Cracking the Circular Economy Barriers of Queensland Local Governments

An examination of barriers experienced by Queensland Local Governments at the start of operational transitions toward a Circular Economy.

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ABSTRACT

The Queensland Waste Management and Resource Recovery (WMRR) Strategy, published by the Department of Environment and Science (Qld) in 2019, aims to develop a circular economy (CE) and transition to zero-waste to landfill by 2050. In doing so, the Strategy sets out three strategic priorities and defines specific actions of four key stakeholders, including Local Government (LG).

The research framework used five multi-method qualitative research instruments, supported by limited data, to examine barriers to a CE specific to LGs in Queensland. A literature review, survey, interview, workshop, and document interrogation were employed to collect data for the twelve-month period following the implementation of the WMRR Strategy. Analysis of the data investigated key themes of each approach individually and collectively to characterise barriers to a CE for Queensland LGs. The Boston Consulting Group DICE Calculator was applied to predict the success of Queensland LGs in achieving the WMRR Strategy CE priorities.

A review of literature identified a gap that CE barriers specific for LG was limited and that LG were often referred to as creating a barrier for other stakeholders. Those barriers were evaluated for their relevance in the Queensland context. Results for each of the research instruments are presented graphically, tabulated or as observations.

The Ellen Macarthur Foundation describes a CE involving many levels of interconnectedness. This research indicated that barriers to a CE are also often interrelated. Seven types of CE barriers are discussed for Queensland LGs, with sub-categories and implications explored for each.

Insufficient knowledge, understanding and the practical application of CE concepts; limited visible leadership and commitment in strategic organisational planning for a CE transition by LG; and risks of unintended barriers created by LG are the three widest reaching types of CE barriers for Queensland LGs. Applying this knowledge to the Boston Consulting Group DICE Calculator, Queensland LGs are not predicted to achieve the WMRR Strategy CE priorities. Barriers in forming local partnerships, using procurement as a CE enabler, economic influences and political influence were also explored.

This research provides a baseline narrative for Queensland LGs as they begin the transition to a CE. It affords LGs the opportunity to address the identified barriers and empower them to realise the WMRR Strategy priorities. Further research could improve upon the barriers identified by qualitatively measuring the degree of impact of each barrier. Opportunities were brought forward for LG and State Government to improve on risks and shape the future of Queensland’s CE.

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed.....*Victoria Hammer*.....

Date.....04/07/2021.....

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ACRONYMS

Acronym	Abbreviated Term	Acronym	Abbreviated Term
ALGA	Australian Local Government Association	**IDEO**	Innovation Design Engineering Organization
BCC	Brisbane City Council	**IP**	Internet Protocol
BCG	Boston Consulting Group	**IRC**	Isaac Regional Council
BSC	Banana Shire Council	**KPI**	Key Performance Indicator
CBM	Circular Business Model	**LAWMAC**	Local Authority Waste Management Advisory Committee
CCC	Crime and Corruption Commission (Qld.)	**LG**	Local Government
CE	Circular Economy	**LGAQ**	Local Government Association of Queensland
COEX	Container Exchange	**MRF**	Material Recycling Facility
CRS	Container Refund Scheme	**QTAC**	Queensland Tertiary Admissions Centre
CTRC	Charters Towers Regional Council	**QTC**	Queensland Treasury Corporation
DES	Department of Environment and Science (Qld.)	**SBREC**	Social and Behavioural Research Ethics Committee (Flinders University)
DICE	Duration, Integrity, Commitment and Effort	**SDG**	Sustainable Development Goal
DLGRMA	Department of Local Government Racing and Multicultural Affairs (Qld.)	**SME**	Small and Medium Sized Enterprise
DSDMIP	Department of State Development Manufacturing Infrastructure and Planning (Qld.)	**SP**	Strategic Priority
DSDTI	Department of State Development, Tourism and Innovation (Qld.)	**TAS**	Tasmania
EESC	European Economic and Social Committee	**TCC**	Townsville City Council
EMF	Ellen Macarthur Foundation	**UN**	United Nations
EU	European	**UN**	United Nations
FY	Financial Year	**USA**	United States of America
Govt.	Government	**WARP**	Waste Avoidance and Resource Productivity
HSC	Hinchinbrook Shire Council	**WMRR**	Waste Management and Resource Recovery

TERMS AND DEFINITIONS

Term	Acronym	Definition
Advanced Payment		Refer to footnote [1] of Section 5.3.2.1.
Australian Local Government Association	ALGA	A federation of state and territory LG associations in Australia (ALGA 2020).
Circular Economy	CE	An economic business model where materials remain within the economy at their highest value for as long as possible (World Bank Group 2018, p. 10)
Department of Environment and Science	DES	The State Government department that regulates environmental management in Queensland (Queensland Government 1995-2021b).
Department of Local Government, Racing and Multicultural Affairs	DLGRMA	Former Queensland Government department for governing LGs and driving sustainable inclusive communities. Refer to DSDILGP.
Department of State Development, Tourism and Innovation	DSDTI	Former Queensland Government department driving the state's economic agenda. Refer to DSDILGP.
Department of State Development, Infrastructure, Local Government and Planning	DSDILGP	The Queensland Government Department, formed after the October 2020 election, responsible for state development, economic development, infrastructure, land use planning, urban growth and LG (Queensland Government 1995-2021b). Formerly DLGRMA and DSDTI.
DICE®	DICE	The registered trademark assessment methodology developed by the Boston Consulting Group that predicts the outcome of change initiatives based on four factors: Duration, Integrity, Commitment and Effort (Boston Consulting Group 2021b). International registration number 1579485, filed 9 July 2020.
Linear Economy		An economic business model where items are typically made from virgin materials, used and then thrown away as part of a 'take-make-use-dispose system' (Queensland Government n.d., p. 8).
Local Government	LG	One of three levels of government in Australia. Defined in the *Oxford Learner's Dictionary* as: LG are: 1. the system of government of a town or an area by elected representatives of the people who live there 2. the organization that is responsible for the government of a local area and for providing services, etc. Also known as council, local government authority, municipal council, municipal government.
Local Government Association of Queensland	LGAQ	The peak professional body representing all 77 of the LGs (LGAQ 2021).
Local Government Stakeholders		Includes but not limited to: LG workers, businesses and community members that partake in transactions with LGs.
Queensland Government		The governing body over the State of Queensland. One of three levels of government in Australia.
Queensland Treasury Corporation	QTC	The Queensland Government's central financing authority (QTC n.d.).
Strategic Priorities	SP1, SP2, SP3	Strategic Priorities of the WMRR Strategy. Refer to Section 1.3 for specific details of each priority.
Waste Avoidance and Resource Productivity Strategy 2014 - 2024	WARP Strategy	The Queensland Government document that was superseded on 1 July 2019 by the WMRR Strategy.
Waste Management and Resource Recovery Strategy	WMRR Strategy	Means the Queensland Government document implemented on 1 July 2019, replacing the WARP Strategy.
Zero-waste to Landfill		Where waste is avoided, reused and recycled to the greatest possible extent. The only waste that goes to landfill is waste for which there is no alternative environmentally, socially or economically viable solution (Queensland Government n.d., p. 7).

1 INTRODUCTION

Consider a world where generating waste and wastage is the exception, not the rule. That is the end goal of the Queensland State Government's new Waste Management and Resource Recovery (WMRR) Strategy. What the strategy puts forward is for the state to:

- transition to a circular economy (CE)
- enhance the management of waste, by putting it to better use and
- reduce the volume of waste disposed of in landfill.

In a CE, materials traditionally thought of as waste, are instead preserved and regarded as valuable resources (Ellen Macarthur Foundation (EMF) 2017e).

The key stakeholders of the WMRR Strategy are the State and Local Governments (LG), and industry. This research project has used the WMRR Strategy as a guide to evaluate the operational readiness of Queensland LGs, on their journey to a CE.

This chapter provides background information (Section 1.1), describes a CE (Section 1.2), places the WMRR Strategy in context for LGs and states the purpose of this research (Section 1.3). Section 1.4 describes the research aims and objectives.

1.1 Background

The WMRR Strategy arose from findings of a review conducted in 2017 by the Queensland Treasury Corporation (QTC) to examine waste management in Queensland. QTC was engaged by the Queensland Department of Environment and Science (DES) to undertake a mid-term review of the *Waste Avoidance and Resource Productivity Strategy (WARP) 2014-2024*. The review found that Queenslanders were not achieving the desired outcomes of the WARP Strategy and were one of the poorest performers for resource recovery in Australia (QTC 2018, pp. 27-29). The review found that the rate at which waste was generated in Queensland exceeded the rate of population growth by almost 11 per cent, and most waste generated was disposed of in landfill (QTC 2018, pp. 11-16). QTC outlined several opportunities for improvement, which DES accepted and recommended to advance Queensland's reputation.

The DES (2019, pp. 13) final report on the review of the WARP Strategy acknowledged that implementation of its objectives through voluntary action plans did not achieve the desired outcome to meet overall targets and in some cases resource recovery had regressed. On 1 July 2019 the Queensland Government released a new strategy in response to the review's key findings and recommendations; the *Waste Management and Resource Recovery Strategy* (the WMRR Strategy).

The implementation of the WMRR Strategy has been supported by substantial changes to waste management policy, legislation and regulation to drive changes in behaviour. The WMRR strategy is anchored by a waste disposal levy (effective on the 1 July 2019 for 39 of the 77 Queensland LGs) and is considered to cover 90% of Queensland's population and therefore most of the areas in which waste is generated (Queensland Government 2020a). Refer to Figure 1-1 for a map of Queensland with pertinent information embedded.

The WMRR Strategy defines actions for stakeholders and ambitious targets to transition Queensland from a linear economy to a CE by 2050.

Queensland Local Government Area of Investigation

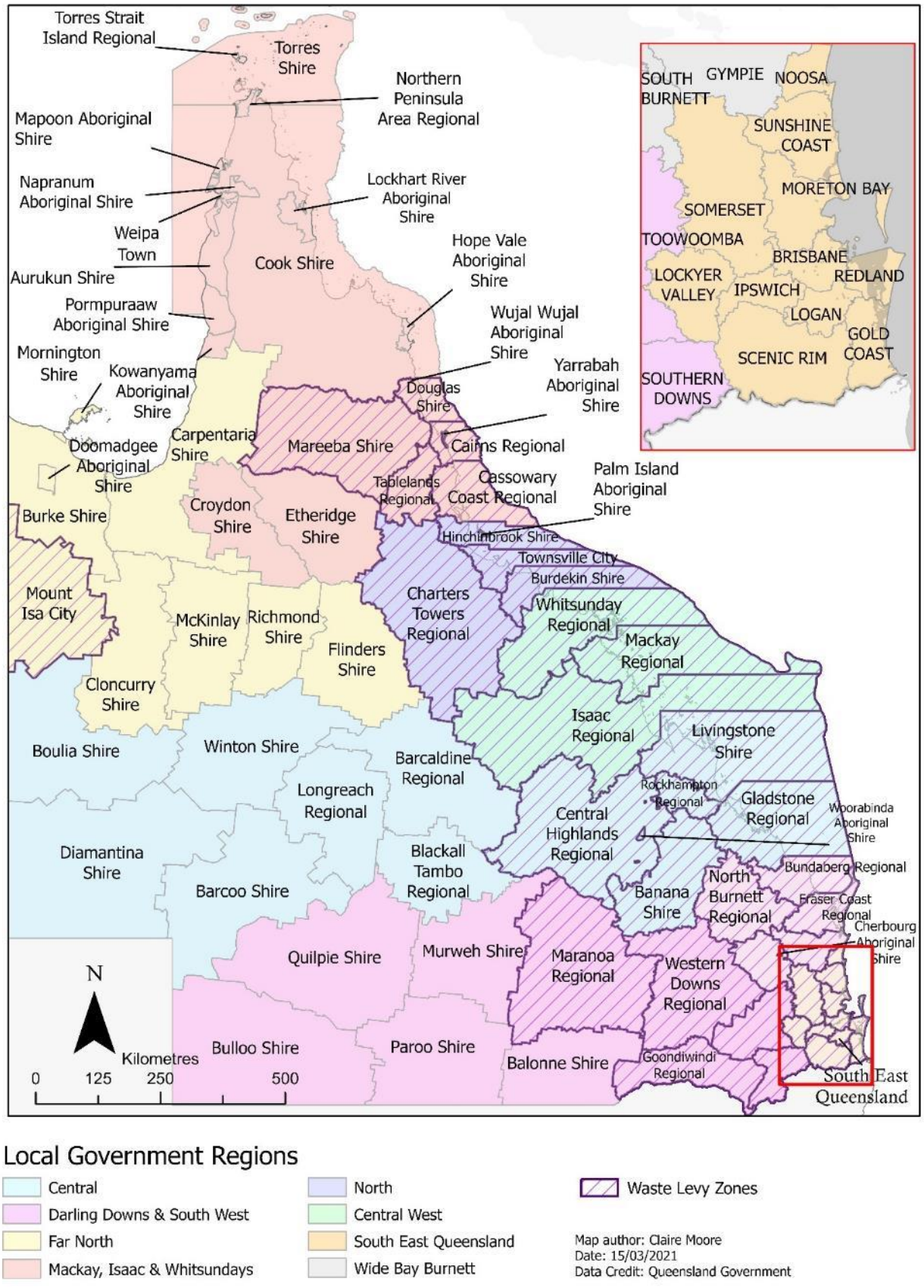

Figure 1-1 Map of Queensland

Source: Adapted from Department of Local Government Racing and Multicultural Affairs (DLGRMA) (2019) and Queensland Government (2020).

1.2 The Circular Economy (CE)

A CE is a term used to express an economic business model where opportunities with circularity are taken over linear single step processes (World Bank Group 2018, p. 10).

CE concepts have existed for decades (EMF 2017d). The European Union first introduced the waste hierarchy to the Waste Framework Directive (Council Directive 75/442/EEC) in 1975 (Council of the European Communities 1975). The WMRR Strategy refers to the importance of the hierarchy framework, and waste avoidance, in moving towards a CE (Queensland Government n.d., pp. 7–10). However, there are calls to improve the waste hierarchy to a more circular and waste free framework (Simon 2019; Stanislaus 2019). Figure 1-2 compares the waste hierarchy to a proposed CE hierarchy (Centre of Expertise on Resources cited in Stanislaus 2019). The hierarchy provides a visual concept and suggests the preferred order of management for materials to provide the most beneficial outcomes.

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Figure 1-2 Comparing the Waste Hierarchy & Proposed CE Hierarchy
Source: (Adapted from Queensland Government n.d., p. 8 and Centre of Expertise on Resources cited in Stanislaus 2019).

In 2015, the United Nations (UN) Member States, including Australia, adopted the 2030 Agenda for Sustainable Development (Department of Foreign Affairs and Trade (DFAT) n.d.). This agenda called for all countries to urgently form a global partnership to address 17 Sustainable Development Goals (SDGs) (United Nations Department of Economic and Social Affairs (UN) n.d.a.). The twelfth SDG 'Responsible Consumption and Production', Target 12.5 seeks to 'substantially reduce waste generation through prevention, reduction, recycling and reuse' by 2030 (UN n.d.b.) which is essentially employing a CE system of consumption. The SDG Target 12.5 is reflected through the WMRR Strategy vision which states:

> *'Queensland will become a zero-waste society, where waste is avoided, reused and recycled to the greatest extent possible. Strategic investment in diverse and innovative resource recovery technologies and markets will produce high-value products and generate economic benefits for the state' (Queensland Government n.d., p. 7),*

whereby it will achieve a CE system that retains materials in-use rather than eliminate them. The Queensland Government consider this change will be facilitated partially by LGs.

As the concept of a CE gains momentum in Queensland, policy-makers and LG leaders may be challenged by many definitions in circulation, leading to confusion of interpretation and implementation but it could also prove a basis for innovation and flexibility. Pheifer's (2017 pp. 9-10) research on barriers to CE business models also identified that deficiency in understanding the principles of a CE proved a barrier to progress at a micro-economic level. This research project does not attempt to pose a single definition for a CE, but presents a number of definitions to facilitate better understanding of the concept.

The *Oxford Learner's Dictionary*, *Merriam-Webster Dictionary* and *Cambridge Dictionary* are all reputable English language dictionaries but do not include a definition of the term 'circular economy'. There have been some attempts by industry stakeholders to define the term. One common and simply applied definition by the EMF (2017f) states: '*A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems*'.

Geissdoerfer et al. (2017, p. 759) evaluated many of the definitions of CE to present a universal definition:

> *'A Circular Economy is a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling'.*

This less than pithy definition loses some impact and comprehension by its length.

The Queensland Government (n.d, p. 8) includes the following definition in the WMRR Strategy of a CE:

> *'a circular economy is one in which products and materials keep circulating within the economy at their highest value for as long as possible, through reuse, recycling, remanufacturing, delivering products as services, and sharing'.*

The Queensland Department of State Development, Tourism and Innovation (DSDTI) (2020) elaborates by adding: '*value can be gained from material otherwise destined for landfill when there are increased options for reuse, recycling and recovery of resources'*. While the State definitions do not specifically include the term '*zero-waste society'*, it is assumed that by realising a CE, the WMRR Strategy vision to be a zero-waste society may be attained.

By contrast, Queensland's economy is currently characterized in the WMRR Strategy as a linear economy. This means products are commonly designed and manufactured using virgin materials, consumed or used, and then disposed of without extracting any further beneficial use (EMF 2017f; Queensland Government n.d., p. 8; Verhaar 2018). A linear economy is typically referred to as a '*take-make-use-dispose system'*, and in Queensland, the bulk of these end-of-life materials are interred to landfill (Queensland Government n.d., p. 8).

In recent years, CE concepts have been adopted more broadly across the globe in academic, political and business platforms. For example, universities across the world now offer topics and degrees solely focussed on teaching CE principles (Coursera 2020 & EMF 2017b), European Governments are developing and implementing frameworks dedicated to achieving a CE that address multiple faculties of a products lifecycle and include targets and actions with firm dates to realise achievements.

The European Commission (n.d.; 2020) adopted a new 'Circular Economy Action Plan' (the first developed in 2015 with 54 actions now completed or in progress), in May 2020 that included a combination of 35 legislative and non-legislative measures to support sustainable growth under the European Green Deal. Europe is often admired and considered a global leader in piloting CE principles (Kirchherr et al. 2018, p. 270), with the European Economic and Social Committee (EESC) President, Luca Jahier, declaring in 2019 "sustainability must be the overarching principle of EU [European] policies" (EESC 2019).

There is strong support for a CE in Europe as they have been measuring the benefits holistically for many years, including its social benefits. Between 2012 and 2018, the EU attributed 4 million jobs being directly linked to their local CE, and have committed to modernizing their skills agenda and investing in training to ensure that CE development is not handicapped by a skills shortage (European Commission 2020). In contrast, the Australian Government does not possess a guiding CE strategy.

Through the WMRR Strategy, the Queensland Government has conveyed the need to improve resource efficiency and capitalize on the economic, social and environmental benefits of a CE (Queensland Government n.d., pp. 7-8).

1.3 Context

In Queensland, LG's, also known as councils, are required either by legislation or by decision to address the needs, interests and aspirations of stakeholders within that community (Local Government Association of Queensland (LGAQ) 2013). This has traditionally included provision of municipal waste management and resource recovery infrastructure and services, either directly (especially in regional areas) or indirectly (under a contract with private businesses) (Blue Environment 2020, pp. 76-77). The Queensland Government (n.d., pp. 4-22) acknowledges LGs play a significant role in delivering and maintaining municipal waste management services and infrastructure, and have identified them as a key stakeholder to deliver the WMRR Strategy. Strategic priorities and stakeholders of the WMRR Strategy are outlined in Table 1-1. A full copy of the WMRR Strategy is included in Appendix A.

Table 1-1 WMRR Strategy Priorities & Stakeholders

Strategic Priority		Key Stakeholders
1	Reducing the impact of waste on the environment	• Queenslanders • State Government • **Local Government** • Waste Sector
2	Transitioning to a circular economy for waste	• State Government • **Local Government** • Waste Sector
3	Building economic opportunity	• State Government • **Local Government** • Waste Sector

(Source: Queensland Government n.d., pp. 13-14).

Specific actions identified for LGs in the WMRR Strategy are detailed below in Figure 1-3.

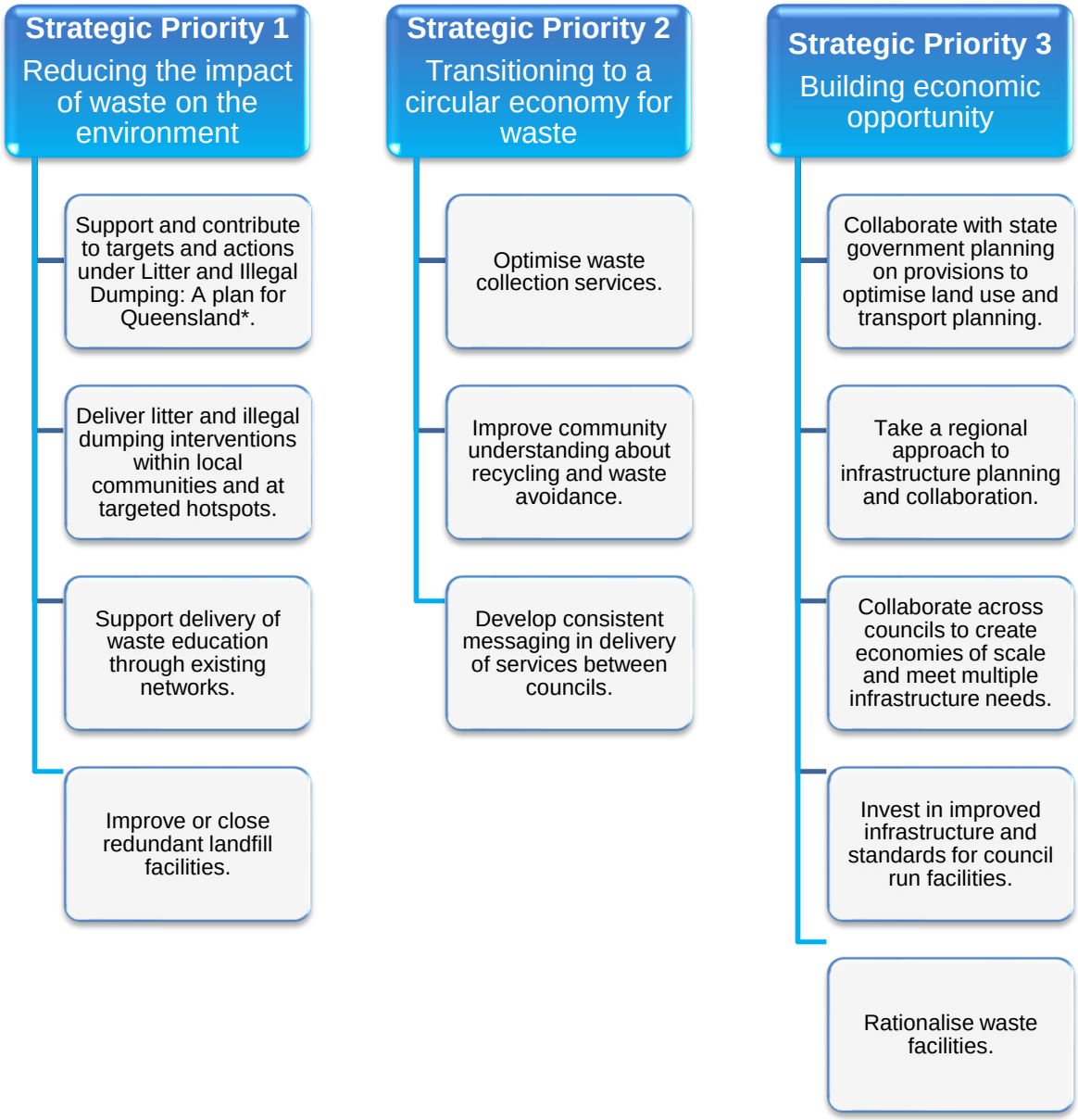


Figure 1-3 WMRR Strategy Actions for LG
(Source: Queensland Government n.d., pp. 13-14)
* denotes document not publicly available from DES (Qld.).

Strategic Priorities 1 (SP1) and 3 (SP3), which reduce the impact of waste on the environment, and build economic opportunity, are considered key to achieve Strategic Priority 2 (SP2); transitioning to a CE. The WMRR Strategy LG actions have been considered within the framework of this research.

LG performs a significant governance function in the community and supports delivery of a range of State Government priorities locally and regionally (DLGRMA 2020, p. 6). In practice, delivery of waste management services by a LG involves many interdependent components. For example, a LG has to provide physical infrastructure and services, such as a landfill, transfer station or kerbside collection, as well as personnel to manage the contracts or services to ensure assets are maintained, provide education to the community and customer service support, conduct

operational or compliance reporting, and process materials; but also needs to recover revenue through rates to fund all this. These functions would not necessarily be performed by the same personnel or by one department within a single LG but multiple personnel and departments.

LGs employ a wide range of professionals across their corporate service functions to deliver essential services to communities that may include water and sewage, roads infrastructure and waste management services. The LGAQ estimates that $10 billion was spent by Queensland LGs in 2018/19 to administer community amenities, transport, public services and safety programs, education, recreation and health services, environmental protection and economic affairs (LGAQ 2020). This demonstrates that as a collective, Queensland LGs have significant buying power to influence CE principles; their employees are leaders within their local communities; and they are well positioned to influence behaviour changes and advocate for CE principles.

Fittingly, LGs have been identified as a key stakeholder in delivering the desired outcomes of the WMRR Strategy as the State Government drives the transition to a CE.

Achieving a CE will require a greater commitment than just the WMRR Strategy, by all levels of government, to facilitate the necessary changes. The desired outcomes of the WMRR Strategy priorities are assumed to be measured by the achievement of the defined targets within their petitioned time frames as presented in Table 1-2.

Table 1-2 WMRR Strategy Targets for 2050

Targets for 2050		Progressive Targets					
		Waste Stream	Baseline (2018)	2025	2030	2040	2050
25%	Reduction in household waste	MSW only	0.54t	10%	15%	20%	25%
90%	Of waste is recovered and does not go to landfill	All waste types*	45.40%	65%	80%	85%	90%
75%	Recycling rates across all waste types	All waste types*	44.90%	60%	65%	70%	75%

* WMRR Strategy includes a break-down of targets for individual waste types of MSW (municipal solid waste), C&I (commercial and industrial), C&D (construction and demolition) and overall.
(Source: Queensland Government n.d., pp. 10).

State Government targets reflect the time needed to transition to a CE and minimal disposal of waste to landfill as a 30-year process, however the LGAQ elected member Policy Executive voted in April 2018 to support Queensland LGs committing to a ‘zero-waste to landfill’ target by 2028 (LGAQ 2018); a mere 10-year transition. By February 2019, the target date had been revised to 2035 (LGAQ 2019a, LGAQ 2019b); thus, assuming that the transition is achievable within 17

years. The LGAQ cautiously revised their support for LGs to adopt ‘zero-waste to landfill’ earlier than the WMRR Strategy target but maintains the belief that the targets set by the State Government can be achieved sooner than 2050.

Setting a target to reduce waste disposed to landfill will not be sufficient to drive the transition to a CE as waste diversion and disposal is but one element of a much larger system. The EMF (2017c) likens a CE to the functions of a human body where the interconnectedness of each element is required to achieve overall function and performance. The WMRR Strategy expands briefly on the current co-dependant strategies and programs that are occurring in parallel with it, driving a holistic transition to a CE, and defines how the WMRR Strategy may contribute to their goals as outlined in Table 1-3 below.

Table 1-3 Co-Dependant Contributions of the WMRR Strategy

Program of Direct Relationship		Contribution of WMRR Strategy to Program Goals
1	Queensland Climate Transition Strategy	• Achieve zero net emissions by 2050 • Reduce emissions by at least 30 per cent below 2005 levels by 2030 (interim target) • Powering Queensland with 50 per cent renewable energy by 2030
2	Advance Queensland Initiative	• Foster innovation and position the state as an attractive destination for investments in new ideas

(Source: Queensland Government n.d., p. 7).

Brisbane City Council attained carbon neutral certification in 2017 against the *National Carbon Offset Standard for Organisations* and to-date are the only LG in Queensland do so (BCC 2019, pp. 45-46; BCC 2020, p. 46; Climate Active 2019a). Certification can be awarded to organisations who demonstrate they have achieved zero net emissions (Climate Active 2019b).

While the WMRR Strategy may positively advance other State Government programs, the co-dependant relationships so far defined by the State appear limited when considering the level of effort required to facilitate a generational change to reduce the present levels of consumption of materials. Additionally, the WMRR Strategy is devoid of recognition of resources and planning contributions, in addition to waste management, that will be required to holistically achieve a CE. The barriers experienced through the progressive journey to a CE is likely to be an erratic experience for all stakeholders, including LGs. However, when barriers to a CE are identified, it presents an opportunity to proactively overcome them (EMF 2015, p. 65).

The purpose of this research is to help understand some of the barriers experienced by Queensland LGs in transitioning to a CE, and empowering them to realize the actions and targets of the WMRR Strategy.

1.4 Research Aims & Objectives

1.4.1 Aim

The research aim is to examine the operational readiness of Queensland LGs to enable a CE and realise the WMRR Strategy actions and targets by understanding and characterizing the barriers they are experiencing.

1.4.2 Objectives

The three objectives of this research are to:

1. Investigate explicit LG barriers to the implementation of a CE and consider their relevance to the Queensland context.
2. Characterize the barriers experienced by Queensland LGs in the first year of implementation of the WMRR Strategy.
3. Evaluate the corporate business plans of Queensland LGs for evidence of adopting CE behaviours reflective of the WMRR Strategy.

1.4.3 Out of Scope

The researcher deemed the following matters to be out of scope:

- Enablers for LGs transitioning to a CE.
- Australian Government Waste Policies or Strategies.
- Individual Australian State Government Policies or Waste Strategies (excluding Queensland).
- Actions for stakeholders (other than LGs) defined in the WMRR Strategy.

2 REVIEW OF LITERATURE

This chapter presents the results and conclusions drawn by other researchers seeking to understand established barriers for Local Governments (LG) to transition to a circular economy (CE), and to evaluate how significant those barriers are in preventing Queensland LGs from acting in accordance with the Waste Management and Resource Recovery (WMRR) Strategy.

2.1 Forward

Implementing a CE requires collaboration by multiple actors and interaction of multiple systems at a global and local level (Loop Circular Economy Platform n.d., pp. 6 & 12-13). Government, including LGs, can be leaders in progressing a CE and providing solutions to multiple problems such as improving sustainable economic development, reducing carbon footprints, managing waste and addressing resource difficulties (Kirchherr et al. 2017, p. 10; Loop Circular Economy Platform n.d., pp. 6-9; Pugalis & Tan 2017, pp. 20 & 27). To do this, they need to understand CE concepts and identify barriers to advance the transition to a CE (Ellen Macarthur Foundation (EMF) 2015, p. 16).

A number of common CE barriers have been discussed in literature. The leading global organisation for CE promotion, the EMF (2015, pp. 63-65), identifies 15 CE barriers within four influence categories: economic, market failures, regulatory failures and social factors. Galvao et al. (2018, p. 82) reviewed 195 articles to provide a summary of CE barriers classified within seven categories: technological, policy and regulation, financial and economic, managerial, performance indicators, customer, and social.

Acknowledging these barriers, those observed in literature that can be deemed specific to LG can be reduced to two categories:

- Barriers to a CE experienced by LG (Section 2.2) and
- Barriers to a CE created by LG (Section 2.3).

2.2 Barriers to a CE Experienced by Local Government (LG)

Within the academic literature small and medium sized enterprises (SMEs) were the group most represented in discussion of the barriers and enablers to implementing CE ideologies, particularly in Europe. Discussion of barriers and challenges relating to LGs exclusively was limited, but LG was often described as creating a barrier to CE progress for SMEs (refer to Section 2.3).

The barriers to LGs transitioning to a CE that were described in the literature were broad in nature and interrelated or co-dependant. Examples of internal barriers to LG adoption of a CE that were cited include: political influence; administrative instruments and policies; data limitations;

infrastructure and economic influences; knowledge and understanding; and skills and capacity of the workforce.

Each of these barriers is detailed below and summarised in Figure 2-1.

Figure 2-1 Summary of CE Barrier Types Experienced by LG in Literature

2.2.1 Political Influence for Strategic Decision-Making

The WMRR Strategy, waste levy and amendments to the *Waste Reduction and Recycling Act 2011* (Qld.) were introduced in Queensland on 1 July 2019 prior to the State Government election, held four months later on October 2020 (Queensland Electoral Commission 2020). There was perceived uncertainty in State Government initiated waste reform in Queensland due to political influences and changes (Queensland Treasury Corporation (QTC) 2018, p. 24). For example, the *Waste Reduction and Recycling Bill 2011* (Qld.) introduced a waste levy on 1 December 2011 that was repealed seven months later by the *Waste Reduction and Recycling Amendment Regulation (No. 1) 2012* (Qld.) following a State Government election and a change in the governing party (Holmes 2012).

Uncertainty in the longevity of waste policy creates a barrier to investment and decision-making needed to progress those reforms (Houston et al. 2018, p. 24; QTC 2018, p. 24). Delays in

decision-making and short-termism is considered a barrier to progressing CE as it aligns with a 'lineal mindset' (Franco 2017, p. 837).

Confidence in LG decision-making in Queensland was rocked following the 2016 LG elections when 'Operation Belcarra' conducted by the Crime and Corruption Commission (CCC) investigated misconduct allegations that LGs had allowed planning and development decisions to be unlawfully influenced (CCC 2017, p. 14; CCC 2021). This had negative effects on the perceptions of the integrity of LG decisions and operations and influence on inequitable local economic development (CCC 2017, p. 76).

Overcoming the barrier of uncertainty concerning LG integrity, administration and policies, is particularly important. Especially by providing greater transparency in decision-making and communicating the strategic direction of operations. As a result of the CCC investigation, transparency in LG operations to improve the integrity and accountability of decisions at a LG level has been at the centre of legislative reform in Queensland since October 2017 (DLGRMA 2020, p. 7).

Contributing to greater transparency is the *Local Government Act 2009* (Qld.) (the *LG Act*), which requires each LG to have a 5-year corporate business plan and an operational plan for each financial year (FY). The *LG Act* also obliges elected members and LG employees to achieve corporate plan objectives. The Corporate plan 'drives and coordinates all strategic documents and policies and forms the basis of strategic decision-making'.

The Operational Plan:

> *'states how the local government will implement the five-year corporate plan and manage operational risks. Typically, the operational plan will include specific initiatives, projects and activities to help meet the strategic objectives of the corporate plan' (Department of Local Government Racing and Multicultural Affairs (DLGRMA) 2020, p. 16).*

As a result, there should be evidence of the WMRR Strategy (including the transition to a CE) influencing LG strategic decision-making in corporate planning documents. Barriers to administrative instruments and policies for LGs transitioning to a CE are explored below.

2.2.2 Administrative Instruments & Policies

2.2.2.1 Planning & Development Instruments

LGs use administrative tools such as planning schemes to regulate and influence the development of land and infrastructure locally, and these are acknowledged as useful instruments to promote CE systems (National Waste and Recycling Industry Council cited in Blue Environment 2020, p. 81; Bolger & Doyon 2019, pp. 2193 & 2201; EMF 2017a, pp. 10-11). But they can also provide barriers within the framework of a linear economy. Some argue that LGs need to update these

tools to advance CE objectives (Bolger & Doyon 2019, p. 2189; EMF 2017a) particularly when they present barriers to the adoption of new technologies needed to progress a CE (EMF 2015, p. 64).

Existing government frameworks have been found to create barriers for CE opportunities unintentionally (EMF 2015, pp. 13 & 64; Kirchher et al. 2018, p. 270). Bolger and Doyon (2019, pp. 2184-2205), when comparing Melbourne with the city of Malmö in Sweden, found that limitations existed within LG planning strategies to facilitate a CE in Australia. One of the biggest challenges was the existence of an imbalance between the creativity and experimentation needed to advance a CE and the rigidity of traditional urban planning governance (Bolger & Doyon 2019, p. 2200; Kirchher et al. 2018, p. 270). In contrast, the Swedish city of Malmö used an approach to incorporate CE drivers into development and planning tools that was described as 'experimental', often allowing innovative plans to be realized, regardless of outcomes and act as a way of learning by observation (Bolger & Doyon 2019, p. 2196).

Refer to Section 2.3.1 discussion on how LG planning and development instruments have been described as impacting CE progress in relation to other stakeholders.

2.2.2.2 Strategic Organisational Planning

The EMF (2015, p. 32; 2017a, p. 7) suggest that for LGs to progress successfully to a CE, then consciousness of CE has to exist within all business functions of the LG organisation and vision statements invoking a CE have to be included in high level strategic planning documents.

The Queensland Government seems to have approached a CE from a materials life end perspective, as evidenced by focussing on developing a strategy aimed at waste management, rather than from a top-down CE policy direction. Governments in Europe, Japan and the USA have also been observed taking a similar approach (Ghisellini, Cialani & Ulgiati 2015, p. 11). Refer to Section 1.2 for the WMRR Strategy vision statement. In 2020 Europe released a universal 'Circular Economy Action Plan' with mantras of *less waste, more value* and *making circularity work for people, regions and cities* (European Commission 2020).

Such internal challenges have been described as 'limited willingness' and an inability of LG departments to harmonize their diverse objectives, leading to contrary rationales, objectives, budgets and schedules (EMF 2015, p. 64; Kirchherr et al. 2018, p. 268; Pugalis & Tan 2017, p. 29). When questioning Planning Department employees within the City of Melbourne, Bolger and Doyon (2019, p. 2194) found that LG departments were siloed, did not share a common CE vision, and that there were competing interests and priorities within and between LG departments.

Bolger and Doyon (2019, p. 2190) showed that the City of Melbourne had five strategic plans compared to two for the City of Malmö's whole of business organisational planning and waste management, which demonstrated greater organisational cohesion. They suggest that there was a

need to integrate CE principals into strategic planning so as to create a harmonious vision of corporate objectives (Bolger & Doyon 2019, p. 2202). It is reasonable to assume that multiple plans across multiple departments would not be cohesive and lead to competing priorities.

A lack of collaboration on strategic planning between Queensland LGs in regional areas, was also noted as a difficulty in progressing resource recovery (QTC 2018, p. 24).

Some think that strategic CE planning by LGs has been limited by a 'hesitant company culture' (Kirchher et al. 2018, p. 268) and the absence of guiding policy by higher levels of government (Bolger & Doyon 2019, pp. 2193 & 2201). Others believe that such an absence is an opportunity for LGs to take the reins and lead senior levels of government to creating a CE (EMF 2017a, p. 11). It has been observed that LGs in urban areas are able to make changes at a faster pace than higher levels of government (EMF 2015, p. 35).

LGs may also find it difficult to identify an established circular business model (CBM) to adopt or turn ideas into a feasible business model (Bet et al. 2018, p. 13; Bocken et al. 2019, p. 14). CBM's need to be able to overcome barriers and apply to different sized organisations (Bocken et al. 2019, p. 14). Bet et al. (2018, pp. 14 & 16) argue that a successful CBM for one organisation may not be so for another, which creates further challenges when transforming existing business models into a CE given that governments traditionally 'operate and make decisions in a linear system'.

This was well summed up in a declaration to Pugalis and Tan (2017, p. 31):

> *"The pace of change is outstripping our [LGs] ability to plan and keep up. Formal/traditional [sic] strategic planning processes which require lengthy consultation can take too long when it comes on an organisation's [sic] or community's ability to seize opportunities. We need a more flexible and responsive strategic planning system" (regional/peak body, TAS [Tasmania]).*

2.2.2.3 Other Administrative or Policy Related Barriers

Additional administrative and policy-related barriers to LGs transitioning to a CE include:

- Differences between policy objectives and community expectations resulting in discord in trying to meet objectives. LG policy instruments influence community behaviours and expectations but counter to this, community expectations also drive the development of government policy (Blue Environment 2020, p. 105).
- LG's ability to influence Federal and State level policy regarding the CE, and result in positive outcomes at a local level, has been challenged (Campbell-Johnston et al. 2019 p. 1237).

- Differently defined geographic boundaries between Federal, State and LG regions in official policy instruments creates barriers for successful collaboration, and harmonizing of priorities and schedules (Pugalis & Tan 2017, p. 24).
- Challenges in navigating complex and abundant legislative and governance material at a LG level have been identified in Australia and in Europe (Bolger & Doyon 2019, p. 2200).
- Governmental administrative instruments, such as policy or local laws, do not align with CE ideology (Govindan & Hasanagic 2018, p. 296; Houston et al. 2018, p. 24; Tura et al. 2019, p. 95) or the waste hierarchy principles (Williams 2015, p. 2).
- Government organisations using recycling initiatives as the primary action to demonstrate CE progress and do not champion other types of CE activities (Ranta et al. 2018, p. 70).

2.2.3 Data Limitations

The WMRR Strategy is underpinned by a waste levy and increased reporting requirements for LGs to collect reliable data. Use of technology and data to measure the success of CE initiatives as a way to identify challenges has been recognised by the EMF (2017a, p. 11); presumably by analysing data thus providing a mechanism for those challenges to be addressed.

The difficulties in collecting and obtaining accurate and reliable data to measure success and identify opportunities in a CE are often cited (Blue Environment 2018, pp. 83-84; Blue Environment 2020, pp. 108-110; Bolger & Doyon 2019, pp. 2197-2198; EMF 2015, p. 59; Govindan & Hasanagic 2018, p. 305; Kirchherr et al. 2018, p. 268). Some fundamental data limitations have been identified in recent (Australian) National Waste Reports which increased the number of significant limitations from six to 13 between 2018 and 2020 (Blue Environment 2018, pp. 83-84; Blue Environment 2020, pp. 108-110).

In the 2020 National Waste Report (Blue Environment 2020, pp. 108-110) significant data gaps included:

1. Data unavailable (Queensland specific)
2. Data from current reporting year missing
3. Data from historical reporting years missing
4. Data inconsistencies across years
5. Double-counting (Queensland specific)
6. Misallocated fate
7. Misallocated jurisdiction (Queensland specific)
8. Misallocated stream
9. Outdated data
10. Over-reporting of recycling in Australia
11. Over-reporting of recycling overseas

12. Stockpiles inadequately reported
13. Data allocation error.

It is hoped that data limitations can be alleviated in future by a national standard that is in development for waste data reporting (Blue Environment 2020, p. 110).

Data provided for the National Waste report is supplied by each state authority (Blue Environment 2018, p. 4), which initially sources the data from LGs and industry (Queensland Government 2018, p. 27). It is reasonable to assume that the data limitations described in the report could apply to some or all of Queensland LGs and that these are acknowledged as a barrier in demonstrating progress towards a CE (Blue Environment 2019, p. 5).

The absence of meaningful data is also a barrier to undertaking informed analysis of waste flows and infrastructure investment, and in establishing metrics to demonstrate the success or failure of material recovery programs (EMF 2015, p. 64; Govindan & Hasanagic 2018, p. 305; QTC 2018, p. 24).

2.2.4 Infrastructure & Economic Influences

In 2017, the Queensland Government commissioned the QTC to report on economic opportunities for Queensland's Waste Industry (QTC 2018, pp. 23-24). The report, the most comprehensive and specific to Queensland, explored barriers to resource recovery from a State perspective but did not consider the influence of a CE specifically. This report and the barriers identified in it have been discussed throughout this paper.

From an economic perspective, barriers to resource recovery investment were attributed to uncertainty regarding political influence on waste reform, especially during an election period (QTC 2018, p. 24). Refer to Section 2.2.1.

Since the QTC report was published, the Federal Government has introduced export bans for many recycled materials (Department of Agriculture Water and the Environment n.d.), which was the primary means of recycling for material collected in Queensland (QTC 2018, p. 23). This will place pressure on LGs to make investments in infrastructure and operations to enable recovery, treatment and redeployment of recovered materials for beneficial use. Limitations in existing infrastructure to store and sort recovered materials, a limited range of local secondary markets, and pressures on logistics and transportation systems, especially regionally, to relocate materials for reprocessing were identified before these bans were announced (Blue Environment 2020, p. 77; Campbell-Johnston et al. 2019, p. 1237; QTC 2018, pp. 23-24). In Denmark, LGs continue to incinerate plastics, rather than upgrading infrastructure to enhance recycling abilities as it is viewed as more economically favourable (EMF 2015, p. 133).

This sentiment is supported by the QTC (2018, p. 23-24) which identified investment in resource recovery infrastructure required to transition to a CE in Queensland, and economic pressures on LGs to keep rates and operational expenses as low as possible, as a barrier to improving waste management in the State.

The National Waste Report 2018 (Blue Environment 2018, p. 54) reflected on challenges to LGs dealing with the increasing costs of providing waste collection and treatment services that meet the expectations of rate payers and the community. The Australian Local Government Association (ALGA) (2019, p. 9) highlighted the economic burden imposed by State and Federal Government increasingly devolving responsibilities on LGs to provide goods and services in local communities but did not mention waste or resource recovery management or infrastructure in its discussion.

LGs are often reliant on revenue from existing waste disposal operations such as landfill, that do not align with WMRR Strategy. This may make them hesitant to divert waste and reduce income that they have come to rely on (QTC 2018, p. 24). This reliance on traditional linear operations, is seen as a key barrier to realising CE business opportunities (Kirchher et al. 2018, p. 268; Tura at al. 2019, pp. 92 & 96).

There are currently no landfill bans in Queensland (Blue Environment 2018, p. 41) but the WMRR Strategy implies that such bans will be introduced in the future (Queensland Government n.d., p. 8). Landfill bans will likely increase cost pressures on LGs and force them to look for alternative processing and treatment solutions as the materials no longer disposed by traditional landfill methods increases and the revenue collected declines. The National Waste Report 2018 (Blue Environment 2018, p. 39), suggests that increasing the cost to customers to dispose of waste to landfill can provide an economic means for LGs to develop recycling programs. How this would work practically with decreasing volumes of waste to landfill remains to be seen and reliable data is needed to demonstrate the actual influence (refer to Section 2.2.3). Additionally, recycling is not at the top of the waste hierarchy and investment may be more beneficial for reducing or reusing.

While the WMRR Strategy advises that partnerships and collaboration between community and private sector stakeholders will encourage the investment to change from a linear to a CE (Queensland Government n.d., p. 12), economic pressures have been noted as a constraint on LGs developing such partnerships (Pugalis & Tan 2017, p. 30). The World Bank Group (2018, p. 14) argues that waste management financial planning is a keystone for delivering municipal services but warns that partnerships between public and private sectors can compound difficulties if there is a lack of rigorous contract supervision and enforcement. Differing objectives and goals of the respective partners and the failure to implement or enforce requirements have also been identified as a barrier to CE progress (EMF 2015, p. 64).

Economic pressures on LGs were said to limit the level of waste services offered in regional areas (Blue Environment 2020, p. 77). A lack of adequate publicly provided waste treatment facilities was noted as a barrier to adopting CE behaviours (EMF 2015, p. 64; Houston et al. 2018, p. 24). In regional Queensland a major barrier was the challenge of having to move relatively small volumes of materials recovered over large distances to end-markets for processing (QTC 2018, p. 24).

Similar economic pressures exist for enforcement and clean-up of litter and illegally dumped materials by LGs in Queensland, a state that is large yet sparsely populated. The cost to Queensland LGs to clean-up litter and illegally dumped materials was reported at $25.3 million for 4,700 tonnes in 2020, in comparison to the state of Victoria where 41,600 tonnes were reported to cost LGs $17.3 million to manage (Blue Environment 2020, p. 100).

The Minister's forward to the WMRR Strategy states that it will bolster Queensland's economic growth by developing new industries and creating employment, and that the waste levy will provide the funds needed for infrastructure to transition to a CE (Queensland Government n.d., p. 2). Information with a high level of detail on waste levy fund allocations by the Queensland Government was not yet publicly available and therefore cannot be discussed in detail.

2.2.5 Knowledge & Understanding

Lack of knowledge and awareness of a CE has been seen as a barrier to organisations implementing CE practices and pursuing development opportunities (Bet et al. 2018, p. 13; EMF 2015, p. 13; Pugalis & Tan 2017, p. 30). The Circular Economy Lab (2021) reported self-assessment survey results from participants in an experimental CE collaborative project that ranked government as one of the lowest demographics for CE awareness.

Research undertaken by Bolger and Doyon (2019, pp. 2198-2202) concluded LGs need to find ways to overcome the barrier of a lack of knowledge of the CE model. LG interviewees expressed the need for cohesive social drivers within the community, especially for removing confusion and enhancing understanding of the CE concept (Bolger & Doyon 2019, pp. 2198-2202). Limited awareness and understanding by the general public of what a CE is, how to be part of it and what it means practically was identified by LG officials as a barrier to progressing a CE (Xue et al. 2010, p. 1300).

Many changes to LG waste and resource recovery operations will be required to implement a CE. The absence of CE knowledge and understanding is documented as a hindrance to creating effective and practical business cases to assess and demonstrate benefits and risks for proposed changes to operations and demonstrating the economic process for recovered materials (Campbell-Johnston et al. 2019, pp. 1236-1237). It has been said that the 'circular economy is a niche discussion among sustainable development professionals [only, and] significant efforts need to be undertaken for the concept to maintain its momentum' (Kirchherr et at. 2018, p. 1).

It is perceived, yet not well understood, that LGs, as significant consumers, can influence public procurement to embrace sustainable targets in transitioning to a CE (Bolger & Doyon 2019, p. 2200). LG can provide support to businesses adopting CBMs by implementing preferred procurement practices that consider CE aspects over the life of an asset and recommend the use of materials and services based on CE principles (EMF 2015, p. 70). Ranta et al. (2018, pp. 78-80) found that a common barrier and limitation to CE progress was the lack of support at all levels of government to advocate for the use of materials with recycled content.

2.2.6 Skills & Capacity of Workforce

Although a range of skills are required to implement new opportunities in waste management and a CE, the availability of suitably qualified and experienced staff to operate new infrastructure, manage compliance and educate communities or provide access to suitable training, was not explored in Queensland's waste industry report (QTC 2018).

The World Bank Group (2018, p. 14) highlights the importance of a skilled workforce and staffing capacity required for LGs to manage waste management systems. Campbell-Johnston et al. (2019, pp. 1235-1236) support a similar view, identifying a lack of skills on how to operate CE technology for reverse logistics systems and assessment of materials for quality and reuse treatments as a barrier to CE foundations. This work was undertaken in Europe, which is ahead of Australia in transitioning to a CE, but these key findings provide Queensland LGs with an opportunity to be mindful of these limitations.

Where capacity is low, LGs often engage the services of external consultants to develop their strategies, which results in a skills gap within the organisation and they are not able to implement the strategies effectively (Pugalis & Tan 2017, p. 30). The skills of staff at regional LGs may be insufficient or absent as a result of fewer resources and staff are required to work across multiple functions (Blue Environment 2020, p. 77). Inconsistent implementation and enforcement of CE-related laws at a local level, particularly in regional areas, has been noted as a barrier to progress (Ranta et al. 2018, p. 78).

The CE knowledge and capacity of the LG workforce and elected members has been reported as 'inefficient' and 'variable' (Pugalis & Tan 2017, P. 30). As well, it has been noted that political leaders appeared to lack the skills and experience to identify economic opportunities to progress a CE (EMF 2015, p. 13). The World Bank Group (2018, p. 20) recommend that where such capacities are inadequate, LGs should enter into partnerships, but some expressed caution in entering into such collaborations, worrying it may result in future amalgamations (Pugalis &Tan 2017, p. 29).

Preparing a skilled workforce will likely require external training to be available and a lack of courses to upskill the LG workforce regarding CE practices could be a barrier for LGs. The

Australian Government Myskills (n.d.) training directory website for accredited training courses does not identify any courses for the search term ‘circular economy’ and only lists a Certificate III and IV in Waste Management (CPP30719 and CPP40911) available in Australia from one training provider, being the Academy Green Learning based in New South Wales (NSW). The course includes a mandatory core unit of ‘assess and advise on waste avoidance options’, however the course description does not specifically refer to ‘circular economy’ and only offers an elective unit of ‘implement and assess sustainable work practices’ (Academy of Green Learning 2021).

An invitation by the Waste Management Review Magazine to subscribers in February 2020 called for businesses to showcase waste management related professional development education and training in Australia as a feature for the April 2020 edition of the magazine. The only training provider featured in the edition was Academy Green Learning (Waste Management Review Magazine 2020, pp. 34-35), showing a lack of training providers offering upskilling opportunities tailored to manage waste and resource recovery in Queensland and to educate the workforce regarding CE principles.

Although a search for CE topics and courses in the Queensland Tertiary Admissions Centre (QTAC 2020), the main platform for university entrance in Queensland, returned zero results, a search using Google returned results via individual university websites, for courses offered in universities in Queensland and the rest of Australia (Google Search 2021). Non-accredited select coaching and learning opportunities on CE content in Australia and abroad were also discovered through non-traditional education platforms (Coreo 2021; Coursera 2020; Holonic 2020). Difficulty in identifying and finding suitable training courses with CE content may create a barrier to upskilling and training opportunities.

2.3 Barriers to a CE Created by LG

Researchers frequently identified government, including LG, as a stakeholder, but often a negative influencer for businesses trying to adopt CE and sustainable principals (Agyemang et al. 2019, p. 985; Bet et al. 2018, p. 27; Govindan & Hasanagic 2018, p. 296; Pugalis & Tan 2017, p. 24; QTC 2018, p. 24; Ranta et al. 2018, pp. 74-78; Rizos et al. 2015, p. 4; 2016, p. 10). This is a significant finding since collaboration and partnerships are indispensable to successful implementation of a CE, and LG plays a significant role in influencing community and business outcomes (EMF 2015, p. 35).

The WMRR Strategy (Queensland Government n.d., pp. 12 & 18) highlights collaboration as a key means to develop the CE but Pugalis and Tan (2017, p. 24) highlight challenges for partnerships posed by the fact that geographic and administrative boundaries, and service delivery levels of individual LGs and each State Government department, are not consistent, thereby creating complexities for project collaboration.

The EMF (2015, p. 14) considers early collaboration crucial to identify and overcome barriers to progress in CE adoption, and highlight the need for policy makers to avoid creating new barriers inadvertently.

Section 2.2.4 highlighted barriers to LG engaging in public/private partnerships as the CE develops, but there are also barriers created by LGs for private sector collaborators in such partnerships. These barriers are explored in Sections 2.3.1 to 2.3.3, and summarised in Figure 2-2.

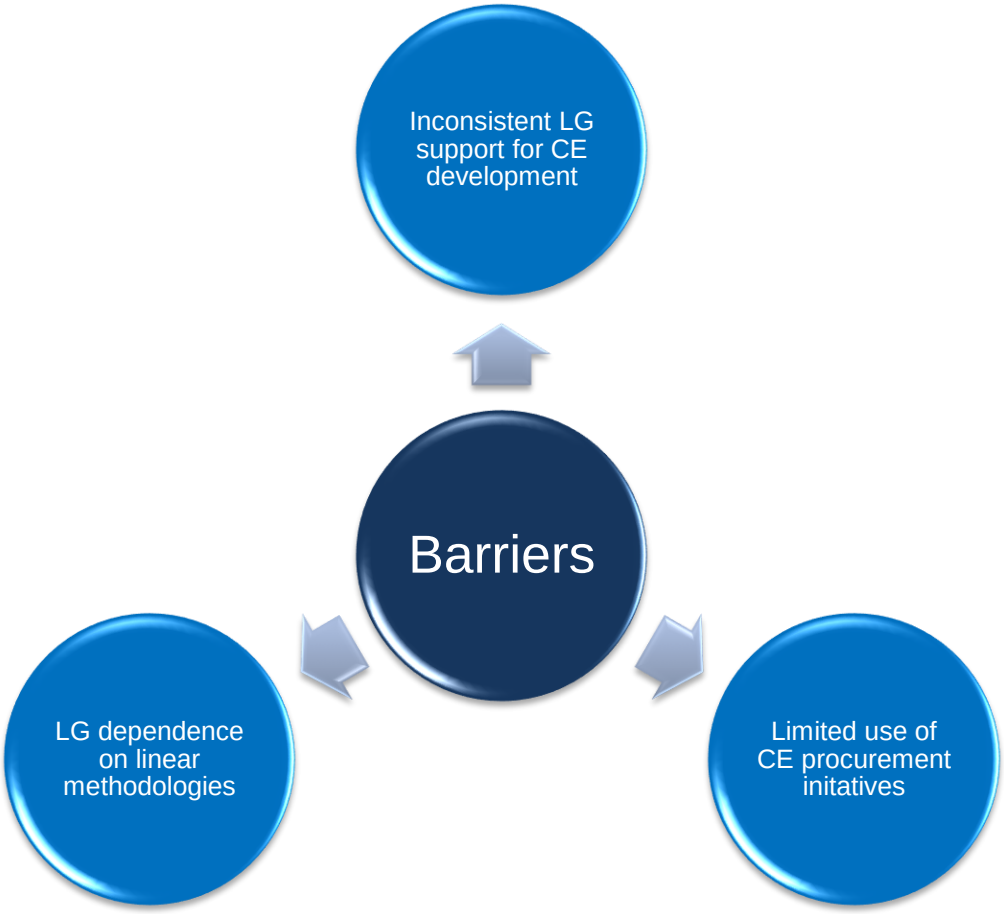


Figure 2-2 Summary of CE Barrier Types Created by LG in Literature

2.3.1 Inconsistent LG Support for CE Development

SMEs are strongly influenced by LGs in relation to environmental performance (Hillary 2004, p. 567) and economic development (Pugalis & Tan 2017, p. 8), which means that LG can influence their adoption of CE principles and practices (EMF 2015, p. 35). Frequently cited in the literature was the challenges for SMEs created by LG to undertake sustainable reform (GreenEcoNet 2014; Pugalis & Tan 2017, p. 27; Rizos et al. 2015, p. 4; Rizos et al. 2016, pp. 10 & 12), or apply practical local laws or provide financial support (Pugalis & Tan 2017, p. 28; Rizos et al. 2016, p. 10 & 12).

The GreenEcoNet is a digital platform for SMEs and government agencies in Europe to collaborate and share resources to support transition to CE systems (European Commission 2015;

GreenEcoNet 2014). A key finding from implementing this CE business platform was that a fundamental challenge to business adopting a CE model was a lack of support from LGs, and that businesses do not identify LG 'as being particularly helpful with regard to circular economy transition' (Rizos et al. 2016, pp. 10-12).

Pugalis and Tan (2017, pp. 8 & 27) regard challenges to businesses as a direct result of LG policies, political disharmony and internal conflicts. Internal conflict within LGs is known to impede local socioeconomic performance and economic growth (Pugalis & Tan 2017, p. 8). Refer also to Section 2.2.2.2 strategic organisational planning discussion.

Stakeholders expect LG to provide funding through grants to encourage and support economic development of sustainable and innovative ideas and adoption of CBMs (Pugalis & Tan 2017, p. 28; Rizos et al. 2016, pp. 11-12).

QTC (2018, p. 24) also noted the negative influence of inconsistent planning approval timelines and ratification as a significant risk and barrier to investors supporting new infrastructure for resource recovery and processing. In Queensland, development and planning approvals are usually assessed by LG but may also have State government agency assessment (Queensland Government 2020b). Stakeholders expect LG to provide 'business-friendly' processes to encourage economic development (Pugalis & Tan 2017, pp. 27–28) but businesses report they lack knowledge of the complex systems and legislative policy obligations required of them to obtain approvals (Rizos et al. 2016, p. 10).

An article by The Fifth State (Johnston, 2019) on the Lendlease housing development at Yarrabiliba in Queensland, aiming to be the first CE town in Australia, interviewed the leading CE Consultant for the project, Ashleigh Morris, Chief Executive Officer of Coreo. Johnston (2019) reports that according to Ms Morris, despite a lack of regulation to incentivise CE initiatives, the project came 'up against one regulatory barrier that was related to water ownership and a local government "*not ready to do something different*". Tura et al. (2019, p. 96) similarly described 'risk aversion' as a barrier to CE progress. In an industry like LG, where the leaders are elected by popular vote, avoiding controversial decisions may be considered the favourable option.

2.3.2 Limited Use of CE Procurement Initiatives

Limitations in government procurement policies, can create barriers for local CE business development (Loop Circular Economy Platform n.d., p. 11). Government procurement policies typically focus on lowest cost, with purchasing of recycled materials not being mandated (Australian Council of Recycling cited in Blue Environment 2016, p. 28; Houston et al. 2018, p. 23). The 2018-19 FY spend for Queensland LGs was just over $10 billion according to the Local Government Association of Queensland (LGAQ 2020), indicating as an industry, LGs can influence adoption of CE technologies and behaviours through procurement initiatives.

High cost and inconsistent supply of secondary beneficial products created by LGs treating materials diverted from landfill, has been indicated as a challenge for consumers of the products, as well as a cause of reluctance by LGs to use their own produced products (Campbell-Johnston et al. 2019, pp. 1236 & 1238).

2.3.3 LG dependence on linear methodologies

Many of the services and infrastructure for waste management in Queensland are provided by or on behalf of LG (Blue Environment 2020, pp. 76-77). A barrier to businesses progressing CE opportunities is the challenge of reconciling new processes and technologies with pre-existing linear operations and infrastructure (Franco 2017, p. 837-839; Tura et al. 2019, p. 96).

2.4 Summary & Implications

Defining barriers experienced by LGs transitioning to a CE has proven a complex task. Literature mainly featured discussion of barriers experienced by SMEs (to which LG posed barriers) and focussed on European examples. Further research and investigation were often suggested to identify knowledge gaps (Bolger & Doyon 2019, pp. 2185-2186 & 2202; Campbell-Johnston et al. 2019, p. 1238; EMF 2017a, p. 13; Kirchherr et al. 2018, p. 269; Ranta et al. 2018, p. 79).

Each barrier to implementing a CE is often interrelated to other barriers as a co-dependency or a consequence. Documented barriers were mostly generic because CE knowledge and implementation is emerging at the global level. No barriers to implementing a CE that were identified were specific to LG, or could be relied upon by Queensland LGs to inform strategic decision-making.

The CE concept is only recently being taken up by LGs, especially in Queensland following the release of the WMRR Strategy on 1 July 2019. Understanding what the potential barriers to adoption are at this early stage can provide LGs with the means to make informed and meaningful decisions, and make success in adopting the WMRR Strategy and leading communities into a CE more likely. As discussed in the research aims and objectives (refer to Section 1.4), this study seeks to contribute to this understanding, particularly for Queensland LGs.

3 RESEARCH DESIGN

3.1 Methodology

Transitioning from a linear to a circular economy (CE) is complex and barriers for Local Governments (LGs) could be many and varied, therefore, a multi-method qualitative approach, supported by limited data, was used to evaluate the operational readiness of Queensland LG to undertake this task. A mixed method applied research approach was chosen to elucidate and characterise the barriers LGs were experiencing in transitioning to a CE and realising the new Waste Management and Resource Recovery (WMRR) Strategy actions and targets, to afford an opportunity to contribute towards problem solving and enabling intervention to rectify those matters.

Five research instruments were employed:

- Literature review
- Survey
- Interview
- Workshop and
- Corporate document evaluation.

Data sourced through the multiple research instruments was analysed to investigate the research aims, referred to academically as methodological triangulation, with the hope of yielding outcomes that can demonstrate strong relationships (Patton 2002, pp. 247-248). Use of multiple data sources and cross-checking the analysis and interpretation of the data, enables balance in the research findings reducing bias to the strengths or weaknesses of a single data source (Patton 2002, pp. 306 & 563).

The data sought included opinions, experiences, observations and perceptions from participants, and behaviour indications from the corporate documents. The results of the multiple lines of enquiry were reconciled through analysis and interpretation, which enabled cross-validation of the data to yield a framework of themes to characterise the barriers identified.

Initially, the research design excluded the evaluation of LG corporate documentation however, during the course of the research program, it became apparent there was a need to add more substance to the research findings, therefore the additional instrument emerged. Figure 3-1 illustrates the research design framework.

Figure 3-1 Research Design Framework

3.2 Ethics

3.2.1 Ethics Approval

Approval was sought from the Flinders University Social and Behavioural Research Ethics Committee (SBREC) to ensure ethical principles were applied in developing the research instruments. Project approval number 8482 was granted on 30 October 2019 for a period of two years, expiring on 30 November 2021. Conditions of the approval included an annual Progress Report to be submitted to the Ethics Committee on the approval anniversary date each year and a Final Report to be submitted on completion of the research prior to approval expiry.

Flinders University introduced a new online platform in 2020 called ResearchNow Ethics & Biosafety. The project's ethics approval was transferred to the new platform on the 15 October 2020 and was issued with a new ResearchNow Ethics ID: 2851.

The project was categorised as non-psychology research and deemed as negligible risk with no foreseeable risk of harm or discomfort to participants.

Ethical considerations and potential risks identified are presented in Table 3-1 below.

Table 3-1 Ethical Considerations

Potential Risk	Management Strategy
Identifiable details of LG, organisation or participant may become known in published text or presentation of results	• Participants were asked to provide written consent (or deem no-consent) prior to participating in the workshop activity and interview for use of identifiable details. • Survey results were recorded in a non-identifiable format.
Bias in participant recruitment	• Participants were sourced from the members of multi-disciplinary third-party professional organisations. • Participation was voluntary and no incentives (financial or otherwise) were offered. • There were no limitations on demographics of participants.
Participants not understanding the activity purpose and use of information	• Information sheets detailing the research objectives, request and use of information was provided to all prospective participants at the time of receipt of invitation.
Data or personal information breech	• Consent forms were provided with activity invitation to participate and were itemised for the workshop and interview to allow maximum flexibility for participants to choose how data and personal information could be used. • All data stored electronically in a de-identified format on a password protected computer in the Flinders University cloud system.
Participant may make a disclosure of an event resulting in significant environmental harm when answering an interview question	• There was a very low probability that a question would lead to a participant disclosing details of environmental harm however, a statement was included in the information to participants regarding any disclosure of environmental harm that met requirements of s.319 of the *Environmental Protection Act 1994 (Qld.),* duty to notify of environmental harm, would be obliged to be reported to the Department of Environment and Science (DES).

3.2.2 Conflict of Interest

A potential conflict of interest/potential for bias was identified as the researcher may have had a previous or current relationship with participants through membership of professional organisations or employment. To mitigate the potential for a conflict of interest, participants were recruited through third-party professional organisations via an invitation scripted by the research supervisor. Participants who may have had a previous or current relationship with the researcher consistently received the same information and questions as all participants for each research instrument used to collect data.

3.3 Participants

Participants of the data gathering activities were sourced through third-party professional organisations representing employees and other stakeholders who had a relationship working with LGs in Queensland. These participants were purposefully sought as they were most likely to be experiencing a direct influence of the WMRR Strategy at the time of the strategy implementation or likely to experience a direct influence of the WMRR Strategy in the near future.

Third-party professional organisations were chosen for their ability to readily distribute information to their members. This approach meant participants could contribute in more than one data gathering activity if they desired.

There were no limitations on how many people from each organisation could participate nor on the professional discipline of participants. The invitations to participate requested variability of professional disciplines (for example: elected members, executives, operational managers and operational staff across multiple disciplines e.g., waste, environment, planning, procurement, engineering, finance, etc.) in an effort to identify the broad range of challenges that may be experienced between disciplines.

The invitation to participate in the online survey extended to all 77 LG authorities, across eight LG areas within Queensland, and included the option for those organisations to extend an invitation to external stakeholders to participate.

The research instruments were designed to elicit from participants various qualitative characteristics of CE barriers, and therefore unlikely to influence overall research findings should an individual participate in multiple activities or if many individuals from one organisation participated.

3.4 Research Instruments

The five research instruments used to establish a qualitative framework of barriers were: literature review, survey, interview, workshop and corporate document evaluation.

3.4.1 Literature Review

A review of academic, government and industry publications, was conducted prior to and while applying out the other research instruments described in this section. The initial literature review aimed to obtain existing information about barriers that LGs in Queensland and other jurisdictions experienced when progressing to a CE. Key factors were identified and used to inform the development of the online survey and interview research questions.

A secondary literature review sought out known barriers for LGs, and more specifically for Queensland LGs progressing a CE and adopting the WMRR Strategy. Refer to References for a list of literature sources mentioned in this report.

Literature reviews may be limited if the subject is not reported accurately or comprehensively by the source (Patton 2002, pp. 306-7). Therefore, sources were scrutinised and limited to academic or peer-reviewed publications as much as possible. Although industry publications did not often meet these criteria, they do provide context and were included if content was deemed appropriate.

3.4.2 Survey

An online survey aimed to discover opinions and experiences of participants, in relation to barriers for LGs achieving the WMRR Strategy actions and transitioning to a CE. Quantitative and qualitative data was derived from responses to closed and open-ended questions. As survey responses can be affected by the personal inclinations and biases of a participant (Patton 2002, p. 306) this affect can be reduced by the use of multi-modal sourced data.

The Qualtrics Survey Software program was utilised to create and administer the survey online. A link to access the survey was distributed by email to potential participants via third-party professional organisations. Queensland is a large and geographically diverse state; therefore, the survey aimed to reach and capture responses from participants located in at least half of the eight Queensland LG regions (refer to Figure 1-1) rather than one target region only. The purpose of this was to capture the potentially broad range of barriers that may be experienced, irrespective of the location of the participant and their LG organisation. This aim was achieved, with seven of the eight LG areas represented by participants.

The survey development was informed by initial insights from the literature review and the WMRR Strategy content. Survey questions were grouped by eight topic sections; titled as follows:

- Demographics
- Risk Management
- Procurement
- Planning
- Local Industry and Community
- Infrastructure and Standards
- General Barriers
- Partnerships.

The survey contained 17 questions composed of a combination of open-ended questions and pre-defined multiple-choice closed ended questions. The open-ended questions were important in capturing information on barriers not obtained in responses to the multiple-choice questions.

Responses to open-ended questions were evaluated via inductive coding using the qualitative data analysis software, NVivo 12 (QSR International 2021), to establish key themes.

It was assumed that participants had an internet connection readily available to them to participate in the survey and were literate. Participation was voluntary and there was a limitation of one response per Internet Protocol (IP) address to reduce the likelihood of one participant completing the survey multiple times and being able to influence the overall results and outcomes.

The survey was distributed via email invitation through third-party professional organisations, launched on 3 November 2019 and closed on 20 December 2020. Several of the invited organisations declined to participate providing a response of "*we are not interested*", "*this isn't applicable"* and "*the content is not relevant for our members*". Other organisations did not respond to the invitation at all or advised they had redirected the invitation to waste department managers. There was a total of 34 survey participants consisting of 17 entire responses and 17 partial responses. The survey questions are reproduced in Appendix B.

3.4.3 Workshop

Workshops can be used to explore group perspectives and for data collection but are often more pleasant for participants in non-threatening environments to share experiences and perspectives (Patton 2002, pp. 385-386).

The Circular Design Guide (Ellen Macarthur Foundation (EMF) & Innovation Design Engineering Organization (IDEO) 2017) workshop resource for circular ventures provided a documented and established workshop activity to afford reproducible outcomes. The aim of the activity was to create a non-threatening environment where participants could identify real world challenges for LGs addressing the transition to a CE, and understand how the scale of circularity might be leveraged with the combined strengths and weaknesses of organisations working together.

The purpose of the workshop activity was to observe the barriers and challenges participants experienced in identifying their strengths and weaknesses to find CE solutions when they encountered a real-world challenge. Handwritten notes, photographs and workshop activity sheets were used to record observations during the workshop.

The workshop was delivered as a standalone single occurrence that coincided with the Local Authority Waste Management Advisory Committee (LAWMAC) meeting on 21 November 2019 in Townsville Queensland. LAWMAC was chosen as its organisational members include 30 Regional Queensland LG organisations and 24 Associate member organisations, dedicated to best practice waste management (LAWMAC 2020). An invitation was extended to the event host, Townsville City Council (TCC), to also invite representatives from internal and external stakeholders with an

interest in the research topic. Participation in the two-hour workshop was voluntary and independent of participation in the remainder of the LAWMAC meeting.

The workshop activity was outcome based with each group required to produce a collaborative solution to a challenge that concluded with a short presentation and development of a collaboration map of the joint venture solution. Group participants were assumed to have reached mutual consensus for the activity output. Visual and auditory observations were noted by the researcher during the workshop delivery, discussions with participants and during participant presentations.

Workshop participants included LG Workers from a range of disciplines (e.g. waste and resource recovery, procurement, education, management, executives and elected members), professional organisation representatives, State Government agency representatives, university researchers with interests in sustainable futures, industry representatives from waste and resource recovery services and management, consultants, and private businesses with an interest in sustainable use of recovered materials (e.g. innovative and at the forefront of change in their field). There were 45 participants collaborating within 11 sub-groups for the activity.

The Circular Design Guide (EMF & IDEO 2017) workshop activity for circular ventures is accessible online and a full copy is reproduced in Appendix C. The materials used for the workshop were in accordance with those listed in the design. The EMF provided confirmation of use of the Circular Design Guide via a personal communication email on 23 October 2020 which has been included in Appendix C. All copyright and intellectual property rights were honoured for the use of the guide in this research project.

3.4.4 Interview

An interview questionnaire, composed of four open-ended questions, was designed to explore and scrutinize specific barriers experienced by the participants' organisation in transitioning to a CE. The interview format was designed to gain qualitative insights from participants without limiting or influencing how they could respond or share information (Patton 2002, p. 353). Nevertheless, it is recognised that these interview responses could contain participant personal bias, information may be subject to recall error and the general emotional state and knowledge of the participant could affect the data (Patton 2002, p. 307).

An invitation was extended to all survey participants to volunteer to participate in a one-on-one interview and provide in-depth examples of their experiences. This invitation was the only mechanism employed to recruit interview participants. The aim was to use the information obtained in the interview to demonstrate barriers to a CE and the WMRR Strategy actions with factual examples.

The project aim was for a 10% representation of LGs (therefore requiring approximately seven or eight respondents) but this was not met as only one volunteer responded and took part in the interview of approximately 30 minutes in duration. The interview was conducted on 3 March 2020 by telephone and transcribed notes were shared with the participant afterwards to confirm it was recorded accurately.

The interview questions are presented in Appendix D.

3.4.5 Corporate Documents Evaluation

An evaluation of the corporate plan and annual operational plan for each of the 39 LGs situated within the waste levy zone area of Queensland, for the 2019/20 and 2020/21 financial year (FY), was conducted to gauge the extent to which the WMRR Strategy had influenced LG corporate programs in the first year of implementation. The levy zone LGs were selected as they were the most likely to be influenced by the WMRR Strategy. Corporate documents of the 38 LGs situated in the non-levy zone were thus excluded from the evaluation. Patton (2002, p. 307) notes the limitations of analysing documentation for drawing conclusions as they may inaccurately state what is happening and information could be incomplete.

The evaluation of the corporate documents was included in this research project to strengthen the research objectives in elucidating barriers to achieving a CE. The aim of the evaluation was to assess if there was a visible theme across the organisation to indicate the LG is actively transitioning to a CE using the WMRR Strategy actions for LG as the evaluation benchmark.

The computer assisted qualitative data analysis software program, NVivo 12 (QSR International 2021), was utilized to record observations and discover insights into the LG corporate documents. The method of investigating a known search term, or deductive coding, was applied to search the documents for specific search terms reflective of key terminology, targets and actions of the WMRR Strategy, and affiliated CE subject matters noted from the literature review. For example, searching how often the phrase '*circular economy*' was used in a corporate document and identifying any specific actions or performance measures nominated. The search terms are presented with the results in Section 4.4.

Each LG had a standalone annual operational plan documented for each FY during the research period, with the exception of Brisbane City Council, Livingstone Shire Council, Moreton Bay Regional Council and Townsville City Council, whereby the operational plan was incorporated into a single Annual Budget document. Additionally, Maranoa Regional Council did not have an operational plan for 2020/21 available on their website. Livingstone Shire Council were the only council to adopt a new corporate plan during the research period time frames.

The corporate documents were publicly available and downloaded directly from the website of each LG. The 2019/20 operational plan and corporate plan documents were downloaded on 13-14 June 2020, and the 2020/21 operational plan and updated corporate plan documents were downloaded between 23 October to 6 November 2020. A bibliography of the corporate documents is presented in Appendix E.

Given that section 123 of the *Waste Reduction and Recycling Act 2011* (Qld.) prescribes an obligation for LGs to have waste reduction and recycling plan, it was assumed that as industry professionals, LG waste departments are already actively advocating to limit volumes of waste disposed to landfill and promote recycling and material recovery as much as possible, and that these plans would reflect this. For the purpose of this research, an assessment of these plans has been excluded from the scope of corporate documents because realising a CE will require an entire organisation to be working towards a common goal and will not be limited to waste management departments only. Therefore, the focus of this evaluation was only on the whole of organisation, overarching corporate plan and operational plan.

3.5 Assumptions & Limitations

This research focused on Queensland only. The state was of particular interest given recent changes in legislation and the introduction of the new WMRR Strategy on 1 July 2019. The challenges and barriers to be defined by the research are broad findings at state, not individual council level.

3.5.1 Research Design Assumptions

Participants were assumed to have an established relationship with Queensland LGs: for example, they were an employee, contractor (i.e., engaged by a LG to supply goods or services) or use a council service to conduct their business (i.e., planning approvals) and therefore were suitable to provide a relevant opinion on the influence of the WMRR Strategy on LGs. It was also assumed the participants had a sound understanding and knowledge of their LGs corporate administrative processes, and that their contribution was an honest and truthful response.

The research data was gathered between November 2019 and June 2020 (excluding the 2020/21 corporate documentation gathered in October/November 2020), therefore results of barriers and experiences of participants in the recorded data is limited to those experienced or observed within that time frame, and representative at that particular period. It is assumed that, over time, the barriers and challenges being experienced will vary as a direct result of organisations responding to risk, meeting corporate objectives and targets, and fluctuating political influence at all three levels of government (federal, state and local). If any LGs made changes to their corporate documents after the date of download indicated, these changes were not captured.

All 2019/20 operational plans were assumed to have been written by each LG prior to the WMRR Strategy implementation on 1 July 2019 which therefore made comparison to the 2020/21 operational plan to demonstrate any potential influence of the WMRR Strategy appropriate.

3.5.2 Limitations of Research Instruments

The following limitations of the research instruments were determined:

- Time restrictions for the workshop activity could have influenced the activity output as participants did not have a lot of time to consider and reflect on their responses, however this limitation was considered insignificant for the purpose of the research objectives as the activity output was not scrutinized rigorously.
- The workshop observations are acknowledged as being subjective.
- Too few participants in the survey and interview data collection activities could have resulted in inconclusive outcomes being drawn directly from the results of each individual activity. Low participation rates may have been due to various reasons such as:
    - potential lack of understanding of the importance of the participants role in the transition to a CE.
    - resource constraints and general lack of availability as there was likely a high work load demand on LG employees with significant waste reform taking place from 1 July 2019. To reduce the burden of time on participants, the data gathering activities varied with the amount of time required for participation, providing a choice for participants on the commitment they wished to make to participate.

To overcome these limitations, the corporate document evaluation was added as an additional research instrument to enhance the credibility of the research outcomes.

Each research instrument used has strengths and weaknesses (refer to individual discussion within each research instrument regarding weaknesses). Employing a multi-method qualitative study approach for this research topic is intended to compensate the respective weaknesses of any one instrument and afford validity to the overall findings of the research.

3.6 Analysis

The data collected through the research instruments were analysed to identify themes or indications of barriers to Queensland LGs adopting the WMRR Strategy and CE behaviours in an effort to qualitatively characterise the barriers. The data collected for each research instrument described in Section 3.4 was evaluated individually in the first instance, then all research instrument results were evaluated and compared collectively.

Analysis of the data included a combination of the following approaches:

- The NVIVO12 qualitative data analysis software program was employed to examine and code results into key (barrier) themes building on the barriers identified in the literature review. This was undertaken as several small-scale discrete projects. The software was used to evaluate themes within survey responses, interrogation of the corporate documents, assessing the workshop outputs, and evaluating results of different research instruments collectively.
- A matrix (using an Excel spreadsheet) of WMRR Strategy actions and targets against CE barriers identified in the literature review was used to identify relationships and themes for characterising barriers in the research results.
- An assessment of projected success of the current LG approaches to transitioning to a CE using the DICE Calculator (refer to Section 3.6.1).
- Employing an objective analysis and critical assessment philosophy to the data results obtained from the different research instruments.

3.6.1 DICE Calculator

A prediction on the likely outcome for Queensland LGs approach in achieving the WMRR Strategy actions and targets was obtained using the BCG Boston Consulting Group (BCG) DICE Calculator (BCG 2021c).

The BCG is a global leader consulting firm specialising in business transformation and change management (BCG 2021a). BCG developed the DICE framework to assess and predict the outcome success for change projects (Sirkin, Keenan & Jackson 2005). The framework was developed from lessons learned and research on companies effecting change management, and assessing their success rates (Sirkin, Keenan & Jackson 2005). The DICE framework uses a calculator tool to consider and apply a score to four key factors that have shown to improve the chance of a project's success: Duration, Integrity, Commitment and Effort (BCG 2021b; BCG 2021d; Sirkin, Keenan & Jackson 2005). Application of the DICE framework is recognised as being subjective but it provides a consistent and statistically proven scoring mechanism to assess a predicted outcome using available information (Sirkin, Keenan & Jackson 2005).

The BCG (2021b; 2021d) DICE factors are:

1. **Duration of the project** – considers the time for the program to be completed and/or time between milestone reviews.
2. **Integrity of the team** – considers the skills and ability of the people responsible for managing the change project and the configuration of that team.
3. **Commitment to change** – considers two elements (C1 and C2). C1 is the visible support of top management; and C2 is the interest level of those people who will adopt the change.

4. **Effort of stakeholders** – considers how much additional workload that the change initiative will create for stakeholders.

The DICE calculator has five assessment elements, with prefilled selection options. A corresponding score is allocated to the selected option. An overall predicted success score is calculated and plotted on a graph. Table 3-2 shows the DICE Calculator choices and scoring method.

The option selected for each element was based on the data collected from the above-described research instruments in Section 3.4 and the interpretation of the researcher. The DICE calculator was selected for this assessment as it is globally recognised and respected as a measurement tool for change management and transformational projects, such as organisations transitioning from linear to CE operations.

Table 3-2 DICE Calculator Choices

Elements	Selection Options	Score
Duration (between learning milestones or till completion)	< 2 months	1
	2 - 4 months	2
	4 - 8 months	3
	> 8 months	4
Team Performance Integrity	Very good	1
	Good - very good	1.5
	Good	2
	Average - good	2.5
	Average	3
	Poor - average	3.5
	Poor	4
C 1 - Commitment (Senior Management)	Clearly, strongly communicate need	1
	Reasonably communicate need	1.5
	Seem to want success	2
	Neutral - seem to want success	2.5
	Neutral	3
	Reluctant - neutral	3.5
	Reluctant	4
C2 - Commitment (Local)	Eager	1
	Willing - eager	1.5
	Willing	2
	Reluctant - willing	2.5
	Reluctant	3
	Strongly reluctant - reluctant	3.5
	Strongly reluctant	4
Effort	< 10% additional	1
	10 - 20% additional	2
	20 - 40% additional	3
	> 40% additional	4
Overall Score Formula	D + 2I + 2C1 + C2 + E	

Source: Adapted from BCG (2021c).

3.7 Timeline

The key time frames and delivery of this research are presented in Figure 3-2; with commencement in July 2019 and completion in June 2021.

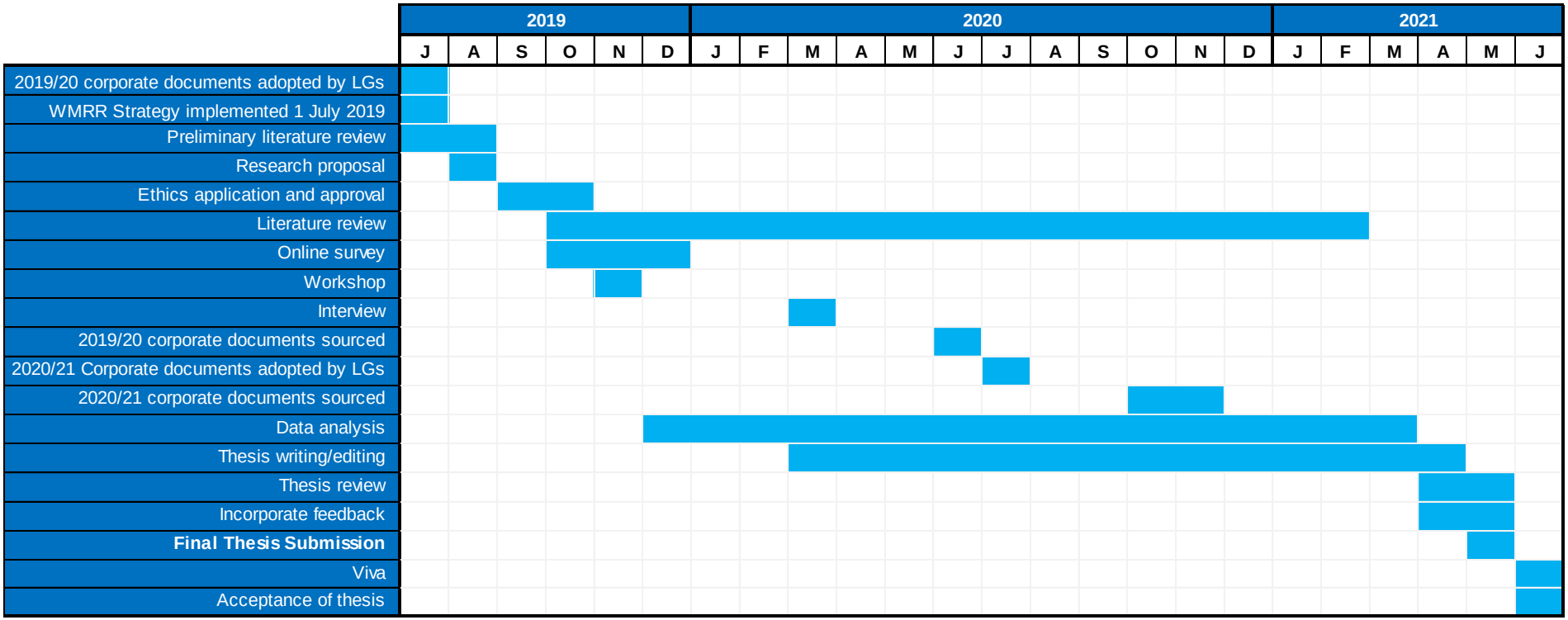


Figure 3-2 Timeline of Research Development

4 RESULTS AND ANALYSIS

This chapter presents the results and analysis of the survey, workshop, interview and corporate document evaluation research instruments.
The research results are presented as follows:

- Section 4.1 presents a graphical representation of the survey outcomes.
- Section 4.2 presents key observations recorded in the course of the workshop activity.
- Section 4.3 presents a summary of key themes discussed during the interview.
- Section 4.4 presents the corporate document investigation outcomes.

The results and analysis of the literature review are presented and discussed in Chapter 2 and Chapter 5.

4.1 Survey Results

The online survey used a combination of open-ended and closed questions to establish participant demographics and investigate how Queensland Local Governments (LG) were carrying out preparations and operations with respect to key themes of the Waste Management and Resource Recovery (WMRR) Strategy; and to discover barriers to a circular economy (CE).

4.1.1 Participant Demographics

A total of 34 participants participated in the survey but only 17 completed it. Of the 17 participants who partially completed the survey, most (11) ceased participation at the fifth question. Survey questions one to four were based on participant demographics and awareness of the WMRR Strategy. Participant demographic survey responses are presented below in Figures 4-1 to 4-4.

Figure 4-1 demonstrates that 88% of participants were employees of LG or worked with LG, and 12% of participants did not work with LG. The research design assumed all participants had a relationship with LG, therefore the 12% of participants who indicated not working with LG (equivalent to 4 participants), may have opted not to continue and complete the survey, as questions in subsequent sections of the survey related directly to LG.

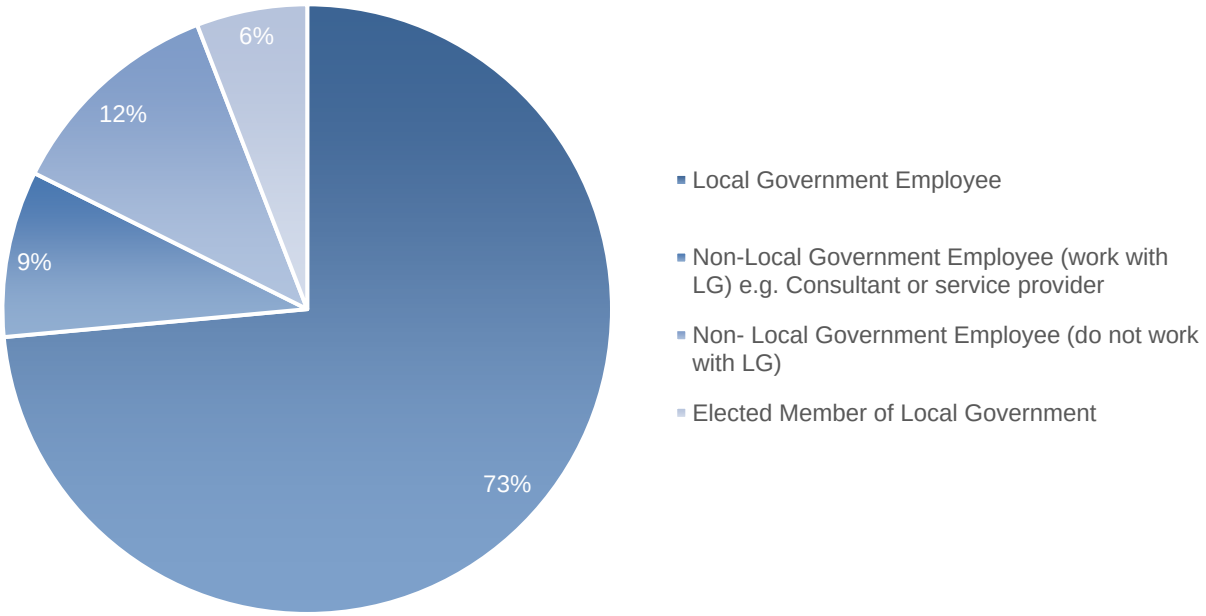


Figure 4-1 Survey Participant Field of Employment

Participants were distributed across seven of the eight LG regions of Queensland (refer to Figure 1-1), therefore achieving the survey aim to represent participants from at least half of the regions. The Central West Queensland area was not represented. Additionally, there were no participants who identified as being from an Indigenous council area. Both of these regions are positioned outside of the waste levy zone and likely have experienced less direct impact of the WRRR Strategy. There was a total of 43 responses (greater than the total number of participants) however, Figure 4-2 indicates only 12.5% (or six participants) made a selection of whether or not their LG region was within the waste levy zone. Participants could answer with more than one selection for this question however, the responses did not elucidate the desired outcome of understanding participant LG region and levy zone position, noting there are 39 of 77 LGs within the levy zone. For this reason, the waste levy zone related results were excluded from further analysis or discussion.

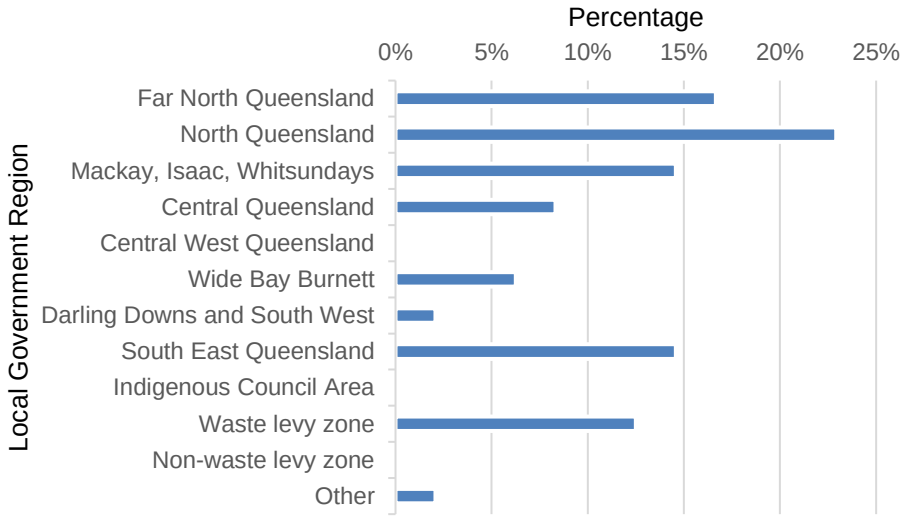


Figure 4-2 Survey Participant Region of Employment

Participants were requested to indicate the primary discipline in which they were employed. Figure 4-3 indicates the highest participant group was those working directly in waste management with 38% of participants indicating this as their primary discipline of employment. None of the participants identified finance, infrastructure/works or resource recovery as their primary discipline of employment.

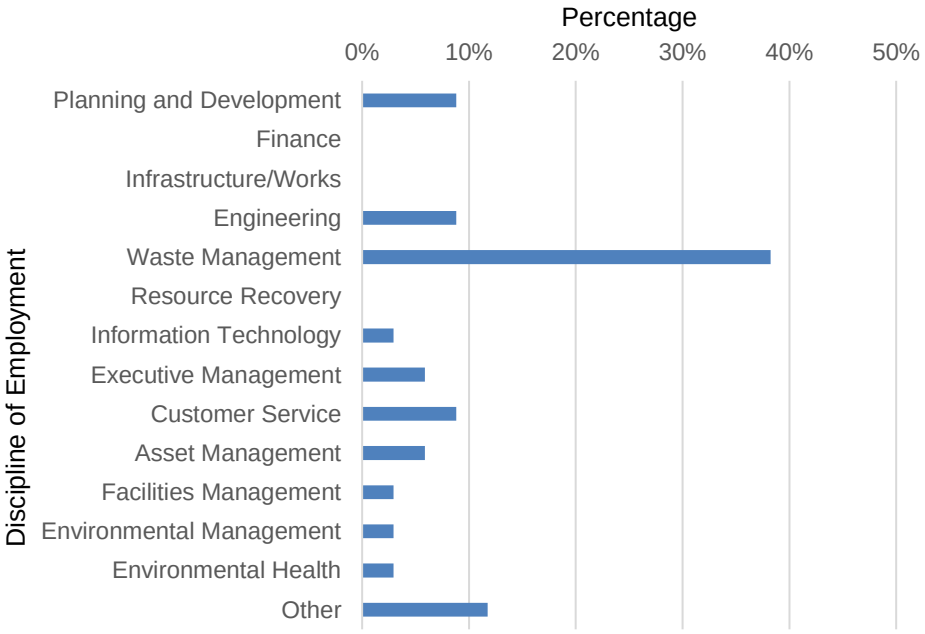


Figure 4-3 Participant Primary Discipline of Employment

Figure 4-4 shows approximately one quarter of participants indicated they had not previously read the WMRR Strategy. This question may have influenced participants to not continue the survey as participant numbers decreased by 32% following this question.

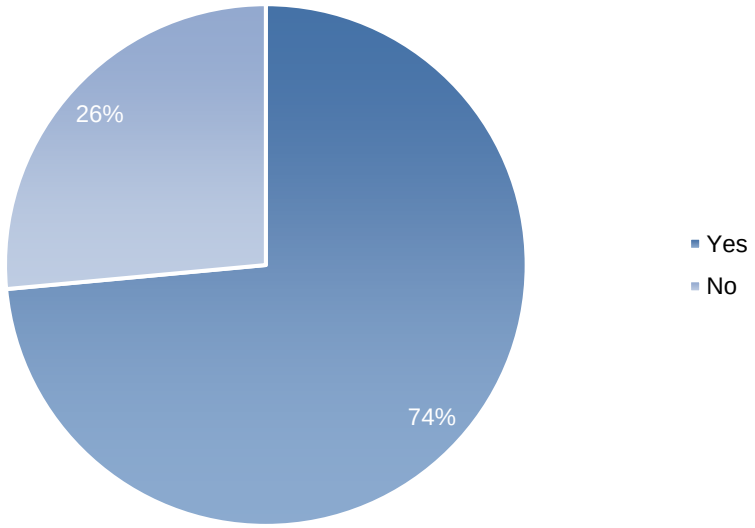


Figure 4-4 Participant Familiarisation with the WMRR Strategy

4.1.2 Risk Management

Participants were asked a series of questions to ascertain the position of LGs in identifying potential risks to business as usual with respect to the actions and targets assigned by the WMRR Strategy commencing on the 1 July 2019. There were 23 participant responses with results displayed in Figure 4-5. The majority of participants (91%) indicated their profession has a role to play in the transition to a CE. Sixty-one percent of participants indicated their LGs corporate plan goals and targets either did not align, or they were not sure if they aligned, with the WMRR Strategy goals and targets however, 74% believed their LG corporate plan includes opportunities to increase resource recovery. The majority of participants indicated a change management plan (86%) or working group (74%) had not been appointed to manage the whole of organisational change to a CE, although 70% indicated their organisation has made changes in day-to-day operations in the way waste is handled since the WMRR Strategy implementation.

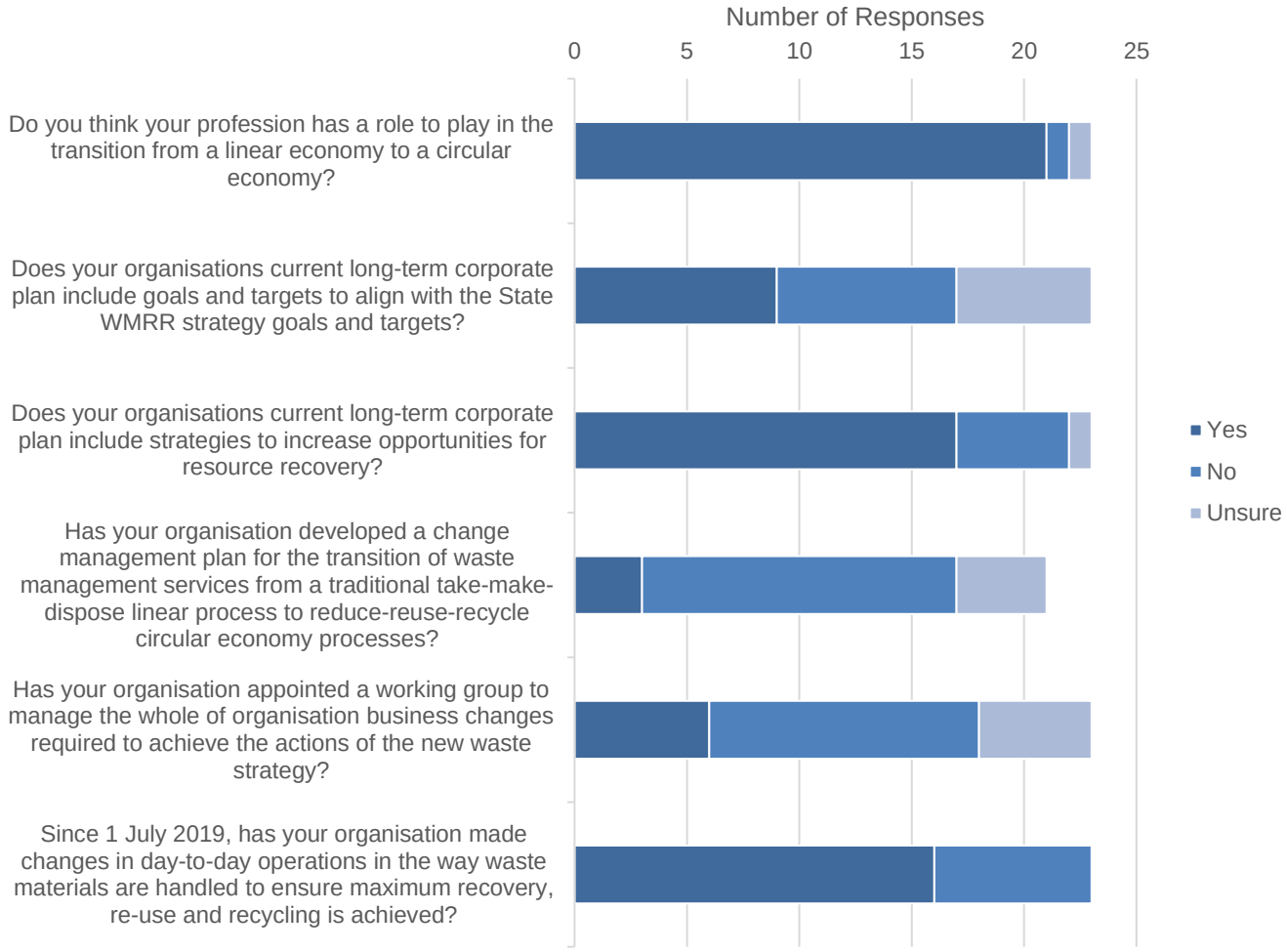


Figure 4-5 Risks to Business as Usual

Participants were asked to indicated if their organisation had considered each of the defined elements when assessing risks to the organisation in the transition from traditional waste management landfill disposal of waste to resource recovery and materials re-use. There were 22 participant responses. Results are presented in Figure 4-6. The top three risk related elements indicated that LGs have considered were level of compliance, environmental benefit or loss, and legal obligations. The least considered elements indicated were availability of trained and competent workers, impact on workforce numbers, and community consultation.

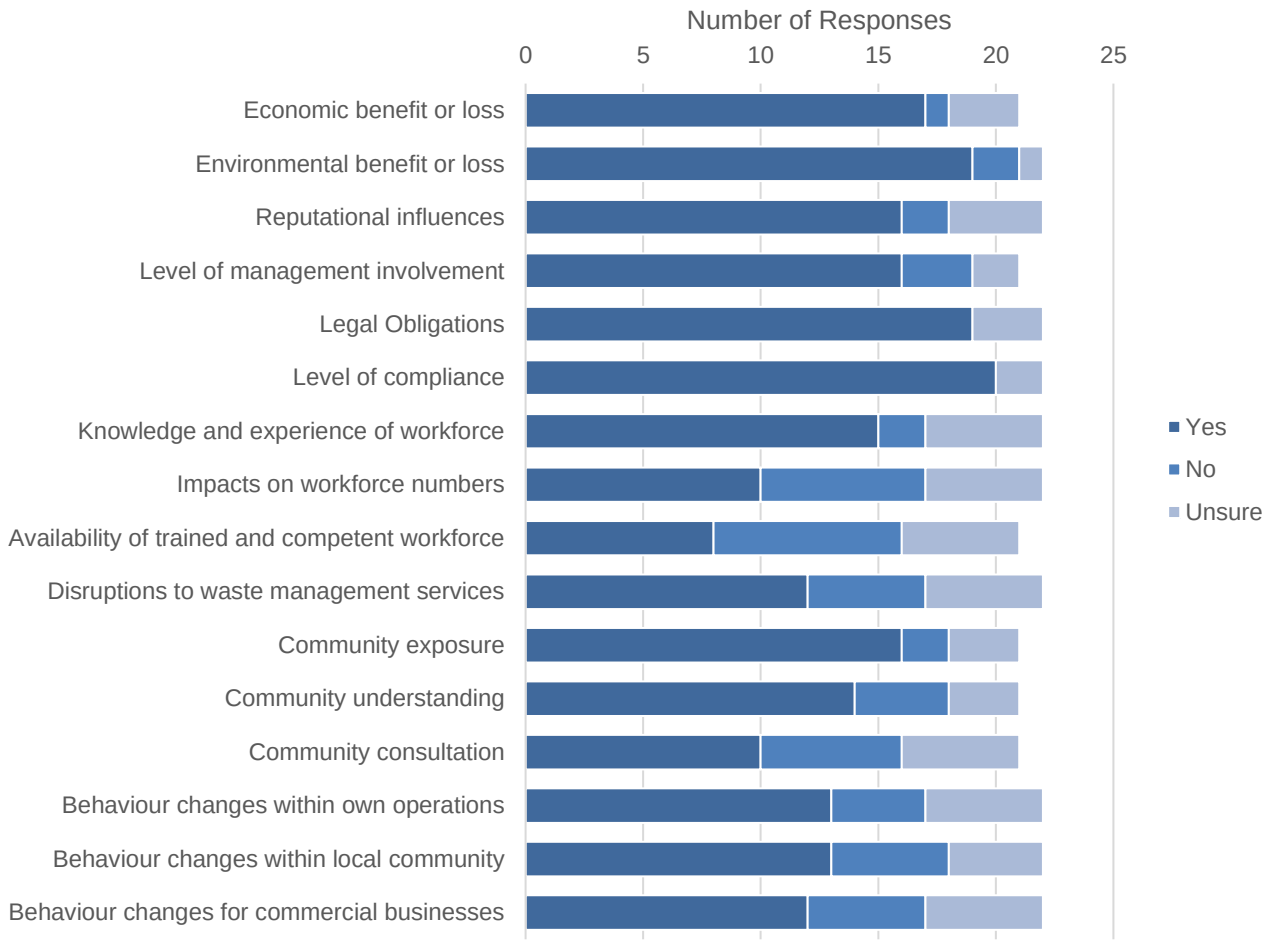


Figure 4-6 Risks to Transition Waste Disposal from Landfill

Participant responses to a number of statements to this question in the survey were excluded from this results section because they no longer conformed with the hypothesis of the research as the program advanced.

All participants who opted to continue the survey after the risk management section, completed the survey; with no further participants terminating for the remainder of the survey.

4.1.3 Procurement

Participants were requested to consider their organisations current procurement processes to indicate if all, some or none of the statements in Figure 4-7 were true. A response to each statement was not mandatory and there were no responses selected for “no” or “unsure”. The number of responses per statement varied between three and 16, therefore is appears participants only selected a response if they were in agreement with the statement selecting either yes (always) or yes (sometimes). The results provide an indicative portrait of procurement elements in support of a CE. Participants indicated their LG procurement process included consideration of future growth and sustainable long-term outcomes of a project and inviting innovative solutions to be presented in submissions most often, with consideration to virgin materials consumed and greenhouse gas emissions of a project the least considered element.

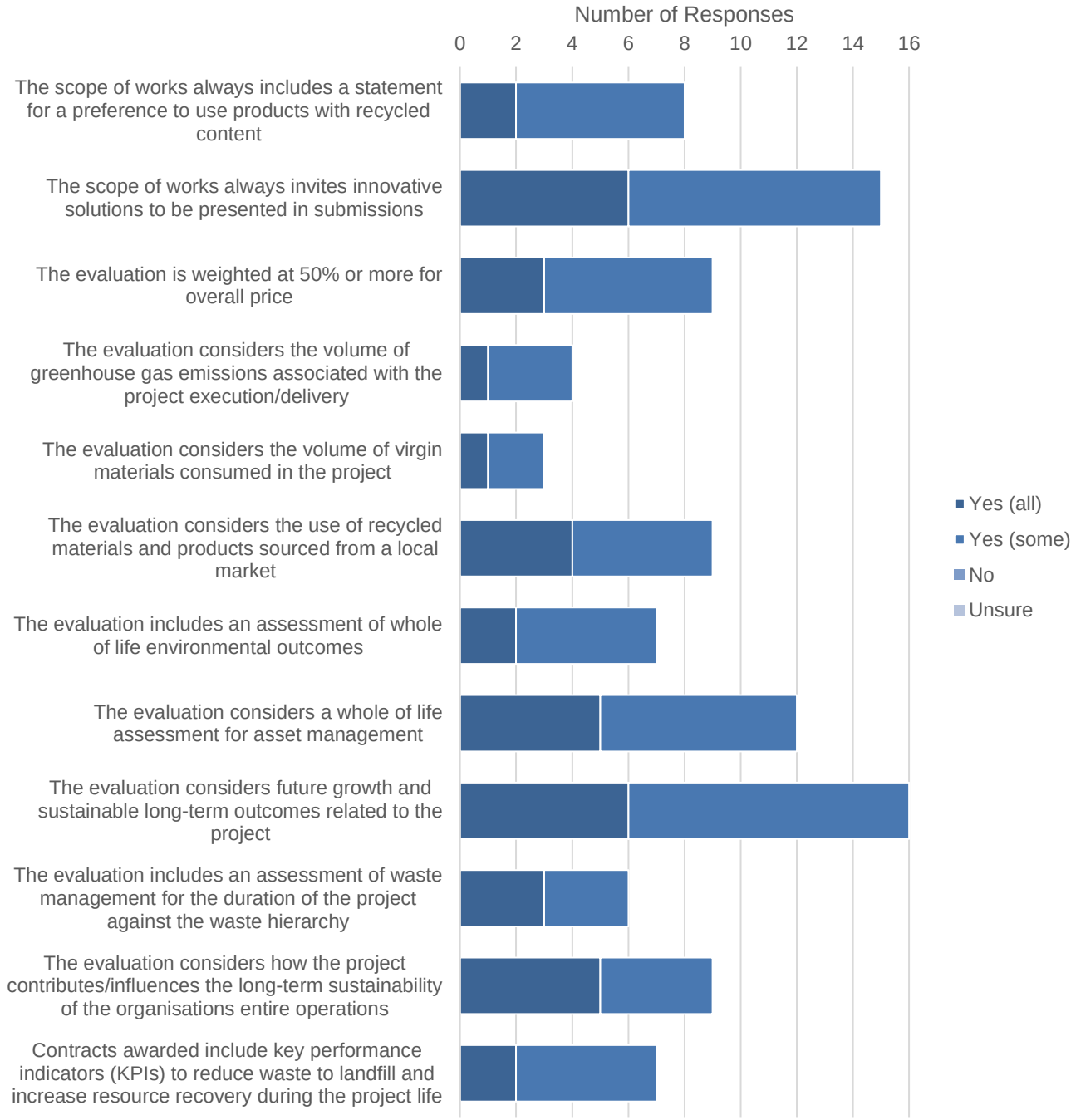


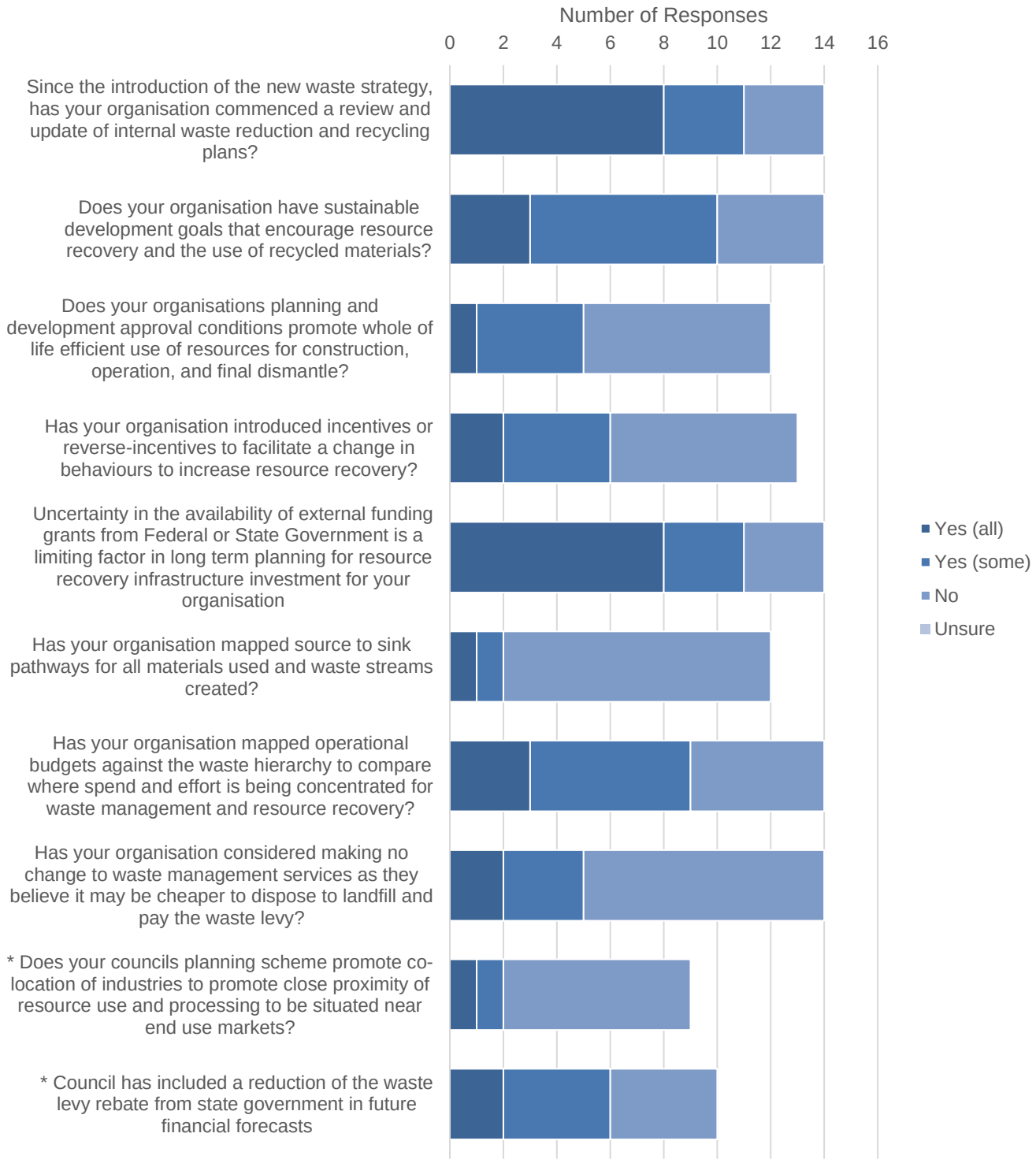
Figure 4-7 Procurement Related Content & Considerations

Participant responses to a number of statements to this question in the survey were excluded from this results section because they no longer conformed with the hypothesis of the research as the program advanced.

4.1.4 Organisational Planning

Participants were requested to consider their LGs organisational planning approaches to indicate if all, some or none of the statements in Figure 4-8 were true. There were no responses selected for “unsure”. The number of responses per statement varied between nine and 16. A response to each statement was not mandatory. Just over half of responses indicated the participants’ organisation

had reviewed and updated their internal waste strategy since the WMRR Strategy release. Some responses indicated participant organisations had considered not making any changes to waste management operations as it is considered cheaper to continue to landfill and pay the waste levy (than adopt CE operations). Three-quarters of responses indicated participant organisations have sustainable development goals to encourage resource recovery.



***** statements were to be considered in respect to the LG where participant lived.

Figure 4-8 Organisational Planning Approaches

Participant responses to a number of statements to this question in the survey were excluded from this results section because they no longer conformed with the hypothesis of the research as the program advanced.

4.1.5 Local Industry & Community

Participants were asked to consider the statements in Figure 4-9 in relation to the local industry and community where their LG is situated and indicate a response: strongly agree, agree, neutral, disagree, or strongly disagree. There were no responses for “agree” to any statements. Responding to each statement was not mandatory. The results provide an indicative portrait of local industry and community considerations for LG that can support successful CE development. The number of responses per statement varied between six and 15. Participants may have opted to not provide a response to a statement if they were unsure of their LG’s organisational viewpoint.

The majority of responses did not indicate that the service providers that participant organisations do business with have a good understanding of CE principles, providing a response of neutral or disagree. Four responses indicated participants strongly agree that businesses should be financially supported to invest in infrastructure for resource recovery and re-use. This increased to seven indicating they strongly agreed the State Government waste levy funds should be used for this purpose. Conversely, two responses indicated participants disagreed with businesses being financially supported in this scenario.

Just over a quarter of responses indicated participants strongly agreed that their LG is seeking partnerships with local businesses to achieve the WMRR Strategy targets however just under a fifth indicated they disagreed with the statement indicating their LG is not actively seeking partnerships with local businesses to achieve the WMRR Strategy targets.

Participant responses to a number of statements to this question in the survey were excluded from this results section because they no longer conformed with the hypothesis of the research as the program advanced.

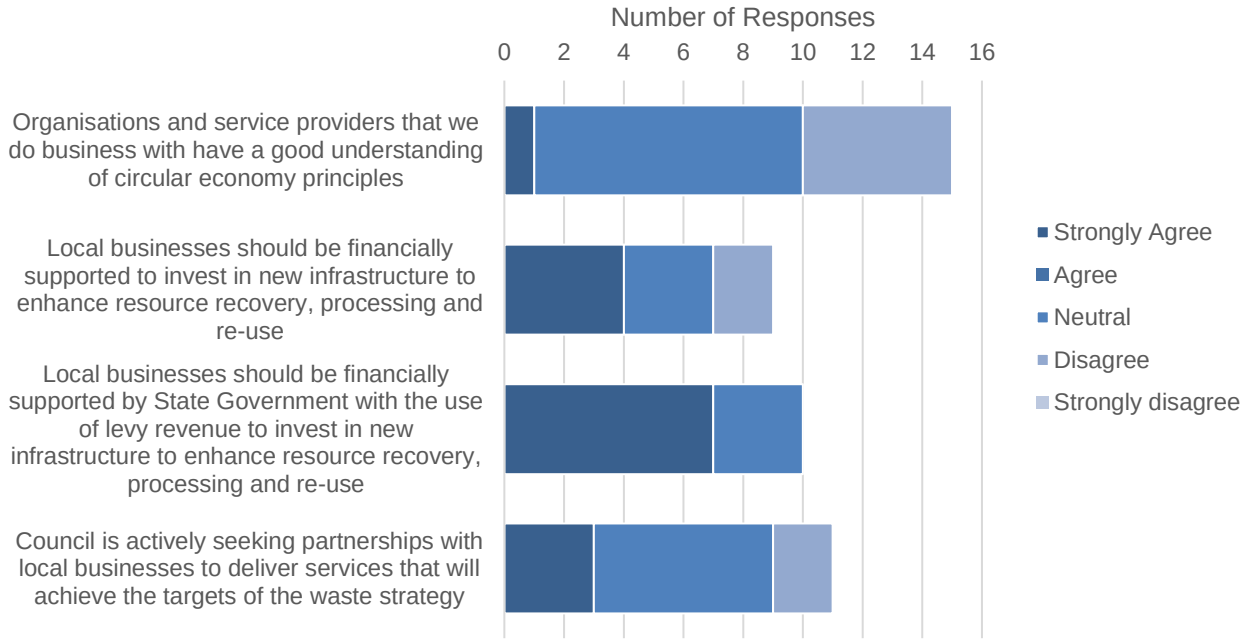


Figure 4-9 Local Industry & Community Reflections

Participants were asked to provide a response of yes or no to each statement, or maybe for the second statement only, in Figure 4-10. A total of 17 responses were received for each statement. Approximately three quarters of responses indicated participant organisations support local social enterprises with commercialised resource recovery concepts, and one quarter indicated they do not. Participants had the option to provide an additional free text comment on why social enterprises promoting resource recovery concepts may not be supported by their organisation locally. The following four responses were received:

- Hope to do so in future if suitable partner found, but barriers include property issues, leases, power, utilities, WHS, risks.
- Unsure.
- The concept is not effective in a rural environment. It costs the community and the benefits are minimal if any.
- Have not been offered an opportunity for consideration.

The majority of participants believed there is or might be benefit to a central point of contact for stakeholders to collaborate on CE matters, with one response indicating the participant does not believe there is benefit to this approach.

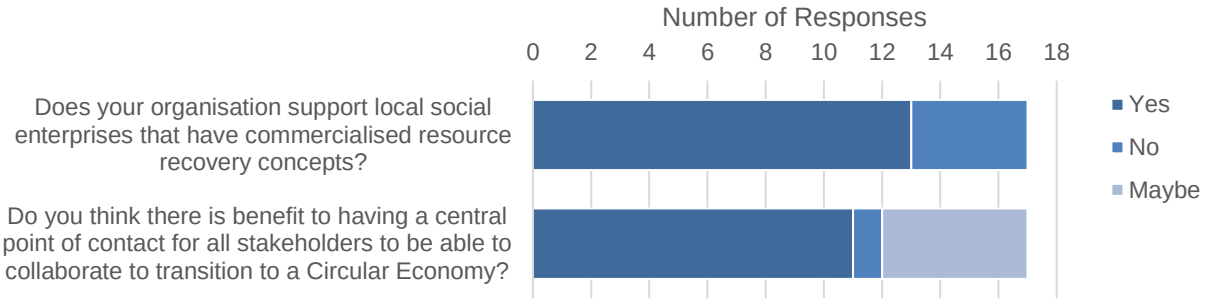


Figure 4-10 Participant Opinion on Social Enterprises

4.1.6 Management of Litter & Illegal Dumping

The WMRR Strategy Strategic Priority 1 focuses on reducing the impacts of waste on the environment and stipulates actions for LG on the management of litter and illegal dumping. Participants were asked to identify the top three challenges for their LG to manage litter and illegal dumping. A response to the question was not mandatory but 10 participants gave responses. Figure 4-11 displays the common themes identified by participants and Table 4-1 displays the codebook descriptions. Five key challenges emerged in the responses; that being cost, historic behaviours, insufficient resources, lack of awareness and no strategic plan.

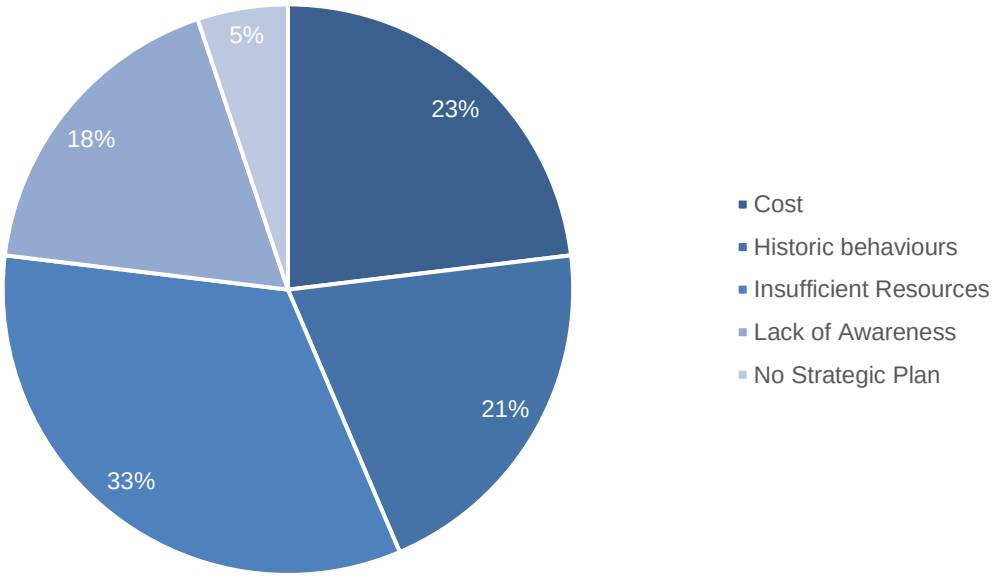


Figure 4-11 Challenges to Managing Litter & Illegal Dumping

Table 4-1 Codebook Descriptions: Litter & Illegal Dumping

Name	Description
Cost	High disposal and clean-up costs.
Historic Behaviours	Public and corporate behaviour / attitude towards litter management.
Insufficient Resources	Lack of availability of resources to manage and enforce.
Lack of Awareness	Lack of knowledge and awareness of litter and illegal dumping.
No Strategic Plan	No method of prioritising a strategy to address litter and illegal dumping.

Participants were asked to share how their LG promotes waste avoidance, via a free text response. Seventeen responses were received, with three responses limited to *'yes'* to indicate promotion of waste avoidance occurs at the LG however, participants did not elaborate further to include specific details of the types of promotion. Two participants indicated they were unsure if any waste avoidance promotion was conducted by their LG. The 12 remaining responses indicated a range of dynamic education efforts. Responses have been summarised in Figure 4-12 according to level of effort and Table 4-2 displays the codebook descriptions. Responses that indicated waste avoidance is promoted but did not elaborate on details were classified as minimal effort. Three quarters of responses indicated a medium or minimal effort to promoting waste avoidance is undertaken by participant LGs. Maximum effort was indicated as occurring least frequently with no effort indicated three times more likely.

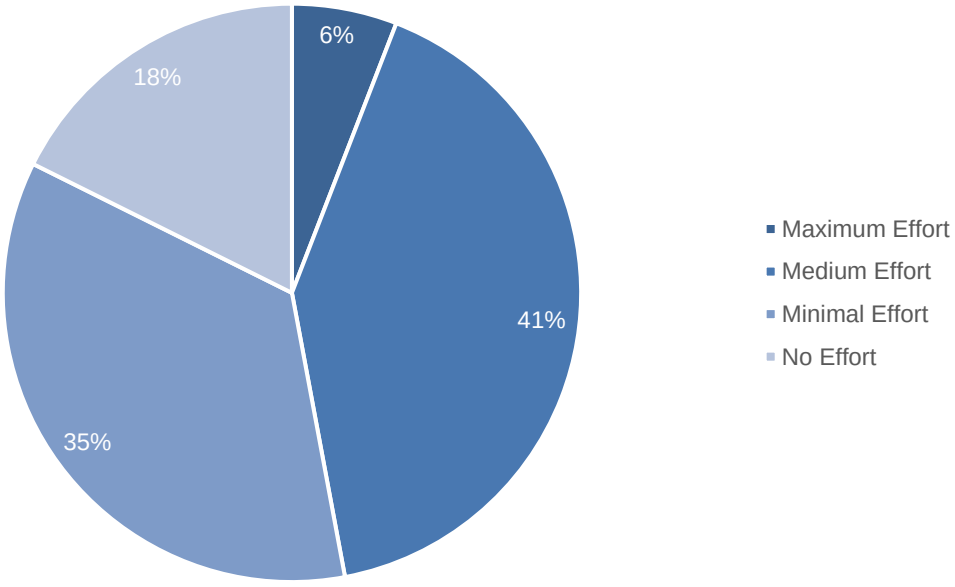


Figure 4-12 Level of LG Effort for Promoting Waste Avoidance

Table 4-2 Codebook: Promotion of Waste Avoidance

Name	Description
Maximum Effort	Interactive learning framework including dedicated resources (staff or infrastructure) to promote waste avoidance.
Medium Effort	Digital media such as television or radio or use of disposal fee.
Minimal Effort	Print and social media only - e.g., Facebook, website, newsletter articles, leaflets, rates notices.
No Effort	Respondent indicated no effort or not aware of any waste avoidance promotion.

4.1.7 Other Barriers & Challenges

Survey participants were given an opportunity to provide a free text response for any barriers or challenges they have experienced that were not captured by the survey content but that they felt was relevant.

Eight responses were received as follows (refer to Glossary of participant terms in Section 4.1.8 for acronym meanings).

- Shortage of skilled and knowledgeable experts, and lack of adequate funding for innovative solutions.
- Disconnect between government agencies - DSDMIP, DES, Local Govt [Government].
- Waste and its management is not an issue for us, there is no issue with regard to space to landfill and the markets for recycling are too distant to make it viable.
- Change management takes a while so your survey may not pick up on concept work under discussion or confidential procurements [*sic*] being undertaken at present. A follow up survey in say 3 years' time could give useful insight into progress against state direction. Regional collaboration also requires a long-term planning horizon.
- CoEx are a significant influencer and disruptor to LG recycling arrangements (gate fees) they have shown little interest in developing regional circular economies.
- The introduction of the CRS has resulted in very low demand for many of the traditional products recovered through a MRF. There is nil commodity value in glass recovered through a MRF, for example. This has resulted in large stockpiles of glass and nowhere to send it.
- There is a general lack of knowledge/understanding about what circular economy is and how residents can make a difference at their individual household level. We need to be careful that we don't expect residents to run before they can walk in this space.
- The challenge is to implement and not to have the ratepayer to pay more through their rates. It must be at the point of purchase, not at the end of pipe.

Participants responded to survey questions regarding product stewardship programs and central CE collaboration platforms however the results did not directly provide insight into barriers for LGs. These responses were therefore not presented or discussed.

4.1.8 Glossary of Participant Terms

Participants used several acronyms in responses to open-ended questions in the survey. A description of the acronyms is explained in Table 4-3 for those that are not included in the Terms and Definitions.

Table 4-3 Glossary of Participant Used Acronyms

Acronym	Term	Definition
CoEx	Container Exchange	Refers to the Product Responsibility Organisation for the Containers for Change Program (COEX Container Exchange 2021).
CRS	Container Refund Scheme	Refers to the *Planning (Container Refund Scheme) Amendment Regulation 2018* (Qld.) program operated by COEX known as Containers for Change (formerly Container Refund Scheme) i.e., return an eligible empty drink bottle for a refund (Containers for Change 2020).
MRF	Material Recovery Facility	A facility that sorts and processes materials collected for recycling (Blue Environment 2020, p. viii).

4.2 Workshop Observations

The purpose of the workshop activity was to observe participant experiences in solving a real-world challenge with a CE solution. Observations made during the workshop delivery and examination of the group task output included:

- **Some participants requested extra time to complete each task.** Extra time was not granted due to the time restrictions for the delivery of the workshop, and time permitted for each workshop activity was consistent with the Circular Design Guide recommendations. Restrictions on time may have contributed to limitations on creative outputs however, measure of creativity was deemed immaterial for the purpose of this research and will not be discussed further.
- **Generally, the most effortless responses for participants were observed in the ‘Asset’ task**. In this task, participants were asked to consider and identify the most valuable assets and key capabilities for their organisation. The broad range of responses demonstrated diversity and started the conversation toward benefits and opportunities of the assets in later workshop tasks.
- **Some participants struggled to identify and define their organisations key strengths.** The superpower card activity required participants to compose a written account of their organisations:
    a) purpose and what they do

b) valuable assets and key capabilities
c) by-products generated (i.e., waste) by the business and elements with surplus or underutilisation
d) role in the wider ecosystem, who and what they influence and value chains to which they are a significant contributor.

Generally, participants who were direct employees of LG organisations often required a verbal prompt, line of enquiry or specific example to be provided to embark on each task and had a tendency to identify elements associated to their field of work and responsibilities, as opposed to the entire organisation. In comparison, participants who were employees of organisations other than LG (e.g., private industry, consultancies or universities) were able to enumerate these particulars with a wider appreciation across their whole organisation and with minimal intervention.

- **Group discussions often included dialogue of barriers.** The challenge card task required participants to determine a solution to a specific scenario employing the key strengths identified in an earlier task. Participants were observed discussing barriers and obstacles to proposed solutions in the quest to resolve the challenge presented. It is therefore hypothesised that to find a solution to a problem, you need to understand the challenges to be able to address and overcome them.
- **Some participants required reassurance that 'outside of the box' thinking and suggestions were acceptable**. There was no right or wrong answer to the challenge card task however, some participants (all LG employees) seemed to think there was a specific answer being sought and required reassurance that any and all ideas for solutions to the challenge card scenarios were considered acceptable and correct; and that they could apply those ideas to the solution without seeking approval to do so.
- **There was an obvious 'turning point' in participant character.** Some of the participants' attitude and behaviour towards the initial tasks had a pessimistic outlook, however there was a very distinctive and noticeable turning-point or light-bulb moment where pessimistic sentiments were no longer observed and a wholistic all-encompassing positive approach of 'we can actually do this' was observed with all of the groups. It was as if the initial task outputs effectively came together for participants and at that moment it had meaning and relevance as the challenge task solution evolved.
- **All groups, irrespective of participant demographics, successfully delivered a circular designed solution to a real-world challenge utilising their organisations attributes.** The creative outcomes of the group output and presentations demonstrated how a CE could work and allowed an opportunity for participants to see options available to them locally.
- **Similar task outputs were developed by multiple groups.** The workshop activity output was to develop a CE solution to a real-world challenge. Four of eleven groups (or 36%)

developed similar solutions by designing a collaborative hub/platform whereby organisations could utilise the waste/underutilised products of other organisations in order to provide a benefit.

- **Many participants provided positive feedback on the networking opportunities the workshop activity offered**. There were obvious limitations regarding what could be developed in a two-hour workshop however, it provided an opportunity to establish the CE concept and how it could be applied. The two-hour workshop activity was intentionally selected but it is worth noting a 12-month workshop program is also available through the Circular Design Guide and may be more suitable for organisations seeking to authentically undertake a similar exercise.

Limitations in the observations noted of the workshop delivery included:

- All participants had an affiliation with the host organisations, the Local Authority Waste Management Advisory Committee (LAWMAC) and Townsville City Council (TCC). LAWMAC promotes best practice sustainability and waste management solutions (LAWMAC 2020). TCC are located in North Queensland and extended an invitation to their goods and service providers with an interest in the area of study. Therefore, task outcomes and challenges may have been different if participant demographics were changed. For example: if people with robust waste management knowledge were excluded from participating.
- Participants at the rear of the room advised approximately one-third through the workshop activity that they could not hear instructions well and were not sure what to do. Once identified, this was addressed promptly to ensure all participants were equitably provided instructions. The difficulty in hearing may have influenced the observations noted, however, the observations noted were generally consistent throughout all workshop groups and not limited to the groups located in the area of the room where the participants indicated they could not hear instructions well.
- Over 60% of the workshop groups identified procurement as a mechanism of strength.
- There were no CE solutions proposed at the top of the waste hierarchy to eliminate or reduce material use, rather the solutions focussed on reuse and recycling of materials.

The workshop output of each individual group is presented in Appendix F.

4.3 Interviewee Experienced Barriers

There was very low interest and uptake of the invitation to survey participants to participate in a more in-depth interview. One person accepted the invitation to take part in an interview. The interview was undertaken on the 12 March 2020 via telephone. The full interview transcript is

presented in Appendix G. The participant indicated the key challenges and barriers they are facing in being able to achieve the actions of the WMRR Strategy were:

- Resource limitations (both physical and human resources)
- Lack of a closed loop (meaning limited end markets and uses for materials diverted from landfill)
- Limited planning mechanisms.

4.4 Corporate Documents Interrogation

The corporate plan and operational plans for the 2019/20 and 2020/21 financial year (FY) for each of the 39 LGs in the waste levy zone of Queensland were interrogated to explore the influence of the WMRR Strategy and in doing so, seek to identify CE barriers to progress the WMRR Strategy LG assigned actions and targets.

4.4.1 Waste Management & Resource Recovery (WMRR) Strategy Content

Key terms and content reflective of the WMRR Strategy actions and targets, including CE themes, were used to search the content of the LG corporate documents. The search results are presented in summary in Table 4-4 with descriptive observations provided in Sections 4.4.1.1 to 4.4.1.16.

Table 4-4 Corporate Document Search Term Results

Search Term	Document	Local Government																																				Total	
		Banana Shire Council	Brisbane City Council	Bundaberg Regional Council	Burdekin Shire Council	Cairns Regional Council	Cassowary Coast Regional Council	Central Highlands Regional Council	Charters Towers Regional Council	City of Gold Coast	City of Ipswich	Douglas Shire Council	Fraser Coast Regional Council	Gladstone Regional Council	Goondiwindi Regional Council	Gympie Regional Council	Hinchinbrook Shire Council	Isaac Regional Council	Livingstone Shire Council	Lockyer Valley Regional Council	Logan City Council	Mirarnoo Regional Council	Mareeba Shire Council	Moreton Bay Regional Council	Mackay Regional Council	Mount Isa City Council	North Burnett Regional Council	Noosa Shire Council	Redland City Council	Rockhampton Regional Council	Scenic Rim Regional Council	Somerset Regional Council	South Burnett Regional Council	Southern Downs Regional Council	Sunshine Coast Council	Tablelands Regional Council	Toowoomba Region	Townsville City Council	Western Downs Regional Council	Whitsunday Regional Council	TOTAL (mentioned)	TOTAL (performance measurement)
"waste management and resource recovery strategy"	Corporate Plan																																					0	0
	Operational Plan 2019-20								X																			X											3	2
	Operational Plan 2020-21																											X											1	1
"Waste Strategy" Internal LG document	Corporate Plan																																					4	0
	Operational Plan 2019-20	X	X					X		X							X	X					X				X	X		X				X			X	12	12
	Operational Plan 2020-21	X			X			X									X	X					X						X	X					X		X	11	11
"Waste Strategy" State document	Corporate Plan																																					1	0
	Operational Plan 2019-20																																					2	0
	Operational Plan 2020-21																																					2	0
WMRR Strategy 2050 Targets	Corporate Plan																																					0	0
	Operational Plan 2019-20																																					0	0
	Operational Plan 2020-21																												X									1	1
Collaborate*	Corporate Plan																											X										30	1
	Operational Plan 2019-20																											X	X		X					X		31	4
	Operational Plan 2020-21																	X										X			X							30	3
Partner*	Corporate Plan											X							X									x										27	3
	Operational Plan 2019-20																											x										27	1
	Operational Plan 2020-21																											x									x	25	2
Illegal Dumping	Corporate Plan										X																											1	1
	Operational Plan 2019-20			X	X	X	X											X																					7	5
	Operational Plan 2020-21			X	X	X	X				X	X									X		X									X							13	8
Litter*	Corporate Plan										X																												4	1
	Operational Plan 2019-20																																						10	0
	Operational Plan 2020-21																																					X	9	1
Resource Recovery	Corporate Plan		X			X													X	X									X										10	5
	Operational Plan 2019-20							X																																12	1
	Operational Plan 2020-21					X		X			X						X			X									X		X						X		13	8
"reduce household waste"	Corporate Plan																																					0	0
	Operational Plan 2019-20																																					0	0
	Operational Plan 2020-21																																					0	0
Landfill*	Corporate Plan																																					17	-
	Operational Plan 2019-20																																					27	-
	Operational Plan 2020-21																																					25	-
Close Landfill	Corporate Plan															X																						1	1
	Operational Plan 2019-20																																					0	0
	Operational Plan 2020-21											X											X																2	2
New Landfill/Landfill Cell	Corporate Plan			X																																		1	1
	Operational Plan 2019-20							X												X		X									X				X				5	5
	Operational Plan 2020-21									X																				X		X					X			4	4
Rehabilitate/Improve Landfill	Corporate Plan		X	X																																X			3	3
	Operational Plan 2019-20		X		X		X			X							X	X	X												X				X	X			10	10
	Operational Plan 2020-21		X		X		X										X	X										X	X		X								8	8
Reduce/Divert Waste from Landfill	Corporate Plan																		X															X					8	2
	Operational Plan 2019-20													X																							X		X	11	3
	Operational Plan 2020-21					X					X																			X	X					X		X	13	6
Circular Economy	Corporate Plan																																					1	0
	Operational Plan 2019-20																																					2	0
	Operational Plan 2020-21																																					3	0
Zero-waste	Corporate Plan		X											X																									2	2
	Operational Plan 2019-20													X																									2	1
	Operational Plan 2020-21																																					2	0
SDG* (12 - CE) sustainable development goal*	Corporate Plan																																					0	0
	Operational Plan 2019-20																																					0	0
	Operational Plan 2020-21																																					0	0
Education^	Corporate Plan		X									X							X				X						X					X			X		7	7
	Operational Plan 2019-20		X		X			X		X							X	X				X							X	X							X		10	10
	Operational Plan 2020-21		X		X		X	X		X		X	X	X			X				X								X	X				X		X			15	14

Legend		
		Search term mentioned in document
	X	Specific performance measurement nominated
	*	Includes term truncation (e.g. litter* = litter, litters, littering, littered, etc.)
	^	Directly linked to waste or resource recovery matters

4.4.1.1 The "WMRR Strategy"

The WMRR Strategy was not mentioned by its name in full in any corporate plans. This was not unexpected as the WMRR Strategy was released after most of the corporate plans were adopted. One LG included an explanation of the 'State Waste Strategy' in their corporate plan.

In the 2019/20 operational plans, 13% of LGs mentioned the WMRR Strategy by its name in full or as the 'State Waste Strategy', and 5% included a specific performance measures linked to the WMRR Strategy.

In 2020/21 7% of LGs referred to the WMRR Strategy by its full name or as the 'State Waste Strategy' in their operational plan. One LG (2.5%) included a specific performance measure linked to the WMRR Strategy. This is a reduction in the inclusion of references to the WMRR Strategy and associated performance measures in LG operational plans compared with the previous FY.

4.4.1.2 "Waste Strategy" Internal LG Document

Ten percent of LGs referred to an internal waste strategy in their corporate plan, with none of those assigning a performance measure.

Approximately 18% of LGs referred to an internal waste strategy with a specific performance measure nominated in both operational plans and a further 23% of LGs were represented in one FY only.

Fifty-one percent of the LGs did not mention a waste strategy in any documents.

The results of this search term excluded reference to 'Waste Management Plan' documents as the term *plan* was considered to reference a document that details how a *strategy* is executed.

4.4.1.3 WMRR Strategy 2050 Targets

The WMRR Strategy has three Targets it aspires to achieve by 2050 (refer to Table 1-2). Rockhampton Regional Council were the only LG to directly include one of the WMRR Strategy Targets, that being to divert 90% of waste from landfill by 2050, in the 2020/21 operational plan; documented in the performance plan for the Waste and Recycling Department. All other LGs were silent on the three defined WMRR Strategy targets.

4.4.1.4 Collaborate and Partner**

The generic term 'collaborate' and it's stemmed derivatives (e.g. collaborating) featured in 76% of LG corporate plans and the 2020/21 operational plans, and 79% of the 2019/20 operational plans. The term 'partner' was considered synonymous with collaborate* and used as an additional search term to identify these instanced. Results indicated almost 70% of LGs mention the generic term 'partner' in their corporate plans and 2019/20 operational plans. This dropped slightly to just under

65% in the 2020/21 operational plans. Each LG mentions collaborate* or partner* in at least one document, with just over half using the term in all three documents.

Ten percent of corporate plans and 13% of 2019/20 and 2020/21 operational plans established a waste specific collaborative performance measure.

All terms or references to collaboration and partnerships may not have been exhaustive in this search owing to the terms use broadly in LG documents, however this provides a general indication that waste specific performance measures of this nature were not established in the majority of documents.

One LGs corporate plan contained generic references for collaboration and partnerships. This was the only search term that particular LG featured a result. Their corporate and operational plans were otherwise silent for all other CE and waste related terms searched.

*4.4.1.5 Illegal Dumping and Litter**

One corporate plan mentioned illegal dumping and nominated a performance measure.

There was an increase from 18% to 31% of LGs that mentioned Illegal Dumping in operational plans for 2019/20 to 2020/21 financial years. Specific Illegal Dumping performance measures also increased from 13% to 21% respectively. These observed increases may have been influenced by the WMRR Strategy SP1 assigned actions. One LG that nominated a performance measure in 2019/20 did not nominate one in 2020/21 FY, the remainder included in both financial year operational plans. Three quarters of the LGs with Illegal Dumping performance measures nominated were located in regional Queensland.

Forty-nine percent of the LGs do not mention Illegal Dumping or Litter in all three documents.

Ten percent of LGs mention Litter in their corporate plans; with one establishing a specific performance measure and one LG identifying Litter in the corporate plan but not in either FY operational plans. All 10% were located in South East Queensland with none of the regional LG's mentioning Litter in corporate plans.

A quarter of LGs mentioned Litter in operational plans in each FY, with one LG nominating a performance measure in 2020/21 only. Five LGs mentioned Litter in one FY only, and seven LGs mentioned it in both FY operational plans.

4.4.1.6 Resource Recovery

One quarter of the LGs included resource recovery in their corporate plan with half of those establishing a performance measure.

Approximately one third of LGs mentioned resource recovery in the 2019/20 and 2020/21 operational plans. There was an increase from one LG in 2019/20 to eight LGs in 2020/21 to nominate specific performance measures in the operational plan. This represents almost a 20% increase and may indicate an influence by the WMRR Strategy and waste levy implementation.

4.4.1.7 "Reduce Household Waste"

None of the LG corporate plans or operational plans refer to the WMRR Strategy term "reduce household waste".

*4.4.1.8 Landfill**

The word Landfill* was featured in approximately 45% of corporate plans, 75% of 2019/20 operational plans and 65% of 2020/21 operational plans. A breakdown of relevant use of the term is discussed in Sections 4.4.1.9 to 4.4.1.12.

Thirteen percent of LGs did not mention landfill in any of their documents. One (2.5%) LG mentioned landfill in the corporate plan only and 25% of LGs mentioned it only in operations plans. Twenty-eight percent of LGs mentioned landfill in one FY operational plan, not both. There was a 5% reduction in the use of landfill in 2020/21, after the WMRR strategy release, compared to the previous FY.

4.4.1.9 Close Landfill

With respect to specific reference to the closure of a landfill, only one corporate plan and two operational plans in 2020/21 mentioned and had specific performance measures. There were no mentions in the 2019/20 operational plans.

4.4.1.10 New Landfill / Landfill Cell

Plans for new landfills or landfill cells with specific performance measures were observed in one (2.5%) corporate plan, and just over 10% of the operational plans in each FY, although at different LGs except for one which mentioned plans for a new landfill in both operational plan FYs.

Most references were for expansions of existing landfills and developing new landfill disposal cells. There were more plans observed in the documents for developing new landfills than closing landfills over the research period.

4.4.1.11 Rehabilitate / Improve Landfill

One LG only mentioned and had performance measures in all three documents for the rehabilitation or improvement of landfills. Approximately 7.5% of corporate plans, 25% of operational plans in 2019/20 and 20% of operational plans in 2020/21 mention and have performance measures for the rehabilitation and improvement of landfills, equivalent to a 20% reduction following the WMRR Strategy implementation.

Thirteen percent of LGs mention rehabilitating or improving landfills in both FY operational plans and 15% of LGs mention it in only one year. Rehabilitation and improvement of landfills featured twice as much as closed or new landfills across all three documents but represents about 20-25% of LGs with recognition of the need to do this in their strategic documents.

4.4.1.12 Reduce / Divert Waste from Landfill

Twenty percent of LG corporate plans discussed a desire to divert or reduce waste disposed to landfill and 5% had a specific performance measure against that desire. Approximately 30% of LGs discussed a desire to divert or reduce waste to landfill in the operational plans with a 5% increase between 2019/20 and 2020/21 (or two additional LGs). The number of LGs assigning a specific performance measure doubled between 2019/20 and 2020/21 from 7.5% to 15% of LGs however this remains relatively low in consideration of the WMRR Strategy desire to use landfill as a last resort for waste disposal. Five percent of LGs included diverting or reducing waste in all three documents. A desire to reduce or divert waste from landfill was not expressed by 49% of LGs.

4.4.1.13 Circular Economy

The term CE featured in one (2.5%) corporate plan, with no performance measure established. Five percent of LGs mentioned CE in both operational plan years with an additional LG taking it to 7.5% in 2020/21. This demonstrated relatively little change or influence of the WMRR Strategy implementation and its Strategic Priority 2 to transition to a CE over the research period.

4.4.1.14 Zero-waste

Only three LGs mention zero-waste in a corporate or operational plan as follows:

- One LG had a performance measure in the corporate plan and 2019/20 operational plan but it had been removed from the 2020/21 operational plan.
- One LG referred to zero-waste in the corporate plan and the 2019/20 and 2020/21 operational plans. That particular LG is largest by population in Queensland with its operations certified as carbon neutral under the *National Carbon Offset Standard for Organisations.*
- One other LG featured zero-waste in the 2020/21 operational plan only. This reference was a mission statement of the Rockhampton Regional Council waste department and reflected the WMRR Strategy target date by stating ‘we will become a *“zero-waste”* community by 2050, diverting 90% of waste from landfill*’*.

None of the LG corporate documents reflected the Local Government Association Queensland (LGAQ) target date of 2035 to achieve zero-waste to landfill.

4.4.1.16 Sustainable Development Goal (SDG)*

Sustainable Development Goals were not mentioned or referenced in any LG corporate or operational plans.

4.4.1.17 Education

Approximately 18% of LG corporate plans discuss education related to waste and resource recovery matters, and approximately 25% of the 2019/20 and 36% of the 2020/21 operational plans, indicating an increasing trend however, 51% of LGs are silent in all three documents on waste related education and 5% only have it included in all three docs. Approximately 18% of LGs had education in both FY operational plans.

For two LGs with waste related education included in their corporate plan, the term was not included in either FY operational plans. The remaining five LGs who included the term in their corporate document also included it in their operational plans at least in one FY (three LGs) or both (two LGs).

Two LGs who had education included in their 2019/20 operational plan did not include it in the 2020/21 operational plan. Only one LG included discussion on waste education in the 2020/21 operational plan without a performance measure nominated.

Two other search terms (“landfills” and “waste strategy”) had consistent levels of LGs mentioning and applying a performance measure in their corporate documents.

4.4.2 Other Notable Observations

Overall, 13% of LGs did not nominate a single performance measure in corporate or operational plans for the search terms. With the exception of one LG (for the search term *collaborate*), all LGs had at least one waste/CE related search term included in at least one of the documents.

The search term results did not demonstrate a relationship or influence of the size and geographic location of a LG and the extent to which the WMRR Strategy had influenced their corporate programs in the first year of implementation. Instead, there was a broad and varied pace of adoption observed across all LGs within the scope of the research. Larger sized LGs were slightly more likely to have used the search terms more often than smaller sized LGs; although the number of performance measures nominated for a search term did not appear to be influenced by or representative of how often a search term was used.

The presentation of corporate documents varied significantly between LGs from a one-page corporate plan document to a 334-page operational plan (2019-20) document.

Quality control of the LG documents also varied broadly. Some LG documents reflected the following:

- The document was labelled as a draft despite being formally adopted by the LG.
- Many did not include a version or date of issue or review information.
- Some operational plans did not change wording or had minimal wording changes between the two FYs.
- At least two different LGs had identical word-for-word text in their plans.
- The 2020-21 Operational Plan for one LG did not have a document title, author details or an organisational logo to identify the document, however the document has been recorded in Appendix E attributed to the LG where it was sourced and by the weblink name used on their website.

Approximately one third of LGs had the current FY operational plan only available on their website, the remaining two-thirds mostly had the previous four FY operational plans available on their website, in addition to the current FY. One LG did not have an updated operational plan for 2020/21 available on their website.

4.4.3 Limitations of Search Results

Spelling errors were observed which presented a limitation for the research project using text searches that relied on accuracy of spelling. Where spelling errors were identified and observed to impact the NVivo 12 software search results, they were manually added to the results table. There is no guarantee all spelling errors were found and accounted for. For example: *waste Smanagement* [*sic*] *strategy* was observed in a 2020/21 operational plan.

Nomenclature varied between LGs and was not consistent with the WMRR Strategy terms, as a result, terms searched may not have been identified although every effort was made to search variations of terms in order to identify the nominated search term. For example, several search terms were checked for reference to the WMRR Strategy in order to account for LGs referring to the document by different naming conventions.

4.4.4 Vision Statement Aspirations

The vision statement of each corporate plan was assessed for themes consistent with the Ellen Macarthur Foundation (EMF) (2015, p. 13 & 2017a, p. 7) suggestion that a CE vision needs to be embedded across all business functions to successfully progress to a CE. Table 4-5 and Figure 4-13 present the vision statements and most frequently used terms identified.

Table 4-5 LG Vision Statements

Local Government	Corporate Plan Vision Statement	Theme		
		Circularity	Sustainable	Innovate
Banana Shire Council	Shire of Opportunity* (BSC 2019).			
Brisbane City Council	Brisbane Vision 2031 is Council's long-term community plan for the city. The main priorities for the plan are to maintain and improve the quality of life for the Brisbane community and ensure Brisbane meets the liveability and sustainability opportunities for the future.		Y	
Bundaberg Regional Council	To build Australia's best regional community.			
Burdekin Shire Council	The Burdekin Shire Council is committed to working with the community to create an inclusive, welcoming and healthy environment that offers a high quality of liveability for residents that is underpinned by a productive and diverse economy.			
Cairns Regional Council	We will: Value our natural environment, lifestyle and surroundings. Support and respect distinctive and vibrant communities.			
Cassowary Coast Regional Council	"…..Better together…."			
Central Highlands Regional Council	A progressive region creating opportunities for all.			
Charters Towers Regional Council	Exceptional Service for an Exceptional Community* (CTRC 2021).			
City of Gold Coast	Inspired by lifestyle. Driven by opportunity.			
City of Ipswich	Our vision, looking forward 20 years, is that people are emotionally connected with a strong sense of belonging and pride in the City. Jobs growth keeps pace with population growth. The City's rate of employment is higher than the Queensland average. Urban development has maximised the opportunities to use public and active transport.			
Douglas Shire Council	A unique, beautiful and sustainable Shire with a connected and inclusive community, thriving economy and deep commitment to protecting the environment for future generations, while honouring our past.		Y	
Fraser Coast Regional Council	N/A			
Gladstone Regional Council	Connect. Innovate. Diversify.			Y
Goondiwindi Regional Council	To strengthen our thriving regional lifestyle and prosperous economy.			
Gympie Regional Council	To be the natural choice to live, work and play.			
Hinchinbrook Shire Council	To strengthen our vibrant regional lifestyle and prosperous economy by growing the population of and opportunities for the Hinchinbrook Shire.* (HSC 2020).			
Isaac Regional Council	Helping to energise the world. A region that feeds, powers and builds communities.* (IRC 2019).			
Livingstone Shire Council	'Working together for a thriving Livingstone'			
Lockyer Valley Regional Council	We will deliver sustainable services to enhance the liveability of our community while embracing our economic, cultural and natural diversity.		Y	
Logan City Council	INNOVATIVE, DYNAMIC, CITY OF THE FUTURE [*sic*].			Y
Maranoa Regional Council	Strong, vibrant and connected communities embracing opportunities to grow.			
Mareeba Shire Council	A growing, confident and sustainable Shire.		Y	
Moreton Bay Regional Council	A thriving region of opportunity where our communities enjoy a vibrant lifestyle.			
Mackay Regional Council	Pride in our community - We have a caring, supportive and vibrant community that recognises our diversity. A strong regional identity - Showcase our natural assets and develop a united regional voice on why we love to live here. An active and healthy community that is resilient - Enjoy and take advantage of our lifestyle and ensure our community is prepared for natural disasters. Build an informed, involved and connected community - We have easy, affordable access to a range of educational and lifelong learning opportunities. Manage and deliver infrastructure that enhances our region - We plan, advocate and deliver infrastructure that supports a high standard of living. The natural environment is highly valued. An innovative organisation - That continually strives for excellence and is responsive to our community. A diverse and buoyant economy - Through attracting investment, championing employment growth and developing partnerships to capitalise on economic opportunities. Support local business - The incentive to pursue projects and strengthen our commitment to buy local. Our region is a major contributor to the development of Northern Australia.			Y
Mount Isa City Council	Making our good city great, through innovation, diversification and cultural enhancement.			Y
North Burnett Regional Council	By 2030, the North Burnett will be the region of choice for people to live, work and play.			
Noosa Shire Council	"Noosa Shire - different by nature"			
Redland City Council	Forward thinking, engaged and focused on enriching community lifestyles.			
Rockhampton Regional Council	One Great Region.			
Scenic Rim Regional Council	N/A			
Somerset Regional Council	N/A			
South Burnett Regional Council	N/A			
Southern Downs Regional Council	N/A			
Sunshine Coast Council	Australia's most sustainable region. Healthy. Smart. Creative.		Y	
Tablelands Regional Council	Our vision for the Tablelands is a region where we all can prosper, enjoying an enviable lifestyle in smart, connected rural communities to realise our full potential.			
Toowoomba Region	The Toowoomba Region is a vibrant, inclusive and liveable region where respect for tradition and diversity is embraced.			
Townsville City Council	Townsville, Capital of Northern Australia, a City of Opportunity and Great Lifestyle.			
Western Downs Regional Council	An innovative team — connected locally, united regionally.			Y
Whitsunday Regional Council	"Natural beauty, global attraction. We have it all."			

* Vision statement not included in corporate plan but available from an alternative source

Approximately 13% of LGs do not have a vision statement in their corporate plan, operational plan or website. A Southern Downs Regional Council representative advised via their websites online chat function, that they believe vision statements are for private organisations only (personal communication, 12 March 2021). Thirteen percent of LG vision statements reflect sustainability and 13% reflect innovation however none reflect both sustainability and innovation. Both terms also featured in the 30 most frequently used themes in the vision statements.

One LG that featured ‘sustainability’ in their vision statement was also certified carbon neutral against the *National Carbon Offset Standard for Organisations* (Brisbane City Council (BCC) 2019, pp. 45-46; BCC 2020, p. 46; Climate Active 2019a).

While the definition and interpretation of what a CE vision may resemble is subjective, none of the vision statements showed truly circular ambitions or considerations to categorically say they achieve the EMF CE vision statement intent (refer to Section 2.2.2.2).

Figure 4-13 LG Vision Statement Most Frequently Used Terms

4.5 DICE Calculator Analysis

As presented in Section 3.6.1, the Boston Consulting Group (BCG 2021c) DICE calculator is a subjective framework employed to assess and predict the outcome success of a behaviour change project. For the purpose of this research, the project was considered the successful achievement of the WMRR Strategy actions and targets (refer to Figure 1-3) for Queensland LGs based on the information gathered through the survey, interview, workshop and corporate document interrogation results.

Two analysis configurations were conducted using the DICE Calculator. The difference between the two configurations being the assumption for percentage of Effort. Effort relates to the percentage of increase in workload the change initiative will create for stakeholders. The Effort level was run at the highest (>40%) and lowest (<10%) possible selections in the calculator as level of effort was not measured as part of the research instruments; assessing the extremes in level of effort afforded consideration for the variability that level of effort may contribute to the overall DICE calculator score. Duration, Integrity and Commitment selections were informed by data from the research instruments and deemed would not change if Effort level changed. The D, I and C selections were the same for both calculated configurations.

The DICE Calculator input and output is presented in Tables 4-6 (maximum effort) and 4-7 (minimum effort). The output of both calculations indicates the current trajectory, based on the information collected through this research and the interpretation of the researcher, and irrespective of the Effort assumed, is that Queensland LGs (as a collective) will not successfully achieve the WMRR Strategy actions and targets.

Table 4-6 DICE Calculator Result (>40% Effort)

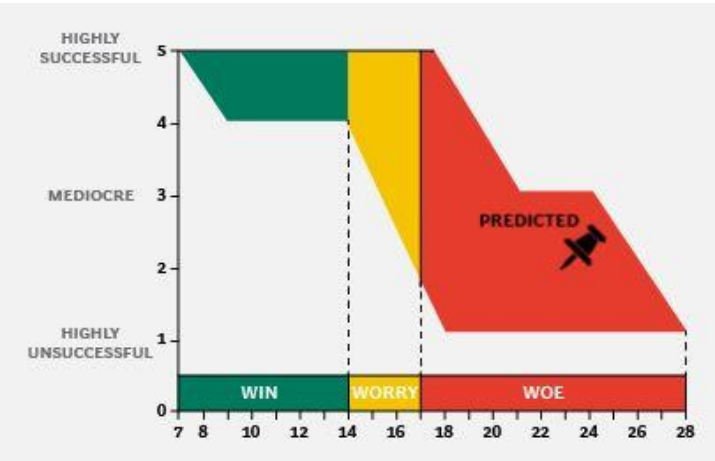
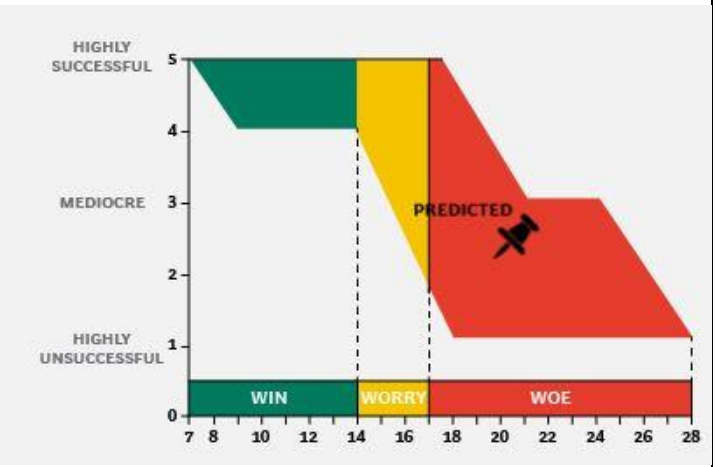
DICE Selection		
Elements	**Selection (input)**	**Score**
Duration (between learning milestones or till completion)	> 8 months	4
Team Performance Integrity	Poor – average	3.5
Commitment (Senior Mgmt)	Neutral	3
Commitment (Local)	Willing	2
Effort	>40%	4
Overall Score		**23**
DICE Result (output)	**DICE Chart**	
Your total DICE score was calculated based on the following equation: DICE = D + 2I + 2C1 + C2 + E. **Structured to Fail.** This initiative is structured to fail. Do not undertake this initiative unless definitive corrective actions can be taken to reduce the DICE> score significantly - to 13 or below.	 Source: BCG (2021c).	

Table 4-7 DICE Calculator Result (<10% Effort)

DICE Selection		
Elements	**Selection (input)**	**Score**
Duration (between learning milestones or till completion)	> 8 months	4
Team Performance Integrity	Poor – average	3.5
Commitment (Senior Mgmt)	Neutral	3
Commitment (Local)	Willing	2
Effort	>10%	1
Overall Score		**20**
DICE Result (output)	**DICE Chart**	
Your total DICE score was calculated based on the following equation: DICE = D + 2I + 2C1 + C2 + E. **Structured to Fail.** This initiative is structured to fail. Do not undertake this initiative unless definitive corrective actions can be taken to reduce the DICE> score significantly - to 13 or below.	 Source: BCG (2021c).	

5 DISCUSSION

This chapter assesses the barriers to a circular economy (CE) for Queensland Local Governments (LGs) applying a qualitative approach. It uses the Waste Management and Resource Recovery (WMRR) Strategy to underpin the assessment. This research did not attempt to quantify or measure the magnitude of occurrence of those barriers.

The chapter is organised into sub-sections based on seven types of barrier. Refer to Section 3 for the Research Methodology and Section 4 for the results of each research instrument.

5.1 Preamble

Queensland LGs are experiencing barriers transitioning to a CE that may not be recognised or apparent to them at this point in time. Minimal changes in LG behaviour reflective of adopting circular business models (CBMs), promotion of a CE or endeavours to accomplish the WMRR Strategy actions and targets were found. Without action to address the barriers, the WMRR Strategy ambition of Queensland becoming a CE state are not likely to be achieved.

The research found that Queensland LGs are embracing the WMRR Strategy's CE ambitions in varying degrees and confirmed they are experiencing barriers inherently similar to those explored in the literature review (refer to Section 2). The research outcomes cover the period from implementation of the WMRR Strategy on 1 July 2019 to approximately one year after.

Not every barrier described in this chapter was experienced by each LG. Discretion should be applied in considering their relevance to a particular LG. It is expected that the barriers to a CE experienced by each LG will change over time with the influence of evolving business strategies and decisions, risk levels, political changes, etc., and as CE progress is achieved. The barriers are not intended to be exclusive and the inter-related nature of the barriers are expected to influence how a LG would experience that barrier and what its resulting implications would be.

The research findings are intended to contribute to LGs awareness of CE barriers so they can proactively address them, position themselves as CE leaders within their communities; and establish a baseline to monitor progress and changes over time.

The objectives of this research were realized by undertaking the following tasks:

1. A literature review investigated barriers identified or likely to transpire for LGs as they transition to a CE.
2. Multiple research instruments gathered data on the practices and experiences of Queensland LGs in the first year following the WMRR Strategy implementation that were evaluated to qualitatively characterize CE barriers.

3. The corporate plan and operational plan of Queensland LGs, situated in the waste levy zone, were evaluated for behaviours reflective of transitioning to a CE.

5.2 DICE Calculator Prediction

Queensland LGs are not predicted to achieve a CE or achieve the WMRR Strategy actions and targets, based on this research and the interpretation of data collected. The Boston Consulting Group (BCG) DICE framework predicts the effective success of change management programs using a calculator tool (refer to Section 3.6.1) (Sirkin, Keenan & Jackson 2005). The DICE calculator result of 'structured to fail', while subjective, was mostly influenced by the high "I" score (integrity of the project teams combined skills and traits) and "C1" score (visible and active commitment of senior management). This opinion was informed by:

- The research participants indicated LGs have not formally allocated responsibilities to manage organisational changes to transition to a CE.
- The corporate document interrogation indicated low volumes of WMRR content and performance measures to demonstrate senior management commitment accepting the WMRR Strategy (acknowledging it is early days yet).
- Low interest from executive management demographic participation in the survey (representing 5% of participants that started the survey).
- Survey participant indications and workshop observations collectively revealed a lack of knowledge and ability to apply CE concepts by LG stakeholders.
- The misalignment of strategic objectives for different professions within LG indicated in the survey responses.

Enhancing the "I" and "C1" attributes would enhance the predicted success rate. This unfortunate predicted outcome has the WMRR Strategy fate trajectory pointing in the same direction as its predecessor, the original *Queensland Waste Avoidance and Resource Productivity Strategy (WARP) 2014-2024,* which failed to achieve its desired outcomes (refer to Section 1.1).

The CE barriers informing the interpretation of data for the DICE calculation are explored in detail below.

5.3 CE Barriers for Queensland LGs

A summary of the types of CE barriers identified in this research for Queensland LGs is presented in Figure 5-1. Each barrier type is explored and characterized in detail in Section 5.3.1 to 5.3.7. A one-page summary of the barriers is offered in Appendix H.

Figure 5-1 Summary of CE Barrier Types for Queensland LGs

5.3.1 Insufficient CE Knowledge & Understanding

Six barriers were categorised for insufficient CE knowledge and understanding. Figure 5-2 summarised these barriers and implications.

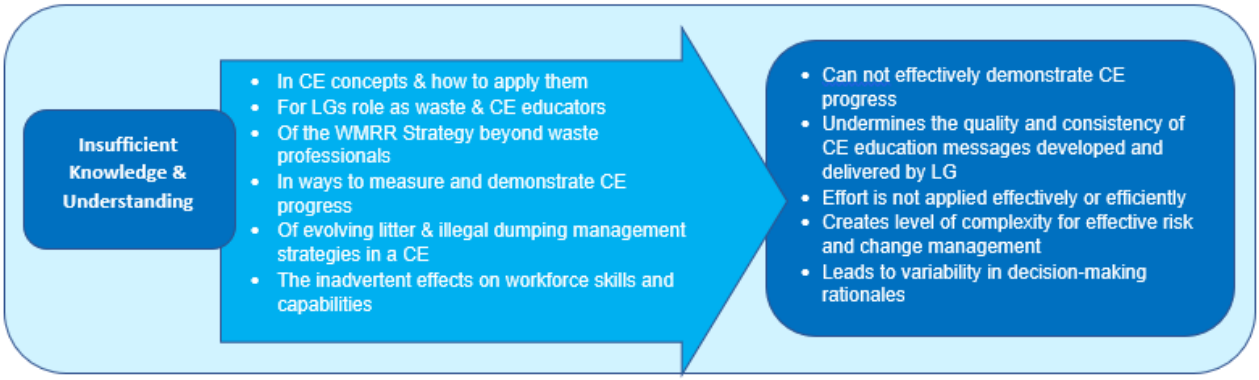


Figure 5-2 Summary of Barriers Arising from Insufficient CE Knowledge & Understanding

5.3.1.1 In CE Concepts & How to Apply Them

A lack of knowledge and understanding of CE principles and business models, and capacity to apply that knowledge, is known to create a barrier for CE development (Bet et al. 2018, p. 13; Ellen Macarthur Foundation (EMF) 2015, p. 13; Pheifer 2017, pp. 9-10; Pugalis & Tan 2017, p. 30). The results of this research are in agreement with this theory and found insufficient CE knowledge applies to the LG community, LG workforce and State Government, which influences LG decisions.

A survey participant attributed slow CE progress within their community to *'there [being] a general lack of knowledge/understanding about what circular economy is and how residents can make a difference at their individual household level*'. This was supported by survey responses which indicated the following as barriers for LG:

- Local communities do not support new practices requiring behaviour change and have limited knowledge of resource recovery and recycling.
- Businesses LG interact with do not understand CE principles.
- A lack of understanding of the economic impacts of the waste levy within the community.

These sentiments were comparable to the lack of community understanding and knowledge on the CE, it's benefits and how it can be applied practically described by Bolger and Doyon (2019, pp. 2198–2202) and Xue et al. (2010, p. 1300).

Insufficient knowledge and understanding of CE concepts within the LG workforce influence the practical application and quality of LG economic development, business cases, strategic decision-making, and organisational planning (Blue Environment 2020, p. 82; Bolger & Doyon 2019, p. 2194; Campbell-Johnston et al. 2019, p. 1236; EMF 2015, p. 13; Govindan & Hasanagic 2018, p. 296; Pugalis & Tan 2017, p. 30). This was observed in the LG Workshop participants who struggled to identify organisational strengths and weaknesses to apply CE concepts compared to those participants from other organisations. There was also very low use of CE terminology in the LG corporate documents and a low number of actions with performance measures to drive and demonstrate CE progress.

Knowledge and application of CE concepts will be required by LGs to ensure consistent decision-making, risk management and effective application of effort is applied to achieve a CE.

5.3.1.2 For LGs Role as Waste & CE Educators

Insufficient knowledge on CE concepts may undermine the quality and consistency of education messages developed and delivered by LG to internal and external stakeholders. Insufficient resourcing to deliver waste education reported by Blue Environment (2020, p. 77) was mirrored in participant opinion which expressed a shortage of human resources and CE expertise due to the recent acceleration of State and community expectations. Queensland LGs have been assigned a

role as waste educators in the WMRR Strategy (refer to Section 1.3); and while a 10% increase in WMRR related education performance measures were observed in operational plans one year after the WMRR Strategy implementation; overall, it was referred to by approximately one third of LGs only.

The survey indicated that a minimal (print and social media only) or moderate (addition of digital media such as television or radio or use of disposal fee) level of effort is applied by LGs to promoting waste avoidance. Although, almost a fifth of responses indicated no effort at all, or an unknown level of effort is applied. One barrier to CE progress noted was the lack of knowledge of CE concepts within the general community and the need for LGs to increase awareness and understanding of these (Bolger & Doyon 2019, pp. 2198–2202; Xue et al. 2010, p. 1300).

LGs in urban areas have been observed as capable of making changes at a much faster pace than higher levels of government (EMF 2015, p. 35) and this may be useful for considering waste and CE education delivery by LG. However, an opposing view was expressed by the interviewee that the State Government should be contributing more to the enhancement of consistent community knowledge for recycling and litter and illegal dumping matters.

Limited accredited upskilling opportunities on the CE for the current and future workforce were discussed in Section 2.2.6, and present an additional barrier for LGs to enhance their own knowledge and understanding as educators. Understanding this limitation affords LG an option to seek opportunities to upskill the workforce early in the CE journey.

A minimal to moderate level of effort applied to community education, coupled with insufficient knowledge on CE concepts (refer to Section 5.3.1.1), undermines the quality and consistency of CE education and creates a level of complexity for LGs to manage risk and behaviour changes.

5.3.1.3 Of the WMRR Strategy Beyond Waste Professionals

There were indications that knowledge and understanding of the WMRR Strategy was poor. A quarter of survey participants reported they had not read the WMRR Strategy and some indicated they do not believe, or do not know, if their professional role has a responsibility for transitioning to a CE. Survey invitation responses indicated recipients either did not find the content relevant or that they had passed on the invitation to people working in waste management roles. Kirchherr et al. (2018, p. 1) noted that CE dialogue occurs mostly amongst professionals working in sustainable development roles and that significant effort is required to progress past this to continue to drive CE progress. This theory was supported by the research as participant demographics reflected the most common discipline was waste management professionals.

The WMRR Strategy LG actions are broad in nature and will require input and effort from a broad range of professional disciplines in order to be achieved. This provides a clearer understanding of

CE barrier trends discussed in several publications for other disciplines and the influence of division of disciplines. CE barrier trends described where limited efforts by LGs to use procurement to influence a CE (Bolger & Doyon 2019, p. 2200; Ranta et al. 2018, pp. 78-80); internal LG departments being siloed with different priorities (Bolger & Doyon 2019, p. 2194); development and planning instruments not evolving to incorporate CE objectives (Bolger & Doyon 2019, p. 2189; EMF 2017a) ;and lack of collaboration and consistency for LG strategic planning (Blue Environment 2020, p. 82; Bolger & Doyon 2019, p. 2194; Govindan & Hasanagic 2018, p. 296; Queensland Treasury Corporation (QTC) 2018, p. 24). It is unlikely waste management professionals will be able to accomplish a transition to a CE (or the WMRR Strategy actions and targets) in isolation of other professions, yet the interest of other professions in recognising their contributions to a CE appears to be sparse.

Strategic approaches to encourage the transition to a CE can be driven from an overarching CE direction or a (waste management) materials life end approach (Ghisellini, Cialani & Ulgiati 2015, p. 11). The lack of interest or understanding to participate in the CE discussion beyond waste professionals may be reflective of the WMRR Strategy document title implying waste management content, rather than CE content. The absence of LG departments cohesively working to achieve a CE (refer to Section 5.3.2.3) will lead to variability in decision-making rationales, especially as the workforce relies on directional material that is inconsistent (refer to Sections 5.3.6.2 and 5.3.7.1), and impedes CE progress for LGs.

5.3.1.4 In Ways to Measure & Demonstrate CE Progress

Data limitations are recognised as a barrier to CE progress, generally and specifically in Queensland, as a result of not being able to obtain reliable data in which to apply to strategic decision-making (Blue Environment 2018, pp. 83-84; Blue Environment 2020, pp. 108-110; Bolger & Doyon 2019, pp. 2197-2198; EMF 2015, p. 59; Govindan & Hasanagic 2018, p. 305; Kirchherr et al. 2018, p. 268). While accuracy or availability of WMRR related data was not explored in this research, knowledge and understanding of the useful measurement and application of data to support CE progress was considered. For example, the majority of survey respondents indicated source to sink pathways had not been explored or mapped by their organisation. However, participants indicated mapping of budgets to the waste hierarchy, to compare spend versus effort, had been undertaken by some organisations to some degree, although not fully by all.

A lack of knowledge on CE concepts and its practical application (refer to Section 5.3.1.1) is also likely to inhibit LGs ability to effectively measure and demonstrate CE progress (Campbell-Johnston et al. 2019, pp. 1236-1237) (refer to Sections 5.3.2.1 and 5.3.2.2). This will have a knock-on effect as reliable measurement tools and data is not available for the development and delivery of business cases requesting support of CE development, and decision-making is influenced by inconsistent and variable data inputs and administrative directions (EMF 2015, p. 59). LG need to

find a consistent and accurate way to measure and demonstrate CE progress within their local communities.

5.3.1.5 Of Evolving Litter and Illegal Dumping Management Strategies in a CE

As the cost of disposing waste into landfill rises in Queensland, it is expected that litter and illegal dumping instances may rise as people try to avoid paying the disposal cost. However, the cost to the community as a whole is often much higher, as LGs ultimately manage the clean-up, disposal and investigations. Appreciation for the true cost implications of managing litter and illegal dumping in Queensland which is geographically large yet sparsely populated is not well understood by rate payers (Blue Environment 2020, p. 100).

Survey responses indicated there is a lack of awareness within the community of the actual cost and resources required to manage the problem of litter and illegal dumping. Most of the responses also indicated community exposure risks had been included by their organisation when considering changes to operations from linear to CE; although approximately half of the participants indicated community consultation had either not been considered or they were unsure if it had been considered. LGs are known to be risk adverse and often not willing to do things differently (Johnston 2019; Tura et al. 2019, p. 96). The traditional business as usual and use of messaging and management practices for litter and illegal dumping, that was previously developed and delivered with linear style operations in mind, may not be the best fit for future management of the problems as CE operations are encouraged and disposal of waste into landfill is no longer an option economically, socially or environmentally.

The corporate documents revealed that there was a slight increase in LGs considerations of illegal dumping and litter management one year after the WMRR Strategy and waste levy implementation. Perhaps this is a result of an increase in dumping occurrences or an increased awareness of obligations by the WMRR Strategy. If LGs are not prepared to seek new and innovative education and consultation mechanisms for CE styles, behaviours and overall management within their communities, the cost to manage litter and illegal dumping in a CE will likely continue to increase.

5.3.1.6 The Inadvertent Effects on Workforce Skills & Capabilities

The demands of economic development on LG coupled with the requirement to progress a CE means that many will employ external consultants with the skills and capacity to develop strategies within this new framework that the LG will not have the capabilities to effectively implement (Pugalis & Tan 2017, p. 30). A skilled workforce is important for effective LG waste management systems (World Bank 2018, p. 14). Survey respondents report CE barriers are being experienced as a result of a '*shortage of skilled and knowledgeable experts'* and noted that LG and State resources are at capacity and unable to undertake work to promote a CE. Evidence from the corporate document interrogation shows that more than one LG has potentially engaged an

external consultancy to develop their corporate plan or organisational plan as the text for different LGs was observed to be identical. Given the documents are publicly available, it is possible that one LG could have copied the text from another (with or without permission), but irrespective of the source, it indicates that there is likely an internal skills or resource deficit leading to use of external resources to develop the document.

Supplementing internal resources with external resources is often necessary but LGs need to remain mindful of the reason why they need to supplement. If a workforce does not have the skills, resources, or the capacity to do the work, taking action to address this, in addition to engaging the supplementary services, will have a better outcome for the long-term implementation and management of a CE.

5.3.2 Strategic Organisational Planning

Seven barriers were identified as strategic organisational planning constraints. Figure 5-3 summarised these barriers and implications.

Figure 5-3 Summary of Barriers Arising from Strategic Organisational Planning

5.3.2.1 Limited Use of Milestones & Visible Leadership to Demonstrate CE Commitment

CE planning is impeded by the absence of a high-level guiding approach and supportive culture (Bolger & Doyon 2019, pp. 2193 & 2201; Kirchher et al. 2018, p. 268). Without milestones and a commitment to achieving them CE progress is problematic (Blue Environment 2020, p. 82; Bolger & Doyon 2019, p. 2194; EMF 2015, p. 64; Govindan & Hasanagic 2018, p. 296; Houston et al. 2018, p. 23; QTC 2018, p. 24). Challenges for LGs adopting a feasible CBM are acknowledged (Bocken et al. 2019, p. 14) but continuing to operate in existing business models results in LGs unable to meet their communities' expectations, take advantage of CE opportunities and they remain reliant on existing technologies (EMF 2015, p. 64; Franco 2017, p. 837; Johnston, 2019; Pugalis & Tan 2017, p. 31; Tura et al. 2019, p. 96). The research found Queensland LGs are in this predicament because:

- Only one LG had taken steps since the implementation of the WMRR Strategy to commit to one of the 2050 targets in their corporate documents (refer to Table 1-2, Section 4.4 and

Section 5.3.2.2). Rockhampton Regional Council's Waste and Recycling Department's performance plan included the WMRR Strategy target of diverting 90% of waste from landfill by 2050 in the 2020/21 operational plan. Brisbane City Council's carbon neutral certification may contribute to the WMRR Strategy targets, although being carbon neutral may not necessarily mean the three WMRR Strategy targets are thus being achieved.

- There was no commitment by LGs to the Local Government Association Queensland (LGAQ) (2019b) zero-waste to landfill 2035 target reflected in the high-level corporate documents.
- Limited performance measures were set by most of the LGs for matters that would contribute to a CE and demonstrate a transition to a more CBM (refer to Section 4.4 results for subject matter specifics).
- There were limited changes between the 2019/20 and 2020/21 operational plans to indicate an influence of the WMRR Strategy illustrating operations have maintained a business as usual pattern.
- Financial incentives (i.e., the *advanced payment*[1]), given by the State Government to assist LG, have been provided without milestones or performance measures to demonstrate beneficial use of the funds toward CE initiatives, except the requirement to include the value of the *advanced payment* on rates notices; and without a time frame of certainty for ongoing payment. This will influence LG decision-making as there is low incentive to make instrumental changes in their behaviours, service provisions or to adopt a more CBM.
- The absence of a decisive corporate CE direction (refer to Section 5.3.2.3).
- Business as usual operations for landfilling are planned to continue.

The absence of leadership being demonstrated at the highest level within LGs (in this instance the corporate plan and operational plan documents) with milestones to support a CE, may result in the failure to effectively achieve and demonstrate CE progress.

Uncertainty in the longevity of policy instruments, such as funding, is known to create a barrier to investment and decision-making for waste management reform (QTC 2018, p. 24). Similarly, delays in decision-making arrests progress and lineal processes subsequently continue (Franco 2017, p. 837).

[1] From 1 July 2019 when the waste disposal levy was introduced, the Queensland State Government has paid LGs affected by the waste levy (refer to Figure 1-1 for the waste levy zone of Queensland) an *advanced payment* to the value of the equivalent waste levy fee to cover the expense for disposal of domestic waste into landfill (LG then pays the applicable waste levy fee for that waste back to State Government) (Queensland Government 1995-2021a). The *advanced payment* is provided to ensure there is no direct impact of the State Government waste disposal levy on households (Queensland Government 1995-2021a). Refer to Section 1.3 and Section 2.2.1 discussion on the timing of the waste levy implementation and political influence, in what was an election year, that the commitment to ensure the waste levy had no direct impact on households. LGs may use surplus *advanced payment* funds and are encouraged to 'invest in measures that reduce the amount of waste being sent to landfill' (Queensland Government 1995-2021a). The general sentiment within LG is that the *advanced payment* will likely cease or reduce over time. Logan City Council has submitted a motion asking LGAQ to lobby the State Government for clarity on the time frame that the *advanced payment* will continue to be paid (Logan City Council n.d.).

5.3.2.2 Lack of Transparency in Performance Measures

The LG corporate plan and operational plans lack a level of transparency in demonstrating a strategic decision-making framework to support a CE. Where performance measures were nominated by LGs, they were often nonspecific, and where a specific improvement was indicated, data of the 'baseline' consideration was not provided. Objectives in individual LG corporate and operational plans were not always consistent. This demonstrates a lack of transparency on how to measure what is trying to be achieved. The absence of meaningful data has been noted as a limitation to informed analysis of CE processes and demonstrating progress towards a CE (Blue Environment 2019, p. 5; EMF 2015, p. 64; Govindan & Hasanagic 2018, p. 305; QTC 2018, p. 24). The absence of clear and transparent performance measures to demonstrate leadership support and organisational progress of CE commitments is a missed opportunity for LGs to improve integrity and accountability within the sector. Senior management leadership and transparency are critical success factors (BCG 2021d, Department of Local Government Racing and Multicultural Affairs (DLGRMA) 2020, p. 7).

One of the few noticeable improvements between the 2019/20 and 2020/21 operational plans, was an increase of performance measures nominated by LGs for resource recovery operations. This might be able to be attributed to an influence of the WMRR Strategy but overall, represented a total of 20% of all LGs within the area of interest, indicating plenty of opportunities for improvement remain.

5.3.2.3 No Clear CE Vision or Overarching Corporate Intention

Section 2.2.2.2 discussed strategic organisational planning barriers to a CE, and the EMFs advice is that LG can overcome some barriers with the approach of a CE vision statement embedded across all business functions (EMF 2015, p. 32; 2017a, p. 7). Without a common goal, LG departments become siloed by working towards opposing goals that do not support a CE (Bolger & Doyon 2019, p. 2194; EMF 2015, p. 64; Kirchherr et al. 2018, p. 268; Pugalis & Tan 2017, p. 29; QTC 2018, p. 24). Queensland LGs are not making use of a corporate CE intention or vision across the whole organisation and this opinion was formed based on the following:

- The vision statement furnished by each LG does not convey clear strategic CE ambitions or aspirations.
- Approximately 13% of LGs do not have a vision statement.
- There is limited commitment to tangible CE actions in corporate documents. There was also no commitment made by LGs to achieve the three WMRR Strategy targets set to directly align with the *Climate Transition Strategy* goal for the State of Queensland to achieve zero net emissions by 2050, the LGAQ 2035 zero-waste to landfill target or to the 2030 Sustainable development goals (SDGs) Target 12.5 goal to reduce waste generation (refer to Section 5.3.2.1 and Section 5.3.2.2).

- Over a third of survey responses indicated participants believed their organisations corporate plan included targets to align with the WMRR Strategy which was in stark contrast to the document interrogation. Of course, these participants may not have been LG employees or could have been from RRC (which committed to one WMRR Strategy target), although it is unlikely in consideration of the distribution of demographic responses received.
- Actions with CE related content had designated responsibility to a specific department, rather than to all departments within the organisation.
- The CE discussion and WMRR Strategy awareness is limited beyond waste management professionals (refer to Section 5.3.1.3).

A strategic CE vision statement can convey to all stakeholders that senior management support an idea and gives siloed departments, and communities, a common goal to attain (Blue Environment 2020, p. 82; Bolger & Doyon 2019, p. 2194; Govindan & Hasanagic 2018, p. 296). In the absence of leadership direction or an incentive to change behaviours and transition to a CE, opposing efforts will continue to consume resources and desired outcomes will be delayed or not eventuate.

5.3.2.4 Limitations of Forward Planning to Manage Risks of a CE Transition

Queensland LGs are obliged to have a corporate plan framework for strategic decision-making and an operational plan detailing the tools used to manage corporate operational risks (DLMGRA 2020, p. 16). This research assessed these documents and survey participant opinions to conclude LG effort towards forward planning and assessment of risks for a CE transition is limited.

- Corporate documents did not detail any specific CE risk or project management planning performance measures.
- Two-thirds of survey responses indicated CE change management plans had not been developed. Over half indicated there were no dedicated working groups appointed to manage the organisations business changes required to achieve the actions of the WMRR Strategy. A third indicated no changes had been made since the WMRR Strategy implementation to day-to-day operations to ensure maximum resource recovery, reuse and recycling was achieved.
- No clear CE vision or overarching corporate intention was expressed (refer to Section 5.3.2.3).
- Survey results indicated LGs are considering risks relating to compliance, legal obligations, and environmental benefit/loss for WMRR matters. Far less consideration was given to risks relating to availability of trained and competent workforce, community consultation, disruption to services, and impact to workforce numbers for WMRR matters (refer to Section 5.3.1.6). These risks were also not considered by the State Government in their

review of economic opportunities for waste management in Queensland (refer to Section 2.2.6).

- Up to a quarter of survey respondents indicated they were not sure of the risks that were being considered by their LG when broken down into CE influencing categories.
- Many LG staff are required to work across multiple functions, especially in regional areas, and this is known to negatively impact availability of resources and staff capacity (Blue Environment 2020, p. 77). Insufficient knowledge and understanding of CE concepts, their practical application and the unplanned influence on workforce skills and capacity was identified as creating barriers for Queensland LGs to progress a CE (refer to Section 5.3.1).

The 'I' (integrity) and 'E' (effort) selections in the DICE calculation (refer to Section 4.5) was influenced by the limitations identified in this section and contributes to the overall predication of an unsuccessful outcome for LGs in achieving a CE within the WMRR Strategy time frames.

Absence of these strategic planning process within LGs inhibits accountability to ensure CE risks are identified and managed, progress is measured and efforts are applied effectively and efficiently.

5.3.2.5 Sustainable Development Goals Underutilized

SDGs that provide significance and meaning for CE initiatives have not been embraced by LGs. Survey participants indicated SDGs were used by their organisation to encourage resource recovery and use of recycled materials; however, the corporate document evaluation did not find reference to any SDGs by LGs. This may be the result of survey participants not being employees of LG; and instead, were from external organisations or were employed by LGs outside of the waste levy zone and area of interest; although it is unlikely in consideration of the distribution of demographic responses received. It may also indicate administrative instruments do not accurately reflect SDG awareness and use within LG organisations. Limitations of drawing conclusions from documentation alone are acknowledged for this reason (Patton 2002, p. 307). Poor quality control of strategic administrative documents and the omission of information by Queensland LGs is explored in Section 5.3.6.2.

The LG vision statements also did not strongly reflect SDG 12 'Responsible Consumption and Production' (United Nations Department of Economic and Social Affairs (UN) n.d.a.). or Target 12.5 seeking to 'substantially reduce waste generation through prevention, reduction, recycling and reuse' by 2030 (UN n.d.b.). There were no actions or targets nominated by LGs to achieve actions of this kind by 2030 consistent with SDG Target 12.5 (refer to Section 5.3.2.1). The SDGs provide universal reasons why the change from a linear to a CE is needed and a platform for awareness of the WMRR Strategy, which can enhance knowledge and understanding and increase the motivation of stakeholders. Underutilisation of SDGs may place LGs at a disadvantage to

demonstrate leadership in behaviour change within their organisation and community, not just limited to CE and waste management matters.

5.3.2.6 Moderate Extent of Review & Update of Internal Waste Strategy Documents

The corporate document interrogation indicated that approximately 60% of LGs may not have taken steps to review their internal waste strategy documents since the WMRR Strategy implementation. The 40% of LGs that did reflect actions to review and update internal waste strategy documents included a limited number that specifically devoted their assigned action to aligning their own strategy with the WMRR Strategy. Aligning to the State WMRR Strategy would presumably capture the intent to adopt CE processes by LG, noting the barriers of limited use of milestones (Section 5.3.2.1), no overarching corporate CE intention (Section 5.3.2.3) and poor forward planning for a CE transition (Section 5.3.2.4) explored earlier.

Survey participants equally indicated corporate plans either do, or do not, align with the WMRR Strategy targets. Only one LG had a defined target to '*become a "zero-waste" community by 2050, diverting 90% of waste from landfill*" (refer to Section 5.3.2.1).

Deferring a review of internal waste strategy documents to the WMRR Strategy could be influenced from many quarters. For example: political influence, workforce capacity or knowledge, economic influences, or limitations in data availability. The direction of a pre-existing internal waste strategy may be different to the WMRR Strategy and could lead to confusion and/or divergent expectations and decision-making by the organisations internal departments and externally within their communities.

5.3.2.7 Planning Instruments not Evolving with Pace of Change

Multiple viewpoints from the survey and interview were expressed that planning schemes are not evolving with the pace of change of CE development in Queensland and were creating a bottleneck for investment and progress. This viewpoint echoes other research that applying pre-existing planning scheme governance to advance a CE that requires creativity and experimentation is a barrier to advancing CE opportunities (Bolger & Doyon 2019, p. 2200; Kirchher et al. 2018, p. 270). LG also has a strong influence on small and medium sized enterprises (SMEs) to adopt CE practices and is often cited as creating barriers to progress (EMF 2015, p. 35; GreenEcoNet 2014; Pugalis & Tan 2017, p. 27; Rizos et al. 2015, p. 4; Rizos et al. 2016, pp. 10 & 12).

Participants reported experiencing barriers in CE progress as a result of the following:

- Planning instruments are not maintaining industry momentum to develop co-location precincts for infrastructure and services. This is where multiple industries and services are located within close proximity for a resources initial or subsequent use, processing facilities and/or other end markets (refer to Section 5.3.6.1).

- Development approval conditions are not supporting CE principles and planning professionals may not understand their role in modernising of planning schemes to adopt CE concepts and technologies (refer to Section 5.3.1.3).
- State level planning assessments are not thorough enough at a local level to monitor and measure CE compliance (refer to Section 5.3.7.1).

Planning and development instruments that are not modernized to capture CE innovation and align with the WMRR Strategy's desire to become a zero-waste State by 2050, will undermine the efforts of all stakeholders.

5.3.3 Collaboration & Partnership

Three barriers were identified for collaboration and partnership as shown in Figure 5-4.

Figure 5-4 Summary of Barriers Arising from Collaboration & Partnership

5.3.3.1 Missed Opportunities with Local Businesses

United Nations (UN) member states, including Australia, assert that partnerships need to be formed to address the SDGs, including SDG 12 and Target 12.5 (Department of Foreign Affairs and Trade (DFAT) n.d.; UN n.d.a.). This is to achieve sustainable consumption and production patterns, and by 2030, substantially reduce waste generation through prevention, reduction, reuse and recycling (UN n.d.a.). The WMRR Strategy highlights the need for collaboration and partnerships needed to encourage investment and innovation to progress a CE (Queensland Government n.d., p. 12).

While these types of partnerships can create barriers if contracts and expectations are not clear or effectively monitored (EMF 2015, p. 64; The World Bank Group 2018, p. 14), they are a necessary foundation of truly CE processes (EMF 2015, p. 35).

The research indicated that LGs are willing to support local social enterprises that have commercialised resource recovery concepts but there are challenges preventing growth in this area. LGs may not support these initiatives, or may have abandoned initiatives, when faced with barriers such as property ownership, lease matters, utilities responsibility and work health and safety risks, rather than seek a workable solution. It was also indicated that collaborative partnership opportunities may not have been offered for consideration or that expenses of a partnership have outweighed the benefits.

The corporate document interrogation indicated high (75%) general use of terms indicative of collaboration and partnerships by LGs, but in contrast to the majority of survey participant opinions, very few corporate documents (13%) described a WMRR specific collaborative performance measure. Without effective collaboration and partnerships and local economic development, LGs risk inhibiting CE progress.

5.3.3.2 LGs Willingness to Lead the CE Movement Locally

In all likelihood, a central authoritative figure will be needed to drive the CE movement locally and lead the discussions that will enable local barriers to be understood and addressed by the collaborators. The workshop activity outputs supported this theory. Just over a third of the groups developed a solution of a similar nature, that being the creation of a central hub/platform whereby organisations could collaborate to utilise the waste/underutilised products of other organisations in order to provide a benefit and create a CE loop.

Similar ventures have been developed in Europe, such as the GreenEcoNet digital platform where SMEs and government agencies collaborate and share resources to support the transition to a CE (European Commission 2015; GreenEcoNet 2014). One of the main challenges reported for that business platform has been the lack of support from LGs (Rizos et al. 2016, pp. 10-12). Queensland LGs can build on lessons learned by others if they are willing to take on the risk of becoming the central driver of a CE in their communities. This may prove difficult if knowledge and understanding, and practical application of CE principles, is not established (refer to Section 5.3.1) and strategic organisational planning leadership and a cohesive overarching corporate intention are not demonstrated (refer to Section 5.3.2).

5.3.3.3 LG Diversity Viewed as a Barrier to Collaboration

LG are viewed as lead actors for progressing a CE that requires multiple actors to collaborate (Kirchherr et al. 2017, p. 10; Loop Circular Economy Platform n.d., p. 6). Barriers to CE progress and collaboration has been attributed to siloed internal LG departments, the difficulties of regional Queensland LGs being able to collaborate on strategic planning for resource recovery and inconsistent government defined boundaries and policy objectives resulting in different priorities (Bolger & Doyon 2019, p. 2202; Pugalis & Tan 2017, p. 24; QTC 2018, p. 24). Economic pressures were also noted as a constraint on LGs pursuing collaborative partnerships. Many are wary that multi-LG cooperation may lead to future amalgamations (Pugalis & Tan 2017, pp. 29). This shows there are diverse influences on LG decision-making that affect their desire to pursue multi-actor partnerships.

Research participants expressed concerns regarding collaboration from a different viewpoint of LG diversity; which may be the underlying factor to the barriers described in literature. Collaboration barriers were described as:

- The diversity of interest level.
- Diversity of resource recovery material availability between LGs.
- Diversity of LGs within a small region which can include waste levy, non-waste levy and indigenous LGs of varying sizes and economic circumstances.
- A variety of skills and capacity available.
- [Lack of] community support.

Examination of the LG vision statements supports the view that diversity is a likely barrier as there were differences in each LG's approach to, and priorities, regarding progressing a CE. Embracing diversity is embedded in the WMRR Strategy vision statement (refer to Section 1.2) but interestingly, most common definitions of a CE (refer to Section 1.2), do not mention that a CE requires multi-actor collaboration and the ability to include diversity in CE solutions. Overcoming barriers to collaborative partnerships in a CE may be one of the biggest challenges LGs face; but diversity could be the single biggest strength for LG in a CE.

Observation of the collaborative discussions during of the workshop activity, where participants from diverse organisations and role responsibilities were required to collectively work together to find a CE solution to a real-world problem, revealed dialogue often included discussion of barriers and obstacles to be overcome. Decision-makers need to understand and identify the unique barriers faced by each LG in order to determine suitable solutions in a CBM (EMF 2015, p. 16). Without a good understanding of barriers created by LG diversity, it will likely remain a factor inhibiting CE progress. The workshop activity identified differences between collaborating organisations because these differences became strengths for discovering CE solutions. Waste or underutilization by one partner could be used or enhanced by another thereby enacting a CE process.

Collaborative partnership barriers are also influenced by unintended barriers created by LGs (refer to Section 5.3.6); insufficient CE knowledge and understanding (refer to Section 5.3.1); and strategic organisational planning limitations (refer to Section 5.3.2).

5.3.4 Procurement as a CE Enabler

Barriers for Queensland LGs using procurement to enable a CE are summarised in Figure 5-5.

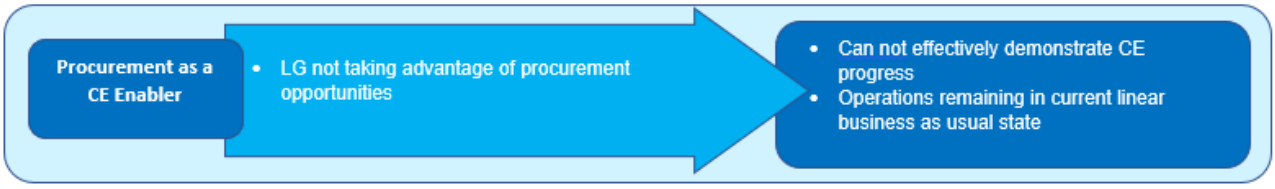


Figure 5-5 Summary of Barriers Arising from Procurement as a CE Enabler

5.3.4.2 LG Not Taking Advantage of Procurement Opportunities

Procurement is a powerful mechanism to enable a CE, although LGs do not use this to its full potential (Australian Council of Recycling cited in Blue Environment 2016, p. 28; Houston et al. 2018, p. 23; Ranta et al. 2018, pp. 78-80). LGs, as large spenders, can influence CE behaviours through procurement initiatives that encourage the preferred waste hierarchy actions (Bolger & Doyon 2019, p. 2200; EMF 2015, p. 70; LGAQ 2020). The research confirmed that Queensland LGs are not taking advantage of their procurement powers.

The survey instrument explored procurement views that indicated LG procurement seeks innovation in general terms, but are less likely to seek specific details to consider volume of greenhouse gas emissions or virgin materials consumed. Participants also indicted LGs are inclined to weigh price heavily in procurement evaluations. (Economic influences as a CE barrier are discussed in Section 2.2.4 and Section 5.3.5). Workshop participants identified procurement as an enabler for CE solutions to real world challenges. If LGs do not change procurement behaviours, products and services will favour the current, more linear, style of operations as business as usual.

Queensland LGs are missing an opportunity to encourage, measure and demonstrate CE progress through procurement practices. The document evaluations for this research did not include corporate procurement policies which affords a future opportunity for researchers to interrogate these in more detail.

5.3.5 Economic Influences

Economic CE barriers were explored in the literature review in Section 2.2.4 but were not specifically investigated as part of this research owing to limited publicly available economic data during the research period. The three economic influences discussed in this section are peripheral economically influenced CE barriers identified during the research. Refer to Figure 5-6 summary.

Figure 5-6 Summary of Barriers Arising from Economic Influences

5.3.5.1 Pressure to Keep Rates Low & Service Delivery High

Participants noted that they were experiencing challenges in implementing changes for a CE without increasing rates and that benefits of a CE were believed to be minimal, if any. A small number of responses indicated some LGs have considered the future impact of a reduced

advanced payment. These sentiments support the theory that LGs experience economic pressure, especially in regional areas, to deliver waste management facilities and services, and encourage the community to adopt CE behaviours without creating an increase in costs to ratepayers (Blue Environment 2020, pp. 54 & 77; EMF 2015, p. 64; LGAQ 2019 p. 9; QTC 2018, p. 24).

5.3.5.2 Lack of Adequate Funding for Innovative Solutions

One survey participant advised that there was a lack of adequate funding for innovative solutions however, no additional information or explanation was provided; and this could be interpreted to have more than one meaning. This view confirms that innovative solutions need financial support to be realised as described in the WMRR Strategy vision statement […] *strategic investment in diverse and innovative* [*sic*] *technologies* (Queensland Government n.d., p. 7).

There are several CE barriers proposed in literature to which this view could relate:

- Economic barriers created by the application of existing LG planning and development instruments to CE development (Bolger & Doyon 2019, p. 2196).
- Inadequate LG provided funding to stakeholders to develop innovative CE ideas (Pugalis & Tan 2017, p. 28).
- A lack of knowledge and practical application of CE knowledge adversely influences the quality of LG business cases which often seek financial support (Campbell-Johnston et al. 2019, p. 1236).

While the context of the participant view cannot be scrutinized, their sentiment is consistent with conclusions drawn by others. Uncertainty in financial incentives, such as the *advanced payment* (refer to Section 5.3.2.1) was also raised as a limiting factor to long-term infrastructure investment and planning. LGs will need to purposefully provide or seek economic support to encourage development of '*innovative and diverse technologies'* to facilitate the CE transition.

5.3.5.3 Expense of Managing/Not Managing Litter & Illegal Dumping Interventions

LG incurred expenses to clean up litter and illegally dumped materials in Queensland is much higher than other areas of Australia due to the vast geographic size and sparse population, especially in regional areas (Blue environment 2020, p. 100). This was supported by the most frequently mentioned challenge for managing litter and illegal dumping by survey participants as cost[2], followed by historic behaviour and resource limitations. The corporate documents showed LGs are increasing strategic performance measures for managing illegal dumping, and litter less so, following the WMRR Strategy implementation.

[2] The *Waste Reduction and Recycling Act 2011*(Qld.) s. 26 prescribes materials collected by LG on behalf of the State Government, related to litter and illegally dumping offences under the Act, are exempt from the waste levy disposal fee. Therefore, it has been assumed the costs referred to by survey participants relate to the expenses incurred for wages, transportation and other non-waste levy disposal fees.

Survey respondents also indicated the removal of the *advanced payment* will be an additional challenge for managing litter and illegal dumping. This indication is a likely outcome if the direct cost to the community appears to increase for the disposal of waste and they seek alternative methods of disposal, such as disposing illegally, as they believe they will avoid having to pay for disposal costs.

These economic influences lead to variability as decisions are influenced by favourable economic outcomes to the disadvantage of other CE favourable attributes. These decisions then negatively influence the adoption of new technologies required to progress a CE.

The financial cost of managing litter and illegal dumping is a challenge and burden for LGs, however the social and environmental risks of not managing it, may come at a higher price for LGs in the long term. The inability to apply CE knowledge (refer to Section 5.3.1) and LGs inclination to favour current operations (refer to Section 5.3.6.4) may also influence LGs to not innovate to manage litter and illegal dumping matters in a CE.

5.3.6 Unintended Barriers Created by LG

For internal and external stakeholders, unintended action/inaction by LG often leads to barriers to CE progress. This research has found that five CE barriers are created unintentionally by LG as shown in Figure 5-7.

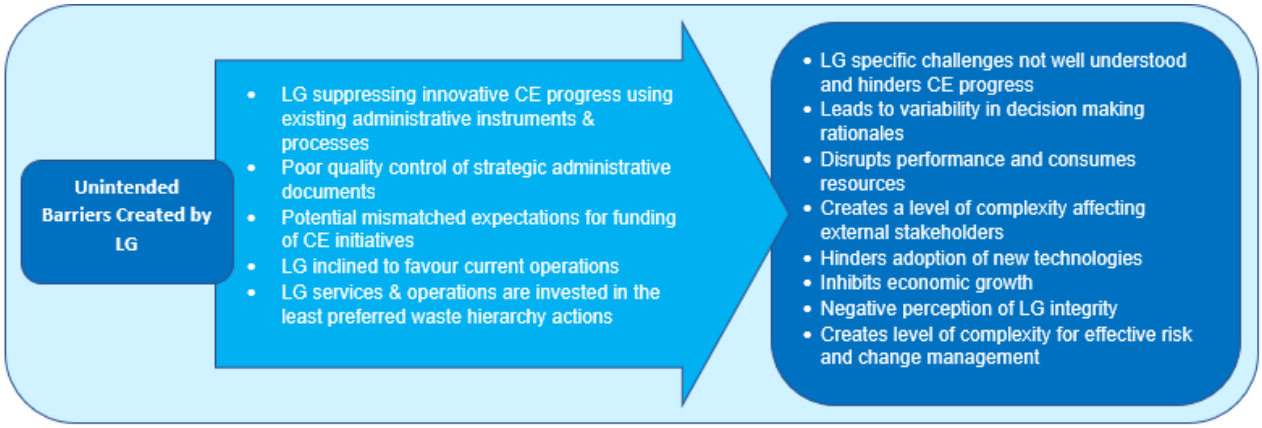


Figure 5-7 Summary of Barriers Arising from Unintended Barriers Created by LG

5.3.6.1 LG Suppressing Innovative CE Progress Using Existing Administrative Instruments & Processes

LGs can strongly influence the adoption of CE business operations by SMEs within their communities (EMF 2015, p. 35; Hillary 2004, p. 567; Pugalis & Tan 2017, p. 8). Part of LGs role in promoting CE innovation is to provide the framework to make this possible and it has been noted that LG planning and development administrative instruments create a barrier to this as they are locked into linear processes, siloed thinking and inconsistent applications (Johnston 2019; Pugalis & Tan 2017, pp. 8 & 29; Rizos et al. 2016, pp. 10-12; QTC 2018, p. 24).

Additionally, LG operations are subject to the application of administrative instruments and processes in delivering services to the community. As a result, LGs are likely to experience the same CE barriers as SMEs in this situation.

The following researcher observations and opinions expressed by participants reflect agreement with these views:

- Investment in infrastructure and services to deliver recycling services was believed to not be economically feasible in some regional areas.
- Traditional linear forms of waste management operations and services, such as landfill for primary disposal, had been considered post WMRR Strategy implementation.
- Some LGs do not currently offer recycling services and rely on other LGs to provide services in some instances.
- LG workshop participants lacked confidence in making a decision to adopt an innovative idea. To be clear, the observation was not in the ability to come up with an innovative idea, it was the lack of confidence in being able to apply the idea without first seeking confirmation to do so, reflective of LG approval processes.

The challenges facing LG applying existing administrative instruments and process in a CE will likely evolve from these views over time. At present, such views indicate that the mindset is to find solutions by applying familiar linear methods rather than innovative CE thinking. Recycling in not at the top of the waste hierarchy and regional LGs particularly would benefit from seeking solutions for resource management that avoids, reduces or reuses materials.

Modernization of LG planning schemes and LG approval processes needs to be undertaken soon and rapidly to address the barriers being created to CE progress. If LGs do not prioritize and progress this, they may no longer be viewed as creating an unintentional barrier but as wilfully inhibiting CE progress.

5.3.6.2 Poor Quality Control of Strategic Administrative Documents

Basic quality assurance (QA) controls were not consistently applied by LGs in key administrative documents which lacks a degree of professionalism. LGs are significant influencers within their communities (EMF 2015, p. 35), and challenges are known to be created when inconsistent information is provided (Patton 2002, p. 35; Pugalis & Tan 2017, p. 24). It has also been said that SMEs view LG as not particularly helpful in the transition to a CE (Rizos et al. 2016, pp. 10-12). It is reasonable to say the provision of incorrect or omitted information by LGs would fall into this category. It is also a reasonable expectation that internal and external stakeholders will seek information and guidance from these high-level strategic LG documents. The types of QA limitations observed included spelling errors; a combination of no date, title or version control information documented; no current document available (i.e., one LG did not have a 2020/21

operational plan available on their website); and historic documents removed from public access (i.e., ten LGs have only the current operational plan available on their website).

Errors and omissions of information in strategic documentation demonstrates a lack of commitment and effort and can lead to confusion or difficulties for stakeholders seeking information and may lead to reputational challenges for LG.

5.3.6.3 Potential Mismatched Expectations for Funding of CE Initiatives

A high-level assessment of expectations for the provision of funding from LGs to SMEs to develop CE ventures indicated there may be a mismatch of expectations between the parties. One of the challenges noted was the expectation of SMEs that LG should provide funding opportunities for them to develop CE ideas and business operations (Pugalis & Tan 2017, p. 28; Rizos et al. 2016, p. 11-12). Survey responses did not wholeheartedly support this view, with less than half suggesting that financial support should be given, but only from funds specifically provided from waste levy revenue. Two participants indicated they do not believe funding should be provided at all to local businesses for this purpose. If LGs are not aware of local SMEs funding expectations, it may adversely affect the success of CE ventures.

5.3.6.4 LG Inclined to Favour Current Operations

Favouring current operations creates unintended barriers to CE progress and can occur as a result of applying pre-existing frameworks, such as planning schemes to innovative CE designs (EMF 2015, p. 64; Kirchher et al. 2018, p. 270; Loop Circular Economy Platform n.d., p. 11), or trying to apply a one-size fits all CBM to linear operations (Bet et al. 2018, pp. 14 & 16). Government institutions have been observed to favour recycling activities over activities higher in the waste hierarchy to demonstrate CE progress (Ranta et al. 2018, p. 70). Section 2.2.4.2 discussed the inclination of LGs in Denmark to favour incineration of plastic rather than upgrading infrastructure to enhance recycling abilities (EMF 2015, p. 133).

Queensland LGs were inclined to favour current operations with the underlying reason likely influenced by historic economic investments.

Current operations were favoured over CE innovation in Queensland LGs in the following instances:

- Opinion that infrastructure offering recycling services is cost prohibitive to small LGs.
- Concern expressed for the negative influences on LG recycling operations due to the State Government introduction of a product stewardship scheme for eligible drink bottle containers under the Container Refund Scheme (CRS).

- LG investment in landfill as primary waste disposal has resulted in big liability costs (management and rehabilitation) and participants believed that this leaves no funding for resource recovery initiatives.
- No new services or significant changes to services were described or observed in the corporate documents, to indicate a move away from traditional and existing landfill and recycling services.
- Minimal landfill closures plans were confirmed in the corporate documents (at best in 2020/21, 5% of LGs nominated a performance measure to a landfill closure) with a greater number of LGs including plans to expand current landfill capacity with new cells more prominent (10% of LGs in 202019/20 and 2020/21), indicating a continuation of landfill as a waste disposal mechanism.
- LG commitment to rehabilitate or improve landfills reduced by approximately 20% after the WMRR Strategy implementation.
- Workshop activity CE solutions employed re-use and recycling methods. There were no solutions to eliminate or reduce resources, which is higher in the waste hierarchy.

In each of these scenarios, LG resource investment (financial and other) into existing landfills, recycling and collection services for waste materials would be high as they have been delivering the services for many years. The exception is the comment on new recycling services; however, it implies introducing a service that reflects the same style of services historically offered by other LGs, rather than a new innovative CE style service.

A strong commitment from LG leaders will be required to prioritise a CE in decision-making. Services, infrastructure and mindset needs to move away from current operational methods because effective CE materials avoidance, recovery and reuse will not support current business as usual technologies and service delivery.

A negative influence of the CRS initiative on LG pre-existing recycling operations may have been an unintended barrier, but LG may be unintentionally creating a CE barrier by favouring their current recycling operations, rather than making changes to accommodate the influence (and disruption) of the new, more circular CRS program, on their operations.

LGs need to be ready to embrace and capitalize on the disruptions to their current service models that transitioning to a CE is going to create. The social, economic and environmental advantages of a CE in their communities will not be realized otherwise.

5.3.6.5 LG Services& Operations are Invested in the Least Preferred Waste Hierarchy Actions

Recycling is secondary to avoiding, reducing and reusing materials in the waste hierarchy. Limitations of existing infrastructure for recycling and processing, and challenges in finding a

secondary market for the materials, are known to create a barrier to CE progress (Blue Environment 2020, p. 77; Campbell-Johnston et al. 2019, p. 1237; QTC 2018, pp. 23-24). Yet Queensland LGs are currently in a position where they have invested heavily for decades in waste management services and infrastructure in the least preferred range of the waste hierarchy, mostly recycling and waste disposal, with some recovering energy in the form of captured landfill gases.

Some participants indicated that their organisation had mapped portions of their budgets against the waste hierarchy, indicating there is awareness of the importance and benefits of this in moving towards a CE. An effective and efficient transition to a CE will require commitment and significant effort from LGs to adapt and change their infrastructure and services to the more preferred actions at the top of the waste hierarchy, where materials are avoided, reduced or reused as a priority (refer to Figure 1-2).

As leaders in their communities and providers of many essential services, LG investment in the least preferred actions of the waste hierarchy directly influences how they make decisions and effects the adoption of CE technologies and behaviours.

5.3.7 Political Influence

Figure 5-8 summarises the political influence CE barrier identified specifically for Queensland LGs.

Figure 5-8 Summary of Barriers Arising from Political Influence

5.3.7.1 Ambiguity in State Government Priorities Influencing LG Decision-Making

Policies of individual State Government departments do not always align with those of other departments, creating uncertainty for LG decision-making. The creation of CE barriers by uncoordinated departmental policy and decision-making has been documented to result in discrepancies of priorities, decision-making and schedules (Bolger & Doyon 2019, pp. 2193 & 2201; Pugalis & Tan 2017, p. 24; QTC 2018, p. 24). This has a flow-on effect causing LG departments to deliver services aligned to different state departments (for example State Government Departments for Environment, Planning and Economic Development will each influence different internal departments of LG organisations). Siloed LG departments are known to create a barrier to CE progress (Bolger & Doyon 2019, p. 2194; QTC 2018, p. 24).

The following are examples of ambiguity in State Government priorities impacting LG decisions and CE progress identified in this research:

- The WMRR Strategy Strategic Priority 1 LG action: *Support and contribute to targets and actions under Litter and Illegal Dumping: A plan for Queensland*; refers to a document that

does not appear to be a current or public facing document. These targets and actions, and the States expectations, are therefore unknown to LG.

- The WMRR Strategy 2050 targets do not align with SDG 12 to ensure sustainable consumption and production patterns are attained by 2030 (refer to Section 1.2 for Australia's commitment to the SDGs).
- The *advanced payment* has been provided to LGs without certainty on time frames or the need to demonstrate beneficial use toward CE initiatives (refer to section 5.3.2.1).
- There is limited strategic planning and due diligence by the State allocating waste levy funds in local regions. Concerns were raised that state infrastructure plans are not aligned to achieve the best outcomes in regional areas where LGs have a larger responsibility to provide infrastructure and services; and that funding allocations by the state are not rigorously assessing CE progress or a return on investment at a local level.
- Funding from a State Government scheme, is believed to have been given to private organisation recipients to construct recycling infrastructure, without due diligence checks of the impacts on similar existing LG services provided in the same region. The participant believed there was not enough feedstock in the region for the existing recycling infrastructure and services, and the new investment would result in a negative impact on the existing LG recycling investment (financial or otherwise).

The ambiguity of State Government priorities for LG introduces complexity to the management of CE risks, leads to variability in decision-making regarding investment and resources, and ultimately delays progress and attainment of a CE (refer to Section 5.3.2.1).

LG also need to be mindful that State Government priorities are evolving and the decision-making framework, services and infrastructure that they are familiar with need to change to accommodate CE progress.

5.4 Limitations of Research Findings

The research findings are specific to Queensland LGs, and mostly to the LGs within the waste levy zone, but it is likely LGs in other jurisdictions are experiencing similar CE barriers. It was beyond the scope of this research to attribute specific CE barriers to specific LGs or attempt to determine the magnitude of those barriers, or draw absolute conclusions.

Recognising that the sample size of the survey, workshop and interview research instruments was low and that the results are therefore limited to the experiences of those participants; the research may not have captured data for all types of CE barriers experienced by Queensland LGs. The workshop observations were subjective and vulnerable to influence of the researcher's interpretation. Additionally, it is acknowledged that LGs may use strategic documents other than the corporate plan and operational plan to manage the organisational transition to a CE. Therefore,

all efforts may not have been considered or captured by this research. Caution is advised to consider the relevance of each barrier to a particular LG and further validation of the findings should be undertaken for that purpose.

The research results are specific to the context and considerations specified in the aims and objectives (refer to Section 1.4) and the time period in which the research took place (refer to Section 3.7) and therefore do not accommodate changes occurring after the data was sourced. At least one LG, Hinchinbrook Shire Council, subsequently published a new corporate plan and this document has not been interrogated. There was no statistically relevant data obtained or conclusions drawn for the LGs within the area of interest. The CE barriers identified represent a generalization only. The discussion is intentionally silent with regard to differences that may exist for each LG and their stakeholders (internal or external). Future research may attempt to address these limitations.

As a qualitative research program, the findings are somewhat subjective and may not be exhaustive, but have been carefully structured and based on the data gathered through multiple research instruments, to accommodate and account for biases.

5.5 Conclusion

The practicalities of a CE involve levels of interconnectedness that resemble the functions of a human body (EMF 2017a). Barriers to a CE are similarly interwoven and interrelated. This presents a barrier in itself to understanding and addressing the challenges for LG.

Analysis of the data collected via the five research instruments, determined that there were seven types of CE barriers:

- Insufficient knowledge and understanding
- Strategic organisational planning
- Collaboration and partnerships
- Procurement as a CE enabler
- Economic influences
- Unintended barriers created by LG and
- Political influence.

These barrier types generally aligned with those discussed in literature. This research has enhanced understanding of the CE barriers by identifying in the Queensland context root causes and implications.

The causes creating the most barriers to a CE for Queensland LGs are limitations in CE knowledge and practical application of CE concepts, an absence of an organisational wide CE

direction from LG leaders, and not actively planning to manage risk and behaviour changes required for a CE.

This research provides a more complete identification of CE barriers experienced by Queensland LGs in the infancy of operational transitions to a CE. It provides a baseline account which can be used to assess individual LG positions and monitor medium and long term progress by LGs.

Creating a CE is akin to a group of friends combining to stitch a patchwork quilt. You need to fit all of the different sized pieces together and depend on each friend's strengths to bring it all together. It has to be created piece by piece, block by block until finally you see the quilt starting to look like the finished product. Before you know it, that quilt becomes part of your life and you can't remember how things were before you and your friends made it.

5.6 Recommendations

In undertaking this research, several opportunities were also realised.

5.6.1 Opportunities for Future Research

Future research could take into account the barriers faced by individual LGs, and benefit from understanding and ranking those barriers by risk and impact to assist with allocating resources.

This could be done by:

a) Qualitatively measuring the level of impact of individual CE barriers on LG.
b) Interrogating LG planning and development administrative instruments for specific CE inhibitors and enablers.
c) Interrogating LG procurement instruments for specific CE inhibitors and enablers.

5.6.2 Opportunities for LG

LGs can personalise their CE journey and success by:

d) Having its leaders adopt a CE framework to support consistent decision-making and allocation of resources.
e) Increasing the workforce skillset and capacity to enable the CE framework.
f) Pursuing a community approach to identify CE barriers and opportunities specific to each LG region.

5.6.3 Opportunities for State Government

g) Improving policy instrument transparency to incentivise CE progress.

REFERENCES

Academy of Green Learning 2021, *Certificate IV in waste management*, Ingleburn, viewed 15 February 2021, <https://academygreen.edu.au/certificate-iv-in-waste-management/>.

Agyemang, M, Kusi-Sarpong, S, Khan, SA, Mani, V, Rehman, ST & Kusi-Sarpong, H 2019, 'Drivers and barriers to circular economy implementation: an explorative study in Pakistan's automobile industry', *Management Decision*, vol. 57, no. 4, pp. 971-994, viewed 30 May 2020, (online Emerald Insight).

Australian Council of Recycling cite in Blue Environment 2016, *Australian national waste report 2016*, Department of the Environment and Energy, Australian Government, viewed 12 August 2020, <https://www.environment.gov.au/system/files/resources/d075c9bc-45b3-4ac0-a8f2-6494c7d1fa0d/files/national-waste-report-2016.pdf>.

Australian Government myskills [*sic*] n.d., *Certificate IV in waste management*, National Careers Institute, viewed 10 May 2020, <https://www.myskills.gov.au/courses/details?Code=CPP40911>.

ALGA (Australian Local Government Association) 2019, *Local communities matter submission to the 2019-20 federal budget,* Treasury, viewed 3 August 2019, <https://treasury.gov.au/sites/default/files/2019-03/360985-Australian-Local-Government-Association.pdf>.

ALGA 2020, *About ALGA*, Deakin, viewed 9 October 2020, <https://alga.asn.au/about-alga/>.

BSC (Banana Shire Council) 2019, *Banana Shire shire of opportunity*, Biloela, viewed 14 September 2020, <https://www.banana.qld.gov.au/>.

Bet, B, Kas, J, Truijens, D, Lee, S, van der Broere, J, Leising, E, Nuninga, T, Bose, P, Ravensberg, E, van Francesco, E, di Wang, Y, Hassan, A, Fanitabasi, F & Wang, Z 2018, *Barriers and best practices for the circular economy*, SMO Promovendi – Circular Minds 2017/2018, Erasmus University, Rotterdam, 3 August 2019, <https://repub.eur.nl/pub/105039/>.

Blue Environment 2018, *National waste report 2018*, Department of the Environment and Energy, Australian Government, viewed 12 April 2020, <https://www.environment.gov.au/system/files/resources/7381c1de-31d0-429b-912c-91a6dbc83af7/files/national-waste-report-2018.pdf>.

Blue Environment 2019, *National waste data and reporting cycle 2017-2019 state and territory feedback and suggested improvements*, Department of the Environment and Energy, Australian Government, viewed 12 August 2020, <https://www.environment.gov.au/system/files/resources/49534283-1e5c-4b9d-a1b0-b5f5b22323f7/files/national-waste-data-and-reporting-cycle-2017-19.pdf>.

Blue Environment 2020, *National waste report 2020*, Department of the Environment and Energy, Australian Government, viewed 15 February 2021, <https://www.environment.gov.au/system/files/pages/5a160ae2-d3a9-480e-9344-4eac42ef9001/files/national-waste-report-2020.pdf>.

Bocken, N, Strupeit, L, Whalen, K & Nußholz, J 2019, 'A review and evaluation of circular business model innovation tools', *Sustainability*, vol. 11, no. 8, viewed 23 February 2021, <https://www.mdpi.com/2071-1050/11/8/2210>.

Bolger, K & Doyon, A 2019, 'Circular cities: exploring local government strategies to facilitate a circular economy', *European Planning Studies*, vol. 27, no. 11, pp. 2184-2205, viewed 23 February 2021, (online Taylor & Francis Online).

BCG (Boston Consulting Group) 2021a, *About BCG*, Boston Consulting Group, viewed 27 March 2021, <https://www.bcg.com/en-au/about/about-bcg/overview>.

BCG 2021b, *Change management DICE*, Boston Consulting Group, viewed 27 March 2021, <https://www.bcg.com/en-au/capabilities/business-transformation/change-management/dice>.

BCG 2021c, *DICE Calculator*, Boston Consulting Group, viewed 27 March 2021, <https://dice.bcg.com/dice-calculator/>.

BCG 2021d, *DICE FAQs*, Boston Consulting Group, viewed 27 March 2021, <https://dice.bcg.com/dice-faqs/>.

BCC (Brisbane City Council) 2019, *Council annual plan and budget 2019-20*, Brisbane, viewed 6 June 2020, <https://www.brisbane.qld.gov.au/about-council/council-information-and-rates/news-and-publications/council-annual-plan-and-budget/council-annual-plan-and-budget-2019-20>.

BCC 2020, *Annual plan and budget 2020-21*, Brisbane, viewed 23 October 2020, <https://www.brisbane.qld.gov.au/sites/default/files/documents/2020-06/20200615-Annual-Plan-and-Budget.pdf>.

Campbell-Johnston, K, Cate, Jt, Elfering-Petrovic, M & Gupta, J 2019, 'City level circular transitions: barriers and limits in Amsterdam, Utrecht and The Hague', *Journal of Cleaner Production*, vol. 235, pp. 1232-1239, viewed 23 February 2021, (online ScienceDirect/Elsevier).

CTRC (Charters Towers Regional Council) 2021, *Our priorities*, Charters Towers, viewed 12 March 2021, <https://www.charterstowers.qld.gov.au/priorities/priorities-1?documentId=166&categoryId=382>.

Circular Economy Lab 2021, *Join the circle, strike a chord*, Circular Economy Lab, viewed 24 March 2021, <https://circularecolab.com/dashboard/>.

Climate Active 2019a, *Brisbane city council*, Climate Active, viewed 12 April 2021, <https://www.climateactive.org.au/buy-climate-active/certified-members/brisbane-city-council>.

Climate Active 2019b, *How it works*, Climate Active, viewed 12 April 2021, <https://www.climateactive.org.au/what-climate-active/how-it-works>.

COEX Container Exchange 2021, *About us*, COEX Container Exchange, viewed 8 May 2021, <https://containerexchange.com.au/about-us/>.

Containers for Change 2020, *About us*, COEX Container Exchange, viewed 8 May 2021, <https://www.containersforchange.com.au/qld/about-us>.

Coreo 2021, *From theory to practice*, Maroochydore, viewed 27 March 2021, <https://coreo.com.au/#services>.

Council of the European Communities 1975, 'Council Directive 75/442/EEC of 15 July 1975 on waste', *Official Journal of the European Communities*, no. L 194/39, viewed 17 March 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31975L0442&from=EN>.

Coursera 2020, *Circular economy courses*, Coursera, viewed 30 December 2020, <https://www.coursera.org/courses?query=circular%20economy>.

CCC (Crime and Corruption Commission) 2017, *Operation belcarra a blueprint for integrity and addressing corruption risk in local government*, CCC, Queensland viewed 1 March 2021, <https://www.ccc.qld.gov.au/sites/default/files/2019-08/Operation-Belcarra-Report-2017.pdf>.

CCC 2021, *Operation belcarra: reforming local government in Queensland*, CCC, Queensland, viewed 1 March 2021, <https://www.ccc.qld.gov.au/public-hearings/operation-belcarra-reforming-local-government-queensland>.

Department of Agriculture Water and the Environment n.d., *Waste exports*, Australian Government, viewed 2 March 2021, <https://www.environment.gov.au/protection/waste/exports>.

DES (Department of Environment and Science) 2019, *Queensland waste avoidance and resource productivity strategy 2014-2024 final review report*, Queensland Government, Brisbane, viewed 3 August 2019, <https://www.qld.gov.au/__data/assets/pdf_file/0021/94062/qld-waste-avoid-resource-prod-strat-2014-24.pdf>.

DFAT (Department of Foreign Affairs and Trade) n.d., *United Nations (UN)*, Australian Government, Canberra, viewed 11 February 2021, <https://www.dfat.gov.au/international-relations/international-organisations/un/Pages/united-nations-un#:~:text=Australia%20is%20a%20founding%20member,to%20the%20UN%20regular%20budget.>.

DLGRMA (Department of Local Government Racing and Multicultural Affairs) 2019, *Local government area boundaries*, Queensland Government, Brisbane, viewed 18 December 2020, <https://www.dlgrma.qld.gov.au/__data/assets/pdf_file/0019/42454/local-government-area-boundaries.pdf>.

DLGRMA 2020, *Community guide to local government in Queensland*, Queensland Government, Brisbane, viewed 28 February 2021, <https://www.dlgrma.qld.gov.au/__data/assets/pdf_file/0028/44947/community-guide-to-local-government.pdf>.

DSDTI (Department of State Development Tourism and Innovation) 2020, *Resource Recovery*, Queensland Government, Brisbane, viewed 9 September 2020, <https://www.statedevelopment.qld.gov.au/industry/priority-industries/resource-recovery.html>.

EMF (Ellen Macarthur Foundation) 2015, *Delivering the circular economy a toolkit for policymakers*, Ellen Macarthur Foundation, viewed 6 September 2019, <https://www.ellenmacarthurfoundation.org/assets/downloads/government/EllenMacArthurFoundation_Policymakers-Toolkit.pdf>.

EMF 2017a, *Cities in the circular economy: an initial exploration*, Ellen Macarthur Foundation, viewed 14 February 2021, <https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Cities-in-the-CE_An-Initial-Exploration.pdf>.

EMF 2017b, *Courses*, Ellen Macarthur Foundation, viewed 30 December 2020, <https://www.ellenmacarthurfoundation.org/resources/learn/courses>.

EMF 2017c, *Learning path - cities and the circular economy*, Ellen Macarthur Foundation, viewed 3 August 2019, <https://www.ellenmacarthurfoundation.org/explore/cities-and-the-circular-economy>.

EMF 2017d, *Schools of thought*, Ellen Macarthur Foundation, viewed 20 December 2020, <https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought#:~:text=The%20circular%20economy%20concept%20has,%2C%20thought%2Dleaders%20and%20businesses.>.

EMF 2017e, *The circular economy in detail*, Ellen Macarthur Foundation, viewed 2 August 2020, <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail#:~:text=Keep%20products%20and%20materials%20in%20use,-What%20if%20we&text=A%20circular%20economy%20favours%20activities,materials%20circulating%20in%20the%20economy.>.

EMF 2017f, *What is the circular economy?,* Ellen Macarthur Foundation, viewed 3 April 2020, <https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy>.

EMF & IDEO (Ellen Macarthur Foundation and Innovation Design Engineering Organization) 2017, *Workshops circular ventures*, Circular Design Guide, viewed 4 August 2019, <https://www.circulardesignguide.com/resources>.

European Commission n.d., *Circular economy action plan*, European Commission, viewed 13 May 2021, <https://ec.europa.eu/environment/strategy/circular-economy-action-plan_en#:~:text=The%20EU's%20new%20circular%20action,(CEAP)%20in%20March%202020.&text=The%20EU's%20transition%20to%20a,create%20sustainable%20growth%20and%20jobs>.

European Commission 2015, *GREENECONET: A best practice platform to support the transition towards a green economy*, Cordis, viewed 22 March 2020, <https://cordis.europa.eu/article/id/169894-helping-smes-go-green-with-a-centralised-platform>.

European Commission 2020, *Circular economy action plan for a cleaner and more competitive Europe*, European Commission, viewed 13 May 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN>.

EESC European Economic and Social Committee 2019, *Europe must become a global leader in sustainable development*, European Economic and Social Committee, 27 March, viewed 30 December 2020, <https://www.eesc.europa.eu/en/news-media/press-releases/europe-must-become-global-leader-sustainable-development>.

Franco, MA 2017, 'Circular economy at the micro level: a dynamic view of incumbents' struggles and challenges in the textile industry', *Journal of Cleaner Production*, vol. 168, pp. 833–845, viewed 6 March 2021, (online ScienceDirect/Elsevier).

Galvao, G, de Nadae, J, Clemente, D, Chinen, G & de Carvalho, M 2018, 'Circular economy: overview of barriers', *Procedia CIRP*, vol. 73, pp. 79-85, viewed 28 February 2021, (online ScienceDirect/Elsevier).

Geissdoerfer, M, Savaget, P, Bocken, NM & Hultink, EJ 2017, 'The circular economy–a new sustainability paradigm?', *Journal of Cleaner Production*, vol. 143, pp. 757-68, viewed 5 April 2020, (online ScienceDirect/Elsevier).

Ghisellini, P, Cialani, Catia, & Ulgiati, Sergio 2016, 'A review on circular economy: the expected transition to a balanced interplay of environmental economic systems', *Journal of Cleaner Production*, vol. 114, pp. 11-32, viewed 23 February 2021, (online ScienceDirect/Elsevier).

Google Search 2021, *Circular economy university courses Australia*, Google, viewed 6 March 2021, <https://www.google.com/search?q=circular+economy+university+courses+australia&oq=circular+economy&aqs=chrome.1.69i57j69i59j0l8.3656j0j15&sourceid=chrome&ie=UTF-8>.

Govindan, K & Hasanagic, M 2018, 'A systematic review on drivers, barriers, and practices towards circular economy: a supply chain perspective', *International Journal of Production Research*, vol. 56, no. 1-2, pp. 278-311, viewed 26 February 2021, (online EBSCOhost).

GreenEcoNet 2014, *About us*, GreenEcoNet, viewed 22 March 2020, <http://greeneconet.eu/about-us>.

Hillary, R 2004, 'Environmental management systems and the smaller enterprise', *Journal of Cleaner Production*, vol. 12, no. 6, pp. 561-569, viewed 14 February 2021, (online ScienceDirect/Elsevier).

Hinchinbrook Shire Council n.d., *Marketing strategy and action plan 2021-2025*, Ingham, viewed 15 September 2020, <https://s3-ap-southeast-2.amazonaws.com/os-data-2/hsc/documents/marketing_strategy__action_plan_compressed.pdf>.

Holmes, B 2012, *Queensland election 2012*, Parliament of Australia, 7 June, viewed 21 February 2021, <https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BN/2011-2012/QldElection2012>.

Holonic 2020, *What we do*, Perth, viewed 27 March 2021, <https://www.holonic.com.au/>.

Houston, J, Casazza, E, Briguglio, M & Spiteri, J 2018, *Stakeholder views report enablers and barriers to a circular economy*, r2piproject, viewed 1 January 2021, <http://www.r2piproject.eu/wp-content/uploads/2018/08/R2pi-stakeholders-report-sept-2018.pdf>.

IRC (Isaac Regional Council) 2019, *Councils mission, statement and corporate values*, Moranbah, viewed 12 March 2021, <https://www.isaac.qld.gov.au/vision-mission-values/councils-mission-statement-corporate-values?documentId=192&categoryId=739>.

Johnston, P 2019, *Queensland town plans to become Australia's first circular economy*, The Fifth State, 10 December, viewed 12 August 2020, <https://thefifthestate.com.au/urbanism/planning/how-a-queensland-town-plans-to-be-australias-first-circular-economy/>.

Kirchherr, J, Hekkert, M, Bour, R, Huijbrechtse-Truijens [*sic*], A, Kostense-Smit, E & Muller, J 2017, *Breaking the barriers to the circular economy*, Deloitte, viewed 30 May 2020, <https://www2.deloitte.com/nl/nl/pages/risk/articles/breaking-the-barriers-to-the-circular-economy.html>.

Kirchherr, J, Piscicelli, L, Bour, R, Kostense-Smit, E, Muller, J, Huibrechtse-Truijens, A & Hekkert, M 2018, 'Barriers to the circular economy: evidence from the European Union (EU)', *Ecological Economics Journal*, vol. 150, pp. 264-272, viewed 9 August 2019, (online Elsevier/Science Direct).

LAWMAC (Local Authority Waste Management Advisory Committee) 2020, *About us*, LAWMAC, viewed 18 December 2020, <http://www.lawmac.org.au/about-us/>.

LGAQ (Local Government Association of Queensland) 2013, *Understanding your council*, LGAQ, Newstead, viewed 12 January 2020, <https://www.lgaq.asn.au/understanding-your-council>.

LGAQ 2018, *Queensland councils vote for zero waste to landfill by 2028*, 27 April, LGAQ, Newstead, viewed 13 May 2021, < https://www.lgaq.asn.au/news/article/255/queensland-councils-vote-for-zero-waste-to-landfill-by-2028>.

LGAQ 2019a, *Partnership with councils needed to achieve zero waste future*, 14 February, LGAQ, Newstead, viewed 5 April 2020, <https://www.lgaq.asn.au/news/article/793/partnership-with-councils-needed-to-achieve-zero-waste-future>.

LGAQ 2019b, *Time for action on waste strategy*, 5 April, LGAQ, Newstead, viewed 5 April 2020, <https://www.lgaq.asn.au/news/article/739/time-for-action-on-waste-strategy>.

LGAQ 2020, *Queensland local general government expenses by purpose*, LGAQ, Newstead, viewed 6 March 2021, <https://www.lgaq.asn.au/downloads/file/231/queensland-local-general-government-expenses-by-purpose>.

LGAQ 2021, *About us*, LGAQ, Newstead, viewed 5 May 2021, <https://www.lgaq.asn.au/us>.

Logan City Council n.d., *LGAQ motion future of the waste levy advance payment*, Logan City Council, viewed 3 April 2021, <https://pub-logancity.escribemeetings.com/filestream.ashx?DocumentId=1238>.

Loop Circular Economy Platform Ltd. n.d., *Queensland's circular economy future*, Loop Platform, viewed 2 April 2020, <https://static1.squarespace.com/static/5b24d6ec697a98226d7a3540/t/5d78571229c1dd56882f5748/1568167736412/queenslandscircularеconomyfuture.pdf>.

Patton, MQ 2002, *Qualitative research & evaluation methods*, 3rd edn, Sage Publications Inc., California.

Pheifer, A 2017, *Barriers & enablers to circular business models*, MBA Innovation Enterprise & Circular Economy, Bradford University, viewed 29 May 2020, <https://www.circulairondernemen.nl/uploads/4f4995c266e00bee8fdb8fb34fbc5c15.pdf>.

Planning (Container Refund Scheme) Amendment Regulation 2018 (Qld.)

Pugalis, L & Tan, SF 2017, *The role of local government in local and regional economic development,* University of Technology, Sydney, viewed 17 October 2020, <https://www.uts.edu.au/sites/default/files/2017-09/The%20Role%20of%20Local%20Government%20in%20Local%20and%20Regional%20Economic%20Development.pdf>.

QSR International 2021, *NVIVO*, QSR International, viewed 8 January 2021, <https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/about/nvivo>.

Queensland Electoral Commission 2020, *2020 state general election*, Brisbane, viewed 12 August 2020, <https://www.ecq.qld.gov.au/elections/election-events/2020-state-general-election>.

Queensland Government n.d., *Waste management and resource recovery strategy*, Brisbane, viewed 3 August 2019, <https://www.qld.gov.au/__data/assets/pdf_file/0028/103798/qld-waste-management-resource-recovery-strategy.pdf>.

Queensland Government 1995–2021a, *For councils*, Brisbane, viewed 3 April 2021, <https://www.qld.gov.au/environment/pollution/management/waste/recovery/disposal-levy/councils#:~:text=This%20covers%20around%2090%20per,with%20an%20annual%20advance%20payment.>.

Queensland Government 1995-2021b, *Our structure*, Brisbane, viewed 5 May 2021, <https://www.qld.gov.au/about/how-government-works/government-structure>.

Queensland Government 2018, *Recycling and waste in Queensland*, Brisbane, viewed 12 August 2020, <https://www.qld.gov.au/__data/assets/pdf_file/0021/93711/recycling-waste-qld-report-2018.pdf>.

Queensland Government 2020a, *Levy zone map*, Brisbane, viewed 14 June 2020, <https://www.qld.gov.au/environment/pollution/management/waste/recovery/disposal-levy/about/waste-levy-map>.

Queensland Government 2020b, *Queensland's planning framework understanding the key concepts*, Brisbane, viewed 8 May 2021, <https://planning.dsdmip.qld.gov.au/planning/better-development/key-concepts>.

QTAC (Queensland Tertiary Admissions Centre) 2020, *Find a course search results for: "circular economy"*, QTAC, Milton, viewed 6 March 2021, <https://www.qtac.edu.au/courses/?drts-search=1&search_keyword%5Btext%5D=circular%20economy&search_keyword%5Bid%5D=&search_keyword%5Btaxonomy%5D=&search_term_directory_category=>.

QTC (Queensland Treasury Corporation) n.d., *About QTC*, Brisbane, viewed 5 May 2021, <https://www.qtc.com.au/about-qtc/>.

QTC 2018, *Interim report: economic opportunities for Queensland's waste industry*, Brisbane, viewed 3 August 2019, <https://www.qld.gov.au/__data/assets/pdf_file/0021/69042/qld-waste-industry-economic-opportunities-interim-report.pdf>.

Ranta, V, Aarikka-Stenroos, L, Ritala, P & Mäkinen, SJ 2018, 'Exploring institutional drivers and barriers of the circular economy: a cross-regional comparison of China, the US, and Europe', *Resources, Conservation & Recycling*, vol. 135, pp. 70-82, viewed 30 May 2020, (online ScienceDirect/Elsevier).

Rizos, V, Behrens, A, Kafyeke, T, Hirschnitz-Garbers, M & Loannou, A 2015, *The circular economy: barriers and opportunities for SMEs*, CEPS (Centre for European Policy Studies), Brussels, viewed 3 August 2019, <https://www.ceps.eu/ceps-publications/circular-economy-barriers-and-opportunities-smes/>.

Rizos, V, Behrens, A, VanderGaast, W, Hofman, E, Ioannou, A, Kafyeke, T, Flamos, A, Rinaldi, R, Papadelis, S, Hirschnitz-Garbers, M & Topi, C 2016, 'Implementation of circular economy business models by small and medium-sized enterprises (SMEs): barriers and enablers', *Sustainability*, vol. 8, no. 11, viewed 22 March 2020, <https://www.mdpi.com/2071-1050/8/11/1212>.

Simon, JM 2019, *A zero waste hierarchy for Europe*, Zero Waste Europe, viewed 17 March 2021, <https://zerowasteeurope.eu/2019/05/a-zero-waste-hierarchy-for-europe/>.

Sirkin, HL, Keenan, P & Jackson, A 2005, *The hard side of change management*, Harvard Business Review, viewed 27 March 2021, <https://hbr.org/2005/10/the-hard-side-of-change-management>.

Stanislaus, M 2019, *5 ways to unlock the value of the circular economy*, 15 April, World Resources Institute, viewed 4 February 2021, <https://www.wri.org/blog/2019/04/5-ways-unlock-value-circular-economy>.

Tura, N, Hanski, J, Ahola, T, Ståhle, M, Piiparinen, S & Valkokari, P 2019, 'Unlocking circular business: a framework of barriers and drivers', *Journal of Cleaner Production*, vol. 212, pp. 90-98, viewed 29 May 2019, (online ScienceDirect/Elsevier).

UN (United Nations) n.d.a, *Sustainable development the 17 goals*, Department of Economic and Social Affairs, viewed 11 February 2021, <https://sdgs.un.org/goals>.

UN n.d.b., *Sustainable development chemicals and waste*, Department of Economic and Social Affairs, viewed 11 February 2021, <https://sdgs.un.org/taxonomy/term/1168>.

Verhaar, H 2018, *The age of sustainalism [sic]: a new growth model for the 21st century*, United Nations Environment Program, viewed 8 October 2020, <https://www.unenvironment.org/news-and-stories/story/age-sustainalism-new-growth-model-21st-century>.

Waste Management Review Magazine 2020, 'Training for the waste sector', *Waste Management Review Magazine*, April, pp. 34-35.

Waste Reduction and Recycling Act 2011(Qld).

Waste Reduction and Recycling Bill 2011 (Qld).

Waste Reduction and Recycling Amendment Regulation (No. 1) 2012 (Qld).

Williams, ID 2015, 'Forty years of the waste hierarchy', *Waste Management*, vol. 40, pp. 1-2, viewed 20 December 2020, (online ScienceDirect/Elsevier).

World Bank Group 2018, *Municipal solid waste management: a roadmap for reform for policy makers*, Washington, viewed 14 February 2021, <https://openknowledge.worldbank.org/bitstream/handle/10986/30434/130055-WP-P162603-WasteManagement-PUBLIC.pdf?sequence=1&isAllowed=y>.

Xue, B, Chen, X-p, Geng, Y, Guo, X-j, Lu, C-p, Zhang, Z-l & Luc, C-y 2010, 'Survey of officials' awareness on circular economy development in China: based on municipal and county level', *Resources, Conservation and Recycling*, vol. 54, no. 12, pp. 1296 – 1302, viewed 26 February 2021, (online ScienceDirect/Elsevier).

APPENDIX A: WMRR STRATEGY

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Queensland Waste Management and Resource Recovery Strategy

APPENDIX B: SURVEY QUESTIONNAIRE

Cracking the Circular Economy Barriers of Queensland Local Governments

Start of Block: Introduction

The Queensland Governments *Waste Management and Resource Recovery Strategy* outlines three strategic priorities and sets ambitious targets to transition Queensland to a circular economy. The strategic priorities are:

1. Reducing the impact of waste on the environment
2. Transitioning to a circular economy for waste
3. Building economic opportunity

The success targets to be achieved by 2050 are:

1. 25% reduction in household waste
2. 90% of waste is recovered and does not go to landfill
3. 75% recycling rates across all waste types

A circular economy is one in which waste is eliminated and materials are designed to be recovered as resources and reused in some form. This transition will challenge our current lineal economy processes and force innovation, in the hope of creating a sustainable future for our communities.

End of Block: Introduction

Start of Block: Participant Demographics

Q1 Please select the most applicable response below. You are a:

- ○ Local Government Employee
- ○ Non-Local Government Employee (work with LG) e.g. Consultant or service provider
- ○ Non- Local Government Employee (do not work with LG)
- ○ Elected Member of Local Government

Q2 Please select the geographic region your organisation is located (select all applicable)

- ☐ Far North Queensland
- ☐ North Queensland
- ☐ Mackay, Isaac, Whitsundays
- ☐ Central Queensland
- ☐ Central West Queensland
- ☐ Wide Bay Burnett
- ☐ Darling Downs and South West
- ☐ South East Queensland
- ☐ Indigenous Council Area
- ☐ Waste levy zone
- ☐ Non-waste levy zone
- ☐ Other

Q3 Please select the discipline/s that most describes your current role:

- ○ Planning and Development
- ○ Finance
- ○ Infrastructure/Works
- ○ Engineering
- ○ Waste Management
- ○ Resource Recovery
- ○ Information Technology
- ○ Executive Management
- ○ Customer Service
- ○ Asset Management
- ○ Facilities Management
- ○ Environmental Management
- ○ Environmental Health
- ○ Other

Q4 Have you previously read the Queensland *Waste Management and Resource Recovery Strategy* (released 1 July 2019)?

- ○ Yes
- ○ No

End of Block: Participant Demographics

Start of Block: Risk Management

Q5 Please select a response for each of the following questions

	Yes	No	Unsure	N/A
Do you think your profession has a role to play in the transition from a linear economy to a circular economy?	○	○	○	○
Does your organisations current long-term corporate plan include goals and targets to align with the State's waste strategy goals and targets?	○	○	○	○
Does your organisations current long-term corporate plan include strategies to increase opportunities for resource recovery?	○	○	○	○
Has your organisation developed a change management plan for the transition of waste management services from a traditional take-make-dispose linear process to reduce-reuse-recycle circular economy processes?	○	○	○	○
Has your organisation appointed a working group to manage the whole of organisation business changes required to achieve the actions of the new waste strategy?	○	○	○	○
Since 1 July 2019, has your organisation made changes in day-to-day operations in the way waste materials are handled to ensure maximum recovery, re-use and recycling is achieved?	○	○	○	○

Q6 To-date, when assessing the risks for your organisation in the transition from traditional waste management landfill disposal of waste to resource recovery and materials re-use, have the following elements been considered?

	Yes	No	Unsure	N/A
Economic benefit or loss	○	○	○	○
Environmental benefit or loss	○	○	○	○
Reputational influences	○	○	○	○
Level of management involvement	○	○	○	○
Legal Obligations	○	○	○	○
Level of compliance	○	○	○	○
Knowledge and experience of workforce	○	○	○	○
Impacts on workforce numbers	○	○	○	○
Availability of trained and competent workforce	○	○	○	○
Impacts on asset management	○	○	○	○
Disruptions to waste management services	○	○	○	○
Community exposure	○	○	○	○
Community understanding	○	○	○	○
Community consultation	○	○	○	○
Behaviour changes within own operations	○	○	○	○
Behaviour changes within local community	○	○	○	○
Behaviour changes for commercial businesses	○	○	○	○
Financial benefit or loss	○	○	○	○
Operational budget impact for future financial years	○	○	○	○
Capital budget impacts for future financial years	○	○	○	○

End of Block: Risk Management

Start of Block: Procurement

Q7 Consider your organisations current procurement processes to respond to the below statements.

	Yes (all)	Yes (some)	No	Unsure
The scope of works always includes a statement for a preference to use products with recycled content	○	○	○	○
The scope of works always invites innovative solutions to be presented in submissions	○	○	○	○
The evaluation is weighted at 50% or more for overall price	○	○	○	○
The evaluation considers the volume of greenhouse gas emissions associated with the project execution/delivery	○	○	○	○
The evaluation considers the volume of virgin materials consumed in the project	○	○	○	○
The evaluation considers whole of life durability of products utilised for the project, including how materials are sourced, used, collected, processed and treated	○	○	○	○
The evaluation considers the use of recycled materials and products sourced from a local market	○	○	○	○
The evaluation includes an assessment of whole of life environmental outcomes	○	○	○	○
The evaluation considers a whole of life assessment for asset management	○	○	○	○
The evaluation considers future growth and sustainable long-term outcomes related to the project	○	○	○	○
The evaluation includes an assessment of waste management for the duration of the project against the waste hierarchy	○	○	○	○
The evaluation considers how the project contributes/influences the long-term sustainability of the organisation's entire operations	○	○	○	○
Contracts awarded include key performance indicators (KPIs) to reduce waste to landfill and increase resource recovery during the project life	○	○	○	○
Current contracts in place for waste collection services or resource recovery services for your organisation will need to be amended or changed as a result of the new waste strategy actions/targets	○	○	○	○

End of Block: Procurement

Start of Block: Planning

Q8 Consider your organisations current planning processes to respond to the below statements and questions (for questions marked with an asterix (*) consider the council where you live)

	Yes (all)	Yes (some)	No	Unsure
Since the introduction of the new waste strategy, has your organisation commenced a review and update of internal waste reduction and recycling plans?	○	○	○	○
Since the introduction of the new waste strategy, has your organisation commenced a review and update of asset and infrastructure plans?	○	○	○	○
Does your organisation have sustainable development goals that encourage resource recovery and the use of recycled materials?	○	○	○	○
Is your organisation actively promoting the development of local solutions for the treatment and processing of recovered and recycled materials?	○	○	○	○
Is your organisation actively promoting the development of end markets for local use of recycled materials?	○	○	○	○
Does your organisations infrastructure development and investment assessments include consideration for whole of life efficient use of resources for construction, operation, and final dismantle?	○	○	○	○
Does your organisations planning and development approval conditions promote whole of life efficient use of resources for construction, operation, and final dismantle?	○	○	○	○
Has your organisation introduced incentives or reverse-incentives to facilitate a change in behaviours to increase resource recovery?	○	○	○	○
Uncertainty in the availability of external funding grants from Federal or State Government is a limiting factor in long term planning for resource recovery infrastructure investment for your organization	○	○	○	○
Has your organisation mapped source to sink pathways for all materials used and waste streams created?	○	○	○	○
Has your organisation mapped operational budgets against the waste hierarchy to compare where spend and effort is being concentrated for waste management and resource recovery?	○	○	○	○
Has your organisation considered making no change to waste management services as they believe it may be cheaper to dispose to landfill and pay the waste levy?	○	○	○	○
* Does your councils planning scheme promote co-location of industries to promote close proximity of resource use and processing to be situated near end use markets?	○	○	○	○
* Council has included a reduction of the waste levy rebate from state government in future financial forecasts	○	○	○	○

End of Block: Planning

Start of Block: Local Industry and Community

Q9 Please select a response for each of the following statements

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
Organisations and service providers that we do business with have a good understanding of circular economy principles	○	○	○	○	○
Local businesses should be financially supported to invest in new infrastructure to enhance resource recovery, processing and re-use	○	○	○	○	○
Local businesses should be financially supported by State Government with the use of levy revenue to invest in new infrastructure to enhance resource recovery, processing and re-use	○	○	○	○	○
The local community expects council to offer more opportunities to recycle and recover materials traditionally disposed to landfill	○	○	○	○	○
The local community expects all drink containers to be included in the container refund scheme (e.g., wine bottles, milk bottles, etc.)	○	○	○	○	○
Council is well supported by the community in the way they currently manage waste	○	○	○	○	○
Council is actively seeking partnerships with local businesses to deliver services that will achieve the targets of the waste strategy	○	○	○	○	○
The local community is supportive of council when new practices are introduced, particularly where the community are required to change their behaviour	○	○	○	○	○
Consumer expectations prefer convenience over sustainability	○	○	○	○	○
Mainstream media significantly influences community understanding (or misunderstanding) and perception (or misconceptions) of resource recovery and recycling	○	○	○	○	○
Social media significantly influences community understanding (or misunderstanding) and perception (or misconceptions) of resource recovery and recycling	○	○	○	○	○
The federal government should mandate Australian recycled content in Australian made products	○	○	○	○	○
The federal government should mandate recycled content for imported products	○	○	○	○	○

Q10 The federal government should introduce mandatory product stewardship programs for the following:

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
Mattresses	○	○	○	○	○
Tyres	○	○	○	○	○
Whitegoods	○	○	○	○	○
Small electrical goods	○	○	○	○	○
Packaging materials that hold more than 1 litre/1 kilogram	○	○	○	○	○
Drink containers currently excluded from the container refund scheme	○	○	○	○	○
Vehicles	○	○	○	○	○
Construction materials	○	○	○	○	○

Q11 Please specify any other mandatory product stewardship programs the federal government could introduce in addition to the question above.

_____

_____

_____

_____

_____

Q12 Does your organisation support local social enterprises that have commercialised resource recovery concepts?

- Yes
- No

Display This Question:

If Does your organisation support local social enterprises that have commercialised resource recover... = No

Q12b Please provide details as to why not. Is the reason a barrier in itself?

_____

_____

_____

_____

_____

Q13 Do you think there is benefit to having a central point of contact for all stakeholders to be able to collaborate to transition to a Circular Economy?

- Yes
- No
- Maybe

Q14 What are the top three (3) challenges for your local council to manage litter and illegal dumping?

_____

_____

_____

Q15 How does your local council promote waste avoidance?

_____

_____

End of Block: Local Industry and Community

Start of Block: Research Project

Q16 Please provide details of any barriers or challenges being experienced that have not been identified in this survey or other general feedback below.

_____

_____

_____

Q17 A copy of the final research thesis or other published materials by the researcher on this topic will be made available to participants. If you would like to receive a copy of the final research thesis or other published materials sent directly by the researcher, please provide email details below.

_____

_____

_____

The researcher invites you to also participate in a one-on-one interview to gain further insight into the challenges faced by local governments (and organisations working with local government) and develop case-studies to be featured in the thesis and other published outputs of this research. If you are interested in receiving more information about participating in an interview, please contact the researcher, Victoria Hammer, directly via email at hamm0180@flinders.edu.au.

End of Block: Research Project

APPENDIX C: CIRCULAR DESIGN GUIDE WORKSHOP ACTIVITY

Content removed for copyright reasons

Circular Design Guide Circular Ventures

APPENDIX D: INTERVIEW QUESTIONNAIRE

One-on-One Interview Form

Cracking the Circular Economy Barriers of Queensland Local Governments

Thank you for volunteering to participate in a one-on-one in-depth interview. Your feedback and comments will help shape and strengthen the research outcomes. A consent form must be signed prior to taking part in the interview.

Interview Date				
Interview mechanism				
Consent forms signed and returned	☐	Use of information	☐	Photographic

Name				
Email & Phone				
Occupation				
	☐	Local Government Employee	☐	Non-Local Government Employee

What are the key challenges and barriers you are facing in being able to achieve the actions of the new waste strategy?
Please provide a detailed example on why each of the items identified in the question above is a challenge or barrier.
Have you identified any key enablers for your organisation with the introduction of the new waste strategy?
Please define the enablers identified and give detailed examples for each.

APPENDIX E: CORPORATE DOCUMENT BIBLIOGRAPHY

Banana Shire Council 2018, *Corporate plan 2016-2021*, viewed 13 June 2020, <https://www.banana.qld.gov.au/downloads/file/5757/2016-2021-corporate-plan>.

Banana Shire Council 2019, *Operational plan 2019-2020*, viewed 13 June 2020, <https://www.banana.qld.gov.au/downloads/file/5681/2019-2020-operational-plan>.

Banana Shire Council 2020, *Operational plan 2020-2021*, viewed 23 October 2020, <https://www.banana.qld.gov.au/downloads/file/5681/2020-2021-operational-plan>.

Brisbane City Council 2017, C*orporate plan 2016-17 to 2020-21*, viewed 13 June 2020, <https://www.brisbane.qld.gov.au/sites/default/files/20170821_-_corporate_plan_2016-17_to_2020-21_-_2017_update.pdf>.

Brisbane City Council 2019, *Council annual plan and budget 2019-20*, viewed 6 June 2020, <https://www.brisbane.qld.gov.au/about-council/council-information-and-rates/news-and-publications/council-annual-plan-and-budget/council-annual-plan-and-budget-2019-20>.

Brisbane City Council 2020, *Annual plan and budget 2020-21*, viewed 23 October 2020, <https://www.brisbane.qld.gov.au/sites/default/files/documents/2020-06/20200615-Annual-Plan-and-Budget.pdf>.

Bundaberg Regional Council 2018, *Corporate plan 2019 - 2023*, viewed 13 June 2020, <https://formstmp.bundaberg.qld.gov.au/MD-7-879.pdf>.

Bundaberg Regional Council 2019, *2019-2020 Operational plan*, viewed 13 June 2020, <https://www.bundaberg.qld.gov.au/downloads/file/1617/operational-plan-2019-20>.

Bundaberg Regional Council 2020, *2020 - 2021 operational plan*, viewed 23 October 2020, <https://www.bundaberg.qld.gov.au/downloads/file/1624/operational-plan-2020-21->.

Burdekin Shire Council n.d., *Corporate plan 2015-2020*, viewed 13 June 2020, <https://www.burdekin.qld.gov.au/downloads/file/1351/corporate-plan-2015-2020>.

Burdekin Shire Council c. 2019, *Operational plan 2019/2020*, viewed 13 June 2020, <https://www.burdekin.qld.gov.au/downloads/file/1390/2019-2020-operational-plan>.

Burdekin Shire Council c. 2020, *Operational plan 2020/2021*, viewed 25 October 2020, <https://www.burdekin.qld.gov.au/downloads/file/1737/2020-2021-operational-plan>.

Cairns Regional Council n.d., *Corporate plan 2017-2022*, viewed 13 June 2020, <https://www.cairns.qld.gov.au/__data/assets/pdf_file/0004/209722/CorpPlan17_22.pdf>.

Cairns Regional Council c. 2019, *Operational plan 2019/20*, viewed 13 June 2020, <https://www.cairns.qld.gov.au/__data/assets/pdf_file/0005/302288/1920op_plan.pdf>.

Cairns Regional Council c. 2020, *Operational plan 2020/21*, viewed 25 October 2020, <https://www.cairns.qld.gov.au/__data/assets/pdf_file/0011/349067/20_21_opplan.pdf>.

Cassowary Coast Regional Council 2019, C*orporate plan 2017 - 2022*, <http://www.cassowarycoast.qld.gov.au/documents/1422210/3094093/corporate%20plan%202019%20email%20final.pdf>.

Cassowary Coast Regional Council c. 2019, *Operational plan 2019/20*, viewed 13 June 2020, <http://www.cassowarycoast.qld.gov.au/documents/1422210/42222377/2019-2020%20Operational%20Plan.pdf>.

Cassowary Coast Regional Council c. 2020, *2020/2021 annual operational plan quarterly report*, viewed 25 October 2020, <http://www.cassowarycoast.qld.gov.au/documents/1422210/42222377/Operational%20Plan%20First%20Quarterly%20Report.pdf>.

Central Highlands Regional Council 2017, C*orporate plan 2017-2022*, viewed 13 June 2020, <http://www.centralhighlands.qld.gov.au/wp-content/uploads/2015/12/7430-Corporate-Plan-2017-2022_ISSUU.pdf>.

Central Highlands Regional Council 2019, *Operational plan 2019-2020*, viewed 13 June 2020, <http://www.centralhighlands.qld.gov.au/wp-content/uploads/2019/08/ECM_1436572_v1_2019-20-Operational-Plan.pdf>.

Central Highlands Regional Council 2020, *2020-2021 operational plan*, viewed 25 October 2020, <http://www.centralhighlands.qld.gov.au/wp-content/uploads/2020/07/ECM_1542294_v5_CHRC-2020-2021-Operational-Plan.pdf>.

Charters Towers Regional Council 2019, *Corporate plan 2018-2023*, viewed 13 June 2020, <https://www.charterstowers.qld.gov.au/downloads/file/217/ctrc-corporate-plan-2018-2023>.

Charters Towers Regional Council c. 2019, *Operational plan 2019 / 2020*, viewed 13 June 2020, <https://www.charterstowers.qld.gov.au/downloads/file/233/operational-plan-2019-2020>.

Charters Towers Regional Council 2020, *2020/2021 operational plan*, viewed 25 October 2020, <https://www.charterstowers.qld.gov.au/downloads/file/1157/operational-plan-2020-2021>.

City of Gold Coast 2018, *Gold Coast 2022*, viewed 25 October 2020, <https://www.goldcoast.qld.gov.au/documents/bf/cogc-corporate-plan-gc-2022-rev-071218.pdf>.

City of Gold Coast 2019, *City operational plan 2019-20*, s.n., s.l.

City of Gold Coast 2020, *City operational plan 2020-21*, viewed 25 October 2020, <https://www.goldcoast.qld.gov.au/documents/bf/city-operational-plan.pdf>.

City of Ipswich n.d., *5 year corporate plan*, viewed 13 June 2020, <https://www.ipswich.qld.gov.au/__data/assets/pdf_file/0016/81421/Corporate_Plan_2017_2022.pdf>.

City of Ipswich 2019, O*perational plan 2019-2020*, viewed 13 June 2020, <https://www.ipswich.qld.gov.au/__data/assets/pdf_file/0010/118639/City-of-Ipswich-Operational-Plan-2019-2020.pdf>.

City of Ipswich c. 2020, O*perational plan 2020-2021*, viewed 25 October 2020, <https://www.ipswich.qld.gov.au/__data/assets/pdf_file/0017/131327/OperationalPlan_2020_A4_Web.pdf>.

Douglas Shire Council n.d., C*orporate plan 2019 - 2024*, viewed 13 June 2020, <https://douglas.qld.gov.au/download/publications__reports/Douglas-Shire-Council-Corporate-Plan-2019-2024.pdf>.

Douglas Shire Council c. 2019, O*perational plan 2019-2020*, viewed 13 June 2020, <https://douglas.qld.gov.au/download/publications__reports/Operational-Plan-2019-2020.pdf>.

Douglas Shire Council 2020, *Operational plan 2020 - 2021*, viewed 8 March 2021, <https://douglas.qld.gov.au/download/publications__reports/Operational-Plan-2020-2021.pdf>.

Fraser Coast Regional Council c. 2019, *2019/20 Operational plan*, s.n., s.l.

Fraser Coast Regional Council 2020, *2018-2023 Fraser Coast corporate plan*, viewed 25 October 2020, <https://www.frasercoast.qld.gov.au/downloads/file/1084/corporate-plan-2018-2023>.

Fraser Coast Regional Council c. 2020, *2020/21 operational plan*, viewed 25 October 2020, <https://www.frasercoast.qld.gov.au/downloads/file/2369/operational-plan-2020-2021>.

Gladstone Regional Council n.d., *2018/2023 Corporate plan*, viewed 13 June 2020, <https://www.gladstone.qld.gov.au/downloads/file/1518/gladstone-regional-council-2018-2023-corporate-plan>.

Gladstone Regional Council c. 2019, *2019-20 Operational plan*, viewed 13 June 2020, <https://www.gladstone.qld.gov.au/downloads/file/2044/operational-plan-2019-2020>.

Gladstone Regional Council c. 2020, *2020-2021 operational plan,* viewed 25 October 2020, <https://www.gladstone.qld.gov.au/downloads/file/2960/operational-plan-2020-2021>.

Goondiwindi Regional Council n.d., C*orporate plan 2019 - 2024*, viewed 13 June 2020, <https://www.grc.qld.gov.au/downloads/file/1085/grc-corporate-plan-2019-2024>.

Goondiwindi Regional Council c. 2019, *Operational plan 2019 - 2020*, s.n., s.l.

Goondiwindi Regional Council c. 2020, *Operational plan 2020 - 2021*, viewed 25 October 2020, <https://www.grc.qld.gov.au/downloads/file/30/operational-plan-2019-2020-pdf>.

Gympie Regional Council n.d., *Operational plan 2020/2021*, viewed 25 October 2020, <https://www.gympie.qld.gov.au/documents/40005057/40005560/2020-2021%20Operational%20Plan.pdf>.

Gympie Regional Council 2017, *Corporate plan 2017-2022*, viewed 13 June 2020, <https://www.gympie.qld.gov.au//documents/40005057/40005560/GRC001>.

Gympie Regional Council 2019, *Operational plan 2019-2020*, viewed 13 June 2020, <https://www.gympie.qld.gov.au/documents/40005057/40005560/GRC002.pdf>.

Hinchinbrook Shire Council n.d., C*orporate plan 2014-2020*, viewed 13 June 2020, <https://s3-ap-southeast-2.amazonaws.com/os-data-2/hsc/documents/corporate_plan_2014-2020_final_version_for_web.pdf>.

Hinchinbrook Shire Council c. 2019, *Operational plan 2019-2020*, viewed 13 June 2020, <https://os-data-2.s3-ap-southeast-2.amazonaws.com/hsc/bundle9/operational_plan_2019-2020_190627_final.pdf>.

Hinchinbrook Shire Council c. 2020, *Operational plan 2020-2021*, viewed 25 October 2020, <https://os-data-2.s3-ap-southeast-2.amazonaws.com/hsc/bundle9/operational_plan_2020-2021__final.pdf>.

Isaac Regional Council 2015, *5 year corporate plan*, viewed 13 June 2020, <https://www.isaac.qld.gov.au/downloads/file/1614/5-year-corporate-plan>.

Isaac Regional Council 2019, *Isaac Region annual operational plan 2019-20*, viewed 13 June 2020, <https://www.isaac.qld.gov.au/downloads/file/1826/annual-operational-plan-2019-20>.

Isaac Regional Council 2020, *2020-2021 Annual operational plan*, viewed 25 October 2020, <https://www.isaac.qld.gov.au/downloads/file/2962/annual-operational-plan-2020-21>.

Livingstone Shire Council c. 2019, *Budget and operational plan 2019 - 2020*, viewed 13 June 2020, <https://www.livingstone.qld.gov.au/downloads/file/522/budget-and-operational-plan-2019-2020>.

Livingstone Shire Council c. 2020a, C*orporate plan*, viewed 25 October 2020, <https://www.livingstone.qld.gov.au/downloads/file/521/livingstone-shire-council-corporate-plan>.

Livingstone Shire Council c. 2020b, Operational plan 2020 - 2021, viewed 13 May 2021, <https://www.livingstone.qld.gov.au/downloads/file/1646/operational-plan>.

Lockyer Valley Regional Council n.d., C*orporate plan 2017-2022*, viewed 13 June 2020, <https://www.lockyervalley.qld.gov.au/our-council/publications/corporate-plan/Documents/FINAL%20LVRC-Corporate%20Plan%202017.pdf>.

Lockyer Valley Regional Council 2019, O*perational plan 2019-2020*, <https://www.lockyervalley.qld.gov.au/our-council/publications/Documents/Adopted%202019-20%20Operational%20Plan.pdf>.

Lockyer Valley Regional Council 2020, O*perational plan 2020-2021*, viewed 25 October 2020, <https://www.lockyervalley.qld.gov.au/our-council/publications/Documents/Operational%20Plan%202020-21.pdf>.

Logan City Council 2017, *Corporate plan 2017-2022*, viewed 13 June 2020, <https://www.logan.qld.gov.au/downloads/file/512/corporate-plan>.

Logan City Council 2019, *Operational plan 2019-2020*, s.n., s.l.

Logan City Council 2020, *Operational plan 2020/2021*, viewed 25 October 2020, <https://www.logan.qld.gov.au/downloads/file/2700/operational-plan-2020-2021>.

Maranoa Regional Council n.d., *Corporate plan 2018-2023*, viewed 13 June 2020, <http://www.maranoa.qld.gov.au/council/Documents/Corporate%20Plan%202018-2023%20Highlights.pdf>.

Maranoa Regional Council c. 2019, *Our plan for 2019/20*, viewed 13 June 2020, <http://www.maranoa.qld.gov.au/council/council-plans-reports#:~:text=The%20Corporate%20Plan%202018%2D2023,in%20their%20decision%20making%20processes.>.

Mareeba Shire Council n.d., *Corporate plan 2018-2022*, viewed 13 June 2020, <https://websync.msc.qld.gov.au/corporate_documents/files/443/Corporate%20Plan%202018%20-2022.pdf>.

Mareeba Shire Council c. 2019, *Operational plan 2019/2020*, viewed 13 June 2020, <https://websync.msc.qld.gov.au/corporate_documents/files/502/Operational%20Plan%202019-2020.pdf>.

Mareeba Shire Council c. 2020, *Operational plan 2020/2021*, viewed 6 November 2020, <https://websync.msc.qld.gov.au/corporate_documents/files/564/Operational%20Plan%202020%20-%202021.pdf>.

Moreton Bay Regional Council n.d., *Corporate plan 2017-22*, viewed 13 June 2020, <https://www.moretonbay.qld.gov.au/files/assets/public/services/publications/corporate-plan-2017-2022.pdf>.

Moreton Bay Regional Council c. 2019, *Budget & operational plan 2019/20*, viewed 13 June 2020, <https://www.moretonbay.qld.gov.au/files/assets/public/services/budget/budget-2019-20/budget-2019-20.pdf>.

Moreton Bay Regional Council c. 2020, *Budget & operational plan 2020 - 2021*, viewed 6 November 2020, <https://www.moretonbay.qld.gov.au/files/assets/public/services/budget/budget-2020-21/budget-2020-21.pdf>.

Mackay Regional Council n.d., *Corporate plan 2016 - 2021*, viewed 13 June 2020, <https://www.mackay.qld.gov.au/__data/assets/pdf_file/0008/213839/MRC_Corporate_Plan_2016-2021_WEB.pdf>.

Mackay Regional Council c. 2019, *Operational plan 2019-2020*, viewed 13 June 2020, <https://www.mackay.qld.gov.au/__data/assets/pdf_file/0008/238823/2019-20_Operational_Plan.pdf>.

Mackay Regional Council c. 2020, *Operational plan 2020-2021*, viewed 6 November 2020, <https://www.mackay.qld.gov.au/__data/assets/pdf_file/0011/254369/20_21_Operational_Plan_V1.0_FINAL.pdf>.

Mount Isa City Council n.d., *2018-2023 Corporate plan*, viewed 13 June 2020, <https://www.mountisa.qld.gov.au/downloads/file/489/corporate-plan-2018-2023>.

Mount Isa City Council c. 2020, *Operational plan 2020-21*, viewed 6 November 2020, <https://www.mountisa.qld.gov.au/downloads/file/1097/operational-plan-2020-2021>.

Mount Isa City Council 2019, *Operational plan 2019 - 2020*, viewed 13 June 2020, <https://www.mountisa.qld.gov.au/downloads/file/584/operational-plan-2019-2020>.

North Burnett Regional Council 2017, *2017 - 2022 Corporate plan*, viewed 13 June 2020, <https://www.northburnett.qld.gov.au/wp-content/uploads/2016/08/nbrc_publications-2013-2018_corporate_plan.pdf>.

North Burnett Regional Council 2019, *Operational plan 2019/20*, viewed 13 June 2020, <https://www.northburnett.qld.gov.au/wp-content/uploads/2019/07/2019-20-Operational-Plan-Draft-240619.pdf>.

North Burnett Regional Council c. 2020, *untitled*, viewed 6 November 2020, <https://www.northburnett.qld.gov.au/wp-content/uploads/2020/10/2020_21_Operational_Plan.pdf>.

Noosa Shire Council 2018, *Corporate plan 2017 - 2037*, viewed 13 June 2020, <https://www.noosa.qld.gov.au/downloads/file/971/corporate-plan-2017-2037>.

Noosa Shire Council 2019, *Operational plan 2019 - 2020*, viewed 13 June 2020, <https://www.noosa.qld.gov.au/downloads/file/968/operational-plan-2019-20>.

Noosa Shire Council 2020, *Operational plan 2020 - 2021*, viewed 6 November 2020, <https://www.noosa.qld.gov.au/downloads/file/2352/operational-plan-2020-21>.

Redland City Council n.d., *Corporate plan 2018-2023*, viewed 13 June 2020, <https://www.redland.qld.gov.au/info/20226/council_plans_and_financial_information/423/corporate_plan>.

Redland City Council c. 2019, *Operational plan 2019-2020*, viewed 13 June 2020, <https://www.redland.qld.gov.au/info/20226/council_plans/427/operational_plan>.

Redland City Council c. 2020, *Operational plan 2020-2021*, viewed 6 November 2020, <https://www.redland.qld.gov.au/info/20226/council_plans/427/operational_plan>.

Rockhampton Regional Council n.d., *Corporate plan 2017-2022*, viewed 13 June 2020, <https://www.rockhamptonregion.qld.gov.au/AboutCouncil/Corporate-Publications-and-Reports/Corporate-Plan>.

Rockhampton Regional Council c. 2019, *Operational plan 2019 - 2020*, viewed 13 June 2020, <https://www.rockhamptonregion.qld.gov.au/AboutCouncil/Corporate-Publications-and-Reports/Operational-Plan>.

Rockhampton Regional Council c. 2020, *Operational plan 2020-2021*, viewed 6 November 2020, <https://www.rockhamptonregion.qld.gov.au/AboutCouncil/Corporate-Publications-and-Reports/Operational-Plan>.

Scenic Rim Regional Council n.d., *Scenic Rim 2023*, viewed 13 June 2020, <https://www.scenicrim.qld.gov.au/downloads/file/959/2018-23-corporate-plan>.

Scenic Rim Regional Council c. 2019, *Operational plan 2019-2020*, s.n., s.l.

Scenic Rim Regional Council c. 2020, *Operational plan 2020 - 2021*, viewed 6 November 2020, <https://www.scenicrim.qld.gov.au/downloads/file/4097/operational-plan-2020-2021>.

Somerset Regional Council n.d., *Corporate plan 2016 - 2021*, viewed 13 June 2020, <https://www.somerset.qld.gov.au/downloads/file/223/corporate-plan-flyer-2016-2021-pdf>.

Somerset Regional Council c. 2019, *Operational plan 2019 - 2020*, s.n., s.l.

Somerset Regional Council c. 2020, *Operational plan 2020 - 2021*, viewed 6 November 2020, <https://www.somerset.qld.gov.au/downloads/file/2295/operational-plan-2020-21>.

South Burnett Regional Council n.d., *Corporate plan 2018/19 to 2022/23*, viewed 13 June 2020, <https://www.southburnett.qld.gov.au/downloads/file/838/corporate-plan-2018-19-to-2022-23>.

South Burnett Regional Council c. 2019, *Executive services operational plan 2019/20*, <https://www.southburnett.qld.gov.au/downloads/file/4134/2019-20-sbrc-operational-plan>.

South Burnett Regional Council 2020, *Operational plan 2020 - 2021*, viewed 6 November 2020, <https://www.southburnett.qld.gov.au/downloads/file/1972/2020-21-sbrc-operational-plan>.

Southern Downs Regional Council 2019, *Corporate plan 2019 - 2024*, viewed 13 June 2020, <https://www.sdrc.qld.gov.au/council/publications/general-publications>.

Southern Downs Regional Council c. 2019, *2019/20 Operational plan*, s.n., s.l.

Southern Downs Regional Council c. 2020, *2020/21 Operational plan*, viewed 6 November 2020, <https://www.sdrc.qld.gov.au/council/publications/general-publications>.

Sunshine Coast Council 2019, *Operational plan 2019-20*, s.n., s.l.

Sunshine Coast Council 2020, *Corporate plan 2020-2024*, viewed 13 June 2020, <https://www.sunshinecoast.qld.gov.au/Experience-Sunshine-Coast/Healthy-Smart-Creative/Corporate-Plan>.

Sunshine Coast Council 2020, *Operational plan 2020-21*, viewed 6 November 2020, <https://www.sunshinecoast.qld.gov.au/Experience-Sunshine-Coast/Healthy-Smart-Creative/Corporate-Plan>.

Tablelands Regional Council 2018, *Corporate plan 2017-2021*, viewed 13 June 2020, <https://www.printfriendly.com/p/g/mG385p>.

Tablelands Regional Council 2019, *Operational plan 2019-20*, viewed 13 June 2020, <https://www.printfriendly.com/p/g/b9hquz>.

Tablelands Regional Council 2020, *Operational plan 2020-21*, viewed 6 November 2020, <https://www.printfriendly.com/p/g/b9hquz>.

Toowoomba Region 2019, *Corporate plan*, viewed 13 June 2020, <https://www.tr.qld.gov.au/about-council/council-governance/plans-strategy-reports/10615-corporate-plan>.

Toowoomba Region 2020, *2019/20 Adopted operational plan report*, s.n., s.l.

Toowoomba Region c. 2020, *Adopted 2020/21 operational plan*, viewed 6 November 2020, <https://www.tr.qld.gov.au/about-council/council-governance/plans-strategy-reports/various-documents/13832-operational-plan-2020-21>.

Townsville City Council c. 2019, *Budget and operational plan 2019/20*, viewed 13 June 2020, <https://www.townsville.qld.gov.au/__data/assets/pdf_file/0017/72008/Budget-and-Op-Plan_F_v2.pdf>.

Townsville City Council c. 2020a, C*orporate plan 2020 - 2024*, viewed 13 June 2020, <https://www.townsville.qld.gov.au/__data/assets/pdf_file/0032/69386/Corporate-Plan_2019_A4.pdf>.

Townsville City Council c. 2020b, *2020/21 Budget and operational plan*, viewed 6 November 2020, <https://www.townsville.qld.gov.au/__data/assets/pdf_file/0030/96357/2020-21-Budget-and-Operational-Plan_web.pdf>.

Western Downs Regional Council n.d., *Corporate plan 2017 - 2022*, viewed 13 June 2020, <https://www.wdrc.qld.gov.au/wp-content/uploads/2017/02/Corporate-Plan-2017-2022.pdf>.

Western Downs Regional Council c. 2019, *2019/20 Operational plan*, viewed 13 June 2020, <https://www.wdrc.qld.gov.au/wp-content/uploads/2019/08/Final-19_20-Operational-Plan.pdf>.

Western Downs Regional Council c. 2020, *2020-21 Operational plan*, viewed 6 November 2020, <https://www.wdrc.qld.gov.au/wp-content/uploads/2020/08/Adopted-2020-2021-Operational-Plan.pdf>.

Whitsunday Regional Council 2020a, *Corporate plan 2016 - 2021*, viewed 13 June 2020, <http://www.whitsundayrc.qld.gov.au/DocumentCenter/View/5609>.

Whitsunday Regional Council 2020c, *Operational plan 2020 - 2021*, viewed 6 November 2020, <https://www.whitsunday.qld.gov.au/DocumentCenter/View/5761>.

Whitsunday Regional Council 2020b, *Operational Plan 2019 / 20*, viewed 13 June 2020, <https://www.whitsunday.qld.gov.au/DocumentCenter/View/5580>.

APPENDIX F: WORKSHOP OUTPUT

Workshop Activity Record

Group Number	1	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

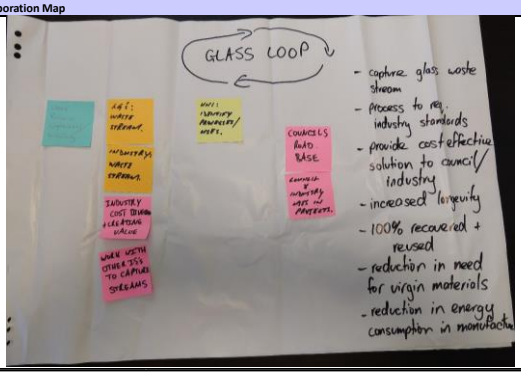
	Superpower Cards		
Company Card	**Assets**	**Ecosystem**	**Waste**
[redacted] University Purpose - Create better living environment for the people living in [redacted] What? - Research/teaching on sustainable development of infrastructure [redacted]	Technical capabilities Research facilities Research capabilities Knowledge	New research/development Global and local Trend setting Partnership with community	General waste Chemical wastes Unused data
[redacted] Council Purpose - to provide environmentally responsible, safe and cost effective waste and recycling services to the community What? - work towards achieving our purpose	Experienced team Sound processes and procedures in place for operations and data management Landfill with 40+ years of airspace Good network of transfer stations across region Good relationships across LG's, contractors & suppliers	Influencer within LG (e.g. setting waste reduction and reuse of recyclables) Influencer through education campaigns targeting community	
[redacted] Purpose - Tourist destination for global guest and local residents whilst delivering a profitable return for island operators. What? - Tourism and hospitality	Resorts & hotels Food & beverage outlets Lease agreement from QLD for island operation Fleet of vehicles/plant equipment Strong brand value and global awareness Large & skilled workforce with strong bench knowledge Barge operations to mainland Mainland logistics network Waste/recycling transfer station Domestic airport Waste water & sewage treatment plants Engineering & services in house department	Largest island resort operator in the [redacted] region Provide infrastructure to surrounding island resort operators Often purchase in bulk/large contracts due to size of operation Control of logistical movements on and off the island	Waste products from operations - MSW - Co-mingled recycling - bio-solids - end of life products from resorts (e.g. furniture) - tyres/batteries - fuels/oils/paints - food waste/organics (some captured at outlets for liquid digestion)

Challenge Card Group Responses

Feedback Loops	Asset Sharing
Regional approaches - economy of scales Tool share library concept - repairing of items rather than disposal	(group did not return paperwork)
Closed Loop	**Waste as a Resource**
Glass: LG's commit to use RGS (recycled glass sand) back into LG projects C&D: LG's commit to use LG generated concrete, asphalt, etc back into LG projects Organics: End market requirements for chosen technology solution for organics (e.g. compost)	(group did not return paperwork)

Venture Concept	Value Proposition
Name: Glass Loop Capture glass waste stream (both LG and industry). Process to industry standard and identify processes and uses (use of uni research capability and knowledge) Council to use in road base, Council and other industry to use in projects	Provide cost effective solution to council/industry 100% recovered and reused Reduction in need for virgin materials Reduction in energy consumption in manufacture

Collaboration Map



Workshop Activity Record

Group Number	2	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

Superpower Cards

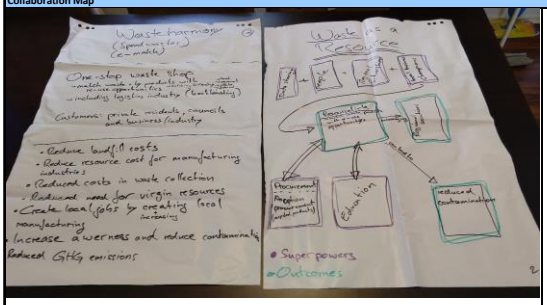
Company Card	Assets	Ecosystem	Waste
[redacted] Purpose - to enjoy life What? - we design, mould and fabricate [redacted] products	People & Machinery - our people can create solutions to problems - Those solutions may be using our existing machinery or new machinery - we can take solutions created locally and provide them globally	Design products locally to solve problems and we can supply them to the planet	Production waste Incoming packaging waste office waste (e.g. paper)
[redacted] Council [redacted] Purpose - provide the appropriate services to the community to enable the best possible lifestyle encompassing essential services as well as a broad range of auxiliary support. What? - Collect waste and recycling, supply water and waste water services.	Infrastructure People Technology Data Technical knowledge Broad range of contact network Vision Experience Population base Smart technology Vehicle fleet	Established supply chains Regional partnerships Buying/selling power Telemetry networks	Surplus mulch Opportunity Office waste
[redacted] Purpose - represent [redacted] What? - advocate for our membership	[redacted] represents [redacted] Engagement value Identifiable brand Opportunity to leverage relationships Working in partnerships Size and scale [redacted] manage + $100 billion assets Expenditure over $10 billion/year Consolidated views	[redacted] can be leaders in - procurement - product stewardship potential - excellence in best practice - scale/buying powers (e.g. 150,000km of LG managed roads v 35,000 km of state roads. One size does not fit all - different approaches by [redacted])	MSW - impact of C & D and C & I - diversion from landfill challenges Problem waste streams - glass - plastic - tyres - e-waste/solar panels Reliance on State and Federal policy Bans - landfill - export Significant opportunity to partner/regions "end of pipe challenges" for councils
[redacted] Council Purpose - local governance economical waste management and protect environment. What? - over see staff and contractors, provide economic and environmental services to community.	Infrastructure Knowledge of operating in large areas and distance Use of recycled	Protector Maintain protection to great barrier reef by controlling material discharge into waterways Practice land care erosion	Work with and assist recycling Compost Scrap metal collection Farm waste disposal

Challenge Card Group Responses

Feedback Loops	Asset Sharing
Matchmaking waste to re-use Share data insights	Reduce duplication Share information Break down barriers Open resource sharing
Closed Loop	**Waste as a Resource**
Regional partnerships Procurement policies (specs) Technology to connect waste with re-use industry	Regional opportunities and partnerships (diagram of hubs in QLD)

Venture Concept	Value Proposition
Name: Waste harmony (Speed waster) (e-match) One-stop waste shop. Match waste and by-products with re-sues opportunities. Matching hierarchy (e.g. local, regional, state, federal). Including logistics industry (backloading). Customers - private residents, councils, business/industry.	Reduce landfill costs Reduce resource costs for manufacturing industries Reduced costs in waste collection Reduced need for virgin materials Create local jobs by creating and increasing local manufacturing Increase awareness and reduce contaminates Reduced GHG emissions

Collaboration Map



Workshop Activity Record

Group Number	3	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

Superpower Cards

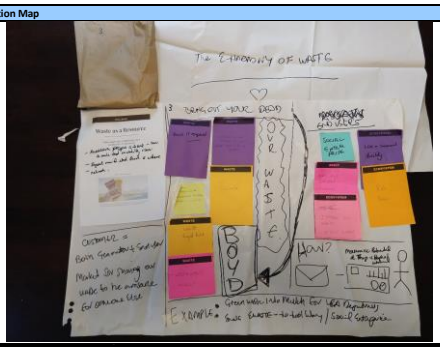
Company Card	Assets	Ecosystem	Waste
[redacted] Purpose - to improve data and process across waste industry What? - provide waste technology and consultancy services	Broad understanding of waste challenges and solutions for and education process perspective (compliance) People Software/technology Data Exposure to network - asset data and ?) Industry knowledge	Process data (standards) Influence regulatory change - data driven LGA and commercial facility	Food packaging General Excess IT equipment
[redacted] Council Purpose - to provide local government services to residents of [redacted] What? - Local government services include waste, roads, parks, footpaths, community, facilities, human/social/youth services, libraries, planning and other activities that provide a safe and healthy city in which to live	Technology (hardware and software) that drives all council systems SEQ collaborate to build MRF/green waste processing Infrastructure (roads, footpaths) Buildings (community facilities, pools, libraries, Depots/offices, sporting facilities, cemeteries) Parks (active and passive recreation spaces) Technology that drives all of councils systems Land - public space [redacted] employees with a range of skill sets Brand - very important to elected members/highly valued and protected Vehicles - cars/trucks/buses/ferries	Can be seen as a leader in LG Ability to influence sustainable procurement Scale/buying power due to size of organisation	Office waste - food, recyclables, general, furniture, e-waste Construction waste Green waste - parks/green spaces Furniture - office/hall/facility etc Road scrapings Clean fill Metals Computers/peripherals Fleet - oils/tyres/etc. Hard plastics Glass fines used was sand substitute in asphalt Road scalping's used as daily cover at landfill
[redacted] Council Purpose: What? - to provide water, waste, road, land, planning and rubbish services	Waste network infrastructure - Trucks - Bins - Road networks - Dumps - Land Knowledge of what is dumped Existing reuse IP and strategies - recycled concrete - glass - green waste Access to rate payers	[redacted] large educator and influencer of community LGA waste network Rate payers	E-waste Landfill (dumped rubbish)
[redacted] Council Purpose - provide services for the [redacted] community. Inclusive and healthy environment, improve liveability and contribute to development of local economy. What? - manage essential and non-essential services for the community all things local government	Purchasing/procurement Infrastructure - waste water - waste - water - parks and open spaces Community facilities Data and information People and opportunities Business Parks and gardens Farmers	Council is responsible for environmental management with the local government area. These include: - weed residuals from local waterways - waste management - environmental considerations on council construction projects - drainage and waste water management Street sweeping Maintenance of parks and open spaces Assistance with clean-up following disaster events Illegal dumping Pest management - weeds - feral animals Land management plans	Kerbside collections - contamination Transfer stations and landfills Council waste Illegal dumping Mulch trial
[redacted] Purpose - Environmental management and regulation for the [redacted] What? - assess applications for waste related industries, waste tracking, contaminated land, compliance	Data/info on waste industries Skills and knowledge of staff Understanding legislative processes	Environmental protection Sustainable development Incident response Improve soil health Reduce water use	E.P. Reg Asbestos transport - 250kg reduced to 175kg Paper Green waste Mulch
[redacted] Purpose - support local government in delivery of services to their communities What? - asset, project and waste management, training, [redacted] services, managed services, [redacted], recruitment	Relationship with elected members and office Relationships with LGAQ, QTC, DES, DSDMIP, Industry participants Our staff and culture local government specific knowledge and expertise "we get local government"	Regional collaboration through key relationships Waste advisory and management services Compliance reviews Strategy/sustainability/operations	E-waste Office consumables General and recyclable waste Low utilisation rate resulting in wasted benefits potential to our clients

Challenge Card Group Responses

Feedback Loops	Asset Sharing
(group did not return paperwork)	(group did not return paperwork)
Closed Loop	**Waste as a Resource**
(group did not return paperwork)	Available people and time - how to make that availability clear (...illegible...) what stock is where Network

Venture Concept	Value Proposition
Name: Bring out your Dead (BOYD) The e-harmony of waste. Maximum potential of things and people (...illegible...)	Both generator and end user market for sharing our waste to be a resource for someone else. E.g. green waste into mulch for LG Depot uses, E-waste to tool library/social enterprise

Collaboration Map



Workshop Activity Record

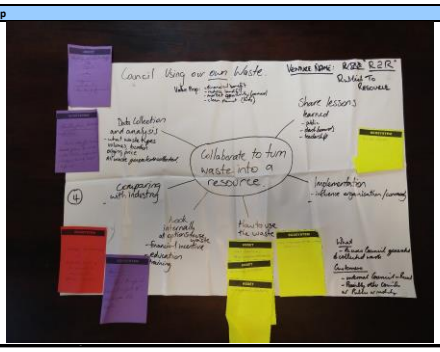
Group Number	4	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

	Superpower Cards		
Company Card	**Assets**	**Ecosystem**	**Waste**
[redacted] Purpose - providing factual advice and assistance to industry of governments What? - consultants. Environmental, planning , engineering, waste management.	Highly skilled staff (engineers, scientific, waste professionals) Methodology - examples of how to solve problems Systems - project manage Project library (reports) - we have done many waste projects for many councils and industry	Skills from broader industries - our staff come from and work with other industries - sugar, salt, coal, defence Influence - we get involved with strategy - reports used to inform policy and plans Advice - paid to spend time to get and analyse the facts	Food waste (crib room waste) Spare capacity (sometimes) Paper waste (not many reports are paper based but drafts are best revised in hard copy) Unused proposals (often we do a lot of analysis and problem solving just to present a proposal which may not be used)
[redacted] Council Purpose - local government What? - serve the community. Provide waste services.	Land/Landfills Buildings/infrastructure Intellectual property	Buying power Fee structure to encourage recycling New front end recovery facility	[redacted] Non-recyclables Food/recycling
[redacted] council Purpose - council What? - provide waste services to the local community	People - Training - Open to ideas and change Systems Landfill Equipment	Be part of emerging industry exploring options Our role is to collect waste from the local community To dispose of waste at our landfill facility To educate the community on recycling Ability to be a part of emerging economies (waste to energy) funding dependant	Food Recycling products (glass, paper etc) ability to find uses in the community/commercial use for it Ability to change and adapt
Company card not returned	Technology - history of process mapping Intellectual property - the knowledge our staff have to effectively and strategically lead our company Infrastructure - our buildings and operational network	Strategic partnerships - Connecting parts of the business to brainstorm effective solutions Process efficiency - reduction of duplication in [redacted] process structure Network of admin skills and knowledge connecting all of [redacted] operational services	Property space - the use of power to buildings not fully staffed Packaging Operational hours - duplication in business processes - waste in staff time - manual delivery of records

Challenge Card Group Responses	
Feedback Loops	**Asset Sharing**
(group did not return paperwork)	(group did not return paperwork)
Closed Loop	**Waste as a Resource**
(group did not return paperwork)	(group did not return paperwork)

Venture Concept	Value Proposition
Name: R2R (Rubbish to Resource) collaborate to turn waste into a resource - Council using own waste generated and collected.	Look internally at options to use waste - financial incentive - education - training Share lessons learned - public - dashboards - leadership

Collaboration Map



Workshop Activity Record

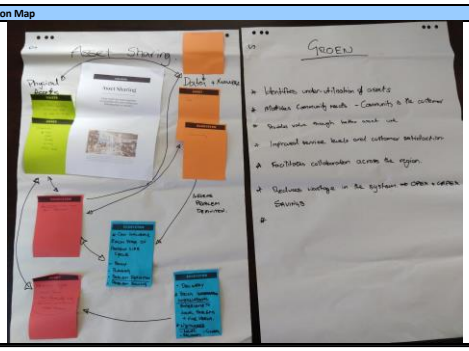
Group Number	5	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

	Superpower Cards		
Company Card	**Assets**	**Ecosystem**	**Waste**
[redacted] Council Purpose - Delivery essential services to the residents of [redacted] shire What? -Waste, water, roads/infrastructure, compliance/regulatory services, community development	Infrastructure - Landfill space - [redacted] Transfer stations Data Employees	Regional networks - LAWMAC - NQWRRP Community education Community	Production waste - bio-solids Mulch C & D
[redacted] Council Purpose - provide local government services to all residents What? -Water supply, waste strategies, roads/infrastructure.	Technology (use of up to date and latest) Employees - skilled (future training, right person for the job) Equipment - up to date with modern technology Water - good supply (control of use, avoid wastage, sale of to agriculture and mining use)	How do council become better involved What is council's role - Various local laws application to council Partnerships with government departments	Landfill (upgrade of facilities, sorting of bins, collection, search for future sites, charges, collection services, distribution of mulch to public and private, collection)
[redacted] Purpose - improving our built and natural environment What? - professional consulting services and design services	Diversity Brand Data People Intellectual Property (IP) Geographical reach Size Regional representation	Can influence each state of project life (policy, planning, problem definition, problem solving) Delivery - bring international experience to local problems and vice versa Networks (local, regional, global)	Incorporation of diversity System inefficiency Bespoke design that is inefficient Better leverage IP
[redacted] Council Purpose - to deliver services to community What? - deliver basic services of roads, rates, rubbish collection and regulatory services and planning authority	Infrastructure (roads, water, sewage, buildings, public halls) Employees (staff with knowledge) Legislative authority (planning, all LG acts) Data and information	Lobby governments Public education/(..?..)decisions (e.g. clos pool) Impact on community through laws (e.g. animals, waste, water) Network with other LG's	Public halls/infrastructure such as park facilities not used all the time Commercial and industrial waste from office operations sewage waste biosolids Road construction waste

Challenge Card Group Responses	
Feedback Loops	**Asset Sharing**
(group did not return paperwork)	(group did not return paperwork)
Closed Loop	**Waste as a Resource**
(group did not return paperwork)	(group did not return paperwork)

Venture Concept	Value Proposition
Name: GROEN Identifies under-utilisation of assets. Matches community needs	Provides value through better asset use Improved service levels and customer satisfaction Facilities collaboration across the region Reduces wastage in the system (OPEX & CAPEX savings)

Collaboration Map



Workshop Activity Record

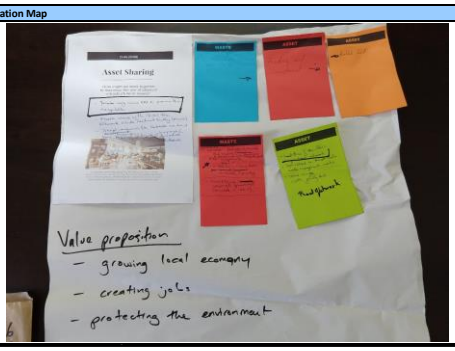
Group Number	6	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

	Superpower Cards		
Company Card	**Assets**	**Ecosystem**	**Waste**
[redacted] Council Purpose - to serve the community to provide infrastructure and services What? -Provide and administer services and support to the community	[redacted] Separate landfill areas. One in each town Available land	n/a	All currently goes to landfill apart from oils, batteries and steel
[redacted] Council Purpose - serve the community What? - kerbside waste management and resource recovery	Alternative waste treatment (WMOO) of kerbside Material recovery facility of kerbside Transfer stations People - staffing (contracts and strategy) Concrete crushing of council generated waste Buyback shop Regional capacity to assist neighbouring councils Container refund processing Pt for CRS scheme	Part of regional healthy waterways partnership Part of FNQROC for procurement contracts Part of LAWMAC [redacted] council arrangement with [redacted] and [redacted] councils AWT and MRF	Compost - beneficial re-use MRF recyclable - building a new MRF to double capacity Crush and re-use council generated concrete
[redacted] Council Purpose - provide municipal services to the Cook Shire community What? - Manage waste, build roads, manage public places	Area of the shire road network Specialised in small scale waste management works Wind energy Cattle grazing land Road network	Local government Local residents and businesses Contractors Continual development through planning scheme	Agricultural waste (banana bags) Biosolids Tyres Packaging waste
[redacted] Purpose - serve the public What? - develop policy and legislation regulate industry to mitigate environmental impacts	Information and technology Funding and investment Knowledge and people	Grow the economy and create jobs Set the rules and provide certainty for investment Facilitate industry development	Knowledge and information
[redacted] Council Purpose - serve the community What? - manage waste services	Infrastructure Staff	Local economy Key partnerships	Sustainable outcomes for waste resources

Challenge Card Group Responses	
Feedback Loops	**Asset Sharing**
Make the data available for others to use Making data more consistent	Share regional contracts - scrap metal, biosolids, batteries Shared resources for kerbside contract development [redacted] share with[redacted] the alternative waste treatment facility [redacted] using [redacted] to process their recyclables
Closed Loop	**Waste as a Resource**
(group did not return paperwork)	Create regional partnerships

Venture Concept	Value Proposition
Name: (No Name) Asset sharing waste collection contracts and treatment/processing facilities and contracts	Growing local economy Creating jobs Protecting the environment

Collaboration Map



Workshop Activity Record

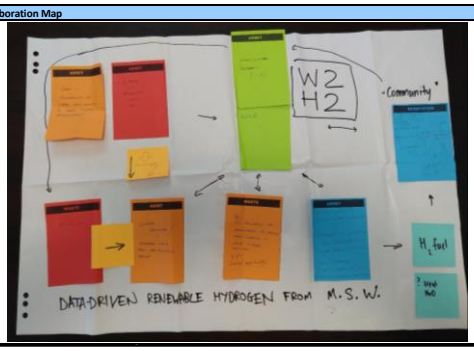
Group Number	7	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

	Superpower Cards		
Company Card	**Assets**	**Ecosystem**	**Waste**
[redacted] Council Purpose - to serve the [redacted] community What? - the three R's plus many other things	People Ready workforce with broad industry/knowledge/experience Influential position Ability to influence policy Land - availability of large land holdings to share future development Waste facilities - manage waste from the [redacted] region	Strategic infrastructure planning Influence waste and asset managers Financial value chain Strategic infrastructure delivery Influence assets delivery and operations Part of the capital investment chain Operations in line with regulatory requirements	Range of C & D (maintenance and office by products) Under utilization of plant and equipment Nil recovery of operational by products from waste and waste water activities (e.g. gas) wasted opportunity
[redacted] Purpose - provide accurate data to support our customers with regulatory accuracy What? - Waste management software	People Data Intellectual Property (IP)	Responsiveness Partnership expectations Global data capabilities Innovation	E waste Unused capacity Unused levels of data
[redacted] Council Purpose - to energise the world What? - we are a local government	Skilled passionate employees Data (waste data) Land with established waste use	Potential feedstocks for waste processing Provide jobs through partnerships (contractors) Protecting the environment	Concrete MSW Low quality mulch
[redacted] Purpose - create business models by transforming GHGs [redacted] What? - [redacted]	[redacted] technology Plasma carbon conversation unit [redacted]	CSIRO QUT Power utility Korea/Japan (turn LGF into H2 to power plant and vehicles)	Heat Water vapor Pressure Carbon dioxide

Challenge Card Group Responses	
Feedback Loops	**Asset Sharing**
Information sharing via - dashboards (at state or local level) - residents platform Consistency of data/commonality of data Use of existing policy to work towards same outcome	Use assets (land and people) to challenge the status quo
Closed Loop	**Waste as a Resource**
Data [redacted] - Landfill gas (councils) - CH4 [redacted] - H2 fuel	Information sharing via - dashboards (at state or local level) - residents platform Consistency of data/commonality of data Use of existing policy to work towards same outcome

Venture Concept	Value Proposition
Name: W2H2 Data drive renewable hydrogen from MSW	Business: development of a domestic renewable hydrogen industry People: jobs, economic gain for community, "feel good" factor Planet : clean energy

Collaboration Map



Workshop Activity Record

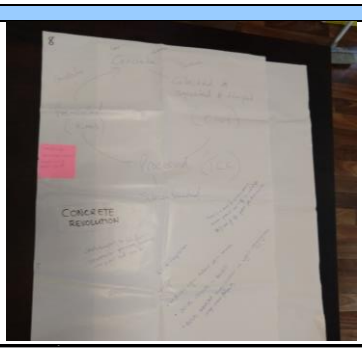
Group Number	8	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

	Superpower Cards		
Company Card	**Assets**	**Ecosystem**	**Waste**
[redacted] Purpose - (blank) What? - (blank)	Human Facilities (transfer stations, landfills) Local knowledge of (..illegible..) influencers on waste industry software to collect data	Influence people behaviour Residents - ratepayers broader local community Part of wide ranging value chain - local buying power [redacted] LG partnerships with companies	Resource recovery - waste products to landfill Green waste Concrete Tyres
[redacted] Purpose - to make a sustainable future possible What? - total waste management services	Good people 115 prized assets - MRF, CRS, landfills 260 + sites 4500 + vehicles	Largest [redacted] company in Australia Scale Total waste solution Access to markets and financial National company with local footprint Invest in innovation - electric vehicles - waste to power reality - etc.	Undesirable recyclable commodities i.e. glass
[redacted] Council Purpose - to deliver a great waste and resource recovery service and shift our community towards a circular economy What? - Run Lfs, TS and SS. Collect residents waste and recycling. Educate and communicate with our community	Waste facilities (LFs, TS's, SS) Contracts with suppliers People Vehicles Small and dynamic	Influence residents Local councillors We take peoples waste and sort it out for them Locally we influence what happens to peoples waste Value chain council office procurement Link to other local governments Control how waste I managed Local businesses Waste industry	Biosolids Leachate Metals Green waste Concrete Car batteries Comingled recycling Gas bottles Used engine oil Paper and cardboard TVs and computers
[redacted] Council Purpose - to provide local government services to our community (...?...) What? - Provide services for our community	Modern contemporary waste assets that include: - best practice landfill - network of 13 transfer stations - fleet of modern collection vehicles - State of the art modern MRF Multi-disciplinary team with innovative thinking with a customer focus Excellent data systems Ongoing investment in asset renewal	Invested in the community Manage community expectations Education provider Service level (quality) reflects community standards Our regions economy is dependant on private investment and is exposed to global economic conditions Being a region does suffer (..illegible..) to distance, access to markets and therefore commercial viability	General corporate waste Custodians of community waste however not all waste Surplus landfill Potential to (...illegible...) waste diversion activities Council encourages private sector management of waste
[redacted] Purpose - leaving the environment in a better shape. Land and water stewardship What? - Land rehabilitation. Waste Water Treatment.	Team of dedicated professionals with specialist knowledge Technology developed in-house for "end of life" waste water such as leachate Intellectual property how to rehabilitate a site using scient to guarantee results	(..illegible..) land care business - specialist skills in soil repair and rehab - trend setting in areas of recycling plastics removed from industrial water ponds Waste water treatment - specialist knowledge around water chemistry and leachate treatment	Land care removes plastic from ponds. Some goes to recyclers some to landfill Waste water generates concentrate and precipitates from the process from treating landfill leachate. It is returned to its source i.e. landfill

Challenge Card Group Responses	
Feedback Loops	**Asset Sharing**
How do we share data? Waste categorisation Waste Audits Generalities don't get us anywhere. We need to get specific about waste categorisation	A context to bring together people to collaborate and share
Closed Loop	**Waste as a Resource**
Concrete collected by councils recovered by crushing it to a product which is used in council footpaths and concrete	Concrete collected by councils recovered by crushing it to a product which is used in council footpaths and concrete construction

Venture Concept	**Value Proposition**
Name: Concrete Revolution There is a market for concrete products. Concrete products have a life and an end of life. At end of life, product gets deconstructed. Collect and transport to LG facility. Sub-contractor processes concrete into product that can be (..unfinished..)	Reduces virgin material use in concrete Avoids concrete in landfill Avoids embedded energy/carbon in virgin aggregates (large carbon footprint)

Collaboration Map



Workshop Activity Record

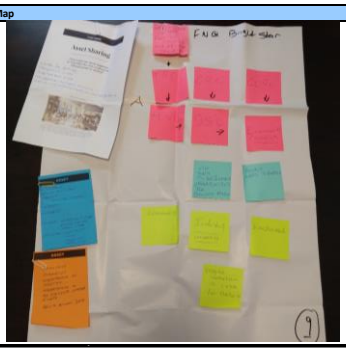
Group Number	9	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

	Superpower Cards		
Company Card	**Assets**	**Ecosystem**	**Waste**
[redacted] Purpose - advise industry and local government on managing waste in an economical/environment and social manner What? - provide advice to industry and local government	Knowledge Experience Understanding of industry Understanding of the community attitude to waste Able to access data	Provide an understanding to local government on opportunities to minimise their impact on the environment and how to encourage the community to be responsible in their use of resources, purchase and consumption.	Advice on responsible management of green waste, e-waste, C & D waste, household, recycle Process, recover, re-use, encourage source separation, materials able to be reprocesses Hazardous - identify waste to be disposed, waste to be treated, beneficial reuse
[redacted] Council Purpose - to recycle and minimise waste goes to landfill. Generate revenue. Educate the community through recycling What? - Recycle through a material recovery facility	MRF - recycling shed Skilled employees Councils transfer stations Combined knowledge Historical information	Steel - FNQQROC Green waste - mulch Encourage the community of the importance to recycle responsibly Cardboard - bailed and sent to a recycler not going to landfill	Small volumes - wet waste sent off site, green waste process to mulch, steel stockpiles, mattresses, glass, no market, cardboard from commercial premises, wooden pallets recycle, ANFO bags
[redacted] Council Purpose - is to reduce the amount of material going to landfill What? Hand sort recycle material that is generated throughout the [redacted]	Most valuable assets are our employees that have the knowledge	Local - generating mulch for public use, minimising landfill issues The public to show we are trying to do the right thing for the environment Generate revenue through recycling Cardboard is received and sent off for reuse	Packaging Recycle material Steel C & D Mattresses Glass
[redacted] Council Purpose - manage municipal waste, education, provide services to the community What? - dispose waste, encourage recycling	Transfer stations Landfill Data collection software	Waste reduction Resource reuse household, composting Recycling promotion Litter and illegal dumping monitoring and enforcement Community understanding/participation	MSW - separation C & D - separation C & I - separation Green waste - reuse Haz-Regulated - treatment Recyclables - CRS Tip shop

Challenge Card Group Responses	
Feedback Loops	**Asset Sharing**
Implementing a share point where councils can put materials on and companies can decide if they can use it and arrange to collect	Waste to energy, processing glass, site buy back shops, collaboration between councils, working with manufacturers to change packaging
Closed Loop	**Waste as a Resource**
Pallets, fertiliser bags and banana bags	Green waste, Cardboard, Metal including aluminium, batteries, plastics and HDPE

Venture Concept	Value Proposition
Name: FNQ Bright Star Use data to determine opportunities for economic reuse (possible waste to energy)	Community, Industry, University Employment Possible reduction in cost of electricity

Collaboration Map



Workshop Activity Record

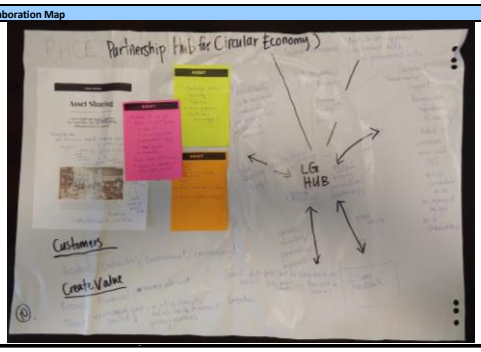
Group Number	10	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

	Superpower Cards		
Company Card	**Assets**	**Ecosystem**	**Waste**
[redacted] Purpose - to achieve integrated environmental outcomes across energy, water and waste. To lead in this space and love learning opportunities What? - Advice, project management, commercial solutions (design and deliver) for energy, water and waste, residential solutions tropical focus	Access to low cost energy systems - solar PV, tariff optimisation, aggregated E (..illegible..) Buying power of [redacted] houses and access to developers doing large projects	Access to many (..illegible..) that love many (..illegible..) (..illegible..) to Ecobiz	Green waste for reuse, lawn clippings, aquatic woods, (..illegible..), perfect ingredients for high value topsoil production. Links to city water use. Approx. 500,000 solar panels in [redacted] LGA to date. many not reaching warranty (..illegible..) no process for reuse. businesses currently stockpiling. $20/panel to dispose. No req ethical purchase Plastic in agriculture (block plastic) common
[redacted] University Purpose - education/research what? - skills development (professional/technical), give degrees/qualifications, contribute new knowledge and expertise to new projects	Knowledge/data/technology/expertise to solve problems create new knowledge	Influence/facilitate changes to industry practice Education Employability Technical expertise to perform specific skills New problems, trial, prototype, test, collect data, provide recommendation for implementation Create best-practice guidance Review/provide independent analysis and commentary of trends (e.g. your research)	Office paper Medical waste Lunch containers/plastic Food waste Coffee cups Contaminants Radioactive/biological/hazardous wastes
[redacted] Council Purpose - waste management What? - control waste, recycle, health	Infrastructure Employees Manage waste in all streams Transfer station land Data	Management environment Local trend setting Key partnerships	No Green waste
[redacted] Council Purpose - Local government waste management What? - control of all waste streams re-diverting from landfill as much as possible	Knowledge Information Methods Highly skilled employees Infrastructure Data Manage waste from all streams Landfill maintenance during and aftercare	Environmental management All economies Key partnerships	Supply raw product to major waste recyclers and diversifiers No food waste

Challenge Card Group Responses	
Feedback Loops	**Asset Sharing**
Feedback from contractors towards	Partnership with contractors towards common goals
Closed Loop	**Waste as a Resource**
(group did not return paperwork)	(group did not return paperwork)

Venture Concept	Value Proposition
Name: PHCE Partnership Hub for Circular Economy partnership with contractors towards common goals. Tendering. LGAs as a hub for innovation.	Create feedback back and forth between LGA, recyclers for specials waste streams Less cost to council (e.g. landfill cost more than processing) Recognise importance of waste/linked to consumers who paid GST - full contribution to be recognised by govt as a stakeholder Create resource efficiency Reduce need to extract virgin materials

Collaboration Map



Workshop Activity Record

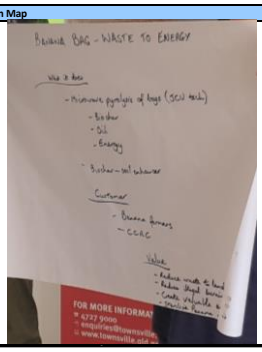
Group Number	11	Workshop Date	21-Nov-19
		Host Event	LAWMAC & TCC

	Superpower Cards		
Company Card	**Assets**	**Ecosystem**	**Waste**
[redacted] Purpose - Providing consultancy services (engineering and environment) to LG and industry What? - Impact assessment and permits, engineering design, project management, environmental assessments and compliance	Financial analytical skills - business case - feasibility studies - financial modelling - Market (..illegible..) Technical skills and knowledge Regional offices (Gladstone, Rockhampton, Mackay, Townsville, Cairns) Engineering design capabilities (landfill, access, transfer station, structures)	Service provider	Some organic waste (food scraps) Underutilised office space (15%) Paper E-waste
[redacted] Council Purpose - local government What? - waste disposal and reduction and removal and recycling	Employees/knowledge Contractors/services Landfills and transfer stations Machinery Computer services (e.g. Mandalay)	Recycling	Fridges and freezers, white goods
[redacted] University Purpose - education and research What? Create skills and knowledge and improve society with a focus on the tropics	Building/Infrastructure (campus, research facilities) Knowledge (research and teaching) Brand value (independent research and verification)	Key partnerships, industry partnerships Sustainability strategy - organisational Waste management strategy and operations	Metals e-waste Food waste/organics (commercial kitchens, paper towel, paper) Packaging waste (cardboard, plastic) Underutilised space Construction waste

Challenge Card Group Responses	
Feedback Loops	**Asset Sharing**
(group did not return paperwork)	(group did not return paperwork)
Closed Loop	**Waste as a Resource**
(group did not return paperwork)	(group did not return paperwork)

Venture Concept	**Value Proposition**
Name: Banana Bag - Waste to Energy Microwave pyrolysis of bags. Biochar, oil, energy. Biochar - soil enhancer.	Reduce waste to landfill Reduce illegal burning Create valuable (..illegible..) Sterilise panama disease

Collaboration Map



APPENDIX G: INTERVIEW TRANSCRIPT

One-on-One Interview Form	Cracking the Circular Economy Barriers of Queensland Local Governments

Thank you for volunteering to participate in a one-on-one in-depth interview. Your feedback and comments will help shape and strengthen the research outcomes. A consent form must be signed prior to taking part in the interview.

Interview Date	12 March 2020			
Interview mechanism	Telephone			
Consent forms signed and returned	X	Use of information	n/a	Photographic

Name	[redacted]			
Email & Phone	[redacted]			
Occupation	[redacted]			
	X	Local Government Employee		Non-Local Government Employee

What are the key challenges and barriers you are facing in being able to achieve the actions of the new waste strategy?
• Resource limitations (both physical and human resources) • Lack of a closed loop - limited end markets and uses for materials diverted from landfill • Limited planning mechanisms
Please provide a detailed example on why each of the items identified in the question above is a challenge or barrier.
• Resource limitations (both physical and human resources) o Litter and illegal dumping - State needs to play a big role, including messaging and reporting, and be more proactive in the compliance space. They are very reluctant to do compliance. E.g., Plastic bag blew out of wheelie bin truck and state officer complained to council. That officer has the power under the act to manage the situation and issue a fine if required but chose not to. The state needs to step up and provide resources. o Medium sized councils struggling with closing redundant landfills – particularly from a cost perspective and the $ required. State needs to support councils as spending big $ to this

then diverts councils from recycling projects o Optimising waste collection services – not as easy to do as it sounds. Councils who don't have a recycling service need to start. But they need State assistance to do so. Guidance is needed to commence the initiative and do a secondary service as it is expensive to commence the service. Some of these councils will also need to rely on other regions and larger councils for services and infrastructure. o Can be achievable with the right resources being provided by state. A State WRR Officer on ground in regions to facilitate with the ROCs and working closely with them required. o LGA resources are at capacity and officers don't have time to work with other councils to make changes to optimise resource recovery across the region. E.g., officers are responsible for Water and waste, disaster, sewage, illegal dumping. LG officers in regional areas need to have wide skill set and manage multiple matters not just WRR. By comparison [redacted] is larger and has everything at its fingertips (i.e. Dedicated staff for each discipline). o State appears to be at capacity as well and experiencing their own challenges. o Shortage of waste expertise in the state due to the huge acceleration by the State and community expectations. So many initiatives introduced in short time span e.g., CRS, levy, etc. however it is good where we are with progress and better than 2-4 years ago.
• Lack of a closed loop - limited end markets and uses for materials diverted from landfill o Recycling commodities have different challenges…. (see below examples) o The inputs and incoming tonnes of glass for recycling warrant the development of a processing facility to be developed however each local government does not have a large market individually. The end market for the crushed glass at present is limited although options are becoming more available o Recycled plastic tonnes and processing facility – there is a local recycled plastic manufacturer who has to source feed stock from Brisbane. The secondary process needs to be viable. o Fibre – paper and cardboard – no end market and not enough local tonnages to develop a paper mill. Send all to Brisbane (assume via road) o E-wastes and solar panel waste – same challenges o C& D ok – seems to be managing (to be diverted and reused/recycled)
• Limited planning mechanisms o [redacted] received State funding under BOR (round 4 $3M) for the upgrade of the MRF that specifically included construction of a new glass sorting and processing plant. The State later awarded funding to a private company to construct a second glass sorting and processing plant in the same region. It is perplexing that the State funding strategy would award funding when there is not enough market (incoming and outgoing) for glass. The funding strategy needs to align. o (The funding strategy needs to align between state development and resource recovery) o Planning required to align funding steams with infrastructure plans of the state to create regional economies for resource recovery and processing o Waste diversion KPIs to align with funding strategies. o Planners need to be involved with developing precincts suitable to co-locate like-minded recycling industry – e.g., VIC has great set-up 20 processes in 4 blocks. o State to do more on education. Broad recycling "do the right thing" message required. People are still disposing of recyclable materials in the general red bin. State should do more to drive this as the annual advance payment to LGAs will cease soon. Composition audits of general waste bins show 20% could be recycled. Stat's relatively consistent across the state. [redacted] example – 20% of recyclable product in the general waste bin is going to landfill (approx. 10,000 tonnes/yr.) and advance is paid on that approx. $75,000 for levy costs. o State need to prioritise investing $ at top of hierarchy. o [redacted]ROC group councils at different levels of resource recovery and one model approach doesn't fit all councils. [redacted] [redacted] councils have vastly different requirements. E.g. [redacted] Indigenous, [redacted] levy zone, [redacted] not in levy zone. Template model doesn't work.

o Imperative for collaboration between LGAs and state. Levy funding money is not going to return states intended investment without strategic planning. Seems to be Ad hoc at present. Needs to be planned correctly. State needs to be mindful who they are giving money to with all the new funding. E.g. A new operator promising the world and doesn't have experience and state gives funding money without going through due diligence processing prior to awarding funds. E.g., third-party glass recycling plant funding – applicant stated he could employ 20 ppl. however, [redacted] currently employ 2 people for processing 10 tonnes of glass now. How is the new business going to employ 20? The numbers don't add up. Can't get funding back if the applicant fails at their proposed venture. How is it managed for future if doesn't do what he says?
o Planning assessments need to consider the waste Strategy and have a person on ground doing the planning assessment. Can the funding applicant actually do what they are proposing? Needs to be assessed thoroughly. All applications for funding. Current feel is state is just rushing to give money to anyone especially in[redacted] region to tick KPI – politically motivated perhaps?
o Planning required to align infrastructure plan and funding plan. E.g., There is no point doubling up services if a glass plant already exists locally, why is another one needed? Yet, Plastic recyclers locally can't get funding to expand. Planning needs to be accelerated as it will help drive towards a CE and achieving waste strategy targets. (effective) Planning is critical to move forward.
o (funding applicants) Must align to state plan to demonstrate this in their funding applications in to state.
o E.g., a tyre crumbing plant application will need a bitumen facility to co-locate as the product has approx. 7-hour life of product. Is the State assessing this? Should be collocated in [redacted] with existing facility. Needs to be strategically planned otherwise it leads to wastage.
o Planning is the corner stone of CE. (state evaluation of) Business cases must consider and track businesses given funding money and how they are achieving the strategy targets. Otherwise, it doesn't stack-up.

Have you identified any key enablers for your organisation with the introduction of the new waste strategy?

• Waste levy introduction
• Policy development to facilitate product stewardship

Please define the enablers identified and give detailed examples for each.

o Waste levy introduction has been a good driver/lever to kick-start the process of moving towards a circular economy and achieving the Waste Strategy goals
o Some businesses are already accepting the waste levy as business as usual and as the levy price increases each year (to $90/tonne by 2022) we expect this to continue to motive businesses to improve waste management processes
o The levy will hopefully keep momentum going for resource recovery from waste materials
o The levy introduction has made funding available in the waste industry and provided access where it has not previously been available in the past few years
o Influence of yellow recycling bin has been positive
o It has been positive to see the State Government introduce the container refund scheme (CRS) and the beginning of product stewardship programs.
o CRS has been an influencer (and disrupter) to the recycling industry

APPENDIX H: SUMMARY OF CE BARRIERS