



Waste and Resource Recovery Strategy

Indian Ocean Territories – Christmas Island and Cocos (Keeling) Islands

Department of Infrastructure, Transport, Regional Development, Communications and the Arts

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Executive Summary

The Indian Ocean Territories (IOT) are comprised of Christmas Island (CI) and the Cocos (Keeling) Islands (CKI), located around 2,600 kilometres (km) and 2,900 km respectively from Perth. Both have their own shire council, being the Shire of Christmas Island (SoCI) and Shire of Cocos (Keeling) Islands (SoCKI).

Department of Infrastructure, Transport, Regional Development and Communications and the Arts (DITRDCA) are seeking to improve waste management practices and performance in the IOT and to nurture a long-term partnership with private businesses and government agencies to deliver waste services that benefit the local economy, the community and the environment. As part of this, DITRDCA has developed a Waste and Resource Recovery Strategy (the Strategy). The purpose of the Strategy is to provide an overarching vision for waste management in the IOT and outline a realistic pathway for improving waste management through the development of better practice goals.

Historically, challenges specific to the local environment have restricted the implementation of traditional waste management options within the IOT. As such, there is a gap between current waste management performance and both national and state waste management targets. All waste streams were considered in the development of the Strategy. However, particular attention was paid to wastes of high environmental impact, and where measurable resource recovery targets could potentially be achieved. Waste types of particular focus in the Strategy are set out below.

Food organics and garden organics	Key recyclables - beverage containers: aluminium, plastic and glass	Plastic - marine debris, packaging and single use plastics	Hazardous waste, biosolids, quarantine and biomedical waste
Batteries and e-waste	Bulky assets	Tyres	

Three broad waste categories were also assessed to better understand disposal and management options in the IOT. These included: **asset disposal, general waste and marine debris management**. Within each category various disposal/management options were considered and preferred options identified. A summary of the assessment results are provided in Table E.1.

Table E.1 Assessment of waste categories

Waste categories assessed	Options	Preferred options
Asset disposal management	Onshore reuse and reprocessing	The assessment indicated that offshore disposal through engaging a private contractor is the most preferable way to handle obsolete assets with the IOT. A suitably experienced private waste management contractor could be contracted to manage removal and recycling/disposal of the obsolete Commonwealth assets identified within CI and CKI.
	Onshore disposal	
	Offshore disposal	
General waste management	Service arrangement	Current service plus kerbside GO or FOGO service
	RRF	Upgrade existing / build resource recovery transfer station/s on CKI
	Processing options to be explored as a priority	<ol style="list-style-type: none">1. Organic waste2. Glass waste3. E-waste and battery waste4. Tyre waste5. Vehicle and metal waste6. Textile waste
	Residual waste disposal	CI - New engineered (lined) landfill and potentially incinerator also CKI - Two small-scale incinerators (each on West Island and Home Island respectively)
	Collection	Regular beach clean up

Waste categories assessed	Options	Preferred options
Marine and plastic debris management	Sorting	Manual sorting (resin identification code based)
	Processing	CI - Landfill disposal CKI - Incineration / combustion

From a review of the current status of waste management in the IOT, stakeholder engagement and the identification of key constraints and opportunities, the following key strategy areas emerged, providing a framework for the overarching Strategy:

- Waste avoidance and sustainable financing
- Commonwealth asset management
- General waste management
- Plastic and marine debris management
- Data management and monitoring
- Governance
- Support / education.

A number of priorities were developed within the strategy areas to provide direction and support for DITRDCA, in collaboration with the Shires, to deliver the Strategy. In planning for the future, standalone implementation plans have been developed for CI and CKI to assist with bridging the gap between Strategy and action.

A suite of solutions will be required to simultaneously achieve the goals of the Commonwealth and the Shires for waste diversion, align with the waste hierarchy and circular economy principles, and optimise the cost effectiveness of waste management. This Strategy for the IOT seeks to build on what the IOT communities are currently doing to manage waste resources and focus on changes that could achieve the greatest benefits in terms of resource recovery, economic production and environmental amenity.

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1. Introduction

1.1 Background

The Indian Ocean Territories (IOT) are comprised of Christmas Island (CI) and the Cocos (Keeling) Islands (CKI), located around 2,600 kilometres (km) and 2,900 km respectively from Perth. Both islands have their own local shire council, which are the Shire of Christmas Island (SoCI) and Shire of Cocos (Keeling) Islands (SoCKI).

Despite being administered by the Australian Government's Department of Infrastructure, Transport, Regional Development and Communications and the Arts (DITRDCA), the government of Western Australia (WA) provides many public services through Service Delivery Arrangements (SDA's), and WA law applies except where the Australian Government has determined otherwise.

DITRDCA are seeking to improve waste management practices and performance in the IOT and to nurture a long-term partnership with private businesses and government agencies to deliver waste services that can benefit the local economy, the community and the environment. Historically, funding constraints and challenges specific to the local environment have restricted the implementation of traditional waste management options within the IOT, which are commonly used on the Australian mainland. As such, there is a gap between current waste management performance and both national and state waste management targets.

1.2 Purpose

DITRDCA engaged GHD Pty Ltd (GHD) to develop a Waste and Resource Recovery Strategy (the Strategy) for the IOT. The purpose of the Strategy is to showcase the DITRDCA vision for waste management in the IOT and outline a realistic pathway for improving waste management through the development of better practice goals.

1.3 Objectives

There is a strong community sentiment towards improved waste management practices in the IOT. The Strategy's overriding objective is to provide consistency with broader Australian Government objectives; specifically, the National Waste Policy Action Plan 2019, and alignment with local aspirations for the waste and resource recovery sector. This Strategy for the IOT seeks to build on what the IOT communities are currently doing to manage waste resources and focus on changes that could achieve the greatest benefits in terms of resource recovery, economic production and environmental amenity.

The Strategy has also been developed towards:

- Supporting waste management activities with practical, effective and enforceable solutions
- Improved waste management ownership and control, infrastructure supporting sustainable operation and maintenance
- Making waste management systems and programs financially self-sustaining
- Delineating and improving understanding of waste management responsibilities
- Developing skilled and trained people within the IOT to effectively manage waste
- Reducing the amount of waste generated at source and residual waste landfilled
- Introducing and enhancing community participation in more sustainable waste management.

Ultimately, appropriate waste management is fundamental to the liveability of the IOT and ensuring the Shires can continue to meet the strategic values, vision and direction of the Commonwealth.

1.4 Scope

Key elements of the Strategy development included:

- Consultation with key stakeholders including SoCI and SoCKI and the WA Department of Water and Environmental Regulation (DWER).
- Development of the following reports:
 - *Review of the Current Waste Management Status within the IOT* which included a review of previous waste studies undertaken for the IOT.
 - *Best Practice Waste Management for Islands*
 - *Asset Disposal Management*
 - *General Waste Management, and*
 - *Marine Debris and Plastic Waste Management.*

1.5 Limitations

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2. Strategic drivers

National, state and region-specific legislative and regulatory frameworks act as strategic drivers for waste management, including waste avoidance, waste minimisation and resource recovery. Detailed discussion of strategic drivers including national, state and local strategic framework, regulations and legislation are included in the *Review of Current Waste Management Status in the Indian Ocean Territories Report* (GHD, 2022).

The following section provides a summary of the key strategic drivers fundamental to development of the Strategy.

2.1 National Waste Policy and Action Plan

The 2018 National Waste Policy (the Policy): Less waste, more resources provides a nationally recognised framework for action by governments, businesses, waste and resource recovery industries and communities to achieve sustainable waste management. The National Waste Policy Action Plan (2019)¹ sets out targets and actions for implementing the Policy. An annexure of the action plan was released in 2022 which provides an update to the action items in the Plan.²

The Policy and its associated action plan are underpinned by the waste management hierarchy and circular economy principles (Figure 2.1), which provide preferred decision-making guidance. The waste hierarchy preferences waste avoidance, minimisation, reuse, recycling and energy recovery over treatment and disposal.



Figure 2.1 Waste hierarchy and Circular Economy principles (Australian Government, 2018)

Circular economy principles represent a shift from a linear take-make-use-dispose approach towards a circular system and product cycle whereby products and materials are kept circulating within the economy at their highest value for as long as possible, through reuse, recycling, remanufacturing, delivering products as services, and sharing of resources. These circular economy principles, in combination with the waste hierarchy, underpin the IOT Waste Strategy.

As a foundational guideline for developing the IOT's future strategic targets, relevant targets from the National Action Plan and other national strategic targets for Australia have been considered with respect to waste management in the IOT. The targets identified as relevant to the IOT are considered in Table 2.1 below.

Table 2.1 Strategic waste and resource recovery targets

Item	National targets	Relevance to IOT
1	Reduce total waste generated in Australia by 10% per person by 2030	Appropriate implementation of the Strategy can contribute significantly to reducing total waste generated.

¹ Australian Government 2019, 'National Waste Policy Action Plan 2019', available from: <https://www.dcceew.gov.au/environment/protection/waste/publications/national-waste-policy-action-plan>

² Australian Government 2019, 'National Waste Policy Action Plan Annexure 2022', available from: <https://www.dcceew.gov.au/environment/protection/waste/publications/national-waste-policy-action-plan>

Item	National targets	Relevance to IOT
2	80% average resource recovery rate from all waste streams following the waste hierarchy by 2030	This will be a difficult target given the current waste management practices, remoteness/isolation, logistical and infrastructure constraints.
3	Significantly increase the use of recycled content by governments and industry	Government departments, agencies, and councils in the IOT, as well as associated industries, can develop and implement sustainable procurement policies and purchasing protocols.
4	Phase out problematic and unnecessary plastics by 2025	Although the timeframe may not be achievable for the IOT, significant progress can be made through collaboration with stakeholders and effective implementation of the Strategy. Strong support from local businesses and communities would also be needed.
5	Halve the amount of organic waste sent to landfill by 2030	Organic waste makes up a large proportion of the IOT's waste stream (as discussed in Section 3.2).
6	Make comprehensive, economy-wide and timely data publicly available to support better consumer, investment and policy decisions	An achievable target which has been incorporated into the Strategy.

2.2 Waste Avoidance and Resource Recovery Strategy 2030 and Action Plan (WA)

The WA Waste Avoidance and Resource Recovery Strategy 2030 and associated Action Plan provide strategies for transitioning to a sustainable, low-waste, circular economy in which human health and the environment are protected from the impacts of waste. The primary objectives of the strategy align with the National Waste Policy. The WA strategy's overarching aim is to reduce the State's reliance on landfills. These principles have been used to guide the development of key recommendations for the IOT Strategy.

3. Current status

A detailed examination of current waste generation, recovery rates and existing waste management infrastructure and services were provided in the *Review of Current Waste Management Status in the Indian Ocean Territories Report* and *Best Practice Waste Management for Islands Report* (GHD, 2022). Constraints and opportunities for the IOT were developed from these reports as the basis for considering future strategic objectives (refer Section 7).

3.1 Regional setting

3.1.1 Demographics

CI is approximately 19 km at its greatest length and 14 km in breadth, with a total area of approximately 135 km². The island has five settlements; namely, Flying Fish Cove, Settlement, Silver City, Poon Saan and Drumsite. CI has a resident population of approximately 1,700, however the number fluctuates due to the existence and/or use of a migrant detention centre on the island, which has a capacity to host 3,000 people.



Figure 3.1 Christmas Island (IOTRDO, 2019)

The CKI territory consists of two atolls made up of 27 coral islands, with a total area of approximately 14 km². Of the 27 islands, only two are inhabited; namely, West Island and Home Island. Between the two islands, the total resident population is approximately 540.



Figure 3.2 Cocos (Keeling) Islands (IOTRDO, 2019)

3.1.2 Projected populations

The permanent and temporary populations within the IOT have been projected using Australian Census population data and IOT visitor data from 2016-2021, which includes data from tourists, tourists visiting friends/relatives and businesses. Figure 3.3 displays projected population growth for CI and CKI.

It is noted that transient groups such as fly-in fly-out (FIFO) workers and visitors (tourists) strain existing infrastructure and assets within the IOT. For CI, this is particularly due to uncertainty surrounding the ongoing operational status, number of detainees and associated staffing requirements at the detention centre, as well as doubts around the long-term future of phosphate mining operations. For CKI, the population on West Island can vary significantly as a result of Commonwealth-related projects. For example, during the airport runway upgrade, it is expected that West Island's population will double.

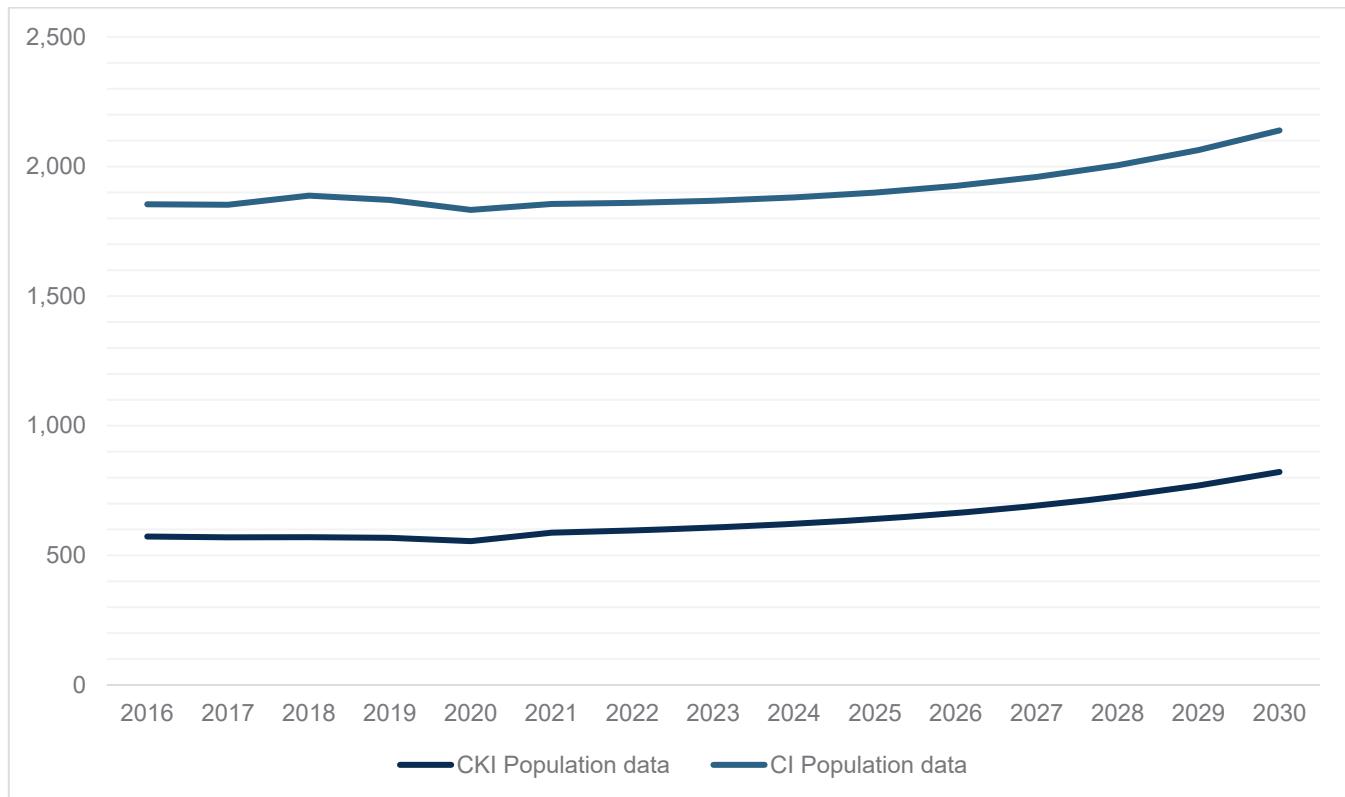


Figure 3.3 Projected population (permanent residents and temporary visitors)³

3.2 Waste generation

Waste generation and disposal approaches currently practiced on the islands are considered unsustainable and have potential to cause serious health, safety and environmental issues. Risks include:

- Emissions to air, groundwater and contamination of fresh water supplies from leaching of nutrients, heavy metals and other pollutants.
- Inappropriate management and stockpiling which attracts pests including mosquitoes, flies, and attracting other pests such as feral cats and rats. Pathogens from sewage sludge disposal also pose an environmental and public health risk.
- Proximity of the existing waste facilities to sensitive environmental receptors such as water bodies, native vegetation and indigenous heritage sites.

The available data on waste generation types and volumes in the IOT is relatively unreliable. This is a common issue for waste management in remote areas, with measurement often based on visual estimates, since installation of weighing infrastructure (e.g. weighbridges) is uneconomic, leading to inconsistencies in estimation and reporting.

³ Note: It has been assumed that temporary groups stay on the Islands for five days, and based upon this, the number of permanent residents these additional visitors would equate to has been calculated. This is considered a conservative approach to population growth estimation.

3.2.1 Waste generation on Christmas Island

On CI, landfill is the main method of waste disposal. The unlined landfill is spread over 10 hectares and is located on Phosphate Hill, adjacent to the temporary detention centre and the SoCI recreation centre. The landfill is operated on a simple collect and cover basis, with putrescible (wet) wastes received, placed and covered daily. Inert (dry) wastes are generally stockpiled and ultimately landfilled. The CI landfill is expected to reach capacity within 5 years.

CI has regular kerbside residual waste collection services for residents and businesses, as well as self-haul arrangements to Shire-operated waste management facilities. Although whitegoods, garden organic (GO) waste and waste wood are generally stockpiled, with no established processing in place, these waste streams are ultimately landfilled. At present no waste is being diverted from the landfill by via separation or recovery of recyclable materials.



Figure 3.4 Stockpiled material (L) and landfill (R) on CI

On the basis of the data provided, an overview of 2021 waste flows for CI have been illustrated in Figure 3.5 below. This diagram indicates relative size of key waste streams, key infrastructure and the fate of each element.

In 2021, it was estimated that a total of approximately 7,500 tonnes of waste was disposed of on CI, and based upon population projections, it is anticipated that waste generation may increase to around 8,500 tonnes by 2030. As of 2021, approximately 11 kg of waste per person per day was generated. Although this includes commercial sources, it is noted that average worldwide waste generation rates are 0.74 kg per person per day.⁴ Therefore, it is possible there is some discrepancy between estimated and actual waste generation rates on CI.

⁴ The World Bank 2022, 'Trends in Solid Waste Management'. Available from: https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html

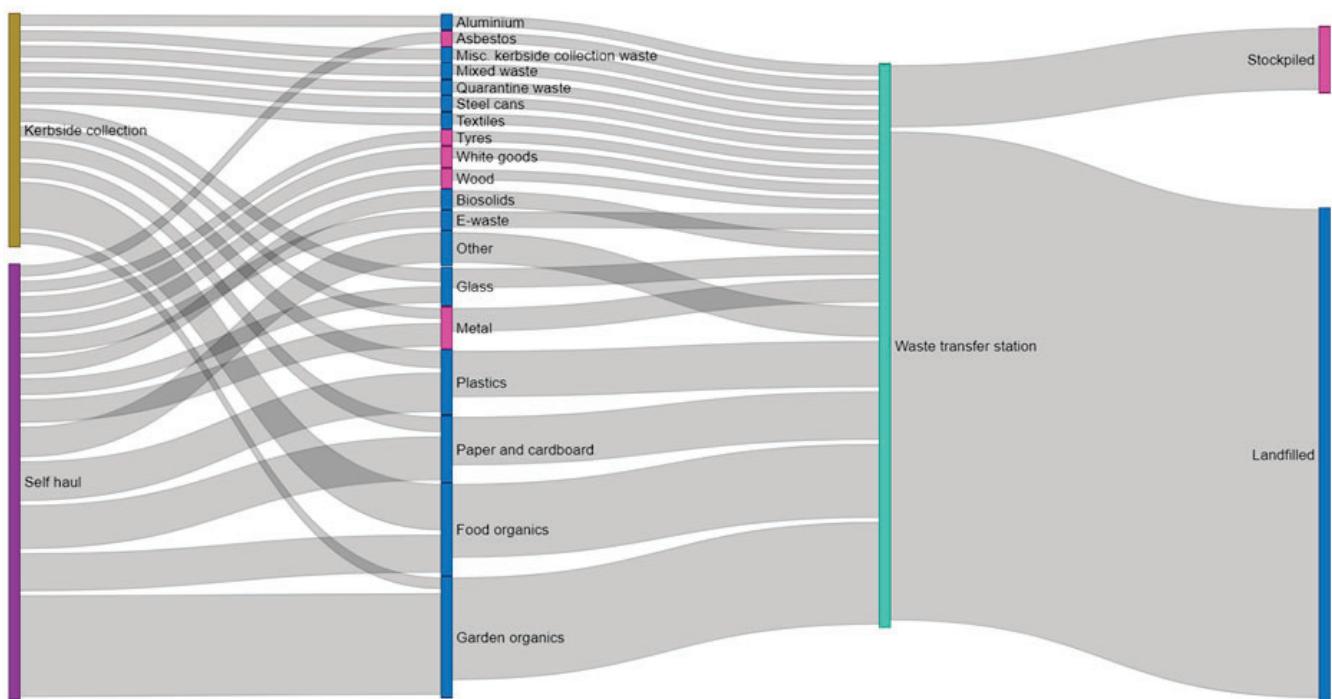


Figure 3.5 Waste flows on CI

3.2.2 Waste generation on Cocos (Keeling) Islands

On CKI, with landfilling precluded as a low-cost disposal option due to the islands' low elevation and shallow water table, the majority of waste is currently either incinerated or open burnt. A diesel-fuelled incinerator was installed on Home Island in 2015 to dispose of most of the residual waste generated. The incinerator has a maximum capacity of up to 8 m³ per week, and significant inherent materials handling challenges. An assessment undertaken in May 2022 by an independent consultant determined that the unit was not fit for purpose and posed a safety hazard to operations staff. As a result, SoCKI ceased incineration operations and the regulator, WA Department of Water and Environmental Regulation (DWER) has temporarily permitted open burning until an alternate interim solution is identified and implemented.

Currently on CKI, regular kerbside collection services are provided for residents and businesses, and self-hauled waste is accepted at Shire-operated waste management facilities. CKI offer a residual waste collection service and fortnightly household collection of pre-separated recyclable glass and aluminium containers, in separate bins.

As of 23 November 2022, the Shire temporarily banned the acceptance of all non-putrescible household waste.⁵ From the 1 July 2023, SoCKI intend to introduce a basic fee structure for the acceptance and management of certain items at the WTSs. The proposed gate fees are intended to ultimately incorporate full cost recovery for management of waste that the SoCKI WTSs are not licenced to receive, and for waste requiring off-island disposal.

⁵ SoCKI 2022, 'CEO Update'

Some items are currently stockpiled outdoors including crushed glass, waste oil, batteries, whitegoods and miscellaneous redundant commercial assets (cars, machinery, shipping containers etc). Compacted and baled aluminium cans are stored inside the transfer station, out of the elements, as there have previously been contamination issues with this material when returned to Australia for recycling. The majority of stockpiled waste does not currently have a readily accessible end market.



Figure 3.6 *Stored material on West Island (CKI)*

Based on the data provided, an overview of 2021 waste flows for CKI (Home Island and West Island) is illustrated below in Figure 3.7 and Figure 3.8. Waste on Home Island is generated by residents, while on West Island, waste is primarily generated by Commonwealth agencies and Contractors including, but not limited to the airport, Royal Australian Air Force (RAAF) base, IOT Administration (IOTA) and IOT Health Services. Waste is also generated by the tourism industry, including the motel and other tourist accommodation, clubs and cafes.

In 2021, it was estimated that a total of 467 and 730 tonnes of waste was disposed of on West Island and Home Island respectively (around 1,200 tonnes total), and based on population projections, waste generation is expected to increase to 630 and 1,083 tonnes (respectively) by 2030 (around 1,700 tonnes total). These waste projections are only estimations, particularly given that on CKI the transfer stations are not continuously attended (by staff) and waste is often open burnt by the communities while the sites are unattended. Therefore, accurate assessment of total waste generation is quite challenging. There are also significant stockpiles of waste including asbestos, batteries, fire extinguishers, paint, e-waste, steel, aluminium and waste oil, as there has been no offshore disposal for these materials for 8 – 10 years.

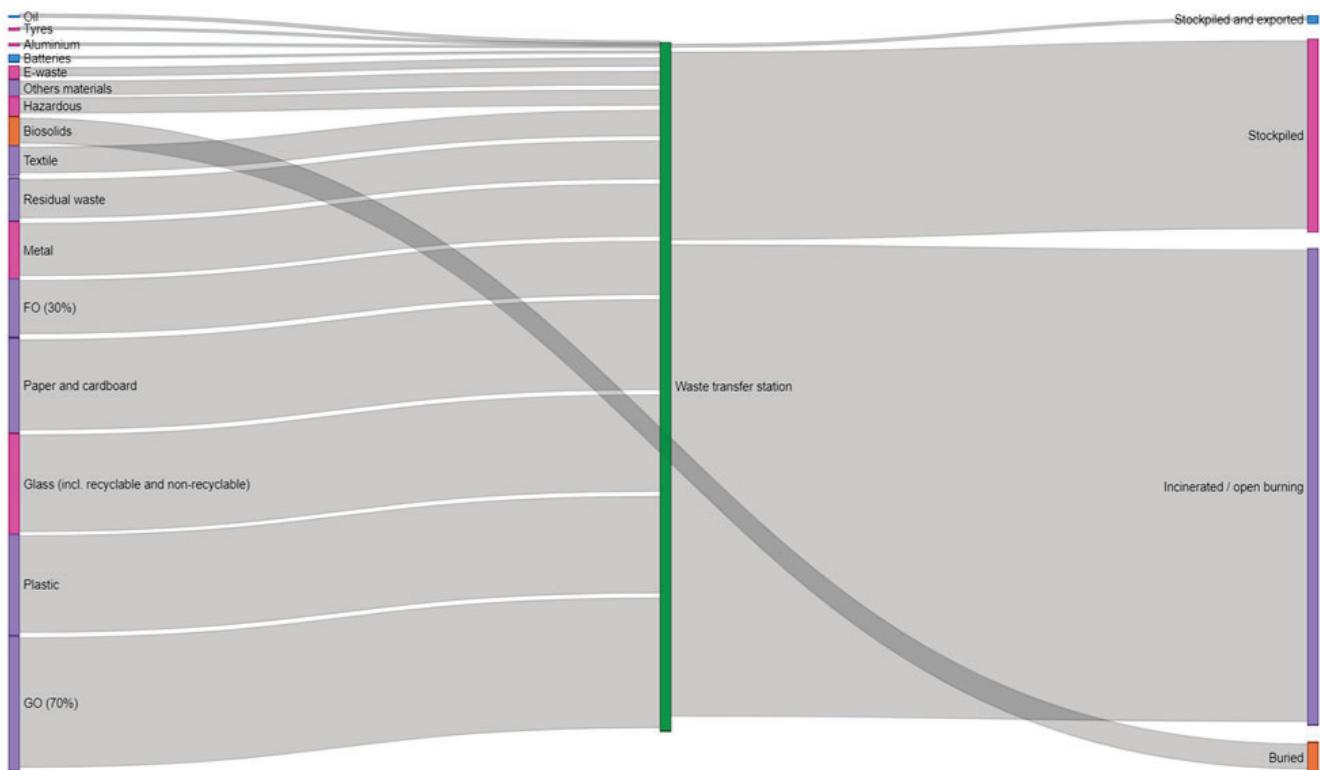


Figure 3.7 Waste flows CKI – Home Island

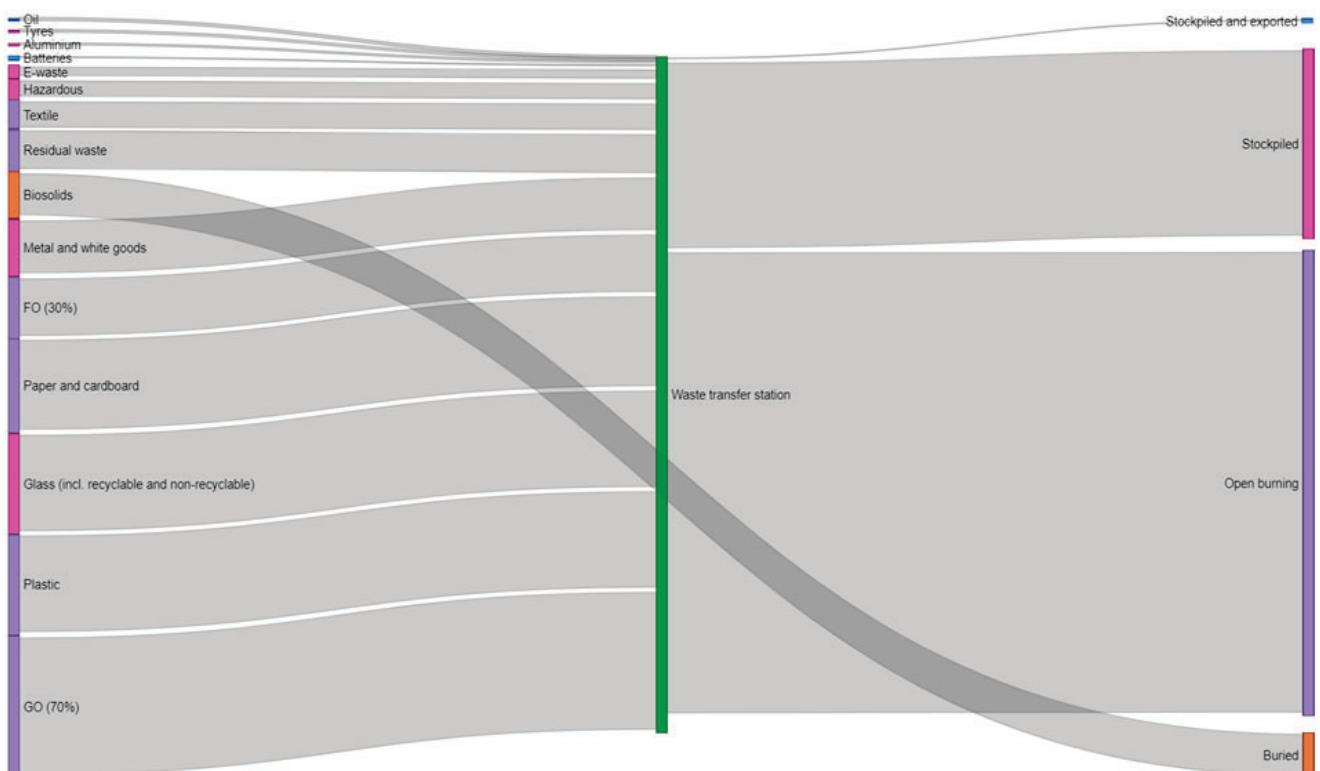


Figure 3.8 Waste flows CKI – West Island

4. Waste types of particular focus

Based on the current context of the IOT and stakeholder engagement undertaken, it is considered that all waste streams need to be considered in the Strategy. However, particular attention needs to be paid to wastes of high environmental impact, and where measurable resource recovery targets could potentially be achieved.

Priority focus wastes are those with high disposal impacts, such as high levels of toxicity, leachability, or potential to generate greenhouse gas emissions, greater social impacts (such as community concern or amenity), and those for which recovery may present resource conservation or business opportunity. These waste groups have been prioritised in the overall strategic objectives and priorities of the Strategy (refer Section 7).

Table 4.1 examines the priority focus wastes, which in some though not all cases, align with Commonwealth and state strategic waste and resource recovery frameworks, such as food organic (FO), garden organic (GO) and FOGO wastes. It is noted however that separation, baling and export of recyclable paper and cardboard are unlikely to present significant waste minimisation and recycling opportunities due to the relatively modest quantities generated and the significant cost of shipping to potential reprocessing centres off-island.

Table 4.1 Waste types of particular focus

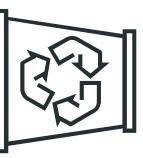
Waste type	Reasoning
FO, GO, FOGO (organic wastes)	<ul style="list-style-type: none">– Readily recoverable via composting and product is potentially a useful local resource.– This material is a large proportion of the general waste stream.– When landfilled, organic wastes generate greenhouse gas (methane) and leachate. As such there is a higher environmental risk associated with disposing this material to landfill.– When disposed via small scale incineration, the high moisture content requires more supplementary fuel to maintain temperatures for clean burning and emissions management.– Open burning of waste produces high levels of smoke and particulates and potentially toxic emissions, including bottom ash containing products of incomplete combustion.– Recovery presents on-island reuse opportunities rather than export or taking up a significant portion of the limited capacity of residual waste disposal infrastructure.
Key recyclables (beverage containers: aluminium, plastic and glass)	<ul style="list-style-type: none">– Opportunities to recover key recyclables from the waste stream (although currently constrained by low commodity value relative to shipping costs).– Clean crushed glass may be reusable as a local resource.– Higher income potential if WA Container Deposit Scheme (CDS) refunds could be accessed via establishment of a SDA, offsetting shipping costs to market/s.– On CKI, aluminium and glass are currently separated on West Island, with glass crushed and stockpiled outdoors and aluminium baled and stockpiled inside the shed.
Plastic (marine debris, packaging and single use plastics)	<ul style="list-style-type: none">– Plastic pollution has become a major concern for the IOT.– Plastic waste takes a long time to break down and degrade in the environment and due to the location of the IOT and prevailing ocean currents, marine plastic debris is frequently deposited on the shores of the islands.– Regular collection and removal of marine debris may support growth of the tourism industry.– Recovery may present resource savings and/or business opportunities.
Bulky assets	<ul style="list-style-type: none">– It has been reported that there are large quantities of redundant bulky assets stockpiled and/or dumped within the IOT. There are a number of redundant metal assets requiring removal and/or disposal.
Hazardous waste, biosolids, quarantine and biomedical waste	<ul style="list-style-type: none">– Pose a high risk to human health if not appropriately managed.– High risk associated with landfill disposal.– An opportunity exists for biosolids to be composted with GO if appropriately managed. However, quantities are relatively low and high rainfall potentially precludes open windrow composting as a low-cost option in the tropical climate setting of the IOT. Cultural issues may constrain use of recycled organic products containing biosolids in the IOT.

Waste type	Reasoning
Batteries and e-waste	<ul style="list-style-type: none"> – It is understood batteries are being stockpiled and stored on the islands. – Long term storage without appropriate environmental controls may pose a high risk to human health and the environment. – High risk associated with landfill disposal (leaching of toxic metals). – Wet cell batteries have well established markets and are generally a viable commodity for recycling from remote islands, despite high shipping costs. – Safety concerns can be addressed with instigation of correct procedures and safety equipment.
Tyres	<ul style="list-style-type: none"> – There are currently large quantities of tyres on the islands that are difficult to manage. – Stockpiling tyres can present serious environmental health risks.

5. Key constraints and opportunities

A number of key constraints were identified in development of the Strategy that are specific to the local environment. These constraints also present opportunities within the IOT for resource recovery and waste management. Challenges and opportunities within the IOT are set out below.

5.1 Services

Aspect	Challenge	Opportunity
Waste services	 Current waste and recyclable bin services provided to residents limit overall recycling opportunities, particularly for the organic component of the waste stream. Organic wastes are a significant source of greenhouse gas and leachate pollution at landfills. Combustion of high moisture organic waste needs more supplementary fuel than dry residual waste.	<ul style="list-style-type: none">– Organic wastes are the largest proportion of the IOT's residual waste stream.– There is potential to increase resource recovery and recycling. An additional organics bin could be used to promote source separation of organics.– Opportunity to explore organic waste processing.– There could be potential to work with local industry and business to improve overall recycling rates.

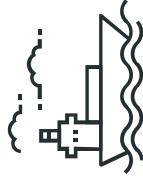
5.2 Infrastructure

Aspect	Challenge	Opportunity
Waste infrastructure	 The current waste infrastructure provides relatively limited recycling or resource recovery opportunities and viable long-term disposal options for residual wastes from residents and businesses.	<ul style="list-style-type: none">– Infrastructure upgrades provide opportunities to target recoverable materials.– There are infrastructure options with potential to produce energy and recycle organics if scale, reliability, operation and maintenance issues can be economically addressed.– Establishment of new waste infrastructure improves diversion of recyclable waste from landfill or incineration and contributes to meeting national and state targets.

5.3 Waste data management

Aspect	Challenge	Opportunity
Waste data management	Data to inform the progress of waste management at a local level is inconsistent and incomplete. Reliable data is needed to understand waste and recycling priorities/targets, inform waste infrastructure investment and track performance/effectiveness of the Strategy in the future. 	<ul style="list-style-type: none"> – The introduction of standardised data collection and reporting systems would allow for clear and consistent data to be reported and monitored to highlight trends, inform management planning and track progress towards targets. – Include requirement for provision of data in electronic format in contracts with waste service providers.

5.4 Logistics

Aspect	Challenge	Opportunity
Challenging logistics	<p>High cost of transport of goods onto and off the islands, as well as quarantine requirements, creates difficulties with the establishment and maintenance of waste infrastructure and the transportation of waste and recyclables off the islands. Furthermore, there is only one sea freight and one air freight carrier to the IOT. This is compounded by port handling mass limitations, high expense and unreliability of deliveries (mostly weather related).</p> <p>A lack of existing developed and accessible markets for recyclable materials limits ability to improve resource recovery. Past attempts to backload recyclable waste material to the mainland have experienced difficulties due to quarantine restrictions.</p> 	<ul style="list-style-type: none"> – Opportunities to treat waste as a resource and focus on reduction, reuse and recycling rather than treat waste as a burden to be removed from the IOT. – Local markets need to be identified and closed loop recycling established. – Backloading has been undertaken in the past on an ad-hoc basis. With updated situation assessment, market research and improved data capture, backloading may present an opportunity to leverage previous work, subsidies and other backloading opportunities. Noting that a suitable pathway for the transportation of waste to Australian mainland would need to be developed / assessed given the strict quarantine requirements imposed. – Opportunities to access markets within Indonesia, Singapore and Malaysia could be explored, particularly for scrap metal, subject to logistics constraints and securing support from appropriately experienced industry participants. – High cost of shipping recyclable beverage containers could be largely offset by higher net commodity value if the WA container deposit scheme could be accessed in the IOT (via establishment of an appropriate SDA).⁶

⁶ Australian Government 2022, 'Service Delivery Arrangements | IOT', available from: [Service delivery arrangements | Department of Infrastructure, Transport, Regional Development, Communications and the Arts](#)
Communications and the Arts
GHD | Department of Infrastructure, Transport, Regional Development, Communications and the Arts | 12564012 | Waste and Resource Recovery Strategy

5.5 Governance and funding

Aspect	Challenge	Opportunity
Governance and funding	<p>Lack of synergy and collaboration between the Shires, State and Commonwealth governments with regards to the implementation of waste management strategies within the IOT.</p> 	<ul style="list-style-type: none"> – Funding and strategic leadership for waste management needs to be openly discussed between the Commonwealth and Shires. – Explore collaboration and funding opportunities between the Shires, State and Commonwealth. This is essential for the successful implementation of the Strategy. – Regular group consultations between the Commonwealth, the Shires of IOT and DWER should be considered. – Although there are currently no formalised strategic waste management plans, considerable resources have been directed towards waste management studies for the IOT. – There is a clear desire in the local communities for improving waste practices as a tangible environmental improvement initiative. – A number of funding / collaboration opportunities are available to assist with the delivery of waste management and resource recovery infrastructure. The key avenues currently available are summarised below. <ul style="list-style-type: none"> • <i>Recycling Modernisation Fund (RMF)</i> (DAWE, 2021) - The RMF supports new infrastructure to sort, process and remanufacture materials such as mixed plastic, paper, tyres and glass. This is a matched funding model, and the Commonwealth will contribute up to 1/3 of capital establishment costs, to be matched by equivalent funding from the relevant state government, with the balance provided by the proponent. IOT Councils' eligibility to access support may need to be confirmed. • <i>Charitable Recyclers Dumping Reduction Program</i> – This supports charitable recyclers that divert used items from landfill and recover them for recycling and reuse. • <i>National Soil Strategy – Food Waste for Healthy Soils Fund</i> (DAWE, 2021) – This program provides funding via co-investment in organics recycling infrastructure to increase diversion of organic waste to composting and soil health restoration. As this is a matched funding model, and the Commonwealth will contribute up to 1/3 of capital establishment costs, to be matched by equivalent funding from the relevant state government, and the balance provided by the proponent. IOT Councils' eligibility to access support may need to be confirmed. • The WA Waste Authority (administered by WA government) supports initiatives which avoid and recover construction and demolition (C&D) materials, including the Roads to Reuse program which encourages the

Aspect	Challenge	Opportunity	
		<ul style="list-style-type: none"> use of recycled C&D products in civil applications, such as road construction. IOT Councils' eligibility to access support may need to be confirmed. Better Bins Plus: Go FOGO - The Waste Authority provides support for the roll out and planning of a consistent three-bin kerbside collection system, which includes separation of FOGO. This funding is reserved for local government. IOT Councils' eligibility to access this funding may need to be confirmed. WasteSorted Grants – Infrastructure and Community Education 2021–22 - Administered by the WA Waste Authority, this grant provides funding for: recycling infrastructure development. IOT Councils' eligibility to access this funding may need to be confirmed. (\$1 million total grant funding), as well as initiatives and events that contribute to waste avoidance and resource recovery (\$150,000 total grant funding). IOT Councils' eligibility to access this funding may need to be confirmed. WA Container Deposit Scheme – refund redemption protocols for MRF operators enable recyclers to redeem container deposit refunds of circa \$0.09 per eligible beverage container, subject to meeting quality, eligibility and audit requirements. A suitable SDA between the Commonwealth and WA governments would need to be established. It is likely that container deposits are embedded in prices paid by IOT residents for beverages imported from Australia to the IOT. IOT Councils' eligibility to access CDS refunds may need to be confirmed. 	
	Waste ownership	<p>Historically, there has been a problem with waste generator ownership in the IOT. Lack of accountability and acceptance of waste management responsibility by stakeholders, particularly regarding obsolete assets, have created legacy waste issues on the islands. Without imposing obligations based on ownership by waste generators, the effective implementation of waste management strategies and actions is inhibited.</p> 	<ul style="list-style-type: none"> Increased accountability for the owners of waste in the IOT and their responsibilities to dispose waste in an appropriate manner. Stakeholder engagement with various groups as part of the broader waste awareness campaign, linked to enhancing appreciation around the responsibility for end of life management, embracing the concept of waste ownership. Improving understanding around the concept of waste ownership helps to conserve natural resources, protect the environment and safeguard public health.

5.6 Waste ownership

Aspect	Challenge	Opportunity
Approvals	<p>Approvals associated with new waste management infrastructure, services, strategies, as well as waste avoidance and sustainable financing mechanisms can be a challenge to implement, particularly if it must be legally enforced. In addition to this, obtaining these approvals can be a lengthy process.</p> 	<ul style="list-style-type: none"> – Recognise that DWER's environmental regulation is an enabling provision for improved waste management within the IOT. – Create an enabling regulatory, policy and commercial environment for sustainable waste management. – Increased power to enforce waste ownership responsibilities and accountability.
5.7 Approvals		

5.7 Approvals

Aspect	Challenge	Opportunity
Engagement and implementation 	<p>Any new waste infrastructure must cater to island residents' needs as local capabilities / resources must be relied upon to execute the Strategy and operate and maintain the infrastructure and ancillary equipment.</p> <p>Minimal formalised education with regards to waste management and repairs and maintenance of mechanical systems and equipment.</p>	<ul style="list-style-type: none"> – Opportunity for community education and engagement as part of a broader waste awareness campaign, linked to improved resource recovery opportunities. – A key factor underpinning the success of any proposed service and infrastructure changes and realisation of waste avoidance and reduction targets is an understanding of the behaviour change elements. This includes opportunities to identify key partnerships and stakeholders, and development and implementation of an engagement and education program. – The development of an engagement and education program could assist with improving resource recovery and decreasing contamination rates in household kerbside recycling bins, along with behavioural change in the communities. – Engaging the services of an appropriately experienced and well-resourced waste management service provider based in Australia to provide regular situation assessments, training, planning support and management oversight, as well as arranging planned and scheduled maintenance and breakdown support, may improve overall waste management system resilience, reliability and viability of more sophisticated resource recovery and waste management initiatives and infrastructure.

6. Waste group options assessments

In developing the Strategy, DITRDCA considered three broad waste categories for assessment to better understand disposal and management options in the IOT. These included: asset disposal, general waste and marine debris management. Context-appropriate solutions were examined and documented in the following reports:

- *Asset Disposal Management Report* (GHD, 2022).
- *General Waste Management Report* (GHD, 2022).
- *Marine Debris Management Report* (GHD, 2022).

The findings of these reports are summarised in the following section.

6.1 Asset disposal management

DITRDCA has sought to investigate options for managing obsolete assets that are either inoperable or beyond their useful lives. Any waste removal from the islands is costly due to isolation and distance, and there are limited disposal options on-island due to lack of available land space. Currently recorded Commonwealth obsolete assets located within the IOT were examined and recommendations for potentially suitable asset disposal management options were assessed in the *Asset Disposal Management Report* (GHD, 2022).

Assets beyond their useful service life and decommissioned assets are currently managed through various registers including the SAP Asset Register, FARM Tools, Samps and AMPS. The primary function of the SAP Asset Register is to monitor useful life and residual capital value of assets still in service.

It is emphasised that to deal with future Commonwealth asset disposal, a focus on waste avoidance and end-of-life management for assets brought onto the islands must be prioritised, as this is the most effective measure in containing waste management costs, especially in remote communities.

6.1.1 Disposal options

A number of disposal options were considered for managing obsolete assets within the IOT. The various available options were divided into three disposal categories:

- Onshore reuse and reprocessing,
- Onshore disposal, and
- Offshore disposal (i.e., removal from island).

Seven sub-options were identified for management of obsolete assets (refer to Figure 6.1).



Figure 6.1 Disposal options considerations

6.1.2 Obsolete assets

A total of 60 obsolete Commonwealth assets were identified on current Commonwealth registers, with 42 of these located on CKI and 18 on CI. It is considered that there are many more abandoned assets on the islands that have not been accounted for or not captured in asset registers. Assessment and categorisation of obsolete assets found that they are largely inert, comprising of mainly vehicles or disused materials and equipment generated from the provision of services and projects undertaken by various commercial enterprises.

To assess the requirements for disposal of the obsolete assets identified, they have been grouped by physical size, as small, medium and large. The rationale behind the categorisation of these groups have been defined as follows:

- **Small assets:** “Small assets” are those considered to weigh up to 100 kg, where the dimensions of the item do not inhibit or do not greatly constrain transportation and these items can be removed by 1 – 2 staff.
 - 17 of the 60 obsolete assets listed have been classified as small assets.



Figure 6.2 Example of small asset



Figure 6.3 Example of medium asset

- **Medium assets:** “Medium assets” are those considered to weigh between 100 kg – 500 kg. Equipment will be required to handle these assets and some disassembly could potentially improve transport efficiency. However, the dimensions of the item do not inhibit or do not greatly constrain transportation of these items. These items can be removed by 1-2 staff with the assistance of mobile materials handling equipment. Furthermore, they can be transported via both sea and air freight, subject to volume/mass cost-efficiency and residual or realisable asset value.
 - 18 of the 60 obsolete assets listed have been classified as medium assets.



Figure 6.4 Example of large asset

6.1.3 Preferred options

The seven management options for obsolete assets were evaluated using Multi Criteria Analysis (MCA) with criteria developed in consultation with DITRDCA. The MCA compared the seven disposal options by four key categories, namely operational requirement and practicality; financial feasibility; health, safety and sustainability and socioeconomic considerations. Table 6.1 summarises the MCA results and displays the recommended management options for small, medium and large assets.

The MCA assessment indicated that engaging a private contractor is the most preferable way to handle small, medium and large obsolete assets with the IOT. A suitably experienced private waste management contractor such as Veolia, Cleanaway, Remondis or similar, could be contracted to manage removal and recycling/disposal of the obsolete Commonwealth assets identified within CI and CKI. This should also include legacy obsolete assets not identified within Commonwealth registers. A tender could be called for an ongoing services contract or one-off event to dispose of the most logically challenging derelict assets. The contractor could handle the removal, transportation (including managing quarantine requirements) and recycling or disposal of the assets on the mainland. They could also be tasked with providing regular inspections, operational efficiency reviews and oversight (via regular scheduled visits) to assess, repair and maintain waste management assets, such as recycling infrastructure (if/when established), waste transfer stations, landfills, and incineration unit/s in the IOT. This option is considered most suitable primarily due to its overall practicality, alignment with the waste hierarchy and likely community support. This option also involves minimal ongoing coordination effort after the tender process and could potentially be managed under delegation to the Shires.

Table 6.1 Preferred management options

Small assets	Medium sized assets	Large assets
<ul style="list-style-type: none"> 1. Option 7 Removal by private contractor (via tender) 2. Option 4 Sale by tender on island 3. Option 2 Transfer to not for profit 	<ul style="list-style-type: none"> 1. Option 7 Removal by private contractor (via tender) 2. Option 4 Sale by tender off island 3. Option 5 Supply to offshore end users or disposal facility 	<ul style="list-style-type: none"> 1. Option 7 Removal by private contractor (via tender) 2. Option 4 Sale by tender off island 3. Option 5 Supply to offshore end users or disposal facility

6.2 General waste management

To improve waste management practices and performance in the IOT and to nurture a long-term partnership with private businesses and government, context-appropriate general waste management and resource recovery options for the SoCI and SoCKI and also for the whole IOT region were examined within the *General Waste Management Report* (GHD, 2022).

Various options were assessed to determine their practicality, viability and to determine which options provide the most value for each community. The waste management options were evaluated via MCA which focused on the following categories:

- Technical performance
- Operational requirements
- Risk, Health and Safety
- Sustainability and legislative drivers
- Social benefits
- Economic feasibility

The preferred options identified from the MCA are summarised in the section below.

6.2.1 Service arrangement (collection)

An efficient source separation system enables the collection of high-quality recyclables or clean waste streams for reuse, recycling and reprocessing purposes. Resource recovery rates and diversion from landfill can generally be increased by introducing further source separated collection services, where reprocessing markets are viably accessible. The **introduction of an organics collection** in addition to the current service arrangement was the most suitable service option recommended to be explored for implementation with the IOT. FOGO currently makes up a large proportion of the IOT residual waste stream. Source separation of this material for further processing directly reduces the quantity of residual waste requiring final disposal. DITRDCA engaged GHD (March 2023) to undertake an organic waste management pre-feasibility assessment to explore the potential implementation of organic waste processing in the IOT.



Figure 6.5 FOGO kerbside collection (City of Launceston, 2022)

Another potentially suitable option for implementation in the IOT is the acquisition of **mobile recycling centres in addition to the current service arrangement**. This was not selected as the preferred option as there is currently limited end markets for recyclable materials on island and there are high costs associated with exportation. Furthermore, there are biosecurity issues associated with exportation to the mainland. Custom designed trailers can be sent to the nominated service area to collect waste and recycling materials on a scheduled basis. Figure 6.6 below shows examples of mobile recycling centres.



Figure 6.6 Examples of mobile recycling centres (SORAB, 2018)

6.2.2 Resource recovery facility

A resource recovery facility (RRF) is a specialised area or processing plant that receives, segregates or separates, and prepares recyclable materials for marketing to remanufacturers or other end-users.

As CI supports a large population in comparison to CKI, an appropriately designed simple RRF will be required to support meaningful resource recovery and reduction in residual waste requiring disposal. As there is minimal airspace left in the current landfill on CI, the opportunity exists to masterplan a centralised 'better practice' facility that integrates a range of potentially synergistic services and functions. The RRF should be designed to facilitate waste exportation and waste storage, particularly through the design of an appropriate quarantine handling area.

The options assessment for the RRF focused on CKI and the most suitable option identified was to **upgrade CKI's existing transfer stations**. These require upgrading to facilitate a higher resource recovery rate and to support processing options that may be implemented within CKI. Furthermore, this option is the only readily available scenario due to the remoteness of the islands, limited disposal options and the limited resources available. From the 1 July 2023, SoCKI intend to implement a new gate fee structure for the acceptance and management of certain items at the WTSs. The proposed gate fees are intended to ultimately incorporate full cost recovery for management of waste that the SoCKI WTSs are not licenced to receive, and for waste requiring off-island disposal.

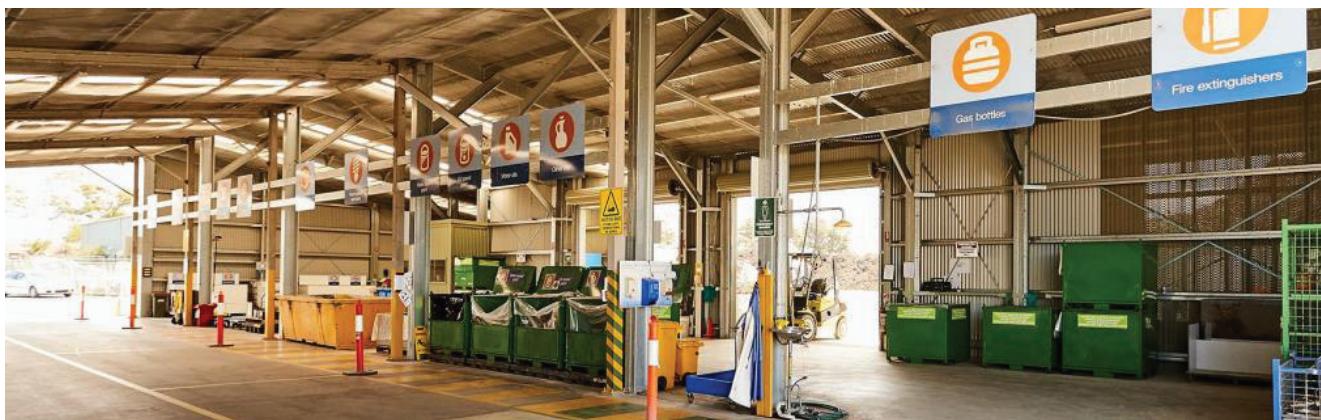


Figure 6.7 Example of RRF (NSW, 2018)

6.2.3 Processing

Various processing technologies that may be potentially suitable for implementation within the IOT were considered for each waste stream. An MCA was undertaken to understand the processing options that are recommended to be further assessed/implemented as a first priority with the IOT.

Based upon the assessment results, as a key priority, further assessment should be undertaken with regards to the **viability of organic waste processing** within the IOT. This is largely because organic waste is the largest component within the IOT's mixed residual waste. Processing and recycling this material on-island provides the opportunity to recover both energy and an organic fertiliser or soil conditioner for beneficial use around the islands, creating new job opportunities and community education and engagement. Three core technologies were explored

for organic waste processing: anaerobic digestion, aerobic composting and dehydration. Examples of anaerobic digestion, aerobic digestion and commercial-scale dehydration systems are shown in Figure 6.8 below.



Figure 6.8 High solids 'dry' anaerobic digestion facility (Bekon, 2018) (top left), HotRot in-vessel composting system (Global Composting Solutions, 2022) (top right) and Biodrying concept by Eggersmann (bottom)

E-waste and batteries, and glass management were the next priority processing options to be further assessed for implementation as a key priority. These are examined further below.

Although priority processing options have been assessed in the MCA, all other processing technologies considered, including tyre waste, vehicle and metal waste and textile waste, should be considered for implementation within the IOT. However, further work is needed to examine the technical and financial feasibility of implementing the range of options identified, particularly after the actual available feedstock for each waste stream has been better quantified.

6.2.3.1 Glass processing

Glass is considered a priority, and due to the low recovered commodity value it is currently unfeasible to export waste glass from the IOT. As such, processing is required to recover glass in a form and at a quality standard that can be reused on-island.

6.2.3.2 E-waste and battery recycling

In the IOT, there are currently significant stockpiles of end-of-life batteries stored in shipping containers. Long term storage of batteries without appropriate environmental controls can pose a high risk to human health and the environment. Heavy metals in printed circuit boards and soldered joints in electronic components, and the complex metal ions and potentially toxic elements in batteries can contaminate groundwater if disposed with the general waste stream in landfill or be concentrated in the ash resulting from incineration. Separation from the general waste stream, aggregation and recycling diverts batteries from landfill and/or incineration, avoiding the toxic by-products of inappropriate disposal.

Substituting non-rechargeable dry-cell and other batteries with rechargeable batteries saves energy, money and the environment, since they can be recharged 1,000 times or more (depending on type), before needing replacement.

Some batteries contain rare and semi-precious materials like magnesium and zinc, as well as elements that can be potentially harmful if released into the environment (nickel, cadmium, lead, cobalt, lithium, vanadium, manganese), which, if recycled, can be recovered and reused in the manufacturing process.

Safety considerations also need to be considered, since lithium batteries have the ability to explode or catch fire if damaged or overheated or exposed to incompatible materials in landfills.

E-waste processing technology is not recommended for small islands due to significant expenditure and potential environmental impacts.⁷ Two management options were considered, being exportation, and repair and reuse. Based upon the assessment results, **exportation, partnered with repair and reuse**, is recommended to be explored further in the IOT.

6.2.4 Residual waste disposal

Residual waste disposal should be the least preferred disposal option as indicated by the waste management hierarchy. The waste management hierarchy preferences waste minimisation, reuse and recycling over treatment and disposal. Waste should be at first avoided and reduced. If waste cannot be avoided, where possible waste should be recycled and recovered and if feasible exported to be recovered. The disposal of waste is the least preferable option and should only be considered as a last resort.

6.2.4.1 Residual waste on Christmas Island

Two options for residual waste disposal were assessed for CI: Construction of a new landfill, or construction of a smaller new landfill with a complementary waste incinerator.. Although a new landfill is not the ideal scenario from a long-term environmental perspective, best practice landfill design and management principles can be applied to minimise environmental impacts.

The analysis found the construction of a new engineered (lined) landfill, without an incinerator to be preferred option, subject to site identification. However, a new smaller engineered landfill with a complementary incinerator is also potentially feasible but could increase overall costs and operational risks. It is recommended that these options are explored further to understand costs and benefits for CI in detail.

The underlying objective of the waste management hierarchy is to reduce reliance on landfill disposal by avoiding and minimising waste generation, and maximising reuse, recycling and resource recovery, thereby minimising the need for new landfill airspace. Following the hierarchy where possible can reduce the overall volumetric capacity required of the new CI landfill and increase the expected lifetime. It is recognised that any new landfill would require engineering to the highest standards to mitigate environmental risks and to prevent contamination of the island's drinking water supply. Development of a new landfill in conjunction with a waste incinerator to manage combustible waste, will likely result in a more balanced approach to waste management on CI, and consideration and further exploration of this scenario is recommended.

6.2.4.2 Residual waste on Cocos (Keeling) Islands

On CKI, landfilling is not considered a viable long-term management solution for residual waste on the islands due to the limited land space, generally low-lying terrain, and a shallow water table, with depth to groundwater less than 2 metres. Two options for residual waste disposal were assessed for CKI: Construction of two small-scale incinerators, and transportation off island for consolidation/disposal on CI.

The preferred option for CKI was found to be the exploring the establishment of two small-scale incinerators, one on West Island and another on Home Island. A key constraint for transportation of waste off island is that currently, the shipping companies only allow some hazardous waste types to be transported, and shipping between the islands does not currently occur on a reliably scheduled basis, often impacted by weather-related delays (swell, tropical storms etc). A more sophisticated intermodal waste transfer facility would need to be established at both

⁷ MRA Consulting Group 2021, *Recycling Market Research Report*, 2021. Available from: <https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/SPREP%20Recycling-Market-Research-Report.pdf>

CKI (for export) and CI (for import). Odour and quarantine/biosecurity concerns would also need to be managed. It is considered unlikely that shipping residual waste from CKI to CI would be a satisfactory management option.

Furthermore, the SoCKI would need to continue to pay SoCI to recover and/or dispose of waste, in addition to the high cost of transporting waste to CI. This would be a significant financial burden for SoCKI to support long-term.

6.3 Marine debris and plastic management

The IOT are located in the path of the Indonesian Through Flow (ITF) current where oceanic waters are transported westwards from the Pacific to the Indian Ocean. The ITF current collects waste debris from the rivers and seas of Indonesia and transports them to the IOT region. Figure 6.9 shows the major oceanic currents relevant to the IOT, in the context of marine debris accumulating on the shores of the islands in the IOT. There is also a general confluence of several currents in the IOT region, including the eastern extents of the Indian Ocean Gyre.

Although more pervasive on CKI, marine debris in both CKI and CI have been recorded in marine, intertidal, and terrestrial environments, which threaten organisms associated with these habitats. Marine debris can also have implications on human health and the local economy, particularly when tourism is the primary industry.

The marine debris problem on CKI and CI is not a unique situation and parallels can be drawn between other islands and coastal areas in ocean current flow paths. The *Marine Debris Management Report* (GHD, 2022) examined context-appropriate marine debris management solutions within the IOT that may help to protect the natural environment and minimise marine litter accumulation. To address management of marine plastic debris, plastic waste generated on-island by the residents and visitors of the IOT was also considered to understand potentially viable plastic management and processing options.

6.3.1 Overview

Managing the accumulation of marine debris on the islands of the IOT is an ongoing challenge. Although there have been recent marine debris surveys conducted at CKI and CI, the time over which the materials accumulated is unclear. That is, the frequency, timing and extent of clean ups undertaken prior to the field surveys is not clearly documented or reported. However, for comparison, the total quantity of all marine debris collected and weighed on CKI beaches in 2017 was reported as 238 tonnes, and in a subsequent survey in 2019, a total of 2.17 tonnes was collected and characterised. The total mass of marine debris collected in a 2019 survey on Christmas Island was 2.74 tonnes.

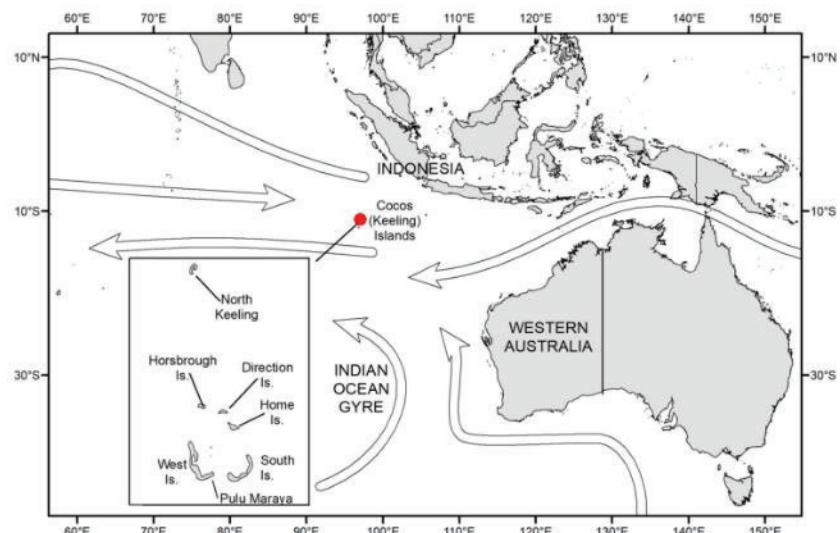


Figure 6.9

Major oceanic currents in the vicinity of Cocos (Keeling) Islands (arrows indicate flow direction) (Lavers et al, 2019)



Figure 6.10

Common marine plastic debris in the CKI. (a) PET bottles with PP or HDPE caps (b) rubber thongs (c) expanded polystyrene fishing float (d) rope mass (e) bottle cap (f) mixed plastic (soft plastic and lighter)

An MCA was used to assess potential plastic management options, including logistics and processing considerations, for CI and CKI. The preferred options based on the MCA results are summarised below.

6.3.2 Collection

Logistically, some CKI locations (such as South Island and Direction Island), and the rocky shoreline and cliff edges of CI are difficult to access, which makes manually collecting marine debris a challenge, with some cost implications. Although there are some logistical challenges associated with manual collection, nets and other floating devices that capture marine debris prior to it landing on shores can affect marine life. For example, it can capture or impede turtles landing on the beaches for breeding. As such, manual collection of marine debris was determined to be the most preferred option.

6.3.3 Sorting

The sorting of plastics is an essential step in waste plastic management. Manual sorting was considered to be the most practicable option to manage marine plastic waste in the IOT. CKI surveys from beaches with plastic accumulation revealed that most plastic items arriving on prevailing ocean currents had intact resin identification code (RIC) labels.

Polymer Name	POLYETHYLENE TEREPHTHALATE	HIGH-DENSITY POLYETHYLENE	POLYVINYL CHLORIDE	LOW-DENSITY POLYETHYLENE	POLYPROPYLENE	POLYSTYRENE	All other plastics, including acrylic, fiberglass, nylon, polycarbonate, and polyalactic acid [a bioplastic]
Resin Identification Code							
Abbreviation	PET or PETE	HDPE	PVC	LDPE	PP	PS	OTHER
Recyclable?	Commonly Recycled	Commonly Recycled	Sometimes Recycled	Sometimes Recycled	Occasionally Recycled	Commonly Recycled (but difficult to do)	Difficult to Recycle

Figure 6.11 Resin identification codes, product applications and recycling potential (from SPREP, 2020)

Manual sorting of plastics based on RIC label identification (refer Figure 6.11) could be easily conducted by volunteer plastic collectors if separate bins were provided for different polymer types. Volunteer-driven sorting may have the potential to offset the full cost to the IOT Shires of needing to redirect resources and personnel.

However, as regular ongoing volunteer collection and sorting cannot be assured, some involvement from IOT personnel and resources would likely be required. Any such involvement would likely be high-cost and labour intensive, when considered on an effort per tonne basis, however effective management of marine debris accumulation has significant environmental benefits. Manual sorting is difficult to implement in the absence of RIC labels, and other methods such as sink float sorting (water bath) may need to be used in conjunction with RIC based manual sorting for effective waste plastic separation and classification by polymer. The sink float method relies on density difference to differentiate between plastic polymer types.

6.3.4 Processing options

Figure 6.11 summarises the different types of plastics and their recycling potential. PET is the most recycled plastic and is also eligible for CDS. In general, plastic recycling in remote locations is challenging due to the low net commodity value and incompatibility of different types of plastics when recycled together.

There are thousands of variations within the seven main types of plastic due to different manufacturing processes, additives and dyes, and the manufacturing of composite products comprising multiple plastic types. Plastics must not be affected by biofouling or extensive UV degradation to be suitable for recycling and recycled product manufacturing.

The isolation of the IOT (from traditional recycling markets) and the generally low net commercial value of recyclable plastic materials, combined with the high cost of shipping materials from the islands, limit the value preservation potential for these materials. Unfortunately, to process the IOT's residual waste plastic and marine debris consistently and cost-effectively, the most suitable options identified in the near term were disposal via incineration on CKI and via landfill on CI.

7. Strategy objectives and priorities

This Strategy has a primary focus of bridging the gap between current waste management performance and relevant national and state waste management targets. From a review of the current status of waste management in the IOT, stakeholder engagement, constraints and opportunities identified, several key sub-strategy areas emerged, providing a framework for the overarching Strategy. Within each sub-strategy, objectives and priorities have been developed to provide direction and support for DITRDCA, in collaboration with the Shires, to deliver the Strategy.

7.1 Waste avoidance and sustainable financing sub-strategy

Table 7.1 Waste avoidance and sustainable financing sub-strategy

Priority #ID	Objectives: <i>Ensure the Commonwealth, commercial entities, tourists, and the communities share responsibility in reducing the quantity of waste material brought to the islands.</i>	Priorities
	Sustainable financing systems: Sustainable financing allows for a ring-fenced pool of money to finance waste management. Mechanisms include extended producer responsibility (EPR), container deposit schemes (CDS), advance disposal fees (ADF), environmental taxes and levies, user-pays or pay-as-you-go fees.	
1.1	Explore the feasibility of implementing an environmental levy for tourists entering the IOT to ensure accountability for waste generation and equitable cost sharing for waste management. Environmental levies could be applied to every visitor (by air and sea) to account for that person's contribution to the waste management burden on the local environment. Options for applying this levy include as a component of the airport departure tax, as a fee charged to operators of leisure craft (e.g., yacht charter, fishing charters, etc.), and a fee charged to cruise ships, based on passenger numbers. There is a clear opportunity to implement a waste levy for tourists entering and exiting the islands.	1.2 Explore incentives and disincentives through imposing import levies. Import levies could be imposed on materials and products which, having become waste, cannot be reclaimed on-island, or are hazardous. This helps fund recycling activities and/or end of life disposal and can be a 'better practice' waste management option that directly targets those creating the waste through the import of their product. A differential levy may be considered, especially where the desire is to encourage behaviour change. For example, a very high levy could be placed on non-biodegradable plastic bags to discourage their use, and a less significant levy could be placed on paper bags and compostable plastic bags to encourage the use of more environmentally sound alternative options. As an alternative to paying a lump sum levy at the point of importation, it may be possible to apply an annual fee to cover end-of-life management costs for vehicles and mobile machinery. This fee could be applied as a levy applied with annual vehicle registration fees. This approach may help alleviate the costs of ultimately disposing of existing already imported vehicles, the management of which is otherwise unfunded at end of life.
1.3	Explore the feasibility of implementing an Extended Producer Responsibility framework where importers and in-country manufacturers share the management and cost burden for end-of-life products.	

<p>Priority #ID</p> <p>Objectives: <i>Ensure the Commonwealth, commercial entities, tourists, and the communities share responsibility in reducing the quantity of waste material brought to the islands.</i></p> <p><i>All waste producers are accountable for the waste they generate.</i></p>	<p>Priorities</p> <p>In the IOT, commercial businesses should be charged waste generation and/or collection fees, on a volume or frequency of service basis, and with differential fees based on costs to manage each waste stream (i.e. hazardous waste).</p> <p>If it is not feasible to calculate waste generation on a volume basis, other ways to calculate 'user' fee could be employed. For commercial customers, user fees could be determined based on annual council rates, lettable floor area of their place of business, a percentage of utility usage or percentage of annual property tax.</p> <p>Purchasing framework: A waste minimisation purchasing framework is a beneficial initiative for implementation within the IOT to reduce the volumes of material brought to the islands that generate significant residual wastes at end of life.</p>
<p>1.4 Explore the feasibility of establishing a waste minimisation purchasing framework.</p> <p>The aim of this policy would be to work towards limiting the overall volume and impact of hard to manage waste streams on the islands (through importation restrictions). For waste types of particular focus of the Strategy these materials could be reviewed before purchase by "authorised individuals" knowledgeable about relevant environmental and safety issues associated with residual and legacy wastes and redundant assets in the IOT.</p> <p>These "authorised individuals" would review the necessity of purchases and suggest alternatives to reduce risks, legacy waste accumulation or regulatory burdens. The "authorised individuals" responsible for this would need to be contractually defined and appropriately trained for this to be successful. Program management oversight would be necessary.</p>	<p>Sustainable procurement and management protocols: Establishment of procurement and management protocols that require waste owners to be responsible for minimising waste generation and maximising waste avoidance practices during their work in the IOT.</p>
<p>1.5 Establishment of sustainable procurement and management protocols within major contracts and service delivery arrangements.</p> <p>Sustainable procurement principles and protocols should be included within tendering terms and project specifications. The contractor and service delivery arrangement personnel should consider the waste hierarchy, evaluate its waste management practices within the IOT, and undertake waste reporting from commencement through to completion of a contract.</p> <p>Contractors and service delivery arrangement personnel should be required to return surplus material, excluding spare parts, to the mainland. For any materials (i.e. spare parts) not removed from the islands, discussion with the Shires should be undertaken.</p> <p>Where appropriate, after sales support, maintenance of machinery and servicing should also be considered within procurement contracts on a whole of life basis, such that infrastructure, equipment and machinery continue to provide value for money service/performance throughout their planned lifecycle.</p>	<p>1.6 Consider establishing sustainable procurement protocols for key waste streams (i.e., batteries) to expand the longevity of materials.</p> <p>For example, rather than importing non-rechargeable dry-cell and other batteries, support the importation of rechargeable batteries that save energy, money and the environment, since they can be recharged 1,000 times or more (depending on type), before needing replacement.</p>
<p>1.7 Maximise local benefits from major projects - Include standardised 'IOT Regional Content'</p> <p>Include standardised 'IOT Regional Content' clauses in all major projects (in line with CKI's Strategic Plan 2030). These clauses should include opportunities to incorporate recycled material/content in procurement of goods and products, as well as in construction.</p> <p>Consideration of a requirement for developers to produce social, environmental and economic. Impact assessments prior to development approval or commencement of major projects (in line with CKI's Strategic Plan 2030).</p>	<p>1.8 Explore the feasibility of a hazardous waste generator responsibility protocol.</p>

Priority #ID	Objectives: <i>Ensure the Commonwealth, commercial entities, tourists, and the communities share responsibility in reducing the quantity of waste material brought to the islands.</i> <i>All waste producers are accountable for the waste they generate.</i>
Priorities	Priorities
1.9	<p>As there are limited options for on-island to dispose of hazardous waste and it is costly and logistically challenging to remove off-island, the feasibility should be explored for the generator retaining primary responsibility for the safe collection, handling and disposal of hazardous wastes they generate. The protocol would only apply to commercial entities and not individuals or residents.</p> <p>Consideration of processing equipment procurement strategy.</p> <p>As part of the Strategy, where processing equipment needs to be procured, it is recommended that ‘like for like’ equipment (in both CKI and CI) should be selected. For example, if a glass crusher is purchased for CI, consideration should be given to purchasing equivalent equipment from the same supplier as the CKI glass crusher. This approach benefits from common training elements and knowledge sharing between CKI and CI operations teams. There will be more staff that understand how to operate and possibly maintain the equipment. There is also a benefit to be realised in accessing common wear components. Another example of relevant and context-appropriate recycling machinery is polystyrene melt machines.</p>
2.0	<p>Collaboration opportunities</p> <p>Explore synergies between the Shires and commercial entities who may assist in providing improved waste management and resource recovery services.</p> <p>The Shires should reach out to commercial entities that have the capacity and are willing to assist with waste management and resource recovery services. This may alleviate some financial pressure on the Shires. For example, CI phosphate suggested during stakeholder engagement that they would be open for discussions on partnerships and funding opportunities that align with PRL's sustainability agenda and provide positive outcomes for the community.</p>
2.1	<p>In the context of waste management, investigate how best to capitalise on the Australian-Singapore Comprehensive Strategic Partnership and investigate the potential to capitalise on similar partnerships with Indonesia and Malaysia.</p>
2.2	<p>Explore the feasibility of offshore partnerships with companies that recycle and process waste.</p> <p>Although conventional recycling programs may not currently be economically viable in the IOT, if coordinated and properly planned, certain materials could be shipped off-island for recycling with partners in countries where recycling and remanufacturing industries are more developed, subject to securing appropriate export approvals and/or exemptions.</p> <p>A further benefit for the IOT would derive from the Shires being provided with technological support and an update on the current active market that may be available to accept recyclable materials from within the IOT if the appropriate export licences are obtained.</p>

7.2 Commonwealth asset management sub-strategy

Table 7.2
Commonwealth asset management sub-strategy

Priority #ID	Objective: <i>/improve asset management to ensure that assets are removed at their end of life.</i> <i>Ensure critical assets and infrastructure and maintained and renewed in a timely manner to mitigate public risks.</i>
	Priorities
	Current Commonwealth obsolete assets

Priority #ID	Objective: <i>Improve asset management to ensure that assets are removed at their end of life. Ensure critical assets and infrastructure and maintained and renewed in a timely manner to mitigate public risks.</i>
Priorities	
2.3	Based on the IOT Part A - Asset Disposal Management Report (GHD, 2022) appropriate disposal/management methods for Commonwealth assets (including legacy assets not identified within Commonwealth registers) should be determined and disposal/management undertaken.
2.4	Funding shall be allocated to facilitate the management of existing obsolete assets.
2.5	Future Commonwealth assets: To deal with future Commonwealth assets, a focus on waste avoidance and sustainable procurement principles is the most effective measure to control asset management costs at their end of life, especially in remote communities (refer to Section 7.1). However, there are other priorities that should be considered.
2.6	Explore the establishment of an overriding asset management plan. An asset management plan should be developed to manage Commonwealth assets through to their end of life. This management plan should include requirements of a yearly sinking fund for assets per their depreciation value. This would cover a portion of the funding for capital equipment replacement and management of the asset at its end of life.
2.7	Maintenance and funding of machinery and equipment need to be considered for purchased Commonwealth assets. This could include establishing a multi-year maintenance and repair service agreement for the purchased equipment.
2.8	Consolidation of asset management registers. Assets with expired useful service life and de-commissioned assets are managed currently through various registers including the SAP Asset Register, FARM Tools, SAMPS and AMPS. Consideration should be given to consolidating all assets into one register for ease of tracking and facilitating effective asset disposal management.

Priority #ID	Objectives: <i>Continually improve the provision of waste services and facilities to reduce the potential environmental, social and financial costs to the community. Meet the needs of the community. Maximise diversion of waste from landfill/burial in CI and open burning/incineration in CKI.</i>
Priorities	
	Service arrangement: Resource recovery rates and diversion from landfill can generally be increased by introducing further source separation and collection services, where reprocessing markets are viably accessible.
2.8	Explore the feasibility of implementing self haul or kerbside GO or FOGO services, with associated downstream processing. GO and FOGO currently make up a large proportion of the IOT's residual waste stream. Source separation of this material for further processing directly reduces the quantity of residual waste requiring final disposal. There is a lower need for manual intervention than kerbside recycling when considered on an 'effort per tonne

7.3 General waste management sub-strategy

Table 7.3 General waste management sub-strategy

Priority #ID	Objectives: <i>Continually improve the provision of waste services and facilities to reduce the potential environmental, social and financial costs to the community.</i> <i>Meet the needs of the community.</i> <i>Maximise diversion of waste from landfill/burial in CI and open burning/incineration in CKI.</i>
Priorities	<p>diverted' basis. Furthermore, there are positive outcomes associated with establishing context-appropriate resource recovery solutions. Recycled organic products can be used for soil fertility enhancement (medium term) and could potentially support local production of fresh fruit and vegetables (long term). <i>D/TRDCA have engaged GHD (March 2023) to undertake an organic pre-feasibility assessment to explore the implementation of organic processing further.</i></p>
2.9	<p>Subject to accessing the WA CDS, explore the feasibility of implementing mobile recycling centres / establishing a recycling bin collection system on CI.</p> <p>Another potentially suitable option for implementation in the IOT is the use of mobile recycling centres in addition to current service arrangements. This was not selected as the preferred option as there are currently limited end markets for recyclable materials on island, high costs and biosecurity/ quarantine issues associated with exportation to the mainland. The success of this option is largely subject to securing access to the WA CDS via establishment of an SDA with the WA Government</p> <p>Subject to securing access to export markets for recyclable materials, CI residents should be provided with a general waste bin and recycling bin. It is considered that the key to a successful waste reduction for CI will be for households and commercial entities to perform source segregation of waste so that when it is collected by the waste service operators a significant proportion of the waste separation has already been achieved.</p>
3.0	<p>Develop interim storage areas (e.g. shipping containers) to facilitate the appropriate storage of recyclables while exportation opportunities are being explored.</p>
	<p>Resource recovery facility (RRF): A RRF is a specialised area or processing plant that receives, segregates or separates, and prepares recyclable materials for marketing to remanufacturers or other end-users.</p>
3.1	<p>Establish a simple RRF on CI and upgrade the existing transfer stations on CKI.</p> <p>An appropriately designed RRF will be required to support meaningful resource recovery and reduction in residual waste requiring disposal. Separation of recyclable materials from residual wastes is a key first step towards reducing reliance on waste disposal infrastructure, and maximising reuse and recycling opportunities.</p>
3.2	<p>Design the RRF with close consideration of ancillary infrastructure to support waste management and resource recovery.</p> <p>A well-designed RRF should be equipped with a clear wayfinding signage system, easy access layout, self-explained collection points and back of house operations. Well trained operation staff add value by assisting customers to segregate and recycle correctly and promote environmental education, for improved environmental outcomes.</p> <p>Consideration should also be given to the layout of the recycling area and design of the holding centre before exportation of recyclable materials.</p> <p>To limit unregulated access to the site, secure fencing around waste management facilities should be provided.</p>
3.3	<p>Consider hiring an experienced waste management service provider/ operator to undertake check-in visits to the islands to assist with staff support and retraining as needed, as well as recognising and identifying waste management assets that require servicing, repair or replacement and arranging such work. Collaborate and coordinate with SoCI and SoCKI.</p> <p>This initiative could include establishing a multi-year maintenance and repair service agreement for the purchased equipment, at time of procurement, and a standardised approach to incorporating these considerations into procurement protocols.</p>
3.4	<p>Explore the establishment of a tip shop on CI.</p>

Priority #ID	Objectives: <i>Continually improve the provision of waste services and facilities to reduce the potential environmental, social and financial costs to the community. Meet the needs of the community. Maximise diversion of waste from landfill/burial in CI and open burning/incineration in CKI.</i>
Priorities	Establishment of a tip shop and repair centre assists with reducing the quantity of residual waste destined for landfill / incineration. It supports circular economy principles of reusing materials for as long as practicable.
3.5	Explore the establishment of a repair centre and/or women's and men's sheds. A women's and men's shed could also be beneficial where community members can come together to participate in the reuse and repurposing of waste materials (i.e. reuse of timber, plastics, metals and textiles). This creates a network for socialising and can provide a sense of community ownership and responsibility, and a hub for community projects.
3.6	Review current gate fees at IOT waste management facilities. Commercial entities should be charged a gate fee to dispose waste at any residual waste disposal facility on CI and CKI. The rates charged by the Shires should be proportionate to the handling and management requirements as well as environmental impact, and target cost recovery to underpin commercially resilient and environmentally responsible waste management practices in the IOT. It is noted that as of the 23 November 2022 ordinary Council meeting, the Shire decided to temporarily ban acceptance of all non-putrescible household waste. From 1 July 2023, SoCKI intend to introduce a basic gate fee structure for acceptance and management of certain items at the WTSS. The proposed gate fee regime is intended to ultimately incorporate full cost recovery for management of waste that the SoCKI WTSS are not licenced to receive, and for waste requiring off-island disposal.
	Hazardous waste management
3.7	Implement best practice hazardous waste management. The RRF should accommodate household hazardous waste, which should be segregated and appropriately stored before being incinerated or transported off-island for disposal at an appropriately licensed facility. Dedicated material aggregation areas and best practice management have been detailed in the <i>IOT Part B – General Waste Management Report</i> (GHD, 2022).
3.8	Explore funding allocations for asbestos management. The Shires' budgets currently have minimal or no allocation to deal with current or future asbestos waste management issues. Asbestos is a considerable issue within the IOT. The SoCKI have noted that there are currently three 20' shipping container loads of asbestos stored on CKI. Buildings constructed in the IOT before the mid 1980's are likely to contain asbestos and the water supply and sewerage systems incorporate ACM piping, which is anticipated to soon require removal and replacement, generating asbestos waste.
3.9	Continue to explore the most efficient and effective pathway to transition the island from diesel-based energy to clean energy sources. This action is in line with the goals of the CI and CKI 2030 Strategic Plans.
	Processing
4.0	Explore the viability of establishing simple organic waste processing infrastructure as a key priority. Organic waste makes up a large proportion of the IOT's overall waste stream and recycled organic products (soil amendments) can be readily used on-island, significantly improving recycling performance, and reducing reliance on disposal infrastructure. Organic waste including food organic and garden organic (FOGO) waste represent a significant recycling and circular economy opportunity. The practice of disposing of organic wastes in landfill or via incineration can no longer be considered acceptable if the IOT are to adopt a resource efficiency mindset and achieve the diversion targets set.

Priority #ID	Objectives: <i>Continually improve the provision of waste services and facilities to reduce the potential environmental, social and financial costs to the community. Meet the needs of the community. Maximise diversion of waste from landfill/burial in CI and open burning/incineration in CKI.</i>
Priorities	<i>It is highlighted that DITRDCA have engaged GHD (March 2023) to undertake an organic waste management pre-feasibility assessment to further explore the implementation of organic waste processing.</i>
4.1	Further explore resource recovery processing options to be implemented within the IOT. Based upon the findings of the <i>IOT Part B – General Waste Management Report</i> (GHD, 2022) further work is required to examine the technical and financial feasibility of implementing the range of options identified, particularly when the actual available feedstock for each waste stream is known. Processing options should be explored in collaboration with the Shires as they would be operating machinery and managing systems and services.
	Residual waste disposal
4.2	Prepare a residual waste masterplan to develop a pathway for the closure of the current landfill and assess location, cost and design of a new landfill and potential procurement of a new incinerator The current landfill on CI is reaching capacity and needs a closure pathway. In addition to this, although a new landfill is not the ideal scenario from a long-term environmental perspective, a new landfill, sited at an appropriate location with best practice landfill design and management could be applied to minimise environmental impacts. The underlying objective of the waste management hierarchy is to reduce reliance on disposal by avoiding and minimising waste generation, and maximising reuse, recycling and resource recovery, thereby minimising the need for new landfill airspace. This drives towards keeping landfills as small as practicable and filling them as slowly as possible. As such, a landfill could be considered in combination with an incinerator. Due to the sensitivity of the groundwater, it is assumed any new landfill (if developed) would require a high-integrity engineered lining system with leachate collection, extraction and management. It is noted that a new landfill on CI would need to be sited with consideration of past unregulated disposal of waste, and underground water source protection requirements.
4.3	Tender and allocate funding for appropriately specified incinerators to be established within CKI on West and Home Islands. The new incinerator unit(s) will need to be appropriately procured to suit CKI and provide ongoing operational supporting, training and maintenance. The quantity of residual waste requiring disposal needs to be considered and will largely be dictated by how much recyclable and organic waste is separated and recovered (largest waste stream), as well as the usual fluctuations in service demands.
4.4	Consideration of a contractual procurement model for design, build, operate and maintain (DBOM) of residual waste infrastructure. This may be a suitable option for the IOT as efficient and competent operation and maintenance is a fundamental sustainability issue. For example, many donor-funded equipment installations operate over relatively short-term project lifespans as continual operational monitoring, inspection and maintenance is often not undertaken as required, leading to availability interruptions and/or failure.
	Waste exportation
4.5	Develop a suitable pathway for transporting waste to the mainland or overseas markets in a manner agreed upon to facilitate the exportation of waste material (particularly recyclables). The Commonwealth, DWER and DCCEEW ⁸ should identify the pathway for the Shires and other commercial entities on the islands to transport material back to Australia or export to overseas markets and still satisfy the requirements of Australian Quarantine and Inspection Services and/or waste export bans. This has been a major challenge for the islands, noting that SoCKI baled a container load of aluminium cans to be shipped to the mainland, but were advised by the Australian Quarantine and Inspection Service that the material would not be accepted as would be unable to inspect the middle of each bale.

⁸ Department of Climate Change, Energy, the Environment and Water, formerly known as Department of Agriculture, Water and the Environment
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Priority #ID	Objectives:
	<i>Continually improve the provision of waste services and facilities to reduce the potential environmental, social and financial costs to the community.</i>
	<i>Meet the needs of the community.</i>
	<i>Maximise diversion of waste from landfill/burial in CI and open burning/incineration in CKI.</i>
Priorities	
4.6	<p>When exportation becomes a more feasible waste management option, the Shires should consider implementing a rolling five-year project to ensure all batteries are removed from the islands.</p> <p>This was suggested by the SoCI as a priority.</p>
4.7	<p>Explore the bulk removal of car bodies off the islands.</p> <p>The SoCI put forward for consideration the removal of car bodies from the islands to the mainland pending customs/quarantine clearance and acceptability conditions from WA DWER.</p>
4.8	<p>Explore the development of a Service Delivery Arrangement (SDA) between DITRDCA and WA Government to enable IOT to participate in the WA container deposit scheme (CDS).</p> <p>The IOT are a Commonwealth jurisdiction, with WA laws only applying in the IOT where there is an SDA between the Western Australian and Commonwealth governments. The container deposit scheme, established under part 5A of the WA <i>Waste Avoidance and Resource Recovery Act 2007</i>, is not currently the subject of such an agreement. For CDS to apply to all eligible beverage containers supplied in the IOT (for both WA and non-WA based supplies) an SDA between the WA and Commonwealth governments would need to be established. The WA Government requires RRF operators and Councils to have a sharing protocol in place for RRF refunds. If no such protocol exists, the CDS revenue must be shared 50/50.</p> <p>Implementation of the CDS and accessing container deposit refunds, has the potential to offset a significant portion of shipping and biosecurity costs for recycling of used beverage containers. There are currently limited end markets for recyclable materials available to the islands and very high costs associated with exportation.</p>
4.9	<p>Explore negotiating air freight rates to facilitate the removal of suitable waste that cannot be recovered or safely disposed within the IOT.</p> <p>Current IOT air freight rates are \$8.10 per kilogram, plus various fees and charges to cover consignment costs, airport fees, customs clearance, quarantine fees and/or dangerous goods transport (if applicable). The Virgin Airlines representative stated that while payment would still be required to meet all applicable fees, there may be scope to reduce the freight rate for 'outbound' waste from the IOT if all other costs (including transport costs to and from each airport) are met.</p>

7.4 Plastic and marine debris management sub-strategy

Table 7.4 *Plastic and marine debris management sub-strategy*

Priority #ID	Objectives:
	<i>Refusing and reducing domestic plastic use in line with Western Australia's Plan for Plastics.</i>
	<i>Collecting and sorting both ocean plastics (marine debris) and domestic plastics.</i>
	<i>Cleaning sorted plastic materials.</i>
	<i>Recycling and creating new products.</i>
Priorities	
5.0	<p>Explore funding allocations for beach clean ups, collecting and sorting marine debris and plastic waste.</p>

Priority #ID	Objectives:
	<p><i>Refusing and reducing domestic plastic use in line with Western Australia's Plan for Plastics.</i></p> <p><i>Collecting and sorting both ocean plastics (marine debris) and domestic plastics.</i></p> <p><i>Cleaning sorted plastic materials.</i></p> <p><i>Recycling and creating new products.</i></p>
	Based upon the findings of the IOT Part C – Marine Debris Management Report (GHD, 2022).
5.1	<p>Consider developing a marine debris management plan.</p> <p>The most effective way to reduce and mitigate the harmful effects of marine debris is to prevent it from entering the marine environment in the first place. This requires incorporating understanding of debris into local, regional, and national decision-making; improved waste management efforts; education and outreach activities; development of technology solutions; anti-dumping campaigns; reducing losses of fishing gear at sea; and incentives to reduce debris.⁹ In the IOT context, reducing marine debris at source is highly challenging, and in the near term, focus is needed on managing accumulation of marine debris on the shores of the islands.</p>
	Plastic waste
5.2	<p>Arrange a collaboration with key stakeholders to examine targets for phasing out single use plastics in line with WA's Plan for Plastics.</p> <p>This workshop should include SoCKI, SocI, DWER, WA Waste Authority and DITRDCA and seek to delineate responsibilities to ensure effective implementation of WA's Plan for Plastics.</p>
5.3	<p>Progressively restrict importation of single use plastics through the implementation of restrictive legislation.</p> <p>This is in line with the WA government's target to implement state-wide legislation to phase out barrier/produce bags, polystyrene packaging, cotton buds with plastic shafts, microbeads, and oxo-degradable plastics.</p>
7.5 Other strategic priorities	
7.5.1 Data management and monitoring sub-strategy	
Table 7.5 <i>Data management and monitoring sub-strategy</i>	
Priority #ID	Objectives:
	<p><i>/Improve and standardise waste data collection.</i></p> <p><i>Effectively monitor the implementation of the Strategy.</i></p>
	Priorities
	<p>Waste data collection: Due to the uncertainty in various transient populations including commercial/Commonwealth portfolios i.e. Defence (CKI) and the immigration detention centre (CI) it is difficult to estimate the type and volume of waste generated given various activity levels over time. Furthermore, there is currently no accurate way to quantify waste generation on the islands due to limited measurement and reporting currently undertaken.</p>
5.4	<p>Facilitate regular audits within CI and CKI to gauge the quantity of marine debris and its rate of accumulation on the shoreline and beaches of the islands.</p>

⁹ Marine pollution: sources, distribution and fate, retrieved May 2022, from <https://www.csiro.au/marine-debris>.

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Priority #ID	Objectives: <i>Improve and standardise waste data collection. Effectively monitor the implementation of the Strategy.</i>
	<p>These audits should be conducted at a frequency of at least once in every three yearly period, and trends monitored based on previous audits.</p>
5.5	Development of standard data collection systems and reporting templates.
	<p>Establish a database for data collected via reporting templates and implement regular reporting protocols. Information from the database would be used to monitor progress towards achieving waste reduction targets and to review and set future waste-related targets. This information will assist with determining appropriate processing solutions with respect to available feedstock.</p>
5.6	Establish waste reporting requirements for Commonwealth entities.
	<p>Commercial entities under the Commonwealth have fluctuating waste portfolios. Under their contractual agreement waste quantities and management fate should be reported on an annual basis.</p>
5.7	Facilitate the collection and analysis of waste data.
	<p>It is essential for the IOT to regularly collect reliable information on waste generation rates, waste composition, effectiveness of waste management programs and economic value or costs of waste. This is necessary for planning of future waste management infrastructure and services, for identifying and assessing waste minimisation opportunities, and for monitoring the effectiveness of other activities carried out.</p>
	<p>Data on waste quantities should be collected on a continuing basis, while waste composition surveys should be carried out regularly where appropriate. Regular waste audits improve understanding of the quantity of material being received at waste management facilities and may be a suitable way to collect waste data to inform future infrastructure planning.</p>
	<p>Monitoring the implementation of the Strategy</p>
5.8	Shires to develop waste management plans for CKI and CI.
	<p>The Shires should develop their own waste management plan to support the overriding Strategy and promote small scale initiatives. These waste management plans should align with the Strategy set out within this document. Some examples of initiatives that can be included are provided below:</p>
	<ul style="list-style-type: none"> – Promote local waste minimisation and clean-up initiatives. This includes: <ul style="list-style-type: none"> • Continue to promote beachside plastic collection containers for locals and tourists, as is currently occurring on CI in partnership with CI Phosphates. • Promote alternatives to plastic water bottles through the installation (and maintenance) of water bubblers and through education. • Promote alternatives to single use plastic crockery and cutlery (e.g., install commercial dishwasher in Cyclone Shelter) with a view to banning the importation of single-use plasticware and straws. – Explore establishment of a co-op style refill station for every-day consumables such as dish detergent, laundry liquid, shampoo, conditioner, body wash to reduce single use plastic containers. This could also be promoted to the community as a cost-effective option as it would be substantially cheaper than individually shipping products from the mainland
5.9	Establish a system for collating information and reporting on the implementation of Strategy objectives and priorities.
	<p>These processes should be used for identifying and responding to issues in Strategy implementation, as well as recognising beneficial changes to the Strategy in response to changing circumstances.</p>

7.5.3 Governance sub-strategy

Table 7.6 Governance sub-strategy

Priority #ID	Objectives:
	<p>Synergy and collaboration between the Shires, State and Commonwealth governments with regards to the implementation of waste management strategies within the IOT.</p> <p>Funding and strategic leadership for waste management is understood and responsibilities known.</p>
Priorities	Governance
6.0	<p>Delineate waste management responsibilities between the Shires and the Commonwealth and State governments.</p> <p>Funding and strategic leadership for waste management need to be openly discussed between the Commonwealth and Shires as this has come up in consultation with the Shires. This workshop will also facilitate program implementation planning and support the objective of developing improved waste management solutions for the IOT.</p> <p>This will also facilitate discussion on how the Shires will operate and manage waste management infrastructure and contribute to the costs of providing the services used to collect, transport, treat and dispose of the wastes they generate.</p>

7.5.4 Support / education sub-strategy

A key factor underpinning the success of any proposed waste services and infrastructure changes and realisation of waste avoidance and reduction targets is an understanding of the behaviour change elements. There was a strong desire by the community to be involved with development and implementation of future waste plans to realise better practice goals for waste management and recycling and to take a pro-active stance to improve the understanding and actions around global waste management. There was also support for other environmental initiatives such as green energy and showcasing sustainability.

Table 7.7 Support / education sub-strategy

Priority #ID	Objectives:
	<p><i>Build community support for any changes to waste management services and infrastructure.</i></p> <p><i>Increase community engagement in waste reduction, recycling, resource recovery and waste management services.</i></p>
Priorities	
6.1	Appointment of a community ‘champion’ on CI and CKI.
6.2	Consider establishing an ongoing community consultation program.

Priority #ID Objective: <i>Build community support for any changes to waste management services and infrastructure.</i> <i>Increase community engagement in waste reduction, recycling, resource recovery and waste management services.</i>	Priorities <ul style="list-style-type: none"> – Development and effective communication of educational material for the present community. – Preparation of new residents' pack, containing information on the IOT environment, water and power supply and the marine environment. <p>Working with business and individuals to implement the Strategy.</p> <p>6.3 Community consultation when acquiring new waste infrastructure and establishing supportive programs.</p> <p>Extensive community consultation is imperative to the long-term success of waste management programs implemented. There is significant upfront investment in new waste services and infrastructure and therefore it is important that this investment is supported by community education and outreach to ensure community engagement and support through the involvement of the local population, combined with political will and commitment of local decision-makers.</p> <p>6.4 Develop waste management environmental inductions for visitors and workers to the IOT.</p> <p>Ensure that there are appropriate cultural and environmental inductions for tourists, workers and any major projects that attract temporary workers / new residents.</p>
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8. Implementation planning

Waste management is an essential service that plays a role in minimising impacts to our environment, providing community amenity and enhancing public health via sanitation. There is no single technological answer to replace landfill on CI and still meet waste avoidance, minimisation, reuse, recycling and landfill diversion targets. On CKI, landfilling of residual wastes is not a viable option due to shallow water table and unsuitable geology. A suite of solutions will be required to simultaneously achieve the goals of Commonwealth and state policies for waste diversion, align with the waste hierarchy and circular economy principles, and optimise the cost effectiveness of waste management. This Strategy has identified a number of challenges, opportunities and priorities for DITRDCA and the Shires. Standalone implementation plans have been developed separately for CI and CKI. The implementation plans map a pathway for waste management for each Shire over the next 10 years. . The implementation plans identify the priorities,, proposed implementation stages, timing and ownership of the identified priorities. It is noted that although the Commonwealth, State and/or the Shires have been identified as 'owners' of the various priorities, input will be required from various stakeholders.

9. Glossary

Table 9.1 *Glossary*

Term	Definition
Better practice	Better practice waste management refers to establishing and maintaining waste management services and infrastructure that enable garbage, recycling, handling systems and collection services to be made in a way that achieves the best possible waste minimisation and resource recovery outcome. Better practice focuses on continual improvement as expectations, technology and standards evolve over time.
Circular economy	An alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible – extracting the maximum value from them while in use, then recovering and reusing products and materials. Three core principles underpin a circular economy – design out waste and pollution; keep products and materials in use; and regenerate natural systems.
Container Deposit Scheme (CDS)	The CDS is one of the first pieces of environmental legislation to focus on the ‘polluter pays’ principle, where beverage suppliers are responsible for funding a refund for returned drink containers. Western Australia Return Recycle Renew Limited (WARRRL) is the not-for-profit organisation created to establish and run Containers for Change in Western Australia. There is significant additional value to recovering CDS eligible containers as material recycling facility (MRF) operators get paid \$0.091c per eligible container via redemption of container deposits under the CDS.
Food organics and garden organics (FOGO)	Food organics include waste food, inedible food, and parts of food that are not consumed and/or are considered undesirable (such as seeds, bones, coffee grounds, skins and peels). Garden organics include organic wastes that arise from gardening and maintenance activities, such as lawn clippings, leaves, cuttings and branches. FOGO can also include other organic wastes that may be compatible with FOGO collections and can include items such as paper and cardboard.
Resource recovery	The process of extracting materials or energy from a waste stream through re-use, reprocessing, recycling or recovering energy from waste.
Service Delivery Arrangement (SDA)	The IOT are a Commonwealth jurisdiction, with WA laws only applying in the IOT where there is a Service Delivery Arrangement (SDA) between the Western Australian and Commonwealth governments.
Waste diversion	The act of diverting a waste away from disposal via landfill or incineration for another purpose such as re-use or recycling.

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