONAL LEVEL - GERMANY

The German Packaging Ordinance was introduced in 1991, covering all packaging, including at the point of sale. The policy mandated through the Ordinance has influenced the development of packaging recycling more broadly across the European Union by introducing producer responsibility for the collective funding of recycling by industry and material specific targets.

The Ordinance applies at the disposal stage, and requires manufacturers and distributors to take back used packaging for reuse, reprocessing or material recycling independently of the public waste disposal system. This encourages producers to amend the standards of products to lower the cost of collection and re-processing.

In the case of sales packaging, rewards apply to distributors through exemptions from their take-back obligations where there is a comprehensive process that collects, sorts and passes on used packaging free of charge for recycling.

Better informed procurement

Procurement policies are an opportunity for purchasers to effectively mandate EPR by only procuring goods and services from companies that are compliant with minimum requirements for post-consumer management and design of products and packaging. New opportunities are unlocked through customers making informed choices to support business modes that are sustainable and support the circular economy.

Procurement can incentivise more businesses to take responsibility for the environmental impacts of their products by rewarding businesses for compliance with co-regulatory and voluntary product stewardship schemes.

At the national level, conditions of sale is an example of mandated EPR, where producers are required to meet design criteria and manage and finance programs for end of life management of products and packaging.

Seek to adopt overseas EPR

For over 30 years, the EU has had product stewardship schemes, changing the way products are made and packaged for sale in member countries. In a global economy, with firms required to meet the standards imposed on them by each jurisdiction, the Government should investigate whether there are opportunities to adopt best practice


standards applied in other markets, and have those producers met the same standards here.

Any opportunities identified should be pursued on a national basis.

Recommendations

TABLE 26: PRODUCT STEWARDSHIP – RECOMMENDATIONS

| Medium-term | ▪ Work with other states on common problematic waste types and seek a national response by the federal government.

▪ Ensure product stewardship schemes secure sufficient funding to deliver the required outcomes.

▪ Increase stakeholder awareness and, through informed procurement practices, influence businesses to raise their standard of product stewardship.

▪ Look for opportunities to adopt existing overseas EPR schemes. |
This report identifies 11 key enablers to maximise the economic opportunities for Queensland’s waste industry. Each enabler will have resourcing implications that Government will need to consider in assessing this report’s recommendations.

The 2018-19 State Budget included estimates of forecast revenue from the introduction of the landfill levy over the forward estimates period, as well as expenditure on key initiatives and undertakings. For completeness, this section takes a 10-year view on the potential revenue generated by the levy, allowing for population growth and improved recovery rates.

The estimates of future expenditure are necessarily high-level, and based partly on experience in other jurisdictions. Some of the items may already be funded by the State. This analysis does not attempt to evaluate such issues, but aims to give an indicative view of the financial implications of potential changes to be made under a new waste strategy.

5.1 Levy revenue

Figure 20 shows the expected decline in future levy income, as recovery rates improve and the amount of resources being landfilled reduces.

Following the introduction of the levy in the first quarter of 2019, the revenue in the early years is fairly stable as any reductions in the amount of waste being landfilled is offset by the $5 per annum increase in the levy rate (estimates per the State Budget). After FY2023, when the levy rate reaches $90/tonne, QTC has made the assumption that the levy will increase in line with CPI (2.5 per cent per annum adopted).

After peaking at over $400 million in FY2022, levy revenue is expected to moderate to $294 million by FY2028.

Based on the assumptions adopted by QTC, over the course of 10 years the levy could raise $3.5 billion, with:

- 38% from MSW
- 30% from C&I, and
- 32% from C&D/regulated waste.

On the assumption the levy only increases by CPI, reaching $102/tonne by FY2028, it is not expected that large scale thermal WtE will be economic, and therefore recovery rates reach maximums of 60 per cent for MSW, 80 per cent for C&I and 90 per cent for C&D.

If WtE were viable at $102/tonne and recovery rates rose to 90 per cent for all three streams, levy revenue in FY2028 would decline from $294 million to $175 million.

The forecast levy revenue is based on the FY2017 tonnes disposed to landfill. No allowance has been made for tonnes that may be subject to an exemption or discounted levy rate.

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332 The long term average tonnes for contaminated soil was adopted as the tonnes in FY2017 were double that long term average.
As any levy exemptions would be expected to have the biggest impact on the C&I stream, a 10 per cent decrease in FY2017 C&I tonnes would equate to a reduction in revenue of $93 million (or 2.7 per cent) over the 10 years.

5.2 Application of levy revenue

Providing industry and the community with clarity on how the levy funds are being applied will be vital for securing support for the strategy.

The investment of levy revenue in policy measures designed to support the goals of the waste strategy was a key theme emerging from stakeholder discussions, and reflects the position advocated in consultations undertaken by the Senate Committee in its recent review of the waste and recycling industry. In Victoria, concerns about the transparency and management of landfill levy revenue has led to an investigation by the state’s Auditor-General, due to be finalised later this year.

The 2018-19 State Budget outlines a number of commitments on the allocation of levy revenue. Over the forward estimates period, it is expected that over 70% of the revenue generated will be allocated to advance payments to councils, scheme start-up and operational costs, industry programs and other environmental priorities. This includes:

- advance payments to councils to meet the cost of MSW sent to landfill and to avoid any direct impact on households.
- funding of $100 million over three years to support the state’s resource and recovery industry through the Resource Recovery Industry Development Program.
- $34.3 million over five years and $6.6 million ongoing for implementation and operational costs associated with the introduction of the landfill levy.

As outlined in previous chapters, there are significant opportunities as Queensland addresses the effects of historical underinvestment in resource recovery in the state, and to progress the transition towards a circular economy. However, significant investment will be required to realise these opportunities.

The following areas will require particular support with the introduction of the levy and the drive towards better resource optimisation:

- Investment in improved resource recovery and recycling infrastructure. While further detailed analysis will be required, addressing the infrastructure deficit may require investment in the order of $30-$40 million per annum on average, with higher upfront expenditure in early years.
- Support to combat illegal dumping activities. States with landfill levies have had to invest heavily in this area. For example, New South Wales has recently allocated $65 million over four years to illegal dumping prevention and enforcement. This is part of a broader $337 million grants and funding initiative designed to improve resource recovery and waste management practices in the state.
- Support for other enablers, including:
  - A holistic, focussed education strategy and supporting funding
  - Improved data and information sharing (including the system build for the data model, ongoing education and maintenance for the system and general IT and web development)
  - Market development (including changing procurement practices, developing and maintaining quality standards and providing support and trials for priority waste types) and partnering.

In Victoria and South Australia, these activities are performed predominantly by SV and GISA respectively. The annual operating budgets of those entities is around $20 million on average, with revenues largely derived from the states’ landfill levies.

In those states, levy revenue also supports the operations of the environmental regulator. For instance, in Victoria, almost $50 million of total levy revenue was allocated to the Environmental Protection Authority in 2016-17.

136 Ibid 15.
137 Ibid 19.
139 It is assumed that the majority of capital expenditure will be financed by the private sector, with facilitation activities coordinated by Government.
Investment across the key enablers discussed in this report will allow Queensland to significantly improve its use of resources and benefit from the associated economic, social and environment opportunities this represents.

To consolidate industry and community support for the landfill levy, it is recommended that Government publish a regular statement on the allocation of levy revenue across the forward estimates period.
To assist in identifying the range of enablers required to deliver better waste management outcomes, QTC selected specific waste types, analysed their current treatment and identified options to get a higher order outcome.

Using categorisations adopted in the ANWR, the selection of waste types used a prioritisation process that considered the volume of waste disposed to landfill, the current recovery rate and environmental impact.

Table 27 summarises the data used in the prioritisation process, showing tonnes of waste disposed by stream and category.

| TABLE 27: SUMMARY OF WASTE DISPOSED IN QUEENSLAND IN FY2015 (TONNES)¹⁴¹ |
|-----------------|--------|-----------|-----------|---------------|----------------|
|                 | Recovery rate | MSW | C&I | C&D | Total by category | % by category |
| Masonry materials | 47% | 37,299 | 229,333 | 1,123,081 | 1,479,613 | 27% |
| Metals          | 82%  | 62,662 | 44,443  | 67,976   | 175,081    | 3%   |
| Organics        | 44%  | 893,653 | 531,986 | 115,289  | 1,540,839  | 28%  |
| Paper & cardboard | 56% | 198,172 | 207,587 | 38,938   | 444,697    | 8%   |
| Plastics        | 6%   | 292,501 | 270,497 | 38,430   | 611,410    | 11%  |
| Glass           | 34%  | 98,795  | 33,878  | 43       | 132,712    | 2%   |
| Other           | 10%  | 39,372  | 103,771 | 0        | 143,143    | 3%   |
| Hazardous       | 35%  | 0       | 556,291 | 382,062  | 938,353    | 17%  |
| Total by stream | 1,622,364 | 1,977,668 | 1,865,819 | 5,465,852 | 100% |
| % by stream     | 30%  | 36%     | 34%     | 100%     |             |     |

Source: ANWR 2016

The remainder of this section discusses the waste types selected for analysis.

6.1 Concrete

Construction and Demolition

At 4.4 million tonnes, C&D is the largest waste stream, representing over 44 per cent of the waste generated in the state in FY2017.¹⁴² For Queensland, the volume of waste ‘generated’ is distorted by the inclusion of 912,000 tonnes of inter-state waste, the majority of which is C&D. However, even adjusting for this, C&D remains Queensland’s largest waste stream.

South Australia reports a diversion rate for C&D waste from landfill of over 90 per cent and, while some specific projects in Queensland plan to achieve such rates,¹⁴³ Queensland’s overall recovery rate for C&D in FY2017 was only 50.8 per cent.

C&D waste is created from:

- major commercial developments, such as Queen’s Wharf in Brisbane
- major road and transport projects undertaken by or for the State or local government
- large scale residential development, such as Yarrabilba, and
- small-scale home or commercial construction and renovation.

Data is not collected based on how the waste has been created. Consultations with relevant stakeholders indicate the types of waste and their current recovery rates vary based on the nature, size and location of the project. The building industry notes that waste avoidance has been achieved through the use of pre-fabricated and pre-cut material and the use of computer software to more accurately estimate quantities.

C&D comprises waste types such as concrete, bricks, rubble contaminated soil, timber, plasterboard and asbestos-related materials.
C&D recovery

Experience from other states suggests the C&D recovery rate is likely to increase rapidly following the introduction of the landfill levy. As C&D waste is generated in large volumes and is typically dense and heavy (predominantly concrete, brick and soils), these materials will be sensitive to the introduction of a landfill levy. Additionally, there are good potential markets for products recovered from C&D waste, such as secondary aggregates and soils that can be used in the construction sector.

Recovery of C&D materials can be considered with reference to broad streams: (1) inert materials and scrap metals, and (2) mixed C&D.

**Inert materials and scrap metals**

If inert materials (concrete, brick and soils) and scrap metals can be separated to some extent on site, they can be processed by basic screening and crushing equipment. This accounts for most of the recovery of C&D waste currently occurring in Queensland. It was noted in the Arcadis report that several existing C&D recyclers (mostly in SEQ) have spare capacity and or the ability to ramp up throughput with minimal investment. Presently, regional areas face barriers to C&D recycling due to the small scale, lower quality of material received and lack of C&D recycling facilities. There is merit in concentrating C&D processing into one or two facilities within each region to maximise efficiencies and product quality.

**Mixed C&D**

The second broad stream is mixed C&D waste, which is usually collected in skip bins. It was noted in the Arcadis report that recovery of this material is more challenging. While it still contains large proportions of concrete and soil, up to one third may be timber, with varying proportions of other materials, including plasterboard, glass, plastic film, Styrofoam, cardboard and vegetation. Recovery of this material requires more advanced processing and manual picking, and such facilities have only emerged in other states when landfill pricing has reached higher levels (e.g., such facilities are commonplace in Sydney with gate fees of $180-200/tonne, and are now emerging in Melbourne, where gate fees are more comparable with SEQ). An alternative solution – separation of materials at source (i.e., on site) – will be challenging for smaller, constrained sites and will require collaboration between the C&D industry, the resource recovery industry and local government, looking at approval conditions, innovation and the assessment of practices adopted in other jurisdictions. Identifying and implementing the best solutions for mixed C&D waste in regional areas and for smaller sites may require government support, both State and local.

**Concrete**

Based on the prioritisation criteria, concrete was selected for detailed analysis of the enablers required to obtain better outcomes.

Current resource recovery activities in Queensland include the crushing of concrete, bricks and tiles for use as recycled aggregate, fill material and beach armouring. Currently, there is high demand for clean recovered concrete and it is competitive against virgin materials. Mixed concrete is more expensive and challenging to recover, as it requires mixed C&D waste sorting facilities, which are currently not cost-effective in Queensland. There is little capacity to recover materials contaminated by asbestos and lead.

To improve recovery rates, a number of options were identified (see Table 28).

<table>
<thead>
<tr>
<th>Key enabler</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education</strong></td>
<td>Increase awareness and drive behavioural change for avoidance of waste</td>
</tr>
<tr>
<td></td>
<td>Promote the benefits of source separation where economic</td>
</tr>
<tr>
<td><strong>Knowledge platform</strong></td>
<td>Integrate design for disassembly and re-use into the supply chain</td>
</tr>
<tr>
<td><strong>Procurement</strong></td>
<td>Update procurement policies to require the inclusion of recycled materials</td>
</tr>
<tr>
<td><strong>Market development</strong></td>
<td>Establish construction material exchange programs</td>
</tr>
<tr>
<td><strong>Waste infrastructure development</strong></td>
<td>Expand C&amp;D reprocessing facilities, particularly outside SEQ</td>
</tr>
</tbody>
</table>
6.2 Food organics

MSW is the smallest waste stream and has the lowest recovery rate, at 30.9 per cent in FY2017. The best performing Australian jurisdictions are achieving MSW recovery rates of over 60 per cent.144

With more than 600,000 tonnes sent to landfill in FY2017, food organics is the largest waste type (by weight) in MSW, estimated to represent 30 per cent of the ‘red top’ bin for general waste.

Including C&I food organics, the total sent to landfill in Queensland was almost 950,000 tonnes. This compares to 68,000 tonnes reported as recovered.145 The above data does not capture on-farm food waste, which is generally used on-site for composting.

According to WRAP, 70 per cent of food waste comes from the community, with 18 per cent from food manufacture and 10 per cent from hospitality and food service. WRAP has therefore focused on the community, including the development of an education program called Love Food, Hate Waste. This program has been adopted by the New South Wales Environmental Protection Authority, SV in Victoria and Brisbane City Council.

While some food materials can be diverted for human consumption, animal feed or reprocessing, the major recovery methods are the production of compost or biofuels. For compost products, key considerations will be market development, to specify and ensure delivery of the required quality, and land-use planning, to ensure odour issues are catered for.

To reduce contamination of the materials, food organics can be separately collected or be included with garden organics (known as FOGO collections). Compost and Anaerobic Digestion processes often include garden organics in the feedstock. Of the 1.1 MT of garden organic waste currently generated, more than half is recovered via mulching and composting.

A final option before landfill would be to direct contaminated residual organics to thermal WtE facilities.

A number of options to improve recovery rates were considered (refer Table 29).

TABLE 29: OPTIONS TO IMPROVE FOOD ORGANICS RECOVERY RATES

<table>
<thead>
<tr>
<th>Key enabler</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Food waste avoidance programs for households</td>
</tr>
<tr>
<td></td>
<td>Food waste avoidance programs for commercial settings</td>
</tr>
<tr>
<td>Partnering</td>
<td>Support and expansion of good resale and donation pathways to a wider variety of businesses</td>
</tr>
<tr>
<td>Market development</td>
<td>Establish categories for the different quality composts and set standards to provide market confidence</td>
</tr>
<tr>
<td>Waste infrastructure development</td>
<td>Source separation of food organics</td>
</tr>
<tr>
<td></td>
<td>Development of composting and Anaerobic Digestion facilities</td>
</tr>
<tr>
<td>Land-use planning</td>
<td>Development of clear planning requirements for approval of composting and Anaerobic Digestion facilities</td>
</tr>
<tr>
<td></td>
<td>Consider options for co-location synergies for organic waste treatment, including proximity to farms or wastewater treatment plants</td>
</tr>
</tbody>
</table>

6.3 Plastics

Plastics is one of the most high profile waste categories, with significant media attention on plastic pollution. Until this year, much of Australia’s (and the world’s) plastic waste was being sent to the PRC. As a result of focussed media attention and change in markets, and the fact that there is often not a viable alternative material, there is a now a global focus on seeking to improve the use and reuse of plastics.

In FY2017, Queensland generated 647,000 tonnes of plastic waste, of which 36,000 tonnes (or 6 per cent) was recovered. This is the lowest recovery rate of any waste type other than contaminated soil (3 per cent), red mud and asbestos (both zero).

There are six types of plastics identified under the resin identification code, with a seventh category for ‘other’.

144 ANWR, above n 14.

145 These tonnes reported as recovered excludes the allocation of landfilled waste due to the capture of landfill gas for energy.
While some of these plastics are recyclable, very little is actually being recycled into products. Current initiatives by the Queensland Government will avoid the generation of plastic waste (single-use lightweight plastic shopping bag ban: #4 LDPE) or improve the collection (container refund scheme: #1 PET and #2 HDPE), but the critical step is ensuring that material is being used.

Plastic can be recycled back into its previous form (eg, bottles and containers), or used to produce furniture, building materials, rail sleepers or part of road pavements. The APCO-led commitment to make all packaging reusable, recyclable or compostable by 2025 or earlier will assist, but requires producers of plastic to use post-consumer recycled plastic.

To improve recovery rates, a number of options were considered, as shown below.

<table>
<thead>
<tr>
<th>Key enabler</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste infrastructure</td>
<td>Investment in recycling infrastructure to scale up capacity to</td>
</tr>
<tr>
<td>development</td>
<td>recycle LPDE and HDPE in comingled packaging plastics stream</td>
</tr>
<tr>
<td>Education</td>
<td>Bans on sale of certain plastic products, including single-use plastic</td>
</tr>
<tr>
<td></td>
<td>utensils (eg, cutlery, crockery)</td>
</tr>
<tr>
<td></td>
<td>Household and business education programs on avoiding, reusing,</td>
</tr>
<tr>
<td></td>
<td>sorting and recycling plastic consumables</td>
</tr>
<tr>
<td></td>
<td>Support incentives and/or enforcement strategies to reduce household</td>
</tr>
<tr>
<td></td>
<td>plastic contamination</td>
</tr>
<tr>
<td>Partnering</td>
<td>Advocate and support federal packaging legalisation for sustainable</td>
</tr>
<tr>
<td></td>
<td>packaging design addressing polymer choice, polymer additives,</td>
</tr>
<tr>
<td></td>
<td>material volumes and innovative packaging solutions</td>
</tr>
<tr>
<td></td>
<td>Build Queensland’s PVC recycling capacity package (including</td>
</tr>
<tr>
<td></td>
<td>collaborating with the Vinyl Council of Australia on their existing</td>
</tr>
<tr>
<td></td>
<td>product stewardship program and PVC recycling strategy)</td>
</tr>
<tr>
<td></td>
<td>Programs and incentives to support MRF’s to improve sorting and</td>
</tr>
<tr>
<td></td>
<td>accountability through improved infrastructure, technology and data</td>
</tr>
<tr>
<td></td>
<td>collection and monitoring support.</td>
</tr>
<tr>
<td>Market development</td>
<td>Work with the federal government and other states to build a</td>
</tr>
<tr>
<td></td>
<td>stewardship program for reusable plastics in the commercial and</td>
</tr>
<tr>
<td></td>
<td>industrial sector, particularly in the agricultural</td>
</tr>
</tbody>
</table>

6.4 Paper and cardboard

Over half a million tonnes of paper and cardboard waste (PAC) is sent to Queensland landfills each year. This represents a disposal rate of almost 50% (one of the highest across all Australian states and territories). However, higher-performing jurisdictions such as South Australia recycle over 75% of PAC waste each year.

The market for recycled paper and cardboard is one of the more mature markets for recycled materials globally. However, reprocessing of PAC waste is often highly integrated with the manufacturing process. As Australia has limited levels of manufacturing, this contributes to limited domestic demand for PAC content for recycling. Of the PAC collected for recycling in Queensland each year, only a quarter remains in the State for processing. The bulk of cardboard is sent interstate, and until recently, the bulk of paper has been sent overseas.

Source separated PAC products are much more valuable as these are easier to recycle. By comparison, mixed waste (otherwise known as commingled waste) must be sent to a material recovery facility (MRF) to be sorted into high, medium and low grades, before pulping. Low grade outputs include paperboard and egg cartons, while medium to high grade outputs include new recycled paper or tissue and toilet paper. Paper and cardboard can only be recycled a finite number of times as the recycling process degrades the fibres (hence the use of virgin materials cannot be completely avoided in the manufacturing process).

Within Queensland, the C&I waste stream generates both source separated and commingled PAC waste (representing over 45% of PAC waste), while MSW generates only commingled PAC waste (representing almost 45% of PAC waste).

Overall contamination rates for commingled waste in Queensland (after sorting at a MRF) usually range from 5-10%. This was acceptable until recently, as the bulk of this content was being sent to the PRC (Australia’s largest market for recycling content). However, the PRC announced that, from early 2018, allowable contamination rates would be reduced to <0.5%, and that various content would also be banned for import.

This has resulted in a significant increase in domestic stockpiles of PAC waste, which is putting existing domestic recycling facilities at risk.
To improve recovery rates, a number of options were considered, as shown in the following table.

**TABLE 31: OPTIONS TO IMPROVE RECOVERY OF PLASTIC AND CARDBOARD**

<table>
<thead>
<tr>
<th>Key enabler</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Increase and maintain awareness and drive behaviour change with regard to PAC avoidance, re-use and recycling in households, businesses and industry</td>
</tr>
<tr>
<td>Procurement</td>
<td>Prioritise procurement of recycled products over those using only virgin materials</td>
</tr>
<tr>
<td>Extended producer responsibility</td>
<td>Requirement to use: minimum levels of PAC in packaging, recycled content, reusable packaging and ensure recyclability</td>
</tr>
<tr>
<td>Waste infrastructure</td>
<td>Expand PAC recycling and MRF infrastructure</td>
</tr>
<tr>
<td>Land-use planning</td>
<td>Required to support expansion of PAC infrastructure</td>
</tr>
</tbody>
</table>

6.5 Tyres

Tyres are a regulated material in Queensland, and fall within the category of Hazardous under ANWR classifications. Out of 92,000 tonnes of tyres, almost 58,000 tonnes were recycled, giving a recovery rate of 63%. However, a significant portion of tyres are not captured by the official data and the scope for better outcomes is believed to be significant.

For instance, the Tyre Stewardship Australia (TSA) 2016-17 Annual Report estimated that one third of end-of-life tyres (or 17.2 equivalent passenger units) are from the mining industry. Currently, these tyres are generally disposed of in mining pits.

Tyres are inert in their natural state, but present a significant environmental risk in terms of fire and a breeding ground for snakes and mosquitoes, and a lost opportunity. Australia’s most common tyre-derived product is shredded tyre, exported overseas as a fuel for cement kilns. Further processing of shredded tyres allows the steel to be separated (up to 25% of the weight of a tyre) and the rubber to be turned into crumb or granules. These forms of rubber can be used in range of civil engineering applications, including road surfaces and soft-fall for playgrounds, and in the manufacture of tile adhesives.

There is also significant research and development into the use of tyres as a feedstock for advanced thermal treatment technologies, with potential by-products being steel, fuel, carbon black or carbon dark and energy. While many projects show potential, work is still required to ensure they can deliver product to the required standard on a commercial scale and find viable end markets for that product.

There is currently a voluntary product stewardship scheme (TSA) for the proper management and disposal of tyres. Some stakeholders proposed that the scheme should be mandatory for all tyres. As with all waste materials however, increasing the supply in the absence of end markets will create other issues. The immediate focus should therefore be on the safe and proper storage of the material and, where appropriate, disposal.

To improve recovery rates, a number of options were considered, as shown in Table 32.

**TABLE 32: OPTIONS TO IMPROVE TYRE RECOVERY RATES**

<table>
<thead>
<tr>
<th>Key enabler</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance and compliance management</td>
<td>Enforce higher standards for stockpiling and storage of tyres</td>
</tr>
<tr>
<td>Policy &amp; legislative framework</td>
<td>Enforce tighter restrictions on whole tyre export</td>
</tr>
<tr>
<td>Procurement</td>
<td>Integrate tyre products into procurement policy and specifications for civil engineering projects</td>
</tr>
<tr>
<td>Market development</td>
<td>Development of advanced thermal treatment for tyres</td>
</tr>
<tr>
<td>Land-use planning</td>
<td>Provide clarity on planning and regulation for thermal tyre treatment</td>
</tr>
</tbody>
</table>

6.6 Selected issues
The following waste materials were identified during the course of the project for specific consideration.

Glass
Over 202,000 tonnes of glass waste is currently generated in Queensland, with over 65% sent to landfill. The majority of this glass waste is from the MSW stream (74%), while C&I waste accounts for 25% of disposal.
While glass waste is not a major contributor to the total waste generated in the state, there is potential to be more effective in resource recovery.
Currently, there are different applications for recycled glass:
- To achieve its highest value, glass waste can be recycled for use in glass production. Glass manufacturing operations in Australia typically incorporate approximately 40% recycled cullet, indicating significant scope for improvement. There is no practical limit to the number of times that glass can be recycled.
- Glass can also be used for building roads, as bedding sand for pipework, and for building construction.
There are a range of existing industry challenges which limit the viability of glass recycling and resulted in unintended consequences (eg, stockpiling). These challenges include:
- recovery of high quality glass from co-mingled recycling streams is becoming difficult due to increasing breakage rates
- mixing of glass colours can limit end-product options
- competition with low cost virgin glass being imported from overseas
- specifications for road-based use for recycled glass do not exist, and
- glass consumption continues to fall due to competition from plastic packaging.
The introduction of the CRS and the landfill levy in FY19 will be important initial steps for providing security for the recycling industry.
Additional enablers will be required to improve resource recovery. These are considered in the table below.

### TABLE 33: OPTIONS TO IMPROVE GLASS RECOVERY RATES

<table>
<thead>
<tr>
<th>Key enabler</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy &amp; legislative framework</td>
<td>Implement a landfill ban for glass</td>
</tr>
<tr>
<td></td>
<td>Implement tariffs on the import of virgin glass</td>
</tr>
<tr>
<td>Education</td>
<td>Household education program on avoiding, reusing, sorting and recycling glass</td>
</tr>
<tr>
<td>Data and information sharing</td>
<td>Fund research which improves the quality, weight and durability of glass, examines potential alternative uses for glass recyclates and provides specifications for the production of durable products from entirely recycled material</td>
</tr>
<tr>
<td>Procurement</td>
<td>Prioritise procurement of recycled products over those using only virgin materials in glass manufacturing</td>
</tr>
<tr>
<td></td>
<td>Prioritise the use of recycled and recyclable materials in roads and construction industry</td>
</tr>
<tr>
<td>Market development</td>
<td>Development of alternative uses for glass recyclates</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Container Refund Scheme</td>
</tr>
<tr>
<td></td>
<td>Source separation of paper from glass in the kerbside collection</td>
</tr>
<tr>
<td>Product stewardship</td>
<td>Implement product stewardship schemes, to ensure manufacturers reuse or recycle their product</td>
</tr>
</tbody>
</table>

Batteries
Batteries contain valuable but potentially hazardous material including lead, nickel, cadmium, mercury and arsenic. Batteries are a rapidly growing waste stream across Australia.
In Queensland there are a range of different types of batteries in use, including household, rechargeable and non-rechargeable batteries, as well as larger industrial and car batteries.
There are high electrical and battery waste contamination rates in Australian landfill. Electronic waste is responsible for 70% of the toxic chemicals found in landfill. If these chemicals are not appropriately managed, they can cause environmental harm. Where batteries are stockpiled, or collected with other materials at waste facilities, they can also pose a danger, representing a fire hazard if they spark. They also pose a serious risk
to organic composting, both in terms of chemical contaminations and as an ignition source.

There is a voluntary scheme - the Australian Battery Recycling Initiative - which has been established by a group of battery manufacturers, recyclers, retailers, government bodies and environmental groups to promote the collection, recycling and safe disposal of all batteries. Their objective is to achieve battery stewardship in Australia.

Presently, industrial and car batteries can be returned to suppliers for recycling, often at their time of replacement. Car batteries can also be returned at most workshops and service stations, however there is no formal producer responsibility scheme for their management. For handheld batteries, less than 6% are recovered for re-processing in Australia, and two thirds go to landfill.

For the C&I sector, batteries are able to be collected by waste management firms such as SUEZ and JJ Richards. Meanwhile, there are fewer options and opportunities for recycling household batteries. Aldi supermarkets and Battery World offer free battery collection points in store; however, there is limited external advertising to improve awareness of their services.

Technology has become a core component of today’s society. As a result, it is likely that batteries will continue to be a high-use product, with consumption unavoidable. With improved innovation it should be possible to streamline the production of batteries so that there are fewer types, facilitating sorting and recycling. Through investigation of replacements for hazardous chemicals or material, batteries could become easier to recycle.

Options to improve recovery rates are shown at Table 34.

<table>
<thead>
<tr>
<th>Key enabler</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy &amp; legislative framework</td>
<td>Implement a landfill ban for batteries and other electronic waste</td>
</tr>
<tr>
<td></td>
<td>Phase-out the manufacturing of non-rechargeable batteries</td>
</tr>
<tr>
<td>Education</td>
<td>Household education program on avoiding, reusing, sorting and recycling batteries and other electronic waste</td>
</tr>
<tr>
<td>Partnering and collaboration</td>
<td>Improve the availability of collection points through developing partnerships between recycling facilities, supermarkets and retailers</td>
</tr>
<tr>
<td>Data and information sharing</td>
<td>Develop grants, fund research, expand existing programs and support emerging technology which finds substitutes for hazardous chemicals currently used in batteries</td>
</tr>
<tr>
<td>Product stewardship</td>
<td>Implement schemes to ensure producers take responsibility for their end product as well as providing information on recovery rates for batteries</td>
</tr>
</tbody>
</table>
The present report contains 34 strategic recommendations in total, ranging across the 11 key enablers around which QTC’s analysis has been structured.

As observed at the outset, the enablers are highly interdependent. The transition from a linear to a circular economy will require sustained and concerted action across each of these areas.

While much of the change will be driven by the market, Government has a pivotal role in providing direction and certainty, establishing optimal institutional arrangements and appropriate policy settings and support, and defining and enforcing compliance standards. Success will hinge on the joint commitment of governments, business, the waste industry and the community, under a clear, long-term plan that has stakeholder support and engagement.

Section 2.2 highlights the state’s poor performance when it comes to waste management and resource recovery, and the ground that must be covered to match the policy, institutional and market maturity of best-practice jurisdictions.

While an important development, the introduction of the landfill levy in early 2019 must be accompanied by a suite of complementary policy measures and industry reforms in order to drive the change required.

The actions set out in Appendix A are based on the more detailed suite of recommendations in Chapter 4, and provide a roadmap for reforms over the near, medium and longer term. Each of these recommendations should be read in conjunction with the analysis set out in its corresponding enabler section.

While the delivery timeframes for certain actions are arguably ambitious, QTC believes they are realistic. Importantly, an aggressive and focussed reform program reflects the urgency of the changes required if Queensland is to make the necessary leap forward, and start to mainstream the principles of a circular economy.
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## Appendix A: Implementation plan for strategic recommendations

<table>
<thead>
<tr>
<th>Ref</th>
<th>Recommendation</th>
<th>Lead</th>
<th>Decision maker</th>
<th>Participants</th>
<th>Timeframe</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4.1. POLICY AND LEGISLATIVE FRAMEWORK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Finalise and publish a new waste management strategy under the <em>Waste Reduction and Recycling Act 2011</em> (‘Waste Act’)</td>
<td>DES</td>
<td>Minister for Environment and the Great Barrier Reef, Minister for Science and Minister for the Arts (‘Minister’)</td>
<td>DES Advisory Group</td>
<td>October 2018 (Draft strategy); March 2019 (implementation of Final strategy)</td>
<td>New waste management strategy (including roadmap)</td>
</tr>
<tr>
<td>2</td>
<td>Finalise the review of Regulated Waste Classification and waste-related Environmentally Relevant Activities</td>
<td>DES</td>
<td>Minister</td>
<td>DES Advisory Group</td>
<td>November 2018: regulation made, with commencement prior to implementation of landfill levy</td>
<td>Implementation of the new regulatory framework</td>
</tr>
<tr>
<td>3</td>
<td>Amend the Waste Act to implement the new landfill levy</td>
<td>DES</td>
<td>Minister</td>
<td>DES Advisory Group</td>
<td>November 2018</td>
<td>Amending legislation to Parliament</td>
</tr>
<tr>
<td>4</td>
<td>Conduct a full review of the Waste Act, having regard to industry developments following the implementation of the new waste management strategy, the landfill levy, and regulatory best practice</td>
<td>DES</td>
<td>Minister</td>
<td>DES</td>
<td>To commence within 18 months of levy implementation</td>
<td>Publication of a report on the outcomes of the review, including a plan on any necessary legislative amendments</td>
</tr>
<tr>
<td>5</td>
<td>Deliver Circular Economy policy</td>
<td>DES</td>
<td>Minister</td>
<td>DES</td>
<td>July 2019 (Draft policy); December 2019 (Final policy)</td>
<td>Complete and publish Circular Economy policy paper</td>
</tr>
<tr>
<td>6</td>
<td>Deliver Waste to Energy policy</td>
<td>DES</td>
<td>Minister</td>
<td>DES</td>
<td>July 2019</td>
<td>Complete and publish Waste to Energy policy paper</td>
</tr>
<tr>
<td>7</td>
<td>Waste harmonisation action plan</td>
<td>DES</td>
<td>Minister</td>
<td>All stakeholders</td>
<td>Ongoing</td>
<td>State harmonisation program</td>
</tr>
<tr>
<td>Ref</td>
<td>Recommendation</td>
<td>Lead</td>
<td>Decision maker</td>
<td>Participants</td>
<td>Timeframe</td>
<td>Deliverable</td>
</tr>
<tr>
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</tr>
<tr>
<td>8</td>
<td>Publish the findings of the regular three-yearly review of the waste management strategy</td>
<td>DES</td>
<td>Minister</td>
<td>All stakeholders</td>
<td>Three years from the approval of the new waste management strategy</td>
<td>Complete and publish strategy review report</td>
</tr>
<tr>
<td>9</td>
<td>Annual performance review based on set measures and targets specified in the waste management strategy</td>
<td>New Entity&lt;sup&gt;146&lt;/sup&gt;</td>
<td>Minister</td>
<td>All stakeholders</td>
<td>Annually</td>
<td>Component of annual waste report</td>
</tr>
</tbody>
</table>

### 4.2. GOVERNANCE AND COMPLIANCE MANAGEMENT

<table>
<thead>
<tr>
<th>Ref</th>
<th>Recommendation</th>
<th>Lead</th>
<th>Decision maker</th>
<th>Participants</th>
<th>Timeframe</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Establish a new statutory authority to implement and deliver waste strategy in Queensland (‘New Entity’)</td>
<td>DES, transitioning to New Entity Board</td>
<td>Cabinet</td>
<td>DES Central agencies New Entity Board</td>
<td>Identify and engage Chair by June 2019 Establish New Entity by December 2019</td>
<td>Establishment of new authority, including enabling legislation and appointment of new Board</td>
</tr>
<tr>
<td>11</td>
<td>Government to consider whether waste regulation and compliance management functions should remain with DES or be transferred to a new, independent regulatory authority (eg, Environmental Protection Authority)</td>
<td>DES</td>
<td>Minister</td>
<td>DES</td>
<td>March 2019</td>
<td>Submission to Cabinet on structural reform of regulatory functions</td>
</tr>
<tr>
<td>12</td>
<td>Provide additional resources to support compliance management</td>
<td>DES</td>
<td>Cabinet Budget Review Committee (CBRC)</td>
<td>DES Treasury</td>
<td>November 2018</td>
<td>2018-19 Mid Year Financial and Economic Review (MYFER) submission outlining the need for assistance, potentially in the form of regulation, data, technology, processes or resources.</td>
</tr>
<tr>
<td>13</td>
<td>Review the effectiveness of existing compliance and enforcement powers, tools and instruments, including undertaking an assessment of regulatory instruments to bolster compliance control</td>
<td>DES (or/or new EPA)</td>
<td>Minister</td>
<td>All stakeholders</td>
<td>Within 18 months of levy implementation</td>
<td>Regulatory impact assessments Introduction of new compliance and enforcement measures, as appropriate</td>
</tr>
</tbody>
</table>

<sup>146</sup> Prior to the establishment of a new entity (subject to Government endorsement of the recommendation), any task assigned to it would be expected to be carried out by DES.
### 4.3. DATA AND INFORMATION SHARING

<table>
<thead>
<tr>
<th>Ref</th>
<th>Recommendation</th>
<th>Lead</th>
<th>Decision maker</th>
<th>Participants</th>
<th>Timeframe</th>
<th>Deliverable</th>
</tr>
</thead>
</table>
| 14  | Establish a forum for the development of a fit-for-purpose data and knowledge-sharing platform, including consideration of existing data gaps:  
  - Illegal dumping  
  - Stockpile management  
  - Forecasting  
  - Measuring success  
  - Tracking material flow (e.g., material flow studies) | DES, transitioning to new entity | Director-General, DES, transitioning to new entity Board | DES, AG Technical Working Group | September 2018 | Establish data and information sharing stakeholder team |
| 15  | Develop a targeted data and information sharing strategy | DES, transitioning to new entity | Director-General, DES, transitioning to new entity Board | DES, Industry, Government, Communities, Households | November 2018: pre-levy implementation readiness | Data and information sharing strategy to underpin waste strategy objectives |

### 4.4. PARTNERING AND COLLABORATION

<table>
<thead>
<tr>
<th>Ref</th>
<th>Recommendation</th>
<th>Lead</th>
<th>Decision maker</th>
<th>Participants</th>
<th>Timeframe</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Establish more formal partnership arrangements with key organisations in the waste sector</td>
<td>New entity</td>
<td>Minister/ new entity Board</td>
<td>New entity, Waste Industries Bodies and Council</td>
<td>June 2019 (communications to occur prior)</td>
<td>Formalise partnership arrangements</td>
</tr>
<tr>
<td>17</td>
<td>Building capacity and supporting key stakeholders identified as waste management partners (local governments, waste industry participants and representative bodies, waste generators (businesses and consumers), research bodies (including universities), funding bodies and co-regulatory bodies such as the Australian Packaging Covenant Organisation (APCO))</td>
<td>New entity</td>
<td>New entity Board</td>
<td>New entity</td>
<td>June 2019 onwards</td>
<td>Finalise funding arrangements</td>
</tr>
</tbody>
</table>

### 4.5. EDUCATION

<table>
<thead>
<tr>
<th>Ref</th>
<th>Recommendation</th>
<th>Lead</th>
<th>Decision maker</th>
<th>Participants</th>
<th>Timeframe</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Establish a framework for delivery of a cohesive education program (including appropriate funding)</td>
<td>New entity</td>
<td>New entity board</td>
<td>All stakeholders</td>
<td>June 2019 (preliminary work to be undertaken prior)</td>
<td>Education team established</td>
</tr>
</tbody>
</table>
| 19  | Develop a targeted education strategy, including:  
  - Clearly-defined roles (including partnerships and collaboration opportunities).  
  - Evidence-based mechanisms to review and measure success over time. | New entity | New entity board | All stakeholders | June 2019 (preliminary work to be undertaken prior) | Education strategy to underpin waste strategy objectives |
### 4.6. LEVY AND BANS

<table>
<thead>
<tr>
<th>Ref</th>
<th>Recommendation</th>
<th>Lead</th>
<th>Decision maker</th>
<th>Participants</th>
<th>Timeframe</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>The landfill levy should be forward-looking and provide clear direction on the levy price path (minimum, rolling four year projections (ie, Budget and forward estimates period)).</td>
<td>DES</td>
<td>CBRC</td>
<td>DES/ Queensland Treasury (QT)</td>
<td>As part of annual State Budget and MYFER updates</td>
<td>Updated projections published on a rolling basis</td>
</tr>
<tr>
<td>21</td>
<td>Government to establish a process to monitor and manage unintended consequences from the implementation of a landfill levy.</td>
<td>DES</td>
<td>Minister</td>
<td>DES</td>
<td>July 2018 and ongoing</td>
<td>Process detailed as part of the initial levy design and ongoing monitoring post levy implementation.</td>
</tr>
<tr>
<td>22</td>
<td>Identify clear KPIs to monitor the performance of the landfill levy and provide transparent reporting on the link between the money raised, monies invested and outcomes achieved.</td>
<td>New entity</td>
<td>Minister/ new entity board</td>
<td>DES/ QT</td>
<td>1 July 2019 onwards</td>
<td>Develop KPIs within the current waste strategy update and formally report progress as part of the annual waste report. Establish a clear and consistent funding allocation framework</td>
</tr>
<tr>
<td>23</td>
<td>Government to provide clear signals to the market on any additional landfill bans and allow sufficient time for local government and industry to make alternative arrangements for the recovery/ treatment of the banned materials.</td>
<td>DES</td>
<td>Minister</td>
<td>All stakeholders</td>
<td>Ongoing</td>
<td>Future landfill bans identified within the current waste strategy update and formally announced to the market via the appropriate channels.</td>
</tr>
</tbody>
</table>

### 4.7. MARKET DEVELOPMENT

<table>
<thead>
<tr>
<th>Ref</th>
<th>Recommendation</th>
<th>Lead</th>
<th>Decision maker</th>
<th>Participants</th>
<th>Timeframe</th>
<th>Deliverable</th>
</tr>
</thead>
</table>
| 24  | Identify significant challenges facing end use markets and prioritise markets that can support an increase in supply of recovered resources most effectively | DES and new entity post formation | Minister/ board of new entity | All stakeholders | Commence on January 2019 and ongoing | - Market development strategy for recovered resources including separate studies for specific waste streams by the time the landfill levy is introduced  
- Ongoing support and funding for relevant enablers |
<table>
<thead>
<tr>
<th>Ref</th>
<th>Recommendation</th>
<th>Lead</th>
<th>Decision maker</th>
<th>Participants</th>
<th>Timeframe</th>
<th>Deliverable</th>
</tr>
</thead>
</table>
| 25  | Develop standards for recovered products that build trust for end use markets through standards | DES and relevant agencies     | Minister for Transport and Main Roads       | DES, TMR, HPW, industry           | November 2018  | ▪ Complete TMR adoption of road specifications for the inclusion of recovered materials (tyres and glass)  
▪ Ongoing development of other specifications for use recovered materials |
| 26  | Incorporate into the *Queensland Procurement Policy* objectives for the use of recovered resources or procurement from suppliers with sustainable business practices. Credible and meaningful targets should be developed in consultation with DES and industry | Department of Housing and Public Works | Cabinet                                 | All government entities             | July 2019      | Amended *Queensland Procurement Policy*                                      |
| 27  | Explore support for sustainable procurement initiatives through risk sharing agreements, classification schemes that allow consumers to identify sustainable businesses practices and development of standard contracting terms | New entity/ QT                 | Cabinet                                     | New entity board/ cabinet           | July 2019 and ongoing | Implement appropriate risk sharing arrangements                               |
| 28  | Consider including waste and resource recovery as a State Interest, therefore elevating its priority in State and local government land-use planning schemes | DSDMIP                        | Cabinet                                     | All stakeholders                   | June 2019      | Revised State Planning Policy  
Update State Infrastructure Plan |
| 29  | Through the financial assistance package, the Government should signal to the market the criteria it considers important in determining what infrastructure to support | DSDMIP                        | DG                                          | DSDMIP/ DES                       | September 2018 | Establish a clear and consistent funding allocation framework |
| 30  | Develop a long-term waste and resource recovery infrastructure plan (30 year plan), incorporating regional implementation plans (5-10 year plans) and governance framework for periodic review and update. | New entity                     | New entity board/ Minister                  | All stakeholders                   | June 2019      | Develop and publish a waste and resource recovery infrastructure plan |
| 31  | Ensure the waste and resource recovery infrastructure planning is aligned with the waste strategy, market | New entity                     | New entity board/ Minister                  | DES                              | Ongoing         | Ongoing co-ordination and alignment with strategy |
development strategy and any other upcoming regulatory decisions (eg, additional landfill bans).

### 4.11. PRODUCT STEWARDSHIP

<table>
<thead>
<tr>
<th>Ref</th>
<th>Recommendation</th>
<th>Lead</th>
<th>Decision maker</th>
<th>Participants</th>
<th>Timeframe</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>Work with other states on common problematic waste types and seek a national response by the federal government</td>
<td>New entity and priority partners</td>
<td>New entity board</td>
<td>DES/ new entity and industry stakeholders</td>
<td>Ongoing</td>
<td>Engage with other states and industry through national problematic waste working groups. Complete annual Problematic waste submissions to the Commonwealth Department of Environment and Energy</td>
</tr>
<tr>
<td>33</td>
<td>Look for opportunities to adopt existing overseas EPR schemes</td>
<td>New entity and priority partners</td>
<td>New entity board</td>
<td>DES/ new entity and industry stakeholders</td>
<td>Ongoing</td>
<td>Adopt appropriate EPR principles and operating guidelines for schemes</td>
</tr>
<tr>
<td>34</td>
<td>Continue to support current product stewardship schemes</td>
<td>DES, transitioning to new entity</td>
<td>DES/New entity board</td>
<td>DES/ new entity and industry stakeholders</td>
<td>July 2018 and ongoing</td>
<td>Support for incumbent product stewardship schemes (eg, the National Tyre Product Stewardship Scheme will require ongoing support)</td>
</tr>
</tbody>
</table>
## Appendix B: Stakeholder consultation

<table>
<thead>
<tr>
<th>Industry Group</th>
<th>Organisation/Entity</th>
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</thead>
<tbody>
<tr>
<td>Waste and Resource Recovery Industry Associations</td>
<td>Australian Council of Recycling</td>
</tr>
<tr>
<td></td>
<td>Australian Food and Grocery Council</td>
</tr>
<tr>
<td></td>
<td>Australian Organics Recycling Association</td>
</tr>
<tr>
<td></td>
<td>Australian Packaging Covenant Organisation</td>
</tr>
<tr>
<td></td>
<td>Tyre Stewardship Australia</td>
</tr>
<tr>
<td></td>
<td>Waste Management Association of Australia</td>
</tr>
<tr>
<td></td>
<td>Waste, Recycling Industry Association (Qld) Inc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industry Group</th>
<th>Organisation/Entity</th>
</tr>
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<tbody>
<tr>
<td>Individual entities</td>
<td>BMI Group</td>
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<tr>
<td></td>
<td>CDP Waste2Energy</td>
</tr>
<tr>
<td></td>
<td>Cleanaway</td>
</tr>
<tr>
<td></td>
<td>Heck Group (Rocky Point Cogen)</td>
</tr>
<tr>
<td></td>
<td>JJ Richards &amp; Sons</td>
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<tr>
<td></td>
<td>OzHarvest</td>
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<td></td>
<td>Peak Services</td>
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<tr>
<td></td>
<td>Qantas</td>
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<td></td>
<td>Rawtect</td>
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<td></td>
<td>Re.Group</td>
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<tr>
<td></td>
<td>Remondis</td>
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<tr>
<td></td>
<td>ResourceCo</td>
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<td></td>
<td>Rio Tinto</td>
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<td>Rocky Point Recycling</td>
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<td>Sims Metal Management</td>
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<td></td>
<td>Soil Cyclers Pty Ltd</td>
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<td></td>
<td>Soil Health Partners</td>
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<td>Tyrecycle</td>
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<td></td>
<td>Veolia</td>
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<tr>
<td></td>
<td>Visy</td>
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<tr>
<td></td>
<td>Wood Mulching Industries</td>
</tr>
<tr>
<td></td>
<td>Woolworths</td>
</tr>
<tr>
<td></td>
<td>Zero Waste Network</td>
</tr>
</tbody>
</table>

<p>| Other Australian | Australian Renewable Energy Agency (ARENA) |</p>
<table>
<thead>
<tr>
<th>Industry Group</th>
<th>Organisation/Entity</th>
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</thead>
<tbody>
<tr>
<td>government/entities</td>
<td>Clean Energy Fund Corporation (CEFC)</td>
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<td></td>
<td>Department of Environment and Energy (Cth)</td>
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<td></td>
<td>EPA South Australia</td>
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<tr>
<td></td>
<td>EPA Victoria</td>
</tr>
<tr>
<td></td>
<td>Green Industries South Australia</td>
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<tr>
<td></td>
<td>New South Wales EPA</td>
</tr>
<tr>
<td></td>
<td>Sustainability Victoria</td>
</tr>
<tr>
<td>State government</td>
<td>Department of Environment and Science</td>
</tr>
<tr>
<td></td>
<td>Department of Premiers and Cabinet</td>
</tr>
<tr>
<td></td>
<td>Department of State Development, Manufacturing,</td>
</tr>
<tr>
<td></td>
<td>Infrastructure and Planning</td>
</tr>
<tr>
<td></td>
<td>Department of Transport and Main Roads</td>
</tr>
<tr>
<td></td>
<td>Queensland Treasury</td>
</tr>
<tr>
<td>Local governments and</td>
<td>Brisbane City Council</td>
</tr>
<tr>
<td>related bodies</td>
<td>Cairns Regional Council</td>
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<td></td>
<td>Hinchinbrook Regional Council</td>
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<tr>
<td></td>
<td>Local Authority Waste Management Advisory Committee</td>
</tr>
<tr>
<td></td>
<td>Local Government Association of Queensland</td>
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</table>

<table>
<thead>
<tr>
<th>Industry Group</th>
<th>Organisation/Entity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mackay Regional Council</td>
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<td></td>
<td>Peak Services</td>
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<tr>
<td></td>
<td>Townsville Regional Council</td>
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</tbody>
</table>
### Appendix C: Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>Anaerobic Digestion</td>
</tr>
<tr>
<td>AG</td>
<td>Recycling and Waste Management Stakeholder Advisory Group</td>
</tr>
<tr>
<td>ANWR</td>
<td>Australian National Waste Report</td>
</tr>
<tr>
<td>APCO</td>
<td>Australian Packaging Covenant Organisation</td>
</tr>
<tr>
<td>C&amp;D</td>
<td>Construction and Demolition</td>
</tr>
<tr>
<td>C&amp;I</td>
<td>Commercial and Industrial</td>
</tr>
<tr>
<td>CBRC</td>
<td>Cabinet Budget Review Committee</td>
</tr>
<tr>
<td>CCIQ</td>
<td>Chamber of Commerce and Industry Queensland</td>
</tr>
<tr>
<td>CPI</td>
<td>Consumer Price Index</td>
</tr>
<tr>
<td>CRS</td>
<td>Container Refund Scheme</td>
</tr>
<tr>
<td>DES</td>
<td>Department of Environment and Science</td>
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<tr>
<td>EOW</td>
<td>End of Waste</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>EP Act</td>
<td><em>Environmental Protection Act 1994 (Qld)</em></td>
</tr>
<tr>
<td>EPR</td>
<td>Extended producer responsibility</td>
</tr>
<tr>
<td>ERA</td>
<td>Environmentally Relevant Activities</td>
</tr>
<tr>
<td>FO</td>
<td>Food organics</td>
</tr>
<tr>
<td>FOGO</td>
<td>Food Organics and Garden Organics</td>
</tr>
<tr>
<td>FTE</td>
<td>Full Time Equivalent</td>
</tr>
<tr>
<td>GISA</td>
<td>Green Industries South Australia</td>
</tr>
<tr>
<td>GO</td>
<td>Garden Organics</td>
</tr>
<tr>
<td>HDPE</td>
<td>High-Density Polyethylene</td>
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<td>LAWMAC</td>
<td>Local Authority Waste Management Advisory Committee</td>
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<tr>
<td>LDPE</td>
<td>Low-Density Polyethylene</td>
</tr>
<tr>
<td>AD</td>
<td>Anaerobic Digestion</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>LGAQ</td>
<td>Local Government Association of Queensland</td>
</tr>
<tr>
<td>MBT</td>
<td>Mechanical Biological Treatment</td>
</tr>
<tr>
<td>MRF</td>
<td>Material Recycling Facilities</td>
</tr>
<tr>
<td>MSW</td>
<td>Municipal Solid Waste</td>
</tr>
<tr>
<td>NFP</td>
<td>Not-For-Profit</td>
</tr>
<tr>
<td>PAC</td>
<td>Paper and Cardboard</td>
</tr>
<tr>
<td>PET</td>
<td>Polyethylene Terephthalate</td>
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<td>Planning Act</td>
<td>Planning Act 2016 (Qld)</td>
</tr>
<tr>
<td>PP</td>
<td>Polypropylene</td>
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<tr>
<td>PRC</td>
<td>People’s Republic of China</td>
</tr>
<tr>
<td>PS Act</td>
<td>Product Stewardship Act 2011 (Cth)</td>
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<tr>
<td>PVC</td>
<td>Polyvinyl Chloride</td>
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<td>QPP</td>
<td>Queensland Procurement Policy</td>
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<td>Queensland Treasury Corporation</td>
</tr>
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<td>R&amp;D</td>
<td>Research and Development</td>
</tr>
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<td>SEQ</td>
<td>South East Queensland</td>
</tr>
<tr>
<td>SPP</td>
<td>State Planning Policy</td>
</tr>
<tr>
<td>SV</td>
<td>Sustainability Victoria</td>
</tr>
<tr>
<td>SWRRIP</td>
<td>Statewide Waste and Resource Recovery Infrastructure Plan (Vic)</td>
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<tr>
<td>TLPI</td>
<td>Temporary Local Planning Instrument</td>
</tr>
<tr>
<td>TSA</td>
<td>Tyre Stewardship Australia</td>
</tr>
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<td>Waste Act</td>
<td>Waste Reduction and Recycling Act 2011 (Qld)</td>
</tr>
<tr>
<td>WMAA</td>
<td>Waste Management Association of Australia</td>
</tr>
<tr>
<td>WRAP</td>
<td>Waste and Resource Action Programme</td>
</tr>
<tr>
<td>WRIQ</td>
<td>Waste Recycling Industry Queensland</td>
</tr>
<tr>
<td>WtE</td>
<td>Waste to energy, also known as energy from waste</td>
</tr>
</tbody>
</table>