Government of **Western Australia**
Department of **Water and Environmental Regulation**

State waste infrastructure plan

Western Australia

May 2024

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Summary

This *State waste infrastructure plan: Western Australia* (infrastructure plan) is a key deliverable of the *Waste Avoidance and Resource Recovery Strategy 2030* (waste strategy), which provides a comprehensive approach to meet the waste and recycling challenges of today and transition toward a more circular economy.

This plan is the first step in providing a high-level analysis of infrastructure needs for the state, using the available data to project future needs, risks and priority areas. This is not intended to provide detailed information on facilities, location, processes, actual capacities, or potential future available capacities, nor as an all-encompassing framework for infrastructure development. The Government of Western Australia (State Government) recognises that multiple stakeholders play a role in the planning and development of the needed infrastructure and later in the operation and viability of it. As technology, markets, and socioeconomic factors evolve, so will the needs for waste infrastructure. So, this is conceived as a first step into a living plan which will undergo an iterative process over time and will need to be considered in combination with other regional, state and federal strategies and instruments.

Western Australia's *Waste Avoidance and Resource Recovery Strategy 2030* builds on Western Australia's previous waste strategy, *Creating the Right Environment*.

The transition to a circular economy requires investment, innovation, people and infrastructure. The infrastructure plan will help guide decisions and investments by setting out current and future waste generation based on achieving the waste strategy objectives and targets and the infrastructure required to support the waste strategy vision. Priorities to address critical areas of growth and opportunity are provided to further guide how this might be achieved.

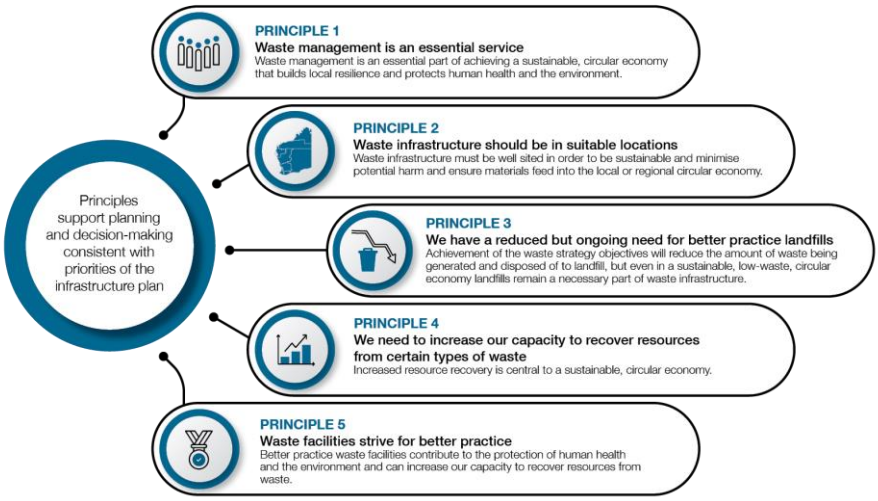
The infrastructure plan recognises waste is everybody's business and proposes five principles to provide ongoing guidance for all stakeholder planning and decision-making in line with the vision, objectives, and targets of the waste strategy.

The key objective of the infrastructure plan is to:

"Provide a long-term information framework and principles to guide decision-making for the planning and development of waste and resource recovery infrastructure in Western Australia."

To deliver this, the infrastructure plan sets out:

- the decision-making principles for stakeholders to use when planning for, developing and approving waste facilities in line with the vision, objectives, and targets of the waste strategy
- an evidence base for stakeholders to understand and plan for the provision of waste services and investments in infrastructure needs and identified priorities across Western Australia.

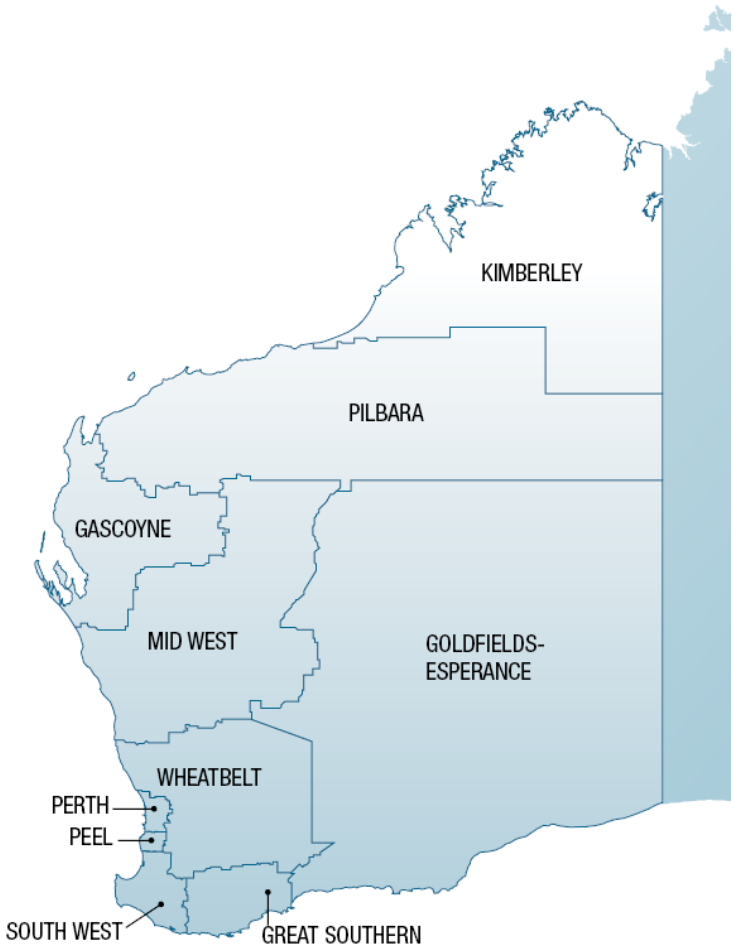


Scope

The infrastructure plan focuses on the built infrastructure (waste recovery and disposal facilities) used across the municipal solid waste, commercial and industrial waste, and construction and demolition waste streams.

The infrastructure plan includes a summary of waste generation, flows and infrastructure needs for each region of the state:

- Perth
- Peel
- Pilbara
- Kimberley
- South West
- Great Southern
- Mid West
- Gascoyne
- Wheatbelt
- Goldfields-Esperance.



Major regional centres as defined by the waste strategy are also included in assessments:

- Albany (Great Southern region)
- Bunbury (South West region)
- Busselton (South West region)
- Greater Geraldton (Mid West region)
- Kalgoorlie-Boulder (Goldfields-Esperance region).

State of waste in 2020

In 2020, just under six million tonnes of waste was generated within Western Australia, with 55 per cent of material recovered. The annual per capita generation was 2.2 tonnes. Only a small amount of waste was transferred to or received from other states. About 171 tonnes of material waste received from other states and 720 tonnes was transferred, reflecting the movement of unprocessed medical waste.

The analysis of waste generation, management by facility type within each region and flow between regions identified:

- Perth generates the highest volume of waste, producing 73 per cent of the total for the state
- more than 85 per cent of waste in the state is generated by three regions (Perth, South West and Peel)
- most of the waste transferred from all regions goes to Perth, where it is treated; however, this represents less than 10 per cent of the volume generated in Perth
- the largest transfers to Perth are from South West and Peel, representing 67 per cent of the total transfers into Perth.

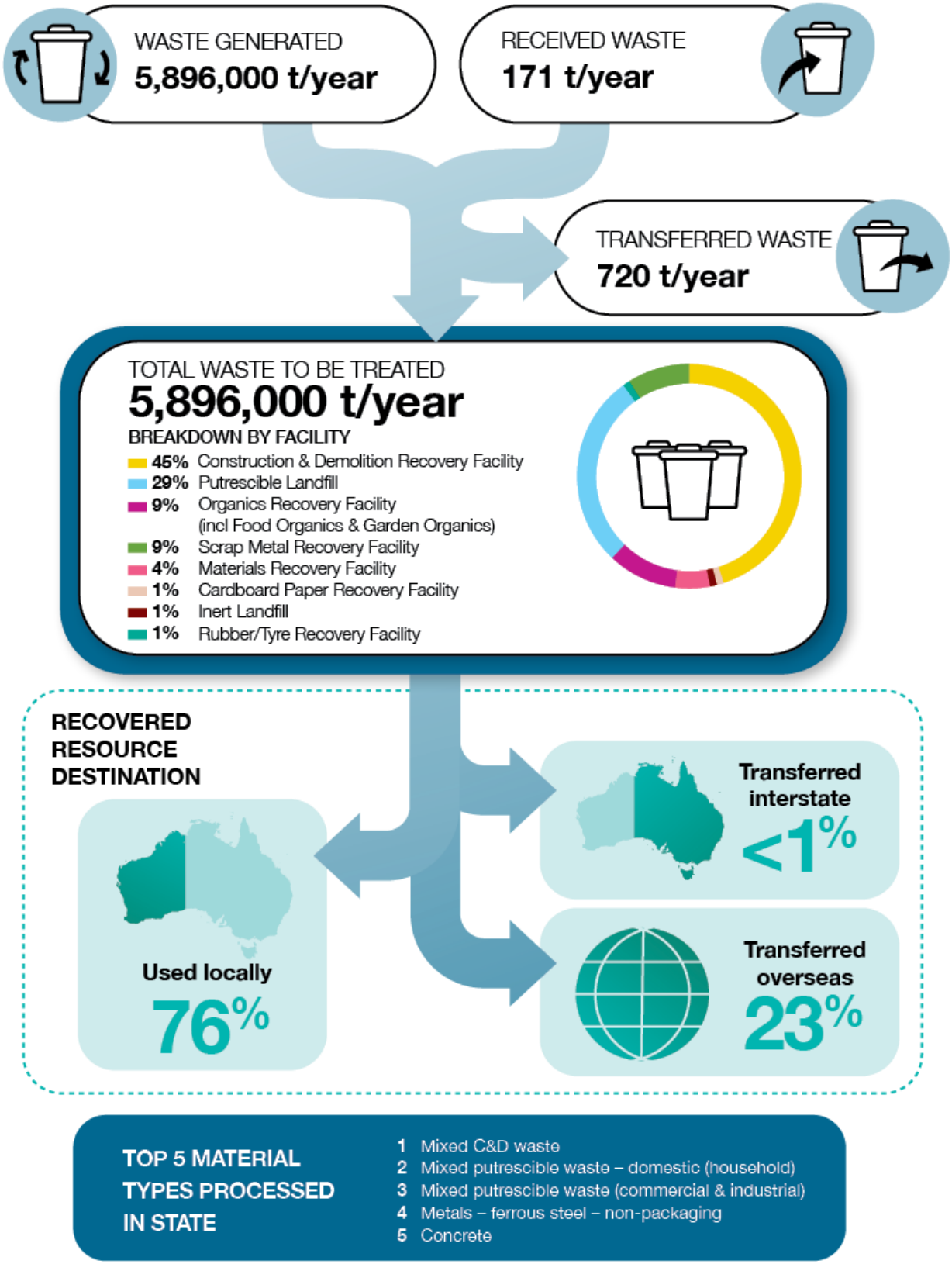
The waste generated in Western Australia was processed by 431 waste facilities including a total of:

- 225 licensed facilities (facilities with an existing prescribed premises licence)
- 96 registered facilities (Category 89 landfills)
- six unlicensed facilities (operational facilities that do not have an existing prescribed premised licence)
- 109 landfills in Aboriginal communities that are operated under the Remote Essential and Municipal Services (REMS) program.

More than three-quarters (76 per cent) of recovered resources in Western Australia are circulated back into the economy through local markets, while the remaining quarter is transported overseas (23 per cent) or interstate (1 per cent).

WASTE FLOWS 2020

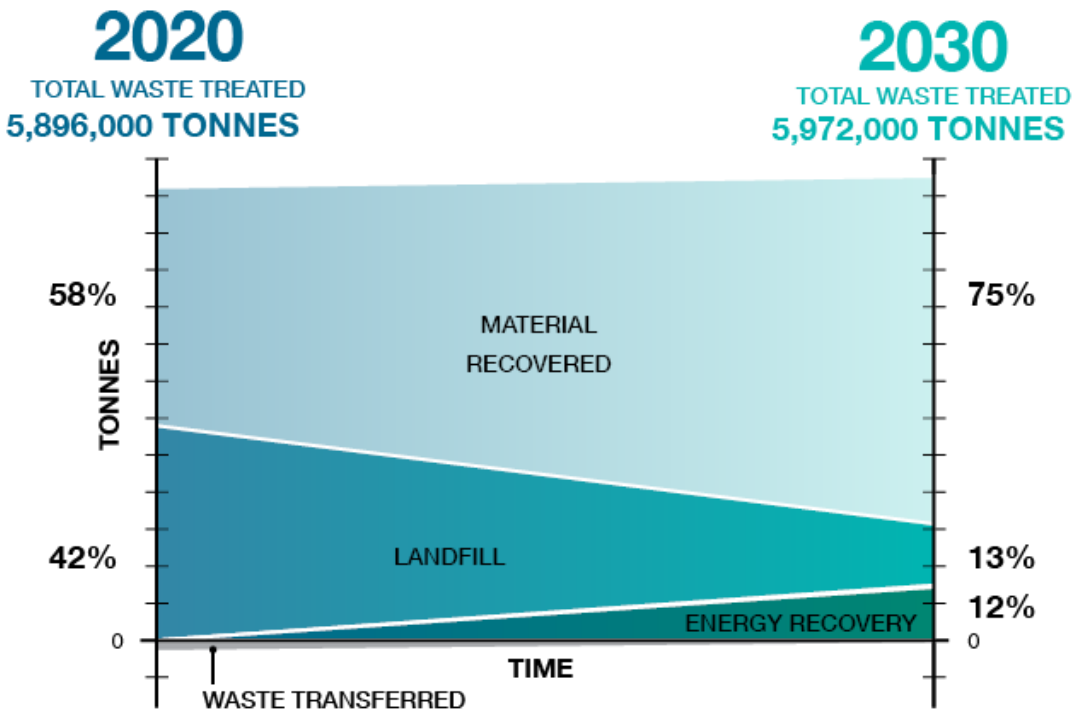
STATE OVERVIEW



The 2030 outlook

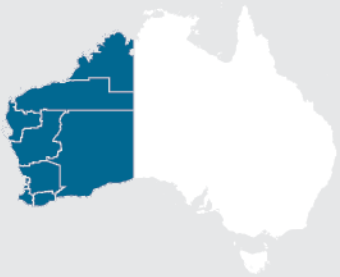
Achievement of the waste strategy targets will see the Western Australia waste generation rate decreasing to 1.88 tonnes per capita in 2030. This will result in statewide waste generation remaining consistent (~0.1 per cent variation) with total generation in 2020, despite a 16 per cent population growth. Improvements to waste infrastructure to prioritise resource recovery will increase the state resource recovery rate from 58 per cent to 87 per cent. These improvements will be supported by the introduction of waste-to-energy recovery to further decrease reliance on landfills.

The figure below depicts the shifting waste management methods of the waste treated in Western Australia in line with waste strategy targets, with the proportion recovered increasing and proportion landfilled decreasing. The amount of waste transferred interstate is modelled to decrease.



The figure below summarises the state of waste and priorities for Western Australia from 2020 to 2030.

WESTERN AUSTRALIA
STATE SUMMARY



AREA
2,541,049 km²

GROSS STATE PRODUCT (2019–20)
$316.32B/CAP

NUMBER OF BUSINESSES (2019–20)
220,658

TOP 5 EMPLOYMENT BY INDUSTRY

16.87%	Construction
12.82%	Professional, scientific and tech services
11.42%	Rental, hiring and real estate services
9.08%	Transport, postal and warehousing
6.09%	Healthcare and social assistance

The mining industry sector makes the greatest contribution to economic output in the region, which at $222.9B accounts for 32.87% of total output. With 121,303 jobs representing 9.27% of total employment, it is the construction industry sector that is the state's largest employer.

2020

- POPULATION 2,683,385
- WASTE GENERATED 5,896,000 TONNES
- WASTE GENERATION PER CAPITA 2.2 TONNES

2030

PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

- POPULATION 3,133,501 (▲16%)
- WASTE GENERATED 5,972,000 TONNES
- WASTE GENERATION PER CAPITA 1.88 TONNES
- CO_2 EMISSIONS REDUCED 800,000 TONNES

2030 INFRASTRUCTURE CAPACITY NEED

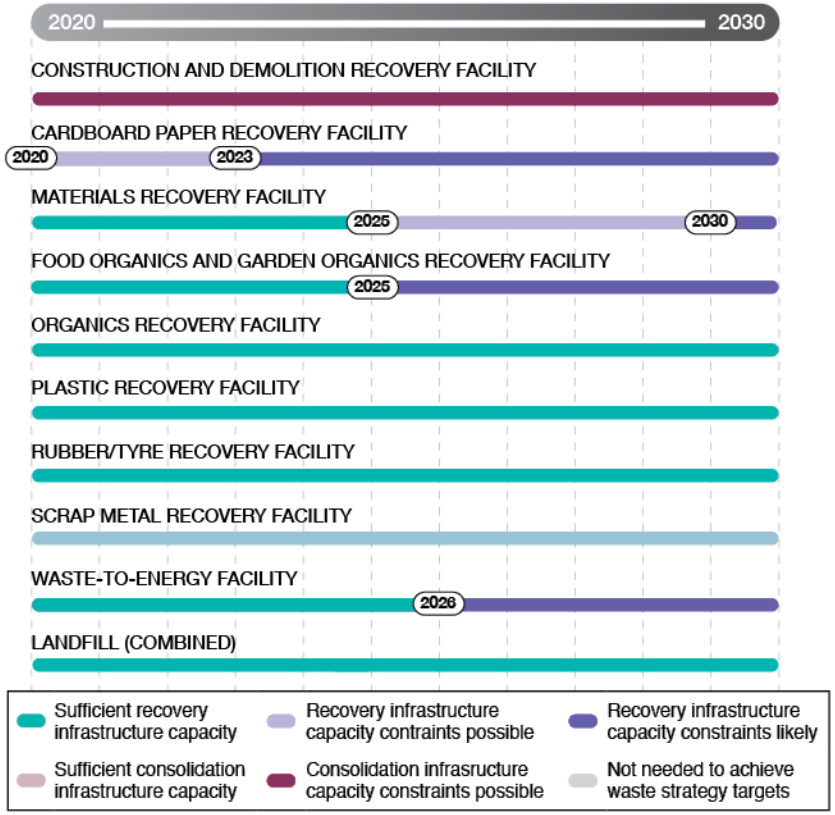
1. Food organics and garden organics | 100,00
2. Material recovery facility | 153,500
3. Rubber/tyre | 8000
4. Waste-to-energy | 164,500

TOP PRIORITIES

1. Investigate contingency planning arrangements for cardboard and paper in Perth.
2. Investigate designating a waste precinct in southern Perth and northern Perth to facilitate additional facilities.
3. Monitor progress of implementation of capacity expected from the Food Waste for Healthy Soils program.
4. Investigate and facilitate upgrade of existing garden organics facilities to accept food organics and garden organics in Perth and the Kimberley.
5. Facilitate appropriate guidelines and regulatory framework and specification for the recovery and treatment of bottom ash.
6. Assess opportunity for an additional waste-to-energy facility in the South West
7. Investigate alternative landfill facility contingency arrangements between Perth and the Peel region.
8. Assess waste generation and infrastructure needs in remote Aboriginal communities to ensure adequate access to services and investigate a rural landfill risk assessment of unlicensed landfill and REMS landfills.
9. Assess whether existing 67A licensed facilities can be increasingly utilised to alleviate food organics and garden organics recovery capacity need.

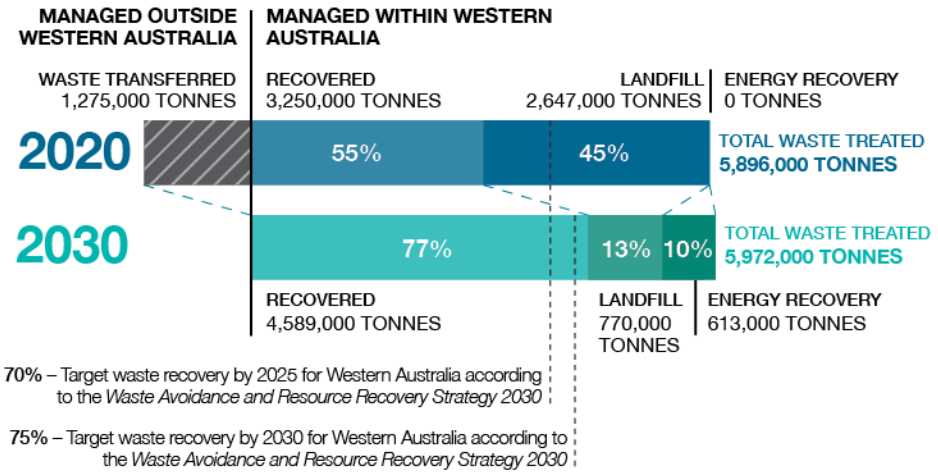
INFRASTRUCTURE NEED BETWEEN 2020 AND 2030

Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN WESTERN AUSTRALIA 2020 AND 2030

Waste projections to 2030 based on meeting the waste strategy targets



Infrastructure needs for 2030

The current and planned waste infrastructure capacity was assessed against the projected waste to be treated within each region across the state in 2030. The assessment of required capacity considered waste generated within each region and flows of material transferring into and out of the region for treatment. An assessment was made as to whether there was sufficient or inadequate infrastructure over the planning timeframe as illustrated in the following figures for each of the ten regions across the state.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030

Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.

PEEL

2020 — 2030

- CONSTRUCTION AND DEMOLITION RECOVERY FACILITY
- CARDBOARD PAPER RECOVERY FACILITY (2020)
- MATERIALS RECOVERY FACILITY
- FOOD ORGANICS AND GARDEN ORGANICS RECOVERY FACILITY
- ORGANICS RECOVERY FACILITY
- PLASTIC RECOVERY FACILITY
- RUBBER/TYRE RECOVERY FACILITY
- SCRAP METAL RECOVERY FACILITY
- WASTE-TO-ENERGY FACILITY
- LANDFILL (COMBINED)

PERTH

2020 — 2030

- CONSTRUCTION AND DEMOLITION RECOVERY FACILITY
- CARDBOARD PAPER RECOVERY FACILITY (2020 — 2023)
- MATERIALS RECOVERY FACILITY (2025)
- FOOD ORGANICS AND GARDEN ORGANICS RECOVERY FACILITY (2025)
- ORGANICS RECOVERY FACILITY
- PLASTIC RECOVERY FACILITY
- RUBBER/TYRE RECOVERY FACILITY
- SCRAP METAL RECOVERY FACILITY
- WASTE-TO-ENERGY FACILITY (2026)
- LANDFILL (COMBINED)

WHEATBELT

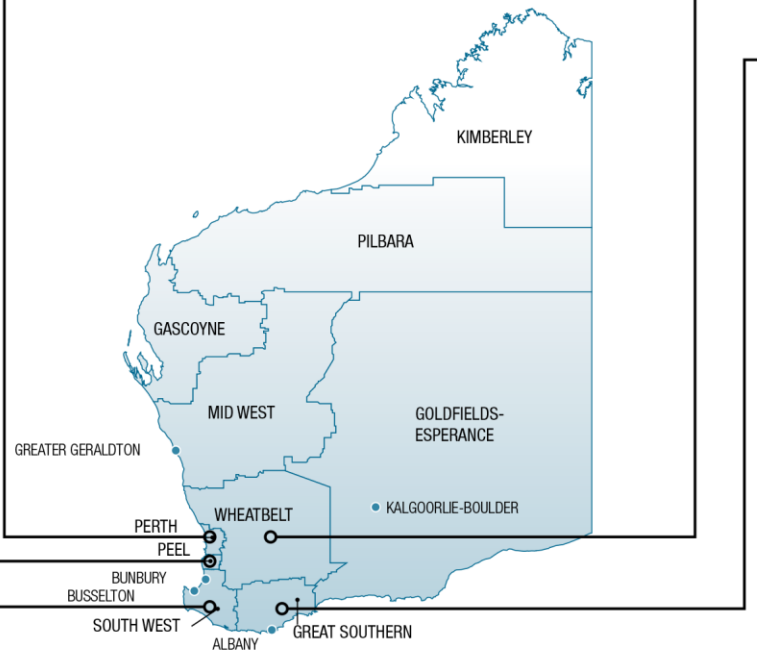
2020 — 2030

- CONSTRUCTION AND DEMOLITION RECOVERY FACILITY
- CARDBOARD PAPER RECOVERY FACILITY
- MATERIALS RECOVERY FACILITY
- FOOD ORGANICS AND GARDEN ORGANICS RECOVERY FACILITY (2025)
- ORGANICS RECOVERY FACILITY
- PLASTIC RECOVERY FACILITY
- RUBBER/TYRE RECOVERY FACILITY
- SCRAP METAL RECOVERY FACILITY
- WASTE-TO-ENERGY FACILITY
- LANDFILL (COMBINED)

SOUTH WEST

2020 — 2030

- CONSTRUCTION AND DEMOLITION RECOVERY FACILITY
- CARDBOARD PAPER RECOVERY FACILITY
- MATERIALS RECOVERY FACILITY
- ORGANICS RECOVERY FACILITY
- PLASTIC RECOVERY FACILITY
- RUBBER/TYRE RECOVERY FACILITY
- SCRAP METAL RECOVERY FACILITY (2024)
- WASTE-TO-ENERGY FACILITY
- LANDFILL (COMBINED)



GREAT SOUTHERN

2020 — 2030

- CONSTRUCTION AND DEMOLITION RECOVERY FACILITY
- CARDBOARD PAPER RECOVERY FACILITY
- MATERIALS RECOVERY FACILITY
- ORGANICS RECOVERY FACILITY
- PLASTIC RECOVERY FACILITY
- RUBBER/TYRE RECOVERY FACILITY
- SCRAP METAL RECOVERY FACILITY
- WASTE-TO-ENERGY FACILITY
- LANDFILL (COMBINED)

Sufficient recovery infrastructure capacity | Recovery infrastructure capacity contraints possible | Recovery infrastructure capacity constraints likely | Sufficient consolidation infrastructure capacity | Consolidation infrasructure capacity constraints possible | Not needed to achieve waste strategy targets | 20XX indicates when capacity constraint changes

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030

Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.

GASCOYNE

2020 — 2030

- CONSTRUCTION AND DEMOLITION RECOVERY FACILITY — 2020
- CARDBOARD PAPER RECOVERY FACILITY
- MATERIALS RECOVERY FACILITY
- ORGANICS RECOVERY FACILITY — 2020
- PLASTIC RECOVERY FACILITY
- RUBBER/TYRE RECOVERY FACILITY
- SCRAP METAL RECOVERY FACILITY
- WASTE-TO-ENERGY FACILITY
- LANDFILL (COMBINED) — 2024 — 2029

PILBARA

2020 — 2030

- CONSTRUCTION AND DEMOLITION RECOVERY FACILITY — 2020
- CARDBOARD PAPER RECOVERY FACILITY
- MATERIALS RECOVERY FACILITY
- ORGANICS RECOVERY FACILITY — 2020
- PLASTIC RECOVERY FACILITY — 2020 — 2021
- RUBBER/TYRE RECOVERY FACILITY
- SCRAP METAL RECOVERY FACILITY
- WASTE-TO-ENERGY FACILITY
- LANDFILL (COMBINED)

KIMBERLEY

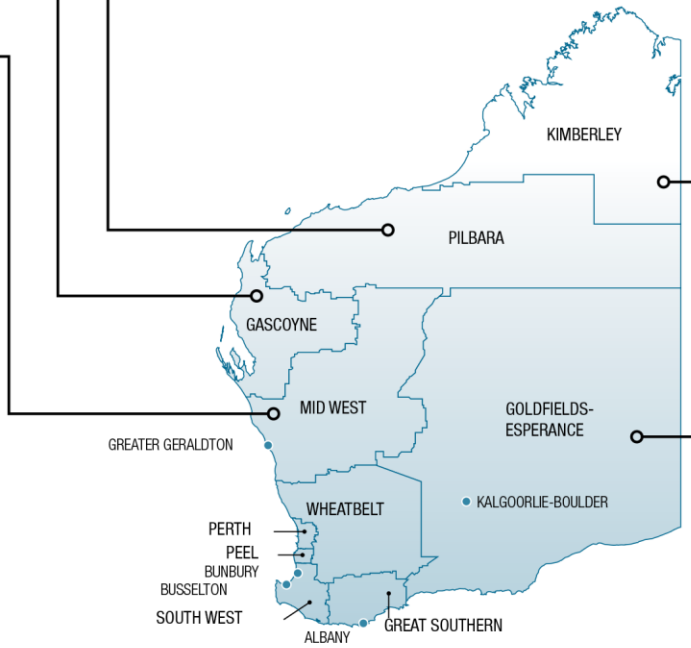
2020 — 2030

- CONSTRUCTION AND DEMOLITION RECOVERY FACILITY — 2020
- CARDBOARD PAPER RECOVERY FACILITY
- MATERIALS RECOVERY FACILITY
- ORGANICS RECOVERY FACILITY — 2020
- PLASTIC RECOVERY FACILITY
- RUBBER/TYRE RECOVERY FACILITY
- SCRAP METAL RECOVERY FACILITY
- WASTE-TO-ENERGY FACILITY
- LANDFILL (COMBINED) — 2022 — 2027

MID WEST

2020 — 2030

- CONSTRUCTION AND DEMOLITION RECOVERY FACILITY
- CARDBOARD PAPER RECOVERY FACILITY
- MATERIALS RECOVERY FACILITY
- ORGANICS RECOVERY FACILITY
- PLASTIC RECOVERY FACILITY
- RUBBER/TYRE RECOVERY FACILITY
- SCRAP METAL RECOVERY FACILITY
- WASTE-TO-ENERGY FACILITY
- LANDFILL (COMBINED)



GOLDFIELDS-ESPERANCE

2020 — 2030

- CONSTRUCTION AND DEMOLITION RECOVERY FACILITY
- CARDBOARD PAPER RECOVERY FACILITY
- MATERIALS RECOVERY FACILITY
- ORGANICS RECOVERY FACILITY
- PLASTIC RECOVERY FACILITY
- RUBBER/TYRE RECOVERY FACILITY
- SCRAP METAL RECOVERY FACILITY
- WASTE-TO-ENERGY FACILITY
- LANDFILL (COMBINED)

Sufficient recovery infrastructure capacity	Recovery infrastructure capacity contraints possible	Recovery infrastructure capacity constraints likely	Sufficient consolidation infrastructure capacity	Consolidation infrasructure capacity constraints possible	Not needed to achieve waste strategy targets	(20XX) indicates when capacity constraint changes

Waste and resource recovery

To determine the need for new resource recovery infrastructure within a region, the infrastructure plan considered the:

- current licensed capacity of facilities in 2020 – this may be higher than the actual annual throughput of facilities
- ability of existing facilities to expand
- estimated (or known) remaining operational life of facilities
- planned capacity of known new developments yet to be permitted, built and/or commissioned
- additional waste projected to be generated in 2030 that will require treatment.

Note: The modelling in the infrastructure plan relies on facilities being able to operate at their full licensed capacity.

Additional assumptions were applied with respect to identifying infrastructure needs:

- the time required to plan, design, seek and obtain approval for, build and commission each type of facility
- an economically minimum viable capacity for each new facility type
- facility lifetime.

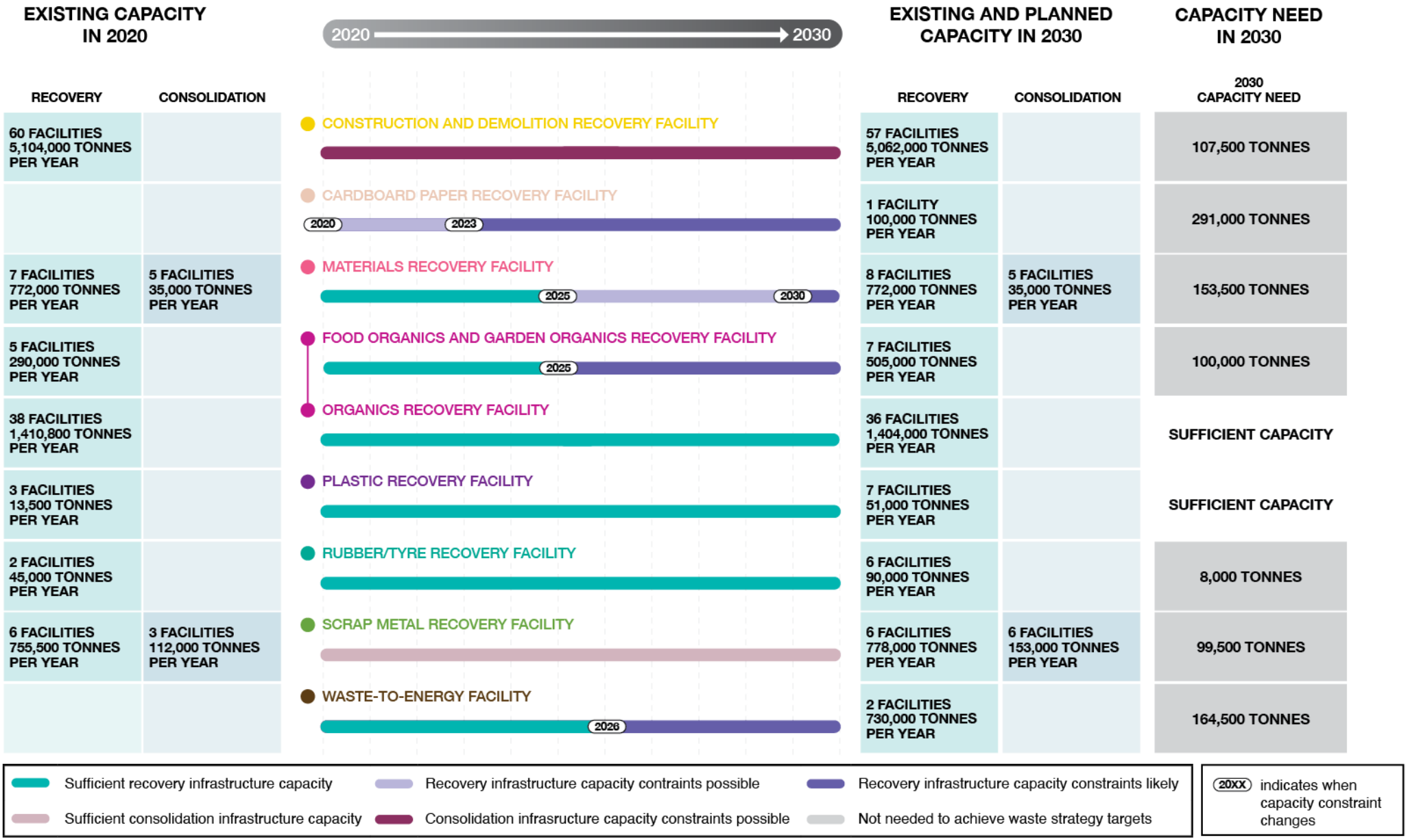
Where a capacity need was identified but did not meet a certain threshold to establish a new facility, the capacity need was identified in the infrastructure plan as the need to establish consolidation centres to aggregate waste and support the development of facilities and the transfer of the material to a region with treatment capacity.

At a statewide level the total current versus planned and needed capacity across the resource recovery facility types is illustrated in the following figure.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

STATE OVERVIEW

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030. It includes planned and approved facilities, as well as closures between 2020 and 2030.



Landfill capacity

The infrastructure plan identities that there will be an ongoing need for landfill infrastructure across the state to:

- manage certain waste streams
- support contingencies such as emergency management and response plans, clean-ups from extreme weather events and/or facility shutdowns
- manage waste in locations where no other options are viable.

Landfills will continue to play a fundamental role in the management of residual, specialised and hazardous waste that remains unrecoverable.

Although there is an ongoing need for landfills, existing and new landfill facilities need to adopt better practice in landfill design and management practices, which incorporate landfill gas abatement and capture measures as a critical component in meeting the State Government's commitment to Net zero emissions by 2050.

The infrastructure plan estimates the state's landfill needs in two ways: comparing an approach based on estimated remaining capacity of landfills with an alternative 'low-risk approach', which is shown below. The low-risk approach aims to mitigate the limitations of the standard landfill lifetime projection. It does this by removing sites found to have the potential to be affected by a range of risk factors which could affect landfill longevity, including:

- uncertainty of existing sites' ability to continue to receive the projected volumes in line with their assumed capacity
- uncertainty in future landfill network capacity with potential compliance issues arising from:
  - licence conditions
  - a limited ability for landfill operations to remain viable while complying with landfill better practice design, construction and operations (which may particularly impact small-scale operations)
- proximity to groundwater and sensitive land use planning issues.

This low-risk approach means more regions are likely to face capacity constraints by 2030, with a total of 37,457,000 tonnes across 144 landfill sites identified as 'at risk'.

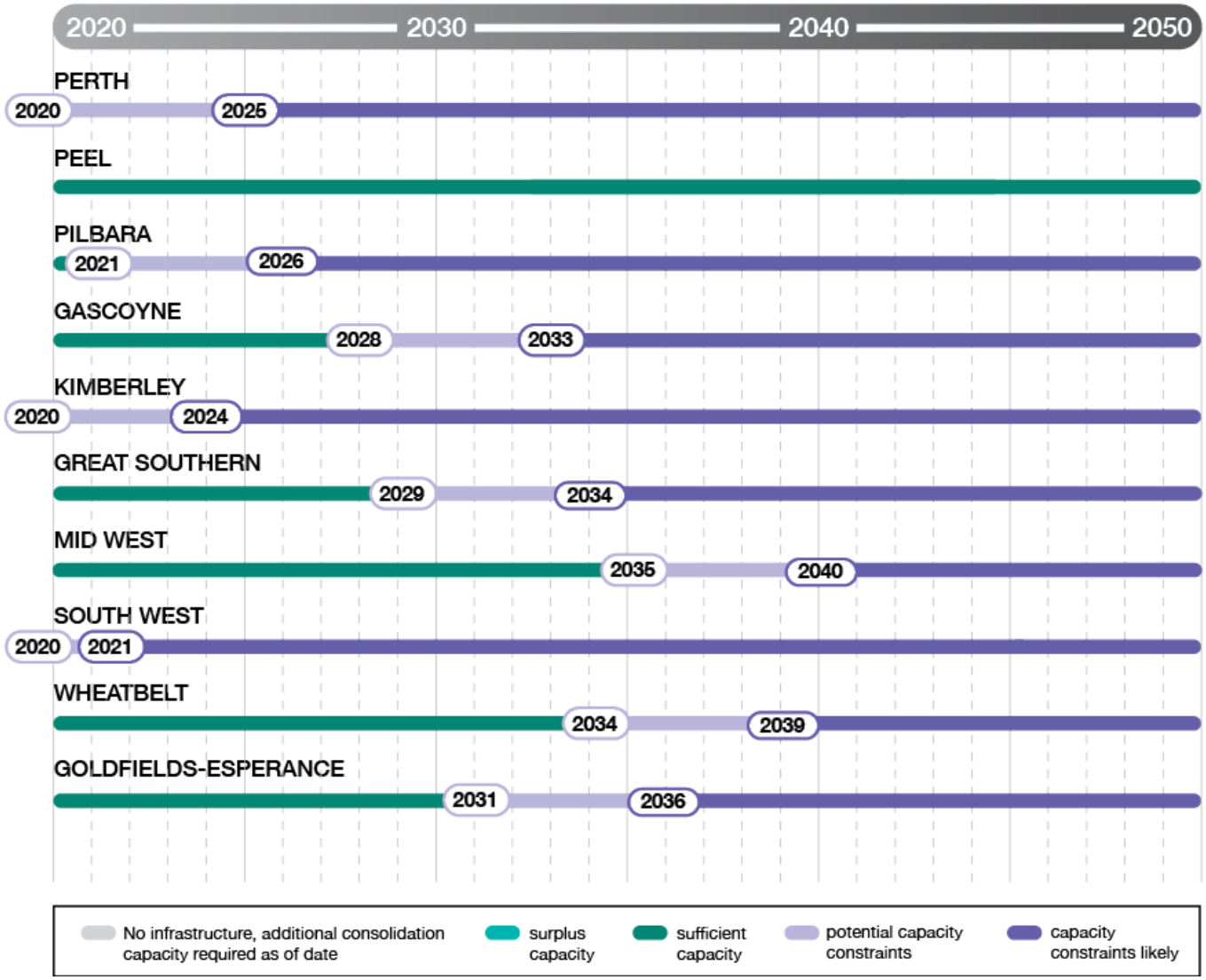
The diagram below shows the projected year that landfill capacity constraints are likely to arise in each region. This is based on current, planned and approved infrastructure under a low-risk approach. The infrastructure plan identifies that planning would be started before the projected capacity exhaustion, allowing five years for planning for expansion or closure and transporting the material to another facility, and seven or more years for the establishment of a new landfill.

This low-risk approach identifies the need for:

- contingency capacity in the Perth and South West regions, which may partly be provided in the Peel region
- the Kimberley region to develop new contingency arrangements while planning for additional landfill capacity in Broome, near the region's major source of waste generation.

LANDFILLS

LOW-RISK APPROACH TO CAPACITY LIFETIME FOR LANDFILL PIPELINE



Priorities

The infrastructure capacity needs to achieve the 2030 waste strategy targets were identified and prioritised, with opportunities to support these priorities outlined for each region and infrastructure type.

Infrastructure type	Recovery facility capacity need (tonnes)	Consolidation facility capacity need (tonnes)	Priority
Cardboard and paper	291,000		High
Food organics and garden organics	100,000		High
Material recovery	29,000	124,500	Medium
Organics recovery	Sufficient		Medium
Construction and demolition	107,500		Medium
Scrap metal*	Sufficient	99,500	Low
Rubber/tyre	Sufficient	8,000	Low
Waste-to-energy	164,500		Low
Bottom ash	Sufficient		Low

**State Waste Infrastructure Needs Analysis* (Talis unpublished) modelling includes e-waste, electronics and electronic goods in the scrap metal treatment pathway.

The infrastructure plan outlines other opportunities to support the development of the infrastructure capacity need identified for 2030. The highest priority opportunities identified include:

- investigate contingency planning arrangements for cardboard and paper in Perth
- investigate waste precinct(s) in northern Perth and/or waste precincts throughout the Perth region to facilitate additional facilities
- monitor progress of implementation of expected capacity from the Food Waste for Healthy Soils and Recycling Modernisation Fund programs
- investigate and facilitate upgrade of existing organics recovery facilities to accept food organics and garden organics
- investigate transfer opportunities between Perth and adjoining regions to support capacity needs for food organics and garden organics recovery
- facilitate appropriate guidelines and regulatory framework and specification for the recovery and treatment of bottom ash
- assess opportunity for a future additional waste-to-energy facility in the South West

- investigate alternative landfill contingency arrangements between Perth and Peel
- assess waste generation and infrastructure needs in Aboriginal communities to ensure adequate access to services
- investigate a rural landfill risk assessment of unlicensed landfill and REMS landfills.

Risks

There are risks relating to infrastructure capacity which may prevent Western Australia from meeting the waste strategy targets. They will require ongoing monitoring and management over the life of the infrastructure plan. These risks include but are not limited to:

- not achieving the waste strategy targets; in particular, not achieving the waste strategy avoidance target
- loss of infrastructure capacity from the system, including existing facilities closing early because of environmental impacts, climate change, community opposition, economic conditions, or increasing standard requirements for better practice
- failure to develop and operate planned infrastructure, particularly any delays to waste-to-energy and bottom ash facility development
- additional volumes of unreported waste being discovered as regulation and enforcement are increased
- increased volumes of waste from natural disasters requiring increased landfilling or recovery capacity
- market failures and imbalanced incentives for appropriate commercial activities to achieve the targets
- regulatory reform at national or jurisdictional levels
- management of specialised or problematic waste streams
- inadequate contingency planning.

Continuing waste generation at current rates could result in 7,465,000 tonnes of waste generated in Western Australia in 2030 – an additional 1,493,000 tonnes to what has been modelled in this infrastructure plan – resulting in increased capacity needs.

A total of 31 waste facilities are planned with approval yet to be granted, and eight facilities are scheduled to close between 2020 and 2030. This presents a risk for loss of infrastructure capacity and failure to develop infrastructure capacity.

Table of contents

Figures

Tables

Waste Avoidance and Resource Recovery Strategy 2030 vision

This *State waste infrastructure plan: Western Australia* (infrastructure plan) is a critical deliverable and supporting document of the *Waste Avoidance and Resource Recovery Strategy 2030* (waste strategy) (Waste Authority 2019). It will guide the decisions and investments for waste and resource recovery infrastructure required to achieve the waste strategy objectives and targets.

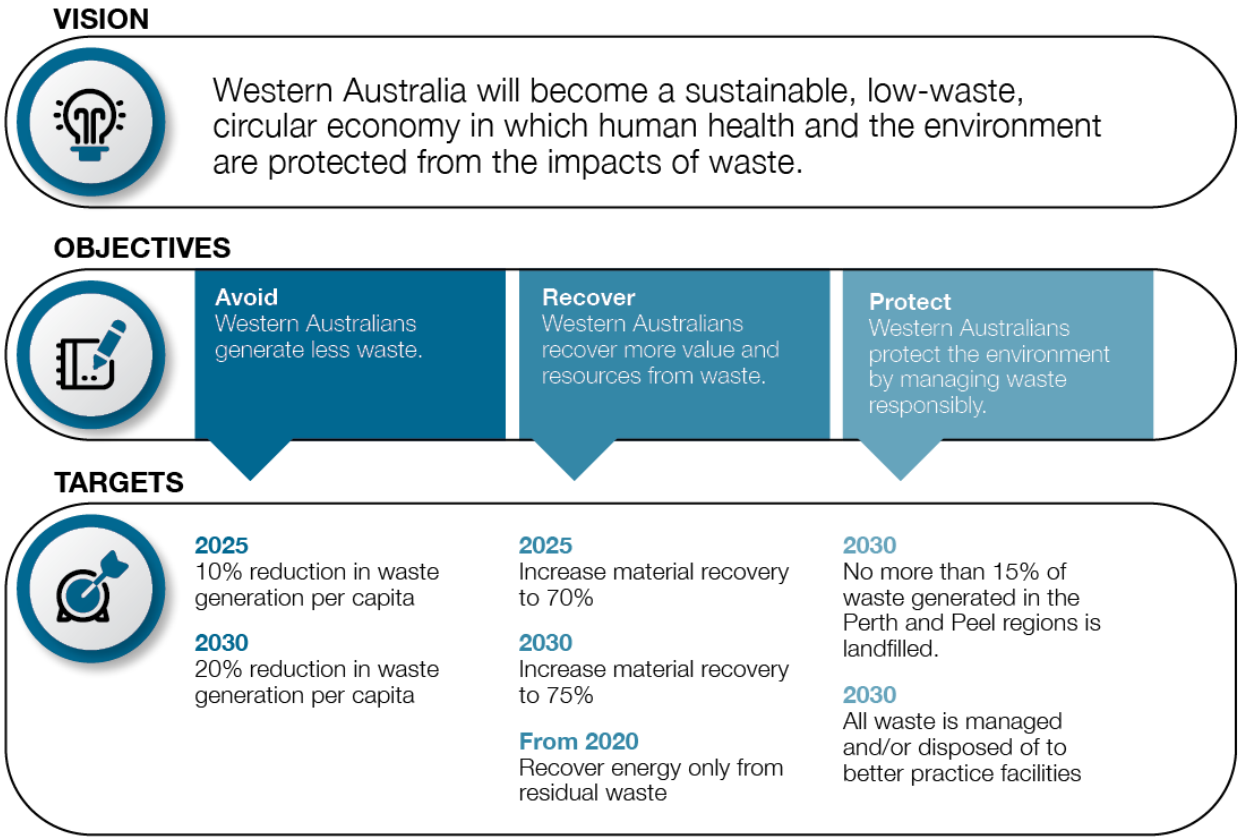


Figure 1 Objectives and targets of the Waste Avoidance and Resource Recovery Strategy 2030

The waste strategy vision is:

> "Western Australia will become a sustainable, low-waste, circular economy in which human health and the environment are protected from the impacts of waste."

Moving towards a circular economy

A circular economy is a system that provides an economic, environmental and social structure for reducing the impacts of waste. It is a regenerative system where resources are used and reused efficiently, decreasing waste generation, disposal and pollution. It aims to keep products and materials in circulation for as long as possible, ultimately commodifying materials that traditionally would be considered as 'waste'.

The infrastructure plan seeks to contribute to building a circular economy in Western Australia by recognising waste management as an essential service, strategically locating waste infrastructure for optimal resource utilisation, emphasising resource recovery, and advocating for better practices in waste facilities. Together, these principles aim to transition Western Australia towards a more resource-efficient and sustainable future, minimising waste and maximising resource value.

The waste hierarchy plays a critical role in a circular economy. Starting with waste avoidance as the preferred option, followed by reuse, recycling, recovery of energy and, finally, disposal to landfill. It aims to minimise environmental impacts and conserve primary resources at every stage.

This infrastructure plan aligns with the *Waste Authority business and action plan 2023–24.* It prioritises the actions and requirements to achieve the waste strategy's 'Recover' and 'Protect' objectives by providing recommendations for resource recovery infrastructure to meet the 2030 recovery targets.

Actions itemised under headline strategy 6 of the *Waste Authority business and action plan 2023–24* include:

- **6.1 Finalise the state waste infrastructure plan:** Finalise the state waste infrastructure plan in consultation with State Government agencies, local government
- **6.2 Further investigations arising from state waste infrastructure plan:** Scope priorities and opportunities related to waste infrastructure identified in the state waste infrastructure plan, develop them into actions and incorporate them into the waste strategy.
- **6.3 Develop Western Australian Planning Commission (WAPC) position statement for waste infrastructure:** Work with the Department of Planning, Lands and Heritage (DPLH) to develop the necessary planning instruments and guidance for local government and developers to facilitate appropriate siting and design of waste facilities (including landfills).
- **6.4 Explore options for improving waste infrastructure planning:** Investigate options for developing a needs-based approach to planning and environmental and licensing approval of new landfills and other waste infrastructure which supports the state waste infrastructure plan, in consultation with DPLH.

The infrastructure plan reflects research and stakeholder feedback. It compares projected waste volumes with existing licensed capacities for waste and recycling infrastructure to predict infrastructure capacity, gaps, risks and opportunities in 2030 and 2050.

The Department of Water and Environmental Regulation (the department) is in the process of developing sectoral emissions reduction strategies (SERS) to transition to a net zero emissions economy by 2050. The circular economy plays a key role in reaching this target as it emphasises diverting waste materials from landfills, thus reducing landfill gas emissions. The section details the process by which landfills contribute to climate change.

Principles to guide waste and resource recovery infrastructure

The five principles adopted by the infrastructure plan, outlined in Figure 2, provide ongoing guidance for stakeholder planning and decision-making in line with the vision, objectives and targets of the waste strategy. The following sections describe each principle and explore how a principle might be applied to planning and decision-making.

The principles provide a foundation for Western Australia's circular economy. An emphasis on strategically locating waste infrastructure ensures that resources are optimally utilised and regenerated, minimising environmental harm. While the principles acknowledge the reduced but ongoing need for landfills, the focus is on ensuring that even these are sustainable and cater to unavoidable wastes.

The drive to increase resource recovery capacity, both by enhancing existing facilities and developing new ones, is at the heart of the circular economy, ensuring that waste is not just discarded but repurposed and reused. Lastly, the push for better practices in waste facilities ensures that the entire process, from collection to disposal, adheres to standards that promote sustainability, resource recovery and environmental protection. Together, these principles lay the groundwork for Western Australia's transition to a more sustainable, low-waste, and circular economy.

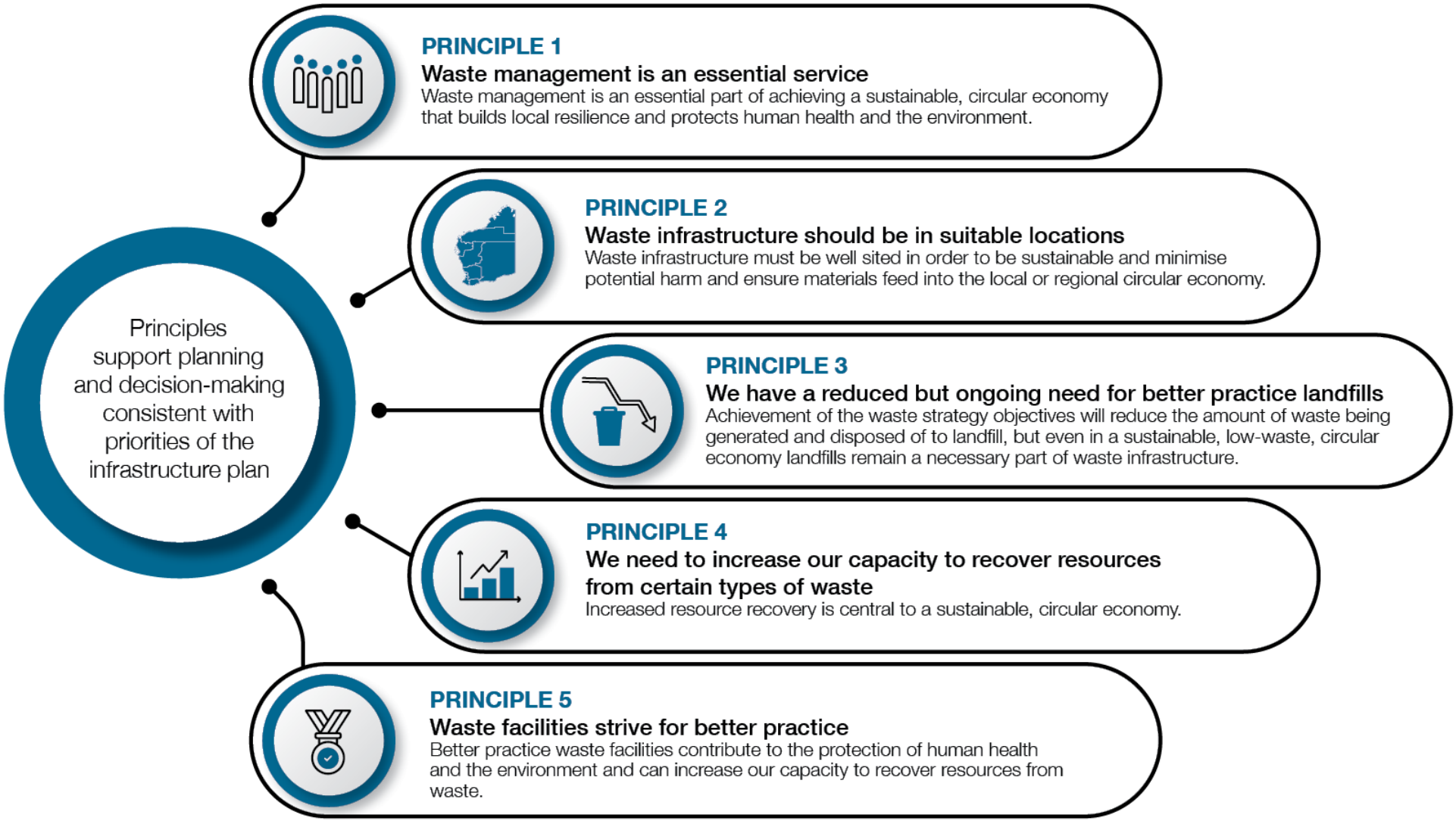


Figure 2 Five principles for planning and decision-making for waste and resource recovery infrastructure

Principle 1: Waste management is an essential service

Waste management is an essential part of achieving a sustainable, circular economy that builds local resilience and protects human health and the environment.

Waste management is an essential service because of its critical role in safeguarding public health and the environment. Resource recovery is an essential part of the transition to a circular economy and the reduction of greenhouse gas emissions.

While some essential services, such as energy and water, can be standardised to some extent – making state-level management more feasible – waste management often involves more local considerations. Factors such as waste composition, economies of scale, transport distances, community expectations and local priorities can vary greatly across the state, necessitating tailored solutions for waste management at a local or regional level.

Recent natural disasters and the COVID 19 pandemic highlight the challenges of providing waste services during a crisis and the need for more equitable access to waste services, especially to vulnerable communities.

This principle should be used to guide planning and decision-making by all stakeholders. When this principle is applied, outcomes include:

- recognition by government that resource recovery and waste management are essential services like water, energy and transport
- consideration and integration of planning for resource recovery and waste management services and infrastructure across all government planning authorities, with all communities planned with waste management and resource recovery in mind
- prioritisation of local waste management solutions where feasible, so waste services can be accessed by all communities
- government support of a sustainable waste industry through procurement, market development, policy and regulation
- planned contingency capacity within the resource recovery and waste infrastructure network
- adoption of better practice management by the resource recovery and waste sector which results in reduced risk of emergencies and disruptions
- implementation of disaster waste planning across the state.

Principle 2: Waste infrastructure should be in suitable locations

Waste infrastructure must be well sited in order to be sustainable, minimise potential harm and ensure materials feed into a local or regional circular economy.

The siting of waste facilities is critical to their sustainability. The infrastructure plan considers waste generation in each region and current and planned infrastructure to identify future needs. These needs may be met through the expansion of the capacity of existing facilities and/or development of new facilities.

When considering expanding or developing capacity, it is also important to consider that the grouping of processes may result in:

- increased viability of projects
- reduced energy and resource use per unit
- improved logistics
- improved environmental indicators
- improved support supply chains
- the creation of end markets that feed into a local/regional circular economy.

It may be more efficient to expand existing infrastructure or develop new infrastructure at the site of facilities that cease operations or are close to the end of their life. Given the need for continuing monitoring/ management, landfills may be considered as possible locations for new processing or recycling facilities as their volume decreases or their capacity is exhausted.

Suitable locations for new infrastructure will be identified through appropriate engagement with the existing local and State Government planning systems and adequate public consultation.

This principle should be used to guide planning and decision-making by all stakeholders. When this principle is applied, outcomes include:

- adoption of integrated planning across all levels of government that aligns with the principles in the infrastructure plan, supporting a statewide waste infrastructure system that effectively manages Western Australia's waste
- adoption of strategic land use planning to prevent incompatible activities near resource recovery and waste management facilities that could affect their operating life and functionality
- prioritisation of local waste management solutions where feasible, so waste services can be accessed by all communities
- placement of waste facilities in appropriate land use zones with adequate separation between waste facilities and sensitive land uses to:
  - maintain the social licence to operate
  - minimise the risk of operational disruptions
  - protect human health, the environment and the amenity of the location from the potential impacts of the waste infrastructure
  - enable safe access to and from the facility
- minimise distances to waste sources and end markets

Principle 3: We have a reduced but ongoing need for better practice landfills

Achievement of the waste strategy objectives will reduce the amount of waste being generated and disposed of to landfill, but even in a sustainable, low waste, circular economy landfills remain a necessary part of waste infrastructure.

Landfills will be important for the provision of the following:

- safe waste management in locations where no other viable options exist
- an alternative facility when other facilities may be shut down because of unforeseen events
- management of large volumes of waste from natural disasters
- an energy source, by capturing biogas through highly efficient gas capture systems, reducing methane emissions
- safe disposal of certain wastes for which no viable recycling or further processing is feasible, such as industrial biproducts and hazardous waste.

This principle is an opportunity to guide planning and decision-making for all stakeholders. When implemented, outcomes include:

- recognition by decision-makers, the waste industry and broader community, that landfills will continue to play a key role in integrated waste management
- development of landfills only if needed, and where they complement resource recovery activities
- availability of adequate, well-located support facilities to service landfills e.g. transfer stations
- regionalisation of landfill capacity, where practical, and development at a scale that supports implementation of better practice
- support for remote communities to site, design and manage landfills in a way that protects human health and the environment
- compliance of all new and existing landfill facilities with licence conditions and better practice standards, through implemented better practice in landfill siting, design and management practices
- adoption of post-closure planning for end-of-life landfills to support better practice.

Principle 4: We need to increase our capacity to recover resources from certain types of waste

Increased resource recovery is central to a sustainable, circular economy.

Infrastructure development should consider:

- all waste strategy targets and priority materials
- product stewardship schemes
- the impact of waste export bans and state disposal bans e.g. e-waste
- infrastructure requirements for implementing the waste strategy and supporting action plan e.g. FOGO recovery
- the development of infrastructure to promote outcomes in accordance with waste hierarchy and circular economy principles.

This principle should guide planning and decision-making for all stakeholders. When applied, outcomes include:

- recognition of the significant investment in, and advancement of, our existing waste infrastructure network to achieve waste strategy objectives and targets
- recognition of key waste infrastructure projects as state significant projects and attributed the relevant support and prioritisation
- creation of demand for reused, recycled and recovered materials and products though robust and sustainable markets
- a clear understanding among the waste industry and infrastructure developers of the State's waste infrastructure priorities
- support for the waste industry and infrastructure developers to develop the infrastructure needed by government policies, programs, procurement and regulation, with investment in infrastructure for priority material and facility types encouraged.

Principle 5: Waste facilities strive for better practice

Better practice waste facilities contribute to the protection of human health and the environment and can increase our capacity to recover resources from waste.

The waste strategy outlines the target that by 2030 all waste is managed and/or disposed of to better practice facilities. Meeting this target requires the department and the Waste Authority to develop better practice guidelines that set benchmarks to be met by the waste industry. The following guidelines/standards are already in place:

- Guideline: Better practice organics recycling (Department of Water and Environmental Regulation)
- Better practice FOGO kerbside collection guidelines (Waste Authority)
- Guidelines for local government kerbside and drop-off services (Waste Authority)

Where better practice guidelines are not yet available, compliance with applicable regulations, licence conditions and industry-recognised international guidelines can be used.

Consideration of better practice when developing and operating waste facilities ensures the production of high-quality recycled materials capable of competing with primary resources.

Infrastructure plan modelling shows that some regions may have sufficient capacity of a facility type; however, these facilities may not align with this principle. Consequently, these facilities may need to be upgraded or replaced in the future (examples of this can be found in the Landfill capacity lifetime assessment to 2030 and 2050 section). Some facilities may be at risk if they cannot meet, or operate viably under, better practice standards.

This principle should guide planning and decision-making for all stakeholders. When applied, outcomes include:

- compliance of all existing and new waste infrastructure to relevant better practice guidelines, with consideration of the time and resources required for this transition
- support of facilities to make continuous improvements to their operations
- increased source separation, and reduced contamination, through implementation of better practice waste collection
- adoption of policies or incentives to encourage innovative solutions for better waste management, including new technologies
- regulation, compliance and enforcement of better practice standards to create an ‘even playing field’ for facility developers and operators, and ensure all facilities are meeting these standards
- production of high-quality materials, resulting from better practice standards and regulations, that are in demand and reduce the reliance on primary resources, thus supporting a circular economy.

Objectives

The infrastructure plan has the overarching objective to:

> "Provide a long-term information framework and principles to guide decision-making for the planning and development of waste and resource recovery infrastructure in Western Australia."

To support this objective, the infrastructure plan:

- provides and applies the five key decision-making principles for stakeholders to use when planning for, developing, and approving waste facilities in line with the vision, objectives and targets of the waste strategy
- provides an evidence base for stakeholders to understand and plan for the provision of waste services and investments in infrastructure needs and identified priorities across Western Australia.

Objective framework

Inclusive of the overarching objective, the infrastructure plan aims to achieve the objectives set out in Table 1.

Table 1 Objectives of the infrastructure plan

Objectives of the infrastructure plan
1. Provide a long-term information framework and principles to guide decision-making for the planning and development of waste and resource recovery infrastructure in Western Australia.
2. Identify the waste infrastructure needs, priorities and investment opportunities over the next 10 years that align with the waste strategy and associated action plan.
3. Provide a basis for further integration of waste with the Western Australian land use planning system to enable appropriate and essential waste and resource recovery infrastructure development.
4. Guide future infrastructure development, including informing the investigation of a 'needs-based' approach to new landfills and prioritised waste and resource recovery infrastructure.
5. Promote better practice and improve standards for the establishment and operation of waste infrastructure.

Living plan

It is proposed the infrastructure plan is reviewed to ensure it remains responsive to changes in communities, environments and economies. The iterative approach outlined in Figure 3 allows for reviews every five years to ensure alignment with and support for current waste strategy objectives and targets and other relevant strategies.

It is expected that these reviews will provide insights into:

- existing and planned waste and resource recovery infrastructure
- current and future waste material generation and flows
- identified infrastructure needs and priorities
- progress towards objectives and targets
- region-specific waste and resource recovery infrastructure characteristics, challenges, opportunities and needs.

Region-specific investigations may include a broader look at waste management challenges and opportunities created by local mining and agriculture industries, in addition to the municipal solid waste, construction and demolition waste, and commercial and industrial waste streams.

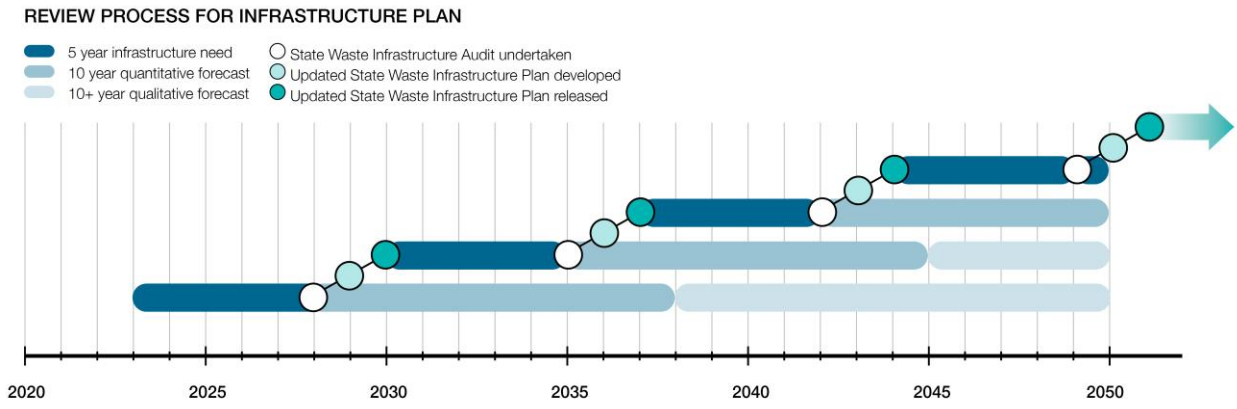


Figure 3 A five-year iterative process for the infrastructure plan

These reviews will include consultation with key stakeholders to ensure that updates to the plan incorporate feedback from these parties, identified in the Stakeholder engagement section below.

Stakeholder engagement

Waste and resource recovery services and infrastructure in Western Australia is managed across a range of stakeholders including local government, skip bin operators and waste transporters, private operators and multinationals.

Recognising the broad range of stakeholders involves a consultative and collaborative approach. The infrastructure plan builds on previous consultation and work by the department, which is highlighted in Figure 4.

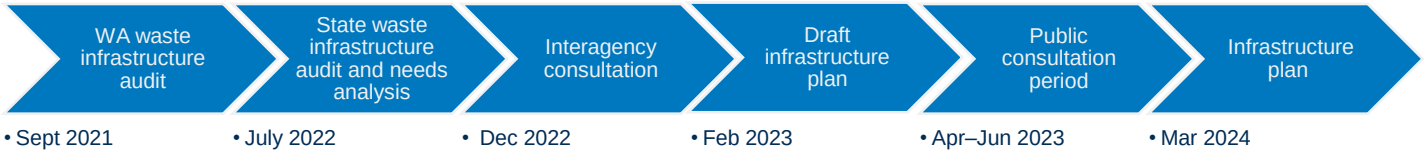


Figure 4 Infrastructure plan development timeline

Stakeholder use of the infrastructure plan

The infrastructure plan will assist various stakeholders by outlining Western Australian priorities (including priority materials and infrastructure gaps) per region as well as a statewide summary.

> **"Waste is everybody's business"**
>
> (Waste Authority, 2019)

Table 2 identifies stakeholders and outlines their respective roles in supporting the infrastructure plan.

Table 2 Audiences of the infrastructure plan

Audience	Role	Key organisations
Australian Government	• Policy/legislative adviser • Strategy • Funding • Waste producer	• Department of Climate Change, Energy, the Environment and Water • Australian Competition and Consumer Commission • Clean Energy Finance Corporation
State Government agencies	• Policy/legislative adviser • Strategy • Funding • Waste producer • Waste service provider (REMS landfills)	• Department of Water and Environmental Regulation • DevelopmentWA • Department of Planning, Lands and Heritage • Department of Transport • Public Transport Authority

Audience	Role	Key organisations
		• Department of Local Government, Sport and Cultural Industries • Department of Communities • Infrastructure Western Australia • Department of Finance • Department of Primary Industries and Regional Development
Waste and resource recovery regulatory agencies	• Policy/legislative adviser • Strategy • Regulation • Compliance and enforcement	• Waste Authority • Environmental Protection Authority Western Australia • Department of Water and Environmental Regulation
Product stewardship bodies	• Policy/legislative adviser • Strategy • Funding	• Australian Packaging Covenant Organisation • Department of Climate Change, Energy, the Environment and Water • Australian Competition and Consumer Commission • Tyre Stewardship Australia • Western Australia Return Recycle Renew Limited (WARRRL)
Local governments	• Waste service provider • Waste producer	• Western Australian Local Government Association • Local governments • Department of Local Government, Sport and Cultural Industries
Business and industry general	• Waste producer	• Australian Industry Group • Chamber of Commerce and Industry Western Australia
Waste and resource recovery industry associations	• Policy/legislative adviser • Strategy	• Waste Recycling Industry Association of Western Australia • Waste Management and Resource Recovery Association Australia

Audience	Role	Key organisations
Waste and resource recovery industry	• Waste service provider • Waste producer	• Waste and recycling businesses (this includes waste transporters, skip bin operators as well waste management companies) • WorkSafe Commissioner • Charity sector/charity waste operators
Charity sector, clothing recyclers and social enterprises	• Support landfill diversion activities	• Charitable Recycling Australia (formerly NACRO) • Charity stores and op shops • Clothing recyclers • Social enterprises
Finance, insurance or auditing bodies	• Funding • Insurance • Waste producer	• Clean Energy Finance Corporation • Insurance Council of Australia • Banks/financial institutions
Community	• Waste producer • Alternative waste service provider (e.g. community-based composting, repair cafes, men's sheds)	• Local government • Community groups and advocacy groups (e.g. those representing Indigenous or culturally and linguistically diverse peoples)
Manufacturers	• Waste producer • Procurement of recycled content	• Australian Industry Group • Chamber of Commerce and Industry Western Australia • Stewardship Centre of Excellence
Innovators/disruptors	• Innovation • Disruption or new business models	• Not a specific stakeholder group • May include research organisations, manufacturers, business and industry
Research organisations	• Research • Career pathways	• Universities and TAFEs • CSIRO • Australian Research Council • Cooperative Research Centres

Scope

The infrastructure plan focuses on resource recovery, disposal and consolidation facilities needed to manage waste arising from three waste sectors in Western Australia:

- municipal solid waste (MSW)
- commercial and industrial waste (C&I)
- construction and demolition waste (C&D).

It articulates the need for new infrastructure by 2030 but does not detail collection mechanisms or any specific technology.

The document is not intended as a detailed analysis to identify specific areas of potential investment. It is intended as a high-level analysis to identify the key priorities for development.

A broad-brush approach has been utilised to provide a holistic view of MSW, C&I and C&D waste management across the entire state of Western Australia. This provides a consistent basis for the development of strategies and priorities, and encourages collaboration among different regions, local governments and stakeholders, leading to more effective waste management strategies and outcomes.

The infrastructure plan offers an initial overarching framework at a state level, representing the first step in guiding stakeholders towards achieving the waste strategy's objectives. Importantly, the responsibilities arising from the recommended infrastructure needs in the infrastructure plan are not expected to be immediately absorbed or actioned by stakeholders. For instance, the infrastructure plan focuses on recommending infrastructure but does not address, or imply responsibility for, collection mechanisms.

Methodology

The infrastructure plan relies on 2020 baseline waste generation, infrastructure and demographic data to project waste volumes in 2030 and 2050, consistent with all waste strategy targets, and identifies the infrastructure needs to support these according to the model developed for the *State Waste Infrastructure Needs Analysis* (Talis unpublished).

The estimation of when each type of facility will be required to be fully operational necessitates consideration of several assumptions, including:

- current capacity of facilities in 2020, their ability to expand and their remaining operational life
- planned capacity of known new developments yet to be permitted, built and/or commissioned
- additional waste and resources to be generated that will require additional capacity by 2030
- the time required to plan, design, seek and obtain approval for, build and commission each type of facility
- an economically viable minimum capacity for each new facility type.

These assumptions and the methodology used to determine any gaps between existing infrastructure and the projected infrastructure needs in 2030 are described below. This includes data sources, infrastructure types and classifications, waste generation projection, infrastructure capacity and capacity needs and more detail on the key assumptions used to assess capacity need.

Data sources

Data for the infrastructure plan was obtained from the following sources:

- *Western Australia Waste Infrastructure Audit Report* (ASK Waste Management unpublished)
- *State Waste Infrastructure Needs Analysis* (Talis unpublished)
- Ongoing State Government infrastructure programs, including the Recycling Modernisation Fund and Food Waste for Healthy Soils Program.

The data obtained from these sources and used in the infrastructure plan are:

- the active waste facilities in Western Australia by facility type, location, licensed capacity and remaining capacity
- population and waste generation by type for 2020 and projected for 2030.

The infrastructure plan relies on the material and waste flows by region and by facility type provided in the above sources.

For consistency, the infrastructure plan adopts the same facility types used in the original sources. Notably, the data sources relied on for the infrastructure plan are more recent and based on a greater number of facilities than was published in the *Waste and recycling in Western Australia 2019-20* (DWER 2021).

Because of discrepancies in data sources relied upon in the infrastructure plan and other reports published by the department, there are common data variations that are less than 5 per cent. This level of variation was considered appropriate, presenting only a low risk to the validity of conclusions made by the infrastructure plan. In cases where variations exceed 5 per cent when compared with the department's publications, further explanation is provided.

Infrastructure types and classification

Resource recovery infrastructure has been grouped into broad categories comprising material recovery, energy recovery and treatment facilities, consistent with the *State Waste Infrastructure Needs Analysis* (Talis unpublished) (Table 3). These facilities are the final processing point for the waste materials described. For a full list of materials relating to each facility type, see the Treatment pathways section (Table 5).

Table 3 Material recovery and energy recovery facility types

Recovery facility type	Description
C&D recovery facility	Facilities for processing and recovery of C&D materials into useable products, generally recycled building products.
Cardboard and paper recovery facility	Facilities for the processing of cardboard and paper materials into recycled products. Facilities process baled materials from material recovery facilities, and clean paper and cardboard streams from source separation collections or community drop-off facilities.
Materials recovery facility (MRF)	Facilities for the collection, aggregation, sorting and baling of recyclable packaging and paper (predominately commingled

Recovery facility type	Description
	kerbside recycling and mixed industrial recycling), before distribution to a final reprocessor.
Food organics and garden organics (FOGO) recovery facility	Facilities for the processing of mixed FOGO and/or food waste into usable products. FOGO recovery facilities have been separated from other organics facilities that predominantly accept green waste. This type of facility includes FOGO waste generated from the MSW stream, and C&I food waste (such as wastes from food processing). This type of facility is considered a final processing point of these waste materials. These facilities are licensed as Category 67A prescribed premises only under the *State Waste Infrastructure Needs Analysis* (Talis unpublished) modelling (Category 67A premises process FOGO, although it may be accepted at and transferred through Category 61A and 62 facilities).
Organics recovery facility	Facilities for the processing of garden organic waste (or 'green waste', not including food waste) into usable products. Facilities may range in size from small-scale regional operations to large industrial facilities handling significant tonnes in metropolitan areas. This subcategory exists to identify facilities that predominantly accept green waste, wood processing waste, etc. and may not be suitable to accept materials containing food waste. This type of facility is considered a final processing point of these waste materials. These facilities have Category 67A, 61 and/or 61A licensing under the *State Waste Infrastructure Needs Analysis* (Talis unpublished) modelling.
Plastic recovery facility	Facilities for the processing of plastic materials into useable products. Feedstock may include source separated containers collected through the container deposit scheme and mixed plastics from MRFs.
Scrap metal recovery facility	Facilities that either consolidate and prepare scrap metal and e-waste materials for transportation to downstream markets, or act as final processing points for conversion into usable products.
Rubber/tyre recovery facility	Facilities for the processing of rubber and tyre materials into useable products. Also includes regional consolidation facilities that prepare rubber for efficient transportation to a reprocessing facility through baling or shredding. There are two facilities that process tyres with the rest being consolidation, predominantly landfills.
Specialist recovery facility	A range of facilities that specialise in the treatment of unique waste materials such as hazardous, textiles and mattresses.
Waste-to-energy facility	Facilities for energy recovery using high-temperature processes, including incineration, pyrolysis and gasification to

Recovery facility type	Description
	convert residual waste into energy. Incineration involves the controlled combustion of waste, pyrolysis utilises heat in the absence of oxygen to break down waste, and gasification converts waste into a combustible gas. These methods aim to generate heat, electricity or fuel from waste materials whilst reducing their volume. Waste-to-energy can be classified as materials recovery only when the bottom ash produced from the process is recycled and reused.
Bioenergy recovery facility	Facilities for converting organic waste into energy (biogas) through anaerobic digestion. Anaerobic digestion involves the breaking down of organic matter in the absence of oxygen to produce biogas.

Bioenergy facilities have not been included in the infrastructure plan but could be a viable solution for regional areas where infrastructure would be needed to process any biomass that may be available. These facilities also contribute to increasing energy from waste capacity, diverting material from landfill, and achieving the State goal of net zero emissions by 2050.

Material streams that flow into the facilities listed above are further described in Table 5. These include glass, and e-waste and batteries:

- Glass containers collected through containers for change go to WA Glass where they are processed and then sent to a furnace in South Australia for bottle manufacture.
- Glass recovered by MRFs is typically crushed for use in construction projects.
- Other glass volume flows through C&D facilities.
- E-waste and batteries are included within scrap metal waste flows.

Landfill facilities

Landfill disposal facility types are categorised in Table 4. These facilities are the final disposal point for the waste materials described.

Table 4 Landfill disposal facility types

Landfill disposal facility type	Description
Inert landfill (Class I) Putrescible landfill (Class II and III) Secure landfill (Class IV) Intractable landfill (Class V)	Landfill for the acceptance of wastes for disposal as defined by the department's Landfill Waste Classification and Waste Definitions 1996 (as amended 2019). These facilities are considered a final disposal point.
Remote Essential and Municipal Services landfill	Landfills delivered by the Department of Communities' Remote Essential and Municipal Services (REMS) program, as part of its waste management services to Aboriginal communities. Typically, the REMS-managed landfills are small, are not registered or licensed, and have minimal or no infrastructure (such as fencing or weighbridges).

Consolidation facilities (transfer stations)

As volumes of materials grow, some consolidation centres may evolve to include processing of one or more materials. In regions where there is insufficient volume to meet the defined threshold for new facility development, consolidation centres are noted for development within the infrastructure plan and an additional need is identified in the regional summary. Consolidation facilities may be co-located on or as part of other facility types such as landfills.

Treatment pathways

The *State Waste Infrastructure Needs Analysis* (Talis unpublished) assumes several treatment pathways to determine how different material types are treated under the infrastructure types and classifications described above. Material treatment pathways are tailored to each region; however, the material types and facilities they are generally treated in are described in Table 5.

Table 5 Treatment pathways for material types

Expected facility for treatment	Material type
Bottom ash recovery facility	Waste-to-energy bottom Ash and metals
C&D recovery facility	Bitumen
	Bricks
	Concrete
	Contaminated soil (excluding Class IV/V)
	Furniture
	Glass – construction
	Glass – other
	Glass packaging – mixed
	Mixed C&D waste
	Mixed inert waste
	Plasterboard
	Rubble/aggregate <150mm
	Rubble/aggregate >150mm
	Sand / soil

Expected facility for treatment	Material type
	Urban wood, timber, sawdust (also C&D waste)
Cardboard paper recovery facility	Cardboard/paper packaging
	Liquid paperboard (LPB)
	Magazines
	Mixed paper/cardboard
	Mixed plastic packaging
	Old newsprint (ONP)
	Paper – mixed
	White office paper
Class IV disposal facility	Class IV Waste
	Fly ash
	Waste-to-energy fly ash
Class V disposal facility	Class V waste
FOGO recovery facility	FOGO from municipal sources
	Food waste, green waste and other organic waste from C&I sources
	Food waste
Inert landfill	Asbestos
	C&D Recovery Facility Residual
MRF	Commingled recycling
	Mixed industrial recyclables
Organic recovery facility	Agricultural waste (excluding manure)
	Biosolids
	Fats and grease

Expected facility for treatment	Material type
	Forestry waste
	Garden waste
	Manures
	Other organic materials
Plastic recovery facility	Hard plastic (not packaging)
	HDPE (2)
	PE-LD/LLD (4)
	PET (1)
	Plastics – other or mixed
	PP (5)
	PS (6)
	PS-E (6)
	PU (7)
	PVC (3)
Putrescible landfill	Waste-to-energy/putrescible waste
Rubber/tyre recovery facility	Foam rubber
	Other rubber, including conveyor belts
	Tyres
Scrap metal recovery facility	Batteries
	Electric and electronic goods
	Metals - ferrous steel – non-packaging
	Metals - ferrous steel – packaging
	Metals – non-ferrous – aluminium – non-packaging
	Metals – non-ferrous – aluminium – packaging

Expected facility for treatment	Material type
	Metals – non-ferrous – other metals
	Whitegoods
Specialist waste treatment	Clinical waste
	Fluorescent lights
	Household chemicals
	Household hazardous waste
	Paint
	Waste Oil
Textile recovery facility	Carpets
	Leather
	Mixed textiles
	Nylon (7)
Waste-to-energy/putrescible landfill	Mixed putrescible waste – (C&I)
	Mixed putrescible waste – domestic (household)
	Treatment residual

Waste generation projections

The infrastructure plan presents waste generation, flows and treatments for 2020, 2030 and 2050. Waste generation projections were obtained from the *State Waste Infrastructure Needs Analysis* (Talis unpublished). The *State Waste Infrastructure Needs Analysis* modelled waste generation, recovery and landfill using a baseline model which applied waste and recycling data collected under regulation through to the State Government's Waste Data Online (WDO), waste levy data, *State Waste Infrastructure Audit* (ASK Waste Management unpublished), annual compliance reports and ABS export data. This waste generation data was projected to 2030 by adjusting for population growth and the waste strategy targets. A summary is presented in Table 6.

Table 6 Waste generation and projection data sources and methods

Year	Source	Methodology used for projections
2020 baseline	Western Australia Waste Infrastructure	Not applicable

Year	Source	Methodology used for projections
	Audit Report, ASK Waste Management Consultancy Services (2021)	
2030 projections	State Waste Infrastructure Needs Analysis, Talis Consultants, prepared for Department of Water and Environmental Regulation (2022)	Uses population growth to extrapolate generation. Applies waste strategy targets for achieving reduction on the 2014-15 per capita waste generation rate of 2.4 tonnes, including the 2030 target of a 20 per cent reduction on the 2014–15 value, equating to a target annual per capita rate of 1.9 tonnes. The annual 1.9 tonnes per capita rate has been carried through to 2050.
2050 projections*		

* Waste material flows are not quantified in the infrastructure plan for 2050, as they cannot be reliably estimated over this timeframe.

Because of the reliance on 2020 baseline waste generation data, there are discrepancies when compared to other baseline and projection figures published by the department. Most notably, other publications have relied on the 2014-15 baseline waste generation rate to project a reduced waste generation target of 1.96 tonnes per capita. The method used in the infrastructure plan results in a projected waste generation target of 1.92 tonnes, which is a discrepancy of less than 5 per cent.

Inter-regional waste flows and impact on regional projections

In 2020, waste flows between regions for processing were identified. In analysing those flows, two types of flows were identified:

- Type I flow – flows that left the origin region even though there was available infrastructure to manage it
- Type II flow – flows that left the origin region because of a lack of infrastructure to locally manage it.

The infrastructure plan considers Type II flows when proposing infrastructure need for 2030. The flows are used, along with the changes in waste and resources projected to be generated in a region for 2030, to establish a need for infrastructure to service a region. An important consideration in the infrastructure plan is that waste flows in the absence of specific regulatory instruments are subject to market factors.

Estimating infrastructure capacity

For the purposes of this plan, the facilities that are predicted to be operational by 2030 comprise the existing facilities, minus any specified for closure, plus proposed facilities.

Modelling undertaken through the *State Waste Infrastructure Needs Analysis* used facility throughput capacities and life expectancy to determine future infrastructure capacity needs. These facilities and throughputs were sourced from works approvals, licences for the relevant facilities, and Waste Data Online. The modelling assumes that facilities will provide all waste services as listed within their licences and/or works approvals and will operate to their full production or design capacity.

Documented licensed capacity may not accurately reflect the practical 'on-the-ground' capacity, particularly evident in cases for organics and FOGO processing, and other waste types such as tyres. For instance, organics processors might possess licenses allowing them to accept FOGO, but logistical or operational constraints could render them unwilling or unable to accommodate it effectively. This discrepancy highlights the importance of considering operational realities beyond licensed capacity. As private operators, whether these capacities are made available will also be dependent on the commercial strategies of each facility and company.

Estimating infrastructure capacity constraints

An estimation of infrastructure capacity constraints is provided for Western Australia and each region to assist those planning waste and resource recovery infrastructure to understand regional infrastructure development priorities. The change in waste generation between 2020 and 2030 was assumed to occur linearly, as was the change in infrastructure capacity between 2020 and 2030, accounting for the planned opening and closure of facilities. By assessing waste generation estimates against infrastructure capacity limits, it was possible to estimate the year when capacity constraints may occur. This year is indicated on infographics (such as Figure 16) using the following legend:

- capacity constraints likely (indicated by the year capacity constraints are estimated)
- possible capacity constraints (estimated using the year capacity constraints are estimated and the planning timeframe for new infrastructure)
- sufficient capacity
- surplus capacity
- no infrastructure, with the need for consolidation centres indicated where relevant.

Key assumptions used for assessing infrastructure needs

The infrastructure plan adopts the following key assumptions from the *Waste Infrastructure Audit Report* (unpublished) and *State Waste Infrastructure Needs Analysis* (unpublished):

- current licensed capacity of facilities in 2020, their ability to expand and their remaining operational life
- planned capacity of known new developments yet to be permitted, built and/or commissioned
- the additional waste and resources to be generated that will require additional facilities in 2030.

The infrastructure plan applies additional assumptions with respect to identifying need:

- the time required to plan, design, seek and obtain approval for, build and commission each type of facility
- an economically minimum viable capacity for each new facility type
- facility lifetime.

Planning timeframe for new infrastructure

When planning for additional infrastructure or expanding existing facilities, additional capacity is necessary where projected waste generation is close to or surpasses projected waste processing capacity.

Figure 5 highlights that decisions will need to be made in advance of reaching the maximum projected capacity, so that any new or additional facilities can be planned, approved, constructed and in operation before capacity is reached.

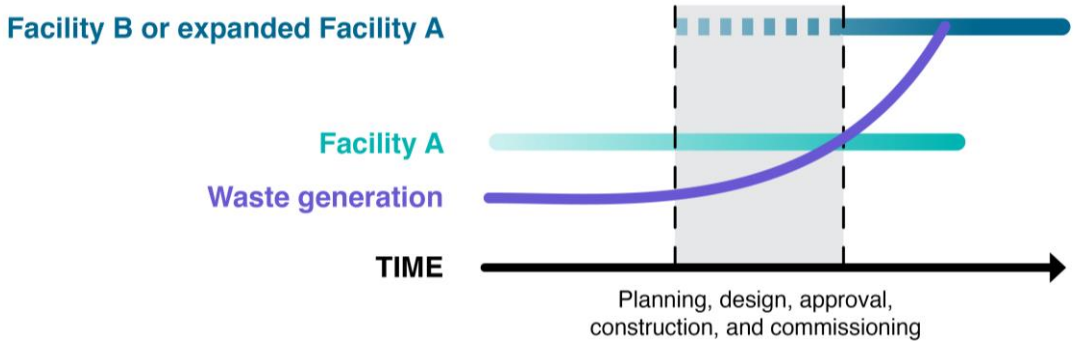


Figure 5 How new infrastructure timelines must be considered when determining infrastructure capacity

Depending on the facility type, more time may be needed to develop the business case, and for planning, design approval, construction and commissioning. Indicative timeframes considered for the completion of these processes are given in Table 7. These timeframes may vary depending on the specific project's sensitivities, complexity, approval requirements, planning requirements, and the quality and scope of the subjected application.

Table 7 Estimated time for planning different waste and resource recovery facility types

Facility types	Estimated time for planning, approval, development and commissioning
C&D recovery Material recovery Plastic recovery Rubber/tyre recovery Scrap metal recovery	3–5 years
Cardboard and paper recovery Organics recovery FOGO Specialist bottom ash recovery Specialist recovery	5–7 years
Waste-to-energy Landfill	7+ years

Market viability and critical mass

The development of sustainable waste processing infrastructure requires a range of pre-conditions to be met including:

- availability of feedstocks
- robust and proven technology
- availability of suitably skilled personnel to operate the facility
- demand for products from the process and markets to take the outputs at known price/cost

- suitable locations
- well-defined regulatory framework
- availability of funding to develop the needed infrastructure.

To be economically viable, facilities require a minimum critical mass of waste within a catchment area that allows transportation to the processing facility at a reasonable cost. If that critical mass is not achievable within the catchment area (or the transport costs are too high to achieve it by extending the area), the material will need to be consolidated and transported to a facility that has achieved the necessary scale.

The infrastructure plan adopts a minimum critical mass to indicate the need to plan for the development of new processing infrastructure in a region. The proposed minimum critical mass values are based on typical capacities for processing using available commercial technology. They reflect the current distribution of licensed facility capacities in Western Australia and input from industry. These values can vary based on:

- regional differences for market costs for energy, labour and materials
- access to markets for final materials produced
- available technologies, and returns on investment at different capacities
- the location of additional processes at the same site
- the sources and cost to finance the project by the developer.

Where the generated volume is below the defined critical mass, the infrastructure plan identifies a need for the development of consolidation centres. Indicative critical mass considered for development of new facility types are provided in Table 8.

Table 8 Minimum critical mass for different waste and resource recovery facility types

Facility	Minimum critical mass
C&D recovery	30,000 tonnes/year
Cardboard and paper recovery	200,000 tonnes/year
Materials recovery	20,000 tonnes/year
FOGO recovery	20,000 tonnes/year
Organics recovery	6,000 tonnes/year
Plastic recovery	10,000 tonnes/year
Rubber/tyre recovery	10,000 tonnes/year
Scrap metal recovery	50,000 tonnes/year
Specialist recovery	5,000 tonnes/year
Waste-to-energy	300,000 tonnes/year
Specialist bottom ash recovery	50,000 tonnes/year

The above values are indicative and are not intended to cover all possible locations, processes and technologies. There may be processes that are viable at lower throughputs, depending on process and technology used. For example, for waste-to-energy facilities,

there are a range of technologies that can generate power from waste at lower scales such as anaerobic digestion.

Minimal viable throughput

The concept of employing small-scale, modular or mobile waste facilities holds promise for regions where waste streams may not meet the minimum critical mass to warrant the construction of large-scale facilities. This idea may be considered to efficiently cater to waste management requirements whilst avoiding the necessity of transporting waste over considerable distances to large-scale recovery facilities. Embracing localised waste solutions offers multiple advantages, including reduced transportation costs, reduced environmental impact from transportation, and the potential to engage local communities in waste management practices. Although the infrastructure plan provides an overarching statewide strategy, subsequent work at the individual region level may explore small-scale or mobile facilities to tailor waste management solutions to the specific needs of regions, enhancing both sustainability and efficiency.

Additional considerations for minimal viable throughput include:

- not all processes are available in a modular configuration
- centralising in larger facilities normally achieves economies of scale and may result in better environmental controls, economic viability and ability to meet better practice standards
- they require the availability of a skilled workforce as well as end markets for recovered streams and/or infrastructure for using or further processing outputs.

Lifetime of facilities

The infrastructure plan considers the life of facilities when assessing the capacity remaining within a region. Where this was unknown for an existing facility, an industry average between 15–25 years was applied, depending on the type of facility. Landfills are treated differently, whereby the lifetime is based on estimated available capacity, derived from the *Western Australia Waste Infrastructure Audit Report* (2021), and the projected quantity of waste that they will receive over the period of the infrastructure plan.

Limitations

Desktop analysis

Desktop analysis was used in the development of this infrastructure plan as it provides a robust starting point for creating a comprehensive statewide framework. This method allows for the collation and assessment of existing data and resources, offering a foundational understanding of waste management across Western Australia. By employing desktop analysis, the plan can efficiently identify overarching priorities and key areas for development while ensuring a holistic view of the state's waste management landscape.

Desktop analysis offers the flexibility to create tailored strategies and solutions that align with the unique needs and capacities of each region within the state. However, desktop analysis does have limitations. One major concern is the potential lack of real-world validation, as desktop analysis relies on data available from various data sources, as outlined in the Data sources section. This can result in a disconnect between theoretical findings and the practical complexities faced on the ground. For example, the use of licence capacities in the *State Waste Infrastructure Needs Analysis* modelling results in the capacity of facilities not accurately reflecting the actual waste volumes and types currently being accepted by a facility.

Region-specific analysis

Desktop analysis can overlook the intricate local contexts and nuances of different regions, as it tends to provide a generalised overview. This can limit the effectiveness of proposed solutions, missing valuable insights and perspectives that can be crucial for successful waste management strategies. The infrastructure plan will be used as a guiding document from which action plans can be developed, such as region-specific plans. Such plans will be guided by the principles and objectives of the infrastructure plan but will incorporate on-site analysis local perspectives.

Interstate treatment of unprocessed waste

Unprocessed waste does not include those materials that are received, sorted and consolidated in Western Australia and then sent out of the state (interstate or overseas) for final processing. The model has considered these materials to be recovered, regardless of their treatment in the final destination. Key materials affected by this modelling approach include glass, scrap metal and paper and cardboard.

While unprocessed waste requires further exploration in future work, modelling determined about 1 per cent of material generated in Western Australia was sent interstate for treatment in 2020. The modelling shows the amount of waste transferred interstate will decrease.

Updates to capacity

The *State Waste Infrastructure Needs Analysis* uses 2015–16 as a baseline for modelling and future projections. The data used was obtained in 2019–20 and subsequently inferred to provide a 2015 baseline, which was extrapolated to provide 2030 and 2050 state waste infrastructure capacities and needs. Additional infrastructure and capacity have been introduced in Western Australia since 2019. Where a change to infrastructure capacity has occurred between 2019–20 and 2023–24, and this change has significantly affected the

State Waste Infrastructure Needs Analysis (Talis unpublished) outcome, specific facilities have been incorporated into the infrastructure plan. These changes are summarised in Table 9.

Table 9 Capacity added post 2019–20 by facility type

Facility type	Capacity added (tonnes)	Location (region)	Reason
FOGO recovery	200,000	Perth	Capacity to be added through funding from the Food Waste for Health Soils Program
	100,000	Peel	
	75,000	Wheatbelt	
Rubber/tyre recovery	90,000	Perth	Capacity to be added through funding from the Recycling Modernisation Fund

Since 2020, licences and work approvals have been granted by the department to the waste and resource recovery facilities listed in Table 10. These facilities have not been considered in the modelling of the infrastructure plan as they were approved after data was obtained in 2019–20 (see Appendix for a full list of facilities included in the 2019–20 modelling).

Table 10 Facility licences and works approvals granted since 2020

Facility type	Facility name	Location
CDS* consolidation and landfill (Category 63 and 64)	Minesite Recycling Pty Ltd	Goldfields
Asphalt manufacturing and consolidation centre	Albany Asphalt Plant	Great Southern
Landfill (Category 63)	GoGo Station Inert Landfill	Kimberley
Landfill (Category 63) and consolidation centre including used trye storage	Broome Regional Resource Recovery Park	Kimberley
Scrap metal recovery facility	Enecell Resource Recovery Solutions	Perth

Facility type	Facility name	Location
Scrap metal recovery facility and consolidation centre	Keppel Holdings	Perth
Used tyre storage	Elan Energy Matrix Pty Ltd Tacoma Facility	Perth
Plastic consolidation and recovery facility	D & M Waste Management	Perth
Scrap metal recovery facility	King Scrap Metal	Perth
Consolidation centre and landfill (Category 63)	Peel Landfill Facility	Peel
CDS consolidation and pyrolysis plant	Collie Pyrolysis Plant	South West
Consolidation centre	Veolia Port Hedland Waste Transfer Station	Pilbara
Landfill (Category 64)	Badgingarra Waste Facility	Wheatbelt
Landfill (Category 89)	Popanyinning Waste Management Facility	Wheatbelt
Landfill (Category 89)	Shire of Koorda Landfill	Wheatbelt
Landfill (Category 64)	Fernview Landfill	Wheatbelt
Consolidation centre	BMT Australia Pty Ltd	Perth
Consolidation centre	Cleartech Transfer Station	Perth

Facility type	Facility name	Location
Consolidation centre	Drainflow	Wheatbelt
Scrap metal recovery facility	FTR Operations	Perth
Organics recovery facility	Wannamal Rd Organics Pty Ltd	Wheatbelt
Consolidation centre	Brajkovich Landfill & Recycling Pty Ltd	Perth
Consolidation centre	Cockburn Resource Recovery Park	Perth
Consolidation centre	Wattleup Sand Supplies	Perth
CDS consolidation and landfill (Category 63 and 64)	Minesite Recycling Pty Ltd	Goldfields
Asphalt manufacturing and consolidation centre	Albany Asphalt Plant	Great Southern

*container deposit scheme

Material stream exclusions

Some material streams are excluded from the *State Waste Infrastructure Needs Analysis* or the infrastructure plan because of a lack of suitable data. The material streams excluded are controlled waste, liquid waste, and waste generated and treated or disposed of on-site for mining, agricultural or industrial operations.

Community recycling centres and container deposit scheme return locations have also been excluded from the modelling undertaken for this infrastructure plan. Despite this, it is recognised that the management of these materials is integral to the infrastructure plan. They play an important role across the waste industry, including in the transition to a circular economy.

Community recycling centres

Community recycling centres are facilities that offer a variety of reuse, recycling and waste drop-off services to the community. These facilities provide collection points close to their point of waste generation, often co-located with existing facilities such as landfill, and are important public-facing infrastructure to assist in the transition to a circular economy.

Community recycling centres have not been considered within this infrastructure plan as insufficient data was available to enable consideration of their capacity and future need. Further auditing of the locations, quantities and type of materials managed, and secondary treatment pathways is required to fully understand the importance of community recycling centres and to identify and address future need.

This infrastructure plan focuses on facilities that are either the final processing or disposal point for materials. Waste materials will often be collected and consolidated at a facility prior to transfer to a recovery or disposal facility.

The existing regional consolidation facilities, all other types of transfer stations, bulking facilities and community recycling centres/container deposit scheme return locations have been excluded from any assessment of existing capacity and from the maps. This is because of a lack of consistent data on the locations, quantities and type of materials managed, and secondary treatment pathways, particularly for unlicensed facilities. This network of facilities requires separate analysis.

These facilities play a crucial role in communities by serving as vital intermediaries in the waste management process. They enable efficient collection and consolidation of waste from local areas, reducing the need for long-haul transportation to distant disposal sites. This not only minimises transportation costs but also lowers the associated carbon emissions, contributing to environmental sustainability. Additionally, waste transfer stations provide a convenient drop-off point for residents and businesses, encouraging responsible waste disposal practices. Overall, these facilities enhance the effectiveness of local waste management, promoting cleaner and healthier communities while optimising resource recovery efforts.

It is acknowledged that these facilities play a vital role in Western Australia's transition to a circular economy; however, their analysis requires region-specific investigation which is considered as an area for future works.

Container deposit scheme

The Western Australian container deposit scheme (CDS) had only recently been introduced when the *State Waste Infrastructure Needs Analysis* modelling was undertaken and has not been factored into the modelling used for the infrastructure plan. It will need to be incorporated into future iterations of the plan.

Recycling and processing facilities that target glass, aluminium and plastics (e.g. MRFs) may receive CDS materials, but the infrastructure plan does not differentiate them from the facilities that receive materials from other sources.

Additional scenario-based modelling undertaken through the *State Waste Infrastructure Needs Analysis* indicated that the CDS could divert up to 10 per cent of material treated through MRFs. If so, there is a potential reduction of 69,000 tonnes of material treated through MRFs, with a proportionate increase in material flowing to glass recovery, paper and cardboard recovery and plastic recovery facilities. These facilities have sufficient capacity to treat material under this scenario. Future iterations of the infrastructure plan may consider the expansion of the CDS to accept a wider range of container types, thus increasing recycling capacity and capability. Future work should seek to verify the diversion of material from MRFs and update assumed treatment pathways for more accurate modelling of state waste infrastructure capacity and needs.

The *Western Australia Return Recycle Renew annual report 2021-2022* (2023) provides the most recent data on the CDS in Western Australia. It accounts that the CDS collected more than 50,000 tonnes in containers. About 84 per cent of these containers were processed and/or reused within Australia, signifying a substantial contribution to domestic recycling and

resource recovery efforts. Notably, about 82 per cent of the collected materials were glass, which underwent processing in Western Australia and then sent to South Australia for bottle manufacturing.

It should be noted that the new facilities developed for processing these containers are accounted for in the infrastructure plan in Table 10, illustrating the commitment to incorporate recent waste management developments that enhance resource recovery within the state.

Remote Essential and Municipal Services landfills

Waste infrastructure planning for REMS landfills is important; however, not enough data is currently available to incorporate REMS landfills into the infrastructure plan's modelling.

A total of 109 REMS landfills across different regions have been mapped in the infrastructure plan (ASK Waste Management unpublished) but these landfills are not licensed as Category 64 or 89 prescribed premises, leaving gaps in information about received volumes, remaining capacities and operational aspects. Consequently, the infrastructure plan omits the modelling of future capacity for these landfills.

Many communities have access to these simple landfill facilities, which generally consist of a fenced area with a landfill trench in place; some do not have fencing.

The Department of Communities funds 19 Aboriginal corporations to deliver municipal services, along with 16 community corporations to deliver municipal services to 33 communities. Additionally, the Department of Communities funds three regional Aboriginal corporations to deliver municipal services to 134 communities, as follows:

- Kimberley region: 95 communities
- Pilbara and Mid-West Regions: 25 communities
- Goldfields region: 14 communities.

The Department of Communities provides guidelines for municipal waste services, including the REMS landfills operations, with guidance available online for planning, operating and maintaining and monitoring these sites. The guidelines provide reasonable support to manage the landfill site to minimise potential environmental impacts, minimise health and safety risks, encourage recycling, and to make the most efficient use of resources on site.

Given the reliance on landfill as a treatment in remote areas of Western Australia, and the large number of communities relying on these landfills, the inability to capture REMS landfill capacity presents a serious limitation for the *State Waste Infrastructure Needs Analysis* (Talis unpublished) and the infrastructure plan. Future iterations of the infrastructure plan should assess options for improving waste generation and infrastructure needs in remote Aboriginal communities to ensure adequate access to services and investigate a rural landfill risk assessment of REMS landfills.

Other material considerations

Consideration of e-waste and emerging waste

There is considerable concern, expressed by stakeholders, about possible impacts of rapidly increasing volumes of e-waste and new types of waste such as solar panels and batteries from e-vehicles and power storage.

The *State Waste Infrastructure Needs Analysis* modelling includes batteries and other e-waste under a scrap metal recovery treatment pathway. At this stage, insufficient data is available to include detailed modelling of the facilities required for the management of newer waste types such as solar panels and large batteries. This plan recognises the challenges

likely to arise from these waste streams given the rapid increase in material, their likely wide geographic distribution, the risk of handling and storage, and the lack of established infrastructure. A preliminary assessment of e-waste and other emerging waste is presented in the Emergence of new waste streams section.

Asbestos

Asbestos waste will continue to need safe disposal in all regions. The *State Waste Infrastructure Needs Analysis* modelling includes asbestos disposal in REMS, inert landfill treatment pathway, and in Category 89 putrescible landfills. The lifetime capacity of inert landfills is explored more in the Landfill capacity lifetime assessment to 2030 and 2050 and Regional summaries sections.

The state of waste in 2020

Waste generation and flow

In 2020, 5.896 million tonnes of waste was generated with Western Australia and the annual per capita generation was 2.2 tonnes. Of the waste generated, 55 per cent of the material was recovered and only a small amount of material was transferred to other states or exported overseas (Figure 6).

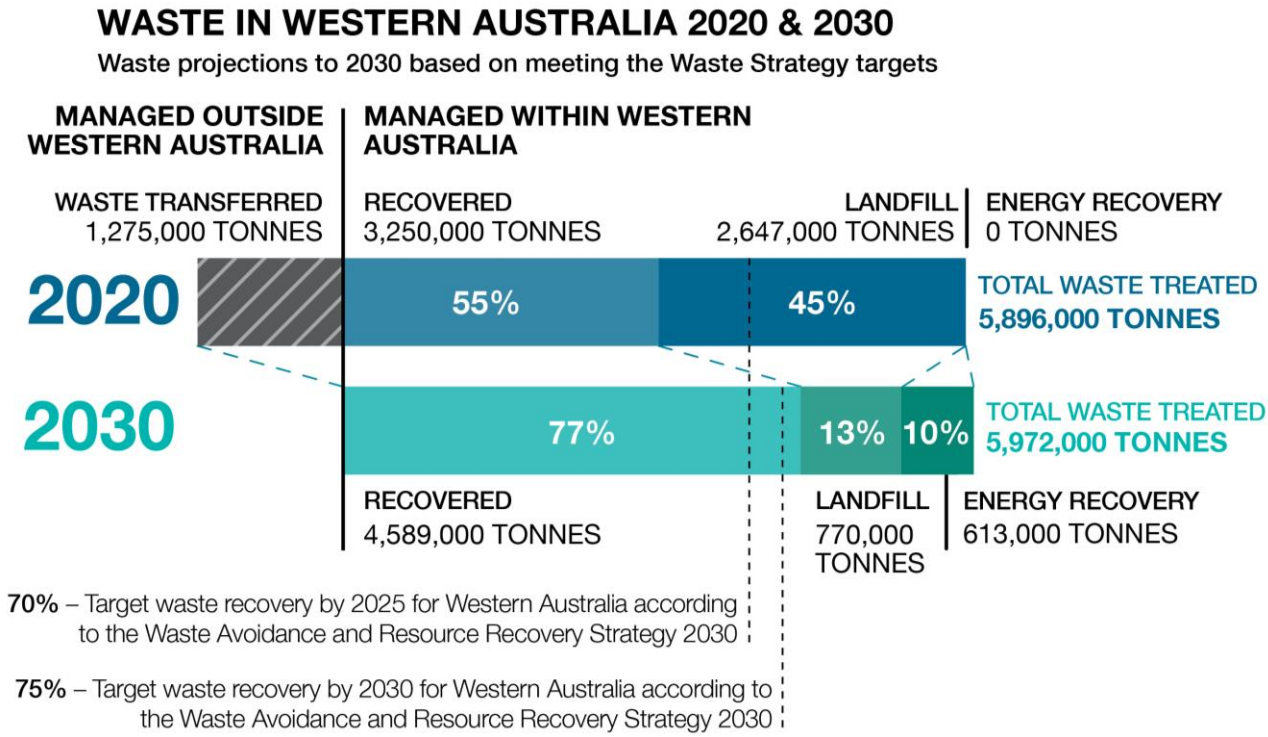


Figure 6 Waste generation, waste management and treatment 2020

Waste generation, classified by its origin, comprised:

- MSW (1.38 million tonnes or 23 per cent)
- C&I (1.83 million tonnes or 31 per cent)
- C&D (2.69 million tonnes or 46 per cent).

Waste recovery rates varied based on its origin in the following manner:

- MSW (30 per cent recovered)
- C&I (55 per cent recovered)
- C&D (80 per cent recovered).

C&D has the largest contribution to the state's generation rate and is already achieving the 2030 waste strategy target of 80 per cent recovery.

Flows and origin and destination of waste are shown in Figure 7 and Figure 8.

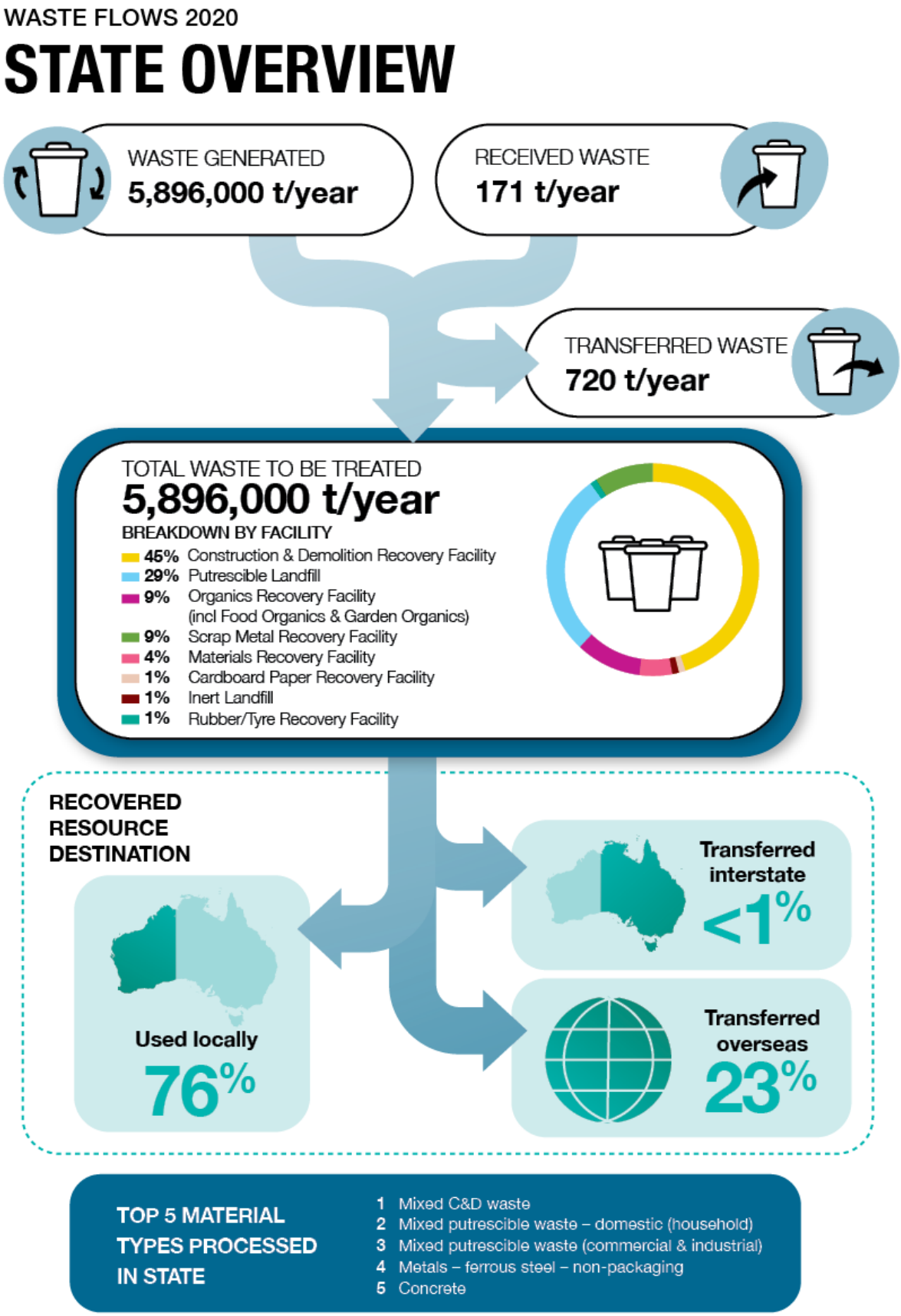


Figure 7 Waste generated, transferred and received (tonnes) in Western Australia in 2020

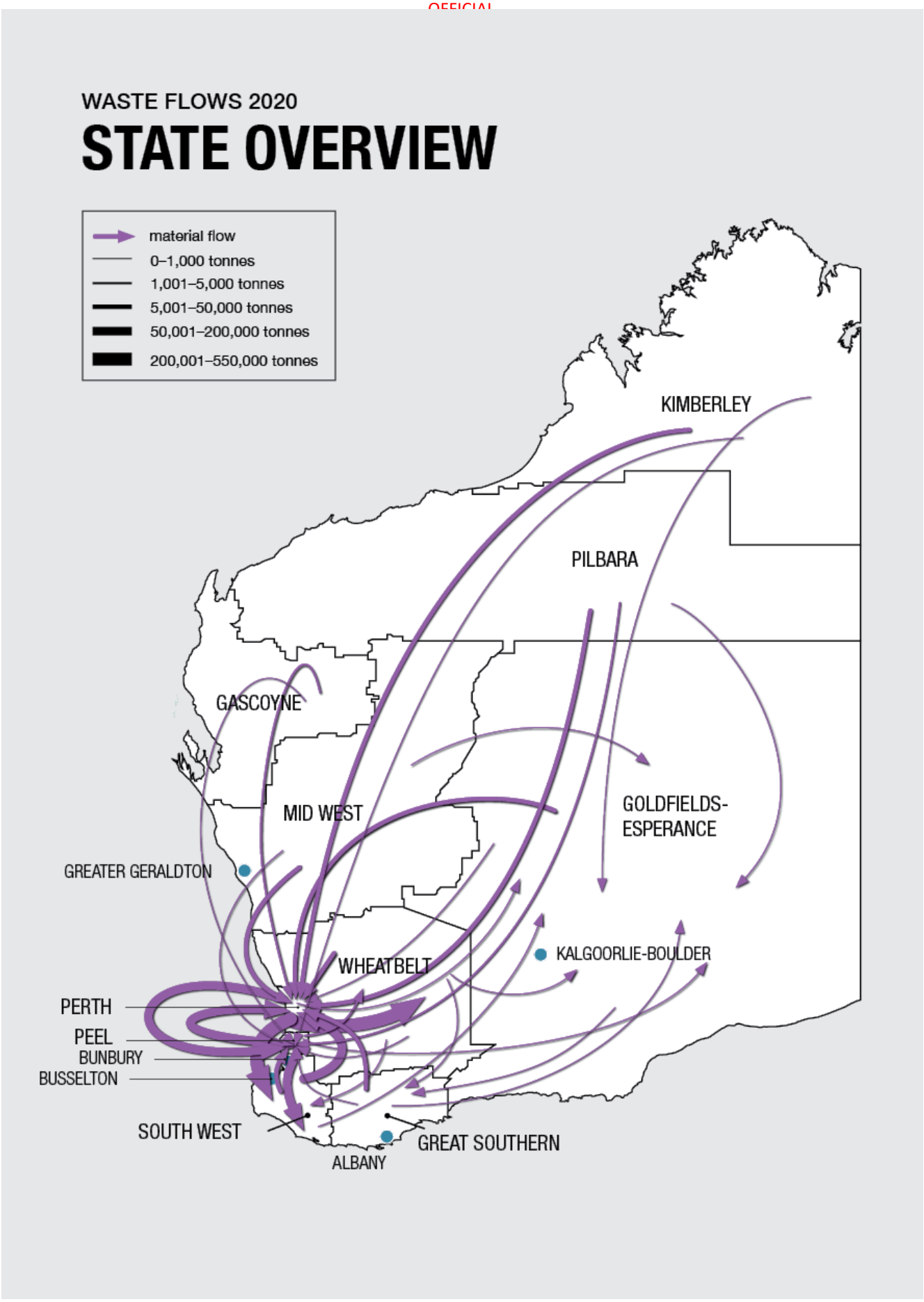


Figure 8 State overview of waste flows in 2020

Significant improvement is required in MSW recovery, especially for major regional centres which collectively have a recovery rate of 14 per cent – well below the 2030 waste strategy target of 60 per cent. Improvements are also needed in Perth and Peel, as these regions currently recover 36 per cent of MSW, with a 2030 target of 70 per cent. Statewide recovery of C&I waste also needs to increase, from the current recovery rate of 55 per cent to the 2030 target rate of 80 per cent.

Recovery rates for MSW, C&D and C&I streams have been sourced from the *State Waste Infrastructure Needs Analysis* and vary from data published in the *Waste and recycling in Western Australia 2019-20* by greater than 5 per cent. Variations are because of different methodologies used to classify waste sources. For example, MSW recovery rates for different regions can either consider only the waste generated and treated in that region, or also consider cross-regional waste transfers for treatment or disposal. Similarly, waste tonnages can change 'source' when passing through a treatment facility. An example is contamination in municipal recycling can be classified as C&I when it leaves an MRF. The infrastructure plan also considers a greater range of waste facilities and sources than are included in the *Waste and recycling in Western Australia 2019-20.*

The classification of waste by its source region, flows in and out of Western Australia and the percentage of waste managed by facility type used for treatment are presented in Figure 7.

The analysis of waste generation, management by facility type within each region and flow between regions (Figure 9) indicates:

- Perth generates the highest volume of waste, producing 73 per cent of the total for the state.
- Three regions (Perth, South West and Peel) generate 85 per cent of the state's waste.
- Most of the waste transferred out of all regions goes to Perth, where it is treated. This represents less than 10 per cent of the total volume treated in Perth
- The largest transfers to Perth are from South West and Peel, representing 67 per cent of the total.

Recovered resource destination

Recovered materials must be transported to an end market for reuse in most cases. The total quantity of transferred material is accounted for in the throughput of recovery and consolidation facilities analysed by the *State Waste Infrastructure Needs Analysis*.

Analysis from other sources published by the department were relied on for data of recovered resource destination (DWER 2021 and DWER 2022). More than three quarters (76 per cent) of recovered resources in Western Australia are circulated back into the economy through local markets, primarily C&D material. The remaining 24 per cent is largely transported overseas (23 per cent) for reuse, with some material being sent interstate (1 per cent).

There are opportunities to strengthen local recovered resource market demand and capacity. This can decrease the reliance on overseas and interstate transportation and improve the overall circular economy standing of the state if resources are reused locally.

Region of destination – waste received by region from region of origin (tonnages 2019–20)	Region of origin – waste transferred out of the region (tonnages 2019–20)										
	Perth	**Peel**	**South West**	**Gascoyne**	**Goldfields-Esperance**	**Great Southern**	**Kimberley**	**Mid West**	**Pilbara**	**Wheatbelt**	**Received Total**
Perth	0	136,000	91,000	1,500	15,600	10,700	6,900	12,600	43,700	20,000	338,000
Peel	64,400	0	16,950	500	900	300	100	400	3,250	300	87,100
South West	242,500	91,000	0	0	0	0	0	0	0	500	334,000
Gascoyne	0	0	0	0	0	0	0	0	0	0	0
Goldfields-Esperance	100	0	50	0	0	0	0	0	50	0	200
Great Southern	0	0	0		500	0	0	0	0	200	700
Kimberley	0	0	0	0	0	0	0	0	0	0	0
Mid West	0	0	0	0	0	0	0	0	0	0	0
Pilbara	0	0	0	0	0	0	0	0	0	0	0
Wheatbelt	511,000	5,000	0	0	0	0	0	0	0	0	516,000
Transferred Total	818,000	231,000	108,000	2,000	17,000	11,000	7,000	13,000	47,000	21,000	1,275,000

Figure 9 Waste generated, transferred, and received (tonnes) by region in Western Australia in 2019–20

Waste and resource recovery facilities

The location and type of current and planned infrastructure comprising registered, licensed, unlicensed and approved facilities were identified in the *Western Australia Waste Infrastructure Audit Report.* In 2020, Western Australia had 431 waste facilities including:

- 225 licensed facilities (facilities with an existing prescribed premises licence)
- 96 registered facilities (Category 89 landfills)
- six unlicensed facilities (operational facilities that do not have an existing prescribed premised licence)
- 109 landfills in Aboriginal communities that are operated under the REMS program.

As shown in Figure 10 and Figure 11, the distribution of facilities is centred around major urban and population centres, with REMS distributed throughout regional Western Australia.

The *Western Australia Waste Infrastructure Audit Report* (ASK Waste Management 2021) identified proposed facilities or facilities under construction including:

- two waste-to-energy facilities
- 29 works approvals for new facilities
- seven projects funded under the Recycling Modernisation Fund
- three projects funded under the Food Waste for Healthy Soils Program.

Western Australia's current and proposed waste and resource recovery infrastructure is concentrated near the state's activity centres (population centres and industrial centres).

The Perth region accounts for the bulk of waste generated in the state and, as such, economies of scale and local economies have driven further diversification and expansion of the sector in the Perth region.

CURRENT AND PLANNED INFRASTRUCTRE

STATE OVERVIEW

Current and planned infrastructure represents registered, licensed and approved facilities on the Western Australia Waste Infrastructure Register through the State Waste Infrastructure Audit

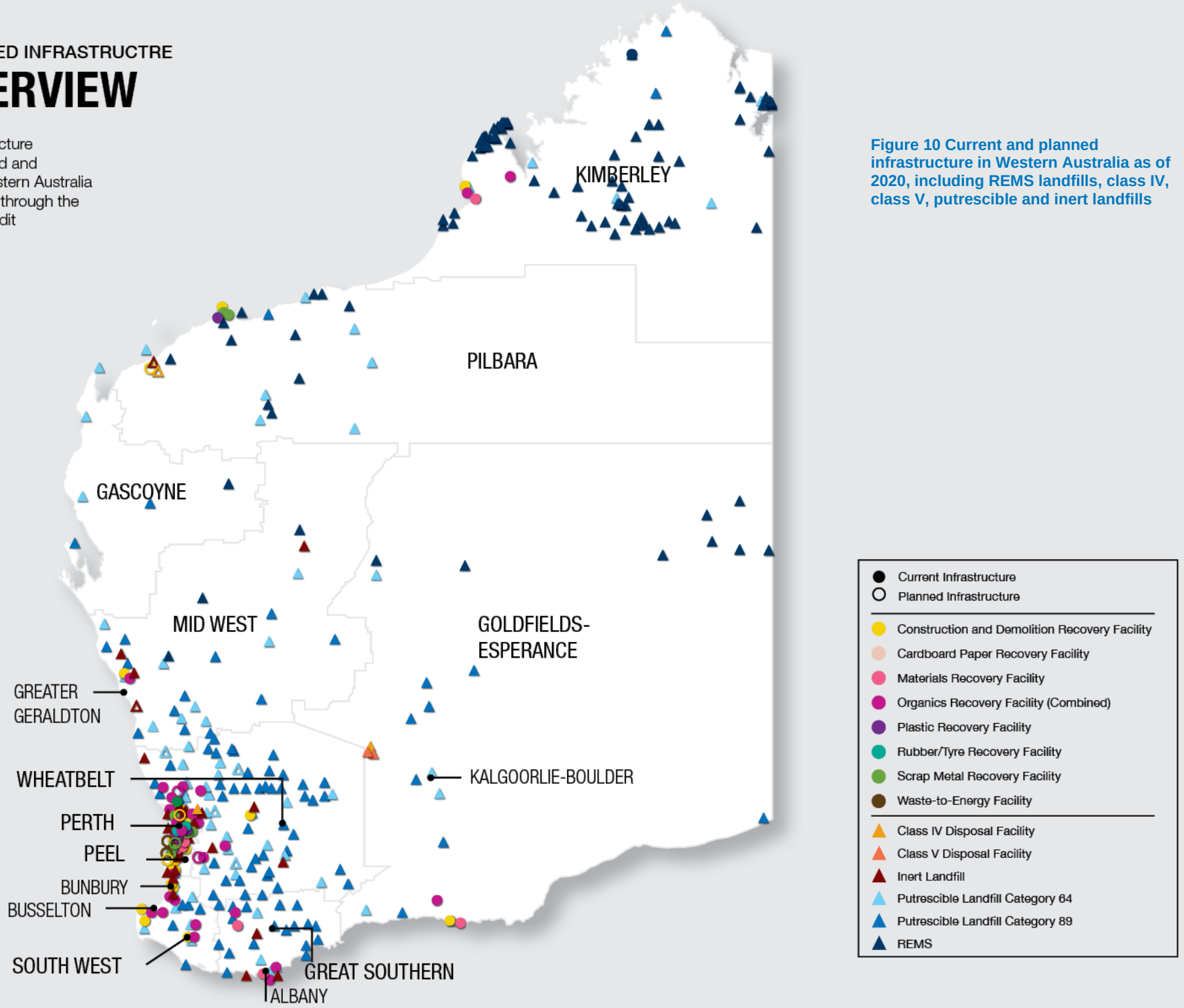


Figure 10 Current and planned infrastructure in Western Australia as of 2020, including REMS landfills, class IV, class V, putrescible and inert landfills

Resource recovery facilities

Resource recovery infrastructure is located throughout regions near the state's major population and industrial centres. The concentration of resource recovery activity takes place in the Perth region. Proximity to major generation sources and additional material received from other regions results in efficiencies and economies of scale for resource recovery activities in the Perth region.

Barriers to infrastructure development in other regional areas may include:

- insufficient or inconsistent access to suitable feedstock quantities
- a greater distance to offtake markets
- limited transportation infrastructure.

Development of waste infrastructure in the regions will be critical to achieving all waste strategy targets. The introduction of new collection services and the increase of material consolidation from less densely populated areas can help generate the necessary material quantities to justify new waste facilities. These facilities should be planned near major regional transportation networks that combine road, rail and port facilities.

CURRENT AND PLANNED RECOVERY INFRASTRUCTRE

STATE OVERVIEW
(EXCLUDING LANDFILL)

Current and planned infrastructure represents registered, licensed and approved facilities on the Western Australia Waste Infrastructure Register through the State Waste Infrastructure Audit

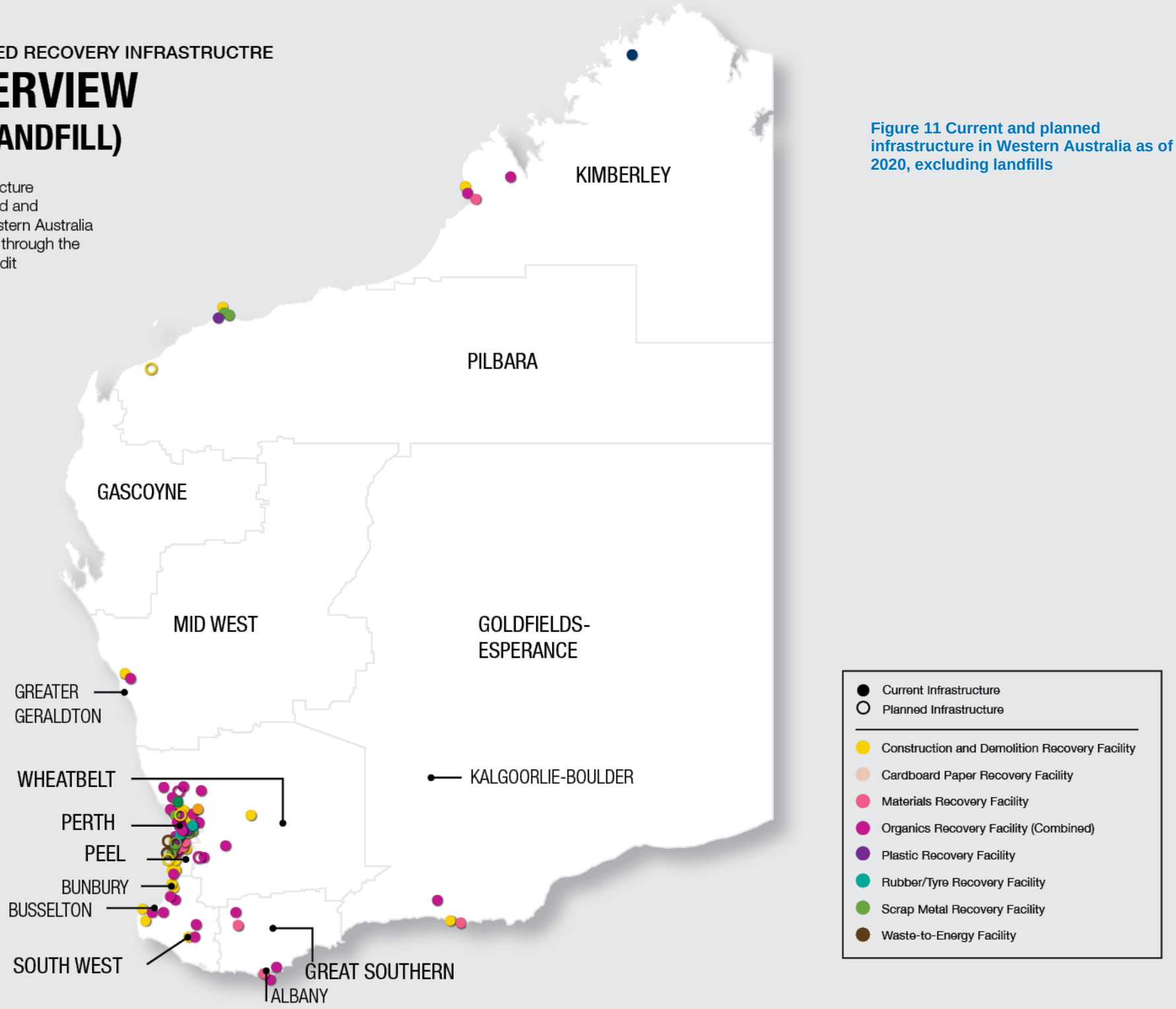


Figure 11 Current and planned infrastructure in Western Australia as of 2020, excluding landfills

Projections for 2030

In this section of the infrastructure plan, estimates of 2030 waste volumes across different regions are presented, along with an evaluation of the adequacy of existing infrastructure to effectively manage the projected waste quantities and meet the waste strategy's 2030 'Recover' targets.

This analysis primarily focuses on addressing resource recovery needs and assumes that waste avoidance targets will be addressed and met concurrently through other strategic actions and initiatives.

Projected waste generation for Western Australia

A comparison of 2020 waste generation and treatment with that projected for 2030 is shown in Figure 14. The infrastructure plan waste forecast modelling assumes that all waste strategy targets are met by 2030, which includes:

- a waste reduction target of 20 per cent
- a materials recovery target of 75 per cent
- no more than 15 per cent of waste generated in Perth and Peel region is landfilled
- a MSW materials recovery target of 70 per cent in the Perth and Peel regions, and 60 per cent in major regional centres
- a C&I materials recovery target of 80 per cent
- a C&D materials recovery target of 80 per cent
- all waste resource recovery facilities adopt better practice.

By achieving the waste strategy targets, Western Australia's waste generation will be about 5.972 million tonnes in 2030, or 1.88 tonnes per capita. The total generation is similar to 2020's total of 5.896 million tonnes, despite an expected population growth of 16 per cent, as shown in Figure 14.

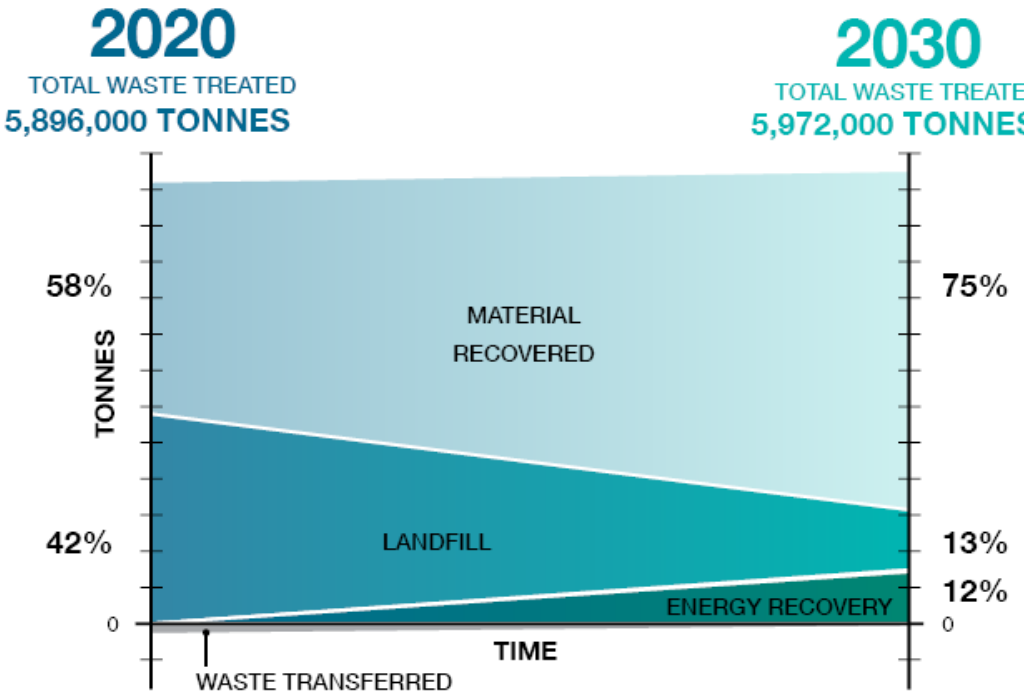


Figure 14 Western Australia's 2030 waste projection summary

The implementation of kerbside collection systems for source separated MSW FOGO in the Perth and Peel regions is a key activity through which Western Australians can recover more value and resources from waste and reduce greenhouse gas emissions. However, decision-makers must consider that modelling in the *State Waste Infrastructure Needs Analysis* assumes that regional centres will achieve a 60 per cent recovery rate for MSW, and that there is an opportunity for municipal FOGO collections in some regions.

It is projected that MSW would represent 28 per cent of the material generated in Western Australia, with C&D representing 40 per cent and C&I representing 32 per cent. This is demonstrated in Figure 15.

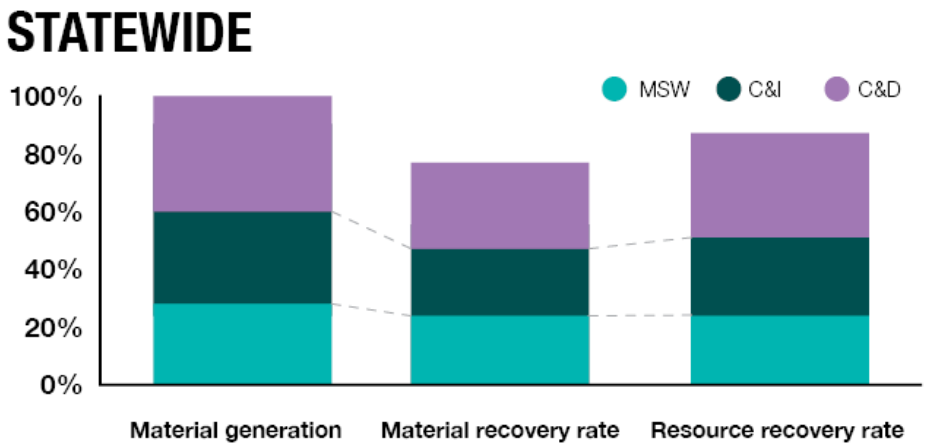


Figure 15 Projected material generation in Western Australia in 2030

Modelling under the *State Waste Infrastructure Needs Analysis* results in a material recovery rate of 75 per cent for Western Australia, rising to 89 per cent for resource recovery including waste-to-energy treatment. To achieve this material recovery rate, 65 per cent of MSW generated in 2030 must be recovered, along with 80 per cent of C&I waste and 80 per cent of C&D waste.

A summary of the waste generation, inter-regional flows and treatment is shown in Table 11. The waste generated by region is a critical consideration when assessing how Western Australians could recover more value and resources from waste. The infrastructure plan considers these trends when identifying the need for future infrastructure. It is important to note that the infrastructure plan employs a consistent statewide methodology for evaluating regional capacity needs. While this approach provides a unified framework, it acknowledges the potential limitations in capturing region-specific nuances and disparities. However, it serves as a foundational guide, providing a basis for the development of tailored regional plans that can address unique characteristics, challenges and priorities in a more detailed and context-sensitive manner.

A detailed discussion is provided for each region in the Regional summaries section.

Table 11 Waste generation, inter-regional flows and treatment summaries by region for 2030

Region	Waste generation, inter-regional flows and treatment summaries for 2030
Perth	Modelling to achieve all waste strategy targets in 2030 found Perth would generate 4,335,000 tonnes of waste, similar to 2020 quantities. Materials received into and transferred out of the region need to change significantly to support the waste strategy targets, with the phase-out of all material transfers out of the region, and an increased capacity for material received (531,000 tonnes). This will result in an increase of the total tonnes treated in Perth by 26 per cent. Infrastructure and strategic initiatives will increase the Perth material recovery rate from 66 per cent to 82 per cent. Based on current, planned and approved infrastructure in 2020, Perth will have a surplus processing capacity of 2,423,000 tonnes for C&D material, 183,000 tonnes for organic material, and 180,000 tonnes for scrap metal material. This surplus capacity can support the capacity needs of other regions, such as the 52,000 tonnes needed for C&D capacity in the Peel region. A more efficient consolidation and transport network will enable this support. Based on current, planned and approved infrastructure in 2020, Perth requires the following additional capacities to meet the waste strategy targets in 2030: • 254,000 tonnes of additional recovery capacity is needed in FOGO facilities, which may be alleviated to 110,000 tonnes by transporting material to the Peel and Wheatbelt regions, which have surplus capacity of 69,000 and 75,000 tonnes, respectively. A preliminary analysis of spare FOGO capacity in Category 67A facilities identified the need may be entirely alleviated by sharing capacity across the Perth, Peel, South West and Wheatbelt regions. • 291,000 tonnes of additional recovery capacity is needed in carboard and paper facilities. • 33,000 tonnes of additional recovery capacity is needed in MRFs. • 73,000 tonnes of additional recovery capacity is needed in waste-to-energy facilities.
Peel	Modelling to achieve all waste strategy targets in 2030 found the Peel region would generate (291,000 tonnes) similar quantities compared with 2020. Waste and materials received into and transferred out of the region are projected to change more significantly, with a decreased rate of material transferred out (112,000 tonnes) and a complete phase-out of material received into the region. Lower rates of material transferred out of the region will increase the total tonnes treated in Peel by 25 per cent. Infrastructure and strategic initiatives will increase the Peel resource recovery rate from 50 per cent to 84 per cent.

Region	Waste generation, inter-regional flows and treatment summaries for 2030
	Based on current, planned and approved infrastructure in 2020, Peel requires the following additional capacities to meet the waste strategy targets in 2030: • 51,500 tonnes of additional recovery capacity is needed for C&D, which is sufficient to allow for an additional facility.
Pilbara	Modelling to achieve all waste strategy targets in 2030 found the Pilbara region would generate (271,000 tonnes) and transfer out of the region (51,000 tonnes) similar quantities compared with 2020. Increases in local infrastructure capacity will increase the Pilbara resource recovery rate from 46 per cent to 58 per cent. Based on current, planned and approved infrastructure in 2020, the Pilbara requires the following additional capacities to meet the waste strategy targets in 2030: • 38,000 tonnes of additional recovery capacity is needed for C&D, which is sufficient to allow for an additional facility. • 26,000 tonnes of additional recovery capacity is needed for organics, which is sufficient to allow for the development of a new organics recovery facility and a FOGO recovery facility. More than half of the organics feedstock (52 per cent) is estimated to consist of MSW, indicating that there may also be a need for FOGO recovery in the region. • 7,000 tonnes of additional consolidation capacity is needed for MRFs.
Kimberley	Modelling to achieve all waste strategy targets in 2030 found the Kimberley region would generate (67,000 tonnes) and transfer out of the region (7,000 tonnes) similar quantities compared with 2020. Additional infrastructure planning and waste strategy initiatives will increase the Kimberley resource recovery rate from 13 per cent to 27 per cent. Based on current, planned and approved infrastructure in 2020, the Kimberley requires the following additional capacities to meet the waste strategy targets in 2030: • 13,500 tonnes of additional recovery capacity is needed for organics recovery, which is sufficient volume for the development of a new organics recovery facility but not enough for a FOGO recovery facility. A high percentage (69 per cent) of the organics feedstock is predicted to consist of MSW, indicating that there may also be a need for FOGO recovery in the region. This may be achieved through the extension or expansion of existing organics facilities to be able to accept FOGO.

Region	Waste generation, inter-regional flows and treatment summaries for 2030
	• 3,000 tonnes of additional consolidation capacity is needed for scrap metal. • 1,000 tonnes of additional recovery capacity is needed for C&D waste, which may need to be consolidated and transferred out of the region if it is not viable to increase the capacity of recovery infrastructure. • Minimal consolidation capacity may be needed for rubber tyre material, with less than 1,000 tonnes of feedstock projected.
South West	Modelling to achieve all waste strategy targets in 2030 found the South West region would generate (467,000 tonnes) and transfer out of the region (148,000) larger quantities of waste compared with 2020 to meet MSW material recovery targets. However, the reduction in putrescible waste imports from other regions means the total waste treated in the South West will decrease by about 51 per cent. This shift, along with the addition of new infrastructure, will increase the South West resource recovery rate from 49 per cent to 81 per cent. Based on current, planned and approved infrastructure in 2020, the South West requires the following additional capacities to meet the waste strategy targets in 2030: • 72,000 tonnes of additional consolidation capacity is needed for scrap metal recovery, which is sufficient to allow for the development of a new recovery facility. • 64,000 tonnes of additional consolidation capacity is needed for an MRF, which is sufficient to allow for the development of a new recovery facility; however, transferring material to Perth for recovery and access to end markets may be more viable. • 8,000 tonnes of additional consolidation capacity is needed for rubber/tyre recovery, which may be sufficient for the development of a new recovery facility. • 92,000 tonnes of additional recovery capacity is needed for waste-to-energy, which is not sufficient to allow for a new facility; however, residual waste may potentially be consolidated and transported to Perth for processing. Alternatively, regional growth in the Bunbury and Busselton centres may make development of a South West waste-to-energy facility possible, particularly given the constraints on putrescible landfill capacity in the region. If a waste-to-energy facility is developed, an additional 18,000 tonnes of bottom ash will need to be processed locally or consolidated and transported to Perth.

Region	Waste generation, inter-regional flows and treatment summaries for 2030
Great Southern	Modelling to achieve all waste strategy targets in 2030 found the Great Southern region would generate (92,000 tonnes) a similar quantity of waste compared with 2020. New consolidation infrastructure developments could significantly increase the rate of waste transferred out of the region (27,000 tonnes) for recovery. This will result in a 25 per cent net decrease in the quantity of waste treated in the Great Southern region. This shift and other waste strategy initiatives will increase the Great Southern resource recovery rate from 23 per cent to 58 per cent. Based on current, planned and approved infrastructure in 2020, the Great Southern requires the following additional capacities to meet the waste strategy targets in 2030: • 16,500 tonnes of recovery capacity is needed for C&D waste, which will require consolidation and transfer from the region as it is not sufficient to allow for an additional recovery facility. A mobile C&D recovery facility may be considered. • 7,000 tonnes of additional consolidation capacity is needed for scrap metal. • 5,000 tonnes of additional consolidation is needed for an MRF. • While not identified though *Infrastructure Needs Analysis* modelling, stakeholders have reported local demand for access to FOGO processing capacity. Further investigation of this need at a regional level is required.
Mid West	Modelling to achieve all waste strategy targets in 2030 found the Mid West region would generate (83,000 tonnes) lower quantities while transferring out of the region (21,000 tonnes) higher quantities compared with 2020. This change will result in a 22 per cent net decrease in the total waste treated in the Mid West region. These changes, supported by new infrastructure, will increase the Mid West resource recovery rate from 14 per cent to 56 per cent. Based on current, planned and approved infrastructure in 2020, the Mid West requires the following additional capacities to meet the waste strategy targets in 2030: • 13,000 tonnes of additional capacity is needed in MRFs, which may be sufficient to allow for an additional recovery facility if augmented with material received from the Gascoyne region (1,000 tonnes). • 7,000 tonnes of additional consolidation capacity is needed for scrap metal recovery.

Region	Waste generation, inter-regional flows and treatment summaries for 2030
Gascoyne	Modelling to achieve all waste strategy targets in 2030 found the Gascoyne region would generate (83,000 tonnes) lower quantities while transferring out of the region (21,000 tonnes) similar quantities compared with 2020. This change will result in a decrease in the total waste treated in the Gascoyne region. New infrastructure will aim to change treatment methods to increase the Gascoyne resource recovery rate from 14 per cent to 56 per cent. Based on current, planned and approved infrastructure in 2020, the Gascoyne requires the following additional capacities to meet the waste strategy targets in 2030: • 500 tonnes of additional recovery capacity is needed for C&D waste, which will require consolidation as it is not sufficient to allow for a new facility. • 1,000 tonnes of additional consolidation capacity is needed for MRFs. • 6,000 tonnes of additional recovery capacity is needed for organics, which is sufficient volume to allow for the development of a new organics recovery facility but not enough for a FOGO recovery facility. A high percentage (68 per cent) of the organics feedstock is estimated to consist of MSW, indicating that there may also be a need for a FOGO recovery in the region. This may be achieved through the extension, or expansion of existing organics facilities to be able to accept FOGO. • 500 tonnes of scrap metal recovery capacity is needed, which will require consolidation, although is not sufficient to allow for a new facility.
Wheatbelt	Modelling to achieve all waste strategy targets in 2030 found the Wheatbelt region would generate (125,000 tonnes) and transfer out of the region (22,000 tonnes) similar quantities compared with 2020. Changing waste received from Perth will significantly decrease the total quantity of waste treated in the Wheatbelt, resulting in a net decrease of 84 per cent compared with 2020. These changes and improvements to local recovery capacity will increase the Wheatbelt resource recovery rate from 18 per cent to 29 per cent. Based on current, planned and approved infrastructure in 2020, the Wheatbelt requires the following additional capacities to meet the waste strategy targets in 2030: • 17,000 tonnes of additional consolidation capacity is needed for MRF. • 5,000 tonnes of additional consolidation capacity is needed for scrap metal recovery.

Region	Waste generation, inter-regional flows and treatment summaries for 2030
Goldfields-Esperance	Modelling to achieve all waste strategy targets in 2030 found the Goldfields-Esperance region would generate (124,000 tonnes) less material while transferring out of the region (48,000 tonnes) significantly more compared with 2020. Greater amounts of waste transfer out of the region for recovery will decrease total waste treated in the region by 37 per cent. Additional infrastructure planning and waste strategy initiatives will increase the Goldfields-Esperance resource recovery rate from 37 per cent to 59 per cent. Based on current, planned and approved infrastructure in 2020, the Goldfields-Esperance region requires the following additional capacities to meet the waste strategy targets in 2030: • 13,500 tonnes of additional capacity is needed for MRFs, which will require consolidation, although is not sufficient to allow for a new facility. • 4,000 tonnes of additional recovery capacity is needed for organics, which is not sufficient volume to allow for the development of an organics recovery facility or a FOGO recovery facility. Half of the organics feedstock (50 per cent) is estimated to consist of MSW, indicating that there may also be a need for a FOGO recovery in the region. This may be achieved through the extension, or expansion of existing organics facilities to be able to accept FOGO. • 5,000 tonnes of additional capacity is needed for scrap metal recovery, which will require consolidation, although it is not sufficient to allow for a new facility.

Infrastructure capacity needs in 2030

Recovery and consolidation infrastructure capacity needs in 2030

The estimated capacity for recovery and consolidation infrastructure needed to process the waste projected for 2030, and meet waste strategy targets, is presented in Table 12 and Figure 16. The method applied for determining capacity constraints is provided in the Estimating infrastructure capacity constraints section.

Western Australia's most significant infrastructure needs include the:

- development of 291,000 tonnes of cardboard and paper recovery capacity with a recovery facility in the Perth region
- development of 100,000 tonnes of food and garden organics recovery capacity (from municipal and commercial sources), to address the state's capacity needs.

The latter may include upgrading existing organics recovery facilities to accept this waste or determining whether spare capacity is available in existing 67A facilities to alleviate FOGO capacity need.

Table 12 Recovery and consolidation infrastructure capacity needed by infrastructure type to achieve the waste strategy 2030 targets

Infrastructure types	Recovery facility	Consolidation facility	Potential to increase capacity through changes to existing facilities	Priority
Cardboard and paper	291,000 tonnes/year			High
FOGO	100,000 tonnes/year		✓	High
MRF	29,000 tonnes/year	124,500 tonnes/year	✓	Medium
C&D	107,500 tonnes/year		✓	Medium
Scrap metal		99,500 tonnes/year		Low
Rubber/tyre		8,000 tonnes/year		Low
Waste-to-energy	164,500 tonnes/year			Low

The Regional summaries section provides further discussion on the facility development options in each respective region.

The infrastructure plan determined that there was sufficient plastic recovery capacity in Western Australia. Another publication (Envisage Works 2021) reports different quantities of plastic generation and reprocessing within the state. It is expected that this analysis relied on different data sources compared to the infrastructure plan, leading to the variation. To maintain a consistent method for all material and facility types, data reported in the other source was not considered as part of the infrastructure plan.

Analysis of licensed capacity to alleviate capacity need

The *State Waste Infrastructure Needs Analysis* (Talis unpublished) determined that there was need for an additional 254,000 tonnes of FOGO recovery capacity in Perth by 2030.

Outside of the Perth and Peel regions, *State Waste Infrastructure Needs Analysis* (Talis unpublished) modelling classified all facilities under licence categories 67A or a combination of 67A, 61 and 61A as organics recovery facilities. This was regardless of whether the facility was processing FOGO, only garden organics (green waste, other non-food organic waste) or a combination. This presents an opportunity to further explore licensed capacity of 67A facilities.

Adjoining regions to Perth may have capacity to receive FOGO to alleviate capacity need. This is also explored in this preliminary analysis of FOGO capacity within Category 67A facilities. The Peel, South West and Wheatbelt regions are considered adjoining regions for the purpose of this analysis.

A preliminary analysis of Perth and adjoining regions has identified the potential FOGO capacity in each region by looking at facilities which are licensed to accept FOGO, but which have not been categorised as processing FOGO in the *State Waste Infrastructure Needs Analysis* (Talis unpublished) modelling.

Under the *State Waste Infrastructure Needs Analysis* (Talis unpublished) modelling, 543,000 tonnes of FOGO waste will be generated in Perth in 2030. Perth will have 330,000 tonnes of FOGO recovery capacity in 2030. Perth will also have 553,000 tonnes of organics capacity. Under licensing, 190,500 tonnes of this capacity is available to accept FOGO. Combined, Perth has the capacity to treat 520,500 tonnes of FOGO material, leaving a 22,500-tonne capacity need to potentially be treated in adjoining regions.

In Peel 31,000 tonnes of FOGO will be generated in 2030. Peel will have 100,000 tonnes of FOGO recovery capacity in 2030. This means Peel has the capacity to accept up to 69,000 of FOGO from Perth or the South West after receiving material generated within the region.

In the South West, 93,000 tonnes of organic material will be generated in 2030. With 48 per cent of this from MSW, the resulting estimate for FOGO waste generation is 45,000 tonnes. The South West will have 210,000 tonnes of organics recovery facility capacity. Under licensing, 5,000 tonnes of this capacity is available to accept FOGO. This means the South West will have a 40,000 FOGO capacity need to be treated in adjoining regions or that will require new capacity to be developed within the region.

In the Wheatbelt, 18,000 tonnes of organic material will be generated in 2030. With 57 per cent of this from MSW, the resulting estimate for FOGO waste generation is 10,500 tonnes. The Wheatbelt will have 370,000 tonnes of organics recovery facility capacity. Under licensing, 222,000 tonnes of this capacity is available to accept FOGO. This means the Wheatbelt has the capacity to accept up to 211,500 tonnes of FOGO from Perth or the South West after receiving material generated within the region.

Combined, the four regions will produce 629,500 tonnes of FOGO material, with capacity to treat 847,500 tonnes of FOGO material. This indicates a surplus of 218,000 across all adjoining regions in the analysis.

This surplus could alleviate the 100,000-tonne capacity need across Western Australia, which is raised by relatively low quantities of organic material generated in more remote regions like the Kimberley, Pilbara, Gascoyne and Goldfields-Esperance regions. The transport of organics from all sources from these regions to the Wheatbelt, Perth, Peel or South West regions, although technically possible, may not be feasible. Instead, these regions may have an opportunity to establish composting and/or bioenergy facilities close to regional centres or towns to supply energy and treat organics.

This preliminary analysis aims to provide decision-makers with insight into the possible capacity available within adjoining regions. There is a limitation with this approach, however, with updated surveying of facilities required to determine, with confidence, the capacity available as facilities change over time. The spare capacity calculated based on facility licensing is a snapshot from 2020, with the actual capacity for FOGO likely to have reduced as these facilities receive more material over time. The avoidance of C&D waste in 2030 is important for meeting waste strategy avoidance targets for the state; however, there is ample processing capacity available.

The additional resource recovery infrastructure capacity needs and priorities, by region, are outlined in the infrastructure priorities and guidance section. A detailed discussion is provided for each region in the Regional summaries section

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

STATE OVERVIEW

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030. It includes planned and approved facilities, as well as closures between 2020 and 2030.

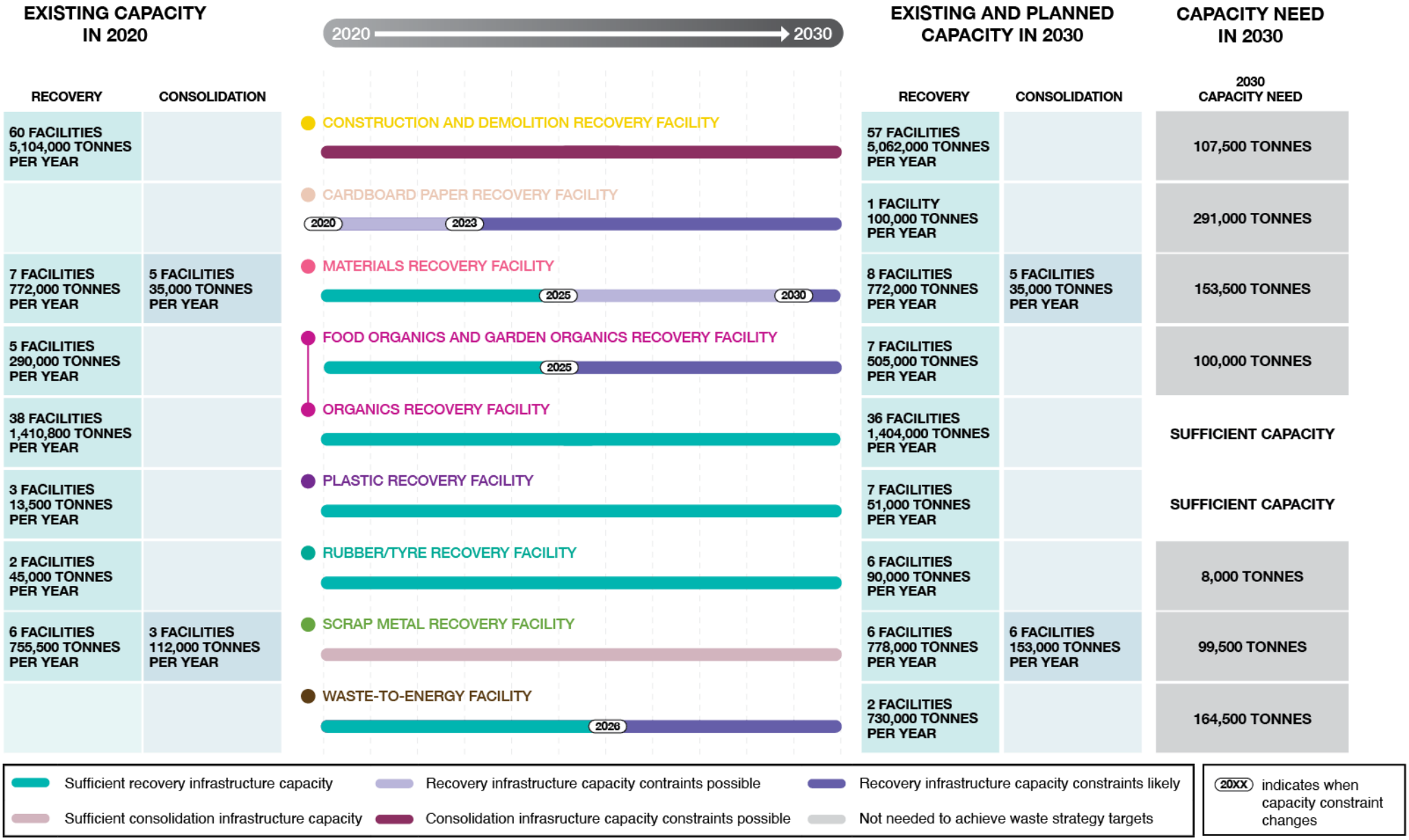


Figure 16 Western Australia infrastructure capacity constraints between 2020 and 2030

Local resource recovery

Western Australia's expansive landscape, where some communities are widely dispersed, increases the significance of localised resource recovery solutions. Treating waste near its point of generation becomes a key consideration for effective and sustainable waste management, in line with Principle 2. While the scope of this plan does consider regional processing options, it does not extend to local (intra-regional) processing and the development of local manufacturing. As an example, development of a manufacturing business that could take shredded plastic to make safety barriers for use in regional roads could prompt local plastic waste sorting and shredding. It is crucial to recognise the importance of fostering local resource recovery solutions. This infrastructure plan, serving as a statewide framework, lays the foundation for guiding regional solutions. As reflected in principle 1, waste as an essential service relies on integrating local solutions where viable.

Local resource recovery strengthens regional communities and economies and contributes to positive environmental outcomes:

- Efficiency: Localised resource recovery reduces transportation distances, lowering associated costs and emissions.
- Tailored solutions: Solutions designed for local needs are more effective in addressing specific waste compositions and management challenges.
- Community engagement: Local resource recovery facilities encourage community involvement and awareness, fostering responsible waste practices.
- Environmental impact: Reducing transport reduces carbon footprint and environmental strain caused by long-distance waste movement.
- Job creation: Local facilities generate employment opportunities, contributing to regional economic development.
- Resilience: Local solutions enhance waste management resilience and self-sufficiency, ensuring continued service availability even in challenging circumstances such as export bans, and reducing reliance on external waste markets.

Landfill facilities

Putrescible landfills are well distributed across urban and regional centres. Inert landfills are concentrated near major C&D generation sources at major urban centres. In areas without inert landfill, inert waste is generally disposed of to putrescible landfill, so increased recovery of inert waste (in particular C&D waste) can both increase recovery rates and extend the lifespan of putrescible landfills. REMS facilities are also distributed across regional areas to service Aboriginal communities.

Landfill capacity lifetime assessment to 2030 and 2050

Landfills will continue to play a role in the provision of waste services in the state. Landfills also provide opportunity for landfill gas capture in which biogas may be used as a renewable energy source.

Using high-level capacity assumptions from the *Western Australia Waste Infrastructure Audit Report* (ASK Waste Management unpublished), a high-level analysis projected remaining landfill capacity by region and the rates of generation for different types of waste disposed of to landfills. The lifetime capacity modelling applies waste generation projection aligned with the waste strategy targets against the remaining capacity of facilities in 2020.

Figure 17 shows the projected year that current landfills will exhaust their capacity. Planning should start before that projected capacity exhaustion, allowing five years for planning for expansion or closure and transporting the material to another existing landfill facility and seven or more years for establishment of a new landfill.

Key assumptions used to establish future landfill capacity use include:

- all facilities will remain in operation and continue to receive waste as identified in the *Western Australia Waste Infrastructure Audit Report* (ASK Waste Management unpublished)
- that waste disposal projections are in accordance with the waste strategy material recovery and avoidance targets
- that waste will be continue to be disposed of in the regions where they originate and/or are modelled to flow
- projecting to 30 years from now, no new processes are introduced to treat material disposed of to landfill other than the two waste-to-energy facilities already planned in Perth.

Figure 17 illustrates that in the short term the Kimberley region will exhaust its current capacity and several other regions need to commence planning to expand capacity or consider alternatives. Further individual site analysis and assessment of remaining landfill capacity is required to provide specific capacity projections for landfills across the state.

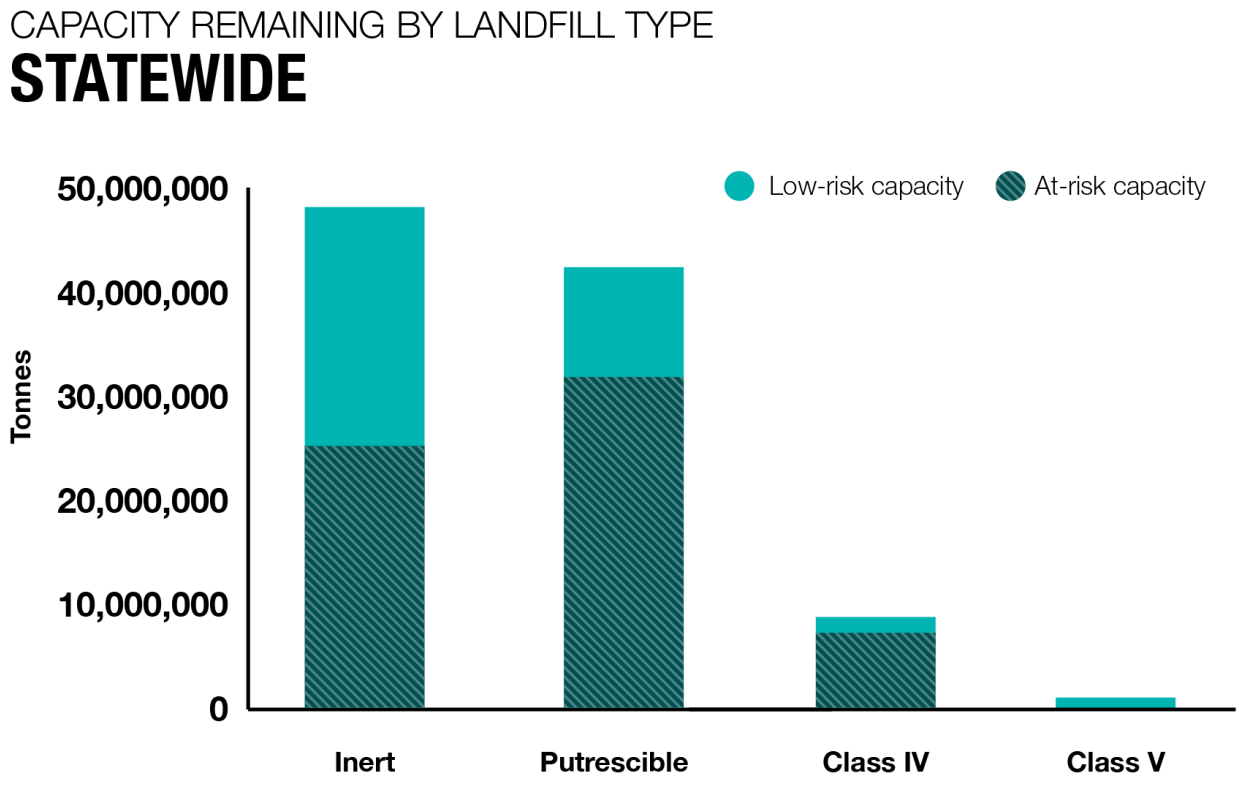
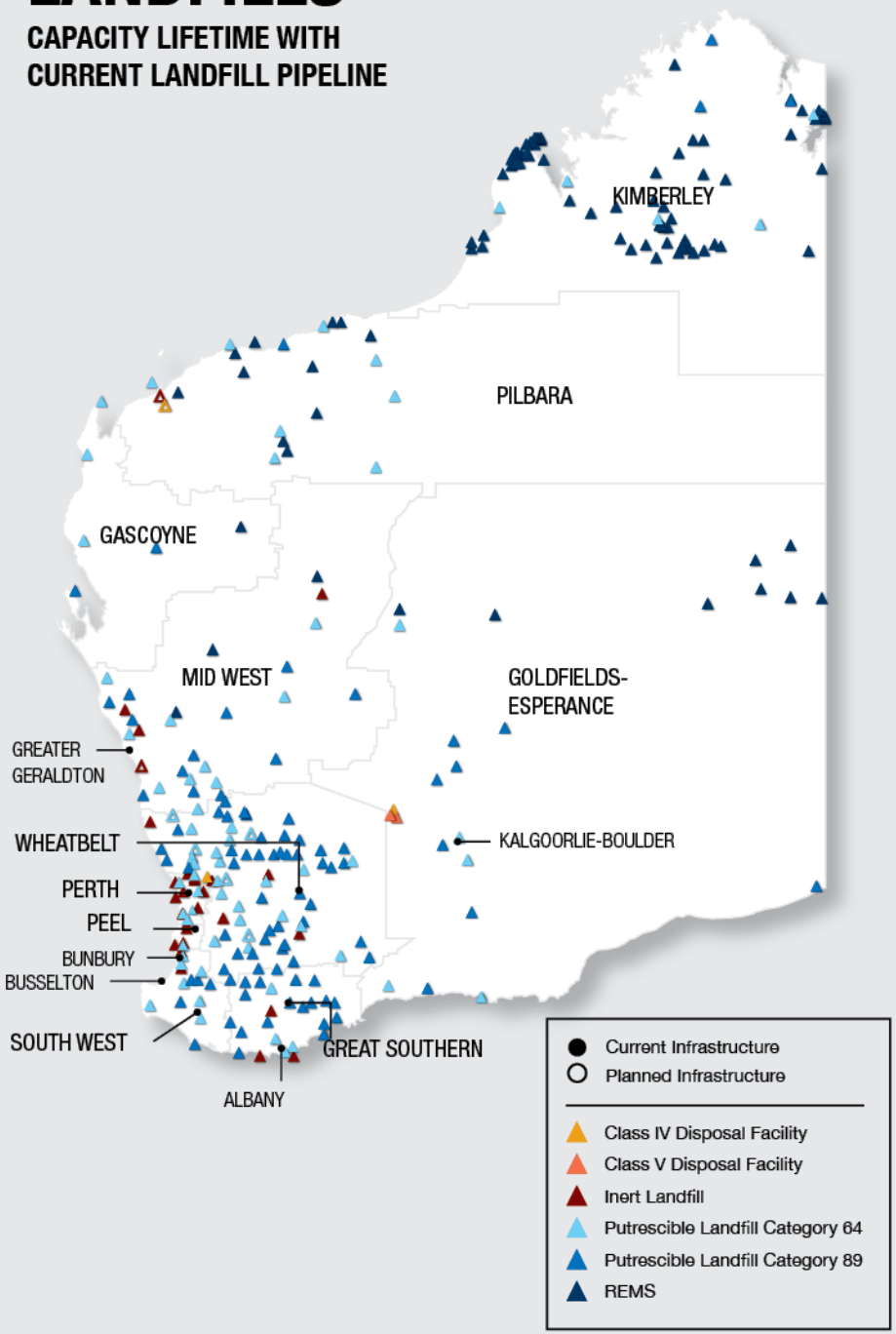


Figure 17 Capacity remaining by landfill type, showing capacity considered low risk and at risk

CURRENT AND PLANNED INFRASTRUCTRE

LANDFILLS

CAPACITY LIFETIME WITH CURRENT LANDFILL PIPELINE



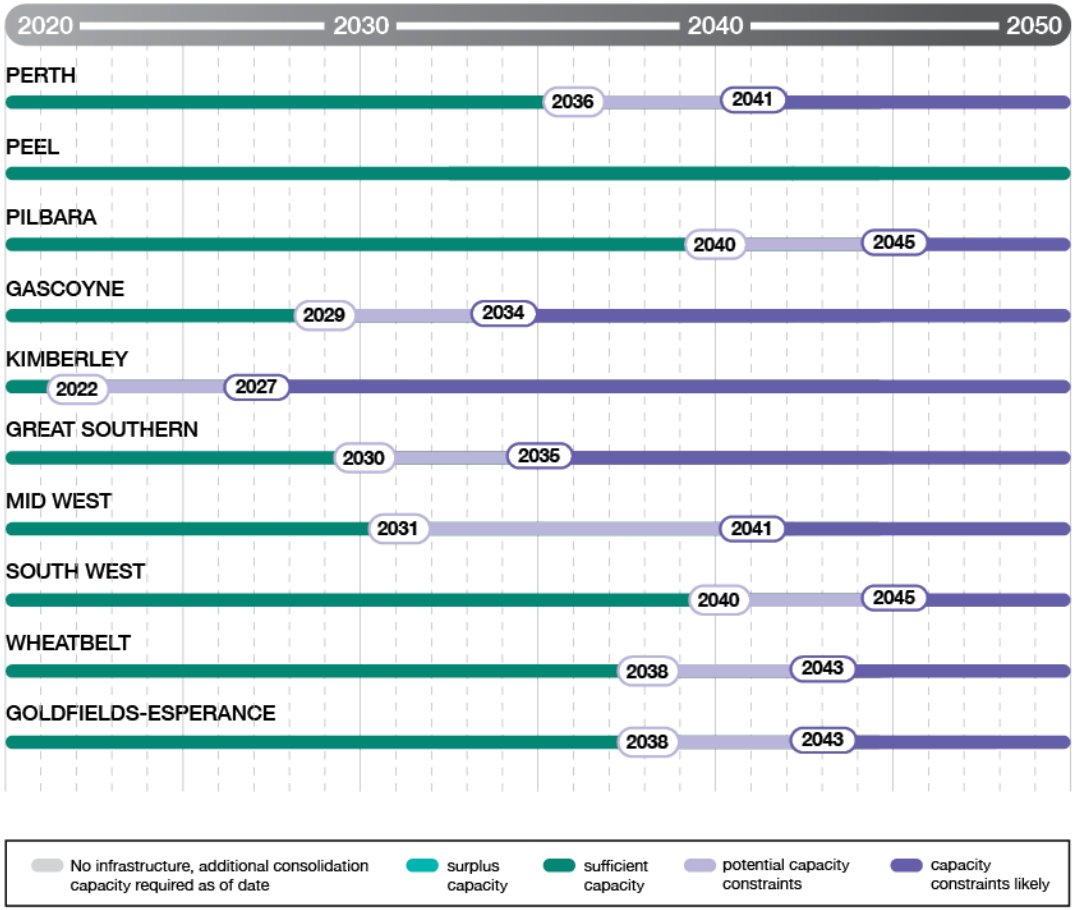


Figure 18 REMS, class IV, class V, putrescible and inert landfill locations and lifetime capacities

The department commissioned ASK Waste Management to conduct a geographic information system (GIS) siting analysis of landfills in Western Australia to provide a high-level indication of the siting of landfills relative to sensitive receptors. The basis for the GIS siting analysis was the list of datasets provided in Appendix 1 of the *Guideline: Environmental siting*.

Several additional datasets were included in the analysis, including local planning zones. The geoprocessing tools in ESRI ArcMap were used to identify where the 1 km buffer around a point locating each landfill identified in the waste infrastructure register intersected with each of the GIS datasets.

Most landfills in Western Australia have few or no identified siting issues based on the scope of this analysis. Of the 326 landfills included in the analysis, 135 had no identified siting issues, and another 82 had only one identified siting issue. However, there are several landfills that are sited close to sensitive areas, either an environment protection area or a residential/urban planning zone.

A key limitation to the landfill lifetime projection is the uncertainty about the ability of existing sites to continue to receive the projected volumes in line with their assumed capacity. By removing landfill facilities and capacity with uncertainty, a low-risk approach to landfill capacity lifetimes can be considered.

Emissions from landfills can pollute land and water (surface and ground water) and contribute to global warming. Factors that increase the risk to the viability and future availability of a landfill site include proximity to groundwater and sensitive land use as well as financial capacity to generate revenue to support the cost associated with landfill better practice design, construction and operations (for example, the State's focus on achieving net zero emissions by 2050 may increase pressure on landfills to operate landfill gas abatement measures and divert organics from landfills). Financial capacity may be particularly restricted for small and unlicensed sites, where gate fees are not applied.

The infrastructure plan considered the size of a landfill as well as previously identified environmental and planning issues as indicators to suggest the potential risk of a landfill site and future availability of its capacity.

Environmental Protection Authority Victoria established a national benchmark with the release of its publication, *Better practice environmental management: Siting, design, operation and rehabilitation of landfills*. In 2017, it released further guidelines for operators on the siting, design, operation, rehabilitation and aftercare of landfills exempt from licensing. This latter guideline addressed the unacceptable environmental and public health risk that unlicensed facilities could present and updated the exemption criteria for municipal landfill facilities occupied by a municipal council and serving less than 500 people. Compliance with higher standard engineering construction requirements and increased operating costs impacted the viability of many regional and rural landfills.

For the infrastructure plan, the following two criteria were used to identify and exclude landfill sites and capacity deemed at risk:

1. The *Western Australia Landfill Siting GIS Analysis* (ASK Waste Management unpublished) report identifies the landfill as being at risk. The potential environmental and social risk as it is situated within 1 km of sensitive land use planning and environmental considerations and/or poses a heightened environmental or public health risk (e.g. limited depth to ground water).
2. The facility was a Category 89 registered landfill or a REMS landfill.

The capacity of facilities that met these two criteria were removed from the assessment for the low-risk approach to landfill capacity. The alternative low-risk or conservative projection of landfill capacity, whereby this uncertainty is taken into consideration, is presented in Figure 19. This is not intended to be a detailed risk assessment of landfills in Western Australia, but an indication of regions where the longevity of landfill capacity may be at higher risk.

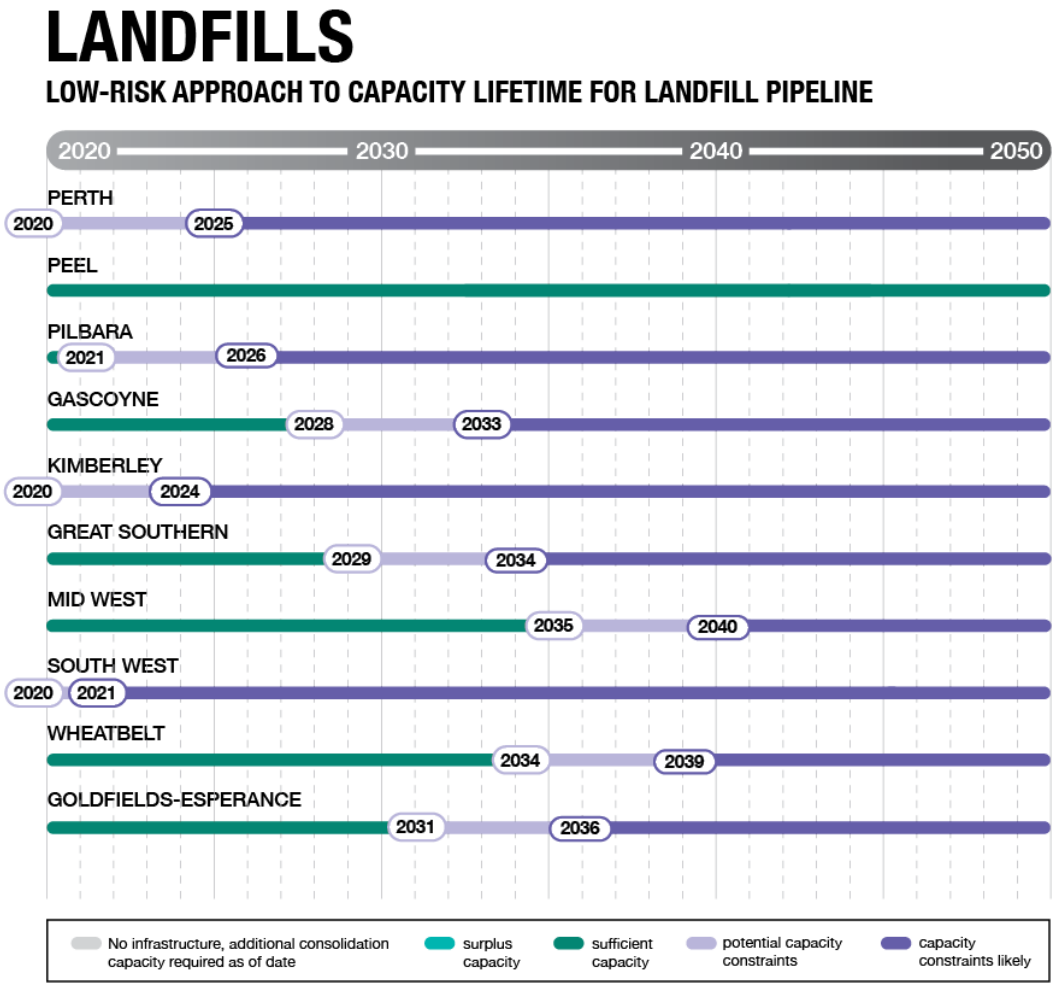


Figure 19 Low-risk approach to capacity lifetime for landfill pipeline in Western Australia

The low-risk approach aims to mitigate the risks of the standard landfill lifetime projection by removing sites identified as likely to be affected by the limitations above. This means more regions are likely to face capacity constraints by 2030, with a total of 37,457,000 tonnes across 144 landfill sites identified as at risk. About 70 per cent (107) of the at-risk sites are putrescible landfill.

In particular, the low-risk approach identifies potential capacity constraints in Perth and the South West. In the short term the surplus capacity forecast for the Peel region may be able to provide contingency capacity for these regions. Similarly, landfill capacity in the Kimberley is identified as being constrained in the short term, and contingency arrangements may be required while planning for additional landfill capacity in the Shire of Broome, near the region's major source of waste generation, and considering local constraints. Further detail is provided in the Regional summaries section.

Projections for 2050

Western Australia is predicted to almost double in population, from 2.7 million in 2020, to 4.2 million in 2050. The rise in population suggests a significant rise in waste generation, even if waste avoidance targets are met. In 2050, it is projected that Western Australia will generate 7.89 million tonnes of waste if the waste strategy targets are achieved in 2030, and these rates of generation and recovery are continued to 2050 (Figure 20 and Figure 21).

As shown in Figure 20, to treat 7.89 million tonnes of waste, infrastructure will be required to landfill just over 1 million tonnes, apply energy recovery to 942,200 tonnes, and recover the remaining 5.918 million tonnes of material.

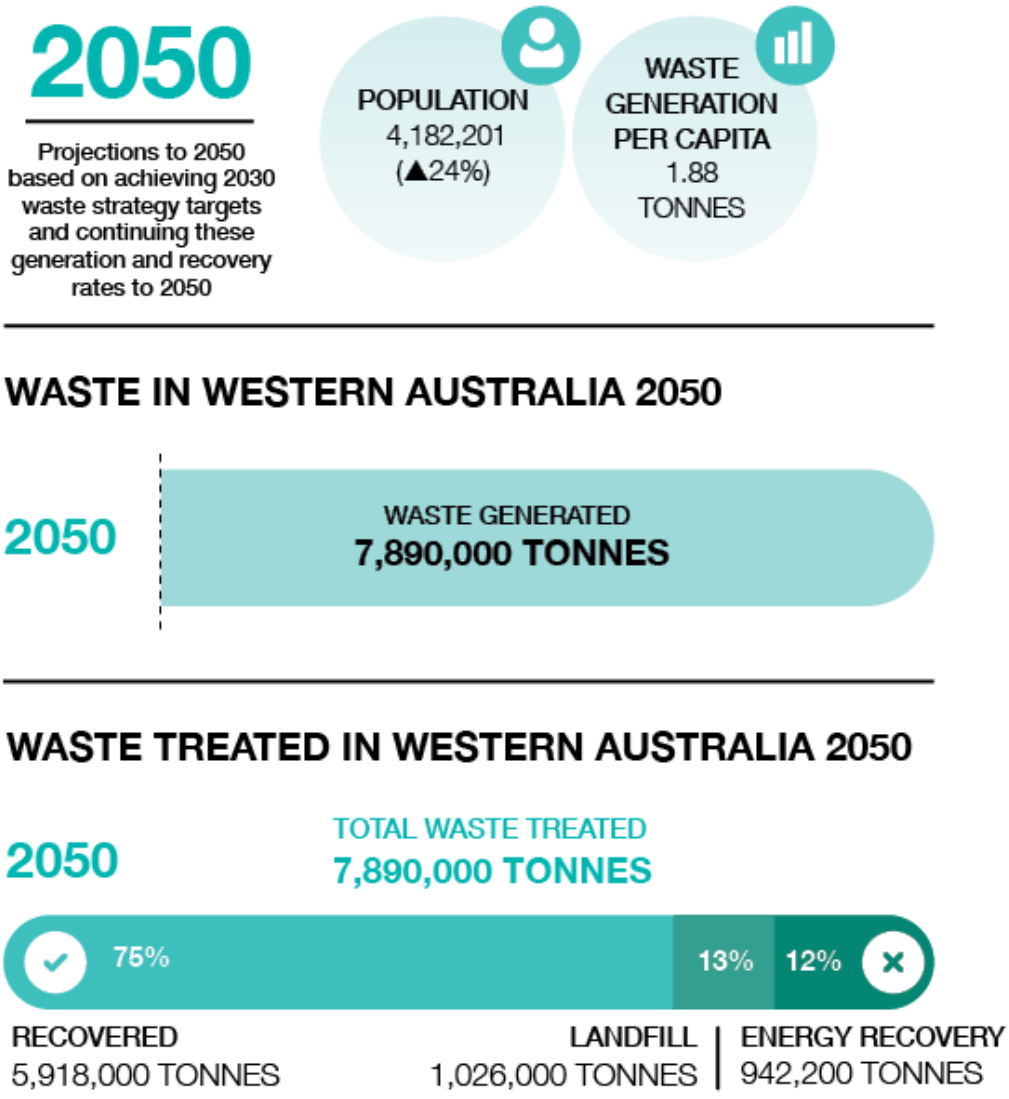


Figure 20 Western Australia project waste generation, recovery and landfill in 2050

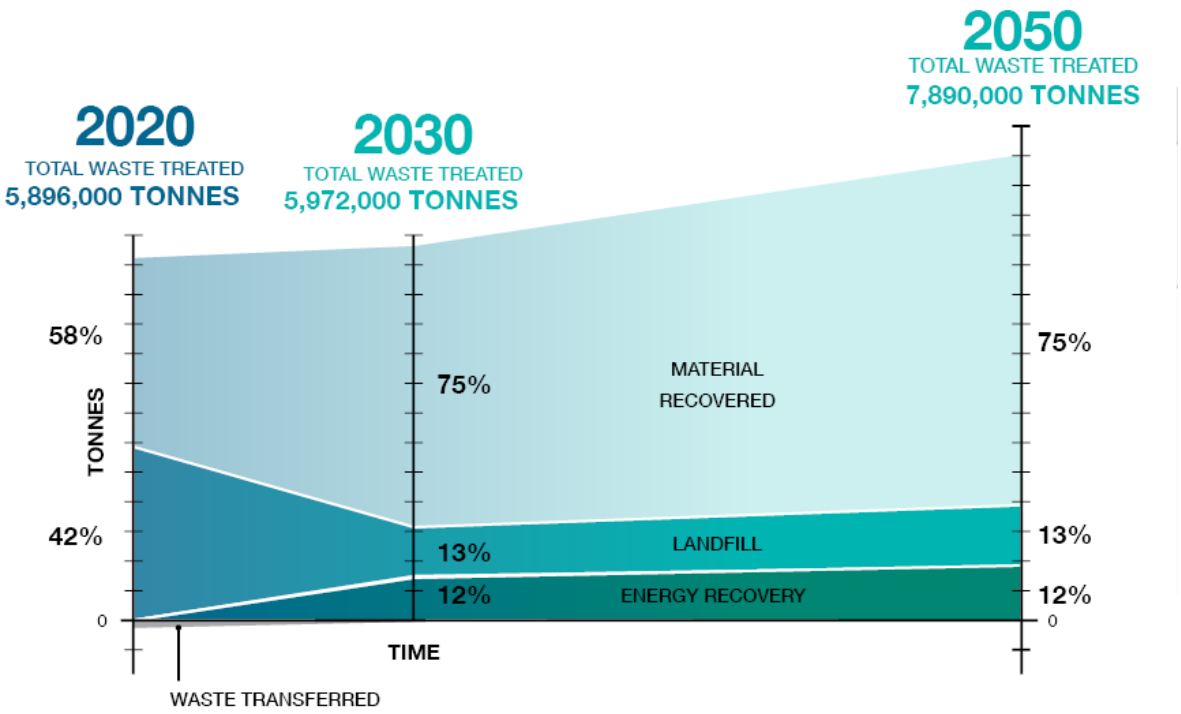


Figure 21 Waste treatment for Western Australia in 2020, 2030 and 2050

Macro trends

Between now and 2050 there may be major shifts affecting waste infrastructure requirements. Anticipated macro trends and how they could affect the economy, society, environmental performance, and the climate in Western Australia with respect to waste management infrastructure, are outlined in Table 13.

Table 13 Macro trends expected to impact waste generation and treatment options in the future

Macro trend	Sub-trend	Effect on waste and resource recovery
Urbanisation	• Significant changes in the way communities live and operate – new major metropolitan centres and urban infill • Shrinking household size	• Increased waste concentration in urban centres • Collection and waste management systems need to be designed for larger urban populations • Need to plan for multi-unit dwelling collection and increased density of generation • Siting of processing facilities need to consider urban needs and constraints • Brown field development and contaminated soils
Changes to energy model	• Electric vehicles • Household and commercial solar and battery storage • Commercial solar and battery storage • Increased generation from renewables • Waste-to-energy • Development of State Bioeconomy Strategy – growth of bioenergy and bio-product industries including biofuels manufactured from waste	• Repurposing of end-of-life electric vehicle batteries e.g. as household battery storage • End-of-life processing of batteries from electrical vehicles, household and commercial installations • End-of-life processing of: – renewable energy infrastructure and equipment; for example, solar panels from household and commercial installations, retired windfarm turbines, etc. – non-renewable energy infrastructure and equipment; for example, demolition of coal fired power stations, decommissioning of oil and gas platforms • Economic incentives to generate power from waste • Increased use of waste as feedstock in energy generation and fuel production • New technologies reducing economies of scale for waste-to-energy and biofuel facilities (e.g. pyrolysis for biofuel production)
Changes in consumer behaviour and social changes	• Increased environmental awareness and consumer pressure to reuse/repurpose • Small businesses growth • Changing material consumption patterns,	• Consumer shift from reliance on convenient and challenging materials (e.g. mixed soft plastics) • Adoption of new stewardship schemes • Increased use of CDS drop-off points • Opportunities for businesses to promote the circular economy

Macro trend	Sub-trend	Effect on waste and resource recovery
	including transitions to new technologies	• High number of smaller businesses spread across the regions may result in dispersion of small generators • Increase in uptake of product stewardship, better product design, etc. by companies that are expected to contribute to the circular economy by reducing waste generation and increasing recycling
Changes in technology	• Robotics/autonomous vehicles • Increase in biopolymers	• High volume of e-waste/batteries and new materials • Biodegradable materials need to be considered for processing • Presence of biopolymers may affect reprocessing
Water	• Scarcity • Recycling	• Water recycling becomes critical • Reduced reliance on fresh water sources and increased need for resource recovery facilities to recycle and reuse their wastewater • Controlled liquid waste and sewage treatment included in further iterations of the infrastructure plan
Western Australia economic activity	• Circular economy • Mining waste • New and different classes of infrastructure • Western Australia growth of primary industries • Growth in healthcare • Investors seeking low-emission projects or requiring strong Environmental Social Governance as part of their decision-making	• Western Australia developing its minerals industry to meet battery materials demand • Increase in primary industry provides more offtake arrangements for compost arising from the treatment of FOGO, which may increase competition for traditional chemical fertilisers • Increase in healthcare activities increases clinical waste volumes in all regions • Mining waste generation increases as new projects are developed requiring management consistent with waste strategy principles
Climate change	• Climate impacts e.g. extreme weather events	• Climate change will increase the frequency of extreme weather events and their severity, resulting in: – an increased amount of waste arising from natural disasters – impacted access to waste infrastructure

Macro trend	Sub-trend	Effect on waste and resource recovery
		– damage to waste infrastructure, resulting in costly repairs and disruption of service • Increased infrastructure development costs, including the cost of building and maintaining waste and resource recovery infrastructure because of increased energy and material needs, more frequent repairs, and increased maintenance requirements • Changing composition of waste and need for separated materials based on the carbon emissions footprint (e.g. organics and textiles), which could require new types of waste and resource recovery infrastructure • Increased need for contingency planning and management of waste generated by events such as floods and fire
Environmental changes	• Positive uptake of the waste strategy by communities, businesses and industries	• Less organic material in landfills reduces the generation of greenhouse gas emissions • Reduced reliance on virgin materials
Regional communities	• Change in communities, • Aggregation of regional townships	• Changes in waste generation patterns • Changes will require consolidation of regional services
Legislative/ regulatory changes	• Foreseeable legislative changes (problematic waste materials) • Product stewardship schemes • Carbon pricing mechanisms • Changing landfill practices • Changes to social licence	• Carbon pricing mechanisms results in businesses and individuals investing in more efficient waste management infrastructure by increasing the cost of carbon-intensive activities; this leads to development of more efficient and sustainable waste management infrastructure • Encouragement of investment in resource recovery technologies, such as composting, anaerobic digestion, and waste-to-energy systems; this could lead to improved resource recovery rates and reduced greenhouse gas emissions • Incentivise reduced waste generation by encouraging businesses and individuals to reduce their carbon footprint

Macro trend	Sub-trend	Effect on waste and resource recovery
		• Increased participation of and regulation on businesses producing waste materials under product stewardship schemes • Development of disassembly industry • Significant reduction of landfill volume may require closure/caretaking/ development of other options
Macroeconomic trends	• Lending abilities • Financial markets	• Risk profile of waste projects may change depending on market conditions requiring the development/implementation of instruments where the market is not responsive

Emergence of new waste streams

As described in the macro trends in the previous section, certain trends will introduce new materials that will require novel treatment processes for which factors – such as the technology used, processing costs, markets for recovered materials, safety and regulatory framework – may be less mature. Emerging waste streams include e-waste, electric vehicles, solar panels and other new technologies.

E-waste is one of the fastest-growing waste streams in Australia. Its growing volume represents huge resource recovery opportunities for Australia.

Western Australia's proposed ban on e-waste disposal to landfill is being delivered by the State Government and seeks to divert materials and unwanted/damaged products away from landfill where they pose a fire risk and loss of resources. The ban is also expected to create local jobs, attract local investment and drive circular economy objectives. Proposed laws see the ban starting on 1 July 2024.

A broad range of items covered under product stewardship schemes or with waste management pathways alternative to landfill are included in the initial bans. Examples are televisions, screens, mobile phones, medical equipment, computers, lighting and lamps. Future phases of the ban are expected to capture small household items and photovoltaic systems.

Business and e-waste service providers will have obligations to manage e-waste responsibly under the proposed laws. The obligations focus on source separation, storage time limits, care with transport and treatment as well as prohibition from sending or leaving e-waste at landfill for disposal. Recordkeeping and reporting provisions are in place and will help to measure and evaluate effectiveness. Infrastructure grants will help industry by offsetting some costs to collect and process e-waste in the state.

Households in the community are not obligated under the ban; however, Western Australians will be encouraged to participate through stakeholder partnerships, communications and community education campaigns.

Western Australian households are rapidly taking up the use of photovoltaic cells and battery systems, with the number of photovoltaic cells in operation increasing by about 17 per cent each year, and the total number of photovoltaic cells having increased more than 12 times

since 2016. Additionally, batteries in operation to support these systems have increased by 92 per cent each year, with more than eight times the number of batteries than in 2016 currently operational (Clean Energy Regulator 2022). Photovoltaic cells and supporting battery systems are an emerging waste trend for Western Australia, with a lifetime of about 10–15 years. As such, the need for capacity for the recovery of this waste stream will increase.

Table 14 provides preliminary estimates of capacity needs in 2030, 2040 and 2050.

The state has developed a battery strategy that considers the recycling of the material (See Future Battery Industry Strategy Western Australia issued by the Department of Jobs, Tourism, Science and Innovation WA).

Table 14 Waste streams and projected volumes

Waste stream	Origin	Assumptions	Projected volume 2030	Projected volume 2040	Projected volume 2050
Batteries	Electric vehicles	Battery lifespan of 10 years, based on projected number of electric vehicles for Western Australia (based on population)	36,000 tonnes	128,000 tonnes	1,314,000 tonnes
Photovoltaic waste	Solar panels	Solar panels lifespan of 15 years, based on projected rooftop solar panels energy production in Western Australia	149,000 tonnes	188,000 tonnes	331,000 tonnes

More than 250 major renewable energy generation projects are expected to be operating in Western Australia by 2050 for a total of renewable energy generation capacity that will exceed 126,000 megawatts (Australian Energy Market Operator 2022).

The construction of these projects and the demolition of retired facilities and technologies such as batteries, wind turbines or solar panels reaching end of life, will generate a range of different waste types that will need to be managed. Further infrastructure and capacity needs analyses would be considered as areas of future investigation.

Pillars supporting the infrastructure plan

Six pillars support the infrastructure plan, enabling and influencing the prioritisation, focus and delivery of initiatives related to this plan. The pillars are interconnected and impact each other.

Strategies, policies and legislation

The State and Australian governments develop strategies, policies and legislation to tackle waste and resource recovery challenges.

Land use planning

Although recognised as an essential service, waste and resource recovery infrastructure requires additional focus and long-term considerations.

Product stewardship

Product stewardship programs are in place for several difficult to manage waste. Currently there are 99 active schemes.

Government procurement

GOVERNMENT OF WESTERN AUSTRALIA

State and local governments are major procurers of services and products. State and local government procurement plays an important role in setting standards, rewarding good operators, driving demand and creating market certainty.

Waste levy and bans

Waste levies send an important signal to the market which drives landfill diversion and creates revenue/funding for future investments and programs. Landfill bans serve to tackle problematic wastes/ materials that may be better managed through other channels.

Climate and carbon

The *Western Australian Climate Policy* sets out the State Government's plan for a climate-resilient community and a prosperous low-carbon future. Reducing waste to landfill and increasing resource recovery supports the objectives of this plan.

Strategies, policies and legislation

The State Government's suite of policy, legislation and guidance drives landfill diversion and resource recovery. These directions support and link to the infrastructure plan which in turn supports the objectives of the waste strategy.

The infrastructure plan also recognises and considers Australian Government policies, legislation and priorities. Table 15 identifies relevant policies and programs at state and national level that link to or support the infrastructure plan.

Table 15 Policy and legislation supporting the infrastructure plan

Waste and environmental policy and legislation	Planning policy and legislation	Infrastructure and legislation	National policy and legislation
Considerations for the infrastructure plan*:*			
Western Australia has a comprehensive suite of policy, legislation and guidance to support landfill diversion and resource recovery.	The relevant agencies' policies and programs promote and acknowledge the opportunities for industry ecology and the factors influencing the establishment of facilities.	*Foundations for a Stronger Tomorrow State Infrastructure Strategy* aligns with the waste strategy, including the acknowledgement of waste infrastructure. Essential infrastructure and major project development is a major producer and consumer of waste and secondary resources (e.g. through the use of recycled products instead of virgin excavated materials).	In recent years, the Australian Government has increased policy, legislation and regulation related to waste. There are now various commitments related to waste, recycling and circular economy.
Key strategy, policy, legislation and guides:			
• *Environmental Protection Act 1987* and Environmental Protection Regulations 1987 • *Waste Avoidance and Resource Recovery Act 2007* and Waste	• *State Planning Strategy 2050* • *Planning and Development Act 2005* • Planning and Development (Local Planning Schemes) Regulations 2015	• *Foundations for a Stronger Tomorrow State Infrastructure Strategy*	• *National Waste Policy* • *National Waste Policy Action Plan* • Recycling Modernisation Fund • National Partnership on

Waste and environmental policy and legislation	Planning policy and legislation	Infrastructure and legislation	National policy and legislation
Avoidance and Resource Recovery Regulations 2008 • *Waste Avoidance and Resource Recovery Levy Act 2007* and Waste Avoidance and Resource Recovery Levy Regulations 2008 • Waste Avoidance and Resource Recovery Regulations (Container Deposit Scheme) 2019 • *Western Australian Climate Policy* • *Waste Avoidance and Resource Recovery Strategy 2030* • *Waste Authority business and action plan 2023-24* • *Better practice FOGO kerbside collection guidelines* • *Guidelines for local government vergeside and drop-off services: Better practice principles* • *Source Separation of*	• *State Planning Policy 4.1 Industrial Interface* • *State Planning Policy 2.5 Rural Planning*		recycling infrastructure • Modern Manufacturing Initiative • Waste Export Bans • Product stewardship • National waste reports • *National Food waste strategy* • Food Waste for Healthy Soils • *Opportunities to increase organic waste recovery* • *Review of Regulations and Standards for Recycled Organics in Australia* • Clean Energy Finance Corporation

Waste and environmental policy and legislation	Planning policy and legislation	Infrastructure and legislation	National policy and legislation
Waste – Position Statement • *Position statement on waste to energy* • *Plan for Plastics – Fast Tracked* • *Better practice FOGO kerbside collection guidelines* • *Guideline: Better practice organics recycling*			

Since 2017, the department has been progressing legislative reform projects to improve waste management in Western Australia, including:

- *Closing the loop: Waste reforms for a circular economy*
- Waste not, want not: Valuing waste as a resource – proposed legislative framework for waste-derived materials
- review of the waste levy
- statutory review of the *Waste Avoidance and Resource Recovery Act 2007*.

These projects have led to the development of a suite of legislative amendments to strengthen the waste legislative framework. The legislative reforms will support the implementation of key targets in the waste strategy and Western Australia's transition towards a sustainable, low-waste circular economy.

In 2022, the department commenced the development of a proposed legislative framework known as the Recovered Materials Framework. The proposed regulatory framework would facilitate the use of materials derived from waste in various applications through the issuing of a recovered materials approval.

Setting standards for recovered materials is expected to provide industry and consumers confidence in the quality and safety of recovered materials. It will also provide assurance and direction for industry to stimulate innovation and research into materials, development of markets, and investment in processing infrastructure.

Work on the legislative framework, standards, system and applications is being progressed, and the project aims to have a Recovered Materials Bill and early-stage guidance for use of the framework by mid-2025. Extensive stakeholder consultation with government, industry and other groups will occur during development to ensure the most practical and effective framework is produced while ensuring the environment is protected.

Land use planning

Headline strategy 6 of the *Waste Authority business and action plan 2023–24* acknowledges the crucial role of land use planning in meeting reuse targets and delivering the infrastructure for a circular economy.

The waste strategy supports meeting better practice standards while exploring options to improve state planning for infrastructure, including the development of planning instruments and guidelines, and investigation of a needs-based approach in consultation with the Department of Planning, Lands and Heritage.

The consultation on the infrastructure plan has shown a desire for better industry assistance in securing approvals for waste-related infrastructure, especially when new technologies are being proposed.

The specific state frameworks and/or plans considered by the infrastructure plan include the:

- *State Planning Strategy 2050* (WAPC 2014)
- *Planning and Development Act 2005* and Planning and Development (Local Planning Schemes) Regulations 2015
- *State Planning Policy 4.1 Industrial Interface*

The *State Planning Strategy 2050* proposes an integrated approach to waste management, favouring the co-location of waste producers and reprocessors, and includes strategic considerations, as listed in Table 16, which have been adopted to inform the land use planning priorities in the infrastructure plan.

Infrastructure Australia is Australia's independent infrastructure adviser. A recent analysis of systemic, sectoral and project risks for infrastructure delivery with detailed consideration of 12 critical risks to upcoming infrastructure projects.

Table 16 Strategic considerations for waste infrastructure planning, State Planning Strategy 2050

Strategic site considerations
Access to feedstock and end markets (including transport linkages roads, rail, airports and ports)
Growth in scale to service a growing population
Accommodation of new processes and changes in technologies
Co-location of complementary waste and reprocessing facilities
Social licence to operate – locations with adequate buffers that can be maintained over time impeding, encroachment by other activities, being residential development or other
Avoiding environmentally and culturally sensitive areas

In the *Infrastructure Market Capacity* report (Infrastructure Australia 2022) risks for all infrastructure projects were analysed. The report included a section focused on waste infrastructure, identifying four main risks:

- inadequate infrastructure development coordination
- community concerns delaying planning approvals
- security and scale of supply for waste-to-energy projects
- low levels of market and regulatory readiness.

The report recognises, as a positive development, that the two largest waste projects (waste-to-energy) in Australia are being developed in Western Australia but also identifies common risks impacting infrastructure project timelines, approvals and community acceptance.

> "Unclear planning and regulations, alongside a lack of community support is creating uncertainty within the waste sector which is driving risks" – Infrastructure Australia

The need for community involvement and cooperation around waste and resource recovery services and infrastructure is still being understood in Australia. Communities in Australia can influence how an industrial sector is regulated, including how planning and other approvals are managed by relevant agencies.

Given the possible community sensitivities posed by the development of some waste infrastructure, developers and operators need to better understand their roles in community engagement, including through the education of the critical role the waste sector plays in communities and in the economy.

Research by CSIRO (McCrea et at. 2016) identifies key drivers that impact (build or erode) public trust and acceptance for waste and resource recovery facilities. Appropriate consideration of the key drivers that impact community acceptance can support proponents of existing or new facilities. Failure to appropriately consider relevant stakeholders will impact project timeframes and, in some cases, project viability.

Most of the state's resource recovery infrastructure is currently concentrated in Perth, as the region is the largest waste generator, and its resource recovery facilities can benefit from economies of scale and support outer lying regions. The infrastructure plan considers that the trend of waste and material consolidation and transport to Perth (or other larger regional centres) will continue, in response to major urban and commercial growth centres, and adopts a concept of critical mass for the viability predicating the establishment of new facilities within a region.

Although consolidation of waste volumes, proximity to developed markets, and synergies with existing waste infrastructure are enablers of infrastructure development, this makes development in regional areas less advantageous and affects waste management costs in smaller communities. Future additional capacity could potentially be managed by a larger number of smaller distributed facilities or by fewer major facilities – both options have pros and cons, and different arrangements will suit different locations. Consideration of these options is provided in more detail in the Regional summaries section.

Small-scale landfills (which fall below the minimum capacity required for licensing) are currently spread across many regions. This can impede implementation of better practice or

improved economic, cultural, environmental and public health outcomes. This is because of the relatively high cost per tonne for management and often a reduced ability to structure gate fees to cover all management costs. The infrastructure plan considers existing site planning constraints, viability and risk associated with smaller landfills. Opportunities to consolidate these landfills to realise more viable regional and cross-regional solutions are discussed further in the Landfill capacity lifetime assessment to 2030 and 2050 section and the Regional summaries section.

Another key consideration, beyond individual facility size and distribution, is the development of waste processing in designated strategic industrial areas. These strategic industrial areas are designed for heavy or strategic industrial activities and include industries which generate significant investment, employment and value for the state. They are found in the Perth, Pilbara, Mid West, South West, Goldfields-Esperance and Great Southern regions. As these areas are selected based on proximity to large resource projects and require infrastructure such as roads or ports, waste management should also be a consideration. As an example, the two waste-to-energy facilities under development in Perth are both in the Kwinana Strategic Industrial Area in southern Perth (there are no strategic industrial areas in northern Perth, which potentially inhibits the development of these kinds of facilities in this area).

Another important planning option to facilitate waste infrastructure development is the creation of waste precincts. These are areas designed for the co-location of waste facilities and offer several economic, social and innovation opportunities (Australian Government 2019). Many existing precincts have emerged organically because of market economics associated with concentration of lower cost industrial land close to waste generators and/or offtake markets. Precincts may also be planned and designed to comprise a concentration of multiple waste and reprocessing activities and could offer significant benefits:

- cross-synergies between processors, where one’s output becomes another’s input, including power generation from waste used in other processes, wastewater recycled for process water, etc.
- optimisation of logistics by consolidating waste materials for collection, transportation and storage
- specialisation of the labour force by developing a skilled workforce in the area
- driving innovation and local partnerships
- bringing together shared values and shared benefits to the local communities that house them
- generation of auxiliary or secondary industries such as mechanical and electrical contractors, transportation, maintenance, etc.
- centralisation of common services such as wastewater treatment and power.

An example of a waste precinct in Western Australia is the Dardanup Waste Precinct, which includes several facilities including liquid waste treatment, composting and landfill. Northern Perth lacks a strategic industrial area, so may benefit from the designation of a waste precinct to support further development of waste infrastructure in this area.

Where a need for additional waste facilities has been identified within the infrastructure plan, planning is needed to ensure availability of suitably zoned land and other supporting infrastructure including power, wastewater and road.

The infrastructure plan considers the availability of appropriate land arising from analysis undertaken in the *State Waste Infrastructure Needs Analysis* (Talis unpublished) and identifies where this challenge needs to be addressed as a priority within each regional assessment.

Product stewardship

Product stewardship, and similar approaches such as extended producer responsibility, aim to manage materials and products at their end-of-life to maximise recovery and minimise impacts from those wastes. These approaches seek to give effect to the principles of shared responsibility and 'polluter pays' by ensuring the responsibility for collection, transportation and management of end-of-life products (post-use) shifts away from communities and governments towards manufacturers, distributors and consumers of products.

Product stewardship acknowledges those involved in designing, manufacturing, selling and consuming products have a responsibility to ensure those products or materials are managed in a way that reduces their environmental and human health impacts, throughout the life cycle (or whole of life) and across the supply chain.

Through a life-cycle approach, product stewardship aims to reduce waste generation through the better design and manufacture of products, including the use of materials that are easier to recover, reuse and recycle, along with – in many cases – the use of targeted systems for the collection of those products. Major product stewardship schemes in Australia include:

- Battery Stewardship Council's **B-Cycle (Battery Stewardship Scheme)**
- Australian Mobile Telecommunications Association's **Mobile Muster**
- Australian Packaging Covenant Organisation's **National Environment Protection Measures**
- Tyre Stewardship Australia's **Tyre Product Stewardship Scheme**

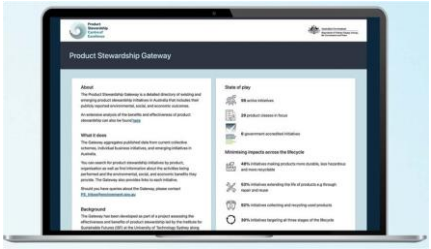
Work is also underway on the development of a national e-stewardship scheme that includes solar panels.

Many product stewardship programs require collection points and a distributed network that maximises collection in a cost-effective way. There are many opportunities for co-location with existing and new infrastructure. Important considerations include ensuring access for remote communities, opportunities for employment and compliance with scheme requirements.

Product Stewardship Centre of Excellence

The Product Stewardship Centre of Excellence

The Product Stewardship Centre of Excellence was established in December 2020 by a consortium of UTS Institute for Sustainable Futures, the Australian Industry Group, and Cox Inall dentsu in partnership with the Australian Government through the Department of Climate Change, Energy, the Environment and Water. It was established with the assistance of a grant through the National Product Stewardship Investment Fund.



Product Stewardship Gateway

The Product Stewardship Gateway is a detailed directory of existing and emerging product stewardship initiatives in Australia that includes their publicly reported environmental, social and economic outcomes.

The Gateway aggregates published data from current collective schemes, individual business initiatives and emerging initiatives in Australia.

The Gateway has been developed as part of a project assessing the effectiveness and benefits of product stewardship.

Approaches in other jurisdictions includes subsidies and cost benefit opportunities for existing facilities that may house drop-off points. Although some schemes will have awareness of product flows through each state, further work may need to be carried out to understand the opportunities for Western Australia. It is likely larger urban and industrial centres would have appropriate volumes for collection/drop-off for some schemes.

These programs are important contributors to the development of a circular economy and must be considered when planning for infrastructure as they can be the most effective driver of waste consolidation and reduction in illegal dumping and landfill disposal of recyclable items.

Government procurement

State and local governments can actively promote a circular economy and related infrastructure development through procurement. The significant expenditure by these levels of government can have a substantial impact on the market when used to achieve specific goals.

This support can take various forms, including spending on products and services that promote a circular economy, making direct investments in resource recovery infrastructure, or offering incentives such as tax credits or subsidies to companies that invest in the desired infrastructure. Such financial support can stimulate the expansion of the circular economy and encourage investment in the essential supporting infrastructure.

The legislative and policy frameworks for these two levels of government are distinct, which means that different approaches may be required to effectively utilise local government and State Government spending to support better infrastructure and circular economy outcomes.

The *Waste Authority Business and Action Plan 2023–24* set outs a range of procurement practices and actions under headline strategy 3: “Implement sustainable government procurement practices that encourage greater use of recycled products and support local market development.”

A priority action of the action plan, and an example of the State Government facilitating the use of recycled C&D products, is the Roads to Reuse program which encourages State Government organisations, local governments, regional councils and the private sector to use recycled C&D products in civil applications, such as road construction.

Waste levy and bans

The *Waste Avoidance and Resource Recovery Levy Act 2007* and the Waste Avoidance and Resource Recovery Levy Regulations 2008 provide for a levy (waste levy) to be paid in respect to waste received at licensed landfills in the metropolitan region and waste collected within the Perth metropolitan region that is received at licensed landfills outside of the metropolitan region.

The waste levy plays a key role in achieving the objectives of the waste strategy by providing a disincentive to dispose of waste to landfill and by generating revenue to fund programs which support the waste strategy.

The waste levy increases the gate fee price of landfill disposal, and thus increases the economic viability of resource recovery facilities. Similarly, increased standards for landfill facilities, such as applying better practice, also increase the costs associated with operating a landfill and supporting the economic viability of resource recovery.

The recent waste levy increases in the state have been found to have a greater impact on the recovery of materials sourced from the C&D sector (DCCEWW 2022) compared with

putrescible waste. This is most likely in part because of the dense nature of the C&D materials, the lower cost to separate and recover, and more readily available markets for major components within the C&D stream. The same effect from the inert waste levy has not yet been observed with putrescible wastes, particularly in those generated by the municipal waste sector. There are significant additional economic hurdles to overcome with respect to the cost of source separated collection, more complex and costly recovery processes to implement and greater barriers with respect to accessing markets for end products.

In other jurisdictions there has been a trend to apply higher levy rates to further incentivise resource recovery, as well as differentiated waste levy rates for metropolitan versus regional waste and disposal facilities.

In addition to economic incentives, additional steps may also be taken by governments to manage risks or issues posed by hazardous, problematic and, in some cases, valuable materials and products. Landfill bans may relate to:

- environmental considerations
- safety or fire risk (including worker safety)
- community concerns
- market regulation.

E-waste is one of the fastest-growing waste streams in Australia. Its growing volume represents huge resource recovery opportunities for Australia and Western Australia's recent consultation on a its proposed ban on e-waste disposal to landfill. This proposed ban seeks to divert materials and unwanted/damaged products away from landfill where they pose a fire risk and loss of resources. This is expected to create local jobs, attract local investment and drive circular economy objectives. On 9 August 2019, at the Council of Australian Governments' meeting, state and territory leaders agreed to establish a timetable to ban the export of waste plastic, paper, glass and tyres, to support increased recycling capacity in Australia and a transition to a national circular economy. The implementation of these bans has created a need for additional infrastructure to process the materials at locations and at a scale where it is economically viable to do so.

On 8 September 2021, the State Government announced that logging in native forests would be banned from January 2024, conserving an estimated 2 million hectares of native forest. The ban's implementation is expected to impact both the volume and composition of feedstock at organics recovery facilities, particularly in the South West and Great Southern regions. Organics recovery facilities may seek alternative sourcing options or re-examine current operations.

Net zero emissions by 2050

The *Western Australian Climate Policy* sets out the State Government's plan for a climate-resilient community and a prosperous low-carbon future. The policy underscores the commitment to adapting to climate change and working with all sectors of the economy to achieve net zero greenhouse gas emissions by 2050. The policy also creates a unique opportunity to develop low-carbon jobs and new industries.

The State Government is developing sectoral emissions reduction strategies which will:

- provide robust and credible emissions reduction pathways for Western Australia with tangible actions for reducing emissions consistent with the State Government's target of net zero emissions by 2050

- recognise the importance of significant action this decade to reduce emissions, transition emissions-intensive industries and protect Western Australia's economy from carbon transition risks.

The structure and content of the sectoral emissions reduction strategies will be informed by modelling and analysis and have regard to opportunities for emissions reduction across WA's economic sectors. These include electricity, industry (including resources and manufacturing), transport, buildings, agriculture, waste, and land use.

In 2020 Western Australia reported direct emissions of 1,927 kilotonnes of carbon dioxide equivalent (CO_2-e) from solid waste management activities, which is equivalent to 2 per cent of the state's total greenhouse gas emissions (DCCEWW 2020). Of this, solid waste disposal to landfill contributes 1,666 kt CO_2-e – or 86 per cent – of waste emissions.

Reform in the waste sector has been underway in Western Australia for more than a decade. These reform measures, alongside the recent programs delivered under the waste strategy, have supported emissions reductions in the waste sector and reduced environmental degradation associated with waste generation and disposal. Most emissions reductions in the waste sector can be achieved through the existing pace and extent of waste reforms, particularly for organic solid waste management. Through achieving the waste strategy material recovery and waste reduction targets, there is likely to be a reduction in emissions of 800 kilotonnes of CO_2-e in 2030 from landfill activity and 500 kilotonnes of CO_2-e in 2050 from landfill activity.

Landfill facilities are the most significant source of greenhouse gas emissions within the waste sector. This is the result of the methane emitted from the landfill before the installation of and/or in the absence of landfill gas capture.

Many large landfills capture methane through landfill gas capture systems to either flare the gas or use generators to produce electricity. Landfill gas capture can be as high as 85 per cent in closed and engineered landfills (bioreactors) or as low as 10 per cent in older, small and poorly managed facilities. The Carbon Credits (Carbon Farming Initiative—Source Separated Organic Waste) Methodology Determination 2016 sets out that an average methane emissions capture rate for a landfill in Western Australia is 30 per cent when undertaking calculations relating to the baseline emissions for landfills.

Opportunities to achieving net zero emissions from the waste sector through directly addressing the impact of landfill emissions include:

- reducing the disposal to landfill of waste materials with degradable organic carbon; for example by separating and diverting organics from landfill to organics recovery facilities (avoiding emissions from avoided landfilling)
- utilising waste-to-energy as the preferred alternative to landfill for the treatment of residual waste
- implementing better practice landfill design to achieve a highly efficient gas capture systems (improving landfill gas flaring and recovery).

Opportunities for consideration across the broader waste and resource recovery infrastructure include:

- the use of energy sources, such as landfill gas, solar, wind and waste-to-energy facilities to reduce the carbon footprint of waste and resource recovery processes
- investment in energy-efficient technologies and equipment to help reduce the amount of energy used in waste and resource recovery processes (DCCEWW 2022).

Infrastructure priorities

The waste and resource recovery infrastructure needs to support the waste strategy targets have been identified for each region in the Regional summaries section. Statewide waste and resource recovery infrastructure capacity needs are drawn from this regional analysis. The prioritised infrastructure capacity needs by region are provided in Table 17 below. The statewide summary is given in the Infrastructure capacity needs in 2030 section.

Table 17 Statewide waste and resource recovery infrastructure capacity needs and priorities

Infrastructure types	Additional capacity need (tonnes)	Recovery facility	Consolidation facility	Change to existing facility	Priority
Perth					
Cardboard and paper	291,000	✓			High
FOGO	254,000	✓		✓	High
Material recovery	33,0000	✓			Low
Waste-to-energy	73,000		✓		Low
Peel					
C&D	51,500	✓			Medium
Pilbara					
C&D	38,000	✓		✓	High
Organics	26,000	✓			High
Material recovery	7,000		✓		Medium
Kimberley					
Organics	13,500			✓	High
Scrap metal	3,000		✓		High
C&D	1,000		✓	✓	Medium
South West					
Material recovery	64,000	✓			High
Scrap metal	72,000	✓			High
Rubber/tyre	8,000	✓	✓		Medium
Waste-to-energy	91,500	✓*	✓		Medium
Great Southern					
C&D	16,500		✓		Medium
Scrap metal	7,000		✓		Medium

Infrastructure types	Additional capacity need (tonnes)	Recovery facility	Consolidation facility	Change to existing facility	Priority
Material recovery	5,000		✓		Medium
Mid West					
Material recovery	13,000	✓	✓		High
Scrap metal	7,000		✓		Medium
Gascoyne					
Organics	6,000		✓		Medium
C&D	500		✓		Low
Material recovery	1,000		✓		Low
Scrap metal	500		✓		Low
Wheatbelt					
Material recovery	17,000		✓		Medium
Scrap metal	5,000		✓		Medium
Goldfields-Esperance					
Material recovery	13,500			✓	High
Organics	4,000		✓		Medium
Scrap metal	5,000		✓		Low

Landfill will continue to play a fundamental role in waste and resource recovery activities in Western Australia, with management of residual, specialised or hazardous waste that remains unrecoverable presenting an ongoing need for landfill. Under a low-risk approach to landfill capacity lifetimes, the additional landfill capacities by region are priorities and guidance on options to address the need is provided in Table 18.

Table 18 The year in which additional landfill capacity is needed under a low-risk approach to landfill capacity lifetime and options to address the capacity need

Region	Year additional landfill capacity needed	Develop capacity within region	Develop contingency with adjoining regions	Provide contingency	Priority
Perth	2025		✓		High
Peel	-			✓	High
Pilbara	2026	✓			High
Kimberley	2024	✓			High
South West	2021	✓	✓		High
Great Southern	2034			✓	Low
Mid West	2040			✓	Low
Gascoyne	2033		✓		Medium
Wheatbelt	2039			✓	Low
Goldfields-Esperance	2036	✓			Low

Additional considerations to improve decision-making and support infrastructure development include:

- monitoring critical programs delivering infrastructure capacity such as the Recycling Modernisation Fund and Food Waste for Healthy Soil programs
- improving the quality and access to data that enables business and investment decisions to be made
- development of guidance:
  - with particular focus on industry practices and waste facility siting, design and operation standards
  - community engagement
  - social licence to operate considerations
- targeted waste reduction and recovery interventions, as industries have specific challenges and opportunities that would benefit from a targeted investigation involving relevant industry sector partners
- improving accuracy of data on waste generation, infrastructure and needs in remote Aboriginal communities

Issues, opportunities and priorities to support infrastructure capacity need

In addition to the infrastructure priorities outlined in Table 17, this section outlines other priority activities or considerations of future work to support the development of infrastructure capacity need identified for 2030. A more detailed discussion of these priorities and the principles applied is provided for each region in the Regional summaries section.

The opportunities with highest identified priorities to support the infrastructure capacity need include to:

- investigate contingency planning arrangements for cardboard and paper in Perth
- investigate waste precinct(s) in northern Perth and/or waste precincts throughout the Perth region to facilitate additional facilities
- investigate and facilitate the upgrade of existing organics 67A licensed facilities to accept FOGO in the Peel, Wheatbelt, South West, and Kimberley regions to alleviate neighbouring regions' FOGO recovery capacity need
- investigate the opportunity for 67A licensed facilities to accept FOGO to alleviate capacity need
- investigate transfer opportunities between Perth and adjoining regions to support capacity needs for FOGO
- facilitate appropriate guidelines and a regulatory framework and specification for the recovery and treatment of bottom ash
- assess the opportunity for treatment of residual waste generated in the South West through a waste-to-energy facility
- investigate alternative landfill facility contingency arrangements between the Perth and Peel regions
- assess waste generation and infrastructure needs in Aboriginal communities to ensure adequate access to services
- investigate a rural landfill risk of unlicensed landfill and REMS landfills.

A summary of these additional opportunities to support the infrastructure capacity need, as identified through the Regional summaries section, are listed below in Table 19.

Table 19 Opportunities to consider and support the infrastructure capacity needs

Area	Opportunities to consider and support infrastructure capacity needs	Priority
All facility types	Develop better practice guidelines for waste facility siting, design and operation standards to provide clear guidance on expectations to industry and other relevant stakeholders.	High
	Update site development and environmental approvals process to include whole-of-life risk assessments, compliance with better practice guidelines, and a needs-based approach to minimise the potential risk of environmental, human health and amenity impacts.	High
	Options for more efficient inter-regional waste transfer infrastructure and systems could create opportunities for an improved consolidation network and inter-regional capacity sharing.	High
	Expand the infrastructure plan to be used as a guiding document from which action plans can be developed, such as region-specific plans.	High
	Investigate future iterations of the infrastructure plan to verify the diversion of material from MRFs and update assumed treatment pathways for more accurate modelling of state waste infrastructure capacity and needs. For example, the CDS' impact on MRFs.	Medium
MRFs	Options for precincts in Perth (33,000 tonnes), Bunbury-Busselton (56,000), Geraldton (13,000 tonnes), and Carnarvon (500 tonnes) could facilitate low-risk development of MRFs.	High
	Investigate lifetime and capacity expansions of existing MRFs in the Kimberley, Great Southern and Goldfields-Esperance regions to decrease the risk, capital costs and timeframes required to meet capacity needs.	High
	Better understand inter-regional needs to support the development of new infrastructure to address capacity need for the Pilbara (7,000 tonnes) and Gascoyne (1,000 tonnes) regions.	Medium

Area	Opportunities to consider and support infrastructure capacity needs	Priority
	Better understand sub-regional gaps for material recovery consolidation near transportation networks to improve infrastructure coverage in the Wheatbelt region.	Medium
Cardboard and paper	Improve contingency planning in Perth (291,000 tonnes) to reduce the risk of capacity needs not being met.	High
FOGO	Implementing the *Guideline: Better practice organics recycling* will improve waste strategy Protect target outcomes.	High
	Options for waste precinct(s), particularly in northern Perth to facilitate low-risk development of organics recovery facilities.	High
	Investigate upgrading existing organics facilities in the Perth, Peel and Wheatbelt regions to accept FOGO to decrease the risk, capital costs and timeframes required to meet capacity needs.	High
	Options for more efficient inter-regional waste transfer infrastructure and contingency arrangements could create opportunities to share capacity or feedstocks between the Perth, Peel and South West regions.	High
Organics	Expand on lifetime and capacity of existing organics recovery facilities in the Kimberley and Goldfields-Esperance regions to decrease the risk, capital costs and timeframes required to meet capacity needs.	High
	Options for a waste precinct in Carnarvon could facilitate low-risk development of co-located consolidation or recovery facilities (including 4,000 tonnes of organics recovery).	Medium
	Leverage the mining rehabilitation markets to create opportunities for recovered organic products offtake in the Pilbara, Kimberley, and Goldfields-Esperance regions.	Low
	Investigate further to confirm actual FOGO processing capacity in regional areas. Comparison of actual capacity versus licensed capacity.	High

Area	Opportunities to consider and support infrastructure capacity needs	Priority
C&D	Expand lifetime and capacity of existing C&D facilities in the Peel, Pilbara and Kimberley regions to decrease the risk, capital costs and timeframes required to meet capacity needs.	High
	Better understand sub-regional gaps for C&D recovery near major regional generators to improve infrastructure outcomes for Albany and Karratha.	Medium
	Options for a waste precinct in Carnarvon could facilitate low-risk development of co-located consolidation or recovery facilities (including 200 tonnes of C&D recovery).	Medium
Scrap metal	Options for waste precinct(s) in Bunbury-Busselton (66,000 tonnes), Geraldton (7,000 tonnes), Esperance (6,000 tonnes) and Carnarvon (400 tonnes) to facilitate low-risk development of scrap metal consolidation facilities.	High
	Better understand sub-regional gaps for scrap metal consolidation near transportation networks required to improve infrastructure coverage in the Kimberley, Great Southern and Wheatbelt regions.	Medium
Rubber/ tyre	Better understand inter-regional opportunities to support the development of new infrastructure to address capacity need for rubber/tyre recovery in the South West (8,000 tonnes). Options include a waste precinct in the Bunbury-Busselton area that could facilitate low-risk development of additional consolidation or recovery infrastructure.	Medium
Waste-to-energy	Investigate increasing waste-to-energy capacity in the South West region through the development of additional infrastructure, to improve the region's progress towards waste strategy Recover and Protect targets, while providing additional contingency to facilities in Perth.	High
	Investigate consolidation infrastructure in northern Perth and Bunbury to facilitate efficient transfers to waste-to-energy infrastructure in southern Perth to decrease reliance on local landfill capacity.	High
Bottom ash	Develop capacity for Peel to supply contingency waste-to-energy bottom ash recovery or disposal to improve outcomes for waste strategy Recover and Protect targets.	High

Area	Opportunities to consider and support infrastructure capacity needs	Priority
	Facilitate appropriate guidelines and regulatory framework and specification for the recovery and treatment of bottom ash. This is a high priority as waste-to-energy facilities are expected to be operation in 2025, necessitating fast-tracked development of bottom ash recovery framework and guidelines.	High
Landfill	Options for more efficient inter-regional waste transfer infrastructure and contingency arrangement could alleviate short-term capacity constraints between the Perth/Peel regions, Kimberley/Pilbara regions and South West/Great Southern/Wheatbelt regions.	High
	Update rural landfill risk assessment methodology of unlicensed landfill and REMS landfills can be used to effectively assess the potential risk of environmental, human health and amenity impacts.	High
	Conduct a more robust landfill risk assessment, particularly for Category 64 and REMs landfills, where accurate capacity and lifetime remaining is a risk of the current *State Waste Infrastructure Needs Analysis* modelling.	High
	Investigate potential synergies between the waste generation and infrastructure needs of mining operations and nearby MSW, C&I and C&D waste generators, to potentially decrease the scope of infrastructure planning and facilitate complementary activities that support local communities.	Medium
	Evaluate waste generation and infrastructure needs in remote Aboriginal communities to improve access to adequate services in remote areas.	High
	Develop better practice guidelines for landfill types, including consultation with stakeholders to carefully understand the implications of better practice guidelines on the lifetime capacity of landfills across Western Australia.	High
Emerging waste	Investigate emerging or unexpected waste material flows to provide a more robust understanding of infrastructure capacity needs scenarios in future iterations of the infrastructure plan. Areas such as batteries from e-vehicles, e-waste and disaster waste will need more research and study. Special focus on remote locations and waste management options in those areas may be a consideration.	Low

Area	Opportunities to consider and support infrastructure capacity needs	Priority
CDS	Incorporate into future reviews of the infrastructure plan the impact and infrastructure of the CDS.	Medium
Waste collection	Develop a detailed assessment on waste collection systems, the role of different stakeholders, and the delivery of waste management services in regional areas to understand the volumes that feed waste infrastructure.	Medium
Planning and financing of infrastructure	Consider instruments that can be used to level the playing field between more developed, larger markets, compared to regional smaller markets, and a more detailed identification of the gaps.	High
Consolidation facilities	Investigate regional consolidation facilities and all other types of transfer stations, bulking facilities and community recycling centres/container deposit return locations. This infrastructure plan focuses on 'final destination' infrastructure for the waste collected through consolidation facilities; therefore, this network of facilities has been excluded from modelling as it would require separate analysis. Their role, requirements, and development and implementation of better practices can be considered for future work.	Low
Controlled waste and clinical waste	Investigate generation, expected trends and available infrastructure to form future scope of the infrastructure plan.	High
Regional collection and disposal	Investigate opportunities for collaboration, partnership or sharing of transport or infrastructure resources with the mining industry.	Medium
	Investigate infrastructure needs in larger regional centres outside the major regional centres as defined by the waste strategy (e.g. Karratha, Broome).	Low

Risk considerations

There are several risks relating to infrastructure capacity which may prevent Western Australia from meeting the waste strategy targets. They will require ongoing monitoring and management over the life of the infrastructure plan. These risks include but are not limited to:

- not achieving waste avoidance targets
- loss of infrastructure capacity from the system (closure of facilities)
- failure to develop and operate planned infrastructure
- market failures
- regulatory reform at national or jurisdictional levels
- management of specialised or problematic waste streams
- inadequate contingency planning
- market demand for recycled materials is insufficient to generate adequate returns on investment for projects.

These risks are explored below. Further investigation of their potential impact, and mitigation strategies, will be considered in future reviews of the infrastructure plan.

Not achieving waste avoidance targets

In this plan infrastructure need has been analysed assuming that the 2030 waste strategy Avoid targets are met. It is acknowledged, however, that there is a risk that interventions will not achieve the waste strategy targets, resulting in waste generation rates exceeding 1.88 tonnes per capita in 2030. Direct interventions to achieve the waste strategy Avoid targets are outside the scope of the infrastructure plan.

Failure to achieve the waste strategy avoidance target, and continuation of waste generation at the 2020 rate of 2.2 tonnes per capita, would result in 7,465,000 tonnes of waste generated in Western Australia in 2030, compared with 5,972,000 tonnes if 2030 targets are met. This additional 1,493,000 tonnes of waste would increase the state's waste infrastructure capacity needs. Failure to achieve the target may vary across waste streams, so projecting which streams will fail to achieve the target would result in multiple scenarios, depending on assumptions.

If the state's waste generation rate is higher than the projected target, it would have a significant impact on the types and capacities of infrastructure needed. This is especially critical for MSW infrastructure capacity which already faces capacity constraints in certain regions.

The waste strategy targets require the C&D sector (the largest waste generation source) to achieve the largest gross tonne waste reduction by 2030. The projected C&D treatment capacity is about 2 per cent less than the projected capacity need. It is important to monitor whether the waste strategy targets will be met for the C&D sector to confirm the state's infrastructure needs.

The infrastructure plan also acknowledges the risk in consumers' resistance to embracing behaviour change, especially regarding the reduction of reliance on convenient yet environmentally damaging packaging. Meeting waste strategy targets and the required capacities outlined in the infrastructure plan necessitates a substantial reduction in the consumption of such materials. A failure to do so poses a significant risk, potentially

overwhelming waste management infrastructure with excess non-recyclable or difficult-to-recycle materials. The success of these waste reduction initiatives hinges on persuading consumers to adopt more sustainable habits, reducing waste at the source, and aligning with broader waste management goals. Resistance to such behavioural shifts could hinder progress and strain waste systems.

Future iterations of the infrastructure plan will be required to review tracking towards waste avoidance targets and update capacity needs if targets are not met.

Loss of expected infrastructure capacity from the system

There is a risk that current infrastructure will close prior to their expected end-of-life because of:

- decreasing feedstocks, or an inability to access feedstocks, impacting operational viability
- planned closures occurring earlier than initially reported
- failure to launch expected capacity (such as that anticipated through programs like the Food Waste for Healthy Soils and the Recycling Modernisation Fund)
- closures of facilities because of community opposition or environmental impacts
- application of better practice which may result in additional operating costs and the need for re-training and/or attracting skilled personnel, with certain facilities potentially unable to implement these or electing to cease operations.

Table 20 summarises the facilities currently scheduled for closure, which have the highest risk of impacting the ability to achieve all waste strategy targets.

Table 20 Identified risk of facilities with planned closure dates

Region	Facilities closing between 2020 and 2030	Capacity at risk
Perth	2 C&D facilities	100,000
	1 FOGO facility	110,000
South West	1 organics facility	20,000
Kimberley	1 C&D facility	6,000
	2 organics facilities	6,800

Priority planning has identified the need to review options to extend the lifetime of the existing C&D facility and organics facilities in the Kimberley region. Additional mechanisms should be investigated to support existing infrastructure and facilitate improvements to better practice standards.

A low-risk approach to landfill capacity lifetimes assumes some capacity will be at risk the under implementation of better practice guidelines for the siting and operation of landfills. Landfill capacity at risk is discussed in the Landfill capacity lifetime assessment to 2030 and 2050 section.

Failure to develop and operate planned infrastructure

Planned facilities are at risk of not being developed within the expected scope (timeframe and capacity) or not overcoming barriers that may prevent their development. Achieving waste strategy targets relies on the capacity provided by future planned infrastructure summarised in Table 21. This includes anticipated facilities funded through the Food Waste for Healthy Soils and Recycling Modernisation Fund programs.

Table 21 Summary of infrastructure in current planning and approval phase

Infrastructure type	Anticipated/ planned	Approved
Organics	7	0
C&D material recover	6	0
FOGO	8	2
Scrap metal recovery	1	1
Cardboard and paper recovery	1	0
Tyre/rubber recovery	1	1
Plastics recovery facility	0	0
Waste-to-energy facility	2	2
Bottom ash recovery facility	2	0

Successful operation of new recovery infrastructure, its viability and its implementation of better practice will also require viable market conditions, a sustainable market outputs, and access to technology and a skilled workforce. These factors are more critical in remote areas.

Certain projects may need long-term contracts to ensure financial viability, and this may be a significant risk.

Market failures

Secondary resources operate in a commodity market and are susceptible to pricing sensitivities. Contractual obligations should consider pricing sensitives, ensuring risks are appropriately managed by the relevant parties. Recent examples of market failures, illustrated through impacts of China National Sword and challenges to MRF operators, have impacted local government contracts and recyclables. This impact could extend into other waste services.

An important consideration is contamination of certain waste streams and its impact on yield of recovered materials, financial viability, technological challenges, and the way contamination levels may affect process and business viability because of removal costs, price decreases of recovered materials and operational costs.

Contingency planning may also be a consideration, and this is explored in more detail below.

Regulatory reform at national or jurisdictional levels

Environmental and market regulation may impact material pathways and treatment options for materials. Regulatory changes may impact economies of scale, facility types, pricing and transport routes. Examples of regulatory changes include landfill bans, additional licensing requirements or requirements on storage and handling, and regulatory restrictions on the end use of materials.

In relation to Principle 5: Waste facilities strive for better practice, instilling better practice policies in waste infrastructure can present challenges. One potential challenge being the financial investment required to implement new technologies, processes or infrastructure to meet higher standards. Transitioning to better practice may lead to disruptions in operations or require adjustments in workforce skills, potentially affecting efficiency in the short term.

Stricter policies could also introduce compliance challenges, requiring facilities to navigate complex regulatory landscapes. Moreover, resistance to change from stakeholders, including employees or management, could hinder the successful adoption of these practices. Funding or resource limitation can exacerbate this and may require additional governmental support to meet better practice standards.

New regulations may also increase volumes of waste or create new waste streams which will need to be considered in future revisions of the plan. Landfill bans of certain materials may change waste composition and volumes, whilst changes to other materials such as requirements for compostable materials in certain areas may increase or shift volumes. An example would be a ban on e-waste disposal to landfills which may divert materials into the hazardous waste streams, requiring facilities handling hazardous waste to accommodate and manage much larger quantities of such materials.

Social and economic factors affecting recycling and waste diversion

Consumer and business behaviours will affect the volume, quality and destination of waste and recyclables. Behavioural change will be a key element in addressing certain areas such as food waste avoidance, unnecessary consumption of single-use items and littering.

Specialised or problematic waste streams

Controlled waste and clinical waste are excluded from this infrastructure plan. These streams will pose challenges including:

- gathering data and information specific to these waste types and treatment pathways
- the geographical dispersion of generators
- ensuring application of better practice to mitigate risk of contamination or incidents
- the scale required to develop adequate infrastructure that deploys best available technologies may be challenged by low volumes of material, such as in the recycling of solvents or processing of materials with mercury.

Suitable data on controlled waste and clinical waste was not available to explore them in detail in this infrastructure plan, so further investigation into these waste streams could form part of future work in this area.

Contingency planning

The process of planning, approving, developing and operating waste infrastructure needs to consider contingency planning. Examples include disaster waste, climatic events, short-term population changes, facility shutdowns, government stimulus programs and the introduction of the CDS in October 2020.

Example contingency and mitigation measures are explored in Table 22.

Table 22 Example contingency and mitigation measures

Contingency	Possible mitigation measures to be considered during planning and design
Facility disruption because of extreme weather, incidents, market failure, legal action, industrial action or equipment/process failures	Consider alternative facilities that provide a similar service. Consider redundancies in equipment. Consider extreme weather events during planning and engineering.
Additional waste arising from extreme events including from natural disasters or accidents. Note that future pandemics may have significant impacts on waste and should be included in emergency waste management planning.	Landfills typically provide ample capacity that can be used but may not be suitable for all waste streams. Inert landfills can play a fundamental role in managing short-term increases in waste arising from extreme events (excluding hazardous waste this would need to be treated in specialised facilities). Consider storage capacities to allow gradual uptake, for planning and design. Consider temporary expansion of storage areas at existing facilities. Consider source separation of waste during the clean-up phase following a disaster, to facilitate resource recovery.
New waste streams	Consider events such as biosecurity outbreaks and the types of waste infrastructure and contingency plans needed to manage waste streams derived from such events.

Maintaining priority of the waste hierarchy

Waste-to-energy and bioenergy technologies offer valuable alternatives to landfill disposal, helping divert waste from landfills and promoting a circular economy, provided that waste management adheres to the waste hierarchy by prioritising reduction, reuse and recycling before energy recovery. A continued focus on the waste hierarchy, and the use of energy recovery for the management of only genuinely residual waste, will be needed to balance emerging market dynamics with circular economy objectives.

Monitoring and evaluation of the infrastructure plan

Process for monitoring, evaluating and reporting

The department will coordinate and monitor the state's progress towards developing the infrastructure needed to meet all waste strategy targets. A monitoring and evaluation plan will need to be developed to track the progress of development of waste infrastructure to support the objectives of the waste strategy.

Proposed indicators for tracking the progress of the development of waste infrastructure towards the objectives of the waste strategy, the related infrastructure plan objectives and principles include:

- improvement in the capacity need of priority infrastructure types in each region
- funds invested (and/or jobs created) by governments and industry in new or upgraded infrastructure
- improvement in the overall material recovery rate (tonnes material recovered over total waste generation) for all wastes in alignment with the waste strategy targets
- improvement in environmental, public health and/or amenity performance of waste management and resource recovery facilities, in alignment with better practice guidance and standards
- consideration of the infrastructure plan within government departments and agencies, including the development and implementation of their own specific waste and resource recovery plans where relevant.

Regional summaries

This section provides more detail on the waste generation and infrastructure needs of each region in Western Australia. Each summary includes a snapshot of the region's industries, demographics and economy, painting a picture of how the region's activities have influenced waste generation in 2020. The 2020 waste generation and demographic data is then used to estimate 2030 waste generation.

The 2020 resource recovery infrastructure capacity is based on licensed capacity which was obtained through the *State Waste Infrastructure Register*. Gaps in existing infrastructure capacity are identified when comparing 2020 infrastructure capacity and 2030 waste generation data. Projections of needed waste infrastructure are developed using the methodology described in previous sections. Existing and planned infrastructure by region is compared to projected waste volumes to determine need, based on the concept of critical mass presented in this plan and the need for expansion of existing or development of new facilities.

Each regional summary includes waste generation by source, including MSW, C&D and C&I, to provide more insight and guide decision-making at the regional level. Each regional summary includes:

- an assessment of the social, economic and environmental indicators of the region
- a summary of waste generation, treatment and movements in 2020
- a summary of waste generation and treatment in 2030
- infrastructure capacity needs in 2030, including assessment of opportunities to provide or access capacity in neighbouring regions
- breakdown of the waste by facility type and source (MSW, C&I or C&D) in 2030
- breakdown of the material generation and recovery in 2030
- analysis of landfills by type and identified capacity risk
- an assessment of the principles and priorities for the region.

A desktop assessment of facilities' licences has been employed to understand infrastructure capacity and, as such, may not accurately reflect the specific activities conducted on site. This is one of the key limitations of with the *State Waste Infrastructure Needs Analysis* methodology for assessment, particularly in relation to FOGO recovery facility capacity needs and organics recovery facility capacity needs.

The infrastructure plan focuses on identifying infrastructure needs in alignment with meeting the waste strategy targets. Targets specifically relating to FOGO are currently limited to the Perth and Peel regions. In regions outside of Perth and Peel, FOGO waste is collectively categorised as 'organics'. Stakeholder feedback highlighted this gap in the 2030 needs assessment as several major regional centre municipalities, such as the South West and Great Southern, are considering or implementing FOGO recovery as a means to achieve their MSW recovery targets.

While there appears to be sufficient licensed capacity for organics recovery to meet regional demands until 2030, the specific availability of FOGO recovery capacity remains uncertain. In addition, there is potential for barriers to arise in regions outside of Perth and Peel depending on regional approaches on kerbside FOGO recovery. Some facilities, despite being licensed for FOGO waste, either do not accept it or handle quantities below their licensed capacity. This is discussed in more detail in the Considerations and limitations section.

Further, more detailed exploration of FOGO capacity needs outside Perth and Peel is required as an area of future work.

The infrastructure plan includes a summary for each region outlined in Figure 22:

- Perth
- Peel
- Pilbara
- Kimberley
- South West
- Great Southern
- Mid West
- Gascoyne
- Wheatbelt
- Goldfields-Esperance.

Major regional centres as defined by the waste strategy are also included in assessments:

- Albany (Great Southern region)
- Bunbury (South West region)
- Busselton (South West region)
- Greater Geraldton (Mid West region)
- Kalgoorlie-Boulder (Goldfields-Esperance region).

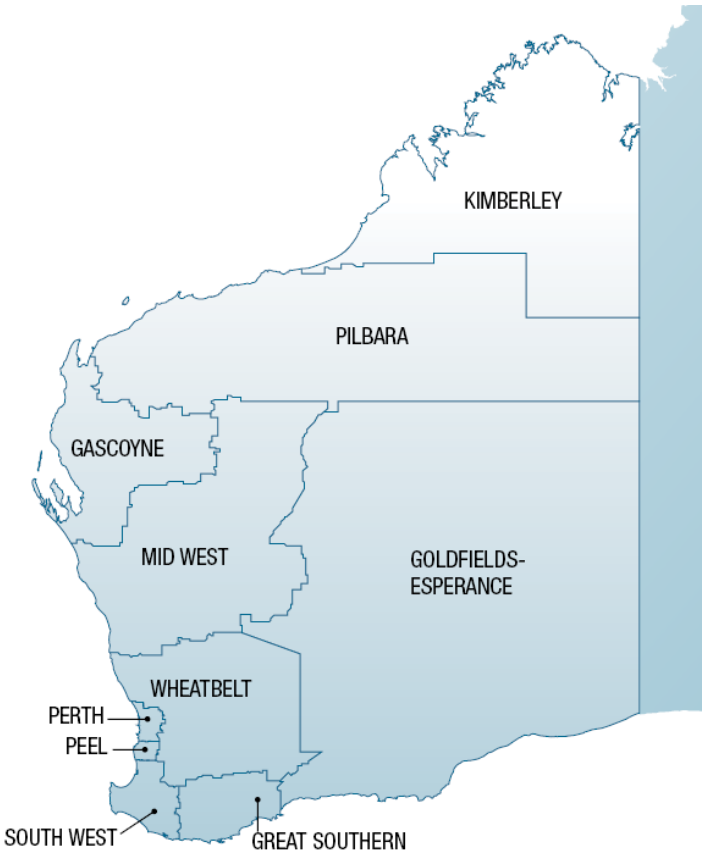


Figure 22 Regions used for the infrastructure plan

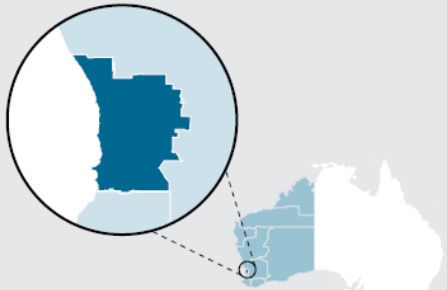
Perth region

Waste profile in 2020

The Perth region generates and treats the largest amounts of waste in Western Australia. The region generated 4,327,000 tonnes of waste in 2020, consisting of about 50 per cent C&D, 25 per cent C&I waste, and 25 per cent MSW. The region treated 3,847,000 tonnes in 2020 with 2,539,000 tonnes (66 per cent) being recovered and 1,308,000 tonnes (34 per cent) being landfilled. Key waste profile data for Perth waste and resource recovery in 2020 is presented below.

Residents in Perth	77 per cent of Western Australia's population resides in the Perth region.
	Population density of 375 people per km^2.
	Residents mostly live on the western coastal side of the region, with higher density around the Perth and Rockingham city centres.
Local governments within the region	City of Armadale, Town of Bassendean, City of Bayswater, City of Belmont, Town of Cambridge, City of Canning, Town of Claremont, City of Cockburn, Town of Cottesloe, Town of East Fremantle, City of Fremantle, City of Gosnells, City of Joondalup, City of Kalamunda, City of Kwinana, City of Melville, Town of Mosman Park, Shire of Mundaring, City of Nedlands, Shire of Peppermint Grove, City of Perth, City of Rockingham, City of South Perth, City of Stirling, City of Subiaco, City of Swan, Town of Victoria Park, City of Vincent, and City of Wanneroo.
Generating waste	Perth generates 73 per cent of the waste generated in Western Australia.
Transporting waste	Comprehensive transport networks and access to markets, using primarily road freight with air, sea freight and commercial rail networks available.
Treating waste	Perth treats 65 per cent of the waste treated in Western Australia.
	Perth recovers 78 per cent of the waste recovered in Western Australia.
	Perth landfills 49 per cent of the waste landfilled in Western Australia.
	Plays a critical role in recycling activities in the Western Australia.

PERTH
REGIONAL SUMMARY



AREA
5,423 km²

GROSS REGIONAL PRODUCT (2019–20)
$56.50B/CAP

NUMBER OF BUSINESSES (2019–20)
169,161

TOP 5 EMPLOYMENT BY INDUSTRY

17.60%	Construction
14.65%	Professional, scientific and tech services
11.81%	Rental, hiring and real estate services
10.26%	Transport, postal and warehousing
6.87%	Healthcare and social assistance

The mining industry sector makes the greatest contribution to economic output in the region, which at $48.4B accounts for 44.15% of total output. This industry sector is also the largest employer with 15,883 jobs which represents 10.63% of total employment within the region.

2020
- POPULATION 2,032,040
- WASTE GENERATED 4,327,000 TONNES
- WASTE GENERATION PER CAPITA 2.13 TONNES

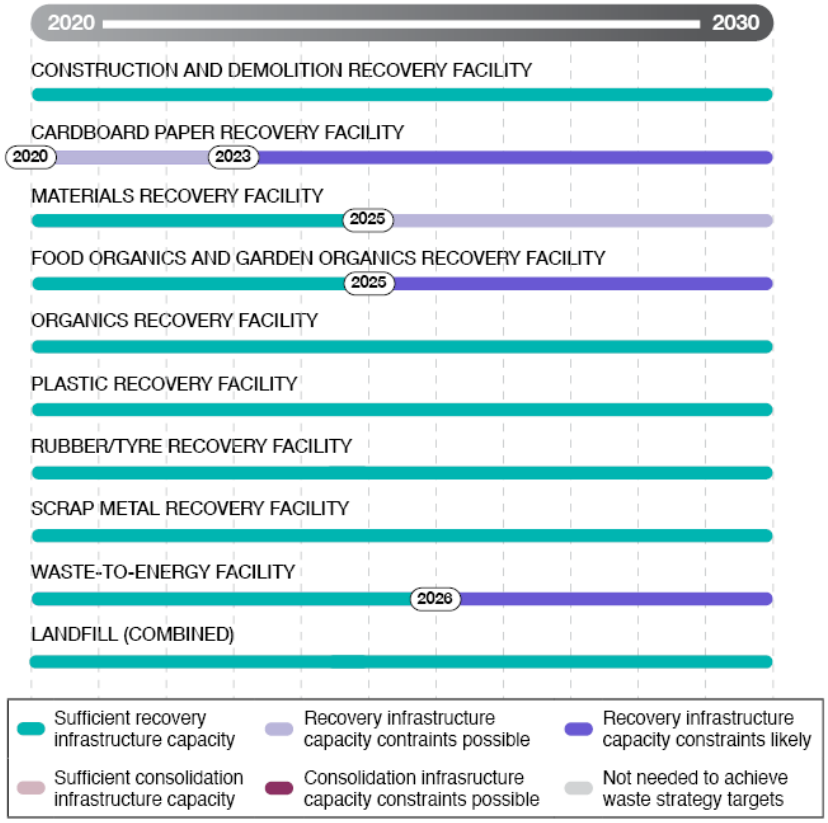
2030
- POPULATION 2,414,036 (▲19%)
- WASTE GENERATED 4,335,000 TONNES
- WASTE GENERATION PER CAPITA 1.79 TONNES

PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

2030 INFRASTRUCTURE CAPACITY NEED
1. Food organics and garden organics | 254,000 tonnes
2. Cardboard and paper | 291,000 tonnes
3. Material recovery facilities | 33,000 tonnes
4. Waste-to-energy | 73,000 tonne

TOP PRIORITIES
1. Investigate designating a waste precinct in southern Perth to facilitate additional facilities.
2. Monitor progress for implementation of capacity expected from the Food Waste for Healthy Soils program.
3. Investigate and facilitate upgrade of existing garden organics facilities to accept food organics and garden organics
4. Investigate contingency planning arrangements for cardboard and paper.
5. Investigate alternative landfill facility contingency arrangements with the Peel region.
6. Assess whether existing 67A licensed facilities in Perth or neighbouring regions can be increasingly utilised to alleviate food organics and garden organics recovery capacity need.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030
Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN PERTH 2020 AND 2030
Waste projections to 2030 based on meeting the waste strategy targets

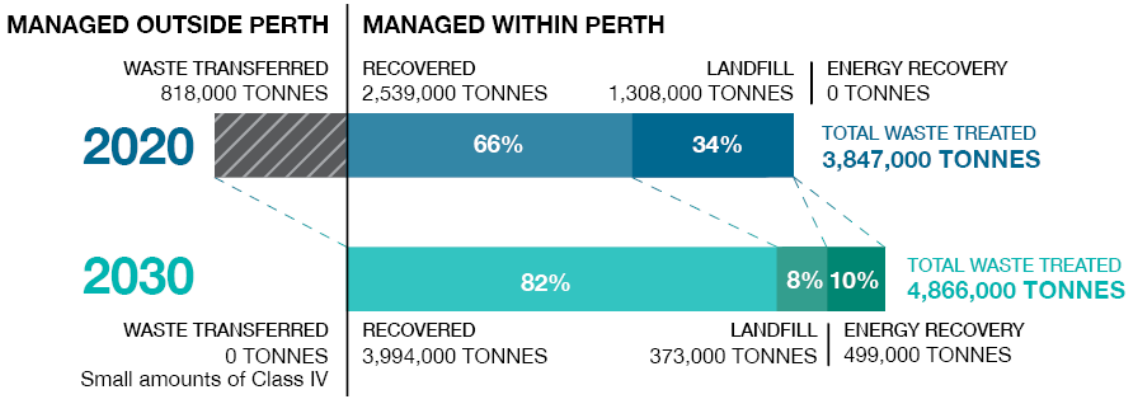


Figure 23 Waste in Perth: statistics and projections

Waste and resource recovery in 2020

Perth acts as a recovery hub for other regions, recovering 2,539,000 tonnes which equates to 78 per cent of all waste recovered in Western Australia. The region recovers significant amounts of C&D waste, with a capacity to process 4,348,000 tonnes of C&D per year. The top five materials processed in the region in 2020 include:

1. mixed C&D waste
2. commingled recycling
3. FOGO
4. metals consisting of ferrous steel
5. mixed putrescible waste.

Most waste infrastructure in the region are resource recovery facilities. There are 11 inert landfills, six putrescible landfills and one class IV disposal facility. There are 44 C&D recovery facilities, 16 organics recovery facilities, five FOGO recovery facilities, seven MRFs and six scrap metal facilities. Western Australia's only two tyre recovery facilities are the Perth region, providing 45,000 tonnes of recovery capacity. Specialist waste treatment facilities accept the remaining material.

Urbanisation and high rates of development in Perth means that C&D waste requires local processing options to mitigate high transportation costs. Similarly, local developments create markets to use recovered C&D products. Perth is also leading the state in emerging waste trends for specialty material such as electronic and electric waste (particularly used solar cells and battery storage). Perth provides speciality waste processing for material received from other regions, along with access to international offtake markets.

The region also has waste infrastructure under development, expecting an increase of five plastic recovery facilities, one paper and cardboard facility and one MRF by 2030. In addition, Perth has two waste-to-energy facilities under development, each being serviced by a bottom ash treatment facility. The two bottom ash treatment facilities are also under development and will be able to treat a total capacity of 190,000 tonnes per annum of bottom ash. Perth may be hindered by high-density development, with possible challenges in siting new waste infrastructure in central areas close to the largest sources of waste generation.

Perth plays a major role recovering material from other regions through material consolidation and transport. Perth received 338,000 tonnes of material from other regions in 2020, consisting predominantly of ferrous steel and mixed C&D waste. The material received comes from as far as the Kimberley region, as shown below. Perth transferred 818,000 tonnes of material to other regions in 2020, consisting predominantly of putrescible waste and green waste. The transferred material travels as far as Goldfields-Esperance, with most transfers occurring to the Wheatbelt, including more than 511,000 tonnes of mixed putrescible waste for landfilling.

The location of current and planned recovery infrastructure in Perth in 2030 are shown in Figure 26 (see Facility lists in the Appendix for a full list of facilities). Facilities granted work approvals since 2020 by the department in the Perth region are listed below in Table 23. These facilities have not been included in the modelling for the infrastructure plan and may alleviate some of the region's capacity needs.

Table 23 Facilities granted licences or works approvals since 2020 in Perth

Facility type	Facility name	Location
Consolidation centre	Controlled Waste Disposals	Perth
Scrap metal recovery facility	Enecell Resource Recovery Solutions	Perth
Scrap metal recovery facility and consolidation centre	Keppel Holdings	Perth
Used tyre storage	Elan Energy Matrix Pty Ltd Tacoma Facility	Perth
Plastic consolidation and recovery facility	D & M Waste Management	Perth
Scrap metal recovery facility	King Scrap Metal	Perth
Consolidation centre	BMT Australia Pty Ltd	Perth
Consolidation centre	Cleartech Transfer Station	Perth
Scrap metal recovery facility	FTR Operations	Perth
Consolidation centre	Brajkovich Landfill & Recycling Pty Ltd	Perth
Consolidation centre	Cockburn Resource Recovery Park	Perth
Consolidation centre	Wattleup Sand Supplies	Perth

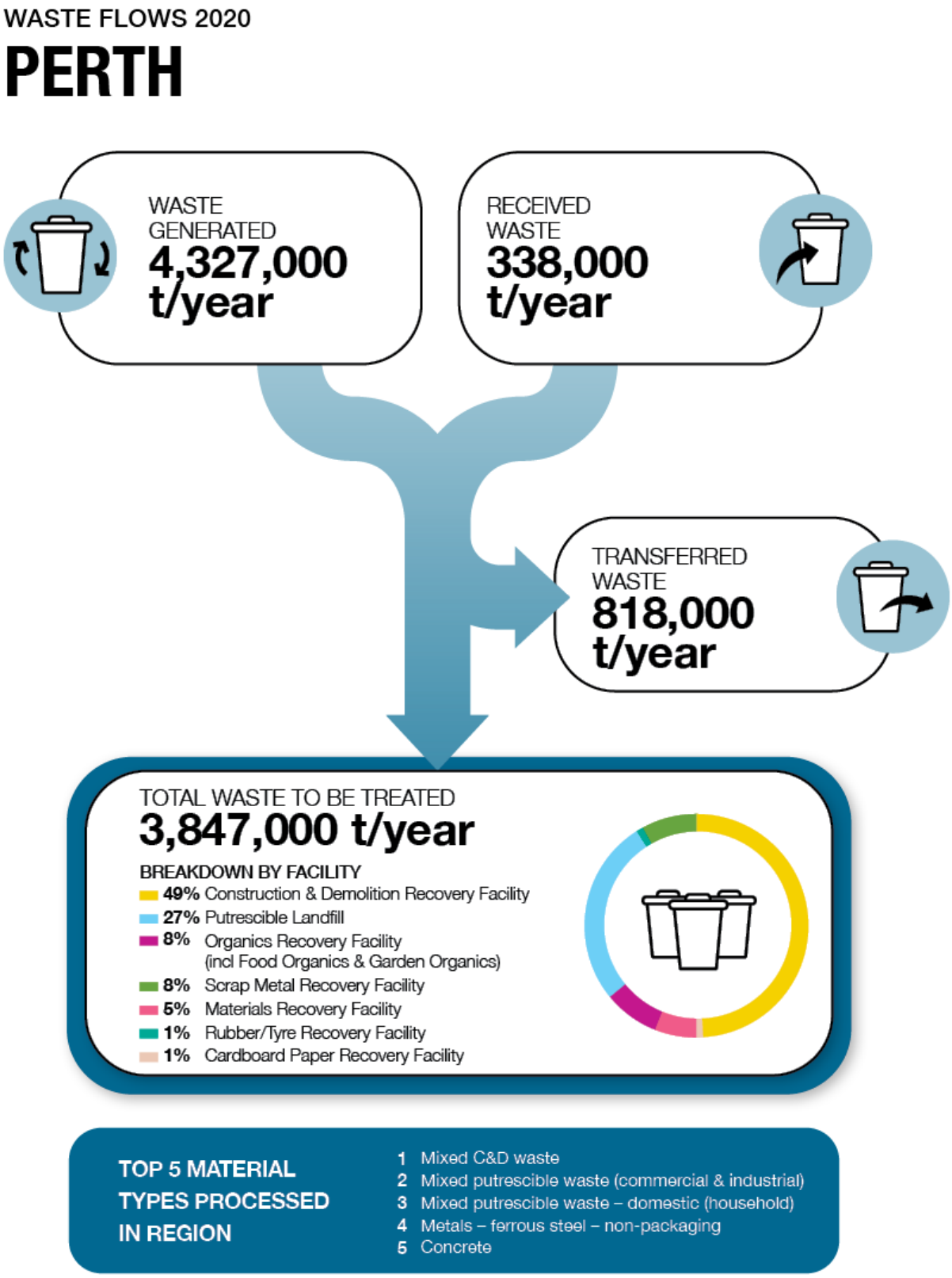


Figure 24 Waste generated, received, transferred and treated in Perth in 2020

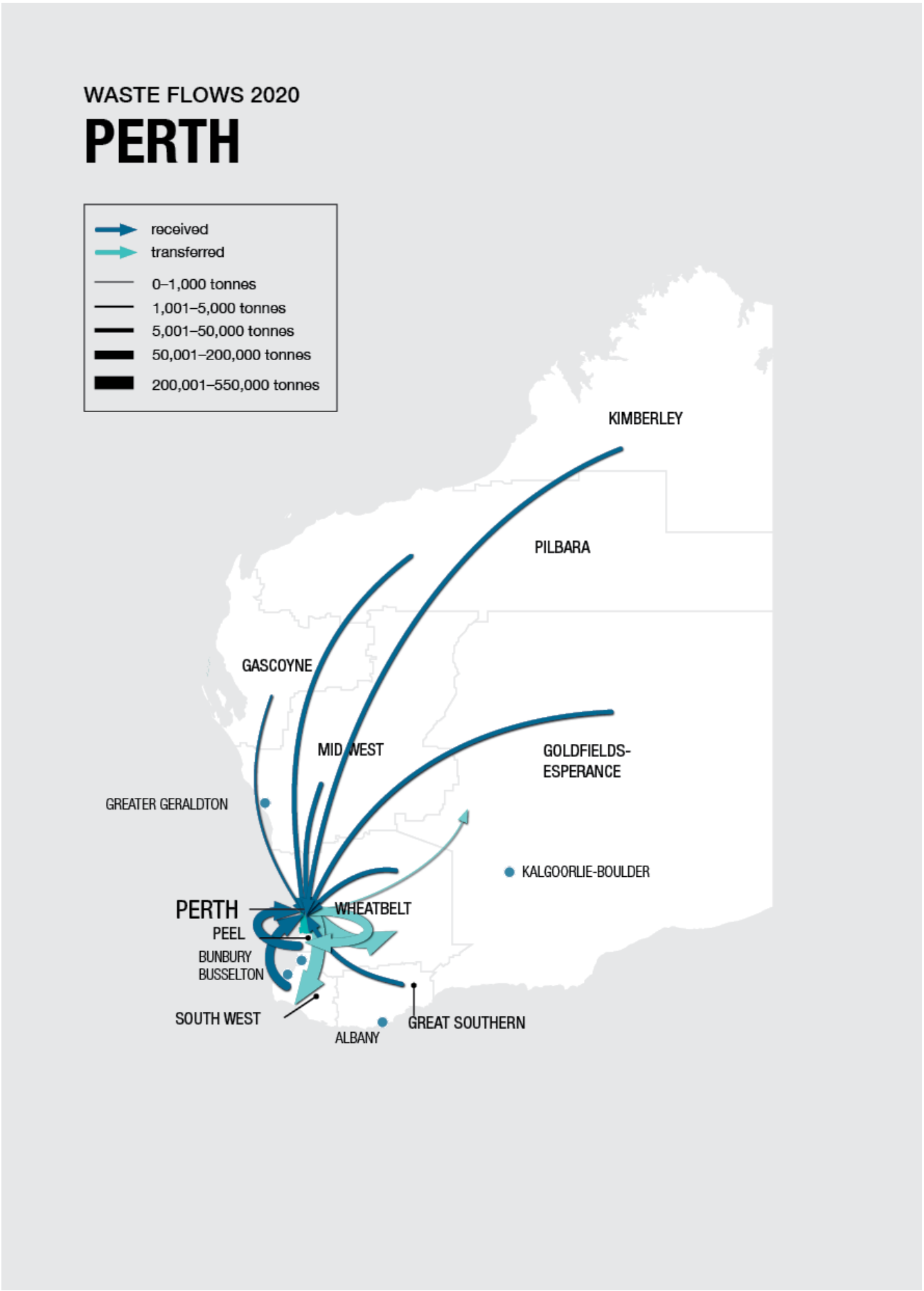


Figure 25 Waste flows in Perth in 2020

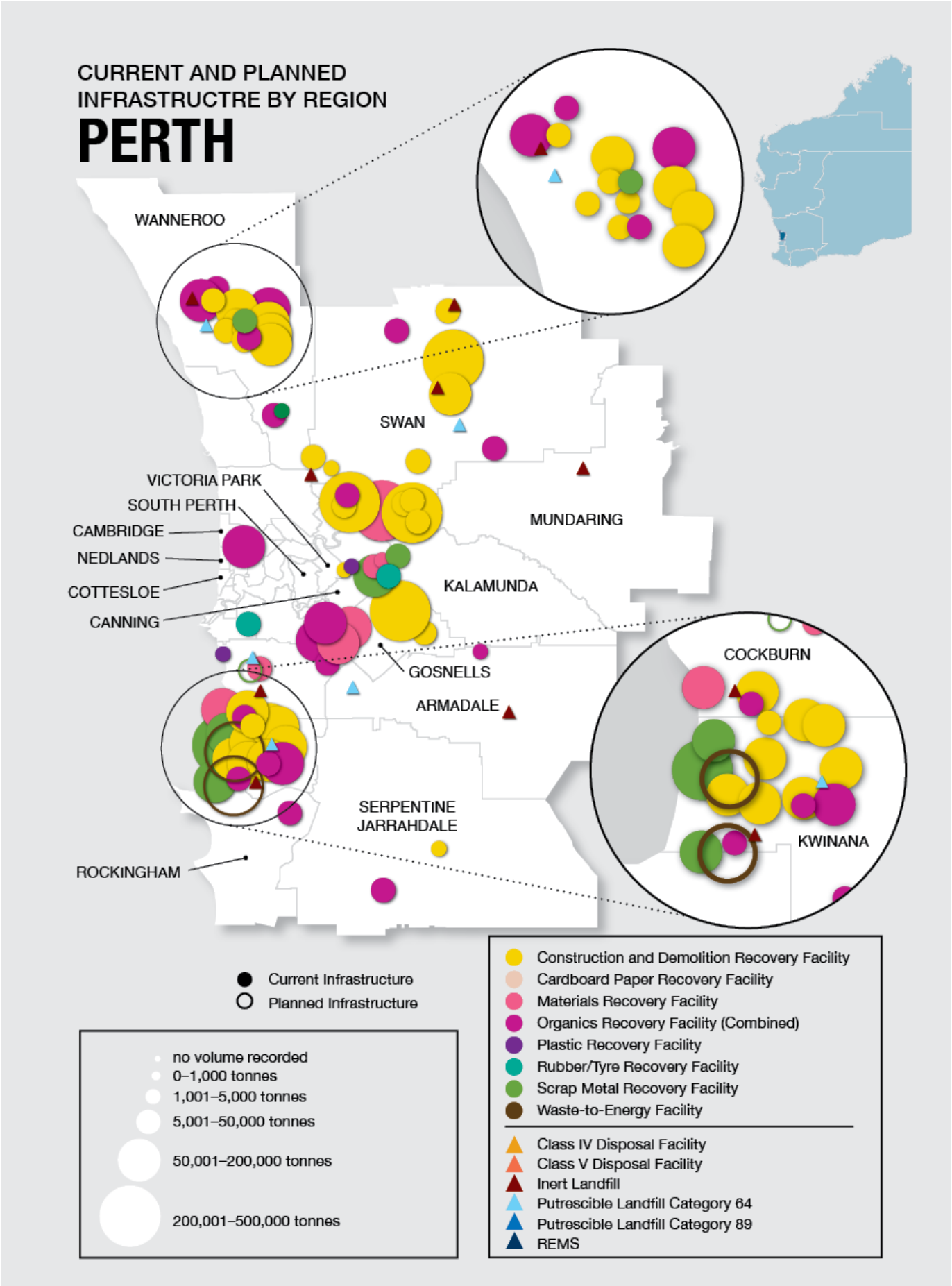


Figure 26 Current and planned infrastructure locations in Perth in 2020

Key aspects of the waste and resource recovery system in Perth in 2020, considered by the infrastructure plan, include:

- Mixed C&D formed the largest waste material generated in the Perth region, consisting of about 2,200,000 tonnes, of which 85 per cent was recovered in the region.
- Perth received 338,000 tonnes of waste from other regions in the state, with 67 per cent of materials from the Peel region (135,000 tonnes) and South West region (91,000 tonnes).
- Ferrous steel and mixed C&D formed the two main material types received into the region.
- The Perth region transferred more than 818,000 tonnes of waste to other regions, predominantly the Wheatbelt, including over 511,000 tonnes of mixed putrescible waste disposal at landfill.
- Development and operation of waste-to-energy facilities will have a significant impact on waste transfers out of the region to neighbouring regions.
- Enabling transport within the region to waste-to-energy facilities will likely result in new consolidation infrastructure in the north of the Perth region.

Waste and resource recovery in 2030

Modelling to achieve all 2030 waste strategy targets found Perth would generate 4,335,000 tonnes, similar to 2020 quantities. However, the increased capacity for materials recovery means the total waste treated in Perth will increase by 26 per cent. This shift will increase the Perth materials recovery rate from 66 per cent to 82 per cent. Figure 27 highlights the increase from materials recovery (82 per cent) to resource recovery (materials recovery plus energy recovery; 92 per cent), emphasising the increasing importance of energy recovery in waste management strategies.

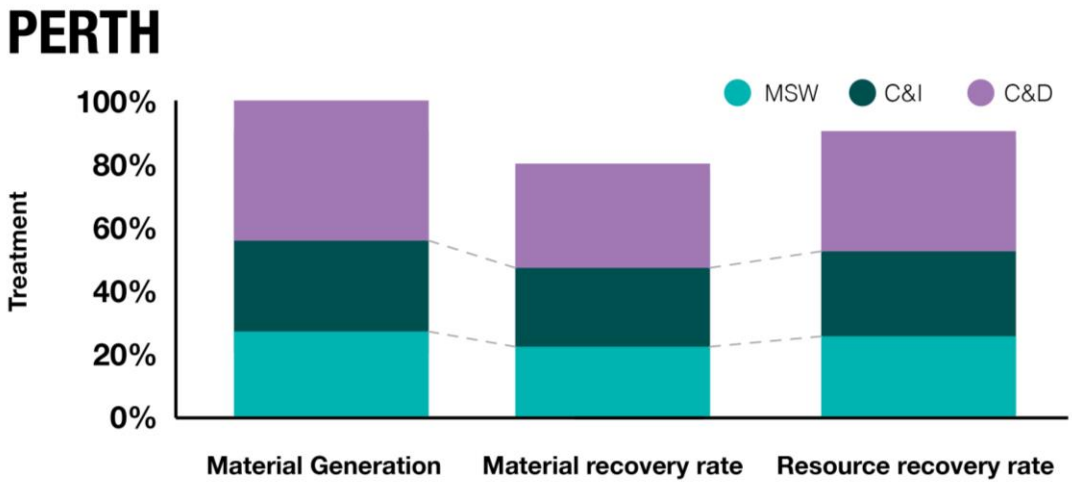


Figure 27 Generation, material recovery and resource recovery by source in Perth in 2030

Figure 28 shows the distribution of feedstock materials used by each facility type, indicating which waste streams are most significant and where the resource recovery efforts should be concentrated. This is also reflected in the Perth region Principles and priorities section.

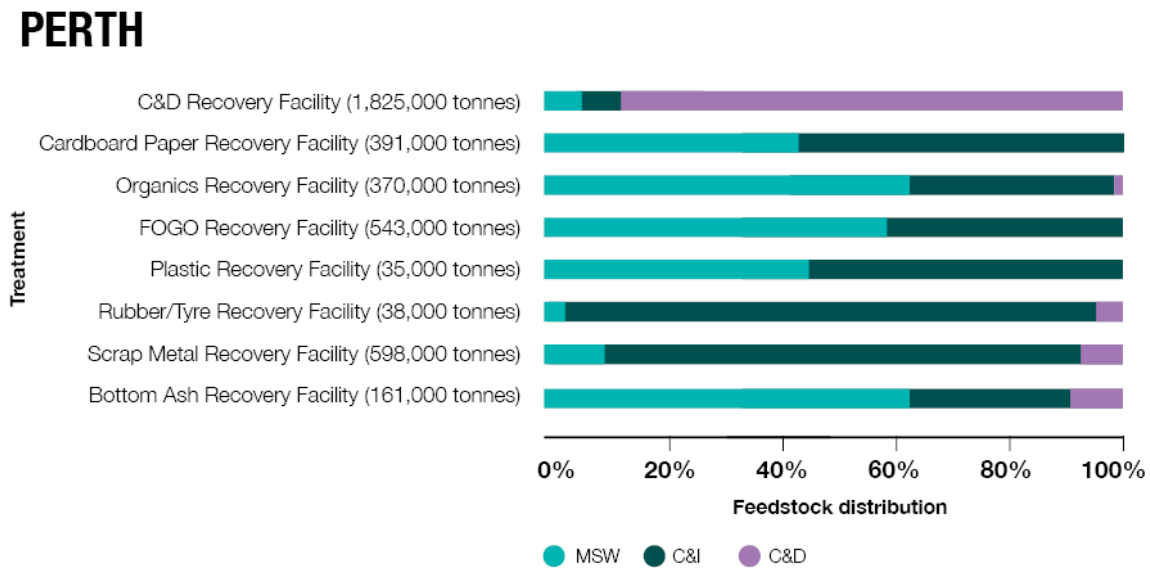


Figure 28 Feedstock distribution of treatments in Perth in 2030

Infrastructure capacity needs in 2030

Based on current, planned and approved infrastructure in 2020, Perth will have a surplus processing capacity of 2,423,000 tonnes for C&D material and 180,000 tonnes for scrap metal material. This surplus capacity can support the capacity needs of other regions, like the 52,000-tonne need for C&D capacity in the Peel region.

Perth requires the following additional capacities to meet the waste strategy targets in 2030:

- 254,000 tonnes of additional recovery capacity is needed in FOGO facilities, which may be alleviated to 110,000 tonnes by transporting material to the Peel (which has 69,000 tonnes surplus capacity) and the Wheatbelt (which has 75,000 tonnes of surplus capacity) regions. A preliminary analysis of spare FOGO capacity in Category 67A facilities identified this capacity need may be entirely alleviated by sharing capacity across the Perth, Peel, South West and Wheatbelt regions.
- 291,000 tonnes of additional recovery capacity is needed in carboard and paper facility.
- 33,000 tonnes of additional recovery capacity is needed MRFs.
- 73,000 tonnes of additional recovery capacity is needed in waste-to-energy facilities.

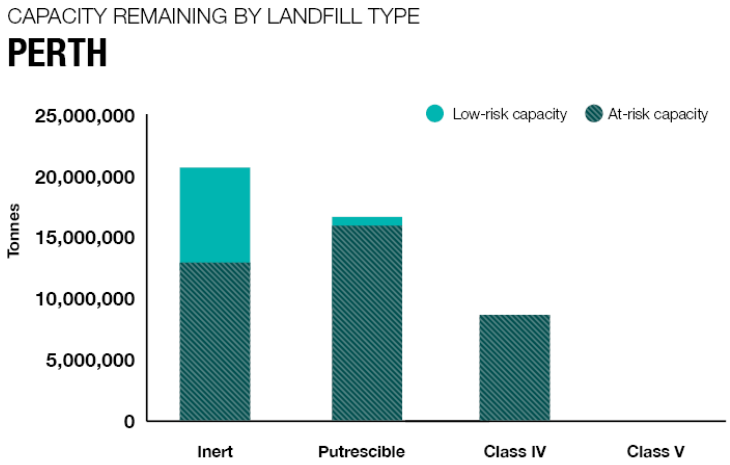


Figure 29 Capacity remaining by landfill type in Perth, including an assessment of low-risk and potentially at-risk capacity

Total remaining capacity by landfill types is presented in . This figure also indicates the proportion of that capacity that is at risk (see section on Landfill capacity lifetime assessment to 2030 and 2050).

Under a low-risk scenario, most of the total landfill capacity of 38 million tonnes was identified as potentially at risk, of which inert landfills make up 34 per cent, putrescible landfills 43 per cent, and class IV landfills 24 per cent. *State Waste Infrastructure Needs Analysis* modelling predicts 395,000 tonnes of residual waste will be disposed of in landfill each year. Feedstock lifetime remaining for landfills is shown in Figure 19 .

Details of the infrastructure needed to support the waste strategy targets are outlined Figure 30, including the expected facilities, capacities and capacity needs in 2030.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

PERTH

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030.
It includes planned and approved facilities, as well as closures between 2020 and 2030.

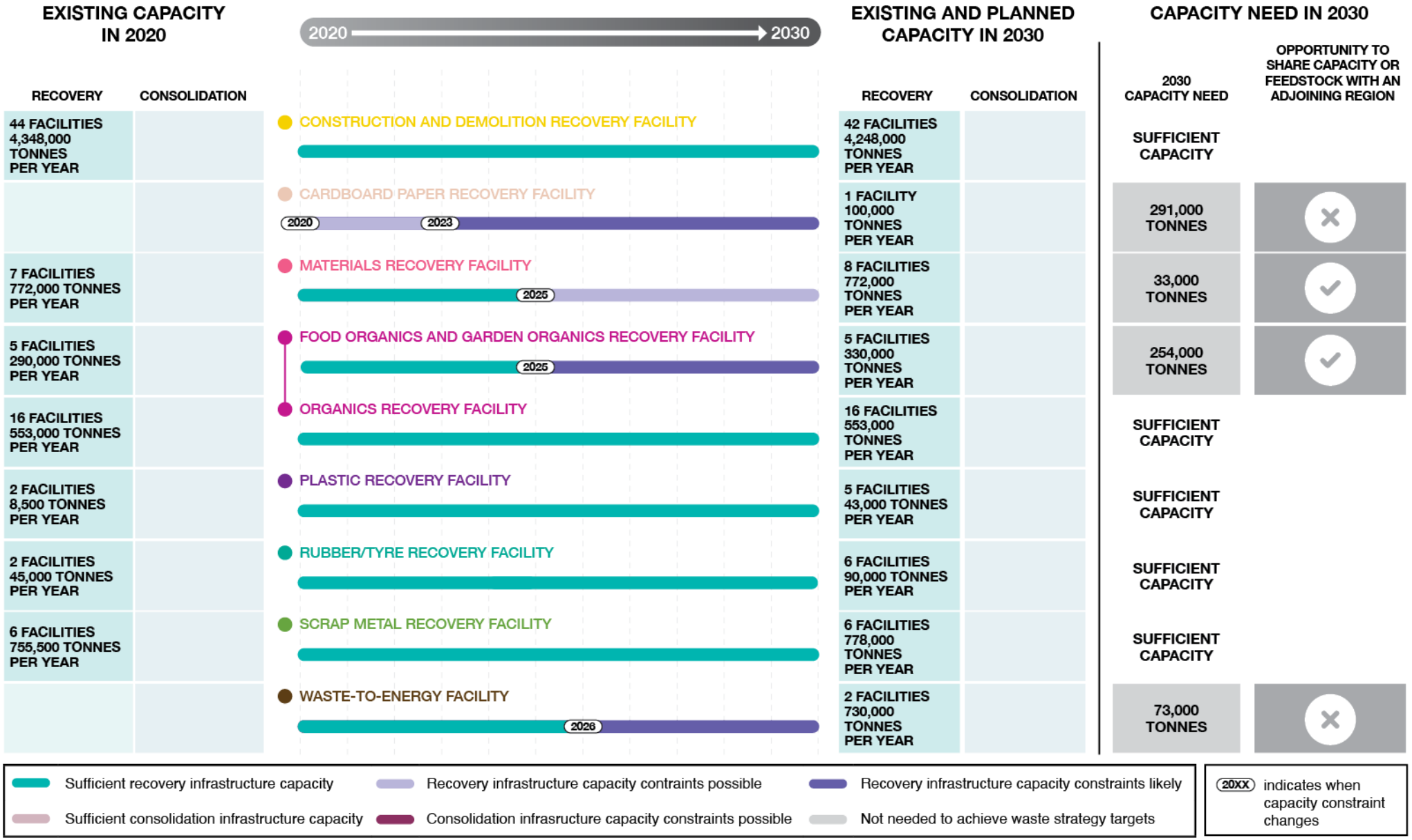


Figure 30 Perth infrastructure capacity need in 2030

Principles and priorities

The principles outlined in this plan have been used to identify priorities.

Priority areas that are projected to go beyond capacity need, based on the completed modelling for the region, arise when applying the principles.

Based on the analysis, the top priorities for the Perth region are:

- Investigate designating a waste precinct in Southern Perth to facilitate additional facilities.
- Monitor progress for implementation of capacity expected from the Food Waste for Healthy Soils program.
- Investigate and facilitate the upgrade of existing garden organics facilities to accept FOGO.
- Investigate contingency planning arrangements for cardboard and paper.
- Investigate alternative landfill facility contingency arrangements with the Peel region.
- Assess whether existing 67A licensed facilities in Perth or neighbouring regions can be increasingly utilised to alleviate FOGO capacity need.

These are discussed in more detail in Table 24 below. The principles are outlined once more in Figure 2 for reference.

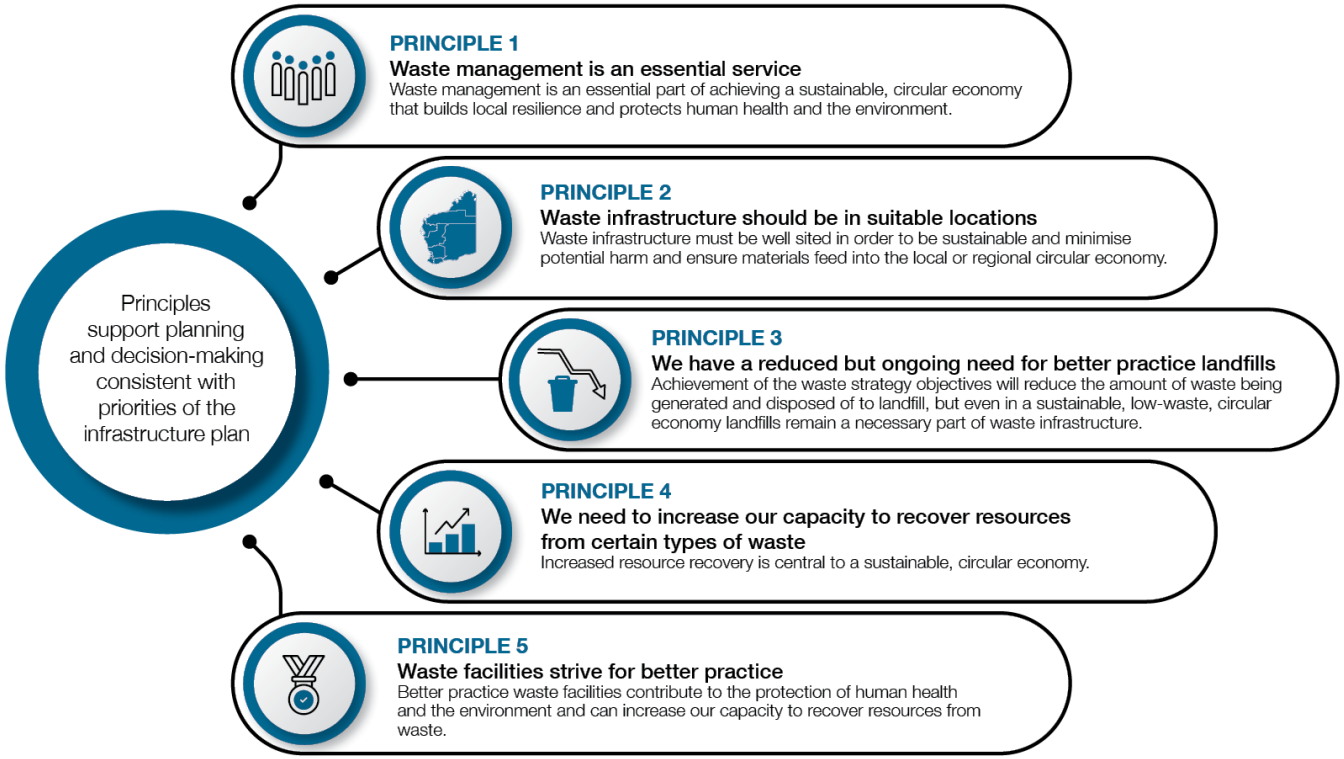


Figure 2 Principles of the *State waste infrastructure plan*

Table 24 Consideration of infrastructure plan principles and priorities in Perth

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings from working to achieve waste strategy 2030 targets (with assigned priority ranking)
254,000 tonnes of additional capacity in FOGO recovery	**Principle 1: Waste management is an essential service** Development of local capacity for FOGO recovery is essential for meeting waste strategy targets and reducing the region's greenhouse gas emissions. While there is an opportunity to alleviate some of the capacity needed by transporting materials to the Peel and Wheatbelt regions, Perth should develop processing infrastructure and leverage agricultural markets in adjoining regions that de-risk organics recovery as a critical element of the circular economy model. Contingency planning should include alternative facilities in adjoining regions to counter emergency situations (such as natural and other disasters) and unexpected closures of facilities arising from a variety of potential causes. **Principle 2: Waste infrastructure should be in suitable locations** Southern Perth has potential siting for new infrastructure with low constraints, as Perth's Strategic Industrial Areas and a significant portion of industrial zoned land are in this area. Siting and development of this additional capacity close to large sources of feedstock, adequate road networks and access to agricultural end markets in adjoining regions makes southern Perth an appropriate location for new facilities; however, facilities are also needed in northern Perth to cater to the growing population and demand for FOGO recovery services there. Barriers may be faced in developing sites in dense, urban environments of the Perth region, and whole-of-life impacts should be determined and evaluated for any proposed site. This includes accounting for eventual urban encroachment and having suitable buffers which may be addressed with strategic industrial areas and/or precincts. **Principle 4: We need to increase our capacity to recover resources from certain types of waste**	**High** Strategically located areas of land for waste processing facilities in northern Perth, and to a lesser extent in southern Perth, would improve infrastructure proximity to source wastes. **High** Upgrading of existing organics facilities in the Perth and Peel regions to accept FOGO will decrease the risk, capital costs and timeframes required to meet capacity needs. **High** Supported implementation of the *Guideline: Better practice organics recycling* will improve waste strategy Protect target outcomes.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings from working to achieve waste strategy 2030 targets (with assigned priority ranking)
	Consideration of principle 4 raises a priority for increased capacity to recover food organics using existing organics facilities. The FOGO capacity need of 254,000 tonnes may be alleviated by increasing the capacity of existing organics facilities within the Perth region and/or transporting organic waste to surrounding regions. If land use planning and licensing allow the upgrade of existing organics facilities to accept FOGO, the capacity needed to achieve waste strategy Recover targets may be reduced by 75,000 tonnes. **Principle 5: Waste facilities strive for better practice** While the large number of facilities needed to achieve capacity targets assists with contingency planning, it also increases the risk of facility or capacity limitations if future better practice standards are implemented under principle 5. A review of existing organics recovery facility compliance with the *Guideline: Better practice organics recycling* would facilitate an understanding of the capacity risk for this facility type.	
291,000 tonnes of additional capacity in carboard and paper recovery	**Principle 1: Waste management is an essential service** The Perth region currently relies on consolidation and export of carboard and paper for treatment. Local cardboard and paper processing capacity should be developed when considering principle 1. With one facility anticipated to be operational in 2030, contingency planning considerations and the additional need for 291,000 tonnes of capacity create an opportunity for a new cardboard and paper facility. Even if this capacity need is met, contingency risk remains as no other regions have paper and cardboard processing capacity that could be used if a Perth facility is not operational for a prolonged period. Given the state dependency on these facilities to process large volumes, development of an additional facility or multiple smaller facilities with lower capacity thresholds should be considered to overcome the contingency risk.	**High** Improving contingency planning in Perth will reduce the risk of capacity needs not being met.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings from working to achieve waste strategy 2030 targets (with assigned priority ranking)
	Principle 2: Waste infrastructure should be in suitable locations Perth needs to recover 391,000 tonnes of cardboard and paper to meet the waste strategy Recover targets. Perth also generates the largest volume of material, generating about 100,000 tonnes of cardboard and paper per annum. With this scale of generation and treatment, combined with access to downstream markets, Perth is a suitable site for additional facilities when considering principle 2. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** The impending fibre export ban will impact processing of cardboard and paper in Perth. Application of principle 4 encourages the development of a cardboard and paper recovery facility to recover more materials and decrease the risk of fibre export bans.	
33,000 tonnes of additional capacity in MRFs	**Principle 1: Waste management is an essential service** MRFs in Perth enable the recovery of material from regions that do not have sufficient capacity to operate a facility, providing essential waste management services according to principle 1. **Principle 2: Waste infrastructure should be in suitable locations** The expected 8 per cent increase in Perth's population and continued urbanisation will drive the need for Perth to recover an additional 33,000 tonnes in MRFs to meet the waste strategy Recover targets. MRFs must continue to play a role in resource recovery to meet the waste strategy Recover and Protect targets. Eight facilities are planned to exist in 2030, with most being in central Perth. Development of a waste precinct in northern Perth for a new facility could increase accessibility to the Mid West region and Goldfields-Esperance region, which have additional capacity needs totalling 26,500 tonnes for material recovery but insufficient feedstock to develop a new facility.	**High** Options for designating a strategic industrial area in northern Perth and/or waste precincts in both northern and southern Perth could facilitate low-risk development of MRFs.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings from working to achieve waste strategy 2030 targets (with assigned priority ranking)
73,000 tonnes of additional capacity in waste-to-energy facilities	**Principle 1: Waste management is an essential service** Two waste-to-energy facilities with combined capacity of 730,000 tonnes per year are under development and are critical to meeting the waste strategy Recover and Protect targets. Any delays in commissioning should be noted and will result in a continued reliance on landfill. Bottom ash treatment has sufficient capacity in two facilities in Perth. **Principle 2: Waste infrastructure should be in suitable locations** Statewide, 803,000 tonnes of residual waste needs to be recovered in waste-to-energy facilities to meet the 2030 material recovery, energy recovery and landfill diversion waste strategy targets. Perth generates almost 90 per cent of the residual waste required. With this large generation and transport networks to obtain feedstock, Perth remains a suitable location for waste-to-energy facilities. However, the northern suburbs of Perth have limited existing resource recovery infrastructure and are currently highly constrained for the development of new waste infrastructure. There is a need for consolidation facilities to enable transfer of material from these areas, in particular for residual waste-to-energy. Development of consolidation facilities in northern Perth is needed for efficient transfer of residual waste to waste-to-energy facilities, as well as other facilities fed by material received from regional Western Australia.	**High** Facilitate appropriate guidelines and a regulatory framework and specification for the recovery and treatment of bottom ash. This is a high priority as waste-to-energy facilities are anticipated to be operational in 2025. **Medium** Consolidation infrastructure for residual waste in northern Perth could facilitate efficient transfers to waste-to-energy infrastructure in southern Perth to decrease reliance on local landfill capacity.
Large volume of organics allows for development of other processes	**Principle 2: Waste infrastructure should be in suitable locations** Development of bioenergy infrastructure could be located where organics are being processed as an additional option to treat suitable organics, to expand capacity, or to diversify outputs (expanding from compost to energy production). This may present an opportunity for the Wheatbelt region to treat organic waste or FOGO waste that exceeds the treatment capacity of the region.	**Medium** Seven facilities are listed in the region with capacities exceeding 40,000 tonnes, with one of them at 135,000 tonnes. These larger existing facilities may consider options to implement other processes or technologies.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings from working to achieve waste strategy 2030 targets (with assigned priority ranking)
	Principle 4: We need to increase our capacity to recover resources from certain types of waste To achieve waste strategy targets, Western Australia needs to recover and process a large volume of organics. Expanding infrastructure to develop facilities that produce bioenergy expands capacity, diversifies options and reduces risk of failure to meet waste strategy targets. **Principle 5: Waste facilities strive for better practice** As volumes of organics are captured by large facilities in the region, there is potential to develop other processes. Better practice guidelines or regulatory requirements may change market activities and present an opportunity to utilise bioenergy more in Perth.	
Landfill capacity risk assessment	**Principle 2: Waste infrastructure should be in suitable locations** Based on current, planned and approved landfill capacity, the Perth region has sufficient landfill capacity to 2030. However, under a low-risk approach to landfill, Perth needs additional capacity to provide adequate options for residual waste disposal. Diversion of material to the adjoining Peel region could help alleviate capacity constraints. **Principle 5: Waste facilities strive for better practice** Consideration of principle 5 highlights there are six facilities that have a total lifetime capacity of 17,240,000 tonnes potentially at risk of noncompliance with better practice in Perth. The Perth region is likely to face capacity constraints for landfill by 2025 under a low-risk approach to landfill. In addition, 60 per cent of landfills also require post-closure planning, having not completed or updated a plan within the past 10 years.[1]	**High** Options for more efficient inter-regional waste transfer infrastructure and contingency arrangements could alleviate short-term capacity constraints between the Perth and Peel regions. This is a high priority given the likelihood of capacity constraints by 2025 under a low-risk approach to landfill capacity lifetime.

[1] Western Australia Waste Infrastructure Audit, ASK Waste Management Consultancy Services on behalf of the Department of Water and Environmental Regulation, (2021).

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings from working to achieve waste strategy 2030 targets (with assigned priority ranking)
Community recycling centres	**Principle 1: Waste management is an essential service** Community recycling centres will make up a crucial component of increasing source separation and improving material recovery rates for various waste types, particularly materials in specialised waste streams like batteries. Co-locating community recycling facilities with existing public transfer stations, depots or community facilities such as container refund points will mean more Western Australians have easy access to community recycling centres as an essential waste management service. The method for co-location and operation of a community recycling centre requires further investigation and consultation, noting the opportunity for community ownership and a community-led circular economy model. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Increasing the ability to recover material locally arises through consideration of principle 4 when working towards circular economy objectives. A comprehensive network of community recycling centres will help advance the circular economy if all communities have access to facilities to engage with and participate in local circular economy activities. Community recycling centres should work with local groups to provide spaces for reuse and upcycling of material. In addition, community recycling centres are an opportunity for Western Australians to drop off CDS items and materials for specialised recovery streams including batteries, solvents and paint or chemicals. There may be opportunity to further develop or incorporate existing sites that collect hazardous material under the Household Hazardous Waste program.[2] This program provides funding to assist with the storage, transport, treatment and recovery of Household Hazardous Waste collected by local governments and regional councils. **Principle 5: Waste facilities strive for better practice**	**High** Detailed assessment of the status of the current network and future need and the facilitation of consultation on the siting and operational model for community recycling centres in Western Australia would increase the scope of future infrastructure planning.

[2] Household Hazardous Waste program, Waste Authority, Department of Water and Environmental Regulation

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings from working to achieve waste strategy 2030 targets (with assigned priority ranking)
	Better practice guidelines will be particularly important to increase source separation and reduce contamination in community recycling centres, and to support management of specialised recovery streams. Co-location with product stewardship scheme collections allows access to existing infrastructure and administration support for certain waste streams.	
E-waste	**Principle 1: Waste management is an essential service** E-waste is one of the fastest-growing waste streams in Australia and appropriate management of this waste is essential when considering principle 1. The growing volume, and Western Australia's upcoming ban on e-waste disposal to landfill, represents a huge resource recovery opportunity. A greater understanding of the infrastructure needs for e-waste is needed to plan for capacity needs. **Principle 5: Waste facilities strive for better practice** A better practice guideline for the collection and processing systems of E-waste will assist in maximising resource recovery from this specialised waste stream.	**Medium** Further review and auditing of collection systems and processing infrastructure to understand the state of e-waste recovery in Western Australia would support future infrastructure planning.

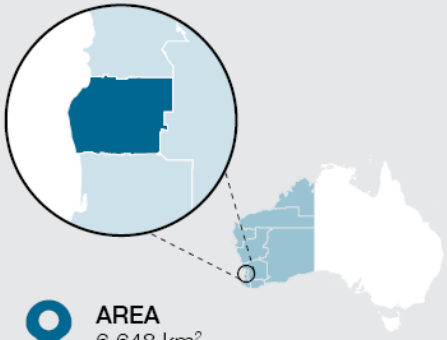
Peel region

Waste profile in 2020

The Peel region is bordered by Perth to the north and is closely related in infrastructure capacity sharing. The region generated 287,000 tonnes of waste in 2020, consisting of about 52 per cent C&D waste, 29 per cent C&I waste, and 19 per cent MSW. The region treated 143,000 tonnes in 2020 with 71,000 tonnes (50 per cent) being recovered and 72,000 (50 per cent) being landfilled. The rate of material received into (87,000 tonnes) and transported out of the region (231,000 tonnes) in 2020 was about equal to the region's generation rate. Key waste profile data for the Peel waste and resource recovery in 2020 is presented below.

Residents in Peel	4 per cent of Western Australia's population resides in the Peel region.
	Population density of 17 people per km^2.
	The majority of the Peel population (65 per cent) resides in Mandurah and surrounds, with low-density communities elsewhere.
Local governments in the region	Shire of Serpentine-Jarrahdale, Shire of Boddington, City of Mandurah, Shire of Murray, and Shire of Waroona.
Generating waste	Peel generates 5 per cent of the waste generated in Western Australia.
Transporting waste	The region has good road and rail infrastructure, especially in connection to Perth.
Treating waste	Peel treats 3 per cent of the the waste treated in Western Australia.
	Peel recovers 2 per cent of the waste recovered in Western Australia.
	Peel landfills 3 per cent of the waste landfilled in Western Australia.

PEEL
REGIONAL SUMMARY



AREA
6,648 km²

GROSS REGIONAL PRODUCT (2019–20)
$7.85B/CAP

NUMBER OF BUSINESSES (2019–20)
7,783

TOP 5 EMPLOYMENT BY INDUSTRY

23.83%	Construction
9.59%	Transport, postal and warehousing
9.42%	Rental, hiring and real estate services
9.06%	Professional, scientific and tech services
7.98%	Agriculture, forestry and fishing

The manufacturing industry sector makes the greatest contribution to economic output in the region, which at $7.4B accounts for 31.74% of total output. With 5,675 jobs representing 12.79% of total employment, it is the retail trade industry sector that is the region's largest employer.

2020

- POPULATION 115,028
- WASTE GENERATED 287,000 TONNES
- WASTE GENERATION PER CAPITA 2.5 TONNES

2030

PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

- POPULATION 139,020 (▲21%)
- WASTE GENERATED 291,000 TONNES
- WASTE GENERATION PER CAPITA 2.1 TONNES

2030 INFRASTRUCTURE CAPACITY NEED

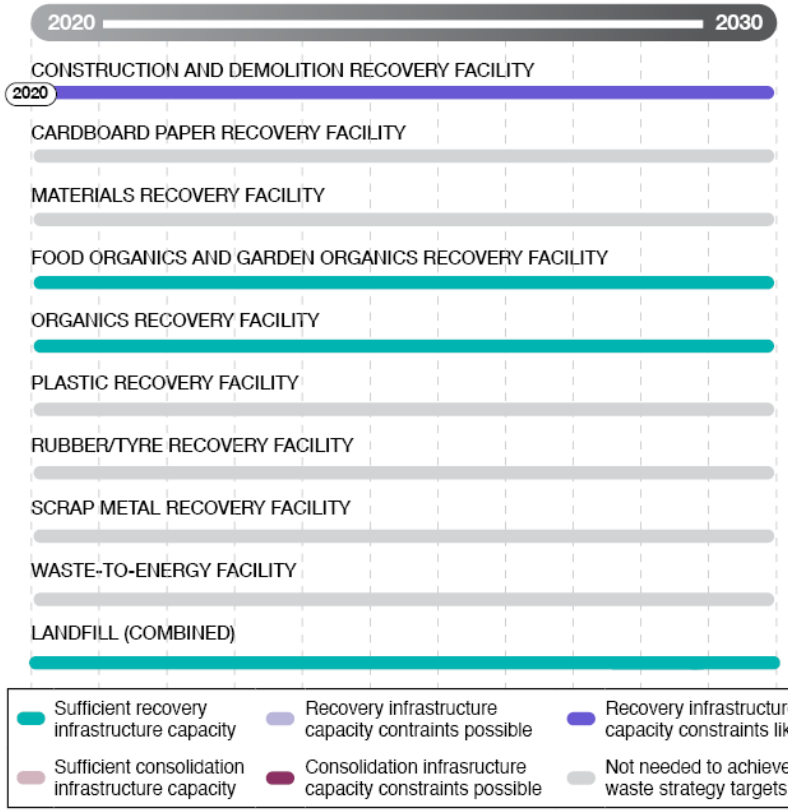
1. Construction and demolition | 51,500 tonnes

TOP PRIORITIES

1. Review options to facilitate lifetime and capacity expansion of existing construction and demolition facilities in Peel.
2. Assess whether existing 67A licensed facilities in Peel or neighbouring regions can be increasingly utilised to alleviate food organics and garden organics recovery capacity need.
3. Monitor progress for implementation of capacity expected from the Food Waste for Healthy Soils program.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030

Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN PEEL 2020 AND 2030

Waste projections to 2030 based on meeting the waste strategy targets

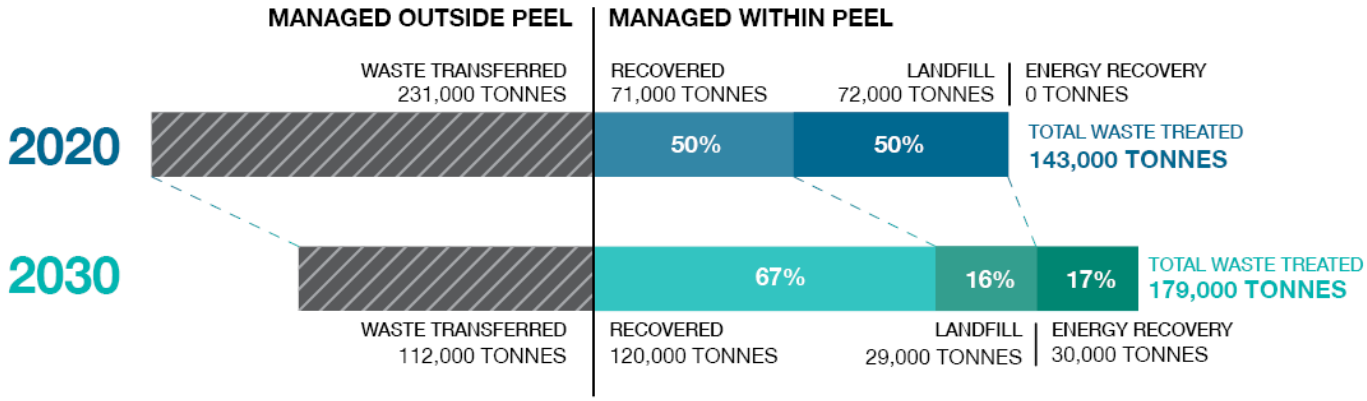


Figure 31 Waste in Peel: statistics and projections

Waste and resource recovery in 2020

Peel is the second most-densely populated region in Western Australia after Perth and is reliant on neighbouring regions for a significant portion of its waste management needs. Mixed C&D waste represented the top material generated, treated, received and transferred from the region. This indicates that capacity sharing within and outside of Peel is key for C&D recovery. The top five materials processed in the region in 2020 include:

1. mixed C&D waste
2. mixed putrescible waste – domestic (household)
3. sand/soil
4. mixed putrescible waste (C&I)
5. metals – ferrous steel – non-packaging.

More than half of the material treated in Peel was through the region's three C&D recovery facilities (with a fourth facility currently in planning). There is also considerable organics processing capacity through the region's three organics recovery facilities. There are no other recovery facilities in the region. Remaining material is disposed of through the region's one putrescible landfill and three inert landfills.

The region's location and good transport infrastructure means that Peel will continue to share processing capacity and constraints with neighbouring regions. Perth was the dominant partner in trans-regional material movements, followed by the South West, although waste imports extended as far as the Pilbara and Goldfields-Esperance regions. Peel is particularly critical in the disposal of asbestos (25 per cent of material imports). Connection with other regions also facilitates a range of market offtake options for C&D and organics recovered in Peel.

Key aspects of waste and resource recovery system in the Peel region in 2020, considered by the infrastructure plan, include:

- Mixed C&D was the largest type of material generated, received into and transferred out from the region.
- Mixed putrescible waste (domestic and commercial) also forms a large portion (28 per cent) of the waste transferred out from Peel.
- Peel plays a critical role in treating asbestos generated in other regions.
- The development and operation of local waste-to-energy facilities (likely in Perth) will have a significant impact on the treatment method of material generated in Peel.

The location of current and planned recovery infrastructure in Peel in 2030 is shown in Figure 34 (see Facility lists in the Appendix for a full list of facilities). Facilities granted work approvals since 2020 by the department in the Peel region are listed below in Table 25 Facilities granted licences or works approvals since 2020 in PeelTable 25. These facilities have not been included in the modelling for the infrastructure plan and may alleviate some of the region's capacity needs.

Table 25 Facilities granted licences or works approvals since 2020 in Peel

Facility type	Facility name	Location
Consolidation centre and landfill (Category 63)	Peel Landfill Facility	Peel

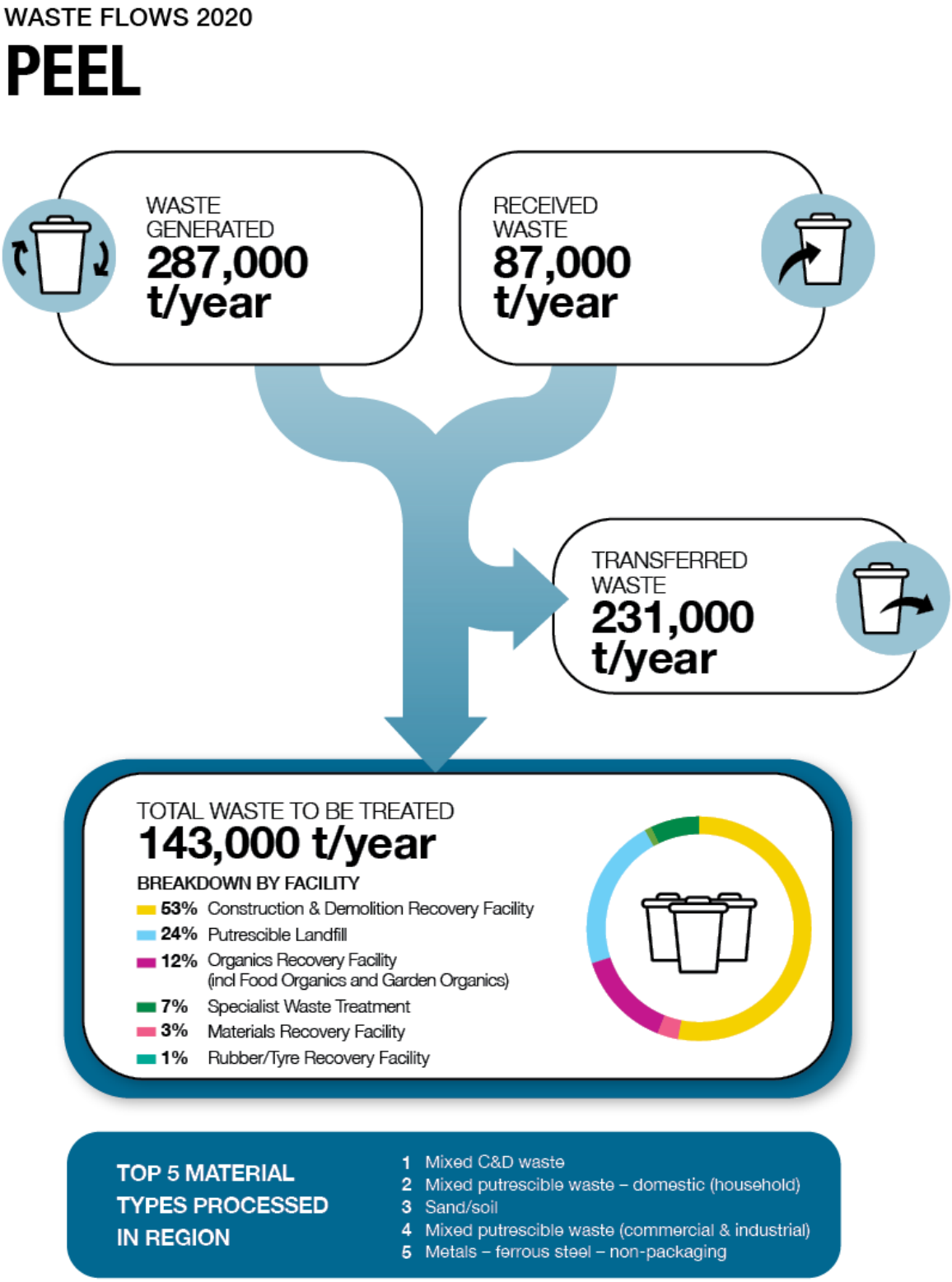


Figure 32 Waste generated, received, transferred and treated in Peel in 2020

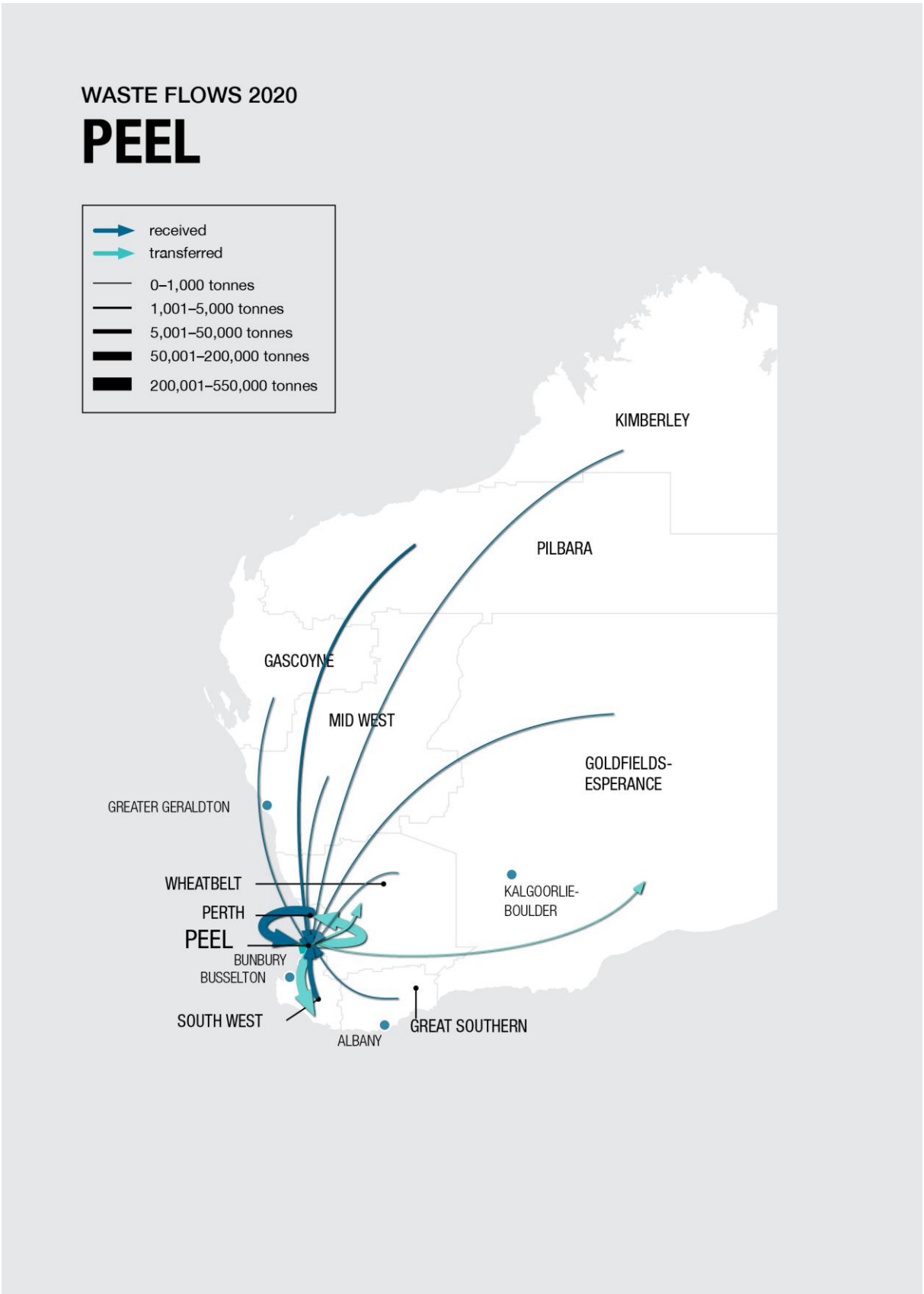


Figure 33 Waste flows in Peel in 2020

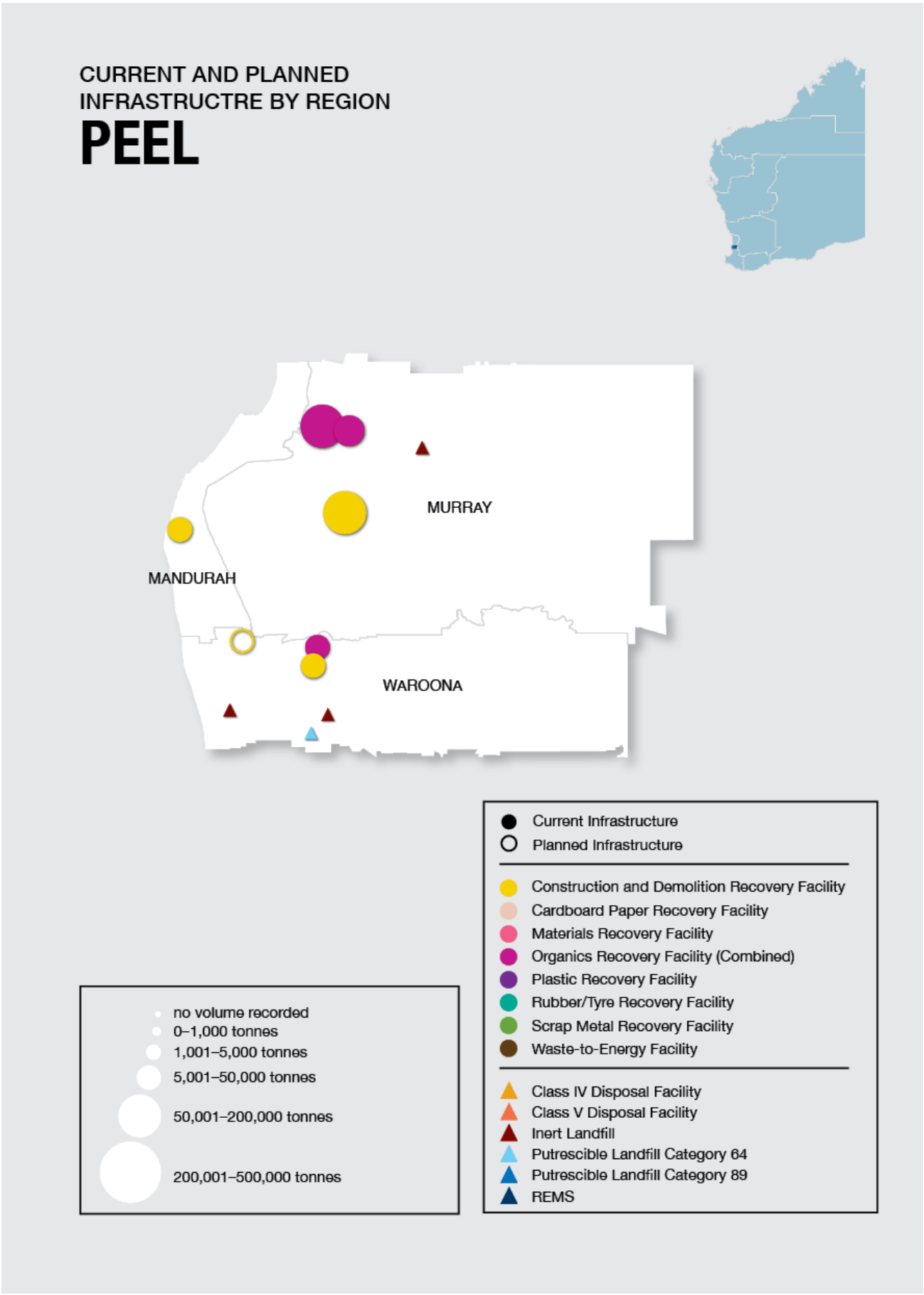


Figure 34 Current and planned infrastructure locations in Peel in 2020

Waste and resource recovery in 2030

Modelling to achieve all waste strategy targets in 2030 found the Peel region would generate 291,000 tonnes, similar to 2020 quantities.

However, the reduction in materials exported means the total waste treated in Peel will increase by 25 per cent. This shift, along with the addition of new infrastructure, will increase the Peel materials recovery rate from 50 per cent to 67 per cent.

Figure 35 highlights the increase from materials recovery (67 per cent) to resource recovery (materials recovery plus energy recovery; 84 per cent), emphasising the increasing importance of energy recovery in waste management strategies.

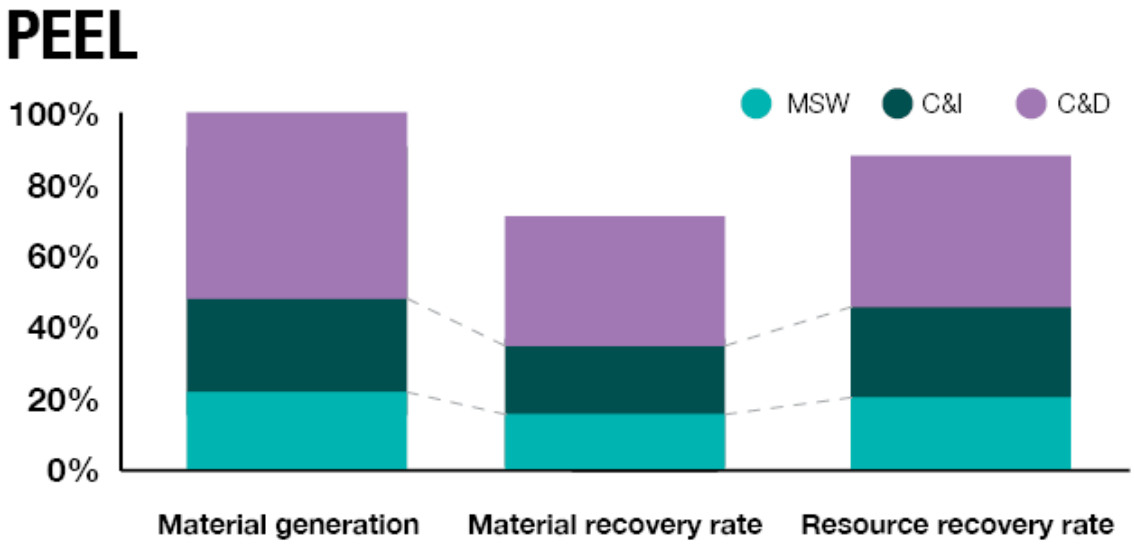


Figure 35 Generation, material recovery and resource recovery by source in Peel in 2030

Figure 36 shows the distribution of feedstock materials used by each facility type, indicating which waste streams are most significant and where the resource recovery efforts should be concentrated. This is also reflected in the Peel region Principles and priorities section.

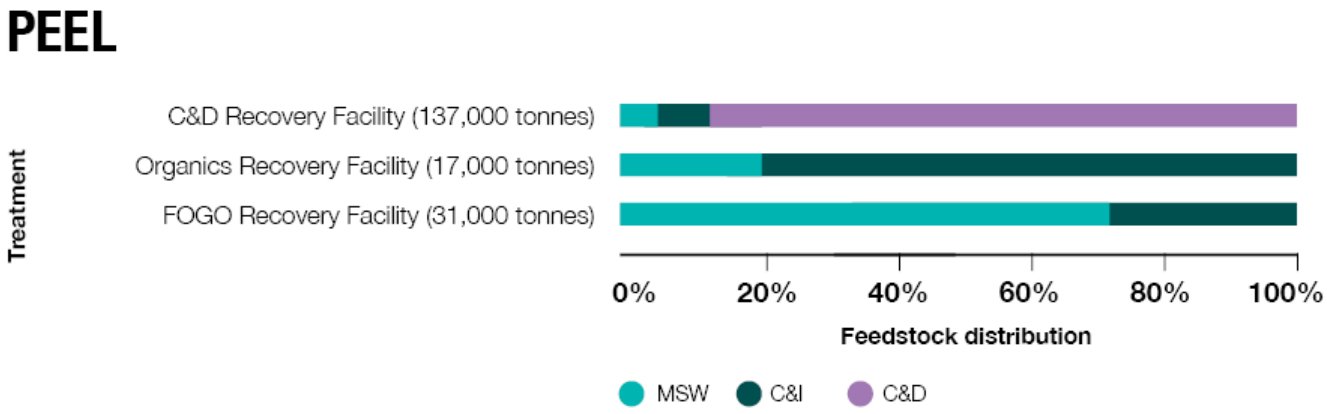


Figure 36 Feedstock distribution of treatments in Peel in 2030

The Peel region is anticipated to provide 69,000 tonnes of FOGO recovery capacity to Perth, as a new facility is expected to add 100,000 tonnes of capacity.

The model uses licensed capacity for facilities and can result in an overestimation of actual capacity. Stakeholder feedback indicates that only a fraction of the region's licensed capacity of 127,000 tonnes of Category 67A capacity is actually available for the processing of FOGO. The Infrastructure priorities section describes the need to investigate further to confirm actual FOGO processing capacity.

Infrastructure capacity needs in 2030

Based on current, planned and approved infrastructure in 2020, Peel requires the following additional capacities to meet the waste strategy targets in 2030:

- 51,500 tonnes of additional recovery capacity is needed for C&D, which is sufficient capacity to allow for an additional facility.

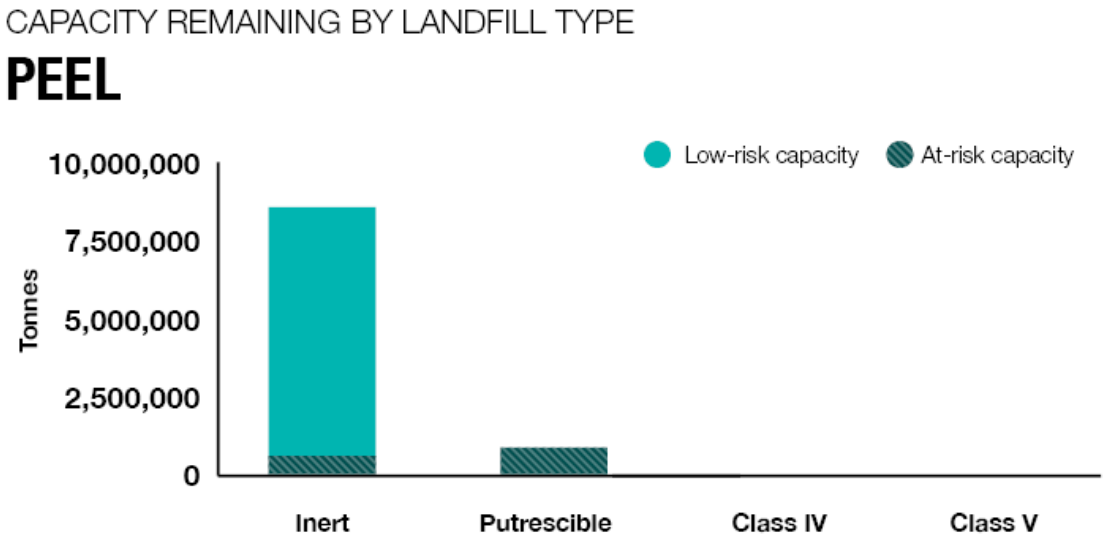


Figure 37 Capacity remaining by landfill type in Peel, including an assessment of low-risk and at-risk capacity

Total remaining capacity by landfill types is presented in . This figure also indicates the proportion of that capacity that is at risk (see section on Landfill capacity lifetime assessment to 2030 and 2050).

Under the low-risk scenario, a total of 1 million tonnes of capacity was identified as potentially at risk, of which inert landfills make up 39 per cent and putrescible landfills 61 per cent. *State Waste Infrastructure Needs Analysis* modelling predicts 24,000 tonnes of residual waste will be disposed of in landfill each year. Feedstock lifetime remaining for landfills is shown in Figure 19

Details of the infrastructure needed to achieve waste strategy targets are outlined in Figure 38, including the expected facilities, capacities and capacity needs in 2030.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

PEEL

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030.
It includes planned and approved facilities, as well as closures between 2020 and 2030.

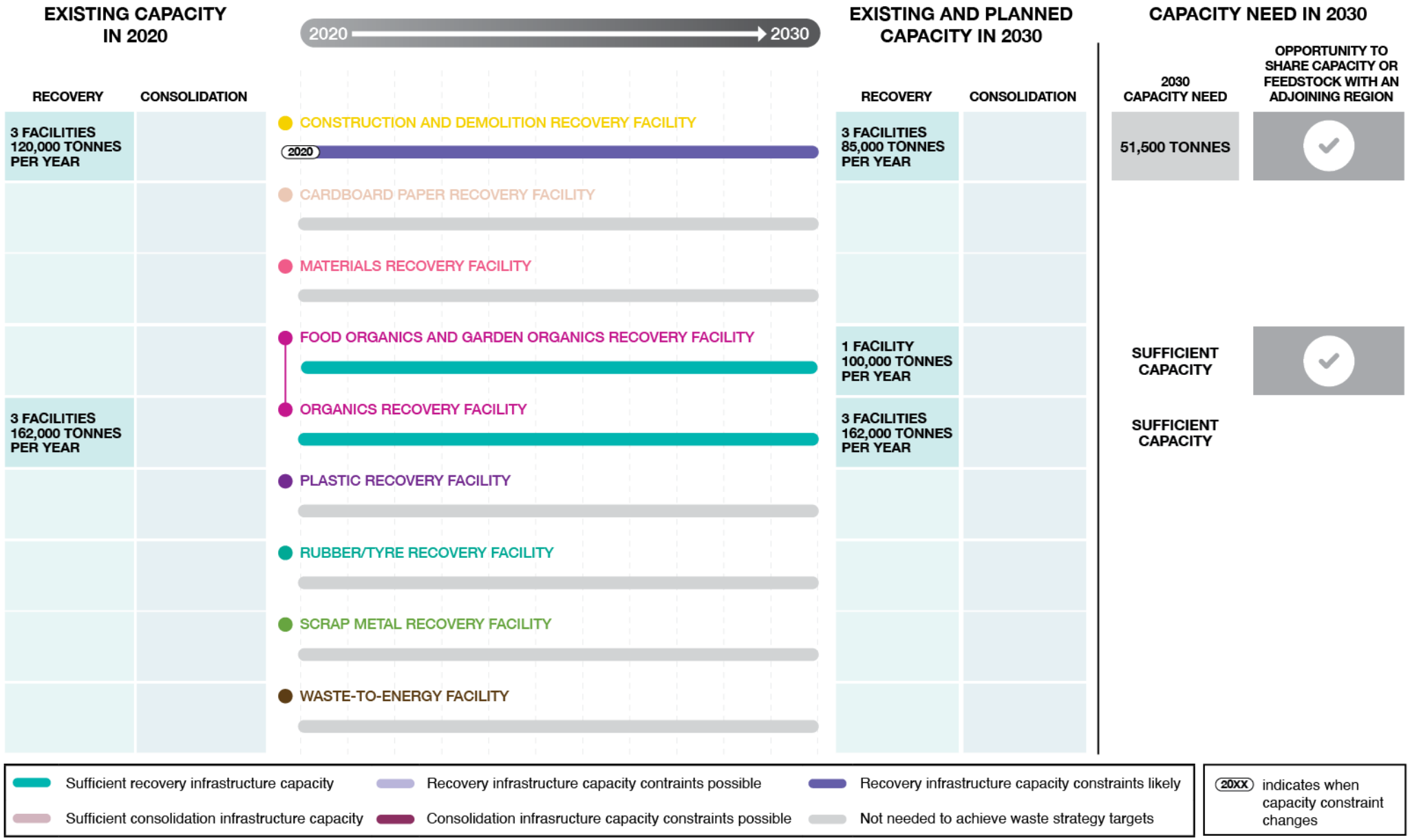


Figure 38 Peel infrastructure pipeline and capacity need in 2030

Principles and priorities

The principles outlined in this plan have been used to identify priorities.

Priority areas that are projected to go beyond capacity need, based on the completed modelling for the region, arise when applying the principles.

Based on the analysis, the top priorities for the Peel region are:

- Review options to facilitate lifetime and capacity expansion of existing C&D facilities in the region.
- Assess whether 67A licensed facilities can be increasingly utilised to alleviate FOGO recovery capacity need in Perth.
- Monitor progress for implementation of capacity expected from the Food Waste for Healthy Soils program.
- Assess whether existing 67A licensed facilities in Peel or neighbouring regions can be increasingly utilised to alleviate FOGO capacity need.

These are discussed in more detail in Table 26 below. The principles are outlined once more in Figure 2 for reference.

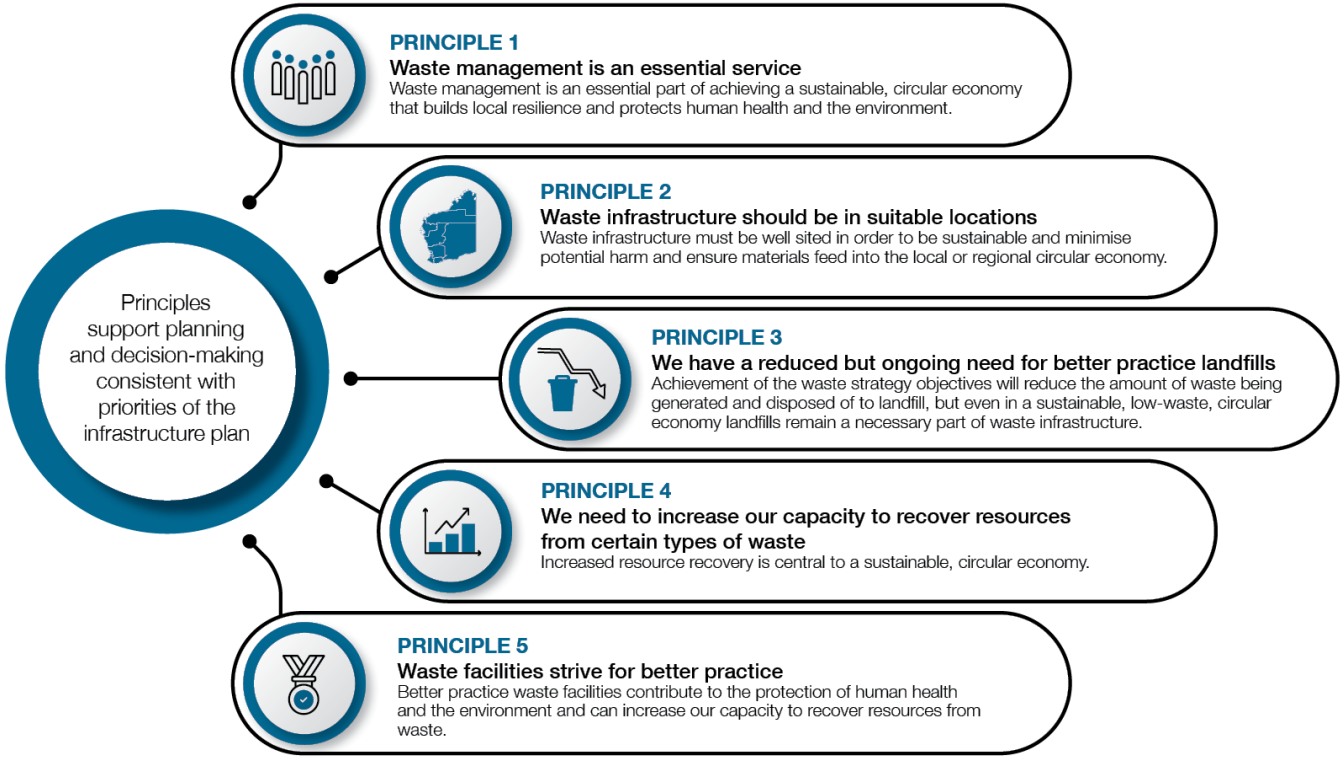


Figure 2 Principles of the *State waste infrastructure plan*

Table 26 Consideration of infrastructure plan principles and priorities

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
51,500 tonnes of additional capacity for C&D recovery	**Principle 1: Waste management is an essential service** Existing capacity constraints to treat C&D material in Peel will be compounded by future population growth and increased urbanisation. Application of principle 1 indicates that there is a high priority to develop additional C&D processing capacity to support a wide range of development projects. **Principle 2: Waste infrastructure should be in suitable locations** C&D processing benefits from being situated close to the source of generation and offtake markets. Peel's proximity to urban development projects in Perth assist in these considerations. Peel has strong transport networks to facilitate access to state population centres, which will de-risk recovered C&D product offtake. Because of the immediate need for extra C&D capacity, options to expand and extend the life of existing facilities should be prioritised. High urban densities in some areas of the Peel region will restrict development options for siting new infrastructure. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** C&D material is the most-generated material type in the Peel region. Investment in new capacity has low risks in accessing necessary feedstocks. Additionally, recovery rates are typically very high and will support waste strategy Recover targets.	**High** Lifetime and capacity expansions of existing C&D facilities in the Peel region will decrease the risk, capital costs and timeframes required to meet capacity needs.
Large volume of organics allows for development of other processes	**Principle 2: Waste infrastructure should be in suitable locations** Development of bioenergy infrastructure could be located where organics are being processed as an additional option to treat suitable organics, to expand capacity, or to diversify outputs (expanding from compost to energy production). This may present an opportunity for the Wheatbelt region to treat organic waste or FOGO waste that exceeds the treatment capacity of the region. **Principle 4: We need to increase our capacity to recover resources from certain types of waste**	**Medium** Three facilities are listed in the region with capacities exceeding 35,000 tonnes, with one of them at 90,000 tonnes. These larger existing facilities may consider options to implement other processes or technologies.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	To achieve waste strategy targets, Western Australia needs to recover and process a large volume of organics. Expanding infrastructure to develop facilities that produce bioenergy expands capacity, diversifies options and reduces risk of failure to meet waste strategy targets. **Principle 5: Waste facilities strive for better practice** As volumes of organics are captured by large facilities in the region, there is potential to develop other processes. Better practice guidelines or regulatory requirements may change market activities and present an opportunity to utilise bioenergy more in Peel.	
Landfill capacity risk assessment	**Principle 1: Waste management is an essential service** Development of new waste-to-energy capacity to service the Perth and Peel regions will decrease the reliance on existing putrescible landfill infrastructure. Excess capacity should still be maintained to provide contingency as waste-to-energy disruptions or disasters have the risk to increase local putrescible waste treatment requirements. **Principle 2: Waste infrastructure should be in suitable locations** Government policy restricting new putrescible landfill development on the Swan Coastal Plain significantly reduces options to develop additional local capacity, compounded by high population density rates. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Increased reliance on waste-to-energy treatment for residual waste originating from the Perth and Peel regions will require increased capacity for the recovery of bottom ash. Modelling indicates that, once the two waste-to-energy facilities under development in Perth are in operation, there will be sufficient capacity for the treatment and recovery of bottom ash. If these recovery facilities experience delay or disruption The excess inert landfill capacity in the Peel region could potentially provide a contingency disposal option.	**High** Improved outcomes for waste strategy Recover and Protect targets could be achieved through development of capacity for Peel to supply contingency waste-to-energy bottom ash recovery or disposal.

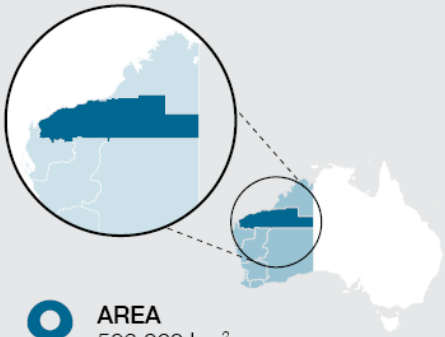
Pilbara region

Waste profile in 2020

The Pilbara is a low-density region of Western Australia that has the highest per capita waste generation rate (4.87 tonnes per capita). The region generated 296,000 tonnes of waste in 2020, consisting of about 46 per cent C&I waste, 37 per cent C&D waste and 17 per cent MSW. The region treated 249,000 tonnes in 2020 with 115,000 tonnes (46 per cent) being recovered and 134,000 (54 per cent) being landfilled. Key waste profile data for Pilbara waste and resource recovery in 2020 is presented below.

Residents in the Pilbara	2 per cent of Western Australia's population resides in the Pilbara region.
	Population density of 0.1 people per km^2.
	Low-density region with one quater (25 per cent) of population in Karratha.
Local governments in the region	Shire of Ashburton, Shire of East Pilbara, City of Karratha, and Town of Port Hedland.
Generating waste	The Pilbara generates 5 per cent of the waste generated in Western Australia.
Transporting waste	Extensive road networks connect the Pilbara with Perth, neighboring regions and two large commercial ports.
Treating waste	The Pilbara treats 4 per cent of the waste treated in Western Australia.
	The Pilbara recovers 3 per cent of the waste recovered in Western Australia.
	The Pilbara landfills 5 per cent of the waste landfilled in Western Australia.

PILBARA
REGIONAL SUMMARY



AREA
506,260 km²

GROSS REGIONAL PRODUCT (2019–20)
$62.22B/CAP

NUMBER OF BUSINESSES (2019–20)
1,096

TOP 5 EMPLOYMENT BY INDUSTRY

16.87%	Construction
13.57%	Rental, hiring and real estate services
10.54%	Transport, postal and warehousing
10.27%	Other services
8.07%	Professional, scientific and tech services

The mining industry sector makes the greatest contribution to economic output in the region, which at $78.6B accounts for 86.33% of total output. This industry sector is also the largest employer with 31,414 jobs which represents 52.55% of total employment within the region.

2020
- POPULATION 60,674
- WASTE GENERATED 296,000 TONNES
- WASTE GENERATION PER CAPITA 4.87 TONNES

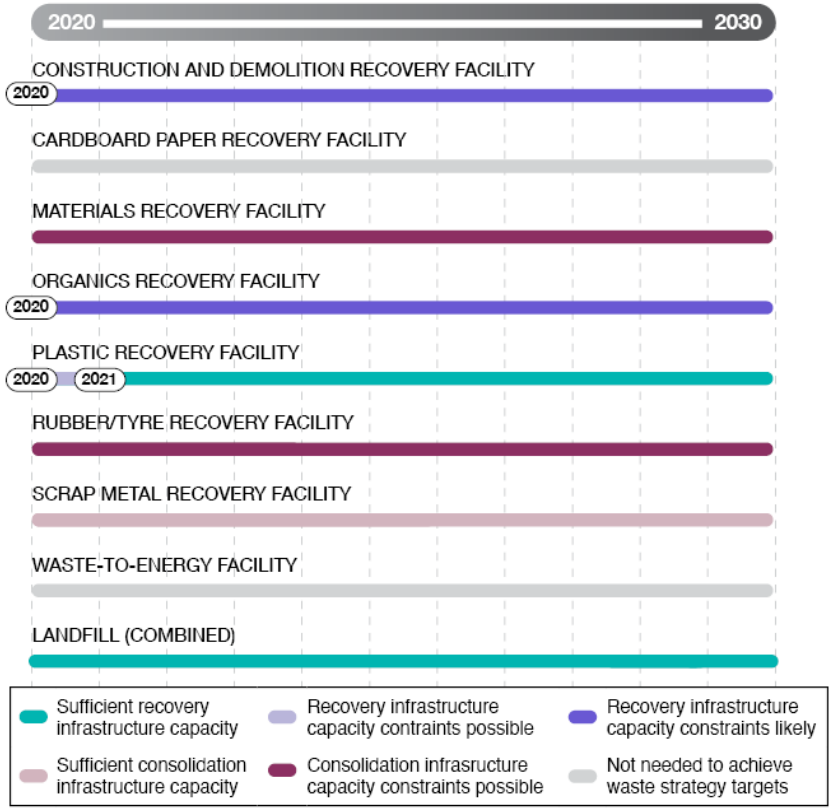
2030
PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

- POPULATION 63,595 (▲5%)
- WASTE GENERATED 271,000 TONNES
- WASTE GENERATION PER CAPITA 4.26 TONNES

2030 INFRASTRUCTURE CAPACITY NEED
1. Construction and demolition | 38,000 tonnes
2. Organics | 26,000 tonnes
3. Material recovery facility | 7,000 tonnes

TOP PRIORITIES
1. Review options to facilitate lifetime and capacity expansion of existing construction and demolition facilities in the Pilbara.
2. Assess waste generation and infrastructure needs in remote Aboriginal communities to ensure adequate access to services.
3. Investigate a rural landfill risk assessment of unlicensed landfill and REMS landfills.
4. Investigate alternative landfill facility contingency arrangements with the Kimberley to alleviate short term capacity constraints in neighbouring regions.
5. Assess whether existing 67A licensed facilities in neighbouring regions can be increasingly utilised to alleviate food organics and garden organics recovery capacity need.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030
Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN PILBARA 2020 AND 2030
Waste projections to 2030 based on meeting the waste strategy targets

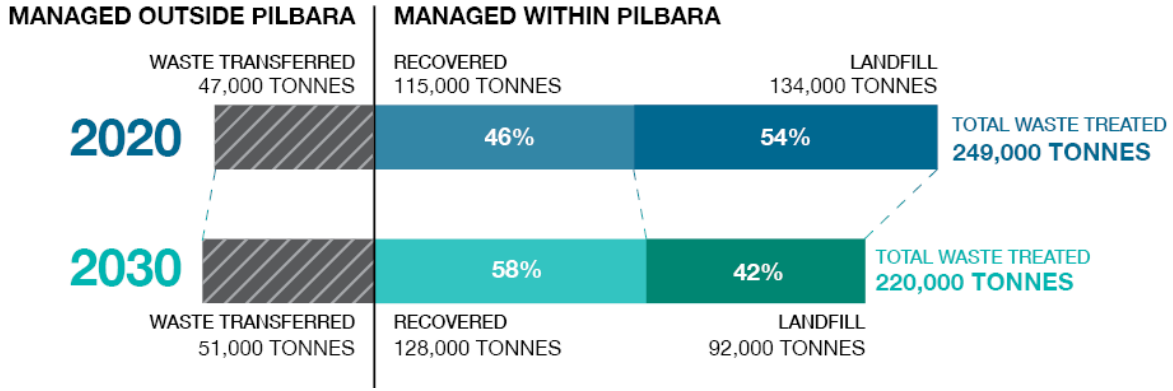


Figure 39 Waste in the Pilbara: statistics and projections

Waste and resource recovery in 2020

Much of the Pilbara population is on the coast, although commercial operations that generate a complex waste mixture extend across the region. Mixed C&D material was the largest single waste material generated and processed in the region, with some volumes being transferred out of the region because of constrained processing capacity. The top five materials processed in the region in 2020 include:

1. mixed C&D waste
2. mixed putrescible waste – domestic (household)
3. metals – ferrous steel – non-packaging
4. mixed inert waste
5. contaminated soil.

Half of the material treated in the Pilbara is through two C&D recovery facilities. There is also one plastics recovery facility (that received support through the Recycling Modernisation Fund). There is additional capacity for rubber/tyre and C&D recovery already planned for the region. Landfill disposal is supported by nine putrescible landfills and 12 REMS-managed landfills. Additional landfill planning is already underway for an inert landfill and a Class IV landfill.

The remote geography of the region creates a barrier to accessing material, although there are opportunities to consolidate material from neighbouring regions such as the Kimberley and Gascoyne. Several key highways and ports in the Pilbara facilitate inter-regional and international material movement. Currently the Pilbara transfers ferrous steel (31,000 tonnes) primarily to Perth.

Key aspects of waste and resource recovery system in the Pilbara in 2020, considered by the infrastructure plan, include:

- C&I formed the largest material generation source in the Pilbara region, consisting of about 140,000 tonnes, of which 47 per cent was recovered
- The majority (92 per cent) of waste transferred out of the Pilbara is transported to Perth for further treatment.
- Mixed ferrous steel was the third-largest material type generated in the Pilbara and was the largest category of material transferred out of the region.
- Recent investment will create additional capacity to treat plastics and rubber/ tyres in the region.

The locations of current and planned recovery infrastructure in 2030 are shown in Figure 42 (see Facility lists in the Appendix for a full list of facilities). Facilities granted work approvals since 2020 by the department in the Pilbara region are listed below in Table 27. These facilities have not been included in the modelling for the infrastructure plan and may alleviate some of the region's capacity needs.

Table 27 Facilities granted licences or works approvals since 2020 in the Pilbara

Facility type	Facility name	Location
Consolidation centre	Veolia Port Hedland Waste Transfer Station	Pilbara

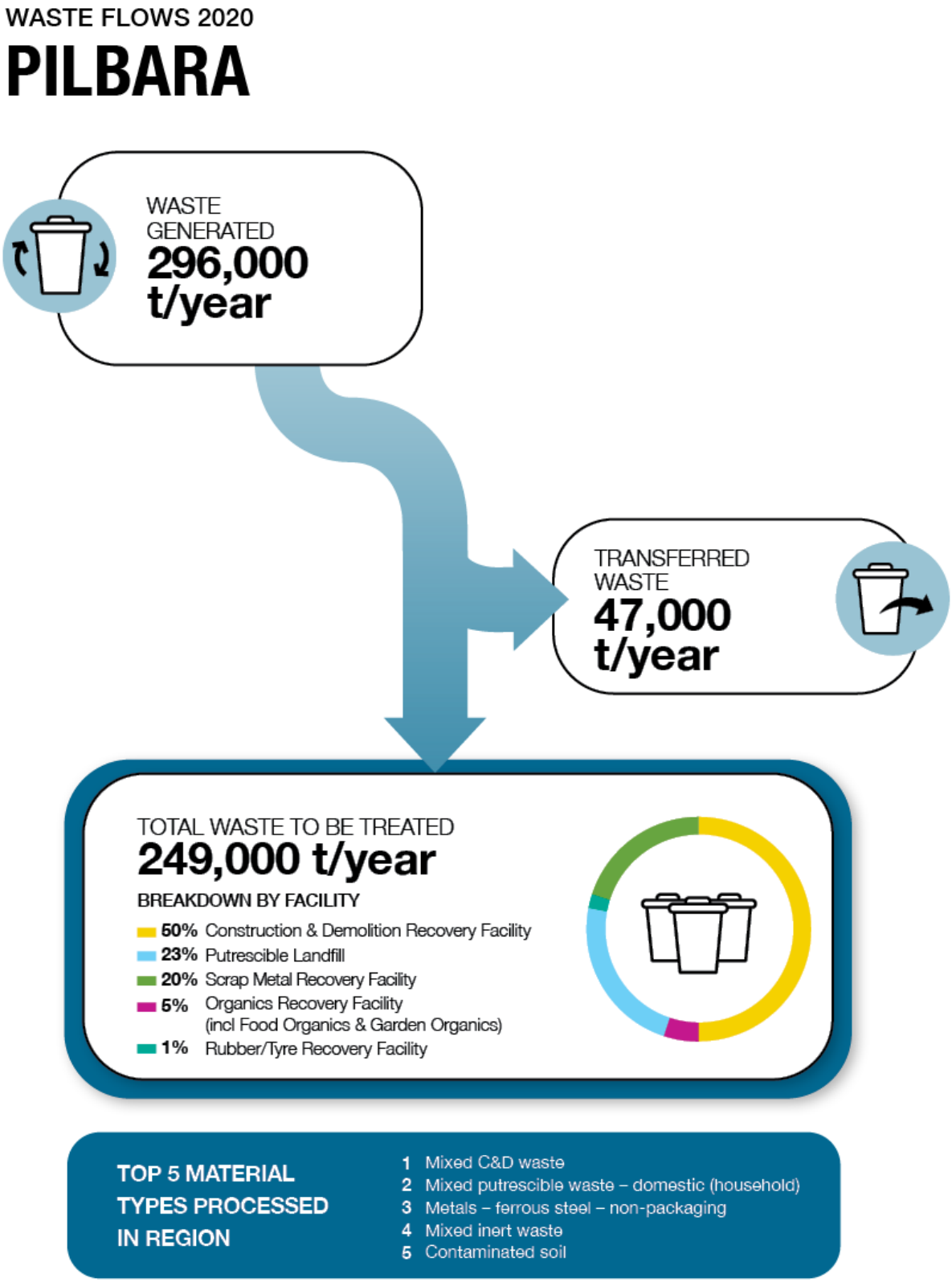


Figure 40 Waste generated, received, transferred and treated in the Pilbara in 2020

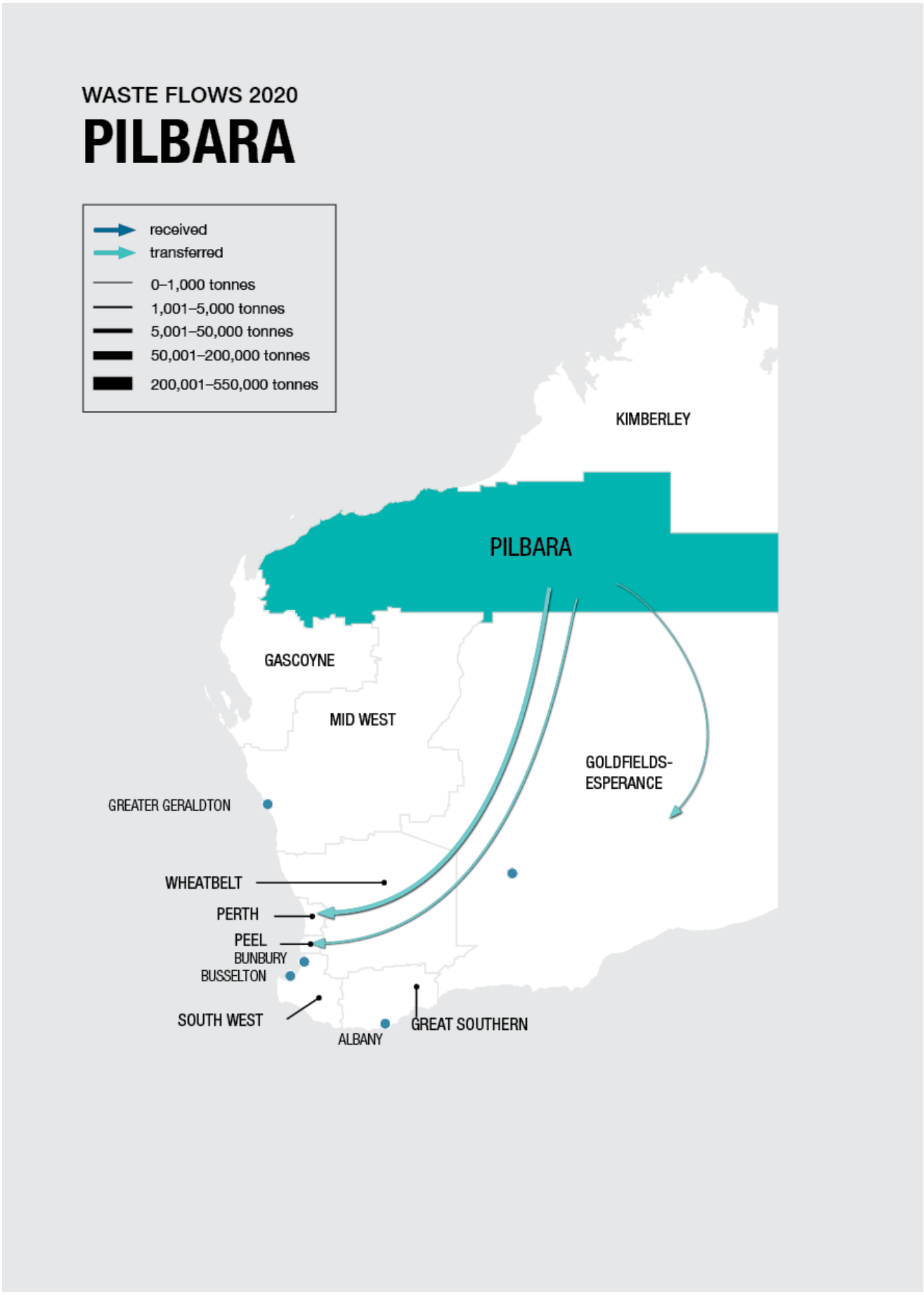


Figure 41 Waste flows in the Pilbara in 2020

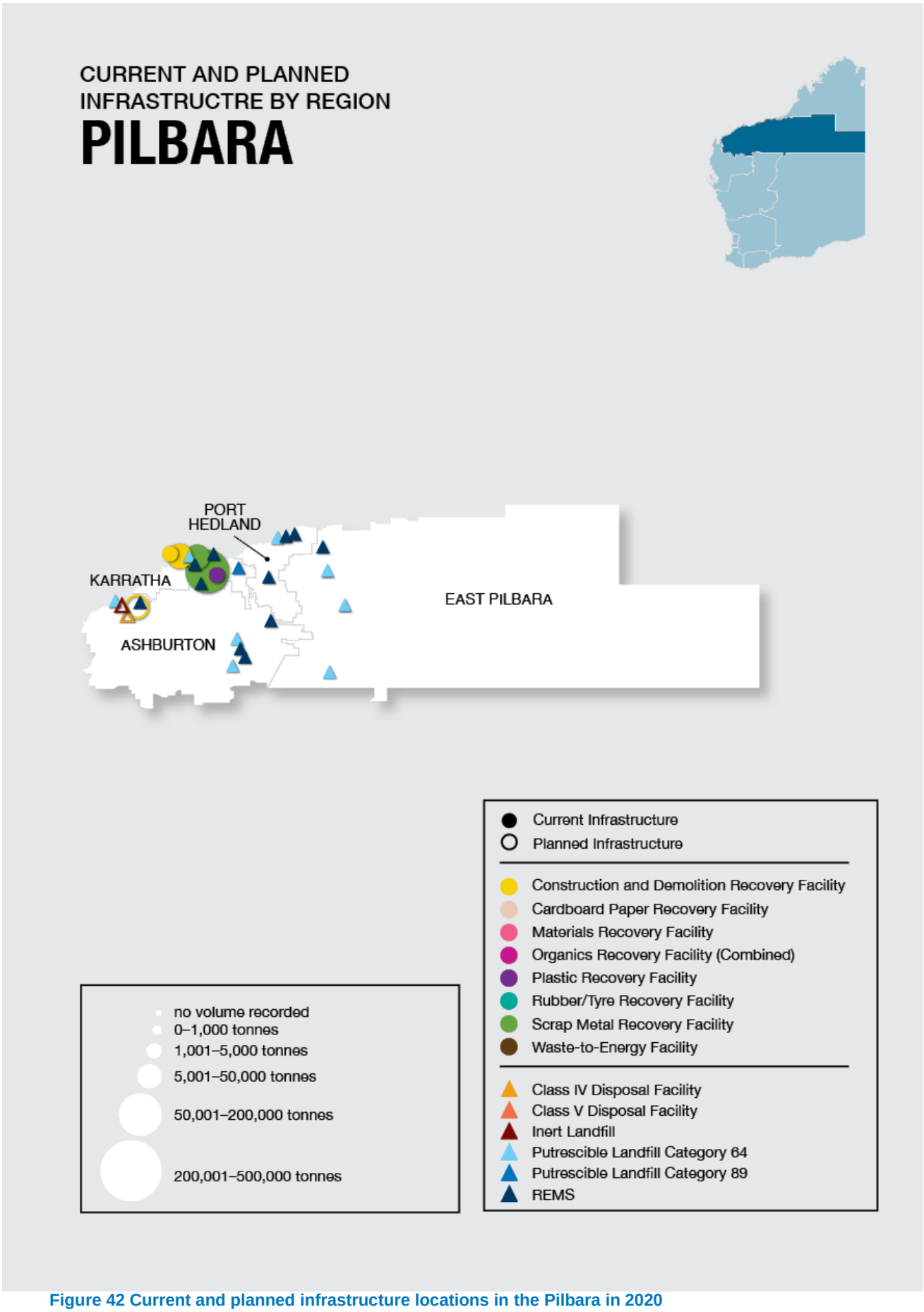


Figure 42 Current and planned infrastructure locations in the Pilbara in 2020

Waste and resource recovery in 2030

Modelling achievement of all waste strategy targets in 2030 found the Pilbara region would generate 271,000 tonnes and transfer 51,000 tonnes out of region, both similar to 2020 quantities.

Increases in local infrastructure capacity will increase the Pilbara material recovery rate from 46 per cent to 58 per cent. Figure 43 shows the distribution of feedstock materials used by each facility type, indicating which waste streams are most significant and where the resource recovery efforts should be concentrated. This is also reflected in the Pilbara region Principles and priorities section.

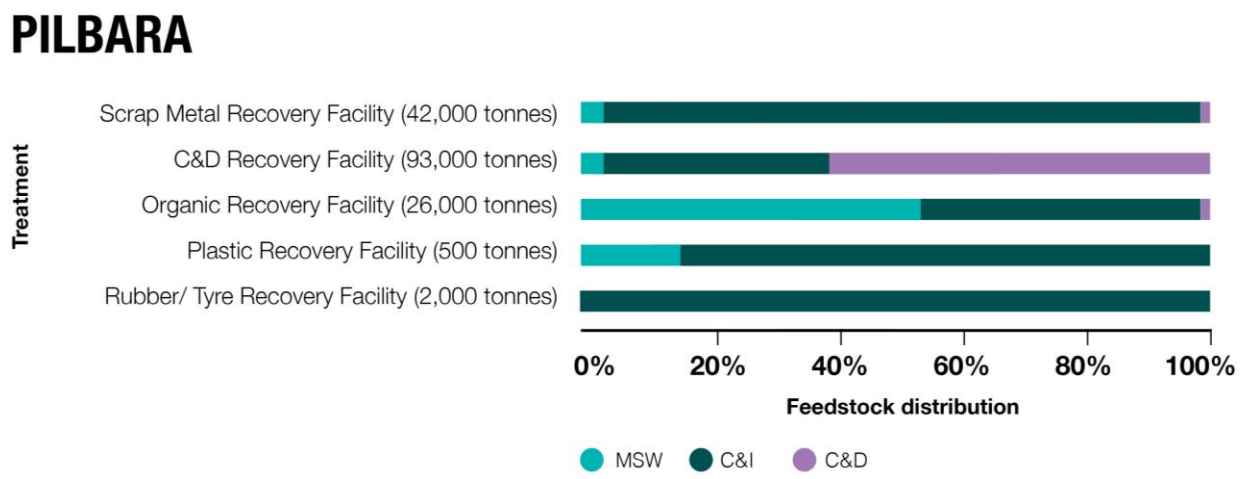


Figure 43 Feedstock distribution of treatments in the Pilbara in 2030

Infrastructure capacity needs in 2030

Based on current, planned and approved infrastructure in 2020, the Pilbara requires the following additional capacities to meet the waste strategy targets in 2030:

- 38,000 tonnes of additional recovery capacity is needed for C&D, which is sufficient to allow for an additional facility.
- 26,000 tonnes of additional recovery capacity is needed for organics, which is sufficient volume to allow for development of a new organics recovery facility and a FOGO recovery facility. As demonstrated in Figure 43, more than half of the organics feedstock (52 per cent) is estimated to consist of MSW, indicating that there may also be a need for a FOGO recovery in the region.
- 7,000 tonnes of additional consolidation capacity is needed for material recovery.

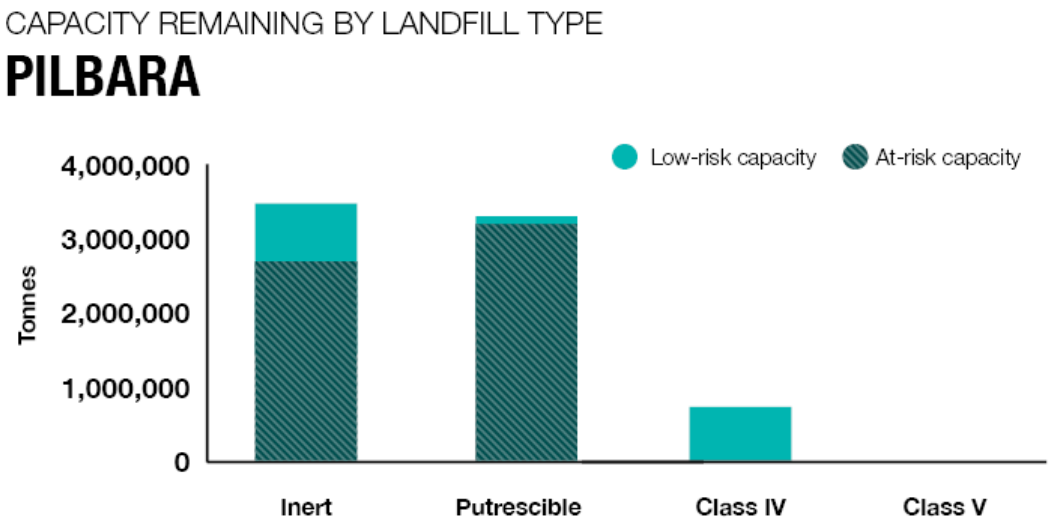


Figure 44 Capacity remaining by landfill type in the Pilbara, including an assessment of low-risk and at-risk capacity

Total remaining capacity by landfill types is presented in . This figure also indicates the proportion of that capacity that is at risk (see section on Landfill capacity lifetime assessment to 2030 and 2050).

Under the low-risk scenario, most of the total landfill capacity of 6 million tonnes was identified as potentially at risk, of which inert landfills make up 47 per cent and putrescible landfills 53 per cent. *State Waste Infrastructure Needs Analysis* modelling predicts 36,000 tonnes of residual waste will be disposed of in landfill each year. Feedstock lifetime remaining for landfills is shown in Figure 19 .

Details of the infrastructure needed to achieve waste strategy targets are outlined in Figure 45, including the expected facilities, capacities, and capacity needs in 2030.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

PILBARA

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030.
It includes planned and approved facilities, as well as closures between 2020 and 2030.

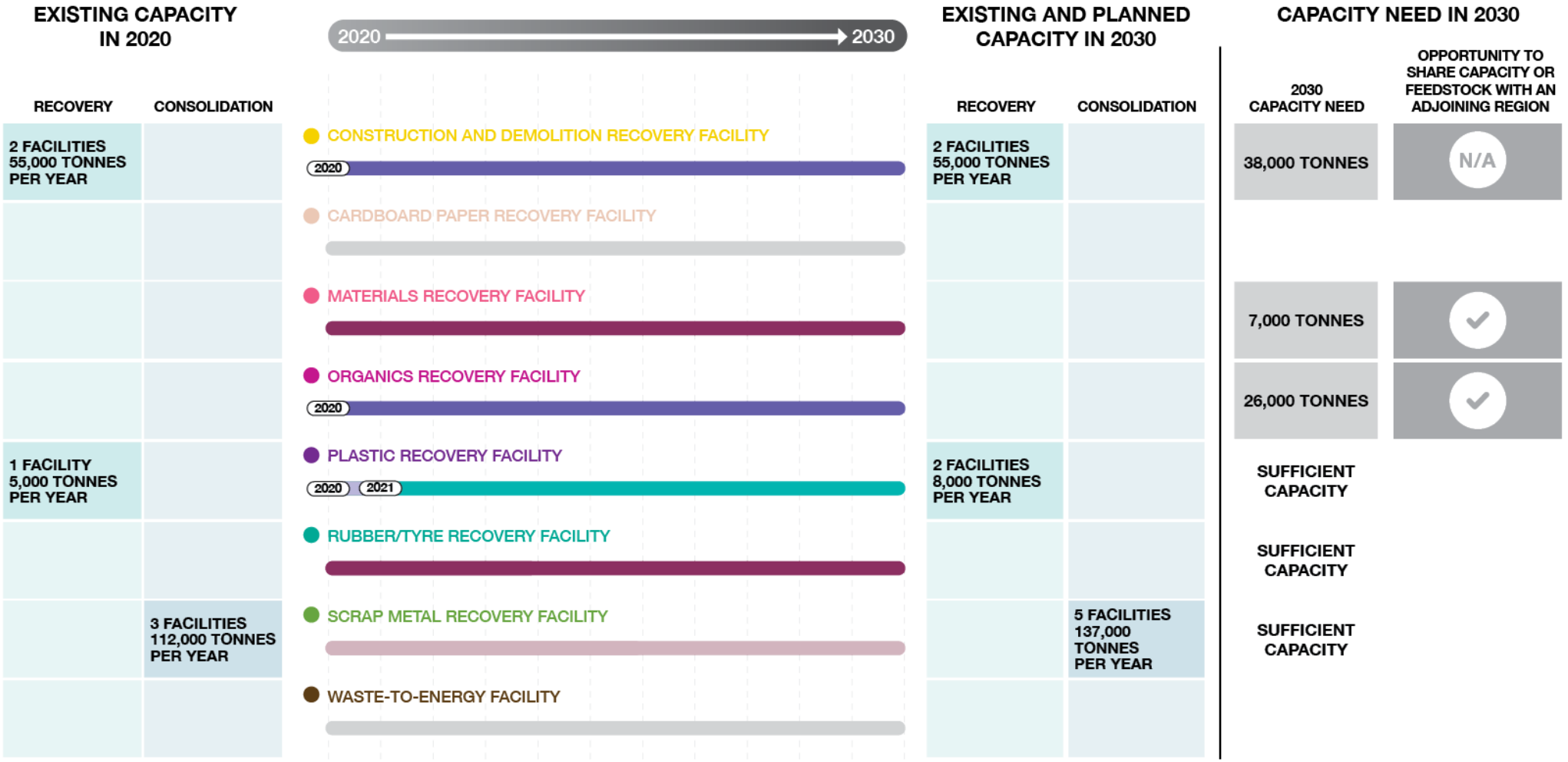


Figure 45 Pilbara infrastructure pipeline and capacity need in 2030

Principles and priorities

The principles outlined in this plan have been used to identify priorities.

Priority areas that are projected to go beyond capacity need, based on the completed modelling for the region, arise when applying the principles.

Based on the analysis, the top priorities for the Pilbara region are:

- Review options to facilitate lifetime and capacity expansion of existing C&D facilities in the region.
- Assess waste generation and infrastructure needs in remote Aboriginal communities to ensure adequate access to services.
- Investigate a rural landfill risk assessment of unlicensed landfills and REMS landfills.
- Investigate alternative landfill facility contingency arrangements with the Kimberley to alleviate short-term capacity constraints in neighbouring regions.
- Assess whether existing 67A licensed facilities in neighbouring regions can be increasingly utilised to alleviate FOGO capacity need.

These are discussed in detail in Table 28 below. The principles are outlined once more in Figure 2 for reference.

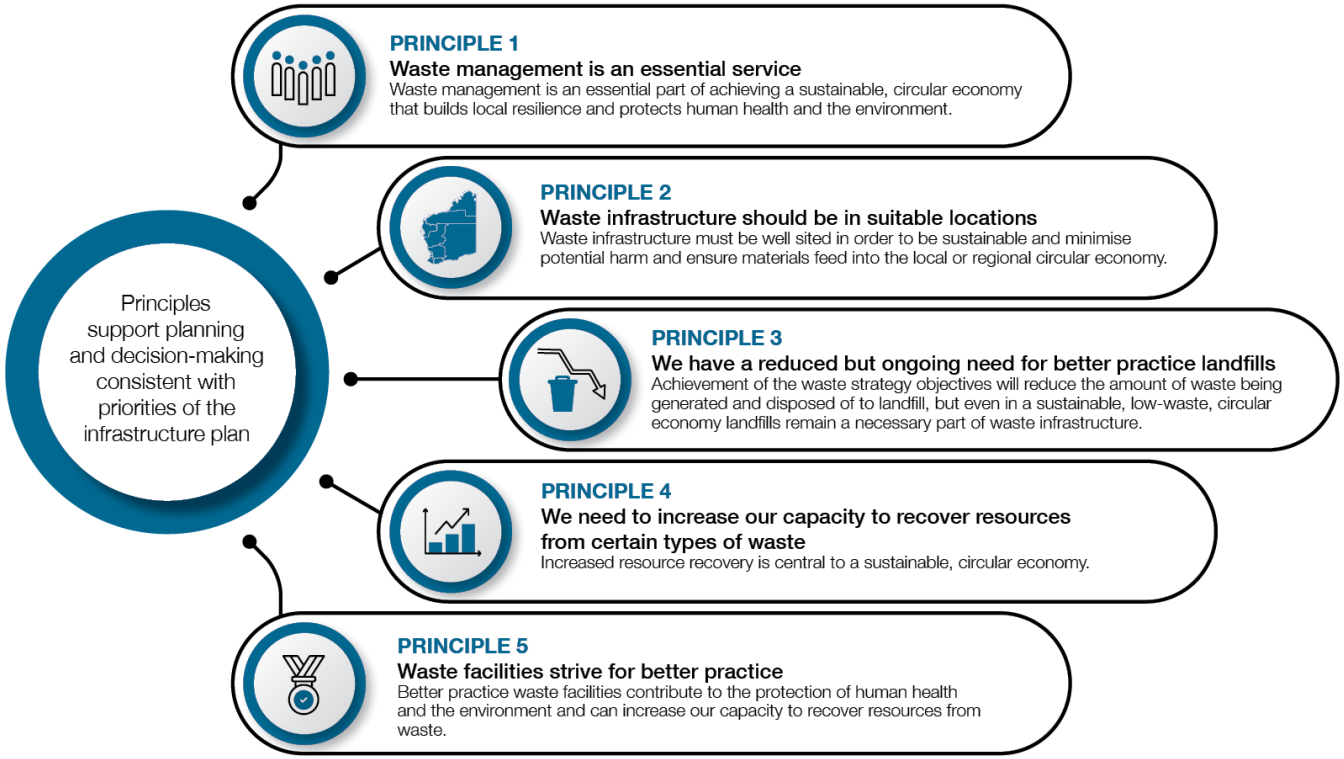


Figure 2 Principles of the *State waste infrastructure plan*

Table 28 Consideration of infrastructure plan principles and priorities in the Pilbara

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
38,000 tonnes of additional capacity for C&D recovery	**Principle 1: Waste management is an essential service** The Pilbara region is currently constrained by high C&D generation rates and limited capacity for treatment. There is a high need to develop additional capacity in the region to minimise the need to transfer C&D out of the region for recovery. Spare contingency is especially important in responding to disaster events which can produce high quantities of mixed demolition waste that requires recovery. **Principle 2: Waste infrastructure should be in suitable locations** Land use constraints (including environmental impact, native titles, Indigenous and cultural heritage areas, and mining tenements) in the Karratha area risk limiting new development options. As the region's existing C&D infrastructure is in Karratha, capacity may be extended across the region by developing capacity in Newman or Port Hedland. These regions have lower constraints compared to Karratha, can support regional development and result in shorter transportation distances for construction outside of Karratha. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** C&D material is the greatest material type generated in the Pilbara region. Investment in new capacity has low risks in accessing necessary feedstocks. Additionally, recovery rates are typically very high and will support waste strategy Recover targets.	**High** Lifetime and capacity expansions of existing C&D facilities in the Pilbara region will decrease the risk, capital costs and timeframes required to meet capacity needs. **High** Better understanding of sub-regional gaps for C&D recovery near major regional generators will improve infrastructure outcomes for Karratha.
26,000 tonnes of additional capacity in organics recovery	**Principle 1: Waste management is an essential service** The lack of existing infrastructure to locally process organic material creates a very high demand to develop new capacity. Significant additional contingency can be developed by undertaking relevant approvals and planning to process organics through existing organics processing. **Principle 2: Waste infrastructure should be in suitable locations** The Pilbara has the highest need for organics processing capacity of the state's northern regions. With capacity constraints in adjoining regions, there is an opportunity to develop organics recovery capacity that can meet the organics capacity needs of the Pilbara while supporting the Kimberley (13,500 tonnes capacity needed) and Gascoyne (6,000 tonnes needed) regions. Location in the Pilbara can also de-risk recovered organic product offtake through access to strong local agricultural markets and mining rehabilitation activities.	**High** New facility development in the Pilbara region can be facilitated through assisted land use planning and approvals frameworks to alleviate local capacity constraints. **High** Better understanding of inter-regional need could support the development of new infrastructure to address capacity need for the Kimberley (13,500 tonnes

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	Principle 4: We need to increase our capacity to recover resources from certain types of waste Application of principle 4 highlights a priority to assess options for recovery of FOGO to improve resource recovery rates in addition to organics capacity alone. New collection services can be offered to regional population centres such as Karratha. **Principle 5: Waste facilities strive for better practice** Application of principle 5 emphasises the importance of better practice organics processing practices because of the risk to surrounding sensitive receivers (in densely populated areas or delicate coastal environments). A review of existing organics recovery facility compliance with the *Guideline: Better practice organics recycling* would facilitate an understanding of the capacity risk for this facility type.	needed) and Gascoyne (6,000 tonnes needed) regions. **Low** Leveraging the mining rehabilitation markets will create opportunities for recovered organic products offtake in the Pilbara region.
7,000 tonnes of additional capacity for material recovery	**Principle 1: Waste management is an essential service** According to modelling, the Pilbara will increase generation of commingled recyclable material, with an additional 7,000 tonnes of local commingled recycling capacity needed achieve the waste strategy Recover targets. This will support population centres implementing new collection services. The lack of contingency in the region (because there are no existing facilities) results in high risks for introducing commingled collection services that may need to transport material long distances to Perth. Excess capacity in the Kimberley could be leveraged to alleviate short term constraints. **Principle 2: Waste infrastructure should be in suitable locations** The need for MRF capacity in the Pilbara (7,000 tonnes) and Gascoyne (1,000 tonnes), compounded by the lack of existing facilities, represents opportunities for a new development that service both regions. A new facility developed east of the region could leverage low constraint zoning around Onslow, located equidistant from regional centres of Karratha and Carnarvon. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Consideration of principle 4 supports development of facilities in the Pilbara to reduce the negative impacts of transport commingled recycling to the Perth or Kimberley region.	**Medium** Better understanding of inter-regional need could support the development of new infrastructure to address capacity need for the Pilbara (7,000 tonnes) and Gascoyne (1,000 tonnes). **Medium** Lifetime and capacity expansions of existing MRFs in the Kimberley regions can act as shared capacity with the Pilbara and decrease the risk, capital costs and timeframes required to meet capacity needs.
Used tyre storage	**Principle 3: We have a reduced but ongoing need for better practice landfills**	**Medium**

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	Waste management of tyres in remote locations poses challenges. Existing landfills are being used for collection and consolidation of tyres and present a suitable centralised location for waste management in remote regions. About 2,000 tonnes per annum of rubber/tyre material is projected to be generated in the Pilbara and this will continue to be generated, highlighting better practice landfills as an important part of the Pilbara's waste management. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Tyres can be processed but infrastructure may only be available in Perth, so the recovery of rubber/tyre materials in the Wheatbelt region is dependent on consolidation and transport to enable recovery. Consolidation and transport will remain the likely fate given the insufficient quantity to support regional processing. **Principle 5: Waste facilities strive for better practice** One class 64 putrescible landfill in the Pilbara is also licensed to store tyres. See the landfill capacity risk assessment below to further understand how the loss of this facilities may occur, noting that this may reduce the ability to consolidate rubber/tyre arising in the Pilbara.	Seven facilities are listed in the region for Category 57, with total capacity exceeding 300,000 tyres. Some of these may be sending tyres to Perth. There is an opportunity to consolidate volumes and transport these tyres for reprocessing outside the region.
Landfill capacity risk assessment	**Principle 1: Waste management is an essential service** Based on current, planned and approved landfill capacity, the Pilbara region has sufficient landfill capacity to 2040. However, under a low-risk approach to landfill, the Pilbara needs additional capacity to provide adequate options for mixed putrescible waste disposal. A large portion of the region's putrescible landfill capacity (13 facilities with a total of 5,810,000 tonnes lifetime capacity) was evaluated to be potentially high risk. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Planning is currently underway to develop new inert and Class IV landfill infrastructure in the Pilbara, which will facilitate special waste streams and relieve strain on the region's putrescible landfills. There is also a need to better understand the landfill infrastructure required to treat mining waste and waste generated in remote Aboriginal communities. Geographic siting of landfills is concentrated in the western Pilbara, indicating possible need to expand sub-regional capacity.	**High** Quantification of waste generation and infrastructure needs in remote Aboriginal communities can improve access to adequate services in remote areas. **High** Updated rural landfill risk assessment methodology of unlicensed landfill and REMS landfills can be used to effectively assess the potential risk of environmental, human health and amenity impacts.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	Principle 4: We need to increase our capacity to recover resources from certain types of waste There is a high need to de-risk existing landfills through better practice management standards. These standards should also be extended to REMS managed landfills in the region. In addition, 62 per cent of landfills also require post-closure planning, having not completed or updated a plan within the past 10 years.[3]	**High** Quantification of waste generation and infrastructure needs for the local mining sector could lead to complementary activities that support local communities. **High** Options for more efficient inter-regional waste transfer infrastructure and contingency arrangement could alleviate short-term capacity constraints between the Kimberley and Pilbara regions

[3] Western Australia Waste Infrastructure Audit, ASK Waste Management Consultancy Services on behalf of the Department of Water and Environmental Regulation, (2021).

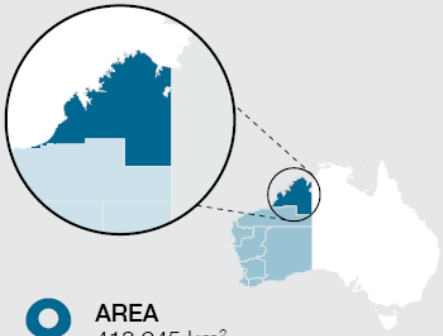
Kimberley region

Waste profile in 2020

The Kimberley region is the northern-most region in Western Australia and is one of the smallest generators of waste. The region generated 68,000 tonnes of waste in 2020, consisting of about 50 per cent MSW, 37 per cent C&I waste, and 13 per cent C&D waste. The region treated 61,000 tonnes in 2020 with 8,000 tonnes (13 per cent) being recovered and 53,000 (87 per cent) being landfilled. Key waste profile data for the Kimberley waste and resource recovery in 2020 is presented below.

Residents in the Kimberley	1 per cent of Western Australia's population resides in the Kimberley region.
	Population density of 0.09 people per km^2.
	Just over one-third of the regions population (39 per cent) reside in Broome.
Local governments in the region	Shire of Broome, Shire of Derby-West Kimberley, Shire of Halls Creek, and Shire of Wyndham-East Kimberley.
Generating waste	The Kimberley generates 1 per cent of the waste generated in Western Australia.
Transporting waste	Limited road network and no rail transportation, although markets can be accessed through four commercial ports.
Treating waste	The Kimberley treats 1 per cent of the waste treated in Western Australia.
	The Kimberley recovers less than 1 per cent of the waste recovered in Western Australia.
	The Kimberley landfills 2 per cent of the waste landfilled in Western Australia.

KIMBERLEY
REGIONAL SUMMARY



AREA
418,945 km²

GROSS REGIONAL PRODUCT (2019–20)
$3.07B/CAP

NUMBER OF BUSINESSES (2019–20)
2,165

TOP 5 EMPLOYMENT BY INDUSTRY

19.83%	Construction
10.84%	Rental, hiring and real estate services
9.78%	Agriculture, forestry and fishing
9.22%	Wholesale trade
7.69%	Professional, scientific and tech services

The mining industry sector makes the greatest contribution to economic output in the region, which at $1.6B accounts for 24.61% of total output. With 1,164 jobs representing 7.44% of total employment, it is the construction industry sector that is the region's largest employer.

2020
- POPULATION 36,561
- WASTE GENERATED 68,000 TONNES
- WASTE GENERATION PER CAPITA 1.85 TONNES

2030
- POPULATION 39,306 (▲8%)
- WASTE GENERATED 67,000 TONNES
- WASTE GENERATION PER CAPITA 1.70 TONNES

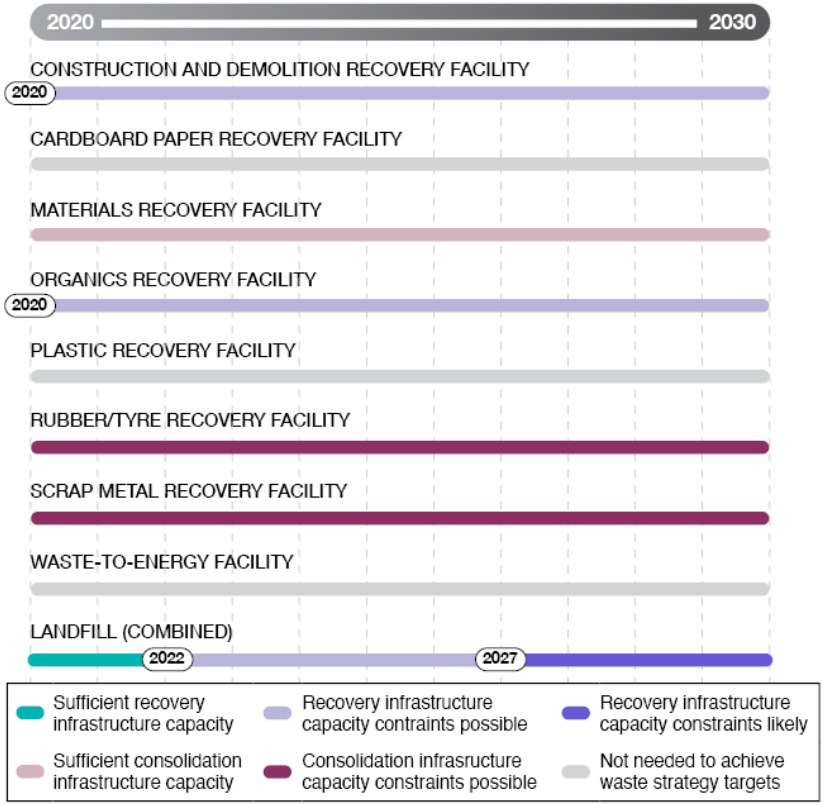
PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

2030 INFRASTRUCTURE CAPACITY NEED
1. Organics | 13,500 tonnes
2. Scrap metal | 3,000 tonnes
3. Construction and demolition | 1,000 tonnes

TOP PRIORITIES
1. Review options to facilitate lifetime and capacity expansion of existing organics recovery facilities.
2. Investigate and facilitate upgrade of existing garden organics facilities to accept food organics and garden organics.
3. Assess waste generation and infrastructure needs in remote Aboriginal communities to ensure adequate access to services.
4. Investigate a rural landfill risk assessment of unlicensed landfill and REMS landfills.
5. Facilitate land use planning and approvals frameworks for development of a landfill in the Kimberley region.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030

Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN KIMBERLEY 2020 AND 2030

Waste projections to 2030 based on meeting the waste strategy targets

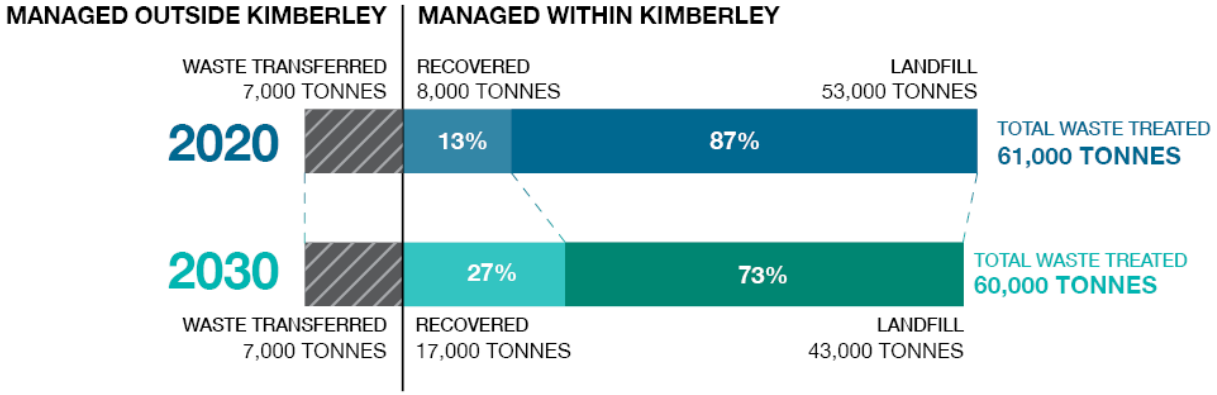


Figure 46 Waste in the Kimberley: statistics and projections

Waste and resource recovery in 2020

The small and isolated nature of regional communities in the Kimberley acts as a barrier to increasing material recovery from mixed waste streams. Although MSW forms the largest waste stream in the Kimberley, only 4 per cent was recovered. The top four materials processed in the region in 2020 include:

1. mixed putrescible waste – domestic (household)
2. metals – ferrous steel – non-packaging
3. commingled recycling
4. mixed C&D waste

Eight putrescible landfills (Category 89 and 64) treat 87 per cent of the region's waste. There are also 85 REMS-managed landfills. Landfill disposal is supplemented by resource recovery facilities that include one C&D recovery facility, one MRF and two organics recovery facilities.

Geography and transport infrastructure is a barrier to improving resource recovery in the Kimberley. Small populations spread across a large region decreases the economic viability of transporting material to recovery facilities. The Great Northern Highway connection between Broome and Perth facilitates regional transfers for processing and access to wider markets. The largest transfer from the Kimberley (predominantly to Perth) is ferrous steel. In 2020 no material was received into the region. Proximity to the Pilbara region creates opportunities for planning to consider consolidation of both regions' generation and capacity, potentially resulting in increased resource recovery for both regions.

Key aspects of waste and resource recovery system in the Kimberley in 2020, considered by the infrastructure plan, include:

- MSW formed the largest waste material source in the Kimberley region, consisting of about 33,000 tonnes, of which 4 per cent was recovered.
- Nearly all (98 per cent) of waste transferred out of region from the Kimberley was transported to Perth for further treatment and recovery.
- Mixed ferrous steel was the second largest material type generated in the Kimberley and was the largest category of material transferred out of region.
- Development of more local capacity for scrap metal recovery could improve recovery and transfer of metal out of the Kimberley.

The location of current and planned recovery infrastructure in the Kimberley in 2030 is shown in Figure 49 (see Facility lists in the Appendix for a full list of facilities). Facilities granted work approvals since 2020 by the department in the Kimberley region are listed below in Table 29. These facilities have not been included in the modelling for the infrastructure plan and may alleviate some of the region's capacity needs.

Table 29 Facilities granted licences or works approvals since 2020 in the Kimberley

Facility type	Facility name	Location
Landfill (Category 63)	GoGo Station Inert Landfill	Kimberley
Landfill (Category 63) and consolidation centre including used trye storage	Broome Regional Resource Recovery Park	Kimberley

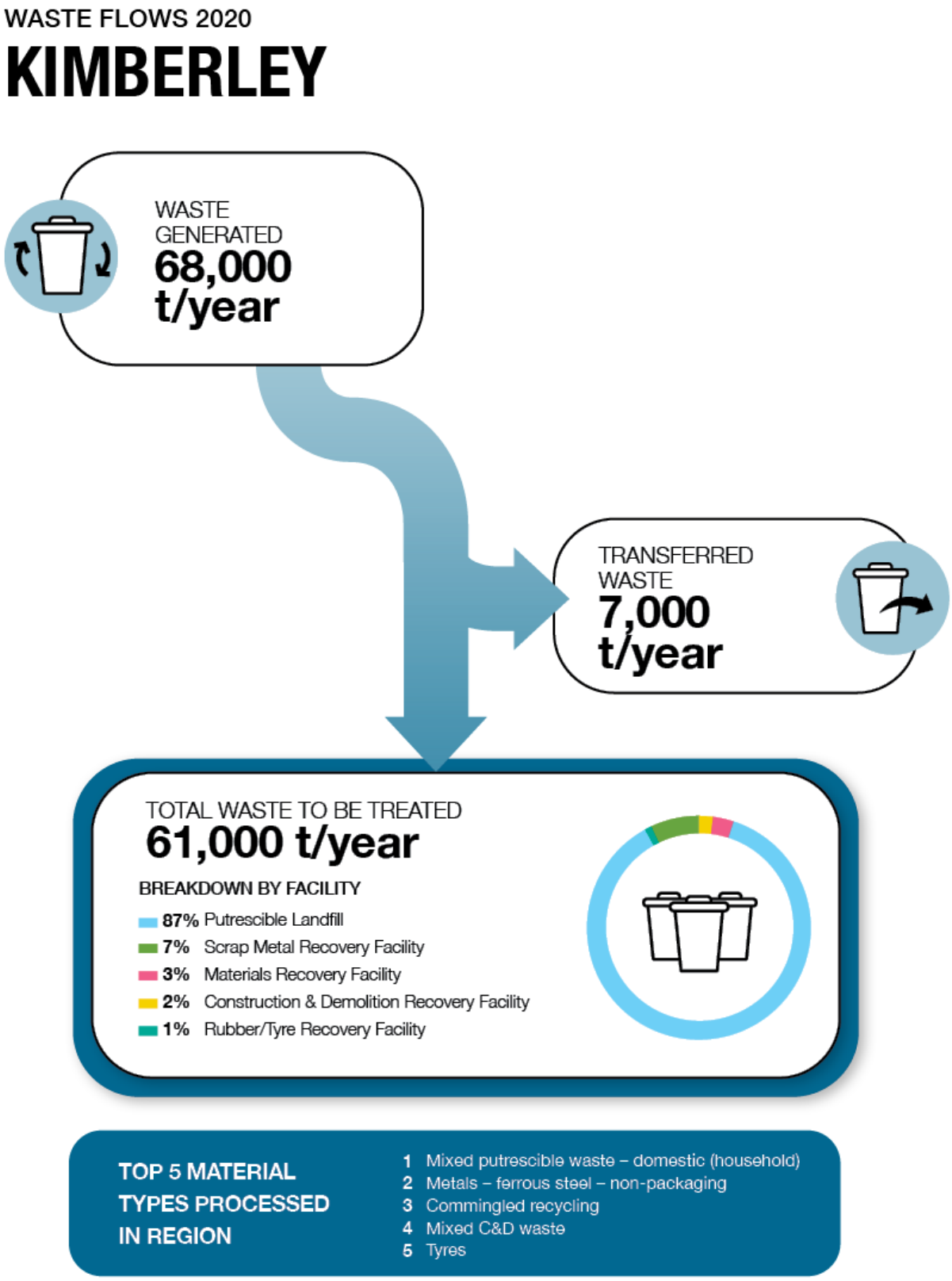


Figure 47 Waste generated, received, transferred and treated in the Kimberley region in 2020

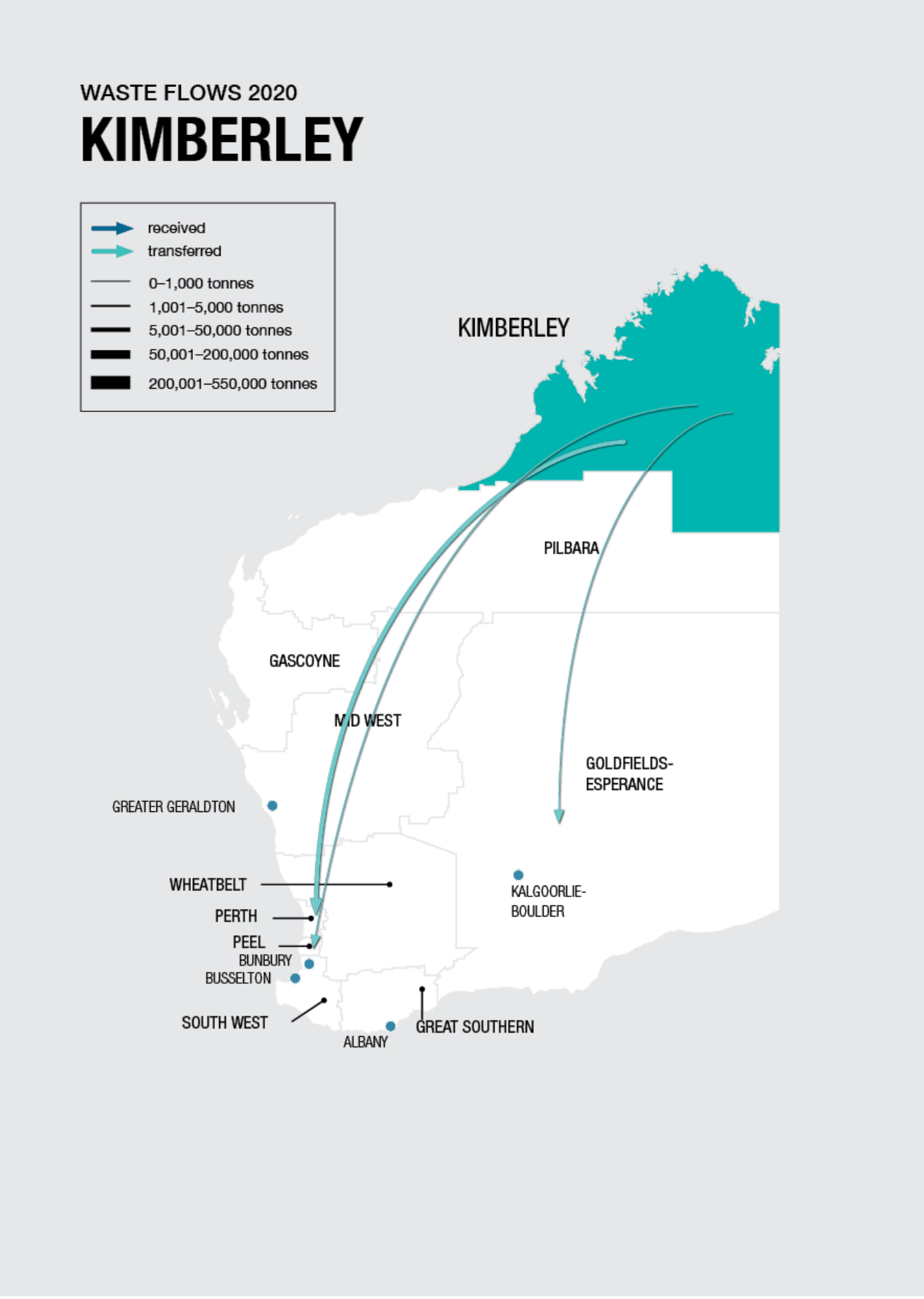


Figure 48 Waste flows in the Kimberley region in 2020

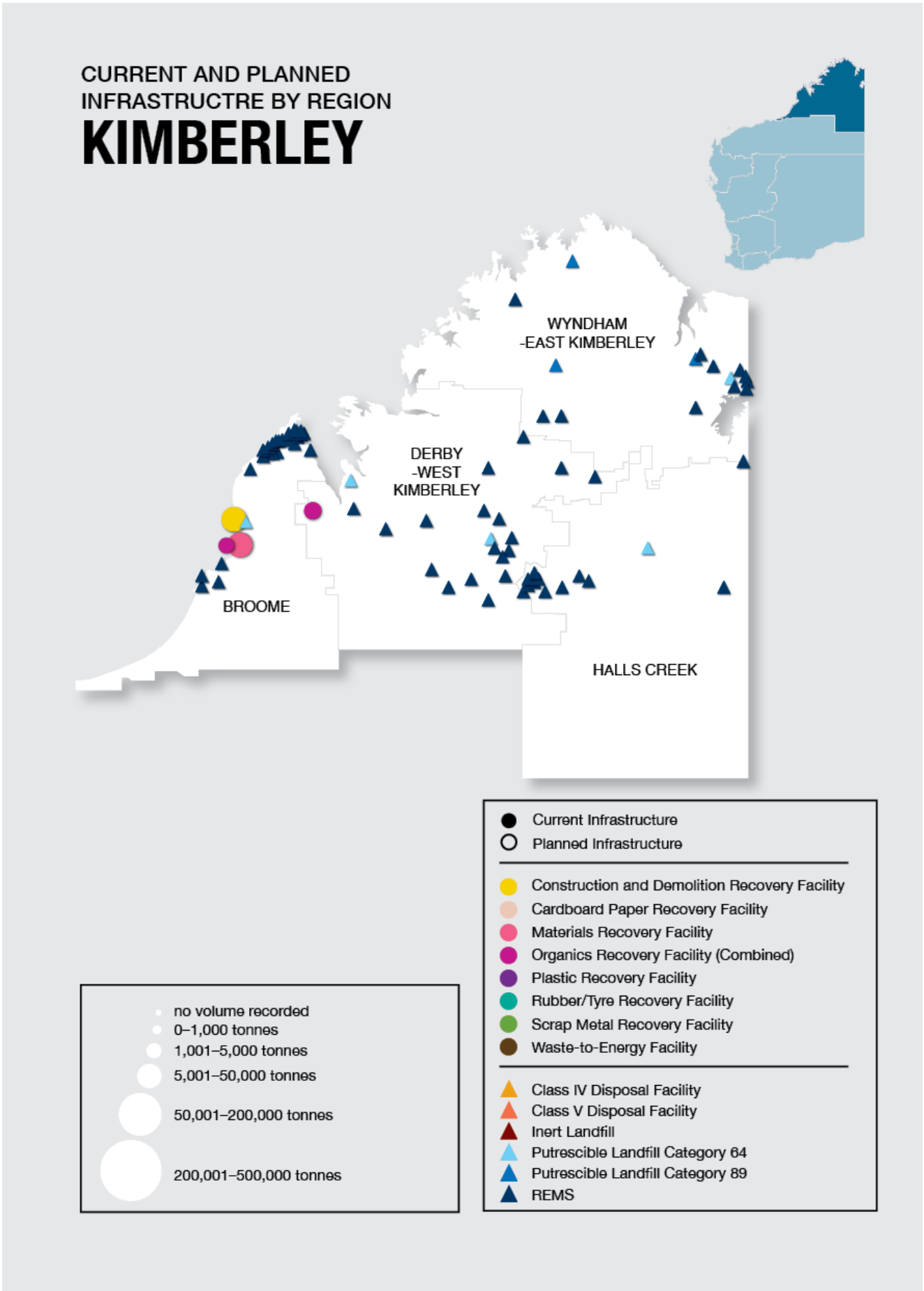


Figure 49 Current and planned infrastructure locations in the Kimberley region in 2020

Waste and resource recovery in 2030

Modelling to achieve all waste strategy targets in 2030 found the Kimberley region would generate 67,000 tonnes and transfer 7,000 tonnes out of the region, similar to 2020 quantities.

Additional infrastructure planning and waste strategy initiatives will increase the Kimberley's materials recovery rate from 13 per cent to 27 per cent.

Figure 50 shows the distribution of feedstock materials used by each recovery facility type in the Kimberley, indicating which waste streams are most significant and where the resource recovery efforts should be concentrated. This is also reflected in the Kimberley region Principles and priorities section.

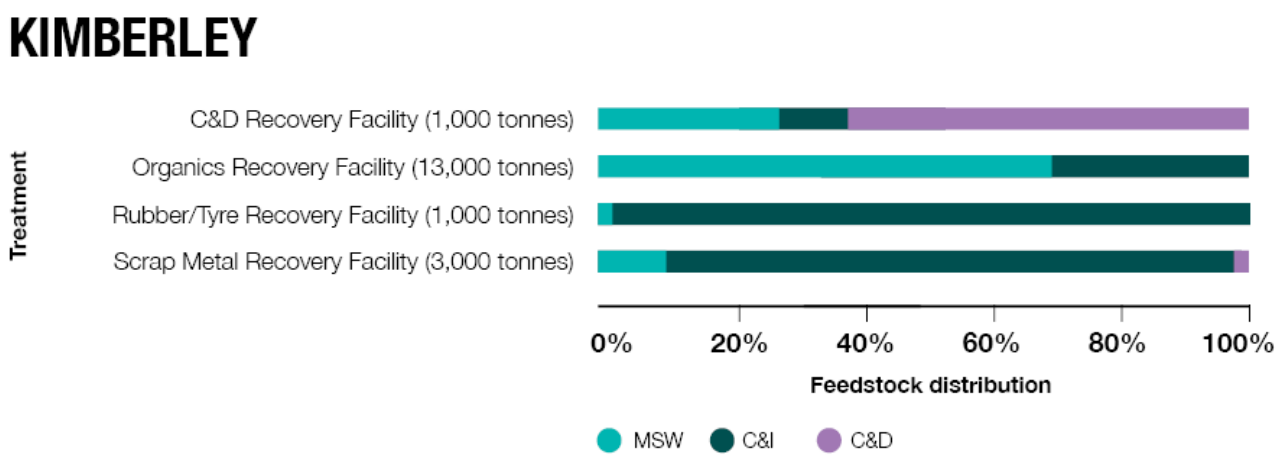


Figure 50 Feedstock distribution of treatments in the Kimberley region in 2030

The model uses licensed capacity for facilities and can result in an overestimation of actual capacity. Stakeholder feedback indicates that only a fraction of the region's licensed capacity of 7,000 tonnes of Category 67A capacity is actually available for the processing of FOGO. The Infrastructure priorities section describes the need to investigate further to confirm actual FOGO processing capacity.

Infrastructure capacity needs in 2030

Based on current, planned and approved infrastructure in 2020, the Kimberley requires the following additional capacities to meet the waste strategy targets in 2030:

- 13,500 tonnes of additional recovery capacity is needed for organics recovery, which is sufficient volume to allow for development of a new organics recovery facility but not enough for a FOGO recovery facility. As demonstrated in Figure 50, a high percentage (69 per cent) of the organics feedstock is predicted to consist of MSW, indicating that there may also be a need for a FOGO recovery in the region. This may be achieved through the extension or expansion of existing organics facilities to be able to accept FOGO.
- 3,000 tonnes of additional consolidation capacity is needed for scrap metal.
- 1,000 tonnes of additional recovery capacity is needed for C&D waste, which may require consolidation and transfer out of the region if recovery infrastructure capacity increase is not viable.
- Minimal consolidation capacity may be needed for rubber tyre material, with less than 1,000 tonnes of feedstock projected.

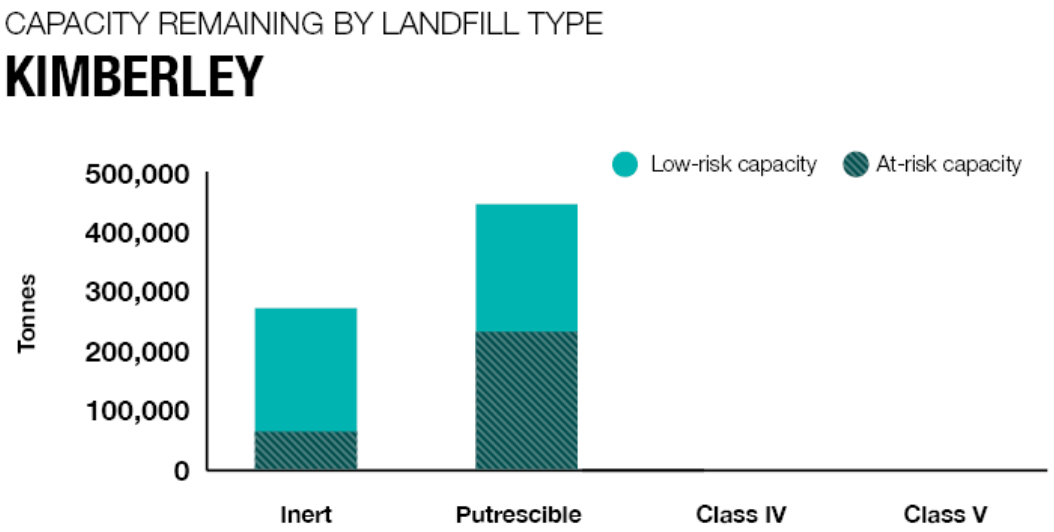


Figure 51 Capacity remaining by landfill type in the Kimberley region, including an assessment of low-risk and at-risk capacity

Total remaining capacity by landfill type is presented in . This figure also indicates the proportion of that capacity that is at risk (see section on Landfill capacity lifetime assessment to 2030 and 2050).

Under the low-risk scenario, half of the total landfill capacity of 301,000 tonnes was identified as potentially at risk, of which inert landfills make up 47 per cent and putrescible landfills 53 per cent. *State Waste Infrastructure Needs Analysis* modelling predicts 28,000 tonnes of residual waste will be disposed of in landfill each year. Feedstock lifetime remaining for landfills is shown in Figure 19 .

Details of the infrastructure needed to achieve waste strategy targets are outlined in Figure 52, including the expected facilities, capacities, and capacity needs in 2030.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

KIMBERLEY

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030.
It includes planned and approved facilities, as well as closures between 2020 and 2030.

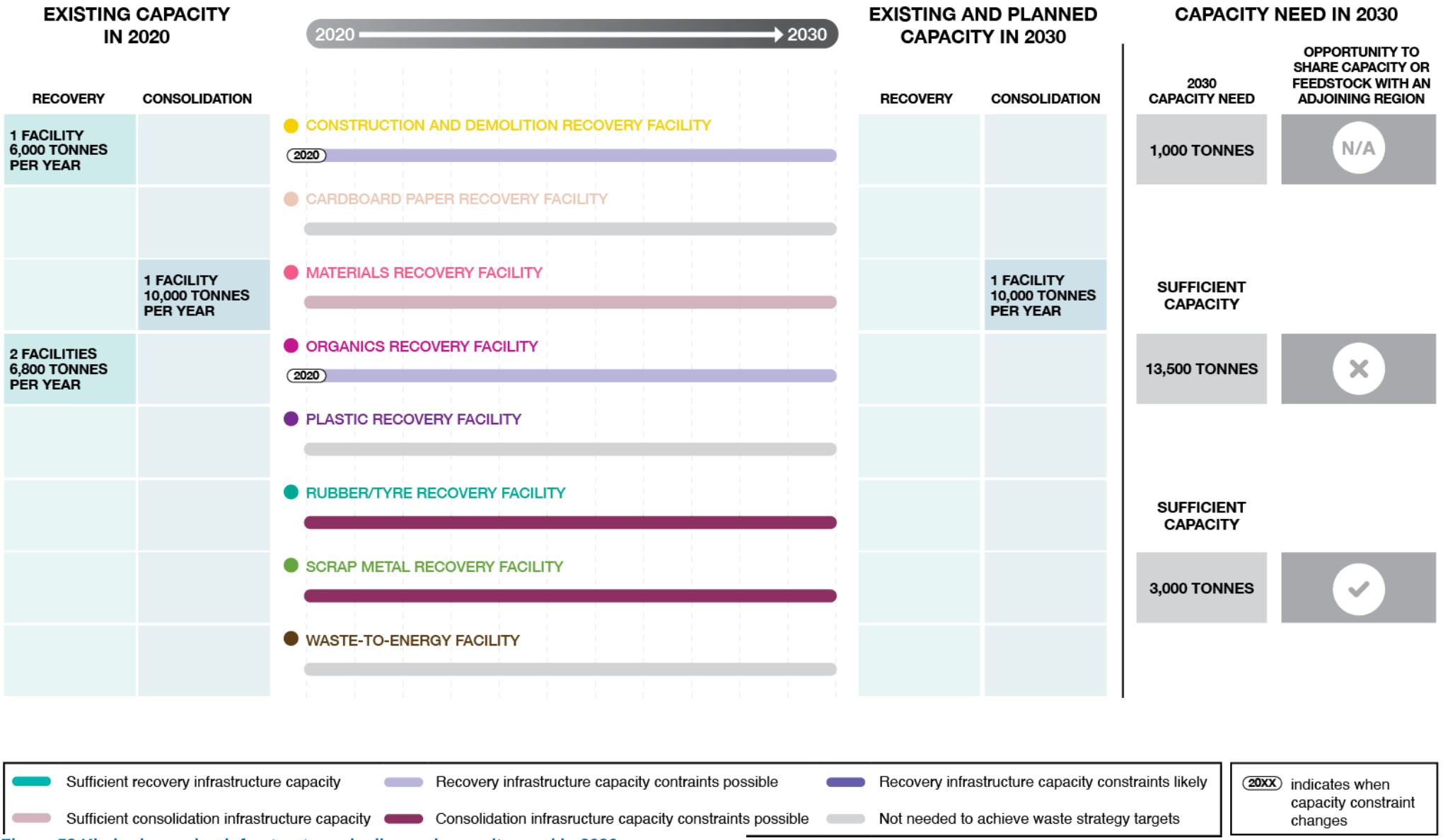


Figure 52 Kimberley region infrastructure pipeline and capacity need in 2030

Principles and priorities

The principles outlined in this plan have been used to identify priorities.

Priority areas that are projected to go beyond capacity need, based on the completed modelling for the region, arise when applying the principles.

Based on the analysis, the top priorities for the Kimberley region are:

- Review options to facilitate lifetime and capacity expansion of existing organics recovery facilities in the region.
- Investigate and facilitate upgrade of existing garden organics facilities to accept FOGO.
- Assess waste generation and infrastructure needs in remote Aboriginal communities to ensure adequate access to services.
- Investigate a rural landfill risk assessment of unlicensed landfills and REMS landfills.
- Facilitate land use planning and approvals frameworks for development of a landfill in the region.

These are discussed in detail in Table 30 below. The principles are outlined once more in Figure 2 for reference.

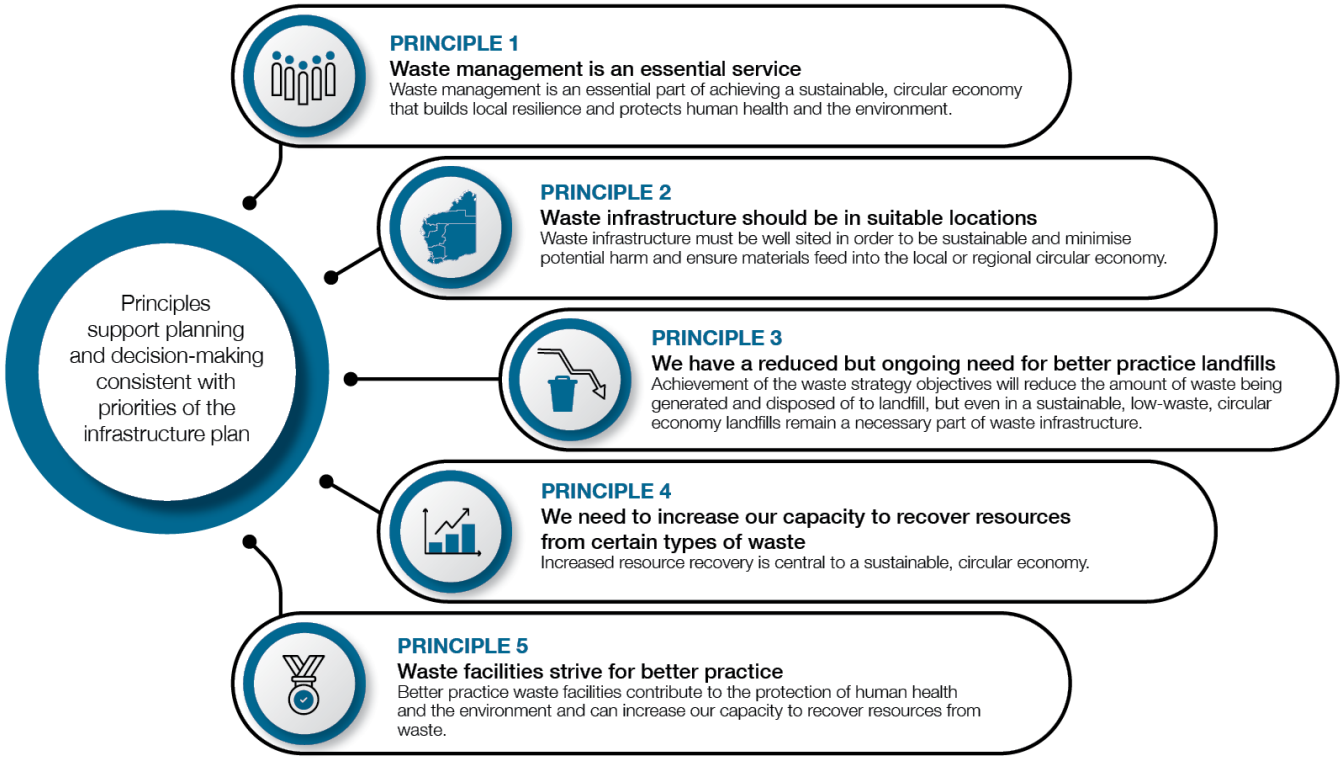


Figure 2 Principles of the *State waste infrastructure plan*

Table 30 Consideration of infrastructure plan principles and priorities in the Kimberley

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
13,500 tonnes of additional capacity for organics recovery	**Principle 1: Waste management is an essential service** Consideration of principle 1 underlines the need for contingency planning for organics recovery in the Kimberley. The establishment of at least two consolidation facilities by 2030 or extending the lifetime and increasing the capacity of the two existing facilities should be considered to address this contingency risk. **Principle 2: Waste infrastructure should be in suitable locations** Consideration of principle 2 determines that extending the lifetime and increasing the capacity of existing facilities is preferred. Constraints for new developments near the regional centres of Broome and Derby justifies expansion of existing processing facilities, while remaining close to major generation sources. In addition, proximity to agricultural mining rehabilitation activities can de-risk recovered organics product offtake. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Consideration of principle 4 highlights an opportunity to increase recovery of food organics. Expansion of existing organics infrastructure to accept food organics can facilitate the introduction of new FOGO collection services to support the waste strategy statewide target of 75 per cent material recovery by 2030. **Principle 5: Waste facilities strive for better practice** A review of existing organics recovery facility compliance with the *Guideline: Better practice organics recycling* would facilitate an understanding of the capacity risk for this facility type.	**High** Lifetime and capacity expansions of existing organics recovery facilities in the Kimberley region will decrease the risk, capital costs and timeframes required to meet capacity needs. **High** Upgrading of existing organics facilities in the Kimberley to accept FOGO will support achievement of waste strategy Recover targets for 2030. **Low** Leveraging lithe mining rehabilitation markets will create opportunities for recovered organic products offtake in the Kimberley region.
3,000 tonnes of additional capacity for scrap metal recovery	**Principle 1: Waste management is an essential service** Scrap metal represents the second largest recovery opportunity in the Kimberley, with 3,000 tonnes of material available predominantly being ferrous metal. Consideration of principle 1 underlines the importance of consolidating this material, which can be moved to the nearest facilities in the Pilbara which have sufficient capacity. Consolidation infrastructure will de-risk waste transfer out of region to the Pilbara or Perth. **Principle 2: Waste infrastructure should be in suitable locations**	**Low** Better understanding of sub-regional gaps for scrap metal consolidation near transportation networks will improve infrastructure coverage in the Kimberley region.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	Principle 2 flags the negative impact of the transport of scrap metal from the Kimberley to the nearest facility in the Pilbara region; however, 3,000 tonnes of feedstock are far below the critical mass required to establish a facility in the Kimberley.	
1,000 tonnes of additional capacity for C&D recovery	**Principle 1: Waste management is an essential service** With an existing 6,000 tonnes per annum C&D recovery facility scheduled for closure by 2030, the development of a consolidation facility is needed when considering principle 1. C&D material is typically processed close to the source of material; however, under a consolidation scenario, the closest facility is in the Pilbara region. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Consideration of principle 4 highlights the negative impact of transporting material long distances to facilities in the Pilbara region. Considering the nature of C&D and the existing facility in the Kimberley region, extension of the lifetime of this facility could be considered. However, as it is far below the capacity of the facility, mobile C&D facilities with lower capacity limits could be considered.	**Medium** Lifetime and capacity expansions of existing C&D facilities and use of mobile facilities will decrease the risk, capital costs and timeframes required to meet capacity needs.
Used tyre storage	**Principle 3: We have a reduced but ongoing need for better practice landfills** Waste management of tyres in remote locations poses challenges. Existing landfills are being used for collection and consolidation of tyres and present a suitable centralised location for waste management in remote regions. About 5,000 tonnes per annum of rubber/tyre material is projected to be generated in the Kimberley and this will continue to be generated, highlighting better practice landfills as an important part of the Kimberley's waste management. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Tyres can be processed but infrastructure may only be available in Perth so the recovery of rubber/tyre materials in the Kimberley region is dependent on consolidation and transport to enable recovery. Consolidation and transport will remain the likely fate given the insufficient quantity to support regional processing. **Principle 5: Waste facilities strive for better practice** One class 64 putrescible landfill in the Kimberley is also licensed to store tyres. See the landfill capacity risk assessment below to further understand how the loss of this facility	**Medium** Two facilities are listed in the region for Category 57, with total capacity exceeding 5,000 tyres. These may be sending tyres to Perth. There is an opportunity to consolidate volumes and transport these tyres for reprocessing outside the region.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	may occur, noting that this may reduce the ability to consolidate rubber/tyre arising in the Kimberley.	
Landfill capacity risk assessment	**Principle 2: Waste infrastructure should be in suitable locations** Based on current, planned and approved landfill capacity, Broome will face landfill capacity constraints prior to 2030. These needs could potentially be addressed by transporting waste to other landfills in the region or the Pilbara. However, under a low-risk approach to landfill, many existing small, unlicensed landfills in both the Kimberley and Pilbara are at risk as they may face limited ability and increased challenges to comply with landfill better practice design, construction and operations. Planning for additional landfill capacity in the Broome area, near the region's major source of waste generation, should be undertaken, with consideration of local constraints: • environmentally sensitive areas • wetlands and water catchments • national and Aboriginal heritage lands. **Principle 3: We have a reduced but ongoing need for better practice landfills** Based on current, planned and approved landfill capacity, the Kimberley will not have sufficient capacity to meet the putrescible waste disposal needs by 2030. Diverting material to alternative landfills in the Pilbara carries risk of capacity constraints; therefore, consideration of principle 3 points to the need for development of landfill capacity within the Kimberley region. **Principle 5: Waste facilities strive for better practice** Consideration of principle 5 highlights 89 facilities with a total capacity of 273,000 tonnes potentially at risk of noncompliance with better practice in the Kimberley region. The Kimberley region is likely to face capacity constraints for landfill by 2024 under a low-risk approach to landfill. In addition, 95 per cent of landfills in the Kimberley also require post-closure planning, having not completed or updated a plan within the past 10 years.[4] Collaboration with the local mining industry will create opportunities to recover mining waste and improve better practice management of REMS landfills.	**High** Quantification waste generation and infrastructure needs in remote Aboriginal communities can improve access to adequate services in remote areas. **High** Updated rural landfill risk assessment methodology of unlicensed landfill and REMS landfills can be used to effectively assess the potential risk of environmental, human health and amenity impacts. **High** Quantification of waste generation and infrastructure needs for the local mining sector would decrease scope of infrastructure planning and could lead to complementary activities that support local communities. **High** New facility development in the Kimberley region can be facilitated through assisted land use planning and approvals frameworks to alleviate local capacity constraints

[4] Western Australia Waste Infrastructure Audit, ASK Waste Management Consultancy Services on behalf of the Department of Water and Environmental Regulation, (2021).

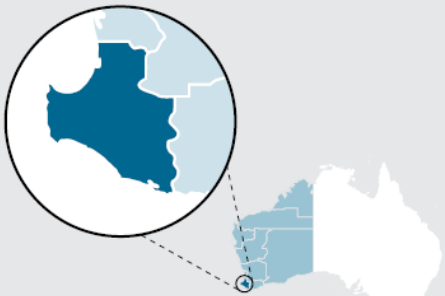
South West region

Waste profile in 2020

The South West region has the second largest waste generation and treatment rate in Western Australia. The region generated 425,000 tonnes of waste in 2020, which was predominantly generated by the C&I sector (53 per cent), with the remaining 47 per cent evenly split between MSW and C&D waste. This region received 334,000 tonnes of waste from other regions, predominantly from Perth and Peel. This material mainly consisted of mixed putrescible waste from domestic (household) and commercial sources. In total, the region treated 651,000 tonnes in 2020, with 325,000 tonnes (49 per cent) being recovered and 326,000 tonnes (51 per cent) being landfilled. Key waste profile data for the South West waste and resource recovery in 2020 is presented below.

Residents in the South West	7 per cent of Western Australia's population resides in the South West region.
	Population density of 8 people per km^2.
	Residents mostly live on the western coastal side of the region, with higher density around Busselton and Bunbury city centres.
Local governments in the region	Shire of Augusta-Margaret River, Shire of Boyup Brook, Shire of Bridgetown-Greenbushes, City of Bunbury, City of Busselton, Shire of Capel, Shire of Collie, Shire of Dardanup, Shire of Donnybrook-Balingup, Shire of Harvey, Shire of Manjimup, and Shire of Nannup.
Generating waste	The South West generates 7 per cent of the waste generated in Western Australia.
Transporting waste	Strong road network and commercial ports connects the South West with reproccessing infrastructure in Perth and Peel.
Treating waste	The South West treats 11 per cent of the waste treated in Western Australia.
	The South West recovers 10 per cent of the waste recovered in Western Australia.
	The South West landfills 12 per cent of the waste landfilled in Western Australia.
	Plays a critical role in providing additional putrescible waste landfill capacity for Perth and Peel.

SOUTH WEST
REGIONAL SUMMARY



AREA
24,000 km²

GROSS REGIONAL PRODUCT (2019–20)
$14.19B/CAP

NUMBER OF BUSINESSES (2019–20)
15,055

TOP 5 EMPLOYMENT BY INDUSTRY

24.32%	Electricity, gas water and waste services
12.63%	Financial and insurance services
10.08%	Rental, hiring and real estate services
7.95%	Construction
6.54%	Education and training

The manufacturing industry sector makes the greatest contribution to economic output in the region, which at $8.0B accounts for 22.67% of total output. With 8,780 jobs representing 10.92% of total employment, it is the construction industry sector that is the region's largest employer.

2020

- POPULATION 184,869
- WASTE GENERATED 425,000 TONNES
- WASTE GENERATION PER CAPITA 2.3 TONNES

2030

PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

- POPULATION 221,288 (▲20%)
- WASTE GENERATED 467,000 TONNES
- WASTE GENERATION PER CAPITA 2.1 TONNES

2030 INFRASTRUCTURE CAPACITY NEED

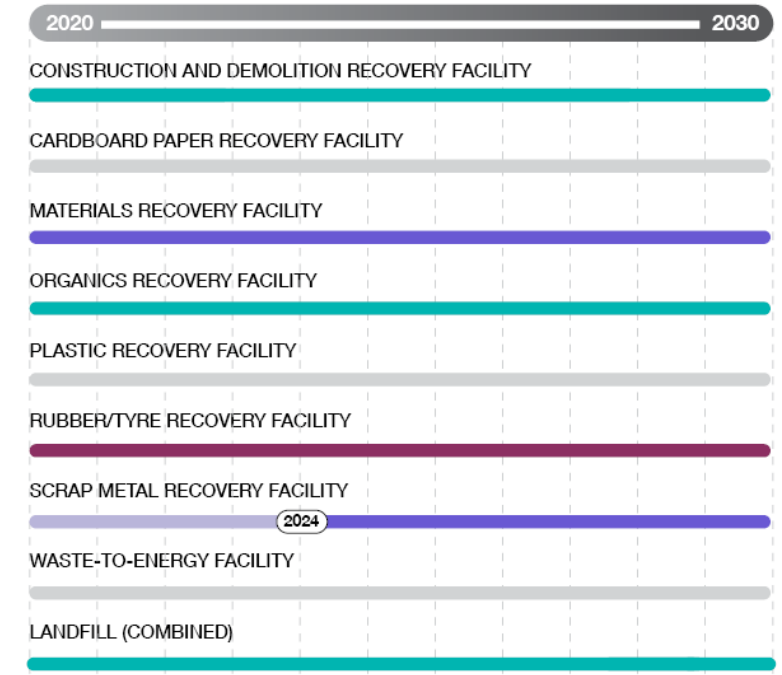
1. Material recovery facility | 64,000 tonnes
2. Rubber/tyre | 8,000 tonnes
3. Scrap metal | 72,000 tonnes
4. Waste-to-energy | 91,500 tonnes

TOP PRIORITIES

1. Investigate designating a strategic industrial area east of Greater Bunbury.
2. Investigate a scrap metal recovery facility and options for consolidation centre for transfer of waste to Waste-to-energy in Perth.
3. Investigate alternative landfill facility contingency arrangements with the Great Southern and Wheatbelt region.
4. Assess whether existing 67A licensed facilities can be increasingly utilised to alleviate food organics and garden organics recovery capacity need in neighbouring regions.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030

Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN SOUTH WEST 2020 AND 2030

Waste projections to 2030 based on meeting the waste strategy targets

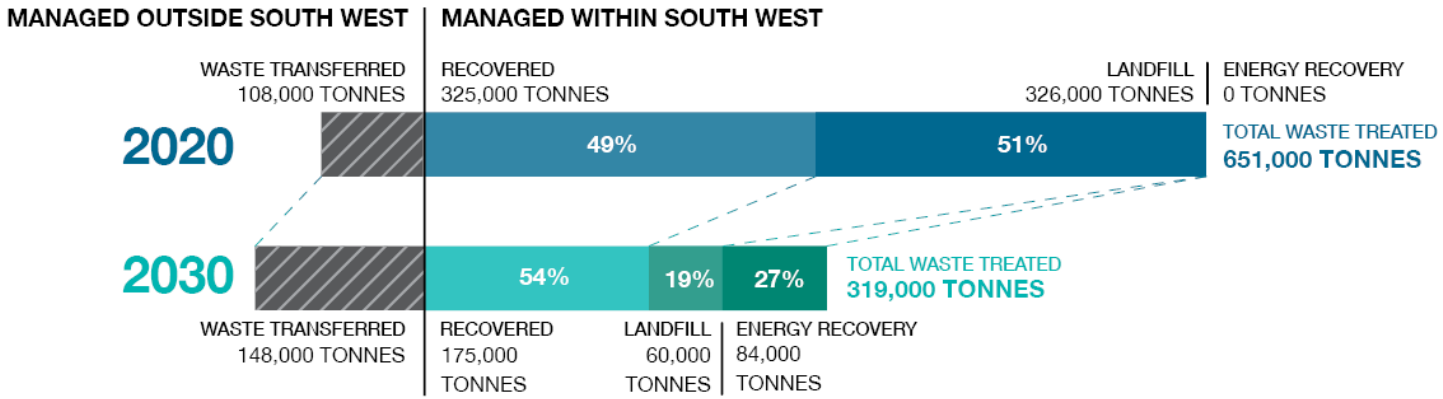


Figure 53 Waste in the South West: statistics and projections

Waste and resource recovery in 2020

The South West region plays an important role in providing treatment capacity for waste generated in the Perth and Peel regions. This contributes to the region's proportionally high volume of material received in from other regions (51 per cent of total waste treated). The top five material processed in the region in 2020 include:

1. mixed C&D
2. mixed putrescible waste – domestic (household)
3. forestry waste
4. metals – ferrous steel – non-packaging
5. contaminated soil.

Most of the waste facilities in the South West region are landfills, including 14 putrescible landfills and one inert landfill. Waste disposal is complemented by six C&D recovery facilities and seven organics recovery facilities. The region recovers significant amounts of C&D waste, with a licensed capacity to process 164,000 tonnes per year. No new infrastructure was identified as currently planned in the region.

Waste transfers out of region were also primarily to the Perth and Peel regions, with dominant material categories being ferrous steel, commingled recycling, and asbestos. The South West region's proximity to Perth and Peel is supported by a strong road network, which allows for opportunities to access reprocessing infrastructure. The region's concentrated population can support additional infrastructure to expand resource recovery activities, such as expanded capacity for local commingled recycling. The commercial port in Bunbury could potentially facilitate access to international recycling markets.

It should be noted that the forestry industry is significant in the region. Forestry waste is not included in the measurement of WA's progress towards waste strategy targets and thus was not included in the modelling undertaken for the infrastructure plan. However, forestry waste currently forms part of the feedstock for some organics waste processors in the region. This may reduce because of the state ban on native forest harvesting beginning in January 2024.

Aspects of waste and resource recovery in the South West in 2020 that must be considered when working towards the waste strategy targets include:

- C&I formed the largest waste material source in the South West region, consisting of about 284,000 tonnes, of which 66 per cent was recovered.
- Of the total waste transferred out of the South West region (predominantly to Perth and Peel), 71 per cent was recovered.
- Forestry waste material was generated (124,000 tonnes) and received (34,000 tonnes) in large quantities, indicating that it forms primary feedstocks for existing organics recovery facilities. The proportion of this coming from native forests (which will be affected by the logging ban), and the impacts of this on existing organics facilities, is unknown.

- Development and operation of waste-to-energy facilities in Perth will have significant impacts on the amount of putrescible waste received into the South West region for disposal to landfill.
- Government policy has established that no new putrescible landfills can be developed in the Swan Coastal Plain because of significant environmental risks and cultural impacts, constraining opportunities to develop new putrescible landfill sites in the South West.

The location of current and planned recovery infrastructure in the South West region in 2020 is shown in Figure 56 (see Facility lists in the Appendix for a full list of facilities). Facilities granted work approvals since 2020 by the department in the South West region are listed below in Table 31. These facilities have not been included in the modelling for the infrastructure plan and may alleviate some of the region's capacity needs.

Table 31 Facilities granted licences or works approvals since 2020 in the South West

Facility type	Facility name	Location
CDS consolidation and pyrolysis plant	Collie Pyrolysis Plant	South West

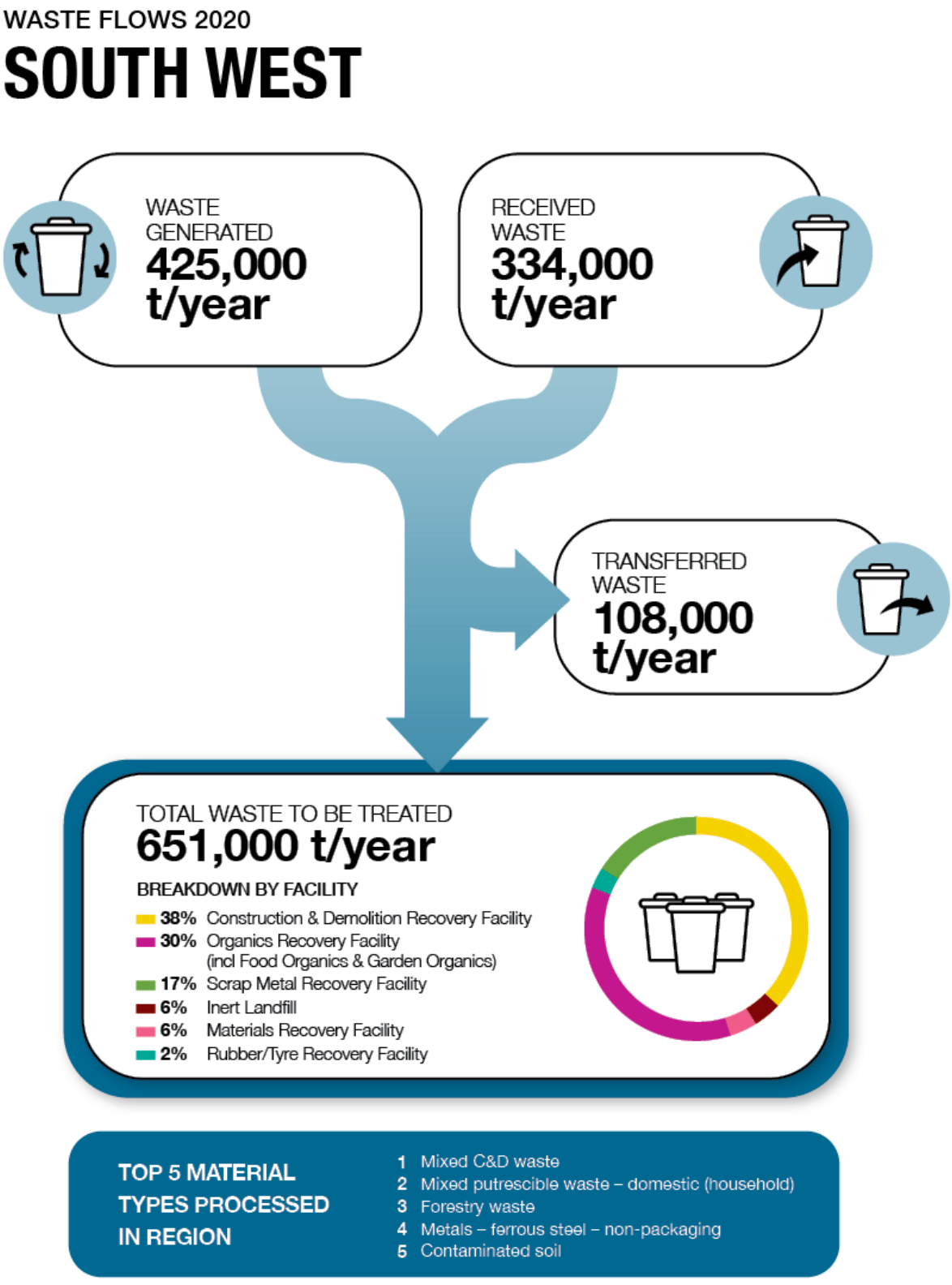


Figure 54 Waste generated, received, transferred and treated in the South West in 2020

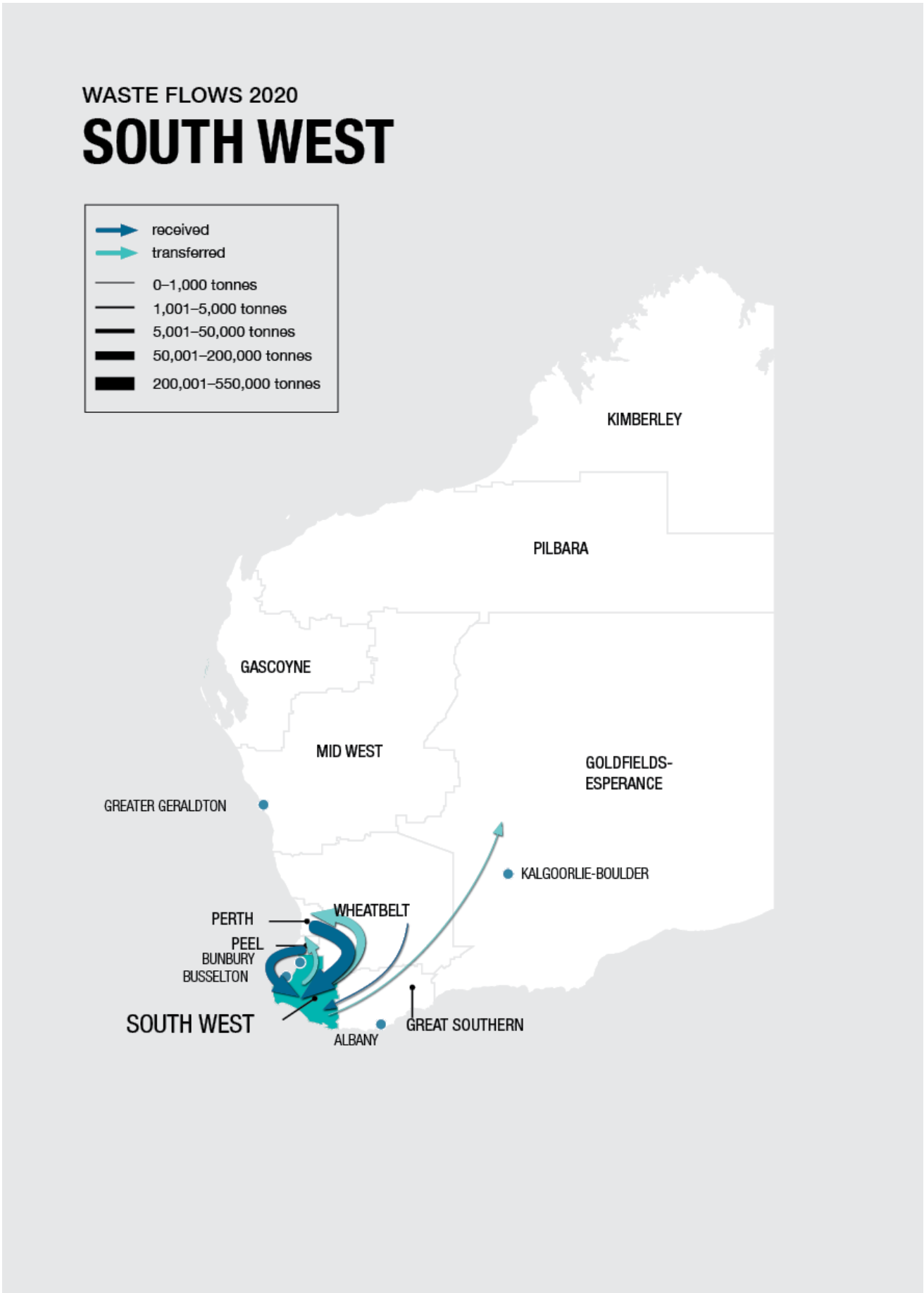


Figure 55 Waste flows in the South West in 2020

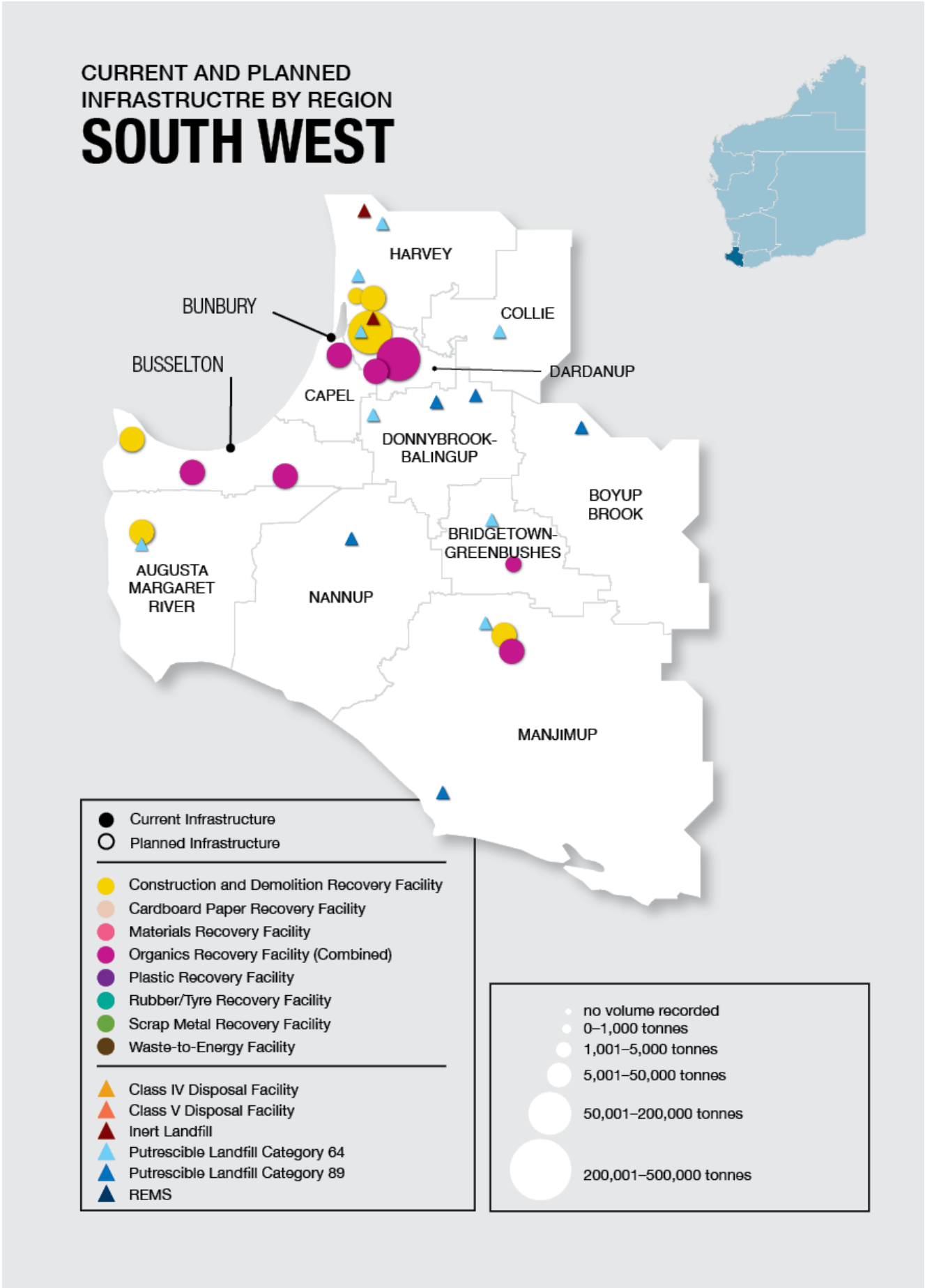


Figure 56 Current and planned infrastructure locations in the South West in 2020

Waste and resource recovery in 2030

Modelling to achieve all waste strategy targets in 2030 found the South West region would generate 467,000 tonnes and transfer 148,000 tonnes out of the region for recovery, both larger quantities of waste compared with 2020.

However, the reduction in putrescible waste imports means the total waste treated in the South West will decrease by about 51 per cent. This shift, along with the addition of new infrastructure, could increase the South West materials recovery rate from 49 per cent to 54 per cent.

Figure 57 highlights the increase from materials recovery (54 per cent) to resource recovery (materials recovery plus energy recovery; 81 per cent), emphasising the increasing importance of energy recovery in waste management.

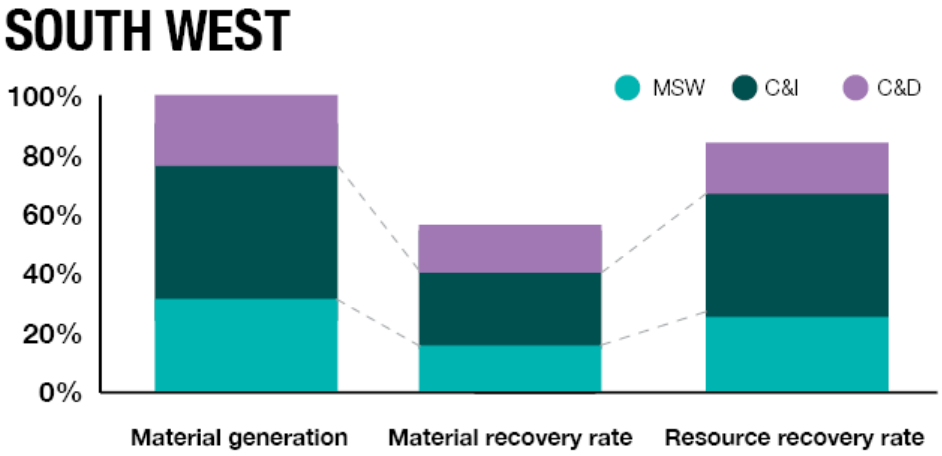


Figure 57 Generation, material recovery and resource recovery by source in the South West in 2030

Figure 58 shows the distribution of feedstock materials used by each facility type, indicating which waste streams are most significant and where the resource recovery efforts should be concentrated. This is also reflected in the South West region Principles and priorities section.

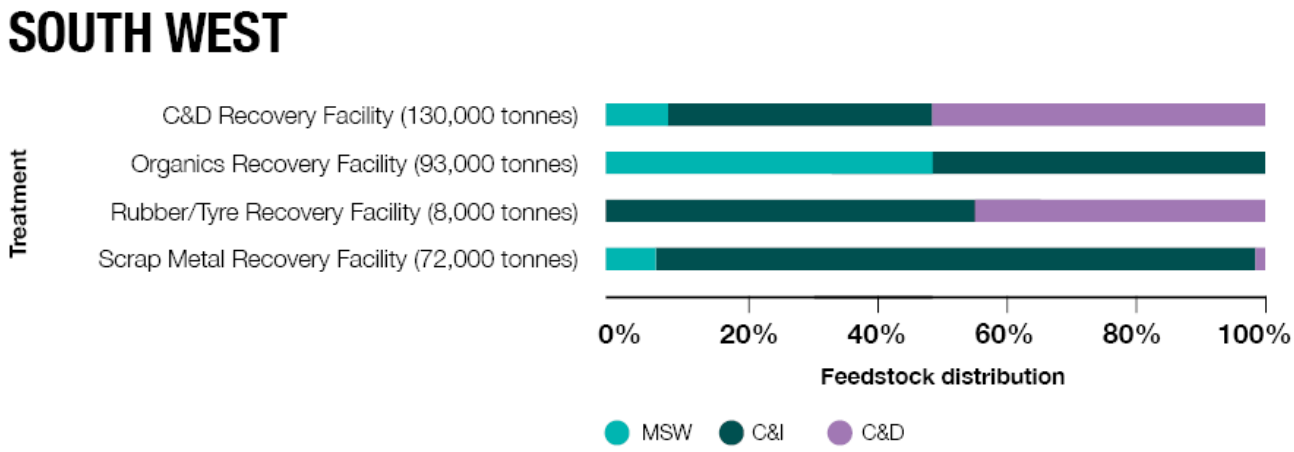


Figure 58 Feedstock distribution of treatments in the South West in 2030

Two South West local governments (the cities of Busselton and Bunbury) are considered major regional centres under the waste strategy. These regional centres are working towards the MSW material recovery target of 60 per cent by 2030. Many South West local governments have already implemented kerbside FOGO collection and recovery (City of Bunbury, shires of Augusta-Margaret River, Capel, Collie, Dardanup, Donnybrook-Balingup and Harvey). Introduction by other governments will further increase demand for local FOGO processing capacity.

The model uses licensed capacity for facilities and can result in an overestimation of actual capacity. Stakeholder feedback indicates that only a fraction of the region's licensed capacity of 205,000 tonnes of Category 67A capacity is actually available for the processing of FOGO. The South West's licensed Category 67A capacity is only in the cities of Busselton and Bunbury. The Infrastructure priorities section describes the need to investigate further to confirm actualFOGO processing capacity.

Infrastructure capacity needs in 2030

Based on current, planned and approved infrastructure in 2020, the South West requires the following additional capacities to meet the waste strategy targets in 2030:

- 64,000 tonnes of additional consolidation capacity is needed for an MRF, which is sufficient to allow for the development of a new recovery facility; however, transferring material to Perth for recovery and access to end markets may be more viable.
- 8,000 tonnes of additional consolidation capacity is needed for rubber/tyre recovery, which may be sufficient to allow for the development of a new recovery facility
- 72,000 tonnes of additional consolidation capacity is needed for scrap metal recovery, which is sufficient to allow for development of a new recovery facility.
- 92,000 tonnes of additional recovery capacity is needed for waste-to-energy, which is not sufficient to allow for a new facility; however, residual waste may potentially be consolidated and transported to Perth for processing. Alternatively, regional growth in the Bunbury and Busselton centres may make development of a South West waste-to-energy facility possible, particularly given the constraints on putrescible landfill capacity in the region. If a waste-to-energy facility is developed, an additional 18,000 tonnes of bottom ash will need to be processed locally or consolidated and transported to Perth.

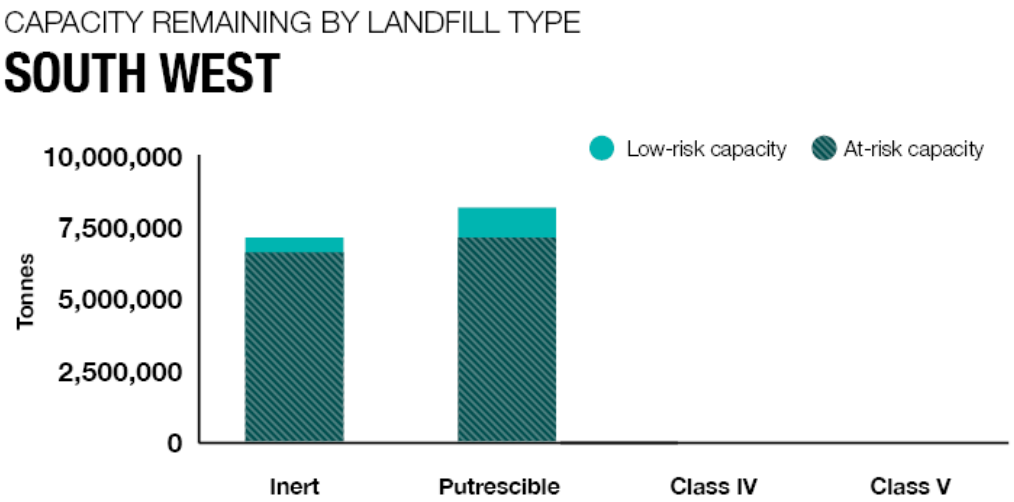


Figure 59 Capacity remaining by landfill type in the South West, including an assessment of low-risk and at-risk capacity

Total remaining capacity by landfill types is presented in . This figure also indicates the proportion of that capacity that is at risk (see section on Landfill capacity lifetime assessment to 2030 and 2050).

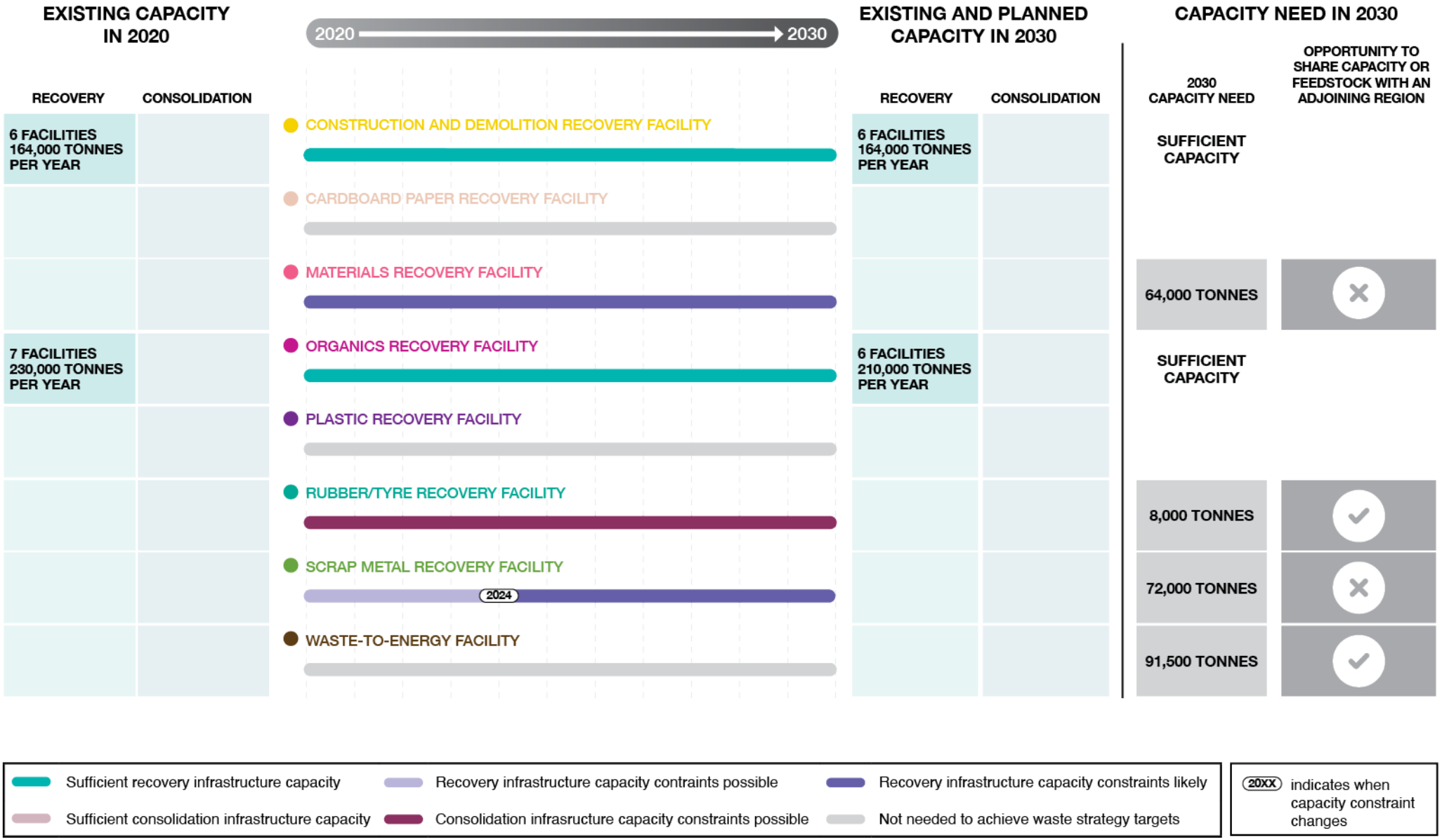
Under the low-risk scenario, most of the total landfill capacity of 15 million tonnes was identified as potentially at risk, of which inert landfills make up 49 per cent and putrescible landfills 51 per cent. *State Waste Infrastructure Needs Analysis* modelling predicts 37,000 tonnes of residual waste will be disposed of in landfill each year. Feedstock lifetime remaining for landfills is shown in Figure 19.

Details of the infrastructure needed to achieve waste strategy targets are outlined in Figure 60, including the expected facilities, capacities and capacity needs in 2030.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

SOUTH WEST

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030.
It includes planned and approved facilities, as well as closures between 2020 and 2030.



Sufficient recovery infrastructure capacity
Recovery infrastructure capacity contraints possible
Recovery infrastructure capacity constraints likely
Sufficient consolidation infrastructure capacity
Consolidation infrasructure capacity constraints possible
Not needed to achieve waste strategy targets
20XX indicates when capacity constraint changes

Figure 60 South West infrastructure pipeline and capacity need in 2030

Principles and priorities

The principles outlined in this plan have been used to identify priorities.

Priority areas that are projected to go beyond capacity need, based on the completed modelling for the region, arise when applying the principles.

Based on the analysis, the top priorities for the South West region are:

- Investigate designating a waste precinct east of Greater Bunbury.
- Investigate a scrap metal recovery facility.
- Investigate options for a consolidation centre for the transfer of residual waste to waste-to-energy facilities in Perth.
- Investigate alternative landfill facility contingency arrangements with the Great Southern and Wheatbelt regions, and longer-term options within the region.
- Assess whether existing 67A licensed facilities can be increasingly utilised to meet local demand and/or potentially alleviate FOGO recovery capacity need in neighbouring regions.

These are discussed in more detail in Table 32 below. The principles are outlined once more in Figure 2 for reference.

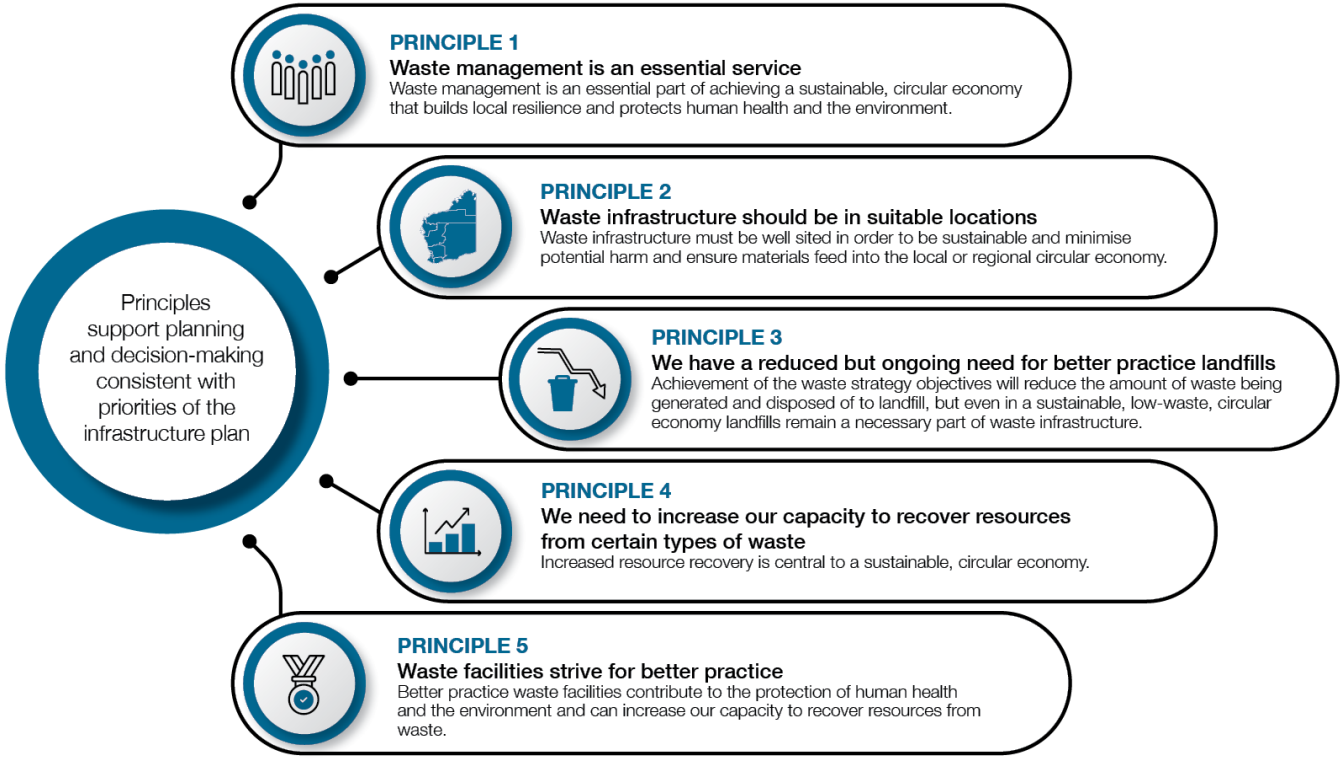


Figure 2 Principles of the *State waste infrastructure plan*

Table 32 Consideration of infrastructure plan principles and priorities in the South West

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Priorities arising from applying principles (with assigned priority ranking)
64,000 tonnes of additional capacity for MRFs	**Principle 1: Waste management is an essential service** The South West will increase recovery of commingled recyclable material to achieve the waste strategy Recover targets, with an additional 64,000 tonnes of capacity for local commingled recycling capacity needed primarily to support for population centres in the region with existing three-bin collection services. Considering principle 1, development of additional MRFs is viable given the projected available feedstock. The capacity need is sufficient to develop three facilities, which eases contingency risk under principle 1. **Principle 2: Waste infrastructure should be in suitable locations** Areas east of Greater Bunbury are appropriate for new facilities when considering principle 2, with low constraints and an ability to co-locate with additional scrap metal capacity needs of 72,000 tonnes or rubber/tyre recovery capacity needs of 8,000 tonnes, to achieve the waste strategy 2030 target. Barriers may be faced when developing sites in dense, urban environments as the South West region grows and whole-of-life impacts should be evaluated for any proposed site. This includes accounting for eventual urban encroachment and having suitable buffers which can be addressed with waste precincts. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Consideration of principle 4 supports development of facilities in the South West.	**High** Investigate options for a precinct(s) east of Greater Bunbury to facilitate low-risk development of MRFs co-located with other waste infrastructure.
8,000 tonnes of additional capacity for rubber/tyre recovery	**Principle 1: Waste management is an essential service** Perth is the closest region with sufficient capacity to receive consolidated rubber/tyre material from the South West, as the current capacity need is not sufficient to allow for a processing facility. However, as urban populations grow in the South West, generation of rubber and tyre material will increase. Critical mass for a new facility may be reached before a consolidation facility is commissioned. Principle 1 outlines the preference for local processing capacity, so development of a processing facility may be feasible in this growing region. The opportunity to co-locate this facility with existing waste infrastructure may reduce planning and approval timeframes, so development of a new facility will be simplified. **Principle 2: Waste infrastructure should be in suitable locations** Principle 2 prioritises consolidation and transport to the Perth region rather than the Great Southern region to minimise negative impact of transport distances. Whether a	**Medium** Better understanding of inter-regional opportunities could support the development of new infrastructure to address capacity need for rubber/tyre recovery in the South West region. Options include a waste precinct in the Bunbury area that could facilitate low-risk development of additional consolidation or recovery infrastructure.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Priorities arising from applying principles (with assigned priority ranking)
	consolidation facility or new processing facility, the area east of Bunbury is suitable, with the least constraints and access to downstream markets near Perth. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Recent tyre export bans highlight the need to proactively increase capacity to recover rubber/tyre material within the region as the region and population grows, when considering principle 4.	
72,000 tonnes of additional capacity scrap metal recovery	**Principle 1: Waste management is an essential service** The South West region will need significant additional capacity of 72,000 tonnes to meet the waste strategy Recover targets, with 68,000 tonnes of this being ferrous steel. The region is a major generator and adjoining regions could potentially provide additional feedstock for any new facility in the South West, with 7,000 tonnes available in the Great Southern region and 5,000 tonnes available in the Wheatbelt region. With sufficient feedstock and access to downstream markets, the South West is an appropriate location for an additional processing facility when considering principle 1. However, the contingency risk of a single point of dependency should be addressed by establishing alternative facility agreements with facilities in the Perth region. **Principle 2: Waste infrastructure should be in suitable locations** Access to facilities or access to downstream markets in Perth make east Bunbury a favourable site with reduced travel distances when considering principle 2.	**High** Options for waste precinct(s) in Bunbury could facilitate viable development of scrap metal consolidation or recovery facilities. This is a high priority given the immediate capacity need and option to support capacity need in adjoining regions.
91,500 tonnes of additional capacity for waste-to-energy facilities	**Principle 1: Waste management is an essential service** The South West needs material recovery of an additional 91,500 tonnes per year through waste-to-energy to meet the waste strategy Recover targets in 2030, from a total volume of 135,000 tonnes of residual putrescible waste. This material could be consolidated and transported to Perth to ensure recovery and diversion from landfill under principle 1. It is noted that any delays in commissioning planned waste-to-energy facilities in Perth should be considered and will result in a continued reliance on landfill in the South West. **Principle 2: Waste infrastructure should be in suitable locations** The construction of a waste-to-energy facility in the region is a potential opportunity, as the region is modelled to generate 135,000 tonnes of residual putrescible waste with the highest growth around the major regional centres of Bunbury and Busselton. If this proceeds, a local bottom ash recovery facility in the region may be feasible.	**Medium** Increasing waste-to-energy capacity in the South West region through the development of additional infrastructure would improve the region's progress towards waste strategy Recover and Protect targets, while providing additional contingency to facilities in Perth. **High**

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Priorities arising from applying principles (with assigned priority ranking)
	If a waste-to-energy facility is developed (or waste is transferred to waste-to-energy facilities in Perth), waste-to-energy bottom ash facility development will be critical to waste-to-energy material recovery and meeting the waste strategy 2030 targets, with the South West needing an additional 18,000 tonnes of capacity for bottom ash recovery. Considering the plans to develop bottom ash recovery facilities in Perth, application of principle 2 promotes consolidation and transport of bottom ash material to Perth, with insufficient feedstock for a facility in the South West region.	Consolidation infrastructure in Bunbury could facilitate efficient transfers to waste-to-energy infrastructure in southern Perth to decrease reliance on local landfill capacity.
Large volume of organics allows for development of other processes	**Principle 2: Waste infrastructure should be in suitable locations** Development of bioenergy infrastructure could be located where organics are being processed as an additional option to treat suitable organics, to expand capacity or to diversify outputs (expanding from compost to energy production). This may present an opportunity for the Wheatbelt to treat organic waste or FOGO waste that exceeds the treatment capacity of the region. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** To achieve waste strategy targets, Western Australia needs to recover and process a large volume of organics. Expanding infrastructure to develop facilities that produce bioenergy expands capacity, diversifies options and reduces risk of failure to meet waste strategy targets. **Principle 5: Waste facilities strive for better practice** As volumes of organics are captured by large facilities in the region, there is potential to develop other processes. Better practice guidelines or regulatory requirements may change market activities and present an opportunity to utilise bioenergy more in the South West.	**Medium** Two facilities are listed in the region with capacities of 120,000 and 50,000 tonnes/year. These larger existing facilities may consider options to implement other processes or technologies.
Used tyre storage	**Principle 1: Waste management is an essential service** About 8,000 tonnes of rubber/tyre material is generated in the South West and this will continue to be generated. Consolidation of this material for processing in other regions is necessary whilst it remains unviable to process within the region. **Principle 2: Waste infrastructure should be in suitable locations** Although tyre material processing may be near end markets that can take crumbed tyres or use recovered materials in manufacturing or construction, consolidation centres will be needed in remote or regional locations.	**Medium** No facilities exist in the South West for tyre processing or storage. There is an opportunity to consolidate volumes and transport these tyres for reprocessing outside the region.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Priorities arising from applying principles (with assigned priority ranking)
	Principle 4: We need to increase our capacity to recover resources from certain types of waste Tyres can be processed, but infrastructure may only be available in Perth so the recovery of rubber/tyre materials in the South West region is dependent on consolidation and transport to enable recovery. Consolidation and transport will remain the likely fate given the insufficient quantity to support regional processing.	
Landfill capacity risk assessment	**Principle 2: Waste infrastructure should be in suitable locations** Based on current, planned and approved landfill capacity, the South West region has sufficient landfill capacity to 2030. However, under a low-risk approach to landfill, 93 per cent of that capacity is considered at risk. The South West needs immediate additional capacity to provide adequate options for putrescible waste disposal. Diversion of material to the adjoining Perth, Great Southern and Wheatbelt regions may address capacity constraints in the short term but may not be a suitable long-term approach. **Principle 5: Waste facilities strive for better practice** Consideration of principle 5 highlights that seven facilities have a total potential lifetime capacity of 7,900,000 tonnes at risk in the South West region. The South West region is likely to face capacity constraints for landfill under a low-risk approach to landfill. In addition, 44 per cent of landfills also require post-closure planning, having not completed or updated a plan within the past 10 years.[5]	**High** Options for more efficient inter-regional waste transfer infrastructure and contingency arrangement could alleviate short-term capacity constraints between the South West, Great Southern and Wheatbelt regions. This is a high priority given the likelihood of short-term capacity constraints under a low-risk approach to landfill capacity.

[5] Western Australia Waste Infrastructure Audit, ASK Waste Management Consultancy Services on behalf of the Department of Water and Environmental Regulation, (2021).

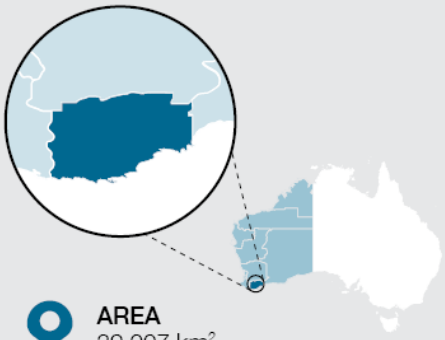
Great Southern region

Waste profile in 2020

The Great Southern region generates 2 per cent of the state's waste and has the lowest waste generation rate per capita of any region. The region generated 98,000 tonnes of waste in 2020, consisting of nearly equal parts C&I (35 per cent), MSW (34 per cent), and C&D (31 per cent). The region treated 87,000 tonnes in 2020, with 20,000 tonnes (23 per cent) being recovered and 67,000 tonnes (77 per cent) being landfilled. Key waste profile data for the Great Southern region waste and resource recovery in 2020 is presented below.

Residents in the Great Southern	2 per cent of Western Australia's population resides in the Great Southern region.
	Population density of 2 people per km^2.
	Residents are mostly concentrated to the Albany major regional centre.
Local governments in the region	City of Albany, Shire of Broomehill-Tambellup, Shire of Cranbrook, Shire of Denmark, Shire of Gnowangerup, Shire of Jerramungup, Shire of Katanning, Shire of Kent, Shire of Kojonup, Shire of Plantagenet, and Shire of Woodanilling.
Generating waste	The Great Southern region generates 2 per cent of the waste generated in Western Australia.
Transporting waste	The Albany Highway provides direct connection between the region's major population centre and Perth, allowing for the transportation of recyclable materials. There is also railway connection to the Wheatbelt and a commercial port in Albany.
Treating waste	The Great Southern treats 1 per cent of the waste treated in Western Australia.
	The Great Southern recovers 1 per cent of the waste recovered in Western Australia.
	The Great Southern landfills 3 per cent of the waste landfilled in Western Australia.
	Acts as a critical hub for the southern regions.

GREAT SOUTHERN
REGIONAL SUMMARY



AREA
39,007 km²

GROSS REGIONAL PRODUCT (2019–20)
$4.52B/CAP

NUMBER OF BUSINESSES (2019–20)
6,717

TOP 5 EMPLOYMENT BY INDUSTRY

36.33%	Agriculture, forestry and fishing
13.48%	Construction
10.35%	Rental, hiring and real estate services
5.74%	Professional, scientific and tech services
5.26%	Wholesale trade

The manufacturing industry sector makes the greatest contribution to economic output in the region, which at $1.3B accounts for 14.39% of total output. With 2,771 jobs representing 10.31% of total employment, it is the retail trade industry sector that is the region's largest employer.

2020

- POPULATION 61,400
- WASTE GENERATED 98,000 TONNES
- WASTE GENERATION PER CAPITA 1.6 TONNES

2030

PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

- POPULATION 65,879 (▲7%)
- WASTE GENERATED 92,000 TONNES
- WASTE GENERATION PER CAPITA 1.39 TONNES

2030 INFRASTRUCTURE CAPACITY NEED

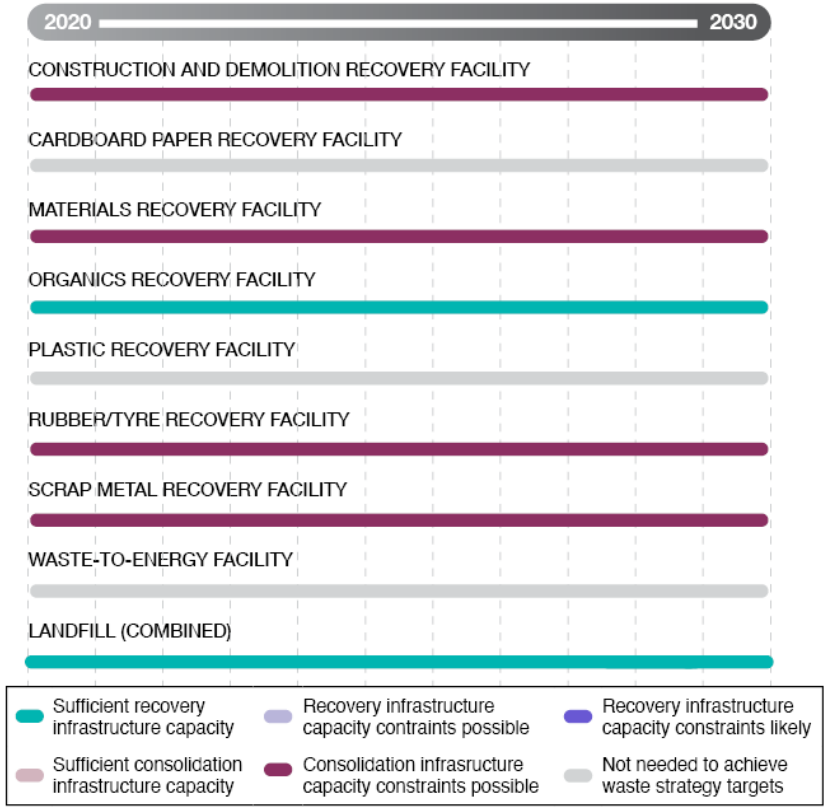
1. Construction and demolition | 16,500 tonnes
2. Material recovery facility | 5,000 tonnes
3. Scrap metal | 7,000 tonnes

TOP PRIORITIES

1. Assess planning and development opportunities for construction and demolition facility siting to service Albany region.
2. Investigate alternative landfill facility contingency arrangements with the Great Southern and Wheatbelt region.
3. Assess whether existing 67A licensed facilities in Great Southern or neighbouring regions can be increasingly utilised to alleviate food organics and garden organics recovery capacity need.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030

Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN GREAT SOUTHERN 2020 AND 2030

Waste projections to 2030 based on meeting the waste strategy targets

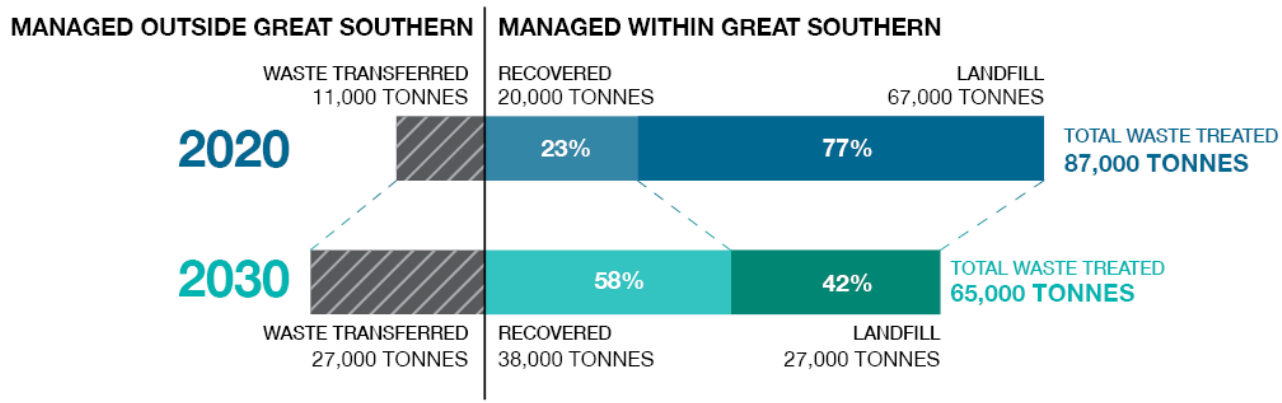


Figure 61 Waste in the Great Southern: statistics and projections

Waste and resource recovery in 2020

The Great Southern region still largely relies on landfill treatment for wastes, although implementation of three-bin collection systems has already begun in some local government areas. The top five materials processed in the region in 2020 include:

1. mixed putrescible waste – domestic (household)
2. sand/ soil
3. mixed putrescible waste (C&I)
4. mixed C&D
5. commingled recycling

Most of the waste infrastructure in the region is disposal facilities, which include three inert landfills and 22 putrescible landfills. Just over half (54 per cent) of all waste treated in the region was through putrescible landfill disposal. Active in waste recovery are two MRFs and three organics recovery facilities. There is no additional infrastructure under development in the region noted in the infrastructure plan.

Waste treated is mostly from local generation, with less than 1,000 tonnes received into the region. Received material consisted of commingled recycling from the neighbouring regions of Goldfields-Esperance and Wheatbelt. The Great Southern region also transferred out of region 11,000 tonnes of material, consisting predominately of ferrous metal and mixed C&D sent to Perth. The Great Southern also supports other adjoining regions by providing MRF capacity. Although the amount of material received from other regions are not large, they are important in achieving the waste strategy strategic objectives.

Waste management practices vary across different areas of the Great Southern. In Albany, a comprehensive three-bin system is in place which collects general waste, commingled recycling and FOGO. In the Shires of Jerramungup, Denmark, and Plantagenet, two-bin kerbside collections are offered, catering to general waste and recycling needs. Moreover, rural residents without access to a kerbside service can utilise drop-off facilities to responsibly manage their waste.

Aspects of waste and resource recovery in the Great Southern in 2020 that must be considered when working towards the waste strategy targets include:

- Mixed C&D contributes more than 20 per cent of waste transferred out of the Great Southern region because of a lack of local capacity to reprocess.
- Nearly all (97 per cent) of waste transferred out from the Great Southern region was transported to Perth for further treatment.
- Mixed putrescible waste from domestic (household) and commercial sources forms the largest waste material processed in the region, requiring ongoing management of landfill capacity.
- Strong transportation connections with adjoining regions and Perth enable opportunities for material consolidation and offtake.
- The region currently imports commingled recycling materials from neighbouring regions for processing.

The location of current and planned recovery infrastructure in the Great Southern region in 2030 is shown in Figure 64 (see Facility lists in the Appendix for a full list of facilities). Facilities granted work approvals since 2020 by the department in the Great Southern region are listed below in Table 33. These facilities have not been included in the modelling for the infrastructure plan and may alleviate some of the region's capacity needs.

Table 33 Facilities granted licences or works approvals since 2020 in the Great Southern

Facility type	Facility name	Location
Asphalt manufacturing and consolidation centre	Albany Asphalt Plant	Great Southern

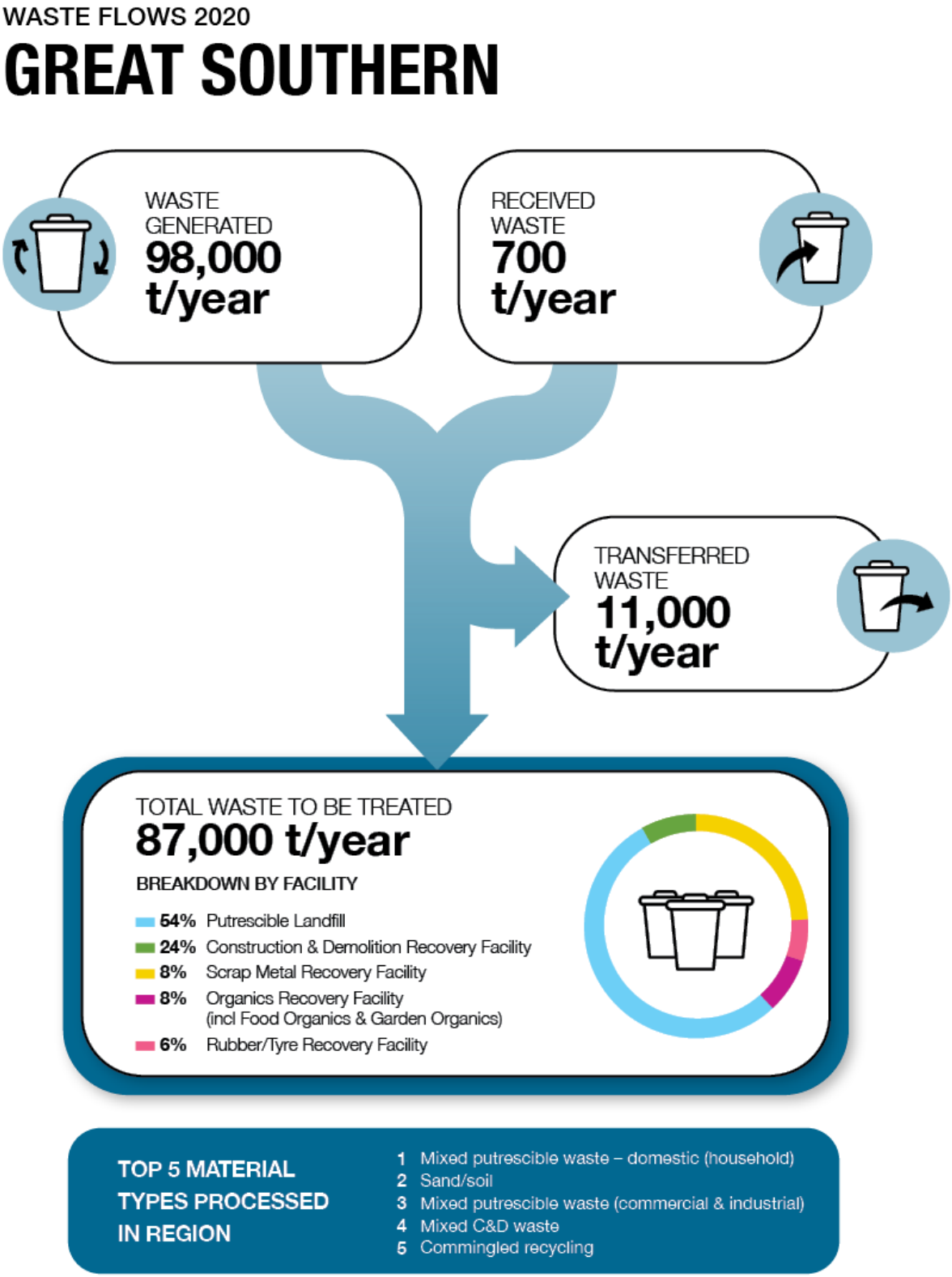


Figure 62 Waste generated, received, transferred and treated in the Great Southern in 2020

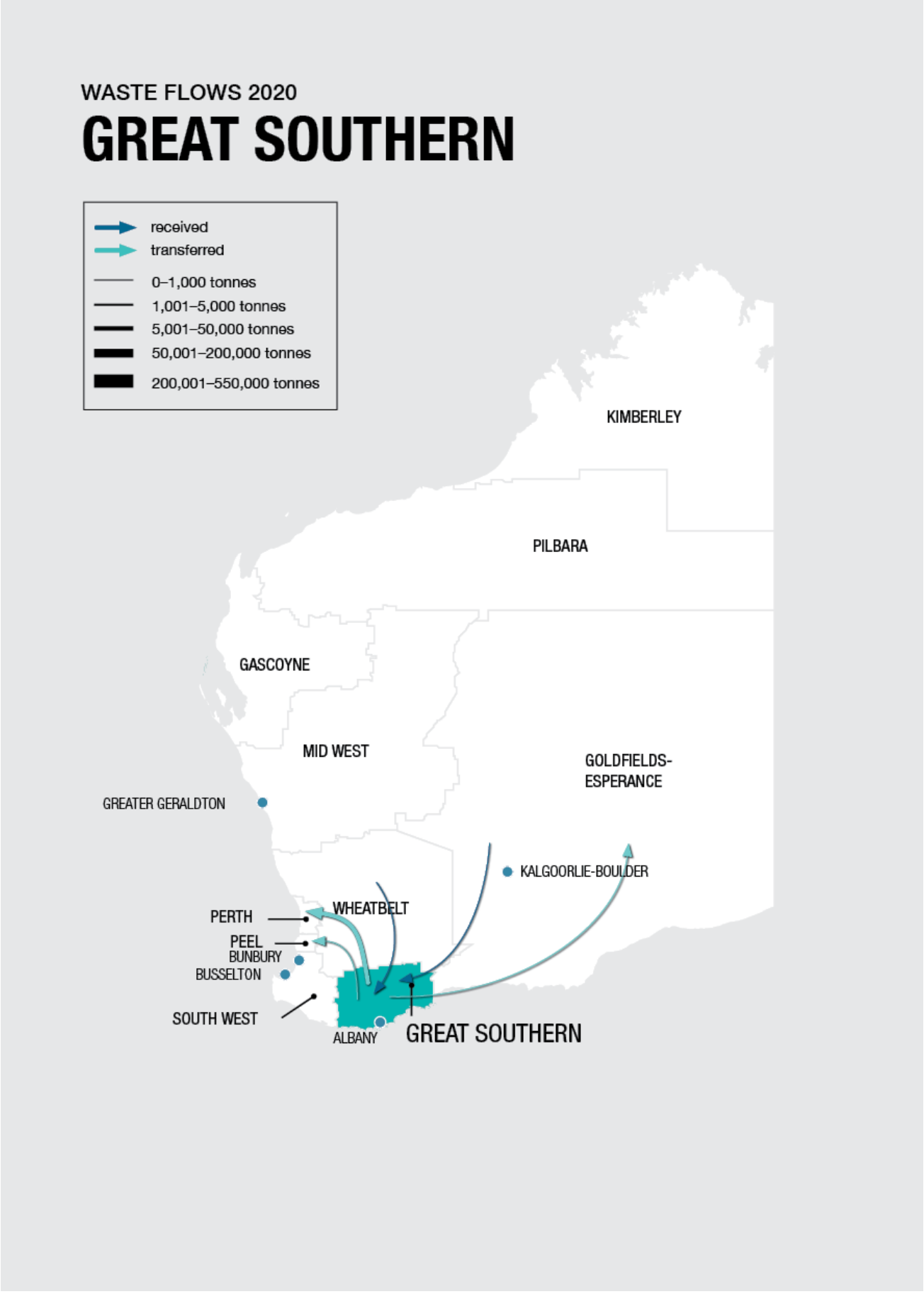


Figure 63 Waste flows in the Great Southern in 2020

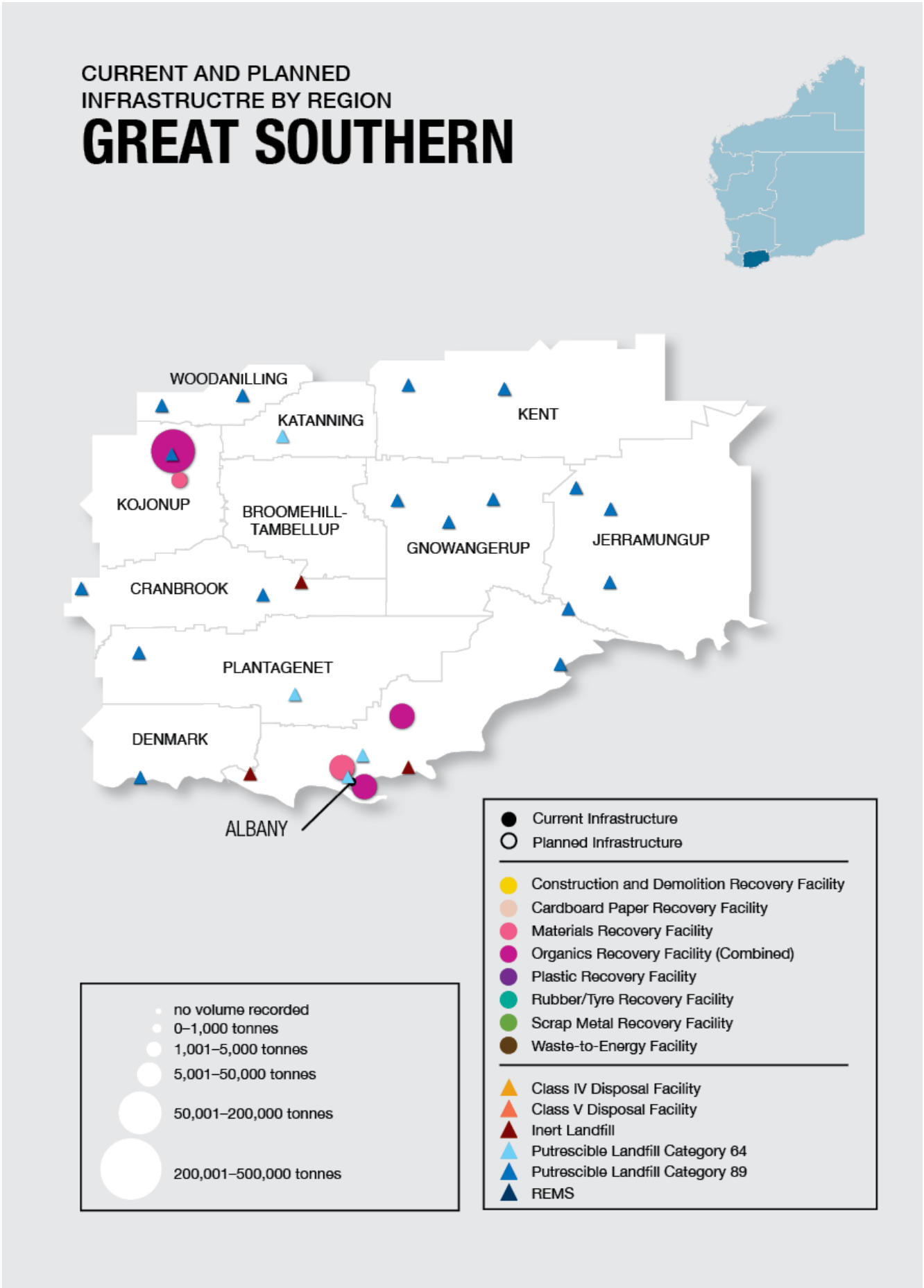


Figure 64 Current and planned infrastructure locations in the Great Southern in 2020

Waste and resource recovery in 2030

Modelling to achieve all waste strategy targets in 2030 found the Great Southern region would generate 92,000 tonnes, similar to 2020 quantities.

However, the increase in waste exported out of the region means the total waste treated in the South West will decrease by 25 per cent. This shift, along with the addition of new infrastructure, will increase the Great Southern materials recovery rate from 23 per cent to 58 per cent.

Figure 65 shows the distribution of feedstock materials used by each facility type, indicating which waste streams are most significant and where the resource recovery efforts should be concentrated. This is also reflected in the Great Southern region Principles and priorities section.

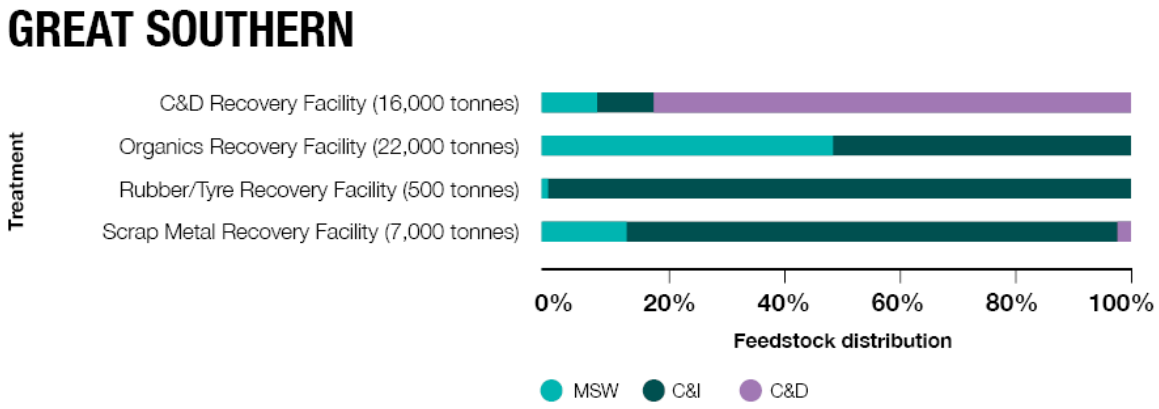


Figure 65 Feedstock distribution of treatments in the Great Southern in 2030

One Great Southern local government (City of Albany) is considered a major regional centre under the waste strategy. This regional centre is working towards the MSW recovery target of 60 per cent by 2030. Other Great Southern local governments and the C&I sector have shown an interest in implementing FOGO collection and recovery, increasing the demand for local FOGO processing infrastructure.

The model uses licensed capacity for facilities and can result in an overestimation of actual capacity. Stakeholder feedback indicates that only a fraction of the region's licensed capacity of 69,000 tonnes of Category 67A capacity is actually available for the processing of FOGO. The Infrastructure priorities section describes the need to investigate further to confirm actual FOGO processing capacity. This is particularly important in regional centres – for example, City of Albany, which has licensed capacity of 18,000 tonnes for Category 67A and is required to achieve 60 per cent recovery of MSW to achieve the waste strategy targets.

Infrastructure capacity needs in 2030

Based on current, planned and approved infrastructure in 2020, the Great Southern requires the following additional capacities to meet the waste strategy targets in 2030:

- 16,500 tonnes of recovery capacity is needed for C&D recovery, which will require consolidation and transfer from the region as it is not sufficient to allow for an additional recovery facility. A mobile C&D recovery facility may be considered.
- 5,000 tonnes of additional consolidation capacity is needed for materials recovery.
- 7,000 tonnes of additional consolidation capacity is needed for scrap metal.
- While not identified though *Infrastructure Needs Analysis* modelling (as explained above), stakeholders have reported local demand for access to FOGO processing capacity. Further investigation of this need at a regional level is required.

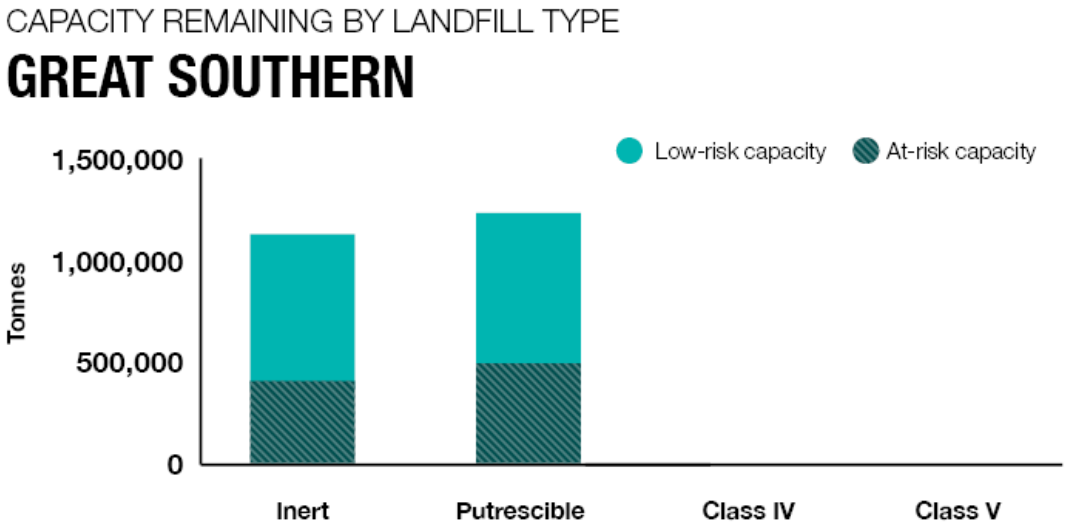


Figure 66 Capacity remaining by landfill type in the Great Southern, including an assessment of low-risk and at-risk capacity

Total remaining capacity by landfill types is presented in . This figure also indicates the proportion of that capacity that is at risk (see section on Landfill capacity lifetime assessment to 2030 and 2050).

Under the low-risk scenario, half of the total landfill capacity of 970,000 tonnes was identified as potentially at risk, of which inert landfills make up 47 per cent and putrescible landfills 53 per cent. *State Waste Infrastructure Needs Analysis* modelling predicts 27,000 tonnes of residual waste will be disposed of in landfill each year. Feedstock lifetime remaining for landfills is shown in Figure 19 .

Details of the infrastructure needed to achieve waste strategy targets are outlined in Figure 67, including the expected facilities, capacities and capacity needs in 2030.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

GREAT SOUTHERN

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030. It includes planned and approved facilities, as well as closures between 2020 and 2030.

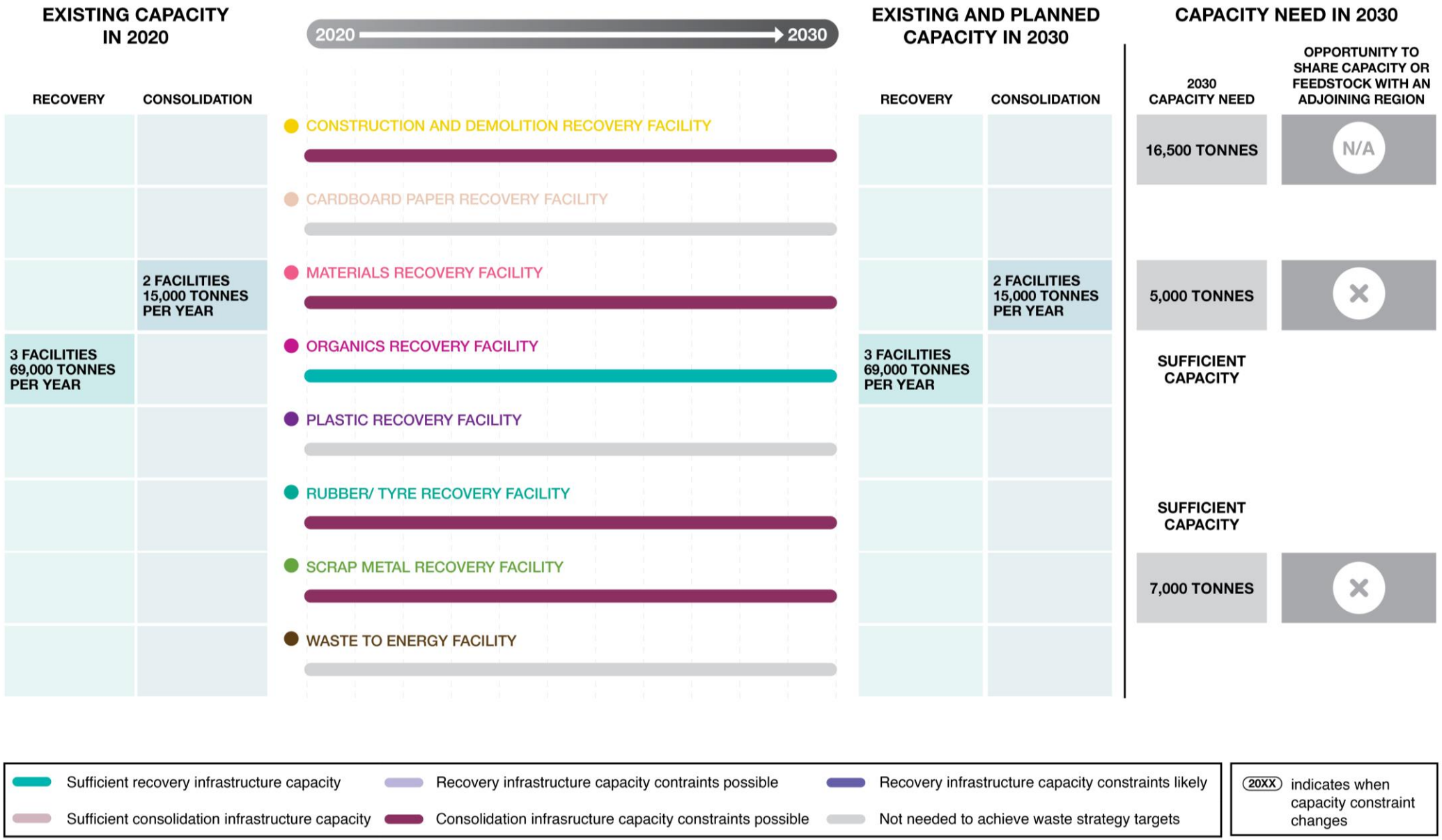


Figure 67 Great Southern infrastructure pipeline and capacity need in 2030

Principles and priorities

The principles outlined in this plan have been used to identify priorities.

Priority areas that are projected to go beyond capacity need, based on the completed modelling for the region, arise when applying the principles.

Based on the analysis, the top priorities for the Great Southern region are:

- Assess planning and development opportunities for C&D facility siting to service Albany region.
- Investigate alternative landfill facility contingency arrangements with the Great Southern and Wheatbelt regions.
- Assess whether existing 67A licensed facilities in the Great Southern or neighbouring regions can be increasingly utilised to alleviate FOGO capacity need.

These are discussed in more detail in Table 34 below. The principles are outlined once more in Figure 2 for reference.

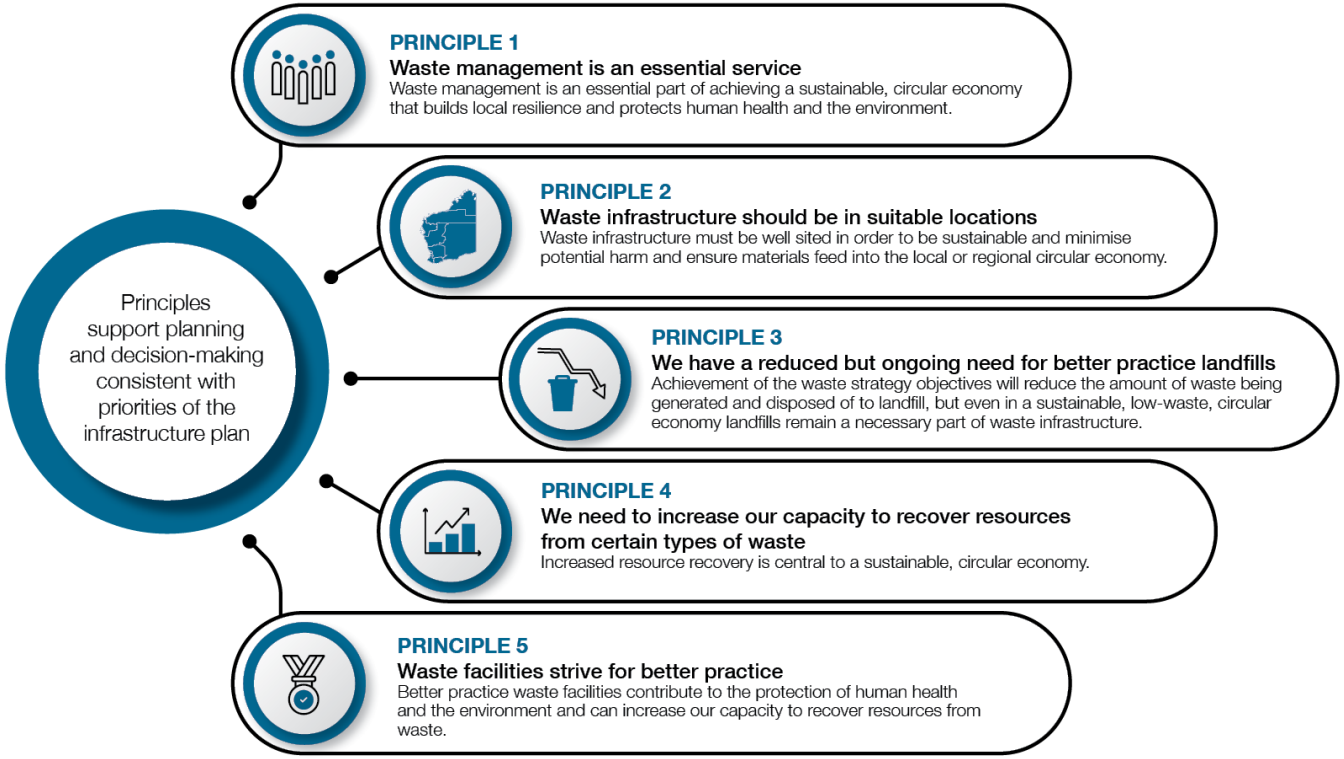


Figure 2 Principles of the *State waste infrastructure plan*

Table 34 Consideration of infrastructure plan principles and priorities in the Great Southern

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
16,500 tonnes of capacity for C&D recovery	**Principle 1: Waste management is an essential service** Existing capacity constraints to treat C&D material will be compounded by future population growth and increased urbanisation of regional centres such as Albany. Application of principle 1 suggests that there is a high priority to develop additional C&D processing capacity to support a wide range of development projects. **Principle 2: Waste infrastructure should be in suitable locations** C&D processing benefits greatly from being situated close to the source of generation and offtake markets. The increasing population and urbanisation of regional centres such as Albany should be considered for the development of additional infrastructure. There are large areas north and east of the city that have opportunities for new developments. This will provide a regional source for recovered C&D material offtake and the decreased need to transfer material to Perth. **Principle 3: We have a reduced but ongoing need for better practice landfills** The development of local capacity to recover inert C&D material will decrease reliance on local inert landfill infrastructure. Inert landfill capacity should be maintained to provide contingency during disaster events or facility constraints.	**High** Better understanding of sub-regional gaps for C&D recovery near major regional generators will improve infrastructure outcomes for Albany
5,000 tonnes of additional capacity for materials recovery	**Principle 1: Waste management is an essential service** Commingled recycling is currently received into the region from the neighbouring Wheatbelt region because of a lack of local processing capacity. Developments of new facilities in the Wheatbelt and South West may decrease the need for Great Southern to process commingled recycling received from these regions. This will create new capacity for local material. Although, the Great Southern is still likely to be relied upon by neighbouring regions during the planning and development stages of any new infrastructure. **Principle 2: Waste infrastructure should be in suitable locations** Existing MRFs in the region are well located to serve regional centres and receive inter-regional material. Commingled collection services are already	**Low** Lifetime and capacity expansions of existing MRFs in the Great Southern region will decrease the risk, capital costs and timeframes required to meet capacity needs.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	offered in Albany so the expansion of existing infrastructure can shorten timelines to develop new capacity. Capacity building should be shared across the two existing facilities to create contingency during constraint periods (such as when one facility is offline).	
7,000 tonnes of capacity for scrap metal recovery	**Principle 1: Waste management is an essential service** Scrap metal is the largest material transferred out of the Great Southern region, indicating access to a strong consolidation and transportation network to supply feedstock for facilities in Perth. Expansion of the existing consolidation network will be required to achieve waste strategy Recover targets. **Principle 2: Waste infrastructure should be in suitable locations** New consolidation facilities should be developed in areas that lack current infrastructure, while still having access to good transportation connections with Perth. Developments in north Albany could also leverage the area's commercial port for inter-regional transportation of material.	**Low** Better understanding of sub-regional gaps for scrap metal consolidation near transportation networks will improve infrastructure coverage in the Great Southern region.
Large volume of organics allows for development of other processes	**Principle 2: Waste infrastructure should be in suitable locations** Development of bioenergy infrastructure could be located where organics are being processed as an additional option to treat suitable organics, expand capacity or diversify outputs (expanding from compost to energy production). This may present an opportunity for the Wheatbelt to treat organic waste or FOGO waste that exceeds the treatment capacity of the region. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** To achieve waste strategy targets, Western Australia needs to recover and process a large volume of organics. Expanding infrastructure to develop facilities that produce bioenergy expands capacity, diversifies options and reduces risk of failure to meet waste strategy targets. **Principle 5: Waste facilities strive for better practice** As volumes of organics are captured by large facilities in the region, there is potential to develop other processes. Better practice guidelines or regulatory requirements may change market activities and present an opportunity to utilise bioenergy more in the Great Southern.	**Medium** There is one facility listed in the region with capacity of 51,000 tonnes/year. These larger existing facilities may consider options to implement other processes or technologies.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
Used tyre storage	**Principle 1: Waste management is an essential service** About 950 tonnes of rubber/tyre material is generated in the Great Southern and this will continue to be generated. Waste management of tyres in remote locations poses challenges. Tyres from mining operations pose their own particular challenges. Consolidation of this material for processing in other regions is necessary whilst it remains unviable to process within the region. **Principle 2: Waste infrastructure should be in suitable locations** Although tyre material processing may be near end markets that can take crumbed tyres or use recovered materials in manufacturing or construction, consolidation centres will be needed in remote or regional locations. Existing landfills are being used for collection and consolidation of tyres and present a suitable centralised location for waste management in remote regions. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Tyres can be processed, but infrastructure may only be available in Perth so the recovery of rubber/tyre materials in the Wheatbelt region is dependent on consolidation and transport to enable recovery. Consolidation and transport will remain the likely fate given the insufficient quantity to support regional processing. **Principle 5: Waste facilities strive for better practice** One class 64 putrescible landfill in the Great Southern is also licensed to store tyres. See the landfill capacity risk assessment below to further understand how the loss of this facility may occur, noting that this may reduce the ability to consolidate rubber/tyre arising in the Great Southern.	**Medium** Two facilities are listed in the region for Category 57 with total capacity exceeding 1,200 tyres. These facilities may be sending tyres to Perth. There is an opportunity to consolidate volumes and transport these tyres for reprocessing outside the region.
Landfill capacity risk assessment	**Principle 2: Waste infrastructure should be in suitable locations** The Great Southern region has sufficient putrescible and inert landfill capacity under low-risk modelling until 2029. These landfills could potentially accept material generated in the South West, which under low-risk modelling is expected to have significant capacity constraints. **Principle 4: We need to increase our capacity to recover resources from certain types of waste**	**High** Options for more efficient inter-regional waste transfer infrastructure and contingency arrangement could alleviate short-term capacity constraints between the South West, Great Southern and Wheatbelt regions.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	Sub-regional analysis reveals a lack of inert disposal capacity in the Katanning region. Low generation rates means that material not recovered locally will require disposal in putrescible landfills. **Principle 5: Waste facilities strive for better practice** 64 per cent of facilities have not completed or updated closure management plans within the past 10 years, which is a requirement of better practice principles. [6]	

[6] Western Australia Waste Infrastructure Audit, ASK Waste Management Consultancy Services on behalf of the Department of Water and Environmental Regulation, (2021).

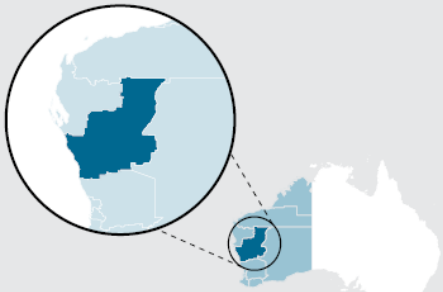
Mid West region

Waste profile in 2020

The Mid West region generates 2 per cent of the state's waste and has the second lowest waste generation rate per capita after the Great Southern region. The region generated 98,000 tonnes of waste in 2020, made up of primarily C&I (46 per cent), followed by MSW (39 per cent) and C&D (15 per cent). The Mid West treated 87,000 tonnes in 2020, with 20,000 tonnes (23 per cent) being recovered and 67,000 (77 per cent) being landfilled. The Mid West region did not receive any waste or material from other regions, although it transferred 13,000 tonnes, primarily to Perth. Key waste profile data for the Mid West region waste and resource recovery in 2020 is presented below.

Residents in the Mid West	2 per cent of Western Australia's population resides in the Mid West region.
	Population density of 0.1 people per km^2.
	Residents are mostly concentrated to the Geraldton major regional centre.
Local governments in the region	Shire of Carnamah, Shire of Chapman Valley, Shire of Coorow, Shire of Cue, City of Greater Geraldton, Shire of Irwin, Shire of Meekatharra, Shire of Mingenew, Shire of Morawa, Shire of Mount Magnet, Shire of Murchison, Shire of Northampton, Shire of Perenjori, Shire of Sandstone, Shire of Three Springs, and Shire of Yalgoo.
Generating waste	The Mid West region generates 2 per cent of the waste generated in Western Australia.
Transporting waste	There are several major roads and railway networks that connect the Mid West with Perth.
Treating waste	The Mid West treats 1 per cent of the waste treated in Western Australia.
	The Mid West recovers less than 1 per cent of the waste recovered in Western Australia.
	The Mid West landfills 3 per cent of the waste landfilled in Western Australia.

MID WEST
REGIONAL SUMMARY



AREA
478,000 km²

GROSS REGIONAL PRODUCT (2019–20)
$6.14B/CAP

NUMBER OF BUSINESSES (2019–20)
4,559

TOP 5 EMPLOYMENT BY INDUSTRY

29.01%	Agriculture, forestry and fishing
14.47%	Construction
9.89%	Rental, hiring and real estate services
6.82%	Transport, postal and warehousing
5.96%	Wholesale trade

The mining industry sector makes the greatest contribution to economic output in the region, which at $6.7B accounts for 47.24% of total output. This industry sector is also the largest employer with 3,921 jobs which represents 14.87% of total employment within the region.

2020

- POPULATION 53,867
- WASTE GENERATED 92,000 TONNES
- WASTE GENERATION PER CAPITA 1.72 TONNES

2030

PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

- POPULATION 52,841 (▼2%)
- WASTE GENERATED 83,000 TONNES
- WASTE GENERATION PER CAPITA 1.57 TONNES

2030 INFRASTRUCTURE CAPACITY NEED

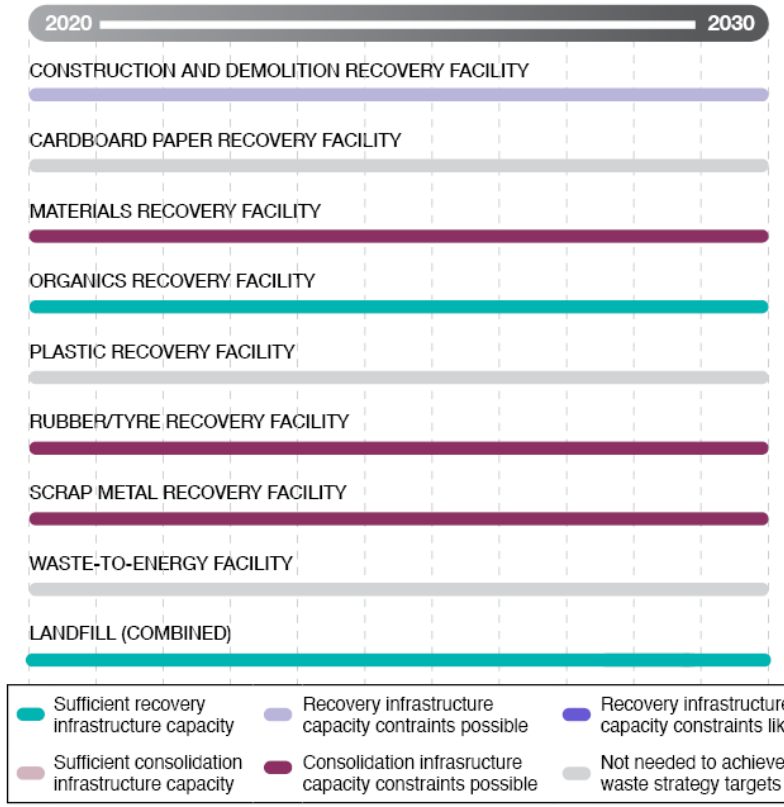
1. Material recovery facility | 13,000 tonnes
2. Scrap metal | 7,000 tonnes

TOP PRIORITIES

1. Investigate designating a waste precinct in the north, east or south of Geraldton.
2. Investigate a rural landfill risk assessment of unlicensed landfill and REMS landfills.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030

Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN MID WEST 2020 AND 2030

Waste projections to 2030 based on meeting the waste strategy targets

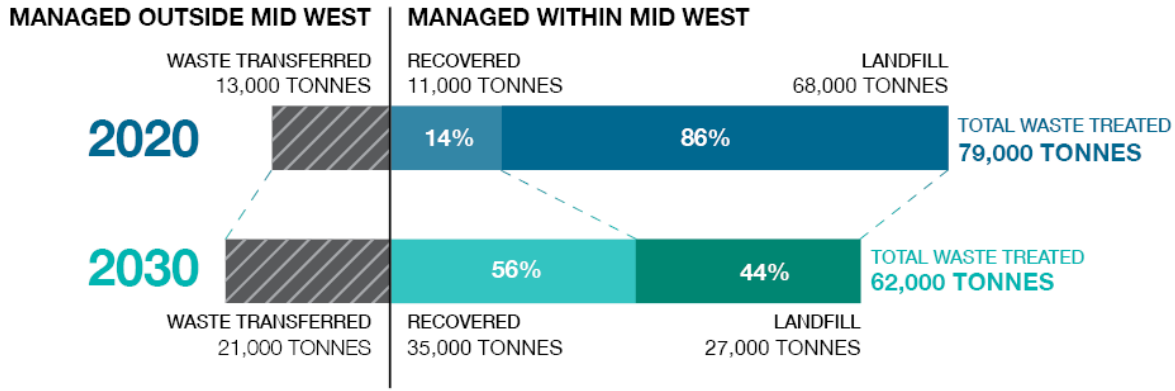


Figure 68 Waste in the Mid West: statistics and projections

Waste and resource recovery in 2020

The Mid West region largely relies on putrescible landfills for the treatment of material. The region generates 36,000 tonnes of MSW, with only 3 per cent recovered. The top five materials processed in the region in 2020 include:

1. mixed putrescible waste – domestic (household)
2. mixed inert waste
3. mixed putrescible waste (C&I)
4. metals – ferrous steel – non-packaging
5. sand/soil.

There are a total of 27 waste facilities in the region, predominantly landfills (including three inert landfills and 21 putrescible landfills) along with one C&D recovery facility and one organics recovery facility. An additional inert landfill is in development in the south of Geraldton. There are also five REMS landfills in the Mid West region.

The region's population is primarily concentrated along the west coast, especially in the Geraldton area. Most waste facilities are also in Greater Geraldton because of the proximity to waste generation sources and road/rail transportation to Perth for material offtake. The commercial port in Geraldton can be leveraged for material transportation to end markets. Offtake opportunities also exist for recovered organic products as the Mid West has a strong agricultural industry.

Transferred material consisted of ferrous steel, mixed C&D and electric and electronic goods.

Aspects of waste and resource recovery in the Mid West region in 2020 that must be considered when working towards the waste strategy targets include:

- C&I formed the largest waste source in the Mid West region, consisting of about 43,000 tonnes, of which 21 per cent was recovered in the region.
- The Mid West transferred 13,000 tonnes of material, predominantly to Perth (97 per cent), which was facilitated by strong transportation networks.
- The Mid West transferred all ferrous metal generated in the region out of the region for processing.
- There is a current lack of MRFs in the region, resulting in low regional resource recovery rates, particularly for MSW.

The location of current and planned recovery infrastructure in the Mid West region in 2020 is shown inFigure 71 (see Facility lists in the Appendix for a full list of facilities).

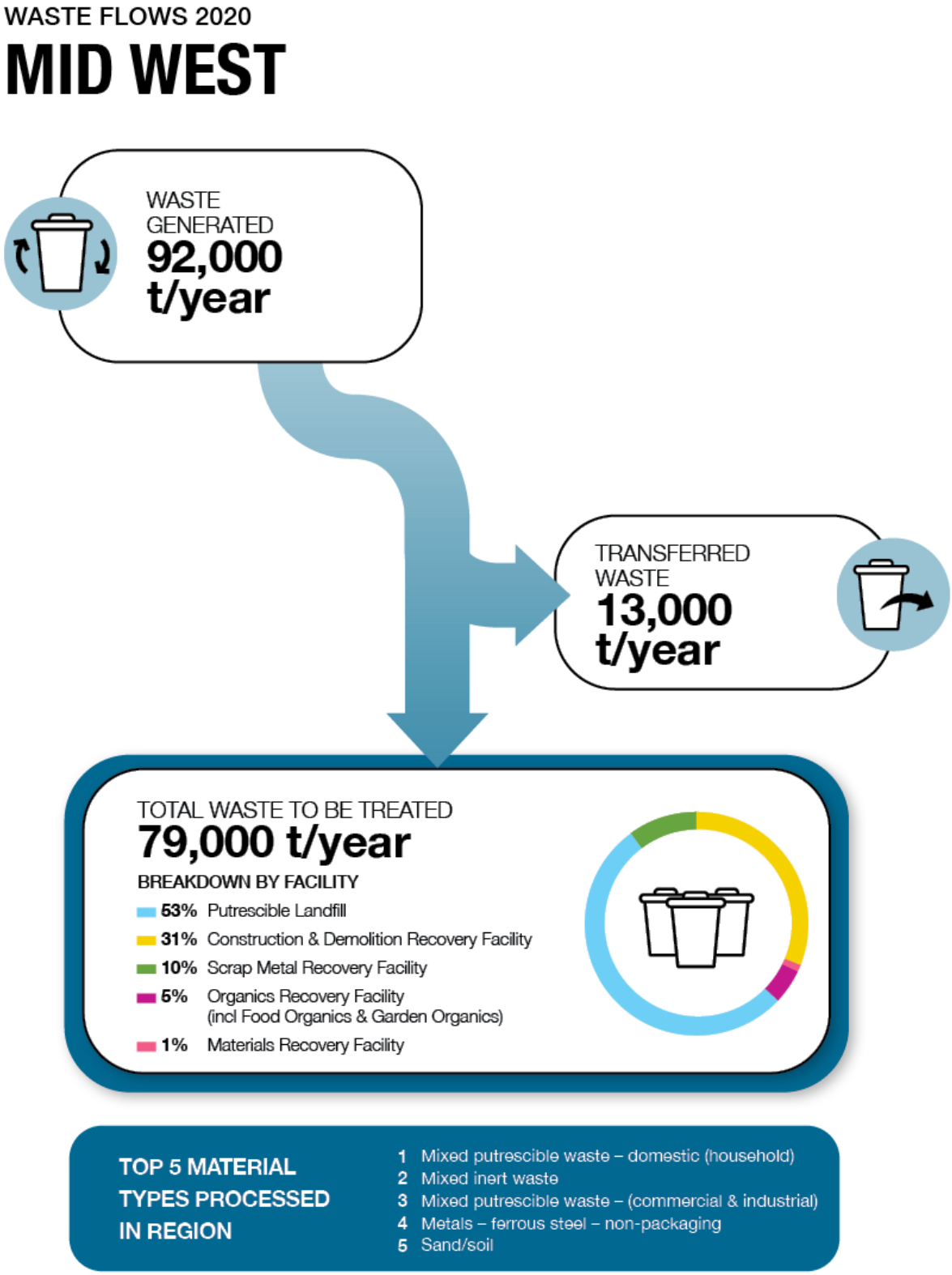


Figure 69 Waste generated, received, transferred and treated in the Mid West in 2020

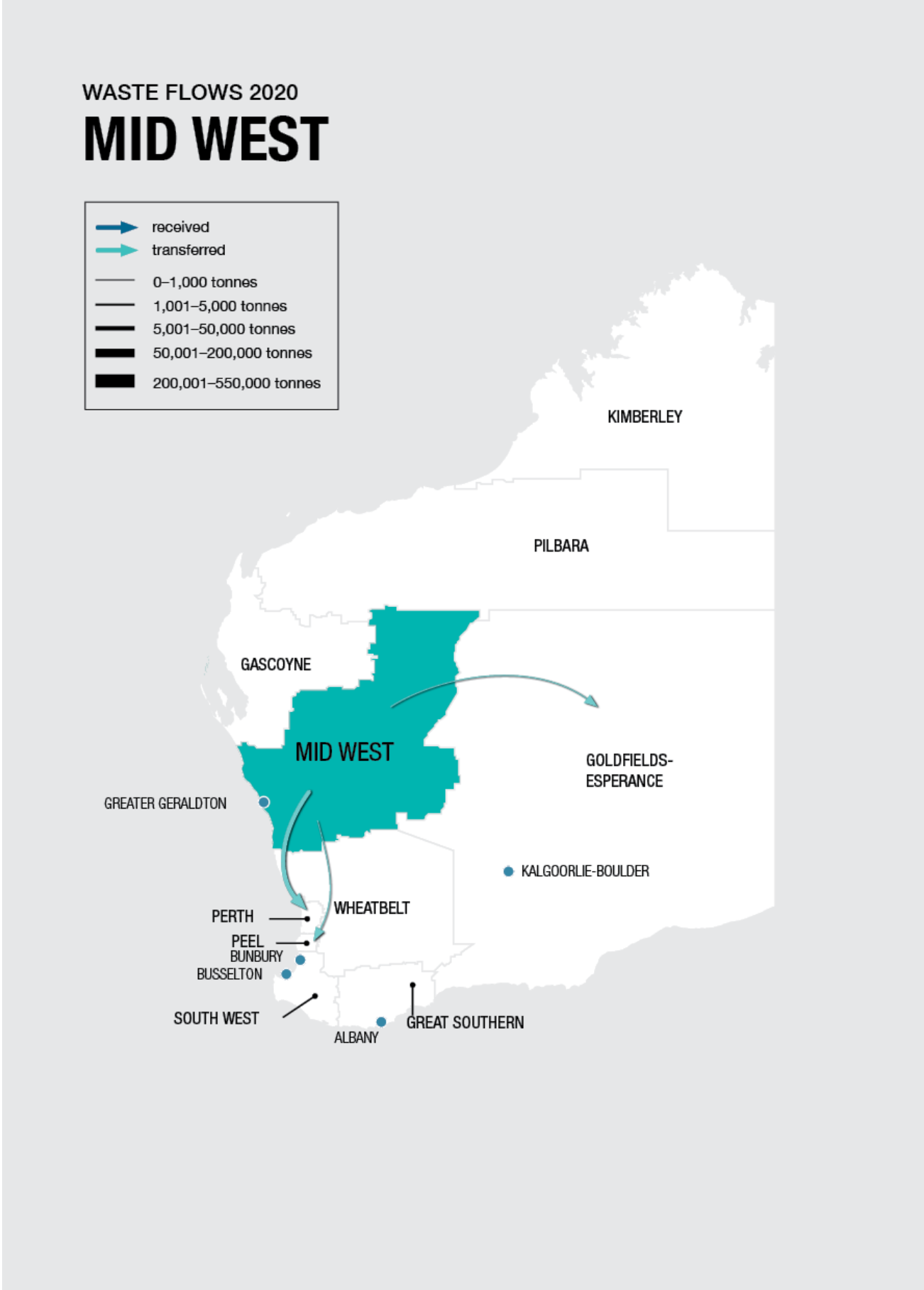


Figure 70 Waste flows in the Mid West in 2020

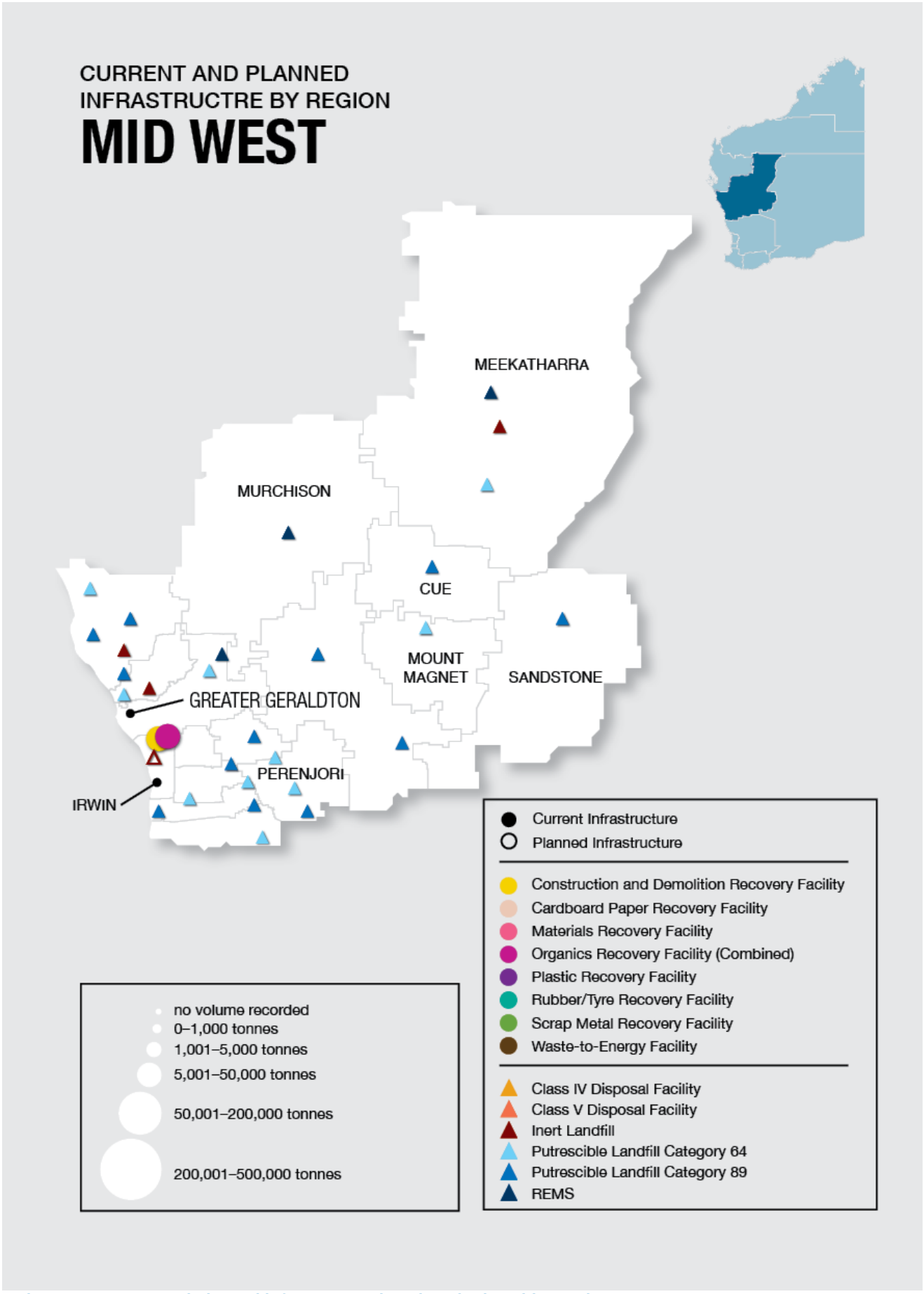


Figure 71 Current and planned infrastructure locations in the Mid West in 2020

Waste and resource recovery in 2030

Modelling to achieve all waste strategy targets in 2030 found the Mid West region would generate 83,000 tonnes, which is lower than 2020 quantities.

However, the increase in materials exported out of the region means the total waste treated in the Mid West will decrease by 22 per cent. This shift, along with the addition of new infrastructure, will increase the Mid West resource materials rate from 14 per cent to 56 per cent. Figure 72 shows the distribution of feedstock materials used by each facility type, indicating which waste streams are most significant and where the resource recovery efforts should be concentrated. This is also reflected in the Mid West region Principles and priorities section.

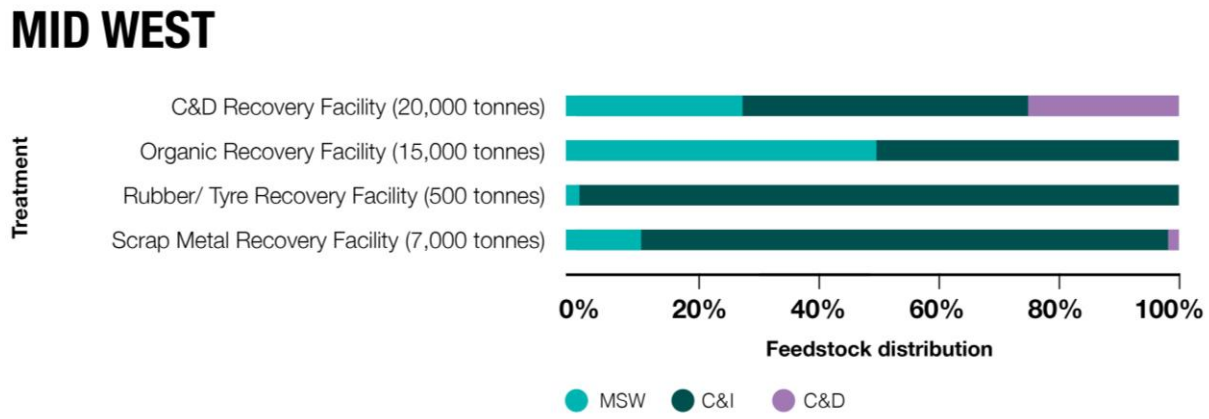


Figure 72 Feedstock distribution of treatments in the Mid West in 2030

One of the Mid West's local governments (City of Greater Geraldton) is considered a major regional centre under the waste strategy. This regional centre is working towards the MSW recovery target of 60 per cent by 2030. Other local governments in the Mid West may be interested in implementing FOGO collection and recovery, increasing the demand for local FOGO processing infrastructure.

The model uses licensed capacity for facilities and can result in an overestimation of actual capacity. Stakeholder feedback indicates that only a fraction of the region's licensed capacity of 20,000 tonnes of Category 67A capacity is actually available for the processing of FOGO. The Mid West's licensed Category 67A capacity is only in the City of Greater Geraldton. The Infrastructure priorities section describes the need to investigate further to confirm actual FOGO processing capacity.

Infrastructure capacity needs in 2030

Based on current, planned and approved infrastructure in 2020, the Mid West requires the following additional capacities to meet the waste strategy targets in 2030:

- 13,000 tonnes of additional capacity is needed in MRFs, which may be sufficient to allow for an additional recovery facility if augmented with material received from the Gascoyne region (1,000 tonnes).
- 7,000 tonnes of additional consolidation capacity is needed for scrap metal recovery.

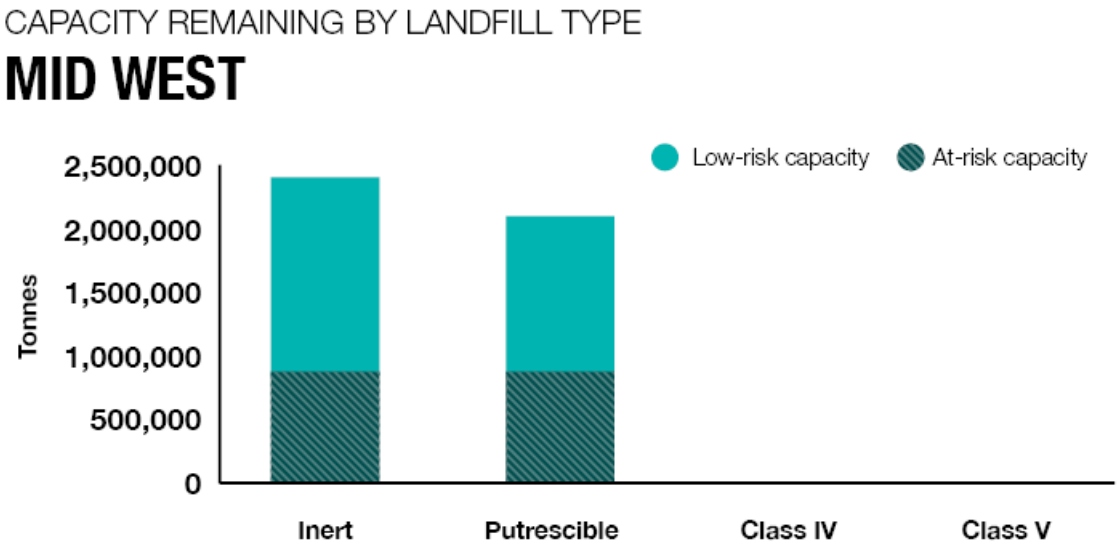


Figure 73 Capacity remaining by landfill type in the Mid West, including an assessment of low-risk and at-risk capacity

Total remaining capacity by landfill types is presented in Figure 73. This figure also indicates the proportion of that capacity that is at risk (see section on Landfill capacity lifetime assessment to 2030 and 2050).

Under the low-risk scenario, half of the total landfill capacity of 1.5 million tonnes was identified as potentially at risk, of which inert landfills make up 50 per cent and putrescible landfills 50 per cent. The region would require 18,000 tonnes of residual waste disposed of in landfill each year. Feedstock lifetime remaining for landfills is shown in Figure 19.

Details of the infrastructure needed to achieve waste strategy targets are outlined in Figure 74, including the expected facilities, capacities and capacity needs in 2030.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

MID WEST

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030.
It includes planned and approved facilities, as well as closures between 2020 and 2030.

Figure 74 Mid West recovery infrastructure pipeline and capacity need in 2030

Principles and priorities

The principles outlined in this plan have been used to identify priorities.

Priority areas that are projected to go beyond capacity need, based on the completed modelling for the region, arise when applying the principles.

Based on the analysis, the top priorities for the Mid West region are:

- Investigate designating a waste precinct in the north, east or south of Geraldton.
- Investigate a rural landfill risk assessment of unlicensed landfills and REMS landfills.

These are discussed in more detail in Table 35 below. The principles are outlined once more in Figure 2 for reference.

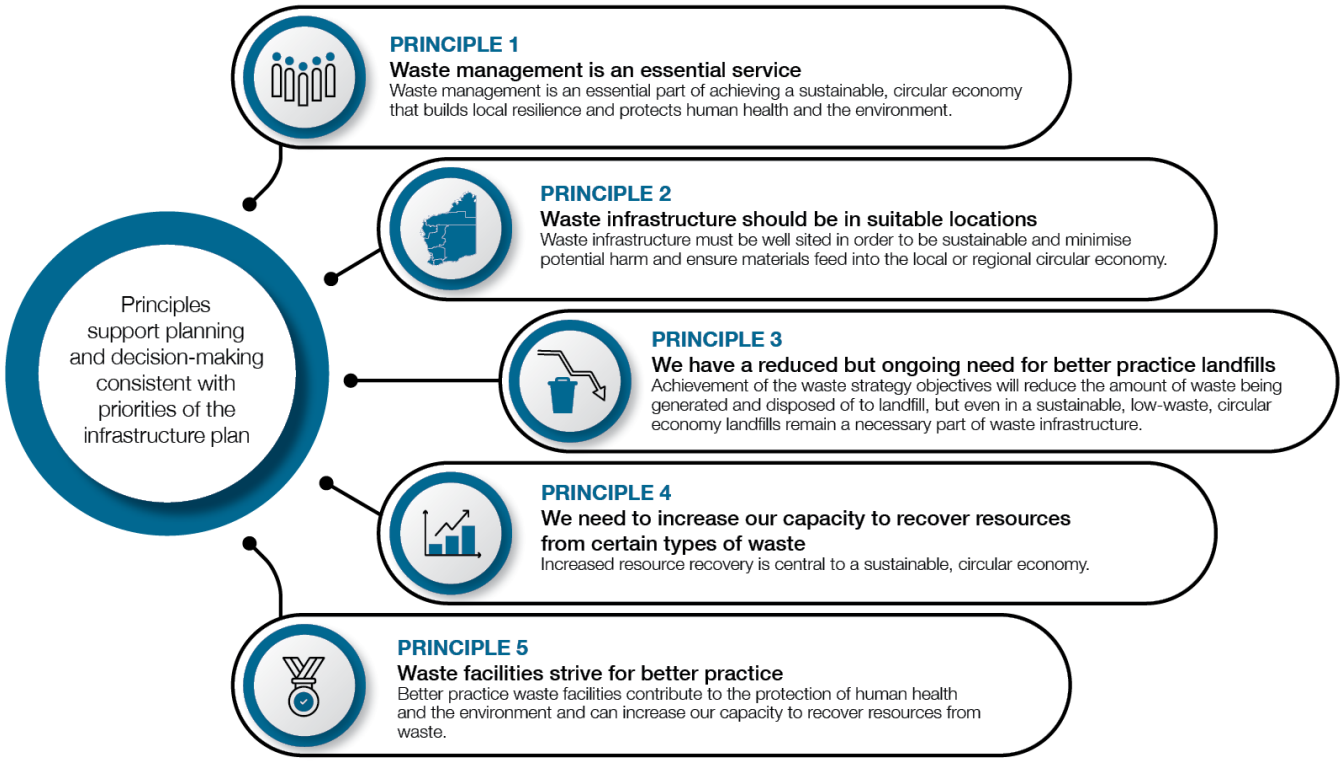


Figure 2 Principles of the *State waste infrastructure plan*

Table 35 Consideration of infrastructure plan principles and priorities in the Mid West

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
13,000 tonnes of capacity for MRFs	**Principle 1: Waste management is an essential service** The lack of existing facilities will require additional licensing and planning considerations. An opportunity to offer recycling collection services to the major regional centre of Greater Geraldton and surrounding areas may create additional feedstocks of about 11,000 tonnes of commingled recycling, pushing the MRF capacity need to 24,000 tonnes, which is sufficient to develop one additional facility. Contingency planning should include alternative facilities in adjoining regions to counter emergency situations (such as natural and other disasters) and unexpected closures of facilities arising from a variety of potential causes. **Principle 2: Waste infrastructure should be in suitable locations** The 13,000 tonnes of capacity needed to achieve waste strategy Recover targets in 2030 is about 85 per cent of the critical mass for an MRF. The adjoining Gascoyne region needs an additional 1,000 tonnes of capacity, which is far below critical mass for a recovery facility. If the Mid West receives material from the Gascoyne region, the 14,000 tonnes of commingled recyclables is 70 per cent of critical mass required for a new MRF. Considering principle 2, this may make the Mid West an appropriate place for an additional MRF in the medium term. Whole-of-life impacts should be determined and evaluated for any proposed site, including the potential for eventual urban encroachment and having suitable buffers. Most of the areas to the north, east and south of Geraldton present areas that are free of the assessed constraints, which may provide opportunities for the siting of waste infrastructure close to the main waste generation hub of the region.	**High** Designating a waste precinct in the areas north, east or south of Geraldton could facilitate low-risk development of an MRF. This is a high priority given the immediate capacity need and potential role supporting the Gascoyne region.
7,000 tonnes of capacity for scrap metal recovery	**Principle 1: Waste management is an essential service** The 7,000 tonnes of capacity needed to achieve the waste strategy Recover targets 2030 requires consolidation and transport to Perth when considering the essential nature of scrap metal recovery under principle 1. **Principle 2: Waste infrastructure should be in suitable locations**	**High** Investigate designating a waste precinct in areas north, east or south of Geraldton. This is a high priority given the immediate capacity need and potential role supporting the Gascoyne region.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	The Mid West is an appropriate place to develop a consolidation facility that can meet the additional capacity need of 7,000 tonnes for the Mid West and 500 tonnes for the Gascoyne region. A designated waste precinct in the areas north, east or south of Geraldton with low constraints will support the future needs of a consolidation facility and improve the efficiency of waste transportation in the region. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Consideration of principle 4 highlights the negative impact of consolidation and transport of scrap metal material long distances to Perth. However, unless downstream markets for recovered scrap metal are developed in the region, transport to Perth as the closest downstream market will remain necessary.	
Used tyre storage	**Principle 3: We have a reduced but ongoing need for better practice landfills** Waste management of tyres in remote locations poses challenges. Existing landfills are being used for collection and consolidation of tyres and present a suitable centralised location for waste management in remote regions. About 1,700 tonnes per annum of rubber/tyre material is projected to be generated in the Mid West and this will continue to be generated, highlighting better practice landfills as an important part of the Mid West's waste management. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Tyres can be processed but infrastructure may only be available in Perth so the recovery of rubber/tyre materials in the Mid West region is dependent on consolidation and transport to enable recovery. Consolidation and transport will remain the likely fate given the insufficient quantity to support regional processing. **Principle 5: Waste facilities strive for better practice** One class 64 putrescible landfill in the Mid West is also a tyre storage facility. See the landfill capacity risk assessment below to further understand how the loss of this facility may occur, noting that this may reduce the ability to consolidate rubber/tyre arising in the Mid West.	**Medium** There is a facility in Geraldton listed in the region for Category 57 with total capacity of 2,000 tyres that may be sending tyres to Perth. There is an opportunity to consolidate volumes and transport these tyres for reprocessing outside the region.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
Landfill capacity risk assessment	**Principle 5: Waste facilities strive for better practice** Based on current, planned and approved landfill capacity, the Mid West region has sufficient capacity to manage residual waste needs to 2030. Under a low-risk approach to landfill capacity lifetime the region continues to have sufficient capacity to manage residual waste needs to 2030. **Principle 5: Waste facilities strive for better practice** Consideration of principle 5 highlights seven facilities with a total capacity of 770,000 tonnes potentially at risk of noncompliance with better practice in the Mid West region. In addition, 95 per cent of landfills also require post-closure planning, having not completed or updated a plan within the past 10 years.[7] Collaboration with the local mining industry will create opportunities to recover mining waste and improve better practice management of REMS landfills.	**High** Updated rural landfill risk assessment methodology of unlicensed landfill and REMS landfills can be used to effectively assess the potential risk of environmental, human health and amenity impacts. **High** New facility development in the Mid West regions can be facilitated through assisted land use planning and approvals frameworks to alleviate local putrescible landfill capacity constraints

[7] Western Australia Waste Infrastructure Audit, ASK Waste Management Consultancy Services on behalf of the Department of Water and Environmental Regulation, (2021).

Gascoyne region

Waste profile in 2020

The Gascoyne has the smallest population of Western Australia's regions, with sparsely distributed communities connected by limited road networks. The region generated 25,000 tonnes of waste in 2020, made up of MSW (52 per cent), C&I (34 per cent) and C&D (14 per cent). The Gascoyne treated 23,000 tonnes in 2020, with 1,500 tonnes (6 per cent) being recovered and 21,500 (94 per cent) being landfilled. Geographic and capacity constraints means the Gascoyne has the lowest material recovery rate compared with other regions. Key waste profile data for the Gascoyne region waste and resource recovery in 2020 is presented below.

Residents in the Gascoyne	Less than 1 per cent of Western Australia's population resides in the Gascoyne region.
	Population density of 0.1 people per km^2.
	Residents are mostly concentrated to the Carnarvon major regional centre.
Local governments in the region	Shire of Carnarvon, Shire of Exmouth, Shire of Shark Bay, and Shire of Upper Gascoyne.
Generating waste	The Gascoyne region generates less than 1 per cent of the waste generated in Western Australia.
Transporting waste	Only one major road connecting the region with the Pilbara in the north and more populous southern regions such as Perth.
Treating waste	The Gascoyne treats less than 1 per cent of the waste treated in Western Australia.
	The Gascoyne recovers less than 1 per cent of the waste recovered in Western Australia.
	The Gascoyne landfills less than 1 per cent of the waste landfilled in Western Australia.

GASCOYNE
REGIONAL SUMMARY

AREA
135,000 km²

GROSS REGIONAL PRODUCT (2019–20)
$1.29B/CAP

NUMBER OF BUSINESSES (2019–20)
927

TOP 5 EMPLOYMENT BY INDUSTRY

27.40%	Agriculture, forestry and fishing
13.96%	Construction
9.38%	Rental, hiring and real estate services
8.44%	Transport, postal and warehousing
7.60%	Accommodation and food services

The mining industry sector makes the greatest contribution to economic output in the region, which at $395.3M accounts for 20.05% of total output. With 435 jobs representing 9.13% of total employment, it is the retail trade industry sector that is the region's largest employer.

2020
- POPULATION 9,835
- WASTE GENERATED 25,000 TONNES
- WASTE GENERATION PER CAPITA 2.55 TONNES

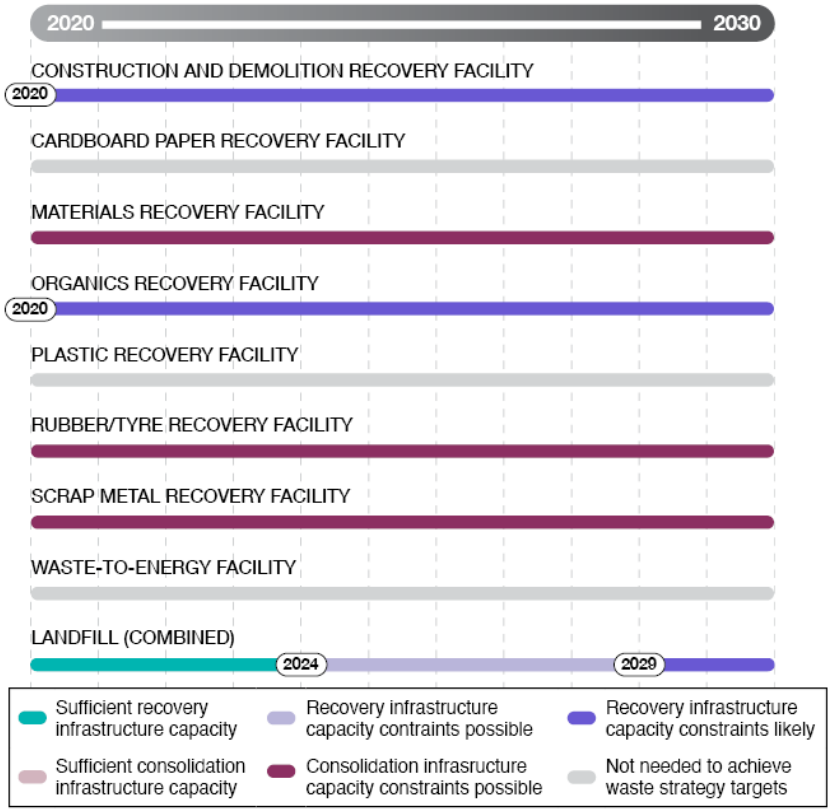
2030
PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

- POPULATION 10,423 (▲6%)
- WASTE GENERATED 24,000 TONNES
- WASTE GENERATION PER CAPITA 2.30 TONNES

2030 INFRASTRUCTURE CAPACITY NEED
1. Construction and demolition | 500 tonnes
2. Material recovery facility | 1,000 tonnes
3. Organics | 6,000 tonnes
4. Scrap metal | 500 tonnesorganics

TOP PRIORITIES
1. Investigate designated strategic industrial area in Carnarvon to facilitate additional facilities.
2. Assess whether existing 67A licensed facilities in neighbouring regions can be increasingly utilised to alleviate food organics and garden organics recovery capacity need.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030
Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN GASCOYNE 2020 AND 2030
Waste projections to 2030 based on meeting the waste strategy targets

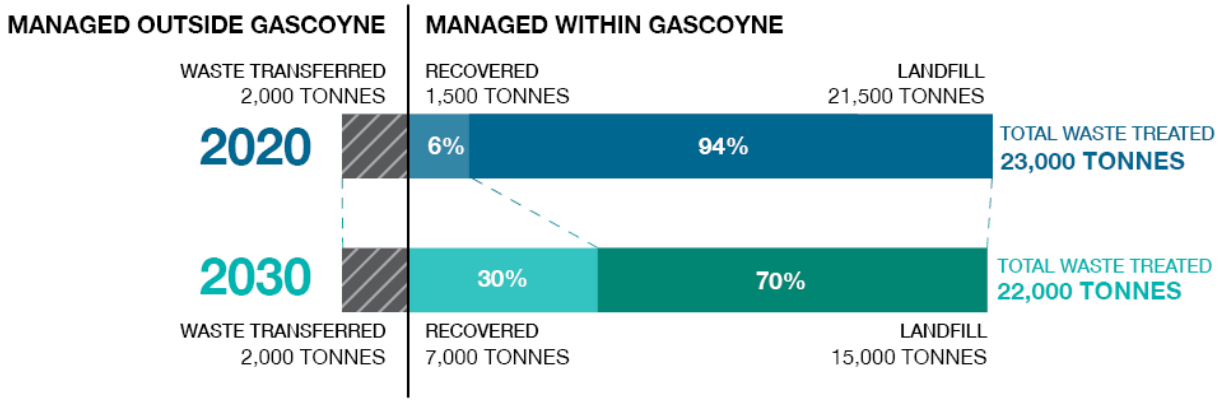


Figure 75 Waste in the Gascoyne: statistics and projections

Waste and resource recovery in 2020

Because of the small and isolated nature of many Gascoyne communities, most waste is treated through putrescible landfill disposal. The region recovers 1,500 tonnes of material per year, primarily consisting of electric and electronic goods. The top five materials processed in the region in 2020 include:

1. mixed putrescible waste – domestic (household)
2. electric and electronic goods
3. mixed C&D waste
4. metals – ferrous steel – non-packaging.

The region is serviced by five putrescible landfills, along with one REMS landfill. The only additional material recovery infrastructure are two rubber/tyre consolidation facilities. No additional infrastructure planned for the region was identified by the infrastructure plan.

The Gascoyne did not receive any waste and materials from other regions, although it transferred 2,000 tonnes per year, primarily to Perth. Transfers were predominantly to specialist waste facilities for the recovery of electric and electronic goods.

Because the region's population is concentrated in the Carnarvon area, there may be opportunities to introduce commingled recycling and FOGO collection services there, to generate feedstocks required for local infrastructure. Other recovered material can be aggregated and transported to the Pilbara or Perth for further reprocessing. These transportation networks can also be used to distribute recovered organic products to the Gascoyne's agricultural sector.

Aspects of waste and resource recovery in the Gascoyne region in 2020 that must be considered when working towards the waste strategy targets include:

- MSW formed the largest waste material source in the Gascoyne region, consisting of about 13,000 tonnes, of which 3 per cent was recovered.
- There is currently no commingled recycling or organics collection services in the region.
- All waste transfers out from the Gascoyne were to the Perth and Peel regions.
- All mixed C&D generated in the region and recovered was transferred out of region because of a lack of local recovery capacity.
- Access to transport networks means the Gascoyne could also transfer material to closer infrastructure in the Pilbara.

The location of current and planned recovery infrastructure in the Gascoyne region in 2030 is shown in Figure 78 (see Facility lists in the Appendix for a full list of facilities).

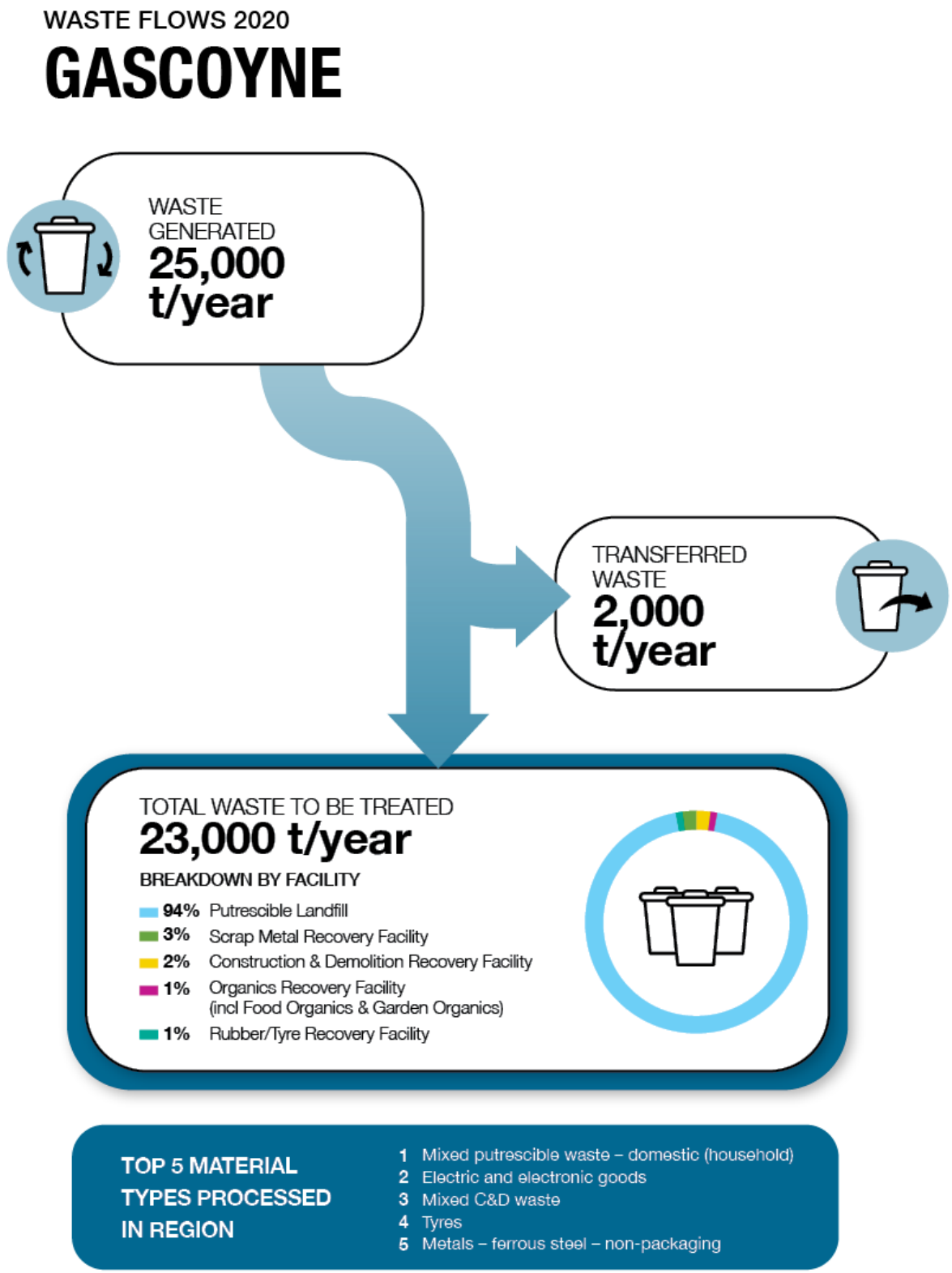


Figure 76 Waste generated, received, transferred and treated in the Gascoyne in 2020

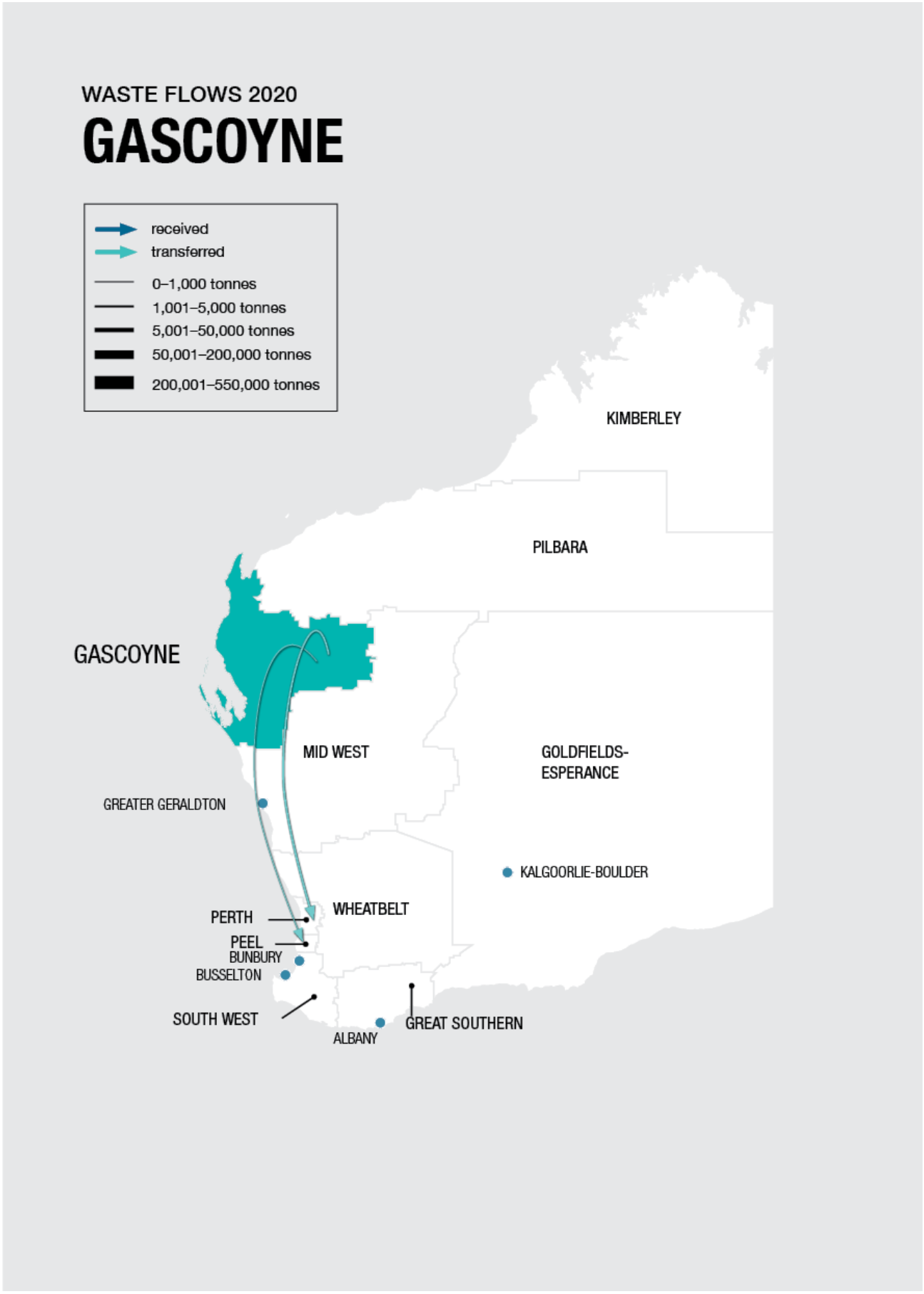


Figure 77 Waste flows in the Gascoyne in 2020

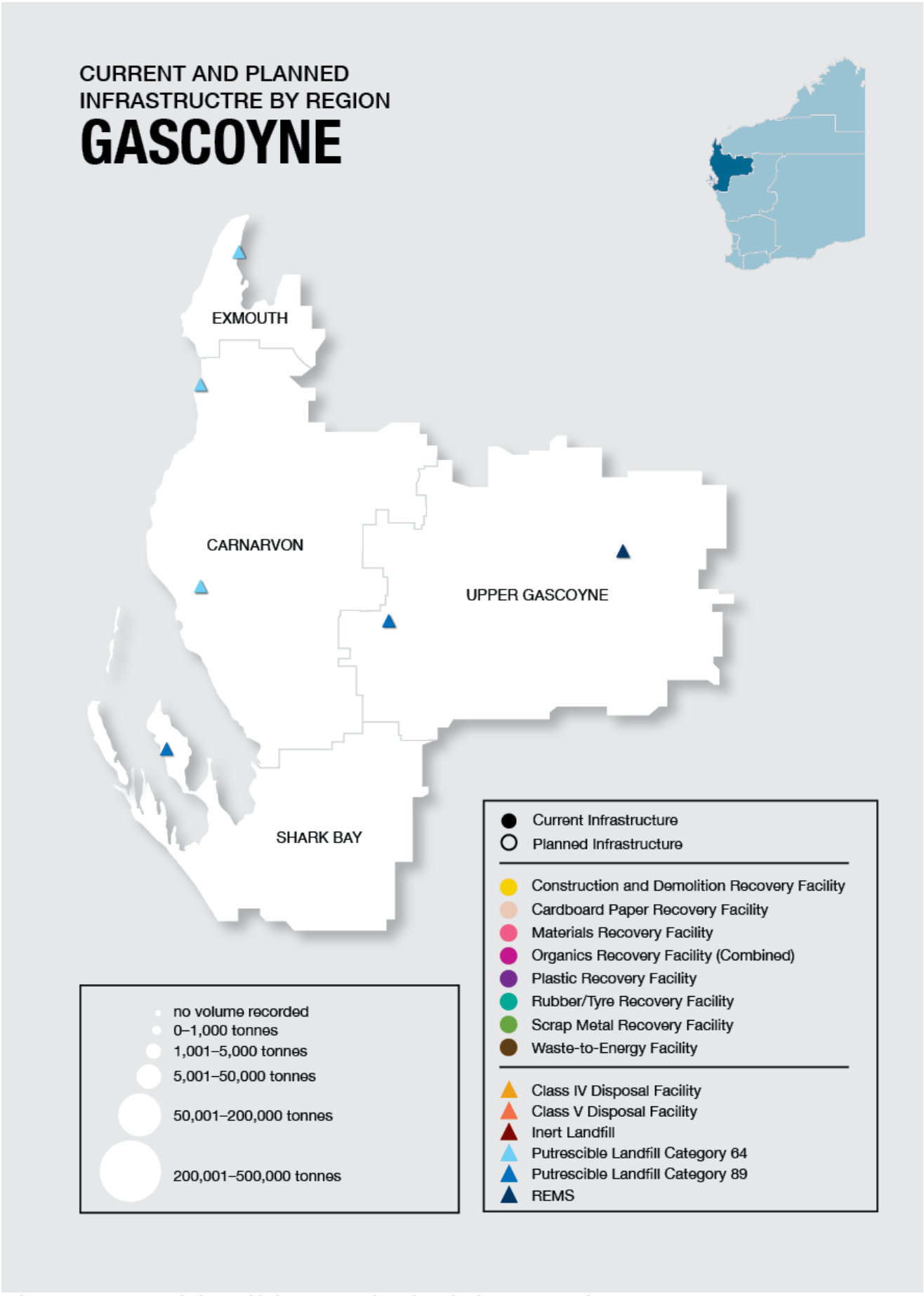


Figure 78 Current and planned infrastructure locations in the Gascoyne in 2020

Waste and resource recovery in 2030

Modelling to achieve all waste strategy targets in 2030 found the Gascoyne region would generate 24,000 tonnes and transfer 2,000 tonnes out of region, both similar to 2020 quantities.

New infrastructure will aim to change treatment methods to increase the Gascoyne materials recovery rate from 6 per cent to 30 per cent. Figure 79 shows the distribution of feedstock materials used by each facility type, indicating which waste streams are most significant and where the resource recovery efforts should be concentrated. This is also reflected in the Gascoyne region Principles and priorities section.

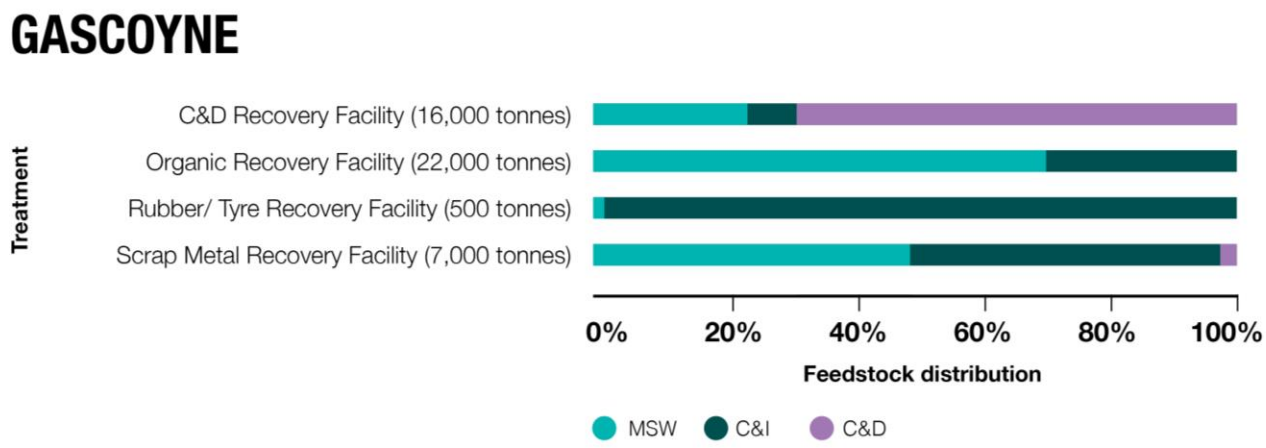


Figure 79 Feedstock distribution of treatments in the Gascoyne in 2030

Infrastructure capacity needs in 2030

Based on current, planned and approved infrastructure in 2020, the Gascoyne requires the following additional capacities to meet the waste strategy targets in 2030:

- 500 tonnes of additional recovery capacity is needed for C&D, which will require consolidation as it is not sufficient for a new facility.
- 1,000 tonnes of additional consolidation capacity is needed for MRFs.
- 6,000 tonnes of additional recovery capacity is needed for organics which is sufficient volume to allow for the development of a new organics recovery facility, but not enough for a FOGO recovery facility. As demonstrated in Figure 79, a high percentage (68 per cent) of the organics feedstock is estimated to consist of MSW, indicating that there may also be a need for a FOGO recovery in the region. This may be achieved through the extension or expansion of existing organics facilities to be able to accept FOGO.
- 500 tonnes of capacity is needed for scrap metal recovery, which will require consolidation, although is not sufficient for a new facility.

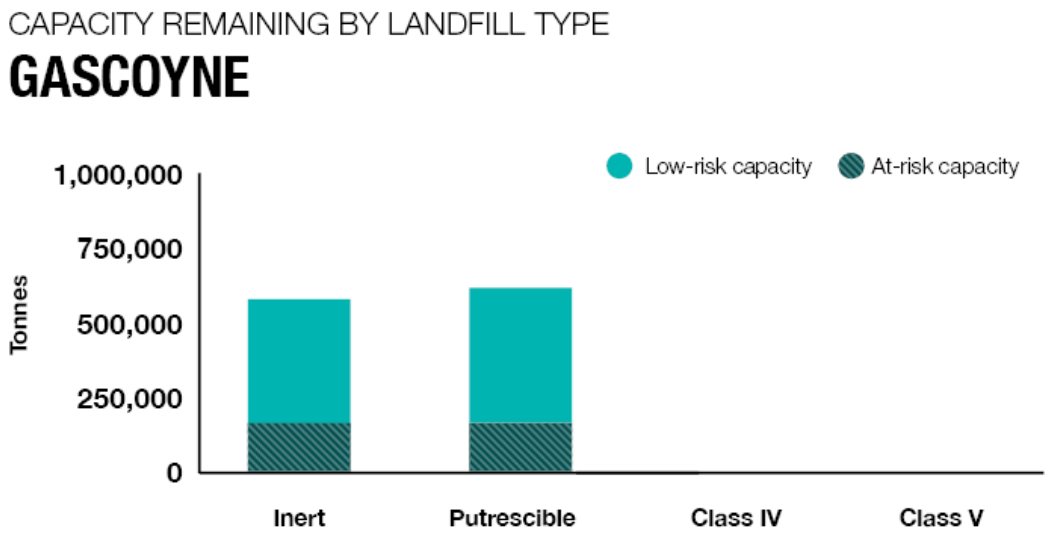


Figure 80 Capacity remaining by landfill type in the Gascoyne, including an assessment of low-risk and at-risk capacity

Total remaining capacity by landfill types is presented in . This figure also indicates the proportion of that capacity that is at risk (see section on Landfill capacity lifetime assessment to 2030 and 2050).

Under the low-risk scenario, a total of 4,000 tonnes of capacity was identified as potentially at risk, of which inert landfills make up 50 per cent and putrescible landfills 50 per cent. *State Waste Infrastructure Needs Analysis* modelling predicts 13,000 tonnes of residual waste will be disposed of in landfill each year. Feedstock lifetime remaining for landfills is shown in Figure 19 .

Details of the infrastructure needed to achieve waste strategy targets are outlined in Figure 81, including the expected facilities, capacities and capacity needs in 2030.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

GASCOYNE

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030.
It includes planned and approved facilities, as well as closures between 2020 and 2030.

Figure 81 Gascoyne recovery infrastructure pipeline and capacity needs in 2030

Principles and priorities

The principles outlined in this plan have been used to identify priorities.

Priority areas that are projected to go beyond capacity need, based on the completed modelling for the region, arise when applying the principles.

Based on the analysis, the top priorities for the Gascoyne region are:

- Investigate designating a strategic industrial area in Carnarvon to facilitate the development of additional facilities.
- Assess whether existing 67A licensed facilities in neighbouring regions can be increasingly utilised to alleviate FOGO capacity need.

These are discussed in more detail in Table 36 below. The principles are outlined once more in Figure 2 for reference.

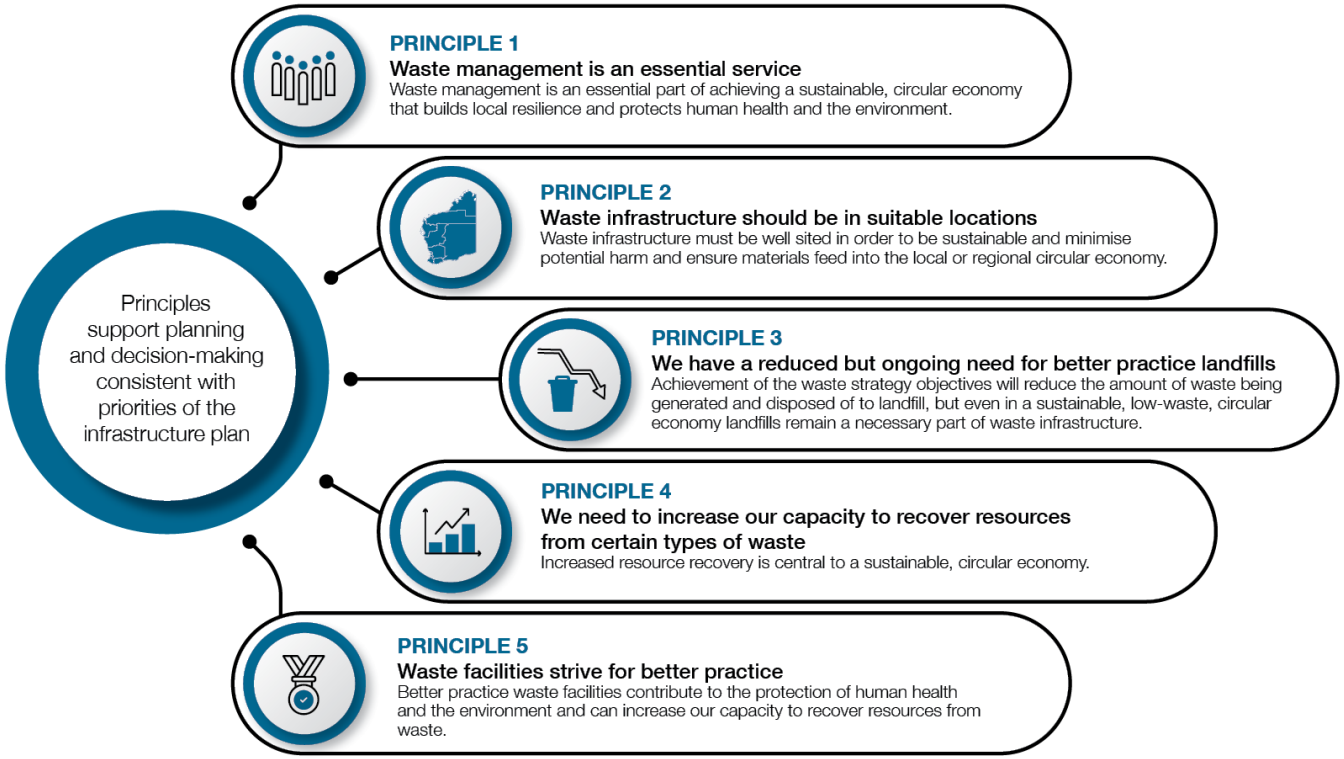


Figure 2 Principles of the *State waste infrastructure plan*

Table 36 Consideration of infrastructure plan principles and priorities in the Gascoyne

Capacity needs to achieve waste strategy targets	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy target (with assigned priority ranking)
500 tonnes of capacity for C&D recovery	**Principle 1: Waste management is an essential service** Expansion of regional material recovery activities, especially near regional centres, will create an additional need to recover C&D material. Small populations in the Gascoyne are a major barrier to developing recovery infrastructure because of the lack of feedstock, but mobile recovery facilities may be considered. **Principle 2: Waste infrastructure should be in suitable locations** The Gascoyne will require consolidation infrastructure to facilitate material transfers to other regions. The small quantities across several material streams indicates an opportunity to develop an integrated waste management facility, or precinct, that practises a diverse range of consolidation activities. Carnarvon is the ideal siting for a new facility because the area has the greatest generation rate in the region, as well as access to transportation networks (to both the Pilbara and Perth) and low constraints for new waste facility developments.	**Medium** Options for a waste precinct in Carnarvon could facilitate low-risk development of co-located consolidation or recovery facilities.
1,000 tonnes of capacity for material recovery	**Principle 1: Waste management is an essential service** As for C&D material, commingled recycling recovery may expand to achieve waste strategy objectives, although not to a capacity to justify the development of a dedicated facility. The greatest opportunity is to offer a collection service to the regional centre of Carnarvon. **Principle 2: Waste infrastructure should be in suitable locations** An integrated approach to material consolidation should consider commingled recycling recovery.	**Medium** Options for a waste precinct in Carnarvon could facilitate low-risk development of co-located consolidation or recovery facilities.
6,000 tonnes of capacity for organics recovery	**Principle 1: Waste management is an essential service** The lack of existing infrastructure to consolidate or process organic material reduces opportunities to achieve waste strategy Recover targets and decrease reliance on landfill disposal. Opportunities to develop organics processing infrastructure in the northern regions should be supported by feedstocks from the Gascoyne, such as a garden organics collection services in Carnarvon. **Principle 2: Waste infrastructure should be in suitable locations**	**Medium** Options for a waste precinct in Carnarvon could facilitate low-risk development of co-located consolidation or recovery facilities.

Capacity needs to achieve waste strategy targets	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy target (with assigned priority ranking)
	The Gascoyne will continue to landfill organic waste unless processing infrastructure in neighbouring regions can be accessed. Given the access to agricultural markets and proximity to mining rehabilitation programs, the Gascoyne may be strategically placed to receive recovered organic products from an inter-regional facility. Consolidation in Carnarvon will have close access major generation sources, along with transportation to potential processing in the Pilbara or Mid West. **Principle 5: Waste facilities strive for better practice** Review organics recovery facility compliance with the *Guideline: Better practice organics recycling* to understand capacity risk for this facility type.	
500 tonnes of capacity for scrap metal recovery	**Principle 1: Waste management is an essential service** As for C&D material, scrap metal recovery will expand to achieve waste strategy objectives, although not to a capacity to justify development of a dedicated facility. **Principle 2: Waste infrastructure should be in suitable locations** An integrated approach to consolidation should consider requirements for scrap metal recovery.	**Medium** Options for a waste precinct in Carnarvon could facilitate low-risk development of co-located consolidation or recovery facilities.
Used tyre storage	**Principle 3: We have a reduced but ongoing need for better practice landfills** Waste management of tyres in remote locations poses challenges. Existing landfills are being used for collection and consolidation of tyres and present a suitable centralised location for waste management in remote regions. About 1,800 tonnes per annum of rubber/tyre material is projected to be generated in the Gascoyne region and this will continue to be generated, highlighting better practice landfills as an important part of the Gascoyne's waste management. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Tyres can be processed but infrastructure may only be available in Perth so the recovery of rubber/tyre materials in the Gascoyne region is dependent on consolidation and transport to enable recovery. Consolidation and transport will remain the likely fate given the insufficient quantity to support regional processing. **Principle 5: Waste facilities strive for better practice**	**Medium** Two facilities are listed in the region for Category 57 with total capacity exceeding 2,000 tyres. These may be sending tyres to Perth. There is an opportunity to consolidate volumes and transport these tyres for reprocessing outside the region.

Capacity needs to achieve waste strategy targets	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy target (with assigned priority ranking)
	One class 64 putrescible landfill in the Gascoyne is also a tyre storage facility. See the landfill capacity risk assessment below to further understand how the loss of this facility may occur, noting that this may reduce the ability to consolidate rubber/tyre arising in the Gascoyne.	
Landfill capacity risk assessment	**Principle 1: Waste management is an essential service** Based on current, planned and approved landfill capacity, the Gascoyne region has sufficient landfill capacity to 2039. However, under a low-risk approach to landfill, capacity constraints could be reached in 2028 because there are three facilities classified as at risk (208,000 tonnes capacity). **Principle 3: We have a reduced but ongoing need for better practice landfills** There is a deficiency of local inert landfill infrastructure, resulting in putrescible landfills having an ongoing requirement to treat small quantities of inert material. This requirement could be alleviated with the development of local resource recovery capacity for C&D material. Existing landfill facilities are well distributed across the region, resulting in low constraints for accessing disposal infrastructure. **Principle 5: Waste facilities strive for better practice** There is a high need to review and de-risk existing landfills through better practice management standards and post-closure planning, as 100 per cent of landfills in the Gascoyne have not completed or updated a plan within the past 10 years.	**Low** Updated rural landfill risk assessment methodology of unlicensed landfill and REMS landfills can be used to effectively assess the potential risk of environmental, human health and amenity impacts. **Low** Quantification of waste generation and infrastructure needs for the local mining sector would decrease the scope of infrastructure planning and could lead to complementary activities that support local communities.

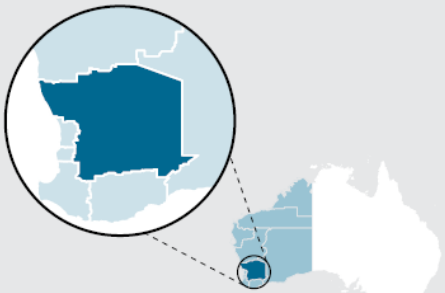
Wheatbelt region

Waste profile in 2020

The Wheatbelt is one of the largest waste processors in Western Australia, despite only generating 2.8 per cent of the state's waste. The region generated 140,000 tonnes of waste in 2020, made up of MSW (46 per cent), C&I (38 per cent) and C&D (16 per cent). The region treated 635,000 tonnes in 2020, with 114,000 tonnes (18 per cent) being recovered and 521,000 tonnes (82 per cent) being landfilled. In the Wheatbelt region, 140,000 tonnes of waste was generated, compared to the 516,000 that was received from other regions. The region has a relatively low recovery rate of 18 per cent. Key waste profile data for the Wheatbelt waste and resource recovery in 2020 is presented below.

Residents in the Wheatbelt	2.8 per cent of Western Australia's population resides in the Wheatbelt region.
	Population density of 0.5 people per km^2.
	Residents are widely dispersed across the region, with the largest concentration in the Merredin local government.
Local governments in the region	Shire of Beverley, Shire of Brookton, Shire of Bruce Rock, Shire of Chittering, Shire of Corrigin, Shire of Cuballing, Shire of Cunderdin, Shire of Dalwallinu, Shire of Dandaragan, Shire of Dowerin, Shire of Dumbleyung, Shire of Gingin, Shire of Goomalling, Shire of Kellerberrin, Shire of Kondinin, Shire of Koorda, Shire of Kulin, Shire of Lake Grace, Shire of Merredin, Shire of Moora, Shire of Mount Marshall, Shire of Mukinbudin, Shire of Narembeen, Shire of Narrogin, Shire of Northam, Shire of Nungarin, Shire of Pingelly, Shire of Quairading, Shire of Tammin, Shire of Toodyay, Shire of Trayning, Shire of Victoria Plains, Shire of Wagin, Shire of Wandering, Shire of West Arthur, Shire of Westonia, Shire of Wickepin, Shire of Williams, Shire of Wongan–Ballidu, Shire of Wyalkatchem, Shire of Yilgarn, and Shire of York.
Generating waste	The Wheatbelt generates 2.8 per cent of the waste generated in Western Australia.
Transporting waste	The region is well serviced with logisitcs routes and as such has good access to major roads and railways with strong connections to Perth, Peel and other adjoining regions.
Treating waste	The Wheatbelt treats 11 per cent of the waste treated in Western Australia.
	The Wheatbelt recovers 3 per cent of the waste recovered in Western Australia.
	The Wheatbelt landfills 20 per cent of the waste landfilled in Western Australia.
	Plays a critical role in accepting waste received from Perth.

WHEATBELT
REGIONAL SUMMARY



AREA
156,766 km²

GROSS REGIONAL PRODUCT (2019–20)
$6.70B/CAP

NUMBER OF BUSINESSES (2019–20)
9,146

TOP 5 EMPLOYMENT BY INDUSTRY

20.13%	Electricity, gas water and waste services
15.91%	Financial and insurance services
10.62%	Accommodation and food services
9.91%	Construction
7.28%	Arts and recreation services

The mining industry sector makes the greatest contribution to economic output in the region, which at $3.4B accounts for 24.34% of total output. With 2,092 jobs representing 6.81% of total employment, it is the retail trade industry sector that is the region's largest employer.

2020

- POPULATION 74,767
- WASTE GENERATED 140,000 TONNES
- WASTE GENERATION PER CAPITA 1.87 TONNES

2030

PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

- POPULATION 72,893 (▼3%)
- WASTE GENERATED 125,000 TONNES
- WASTE GENERATION PER CAPITA 1.71 TONNES

2030 INFRASTRUCTURE CAPACITY NEED

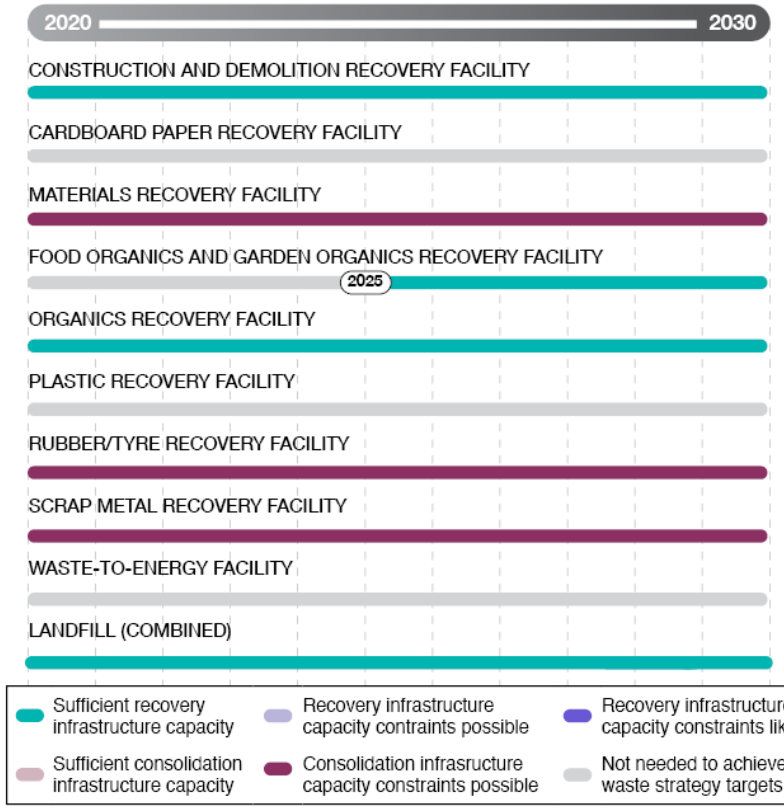
1. Material recovery facility | 17,000 tonnes
2. Scrap metal | 5,000 tonnes

TOP PRIORITIES

1. Assess sub-regional gap and needs of material recovery consolidation near transportation networks.
2. Monitor progress for implementation of capacity expected from the Food Waste for Healthy Soils program.
3. Assess whether existing 67A licensed facilities can be increasingly utilised to alleviate food organics and garden organics recovery capacity need in neighbouring regions.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030

Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN WHEATBELT 2020 AND 2030

Waste projections to 2030 based on meeting the waste strategy targets

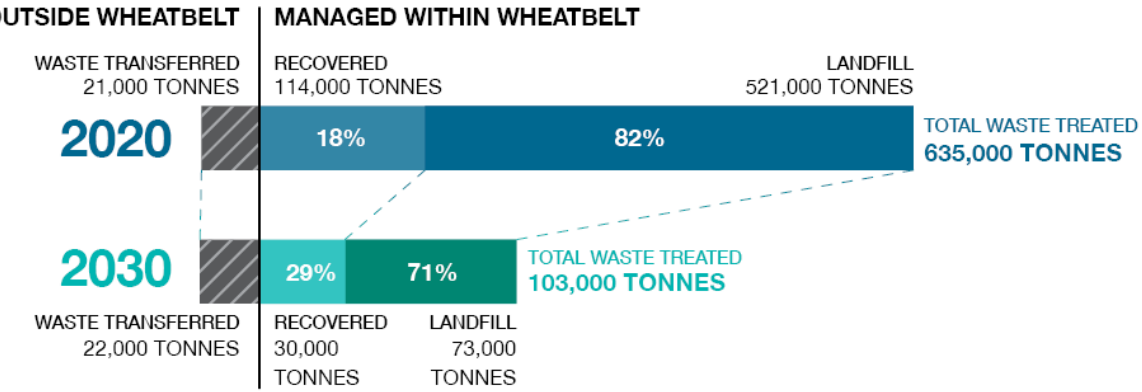


Figure 82 Waste in the Wheatbelt: statistics and projections

Waste and resource recovery in 2020

The Wheatbelt acts as a major receiver of mixed putrescible waste and organic material from Perth and relies on 73 putrescible landfills to treat 74 per cent of the waste generated in, and received by, the region. An additional five new putrescible landfills are currently planned for the region. The top five materials processed in the region in 2020 include:

1. mixed putrescible waste – domestic (household)
2. metals – ferrous steel – non-packaging
3. mixed C&D
4. commingled recycling
5. mixed inert waste.

Other waste facilities in the Wheatbelt include six inert landfills, five organics recovery facilities, and two C&D recovery facilities. A further two organics recovery facilities are being developed near road and rail transport networks, to receive material from Perth.

The strong agricultural sector in the Wheatbelt creates offtake markets for recovered organic products.

Major waste imports include mixed putrescible waste and a variety of other organic waste (including garden organics, food organics, FOGO and fats). The region transferred out 21,000 tonnes of waste material, primarily to Perth, which is comparatively low compared to the materials received from other regions. Major transfers out of the region include scrap ferrous metal, commingled recycling and mixed C&D waste. The high rates of waste transportation to and from the region are supported by a strong network of roads and railways, along with geographic proximity to the state's major population centres.

The region lacks MRFs and scrap steel processing and consolidation infrastructure, with material transported to other regions for recovery. The region's large size and relatively small and widely distributed population acts as a barrier to establishing widespread recycling services.

Aspects of waste and resource recovery in the Wheatbelt region in 2020 that considered when working towards the waste strategy targets include:

- Most waste treated in the Wheatbelt was received from other regions (81 per cent), with the majority (99 per cent) being generated in Perth.
- MSW formed the largest waste material generated in the Wheatbelt region, consisting of about 64,000 tonnes, of which 6 per cent was recovered.
- Ferrous steel was the second largest material category generated in the region, all of which was transferred out of the region.
- There are no commingled recycling collection services in the Wheatbelt, and no local processing capacity.
- Changes to waste received from Perth will significantly change waste treatment in the Wheatbelt.

The location of current and planned recovery infrastructure in the Wheatbelt in 2030 is shown in Figure 85 (see Facility lists in the Appendix for a full list of facilities). Facilities granted work approvals since 2020 by the department in the Wheatbelt region are listed below in Table 37. These facilities have not been included in the modelling for the infrastructure plan and may alleviate some of the region's capacity needs.

Table 37 Facilities granted licences or works approvals since 2020 in the Wheatbelt

Facility type	Facility name	Location
Consolidation centre	Swan Waste Solutions	Wheatbelt
Landfill (Category 64)	Badgingarra Waste Facility	Wheatbelt
Landfill (Category 89)	Popanyinning Waste Management Facility	Wheatbelt
Landfill (Category 89)	Shire of Koorda Landfill	Wheatbelt
Landfill (Category 64)	Fernview Landfill	Wheatbelt
Consolidation centre	Drainflow	Wheatbelt
Organics recovery facility	Wannamal Rd Organics Pty Ltd	Wheatbelt

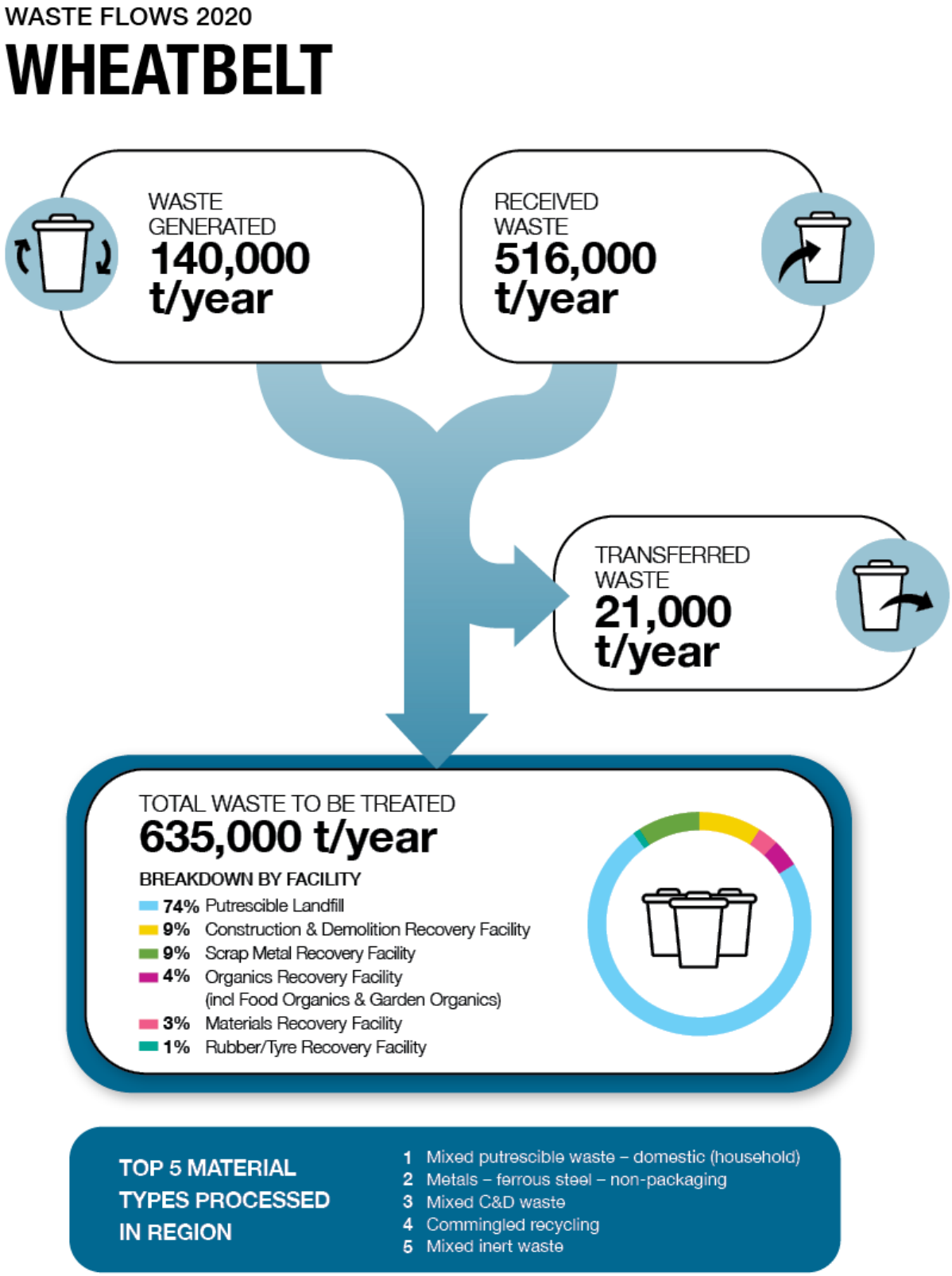


Figure 83 Waste generated, received, transferred and treated in the Wheatbelt in 2020

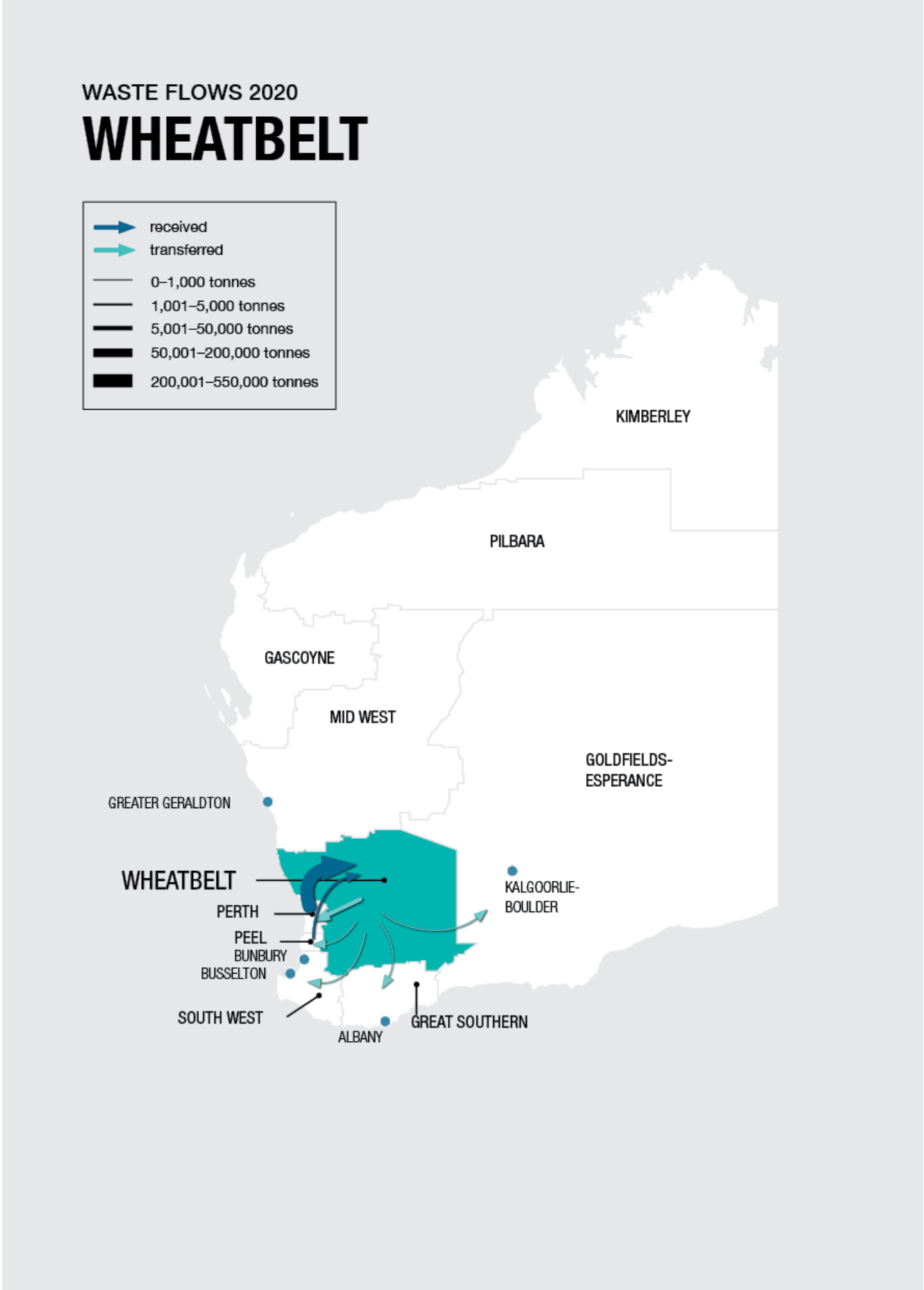


Figure 84 Waste flows in the Wheatbelt in 2020

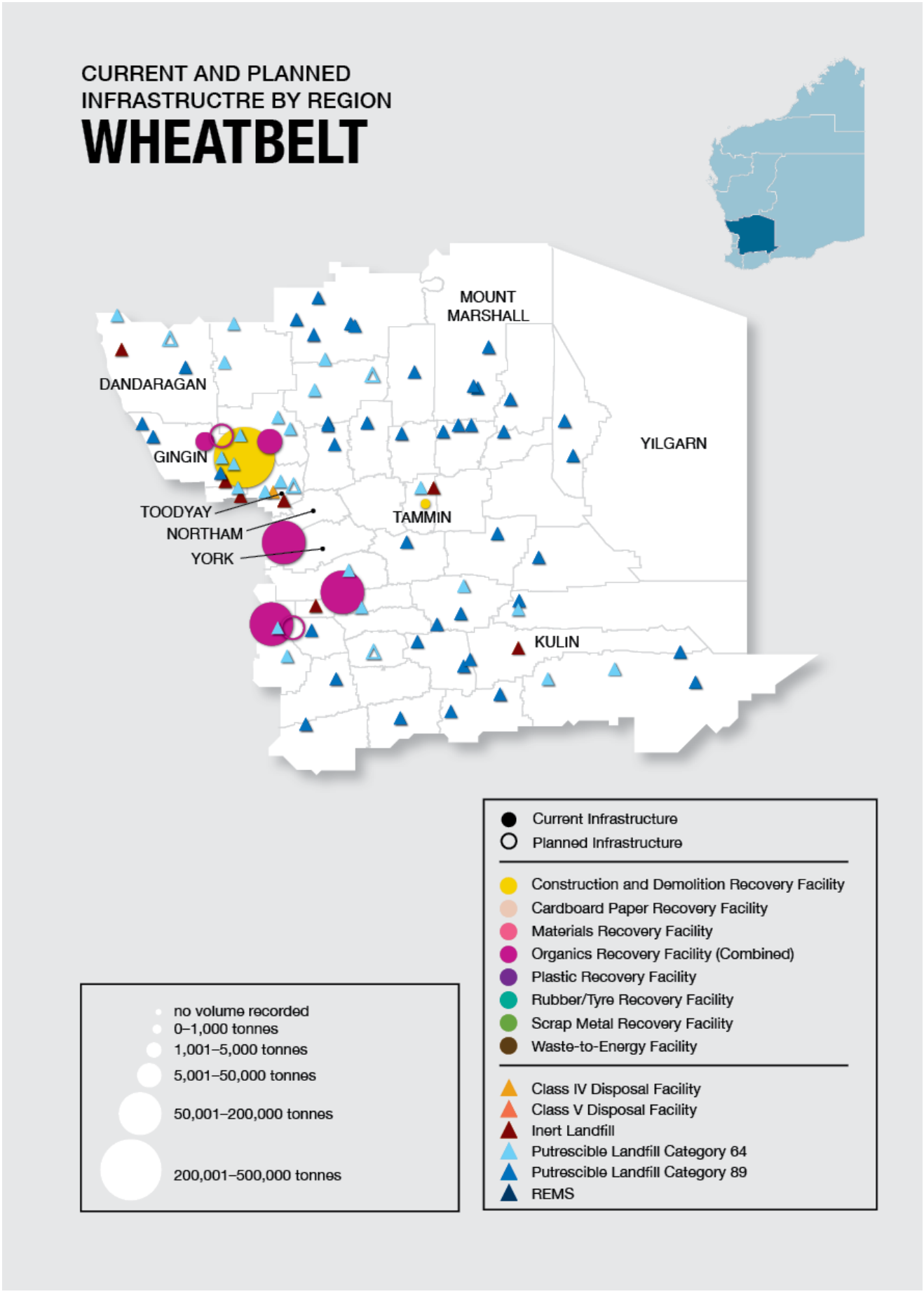


Figure 85 Current and planned infrastructure locations in the Wheatbelt in 2020

Waste and resource recovery in 2030

Modelling to achieve all waste strategy targets in 2030 found the Wheatbelt region would generate 125,000 tonnes and transfer 22,000 tonnes out of the region, both similar to 2020 quantities.

Changes to the waste received from Perth will significantly decrease the total quantity of waste treated in the Wheatbelt, resulting in a net decrease of 84 per cent compared with 2020. These changes and improvements to local recovery capacity will increase the Wheatbelt materials recovery rate from 18 per cent to 29 per cent.

Figure 86 shows the distribution of feedstock materials used by each facility type, indicating which waste streams are most significant and where the resource recovery efforts should be concentrated. This is also reflected in the Wheatbelt region Principles and priorities section.

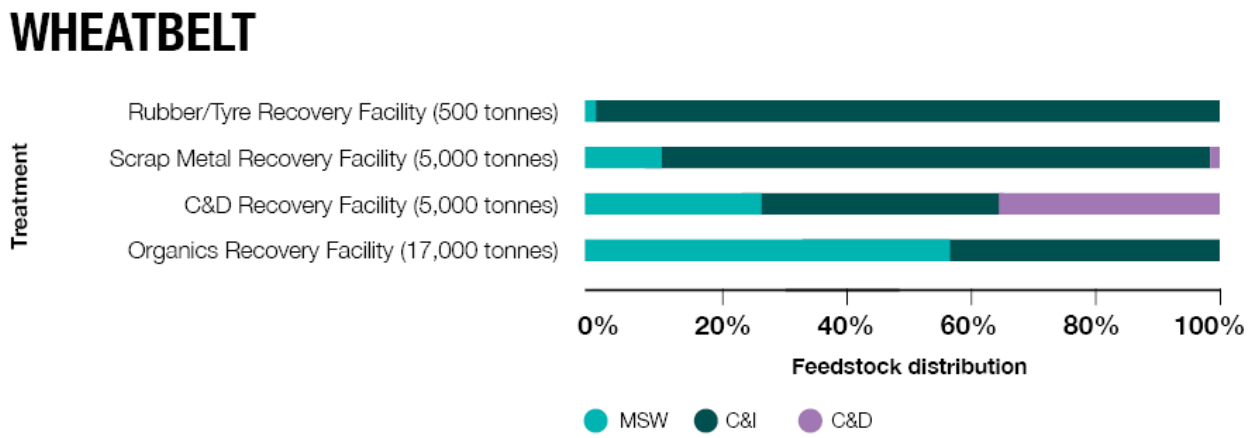


Figure 86 Feedstock distribution of treatments in the Wheatbelt in 2030

The Wheatbelt region is expected to provide 75,000 tonnes of FOGO recovery capacity to Perth, with an additional 75,000 tonnes of recovery capacity expected through upgrades of an existing organics recovery facility to accept FOGO.

The model uses licensed capacity for facilities and can result in an overestimation of actual capacity. Stakeholder feedback indicates that only a fraction of the region's licensed capacity of 420,000 tonnes of Category 67A capacity is actually available for the processing of FOGO. The Infrastructure priorities section describes the need to investigate further to confirm actual FOGO processing capacity.

Infrastructure capacity needs in 2030

Based on current, planned and approved infrastructure in 2020, the Wheatbelt requires the following additional capacities to meet the waste strategy targets in 2030:

- 17,000 tonnes of additional consolidation capacity is needed in for material recovery
- 5,000 tonnes of additional consolidation capacity is needed for scrap steel recovery.

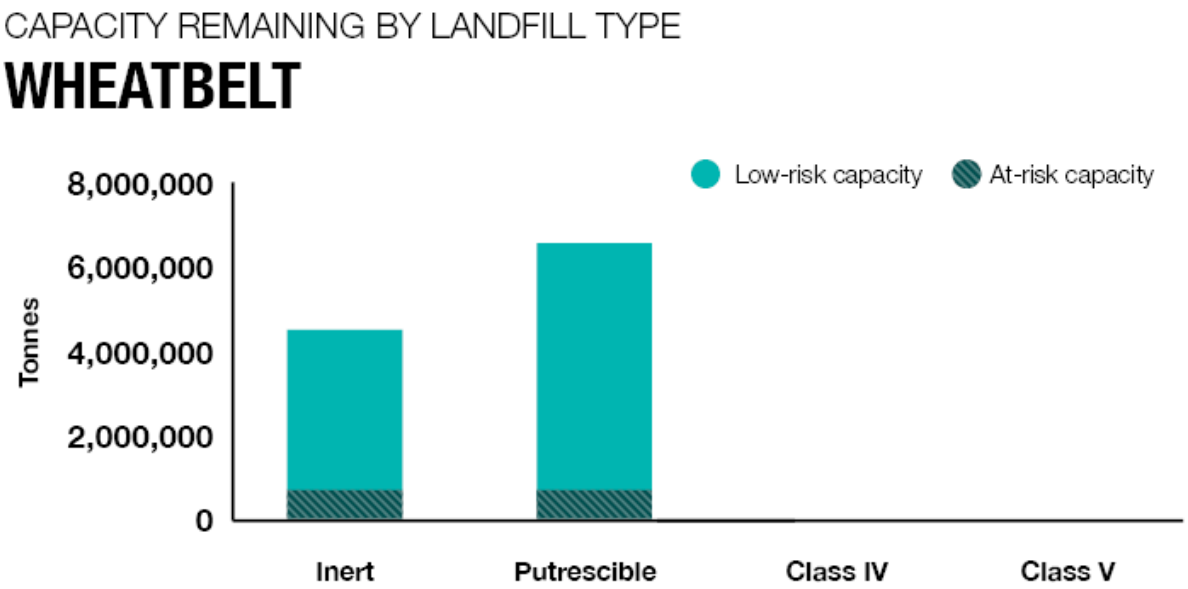


Figure 87 Capacity remaining by landfill type in the Wheatbelt, including an assessment of low-risk and at-risk capacity

Total remaining capacity by landfill types is presented in . This figure also indicates the proportion of that capacity that is at risk (see section on Landfill capacity lifetime assessment to 2030 and 2050).

Under the low-risk scenario, a total of 1.5 million tonnes of capacity was identified as potentially at risk, of which inert landfills make up 50 per cent and putrescible landfills 50 per cent. *State Waste Infrastructure Needs Analysis* modelling predicts 27,000 tonnes of residual waste will be disposed of in landfill each year. Feedstock lifetime remaining for landfills is shown in Figure 19 .

Details of the infrastructure needed to achieve waste strategy targets are outlined Figure 88, including the expected facilities, capacities and capacity needs in 2030.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

WHEATBELT

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030.
It includes planned and approved facilities, as well as closures between 2020 and 2030.

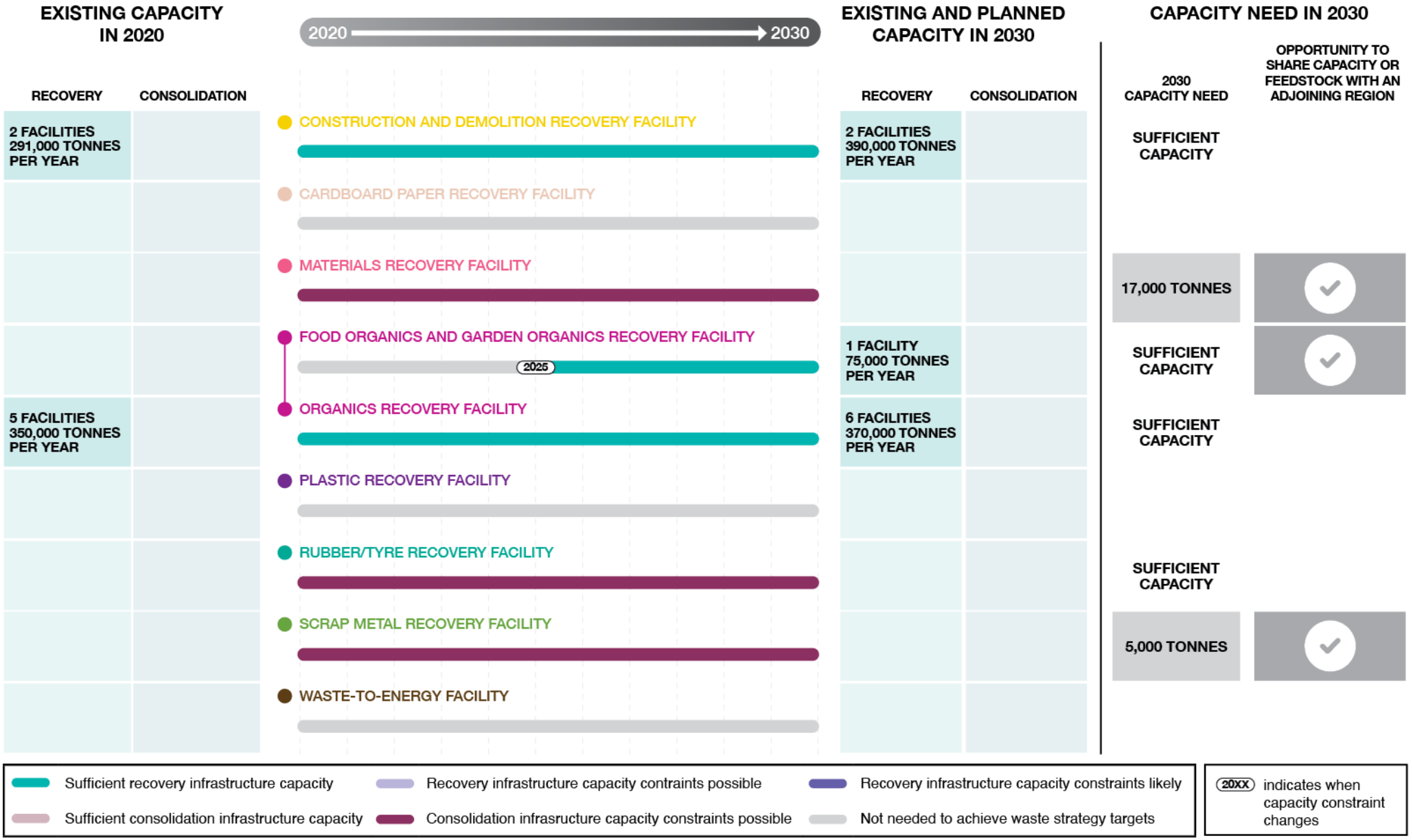


Figure 88 Wheatbelt recovery infrastructure pipeline and capacity needs in 2030

Principles and priorities

The principles outlined in this plan have been used to identify priorities.

Priority areas that are projected to go beyond capacity need, based on the completed modelling for the region, arise when applying the principles.

Based on the analysis, the top priorities for the Wheatbelt region are:

- Assess the sub-regional gap and needs of material recovery consolidation near transportation networks.
- Monitor progress for the implementation of capacity expected from the Food Waste for Healthy Soils program.
- Assess whether existing 67A licensed facilities can be increasingly utilised to alleviate FOGO capacity need in neighbouring regions.

These are discussed in detail in Table 38 below. The principles are outlined once more in Figure 2 for reference.

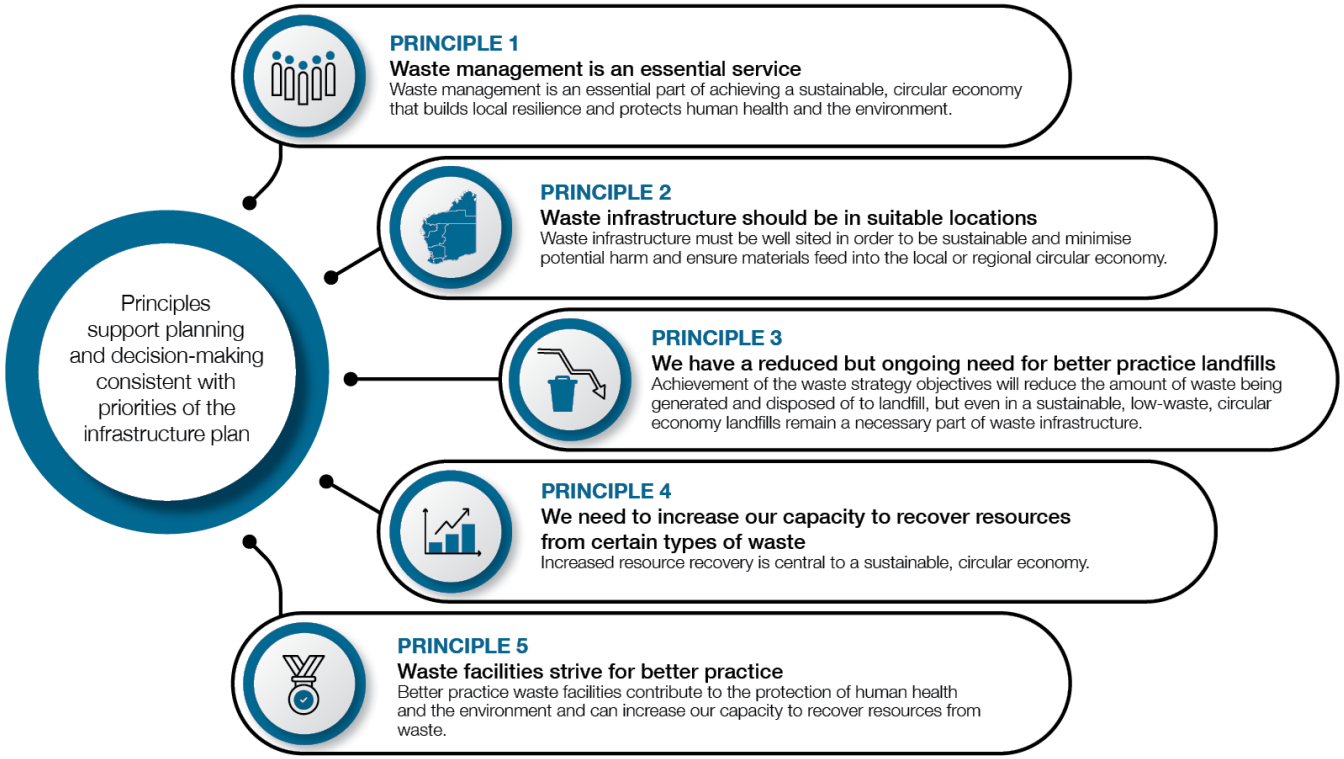


Figure 2 Principles of the *State waste infrastructure plan*

Table 38 Consideration of infrastructure plan principles and priorities in the Wheatbelt

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
17,000 tonnes of additional capacity for MRFs	**Principle 1: Waste management is an essential service** According to modelling, the Wheatbelt will increase generation of commingled recyclable material to achieve the waste strategy Recover targets, with an additional 17,000 tonnes capacity required to support regional centres implementing new collection services. There is a lack of consolidation infrastructure within the region, creating high risks and a lack of contingency. Additional consolidation capacity will need to be developed to efficiently transport and process material in Perth. **Principle 2: Waste infrastructure should be in suitable locations** The large geography and rural nature of major Wheatbelt population centres means there is need to develop multiple consolidation points across the region. Analysis shows that the areas around Northam, Narrogin and Merredin have low constraints for new development. Proximity to Perth de-risks the offtake of recovered recyclables. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Consideration of principle 4 supports the development of material recovery infrastructure in the Wheatbelt as an important approach to increasing the regional recovery rate.	**Medium** Better understanding of sub-regional gaps for material recovery consolidation near transportation networks will improve infrastructure coverage in the Wheatbelt region.
5,000 tonnes of additional capacity for scrap steel recovery	**Principle 1: Waste management is an essential service** Scrap metal is projected to be the second largest material type treated in the Wheatbelt in 2030, all of which will be consolidated and transferred out of region. This indicates a strong demand for scrap metal material and surplus capacity for recovering this material in Perth. Expansion of the region's consolidation network is low risk and will be required to achieve material recovery waste strategy Recover targets. **Principle 2: Waste infrastructure should be in suitable locations** Like material recovery capacity, there is a lack of scrap steel consolidation infrastructure in the Wheatbelt. New consolidation facilities could be co-located alleviate planning requirements and leverage transportation efficiencies.	**Low** Better understanding of sub-regional gaps for scrap metal consolidation near transportation networks will improve infrastructure coverage in the Wheatbelt region.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
Large volume of organics allows for development of other processes	**Principle 2: Waste infrastructure should be in suitable locations** Development of bioenergy infrastructure could be located where organics are being processed as an additional option to treat suitable organics, to expand capacity or to diversify outputs (expanding from compost to energy production). This may present an opportunity for the Wheatbelt to treat organic waste or FOGO waste that exceeds the treatment capacity of the region. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** To achieve waste strategy targets, Western Australia needs to recover and process a large volume of organics. Expanding infrastructure to develop facilities that produce bioenergy expands capacity, diversifies options, and reduces risk of failure to meet waste strategy targets. **Principle 5: Waste facilities strive for better practice** As volumes of organics are captured by large facilities in the region, there is potential to develop other processes. Better practice guidelines or regulatory requirements may change market activities and present an opportunity to utilise bioenergy more in the Wheatbelt.	**Medium** Six facilities are listed in the region with capacities exceeding 40,000 tonnes, with two of them at 100,000 tonnes. These larger existing facilities may consider options to implement other processes or technologies.
Used tyre storage	**Principle 1: Waste management is an essential service** About 400 tonnes of rubber/tyre material is generated in the Wheatbelt and this will continue to be generated. Waste management of tyres in remote locations poses challenges. Tyres from mining operations pose their own particular challenges. Consolidation of this material for processing in other regions is necessary whilst it remains unviable to process within the region. **Principle 2: Waste infrastructure should be in suitable locations** Although tyre material processing may be close to end markets that can take crumbed tyres or use recovered materials in manufacturing or construction, consolidation centres will be needed in remote or regional locations. Existing landfills are being used for collection and consolidation of tyres and present a suitable centralised location for waste management in remote regions. Most landfills in the Wheatbelt are acting as tyre storage facilities for consolidation. **Principle 4: We need to increase our capacity to recover resources from certain types of waste**	**Medium** Five facilities are listed in the region for Category 57 with total capacity exceeding 4,000 tyres. Some of these may be sending tyres to Perth. There is an opportunity to consolidate volumes and transport these tyres for reprocessing outside the region.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	Tyres can be processed, but infrastructure may only be available in Perth so the recovery of rubber/tyre materials in the Wheatbelt region is dependent on consolidation and transport to enable recovery. Consolidation and transport will remain the likely fate given the insufficient quantity to support regional processing. **Principle 5: Waste facilities strive for better practice** Two class 64 putrescible landfills in the Wheatbelt are also licensed to store tyres. See the landfill capacity risk assessment below to further understand how the loss of these facilities may occur, noting that this may reduce the ability to consolidate rubber/tyre arising in the Wheatbelt.	
Landfill capacity risk assessment	**Principle 3: We have a reduced but ongoing need for better practice landfills** Decreasing waste received from Perth will create surplus capacity for Wheatbelt landfills. The Wheatbelt could provide contingency capacity to surrounding regions during periods of elevated generation (e.g. resulting from disaster events) or if alternative processing infrastructure (such as waste-to-energy) becomes constrained. There will also be a need for putrescible landfills to treat small quantities of inert material generated in the Wheatbelt region, as the quantities and distribution of inert waste generated (200 tonnes per year in 2030) would likely not justify the development of new inert landfills. **Principle 5: Waste facilities strive for better practice** Improvement of better practice landfill management in the Wheatbelt will require 72 per cent of facilities to develop or update post-closure plans, and potentially three facilities (totalling 1,736,500 tonnes of capacity) to implement actions to de-risk their operations.	**Low** Options for more efficient inter-regional waste transfer infrastructure and contingency arrangement could alleviate short-term capacity constraints between the South West, Great Southern and Wheatbelt regions.

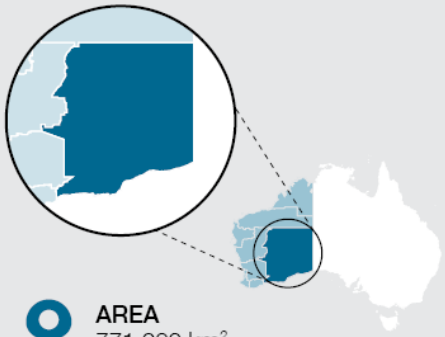
Goldfields-Esperance region

Waste profile in 2020

The Goldfields-Esperance region is the largest region in Western Australia by size, with low-density populations distributed across the region. The region generated 137,000 tonnes of waste in 2020, consisting of C&I (51 per cent), MSW (27 per cent) and C&D (22 per cent). The region treated 121,000 tonnes in 2020, with 45,000 tonnes (37 per cent) recovered and 76,000 tonnes (63 per cent) being landfilled. Key waste profile data for the Goldfields-Esperance region waste and resource recovery in 2020 is presented below.

Residents in Goldfields-Esperance	2 per cent of Western Australia's population resides in the Goldfields-Esperance region.
	Population density of 0.1 people per km^2.
	Residents mostly live the Kalgoorlie regional centre.
Local governments in the region	Shire of Coolgardie, Shire of Dundas, Shire of Esperance, City of Kalgoorlie–Boulder, Shire of Laverton, Shire of Leonora, Shire of Menzies, Shire of Ngaanyatjarraku, Shire of Ravensthorpe, and Shire of Wiluna.
Generating waste	Goldfield-Esperance generates 2 per cent of the waste generated in Western Australia.
Transporting waste	A good transport network of roads and rails connects the region with Perth and neighbouring regions. There is a commercial port in Esperance.
Treating waste	Goldfields-Esperance treats 2 per cent of the waste treated in Western Australia.
	Goldfields-Esperance recovers 1 per cent of the waste recovered in Western Australia.
	Goldfields-Esperance landfills 3 per cent of the waste landfilled in Western Australia.
	Plays a critical role in recycling activities in the Western Australia.

GOLDFIELDS-ESPERANCE
REGIONAL SUMMARY



AREA
771,000 km²

GROSS REGIONAL PRODUCT (2019–20)
$9.31B/CAP

NUMBER OF BUSINESSES (2019–20)
4,049

TOP 5 EMPLOYMENT BY INDUSTRY

19.08%	Agriculture, forestry and fishing
15.51%	Construction
11.70%	Rental, hiring and real estate services
7.79%	Other services
6.91%	Transport, postal and warehousing

The mining industry sector makes the greatest contribution to economic output in the region, which at $22.2B accounts for 67.77% of total output. This industry sector is also the largest employer with 14,773 jobs which represents 39.19% of total employment within the region.

2020
- POPULATION 54,344
- WASTE GENERATED 137,000 TONNES
- WASTE GENERATION PER CAPITA 2.53 TONNES

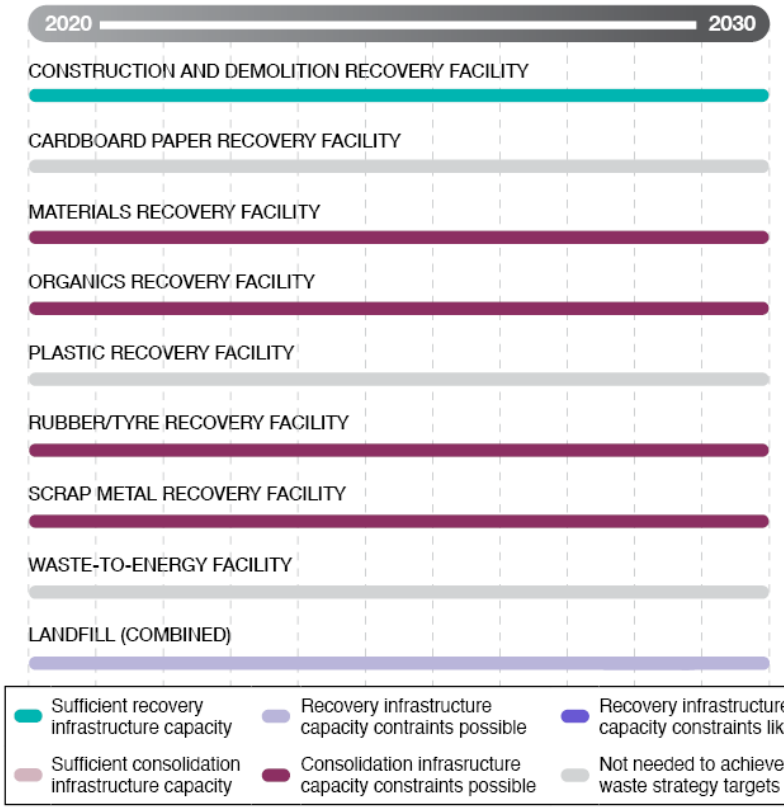
2030
PROJECTIONS TO 2030 BASED ON ACHIEVING WASTE STRATEGY TARGETS

- POPULATION 54,219 (0%)
- WASTE GENERATED 124,000 TONNES
- WASTE GENERATION PER CAPITA 2.28 TONNES

2030 INFRASTRUCTURE CAPACITY NEED
1. Material recovery facility | 13,500 tonnes
2. Organics | 4,000 tonnes
3. Scrap metal | 5,000 tonnes

TOP PRIORITIES
1. Review options to facilitate lifetime and capacity expansion of existing materials recovery facilities.
2. Investigate opportunities to develop regional food organic and garden organic process capacity.
3. Assess whether existing 67A licensed facilities in neighbouring regions can be increasingly utilised to alleviate food organics and garden organics recovery capacity need.

INFRASTRUCTURE NEED BETWEEN 2020 AND 2030
Projections for capacity constraints compare current, approved and planned capacity against the infrastructure needs by 2030 to meet the waste strategy targets.



WASTE IN GOLDFIELDS-ESPERANCE 2020 AND 2030
Waste generation to 2030 based on meeting the waste strategy targets

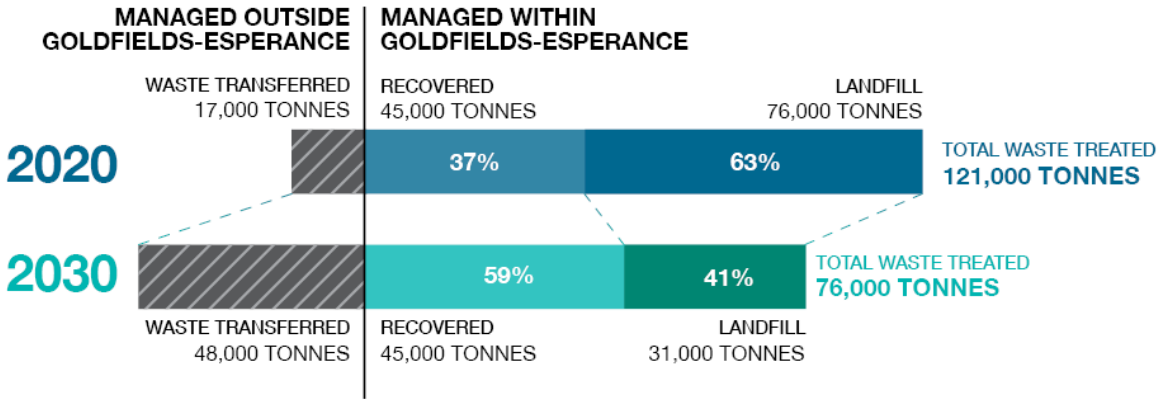


Figure 89 Waste in Goldfields-Esperance: statistics and projections

Waste and resource recovery in 2020

Although Goldfields-Esperance received low amounts material from other regions, it receives difficult-to-manage waste, which is disposed of in the region's one secure landfill (Class IV) and two intractable landfills (Class V). The top five materials processed in the region in 2020 include:

1. mixed putrescible waste – domestic (household)
2. metals – ferrous steel – non-packaging
3. sand/soil
4. mixed C&D
5. biosolids.

Half of the waste treated in the region is disposed of at 12 putrescible landfills. These are complemented by two MRFs, one C&D recovery facility and one organics recovery facility. Recovery facilities are localised to rail/road infrastructure in Kalgoorlie-Boulder and road/port infrastructure in Esperance. There are also six REMS landfills in Goldfields-Esperance.

Goldfields-Esperance transferred 17,000 tonnes of material out of the region, which largely consisted of ferrous steel transferred to Perth. Although road and rail networks are strong through the region, there are geographic barriers to access remote eastern communities. The region's location also makes exports to the Northern Territory or South Australia viable.

Aspects of waste and resource recovery in the Goldfields-Esperance region in 2020 that must be considered when working towards the waste strategy targets include:

- C&I formed the largest waste material source generated in the Goldfields-Esperance region, consisting of about 70,000 tonnes, of which 39 per cent was recovered.
- The majority of waste transfers were to Perth (92 per cent).
- Ferrous steel was the second largest category of material consolidated in the region, and the largest category of material transferred out of the region.
- Development of local capacity for scrap metal recovery will improve the recovery of metals from Goldfield-Esperance and create opportunities to receive scrap metal from adjoining regions.

The location of current and planned recovery infrastructure in the Goldfields-Esperance region in 2030 is shown in

Figure 92 (see Facility lists in the Appendix for a full list of facilities). Facilities granted work approvals since 2020 by the department in the Goldfields-Esperance region are listed below in Table 39. These facilities have not been included in the modelling for the infrastructure plan and may alleviate some of the region's capacity needs.

Table 39 Facilities granted licences or works approvals since 2020 in Goldfields-Esperance

Facility type	Facility name	Location
CDS consolidation and Landfill (Category 63 and 64)	Minesite Recycling Pty Ltd	Goldfields-Esperance

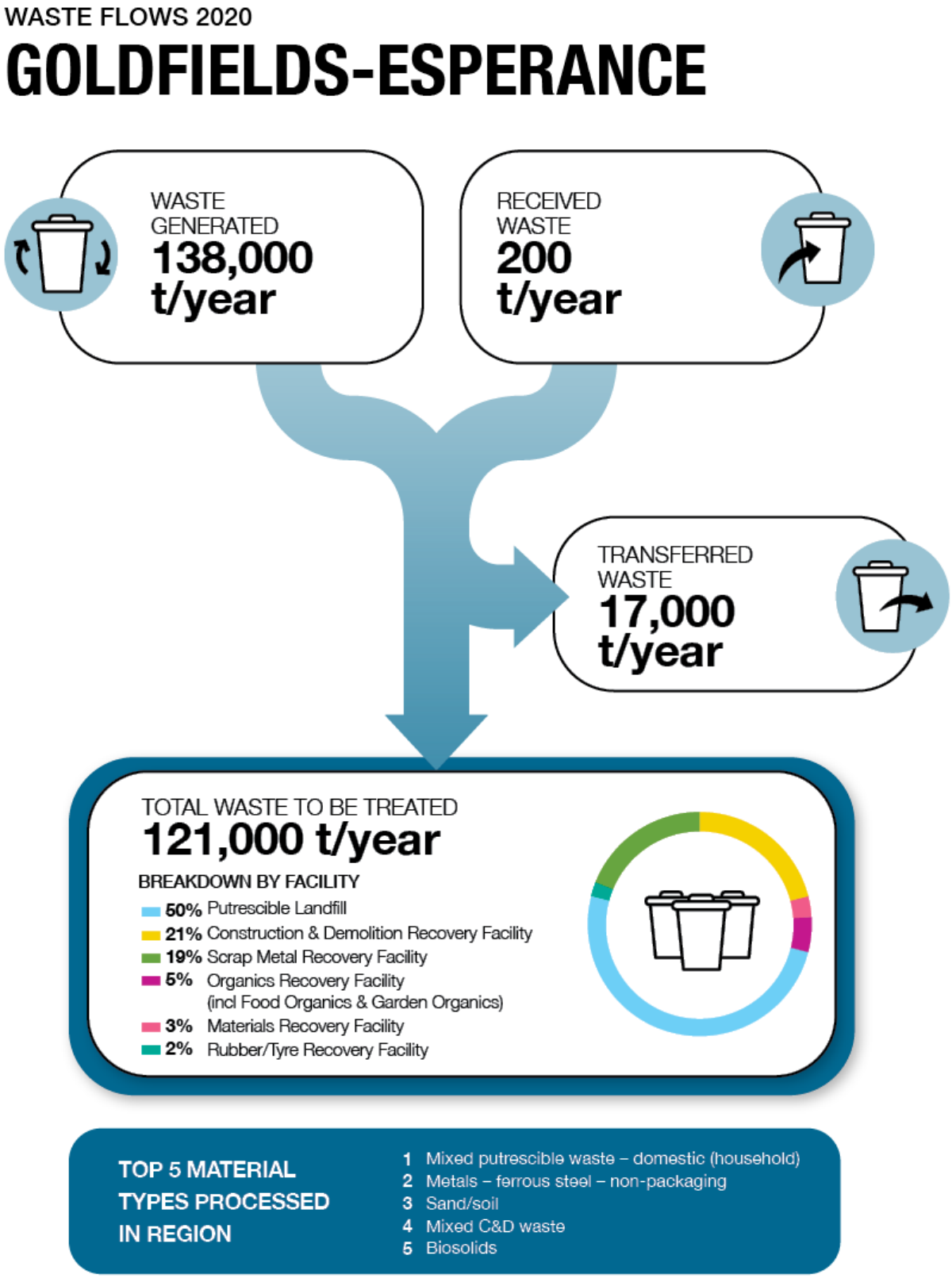


Figure 90 Waste generated, received, transferred and treated in Goldfields-Esperance in 2020

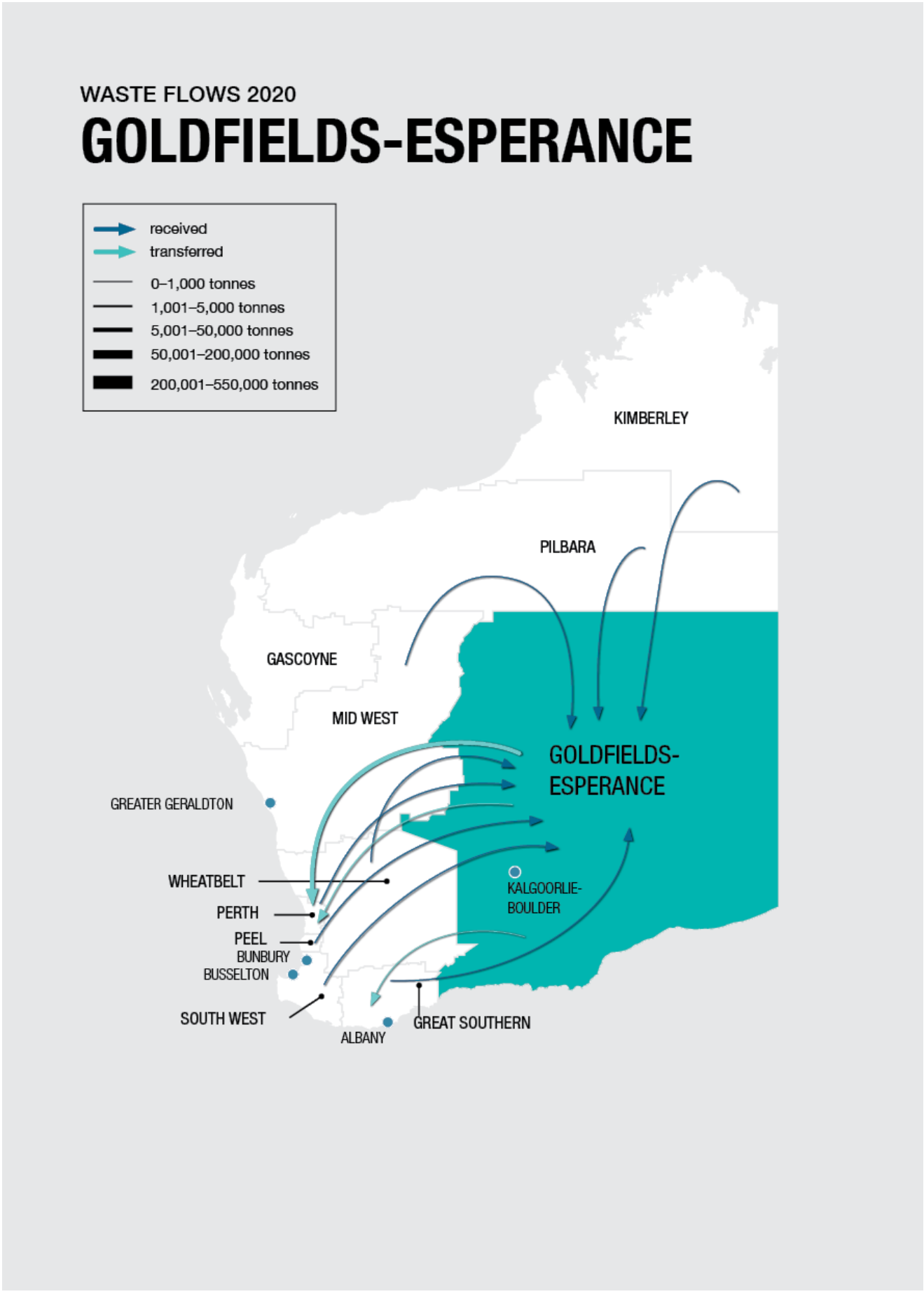


Figure 91 Waste flows in Goldfields-Esperance in 2020

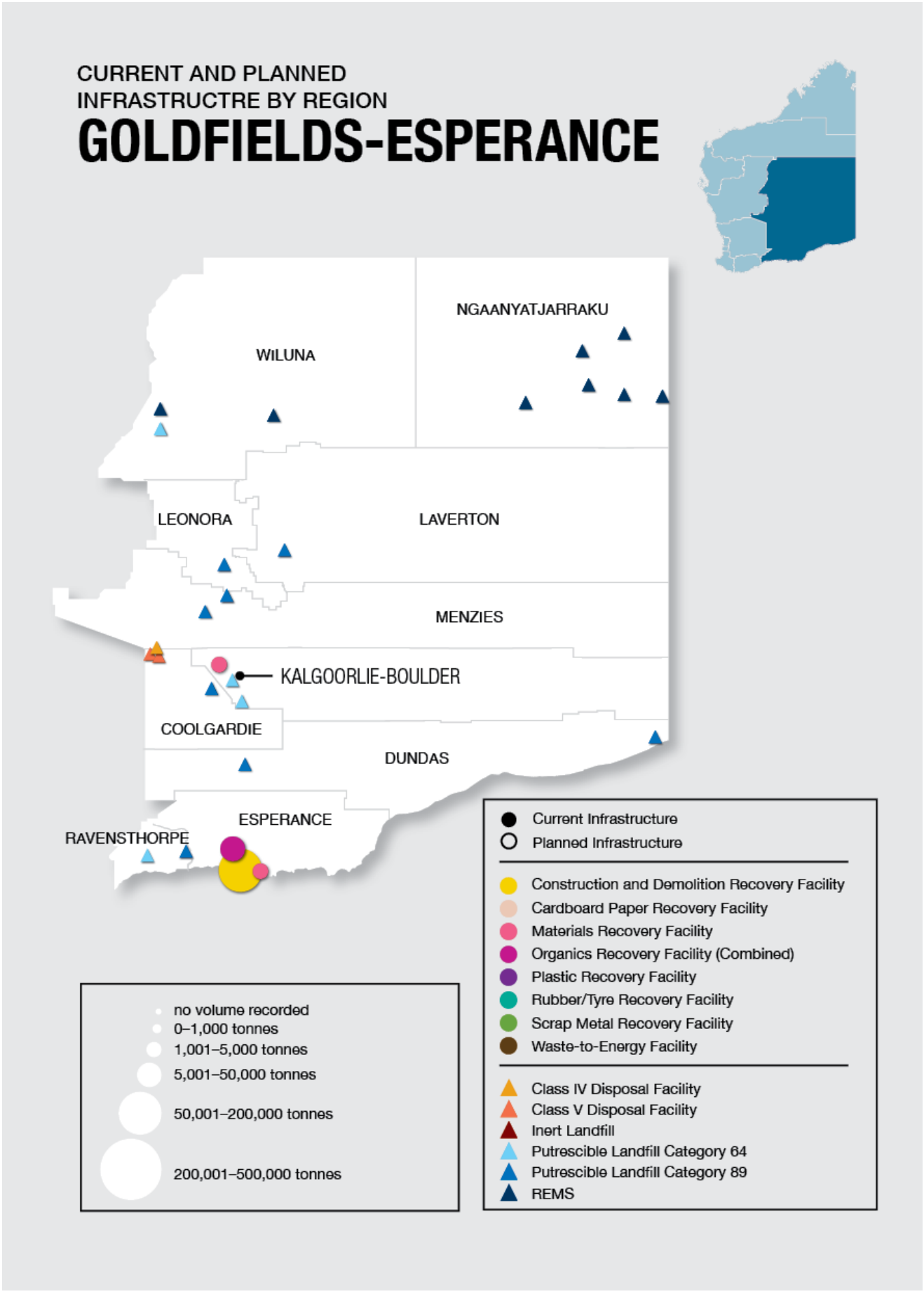


Figure 92 Current and planned infrastructure locations in Goldfields-Esperance in 2020

Waste and resource recovery in 2030

Modelling to achieve all waste strategy targets in 2030 found the Goldfields-Esperance region would generate 124,000 tonnes less material while transferring 48,000 tonnes out of the region, which is a significantly greater quantity when compared with 2020.

However, the increase in materials exported out of the region means the total waste treated in the Goldfields-Esperance region will decrease by 37 per cent. Additional infrastructure planning and waste strategy initiatives will increase the Goldfields-Esperance materials recovery rate from 37 per cent to 59 per cent. Figure 93 shows the distribution of feedstock materials used by each facility type, indicating which waste streams are most significant and where the resource recovery efforts should be concentrated. This is also reflected in the Goldfield-Esperance region Principles and priorities section.

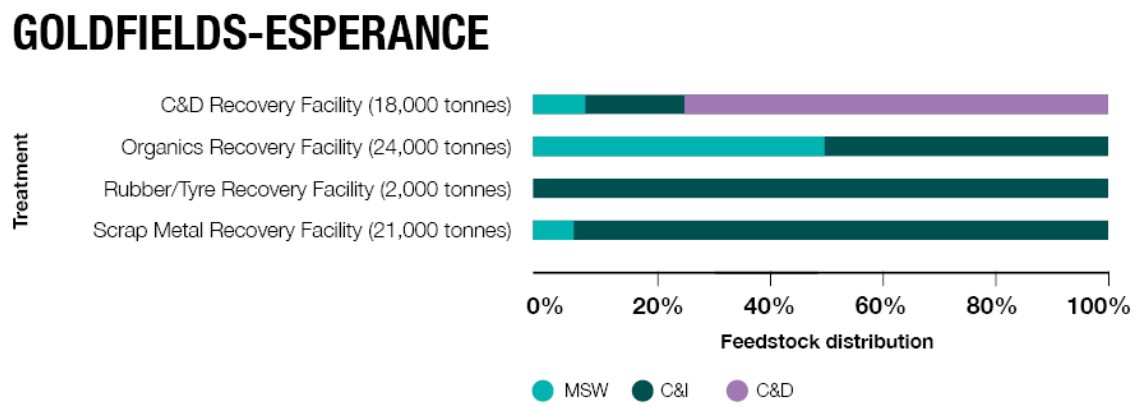


Figure 93 Feedstock distribution of treatments in Goldfields-Esperance in 2030

One of the Goldfields-Esperance region's local governments (City of Kalgoorlie-Boulder) is considered a major regional centre under the waste strategy. This regional centre is working towards the MSW recovery target of 60 per cent by 2030. Many Goldfields-Esperance local governments may be interested in implementing kerbside FOGO collection and recovery increasing the demand for local FOGO processing infrastructure.

The model uses licensed capacity for facilities and can result in an overestimation of actual capacity. Stakeholder feedback indicates that only a fraction of the region's licensed capacity of 2,000 tonnes of Category 67A capacity is actually available for the processing of FOGO. The Infrastructure priorities section describes the need to investigate further to confirm actual FOGO processing capacity.

Infrastructure capacity needs in 2030

Based on current, planned and approved infrastructure in 2020, the Goldfields-Esperance region requires the following additional capacities to meet the waste strategy targets in 2030:

- 13,500 tonnes of additional capacity is needed for MRFs, which will require consolidation, although it is not sufficient to allow for a new facility.
- 4,000 tonnes of additional recovery capacity is needed for organics, which is not sufficient volume to allow for development of an organics recovery facility or a FOGO recovery facility. As demonstrated in Figure 93, half of the organics feedstock (50 per cent) is estimated to consist of MSW, indicating that there may also be a need for a FOGO recovery in the region. This may be achieved through the extension or expansion of existing organics facilities to be able to also accept FOGO.
- 5,000 tonnes of additional capacity is needed for scrap metal recovery, which will require consolidation, although in insufficient to allow for a new facility.

Total remaining capacity by landfill types is presented in

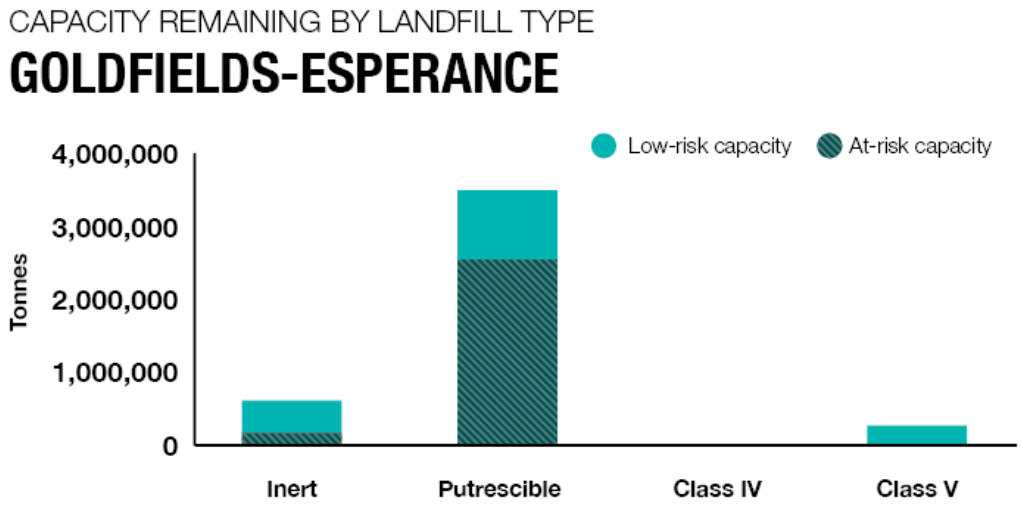


Figure 94 Capacity remaining by landfill type in Goldfields-Esperance, including an assessment of low-risk and at-risk capacity

. This figure also indicates the proportion of that capacity that is at risk (see section on Landfill capacity lifetime assessment to 2030 and 2050).

Under the low-risk scenario, most of the total landfill capacity of 2.5 million tonnes was identified as potentially at risk, of which inert landfills make up 6 per cent and putrescible landfills 94 per cent. *State Waste Infrastructure Needs Analysis* modelling predicts 28,000 tonnes of residual waste will be disposed of in landfill each year. Feedstock lifetime remaining for landfills is shown in Figure 19.

Details of the infrastructure needed to achieve waste strategy targets are outlined in Figure 95, including the expected facilities, capacities and capacity needs in 2030.

CURRENT RECOVERY INFRASTRUCTURE PIPELINE

GOLDFIELDS-ESPERANCE

This overview includes a comparison of projected generation and capacities to determine the infrastructure need in 2030.
It includes planned and approved facilities, as well as closures between 2020 and 2030.

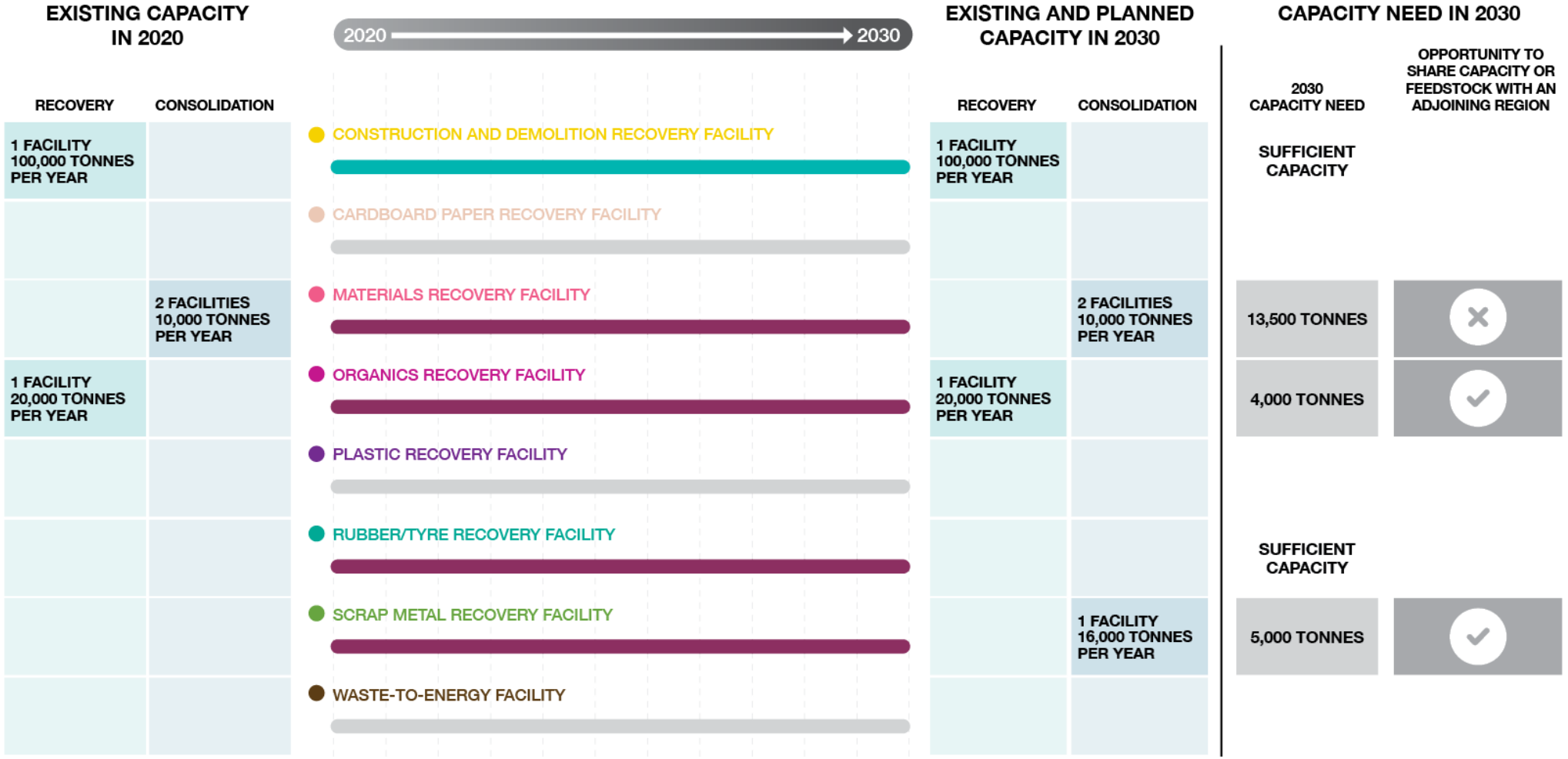


Figure 95 Goldfields-Esperance recovery infrastructure pipeline and capacity needs in 2030

Principles and priorities

The principles outlined in this plan have been used to identify priorities.

Priority areas that are projected to go beyond capacity need, based on the completed modelling for the region, arise when applying the principles.

Based on the analysis, the top priorities for the Goldfields-Esperance region are:

- Review options to facilitate lifetime and capacity expansion of existing MRFs.
- Investigate opportunities to develop regional FOGO processing capacity.
- Assess whether existing 67A licensed facilities in neighbouring regions can be increasingly utilised to alleviate FOGO capacity need.

These are discussed in detail in Table 40 below. The principles are outlined once more in Figure 2 for reference.

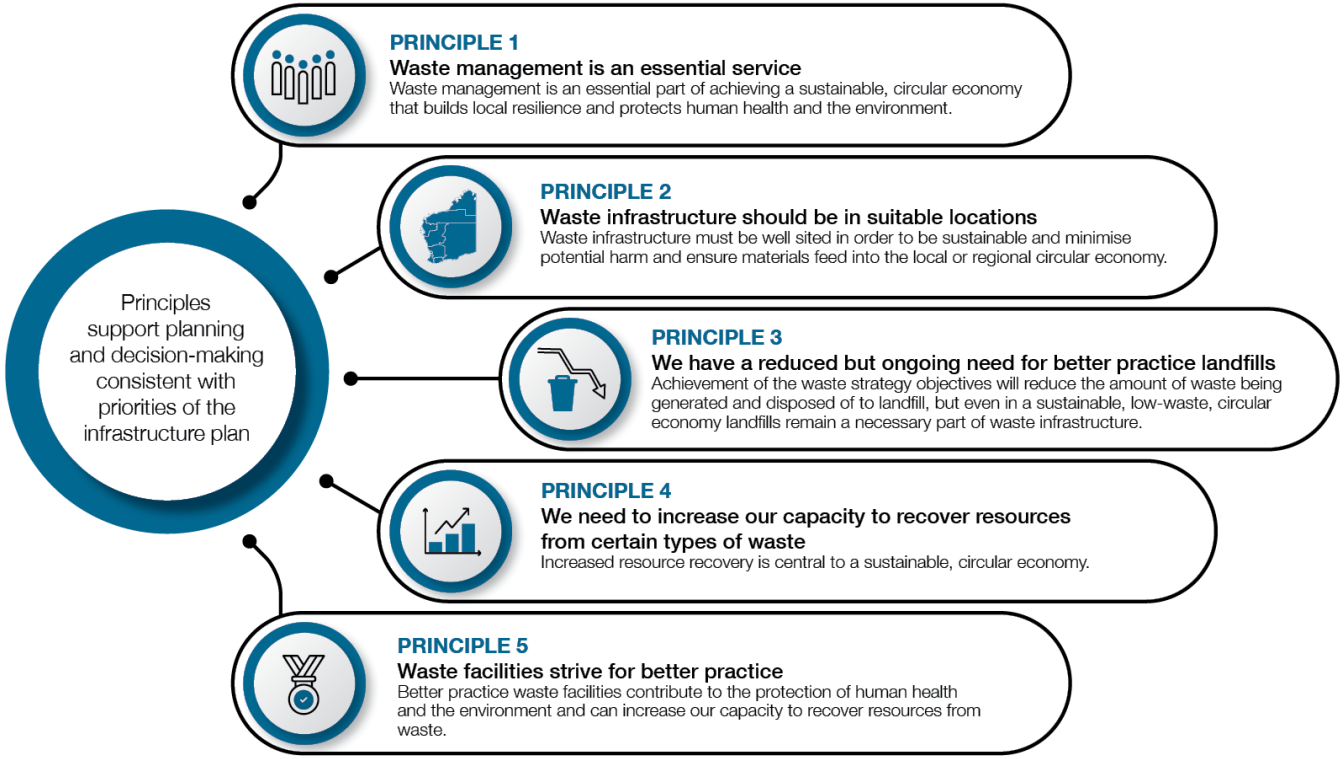


Figure 2 Principles of the *State waste infrastructure plan*

Table 40 Consideration of infrastructure plan principles and priorities in Goldfields-Esperance

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
13,500 tonnes of additional capacity in materials recovery	**Principle 1: Waste management is an essential service** According to modelling, Goldfields-Esperance will increase generation of commingled recyclable material to achieve the waste strategy targets, with an additional 13,500 tonnes of capacity sourced through existing and expanded collection services. Principle 1 highlights the need to expand existing services that have established access to feedstocks and downstream markets. **Principle 2: Waste infrastructure should be in suitable locations** Existing MRFs in the region are well located to serve regional centres of Kalgoorlie and Esperance. Commercial port access in Esperance may also facilitate the transportation of recovered material to wider markets. The expansion of existing infrastructure can shorten timelines to develop new capacity. Capacity building should be shared across the two existing facilities to create contingency during constraint periods (such as when one facility is offline).	**Medium** Lifetime and capacity expansions of existing MRFs in the Goldfields-Esperance region will decrease the risk, capital costs and timeframes required to meet capacity needs.
4,000 tonnes of additional capacity in organics recovery	**Principle 1: Waste management is an essential service** To achieve waste strategy Recover targets, there is need to grow capacity to recover organics. The projected amount is minor and could be addressed through the expansion of the existing facility near Esperance. Although, there are opportunities to develop new infrastructure near Kalgoorlie to treat feedstocks closer to their source. A Kalgoorlie FOGO recovery facility would also improve access to the region's extensive mining industry, which can act as an additional source of feedstock and de-risk recovered organic product offtake through rehabilitation activities. **Principle 2: Waste infrastructure should be in suitable locations** Development in Kalgoorlie may be constricted because of the presence of native land titles and mining claims. These factors can limit the availability of land for development and require careful consideration and coordination to ensure sustainable and equitable land use. However, a local processing option would allow a three-bin system to be offered to the region's major population centre. Additional contingency during shutdown	**Medium** Upgrading of existing organics facilities in to accept FOGO will support achievement of waste strategy Recover targets for 2030. **Medium** Lifetime and capacity expansions of existing organics recovery facilities will decrease the risk, capital costs and timeframes required to meet capacity needs. **Low** Leveraging the mining rehabilitation markets will create opportunities for recovered organic products offtake in the Goldfields-Esperance region. **Medium**

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	periods could take advantage of excess capacity in the neighbouring Great Southern and Wheatbelt regions. **Principle 5: Waste facilities strive for better practice** Review organics recovery facility compliance with the *Guideline: Better practice organics recycling* to understand capacity risk for this facility type.	Supported implementation of the *Guideline: Better practice organics recycling* will improve waste strategy Protect target outcomes.
5,000 tonnes of additional capacity in scrap metal recovery	**Principle 1: Waste management is an essential service** Scrap metal is the largest material type transferred out of the Goldfields-Esperance region, because of access to a strong consolidation and transportation network to Perth. Expansion of the existing consolidation network will be required to achieve waste strategy Recover targets. **Principle 2: Waste infrastructure should be in suitable locations** New consolidation facilities should be investigated for areas that lack current infrastructure but have access to good transportation connections with Perth. Location of a facility in the Esperance region would allow access to strong road and port transportation options, while having low constraints to new developments.	**Low** Development of a consolidation facility for scrap metal in Esperance could facilitate low-risk recovery of material in the region.
Used tyre storage	**Principle 3: We have a reduced but ongoing need for better practice landfills** Waste management of tyres in remote locations poses challenges. Existing landfills are being used for collection and consolidation of tyres and present a suitable centralised location for waste management in remote regions. About 4,700 tonnes per annum of rubber/tyre material is projected to be generated in the Goldfields-Esperance region and this will continue to be generated. **Principle 4: We need to increase our capacity to recover resources from certain types of waste** Tyres can be processed, but infrastructure may only be available in Perth so the recovery of rubber/tyre materials in the Goldfields-Esperance region is dependent on consolidation and transport to enable recovery. Consolidation and transport will remain the likely fate given the insufficient quantity to support regional processing. **Principle 5: Waste facilities strive for better practice** Two class 64 putrescible landfills in Goldfields-Esperance are also tyre storage facilities. See the landfill capacity risk assessment below to further understand	**Medium** Four facilities are listed in the region for Category 57 with total capacity close to 7,000 tyres. Some of these may be sending tyres to Perth. There is an opportunity to consolidate volumes and transport these tyres for reprocessing outside the region.

Capacity needs to achieve waste strategy targets 2030	Consideration of infrastructure plan principles	Findings in response to meeting the waste strategy 2030 target (with assigned priority ranking)
	how the loss of these facilities may occur, noting that this may reduce the ability to consolidate rubber/tyre arising in Goldfields-Esperance.	
Landfill capacity risk assessment	**Principle 1: Waste management is an essential service** Based on current, planned and approved landfill capacity, the Goldfields-Esperance region has sufficient landfill capacity to 2038. However, under a low-risk approach to landfill, capacity constraints could be reached in 2031 because there are potentially nine facilities classified as at risk (2,455,000 tonnes capacity). **Principle 3: We have a reduced but ongoing need for better practice landfills** The development of Class IV and Class V landfill capacity in Goldfields-Esperance plays a significant statewide role in treating certain specialist waste. This material is received from as far as Perth, the South West and the Pilbara. There is a deficiency of local inert landfill infrastructure, although because of low expected quantities this material can be treated through putrescible landfills. **Principle 5: Waste facilities strive for better practice** There is a high need to de-risk existing landfills through better practice management standards. These standards should also be extended to REMS-managed landfills in the region. In addition, potentially 62 per cent of landfills also require post-closure planning, having not completed or updated a plan within the past 10 years.	**High** Quantification of waste generation and infrastructure needs in remote Aboriginal communities can improve access to adequate services in remote areas. **High** Quantification of waste generation and infrastructure needs for the local mining sector would decrease scope of infrastructure planning and could lead to complementary activities that support local communities. **Medium** Updated rural landfill risk assessment methodology of unlicensed landfills and REMS landfills can be used to effectively assess the potential risk of environmental, human health and amenity impacts.

Appendix

Data sources

Table 41 Data sources and uses

Source	Use
ASK State Waste Infrastructure Audit	Waste data, facility data
State Waste Infrastructure Needs Analysis	2030 waste projections Infrastructure needs
CSIRO Electric Vehicle Projections	Modelling macro changes in waste materials
Department of Jobs, Tourism, Science and Innovation Future Battery and Critical Minerals Industries	Modelling macro changes in waste materials
Department of Jobs, Tourism, Science and Innovation Western Australia's Future Battery Industry Strategy	Modelling macro changes in waste materials

At-risk landfill sites' capacity by region

Landfill sites and their respective capacities that met either of the following criteria were identified as 'at risk':

1. The *Western Australia Landfill Siting GIS Analysis* (ASK Waste Management Consultancy, 2021) report identifies the landfill as being at risk. The potential environmental and social risk as it is situated within 1 km of sensitive land use planning and environmental considerations and/or poses a heightened environmental or public health risk (e.g. limited depth to ground water).
2. The facility was a Category 89 registered landfill or a REMS landfill.

These facilities and capacities were then removed from the modelling to provide the assessment outlined in Table 42.

Table 42 Landfill facilities and capacities deemed at risk in the low-risk approach to landfill capacity lifetime assessment

Region	Landfill capacity at risk (Tonnes)	Landfill facilities at risk
Perth	17,241,000	6
Peel	647,000	3
Pilbara	5,810,000	13
Gascoyne	208,000	3
Kimberley	237,000	89
Great Southern	515,000	4
Mid West	707,000	7
South West	7,900,000	7
Wheatbelt	1,737,000	3
Goldfields-Esperance	2,455,000	9

Considerations and limitations

Scale of plan

This infrastructure plan is designed to identify major trends, main priorities, key indicators and those strategic actions that stakeholders can adopt to address and plan for waste and resource recovery infrastructure for the state. Considerations in preparing the plan and in considering future needs are outlined below in Table 43.

Table 43 Considerations and limitations

Parameter	Scale parameter	Consideration
Waste flows	Mass (tonnes per year)	Flows are estimated based on 2020 data, rounded to the nearest thousand (‘000). For each region, three flows are considered – waste generated within the region, waste received into the region, and waste transferred out of the region. Net waste to be treated in existing and projected infrastructure for the region is calculated as the net flow resulting from subtracting transfers out waste from the sum of generated plus waste received from other regions.
Capacity by facility type	Throughput (tonnes per year)	Existing and projected infrastructure capacity by facility type is estimated based on 2020 data, rounded to the nearest thousand (‘000). For each facility type, new infrastructure capacity is defined for each facility type, based on typical throughput and detailed in the Regional summaries section. A critical mass is defined in Table 7, which is used as the waste volume threshold to be reached to justify development of that specific infrastructure type. An estimated development and approval time is also included for each facility type as to allow early planning to meet the future need.
Projections	Mass (tonnes per year)	Waste projections are estimated based on 2020 data, to the nearest thousand (‘000).

Limitations in the scope of the infrastructure plan

Sources, trends, and assumptions

The infrastructure plan draws from two identified key data sources for its projections and incorporates information obtained from research and consultation with stakeholders. A list of these sources and their use is listed in the Data sources section.

Waste and capacity projections reflect several estimates and assumptions regarding anticipated trends in population, levels of business, industrial activities, consumer behaviours and waste industry responses to market drivers. The infrastructure plan is designed as a living plan; it is intended to be reviewed regularly to review its assumptions and status

against its projections, so that adjustments can be made. Projections and indicators would then be revised to update the infrastructure plan.

Over time each of the following influences will affect the projections:

- **Waste processing technologies:** The infrastructure plan proposes 15 types of waste infrastructure. This is a general classification and does not consider process or technologies. As technology and regulations evolve, new types of infrastructure may emerge that can process different types of waste, improve yields, reduce the need to separate waste types, or make lower throughputs more economical.
- **Social trends:** The infrastructure plan assumes that no major social changes will take place, although trends are discussed in the Macro trends section. Social trends could have a significant impact on waste generation and waste types over the considered time span. As an example, evolution of digital content has significantly affected the number of published newspapers and, hence, the amount and composition of waste paper in the recycling bin from 1980 to 2000.
- **Materials science and design changes:** As materials evolve or new materials are brought to market, these may affect waste composition, recycling options and waste flows. Examples include the development of biodegradable materials (including plastics), transitioning from glass to plastic packaging, light-weighting of containers, and product design changes to enable disassembly and recycling of components.
- **Regulatory drivers:** The infrastructure plan has considered the impact of policy objectives and instruments such as landfill diversion targets, landfill levies and material bans (such as the ban of single-use plastics in Western Australia). However, the infrastructure plan does not model the impact of any new significant regulatory change that may impact on particular waste types, regions, flows between regions or processes. For example this infrastructure plan does not consider if introduction of regulations for per- and poly-fluoroalkyl substances will affect food packaging recycling, composting, waste processing or other areas.
- **Population trends:** The infrastructure plan uses population growth rates to project waste volumes in 2030. It is based on Australian Bureau of Statistics projections for each region and does not consider any major trends not identified in the Australian Bureau of Statistics projections such as regional migrations or any other deviation.
- **Economic trends:** The infrastructure plan does not consider abnormalities in economic activity in the state. It also assumes that development of waste and resource recovery infrastructure will offer a financial return commensurate with requirements for funding those projects. The infrastructure plan does not propose specific infrastructure that may be government-owned or government-operated on a not-for-profit basis (e.g. local government transfer stations).
- **Climate change:** It is anticipated that the infrastructure plan may be impacted by, and will need to be adapted to address, the following areas:
    a. The effects of climate change may be so severe that sites for waste and resource recovery infrastructure need to be chosen to ensure minimal disruption to waste processing activities. Examples include changes in sea level and increased frequency of floods.
    b. Economic impacts may arise from mitigation policies such as decarbonisation of the economy.
    c. Waste generated from disasters caused by climate change become a significant volume in certain regions but, given the difficulty in predicting these events, these volumes cannot be assigned to regions with a high degree of certainty.

d. The effects of climate change are so severe that they trigger emergency actions that affect industrial and business activity, waste generation and/or waste processing.

- The Contingency planning section includes consideration of waste volumes impacted by climate change disasters, but waste generation projections do not include predicted volumes from these. Planners should consider these factors and project developers should consider measures to mitigate the effects of these risks.
- **Industrial and business activities**: The Macro trends section explores some of the trends that may affect general economic activity in the state. The infrastructure plan projects waste based on population and does not consider the possible impacts of major changes in industrial and business activities. Significant new industrial projects in regional areas or cessation of certain activities will affect regional waste generation, populations and economic viability of waste activities.

Data availability for organics and FOGO outside of Perth and Peel

There are several limitations with the *State Waste Infrastructure Needs Analysis* methodology for assessment of FOGO recovery facility capacity needs and organics recovery facility capacity needs. These include:

- The aggregation of FOGO in regions outside of Perth and Peel.
- Available capacity is based on licensed or permitted capacity and may not necessarily reflect actual projected capacity. Commercial facilities may decide not to accept additional material or make decisions on expanding throughput based on commercial and/or strategic considerations.
- Factors that will affect whether material can be processed in other regions, even if there is available capacity, have not been determined by the infrastructure plan and will largely be determined by industry. These may include:
  - distance and transportation costs
  - whether the facility can accept the material because of technical reasons or specifications, such as the percentage of contamination of the material
  - commercial considerations.
- Overall available capacity results from aggregation of all theoretical excess capacity from all listed facilities.
- As material categories are also aggregated, the analysis does not consider individual waste categories or whether they would be acceptable for processing at the facilities with ‘excess available capacity’.
- Facilities may be able to seek licence changes to expand capacity and accepted waste categories.

Facility lists

Table 44 outlines the facilities used in the *State Waste Infrastructure Needs Analysis* modelling and subsequent infrastructure plan.

Table 44 Facility list used from State Waste Infrastructure Needs Analysis

Premises name	Local government area	Western Australian region	Infrastructure plan category
Darkan Refuse Site	West Arthur	Wheatbelt	Putrescible landfill
Denham Refuse Disposal Site	Shark Bay	Gascoyne	Putrescible landfill
Duranillin Refuse Site	West Arthur	Wheatbelt	Putrescible landfill
Eucla Landfill Site	Dundas	Goldfields	Putrescible landfill
Laverton Refuse Site R1637/2004/1	Laverton	Goldfields	Putrescible landfill
Norseman Waste Facility R1491/2003/1	Dundas	Goldfields	Putrescible landfill
Shire of Woodanilling Refuse Site	Woodanilling	Great Southern	Putrescible landfill
Green Machines Lab	Gosnells	Metro	Plastic recovery facility
Dodd and Dodd Group Pty Ltd - Kalgoorlie	Kalgoorlie-Boulder	Goldfields	Scrap metal recovery facility
Dodd & Dodd Group Pty Ltd - Karratha	Karratha	Pilbara	Scrap metal recovery facility
Schutz Australia Pty Ltd	Cockburn	Metro	Plastic recovery facility
Yarri Road Refuse Facility	Kalgoorlie-Boulder	Goldfields	Putrescible landfill
Yarri Road Refuse Facility	Kalgoorlie-Boulder	Goldfields	Used tyre storage
Red Sands Supplies Pty Ltd	Kwinana	Metro	C&D recovery facility
Malatesta Road Paving & Hot Mix and Green Organic Recycling Contractors	Bunbury	South West	Organics recovery facility
Buller Road Refuse Disposal Site	Waroona	Peel	Putrescible landfill
Atlas Group Pty Ltd	Stirling	Metro	Inert landfill
Waste Stream Management	Kwinana	Metro	C&D recovery facility
Waste Stream Management	Kwinana	Metro	Inert landfill
Paraburdoo Waste Disposal Site	Ashburton	Pilbara	Putrescible landfill
Tom Price Refuse Disposal Site	Ashburton	Pilbara	Putrescible landfill
Onslow Refuse Disposal Site	Ashburton	Pilbara	Putrescible landfill
Onslow Refuse Disposal Site	Ashburton	Pilbara	Used tyre storage
Bridgetown Class II Putrescible Landfill Site	Bridgetown-Greenbushes	South West	Putrescible landfill

Premises name	Local government area	Western Australian region	Infrastructure plan category
Bridgetown Class II Putrescible Landfill Site	Bridgetown-Greenbushes	South West	Organics recovery facility
Gibbs Rd Class II Putrescible Landfill Site	Collie	South West	Putrescible landfill
Muchea Landfill & Recycling Centre	Chittering	Wheatbelt	Putrescible landfill
Perenjori Landfill Site	Perenjori	Mid West	Putrescible landfill
Latham Landfill Site	Perenjori	Mid West	Putrescible landfill
Tim's Thicket Septage and Inert Disposal Facility	Mandurah	Peel	C&D recovery facility
Tim's Thicket Septage and Inert Disposal Facility	Mandurah	Peel	Inert landfill
McIntosh Rd Landfill	Denmark	Great Southern	Inert landfill
Kalbarri Waste Management Facility	Northampton	Mid West	Putrescible landfill
Northampton Waste Management Facility	Northampton	Mid West	Inert landfill
Northampton Waste Management Facility	Northampton	Mid West	Used tyre storage
Wylie Bay Sanitary Landfill Site	Esperance	Goldfields	C&D recovery facility
Wylie Bay Sanitary Landfill Site	Esperance	Goldfields	Putrescible landfill
Wylie Bay Sanitary Landfill Site	Esperance	Goldfields	MRF
Wylie Bay Sanitary Landfill Site	Esperance	Goldfields	Used tyre storage
Tammin Refuse Disposal Site	Tammin	Wheatbelt	C&D recovery facility
Tammin Refuse Disposal Site	Tammin	Wheatbelt	Putrescible landfill
Seabird Waste Management Facility	Gingin	Wheatbelt	Putrescible landfill
Gingin Waste Management Facility	Gingin	Wheatbelt	Putrescible landfill
Lancelin Waste Management Facility	Gingin	Wheatbelt	Putrescible landfill
Shire of Broome Refuse Site	Broome	Kimberley	Putrescible landfill
Mullewa Waste Management Facility	Greater Geraldton	Mid West	Putrescible landfill
South Hedland Tip Site	Port Hedland	Pilbara	Putrescible landfill
South Hedland Tip Site	Port Hedland	Pilbara	Used tyre storage

Premises name	Local government area	Western Australian region	Infrastructure plan category
Katanning Shire Refuse Site	Katanning	Great Southern	Putrescible landfill
Katanning Shire Refuse Site	Katanning	Great Southern	Used tyre storage
Albany Refuse Site	Albany	Great Southern	Putrescible landfill
Carnamah Waste Disposal Site	Carnamah	Mid West	Putrescible landfill
Eneabba Waste Disposal Site	Carnamah	Mid West	Putrescible landfill
Wongan Hills Waste Management Site	Wongan-Ballidu	Wheatbelt	Putrescible landfill
Roleystone Greenwaste Site	Armadale	Metro	Organics recovery facility
Calingiri Refuse Site	Victoria Plains	Wheatbelt	Putrescible landfill
Bolgart Refuse Site	Victoria Plains	Wheatbelt	Putrescible landfill
Tamala Park Waste Management Facility	Wanneroo	Metro	Putrescible landfill
City of Armadale Landfill & Recycling Facility	Armadale	Metro	Putrescible landfill
Corio Road Waste Transfer Station	Murray	Peel	Inert landfill
Old Quarry Road Waste Disposal Facility	Northam	Wheatbelt	Putrescible landfill
Davis Road Class II putrescible landfill site	Augusta-Margaret River	South West	Putrescible landfill
Cervantes Waste Management Facility	Dandaragan	Wheatbelt	Inert landfill
Jurien Waste Management Facility	Dandaragan	Wheatbelt	Putrescible landfill
Jurien Waste Management Facility	Dandaragan	Wheatbelt	Used tyre storage
Manjimup Recycling & Refuse Centre	Manjimup	South West	C&D recovery facility
Manjimup Recycling & Refuse Centre	Manjimup	South West	Putrescible landfill
Manjimup Recycling & Refuse Centre	Manjimup	South West	Organics recovery facility
Mogumber Refuse Site	Victoria Plains	Wheatbelt	Putrescible landfill
Kulin Rubbish Tip	Kulin	Wheatbelt	Inert landfill
Seven Mile Waste Disposal Facility	Karratha	Pilbara	Putrescible landfill
Seven Mile Waste Disposal Facility	Karratha	Pilbara	Used tyre storage
Wiluna Refuse Disposal Site	Wiluna	Mid West	Putrescible landfill

Premises name	Local government area	Western Australian region	Infrastructure plan category
Meekatharra Refuse Site	Meekatharra	Mid West	Putrescible landfill
Mt Barker Waste Management Facility	Plantagenet	Great Southern	Putrescible landfill
Humpty Doo Farm Bringo-(Geraldton)	Greater Geraldton	Mid West	Inert landfill
Bakers Junction Waste Management Facility	Albany	Great Southern	Putrescible landfill
Corrigin Waste Management Facility	Corrigin	Wheatbelt	Putrescible landfill
Nullagine Refuse Site	East Pilbara	Pilbara	Putrescible landfill
Marble Bar Refuse Site	East Pilbara	Pilbara	Putrescible landfill
Newman Refuse Site	East Pilbara	Pilbara	Putrescible landfill
Cross Resource Management	Harvey	South West	C&D recovery facility
Cross Resource Management	Harvey	South West	Inert landfill
Millar Road Landfill Facility	Rockingham	Metro	Putrescible landfill
Millar Road Landfill Facility	Rockingham	Metro	Organics recovery facility
Browns Range Waste Management Facility	Carnarvon	Gascoyne	Putrescible landfill
Browns Range Waste Management Facility	Carnarvon	Gascoyne	Used tyre storage
Coral Bay Landfill Site	Carnarvon	Gascoyne	Putrescible landfill
Mt Magnet Refuse Site	Mount Magnet	Mid West	Putrescible landfill
Donnybrook Waste Management Facility (Class II Putrescible Landfill Site)	Donnybrook-Balingup	South West	Putrescible landfill
Narrogin Waste Management Facility	Narrogin	Wheatbelt	Putrescible landfill
TJ Depiazzi & Sons - Composting Facility	Dardanup	South West	Organics recovery facility
Ballidu Tip Site	Wongan-Ballidu	Wheatbelt	Putrescible landfill
Cadoux Tip Site	Wongan-Ballidu	Wheatbelt	Putrescible landfill
Pingelly Waste Management Facility	Pingelly	Wheatbelt	Putrescible landfill
Pingelly Waste Management Facility	Pingelly	Wheatbelt	Used tyre storage
Lake Grace Rubbish Tip	Lake Grace	Wheatbelt	Putrescible landfill

Premises name	Local government area	Western Australian region	Infrastructure plan category
Lake Grace Rubbish Tip	Lake Grace	Wheatbelt	Used tyre storage
Halls Creek Rubbish Tip	Halls Creek	Kimberley	Putrescible landfill
Mushroom Exchange Pty Ltd (Wandalup Farms)	Mandurah	Peel	Organics recovery facility
Baileys Fertilisers	Kwinana	Metro	Organics recovery facility
Watheroo Rubbish Tip	Moora	Wheatbelt	Putrescible landfill
Moora Townsite Rubbish Tip	Moora	Wheatbelt	Putrescible landfill
Kununurra Waste Disposal Site	Wyndham-East Kimberley	Kimberley	Putrescible landfill
Richgro Garden Products	Cockburn	Metro	Organics recovery facility
Kununurra Waste Disposal Site	Wyndham-East Kimberley	Kimberley	Used tyre storage
Atlas Composting Facility	Victoria Plains	Wheatbelt	Organics recovery facility
Mindijup Road Multiple Use Facility	Albany	Great Southern	Inert landfill
Mindijup Road Multiple Use Facility	Albany	Great Southern	Putrescible landfill
Mindijup Road Multiple Use Facility	Albany	Great Southern	Organics recovery facility
Cashmans (Lightrange)	Meekatharra	Mid West	Inert landfill
Amazon Soils & Landscaping Supplies (Richgro)	Wanneroo	Metro	FOGO recovery facility
Amazon Soils & Landscaping Supplies (Richgro)	Wanneroo	Metro	Organics recovery facility
Miles Contracting Services Pty Ltd	Kalgoorlie-Boulder	Goldfields	Used tyre storage
Waste Care WA	Bayswater	Metro	C&D recovery facility
Waste Care WA	Bayswater	Metro	C&D recovery facility
Buckingham Road Inert Landfill	Brookton	Wheatbelt	Inert landfill
Northsands Resources	Wanneroo	Metro	C&D recovery facility
Northsands Resources	Wanneroo	Metro	Inert landfill

Premises name	Local government area	Western Australian region	Infrastructure plan category
Northsands Resources	Wanneroo	Metro	Organics recovery facility
Regional Resource Recovery Centre	Canning	Metro	MRF
Regional Resource Recovery Centre	Canning	Metro	Organics recovery facility
Regional Resource Recovery Centre	Canning	Metro	FOGO recovery facility
Abbotts Liquid Salvage	Albany	Great Southern	Organics recovery facility
Aussie Organics	Serpentine-Jarrahdale	Metro	Organics recovery facility
M8 Sustainable Ltd	Gosnells	Metro	C&D recovery facility
Purearth	Bayswater	Metro	Organics recovery facility
Kambalda Waste Disposal Site	Coolgardie	Goldfields	Putrescible landfill
Hopelands Farm	Brookton	Wheatbelt	Organics recovery facility
Salt Valley Road Inert Landfill	Toodyay	Wheatbelt	Inert landfill
Mt Walton Intractable Waste Disposal Facility (IWDF) Class V Landfill	Coolgardie	Goldfields	Class V disposal facility
Brockwaste WA	Nedlands	Metro	FOGO recovery facility
Tyre Storage & Recycling WA	Broomehill-Tambellup	Great Southern	Inert landfill
Mindarie Resource Recovery Facility	Wanneroo	Metro	FOGO recovery facility
Mathieson Road Transfer Station	Mundaring	Metro	Inert landfill
Waste Care (Jackson St)	Bayswater	Metro	C&D recovery facility
Wangara Recycling Centre	Wanneroo	Metro	Organics recovery facility
Newdegate Waste Management Facility	Lake Grace	Wheatbelt	Putrescible landfill
C-Wise	Murray	Peel	Organics recovery facility
Asphaltech Pty Ltd	Swan	Metro	C&D recovery facility
Tullamore Holdings Pty Ltd	Kojonup	Great Southern	Organics recovery facility

Premises name	Local government area	Western Australian region	Infrastructure plan category
Karratha Environmental Crushing Site	Karratha	Pilbara	C&D recovery facility
Kondinin Landfill site	Kondinin	Wheatbelt	Putrescible landfill
Karingal Pastoral Company	Esperance	Goldfields	Organics recovery facility
Merredin Landfill	Merredin	Wheatbelt	Putrescible landfill
VMS Contractors Composting Facility	Busselton	South West	Organics recovery facility
Shire of Beverley Landfill	Beverley	Wheatbelt	Putrescible landfill
Pinjarra Transfer Recycling Station	Murray	Peel	C&D recovery facility
REMONDIS Australia	Cockburn	Metro	MRF
Derby Waste Management Facility	Derby-West Kimberley	Kimberley	Putrescible landfill
Southern Cross New Waste Management Facility	Yilgarn	Wheatbelt	Putrescible landfill
WA Recycling	Swan	Metro	C&D recovery facility
Premium Waste Management	Waroona	Peel	C&D recovery facility
Premium Waste Management	Waroona	Peel	Inert landfill
Premium Waste Management	Waroona	Peel	Organics recovery facility
Tyrecycle	Fremantle	Metro	Rubber/tyre recovery facility
Kojonup Transfer Station	Kojonup	Great Southern	MRF
Kojonup Transfer Station	Kojonup	Great Southern	Used tyre storage
Wellington Group of Councils Compost Facility	Dardanup	South West	Organics recovery facility
Boddington Refuse Disposal Site	Boddington	Wheatbelt	Putrescible landfill
Baileys Fertilisers	Kwinana	Metro	C&D recovery facility
Purearth Woottating Facility	Northam	Wheatbelt	Organics recovery facility
Fitzroy Crossing Waste Management Facility	Derby-West Kimberley	Kimberley	Putrescible landfill

Premises name	Local government area	Western Australian region	Infrastructure plan category
SUEZ Bibra Lake Resource Recovery Facility	Cockburn	Metro	MRF
CD Dodd Scrap Metal Recyclers	Kalamunda	Metro	Scrap metal recovery facility
Hovey Solid Waste Depot	Harvey	South West	C&D recovery facility
Ravensthorpe Waste Disposal Site	Ravensthorpe	Goldfields	Putrescible landfill
Northrock	Karratha	Pilbara	C&D recovery facility
Karratha Waste Handling Facility	Karratha	Pilbara	Used tyre storage
RES 51151, Lot 400 Buckleys Road	Broome	Kimberley	C&D recovery facility
RES 51151, Lot 400 Buckleys Road	Broome	Kimberley	Organics recovery facility
RES 51151, Lot 400 Buckleys Road	Broome	Kimberley	Used tyre storage
Downer EDI Works - Hope Valley	Kwinana	Metro	C&D recovery facility
Capital Recycling	Canning	Metro	C&D recovery facility
North Bannister Waste Facility	Boddington	Wheatbelt	Putrescible landfill
North Bannister Waste Facility	Boddington	Wheatbelt	Organics recovery facility
North Bannister Waste Facility	Boddington	Wheatbelt	Used tyre storage
Onslow Waste Transfer Station	Ashburton	Pilbara	Used tyre storage
Garden Organics	Gingin	Wheatbelt	Organics recovery facility
Red Hill Waste Management Facility	Swan	Metro	Putrescible landfill
Red Hill Waste Management Facility	Swan	Metro	Class IV disposal facility
Red Hill Waste Management Facility	Swan	Metro	Organic recovery facility
Red Hill Waste Management Facility	Swan	Metro	FOGO recovery facility
Banksia Road Landfill Site	Dardanup	South West	Putrescible landfill
TSR WA Tammin	Tammin	Wheatbelt	Inert landfill
Sims Metal Management	Kwinana	Metro	Scrap metal recovery facility

Premises name	Local government area	Western Australian region	Infrastructure plan category
Cockburn Receival Sales Depot	Cockburn	Metro	Organics recovery facility
Carramar Resource Industries	Wanneroo	Metro	C&D recovery facility
Direct Transport	Wanneroo	Metro	C&D recovery facility
Alkina Holdings	Wanneroo	Metro	C&D recovery facility
Stanley Road Class II Putrescible Landfill site	Harvey	South West	C&D recovery facility
Stanley Road Class II Putrescible Landfill site	Harvey	South West	Putrescible landfill
Clean Site Bins	Wanneroo	Metro	C&D recovery facility
Westralian Resource Solutions	Wanneroo	Metro	C&D recovery facility
Capital Recycling - Postans	Kwinana	Metro	C&D recovery facility
Postans Glass Processing and Waste Sorting Facility	Kwinana	Metro	C&D recovery facility
Allday Construction	Wanneroo	Metro	C&D recovery facility
Allday Construction	Wanneroo	Metro	C&D recovery facility
Brajkovich Landfill North	Swan	Metro	C&D recovery facility
Brajkovich Landfill North	Swan	Metro	Inert landfill
Abercrombie Road Resource Recovery Centre	Kwinana	Metro	Organics recovery facility
Earthcare Recycling Pty Ltd	Swan	Metro	C&D recovery facility
Yeeda Station	Derby-West Kimberley	Kimberley	Organics recovery facility
Gap Ridge metal recycling and asbestos storage facility	Karratha	Pilbara	Scrap metal recovery facility
Gap Ridge metal recycling and asbestos storage facility	Karratha	Pilbara	Used tyre storage
Cleanaway Kimberley Resource Recovery Centre	Broome	Kimberley	MRF
Guildford Materials Recovery Facility	Swan	Metro	MRF
Western Tree Recyclers	Kwinana	Metro	Organics recovery facility

Premises name	Local government area	Western Australian region	Infrastructure plan category
Qualing Scarp Waste Management Site	Exmouth	Gascoyne	Putrescible landfill
Qualing Scarp Waste Management Site	Exmouth	Gascoyne	Used tyre storage
Asphaltech Road Pavement Recycling Operation	Wanneroo	Metro	C&D recovery facility
Temporary Soil Processing Plant	Armadale	Metro	C&D recovery facility
Temporary Soil Processing Plant	Armadale	Metro	C&D recovery facility
Community Greenwaste Recycling Pty Ltd	Wanneroo	Metro	C&D recovery facility
Community Greenwaste Recycling Pty Ltd	Wanneroo	Metro	C&D recovery facility
Community Greenwaste Recycling Pty Ltd	Wanneroo	Metro	Organics recovery facility
GMF Contractors Pty Ltd	Wanneroo	Metro	C&D recovery facility
TRG Tyre Recycling	Cockburn	Metro	Rubber/tyre recovery facility
Elan Energy Matrix Pty Ltd	Canning	Metro	Rubber/tyre recovery facility
Urban Resources	Kwinana	Metro	C&D recovery facility
Recovery Centre Bullsbrook	Swan	Metro	Organics recovery facility
Watkins Road Transfer Station	Serpentine-Jarrahdale	Metro	C&D recovery facility
Salt Valley Road Landfill	Toodyay	Wheatbelt	Putrescible landfill
City of Busselton Concret Crushing Dunsborough	Busselton	South West	C&D Recovery Facility
BGC Neerabup	Wanneroo	Metro	C&D Recovery Facility
Inkpen Road Waste Management Facility	Northam	Wheatbelt	Putrescible landfill
Inkpen Road Waste Management Facility	Northam	Wheatbelt	Used tyre storage
Meru Waste Disposal Facility	Greater Geraldton	Mid West	C&D recovery facility
Meru Waste Disposal Facility	Greater Geraldton	Mid West	Putrescible landfill

Premises name	Local government area	Western Australian region	Infrastructure plan category
Meru Waste Disposal Facility	Greater Geraldton	Mid West	Organics recovery facility
Perth Services Centre	Canning	Metro	MRF
Conveyor Belt Solutions Kwinana	Kwinana	Metro	Rubber/tyre recovery facility
REMONDIS Canning Vale MRF	Canning	Metro	MRF
Brajkovich Demolition and Salvage Pty Ltd	Cockburn	Metro	C&D recovery facility
Henderson Waste Recovery Park	Cockburn	Metro	Inert landfill
Henderson Waste Recovery Park	Cockburn	Metro	Putrescible landfill
Bindoon Landfill & Recycling Centre	Chittering	Wheatbelt	Putrescible landfill
Rottnest Island Landfill	Cockburn	Metro	Inert landfill
The Valleys Bullsbrook Pty Ltd	Swan	Metro	C&D recovery facility
The Valleys Bullsbrook Pty Ltd	Swan	Metro	Inert landfill
Landsave Organics	Busselton	South West	Organics recovery facility
Dunsborough Waste Facility	Busselton	South West	Putrescible landfill
Brajkovich Demolition Malaga	Swan	Metro	C&D recovery facility
Kalgoorlie Materials Recovery Facility	Kalgoorlie-Boulder	Goldfields	MRF
Cleanaway Albany	Albany	Great Southern	MRF
Allied Metal Recyclers	Canning	Metro	Scrap metal recovery facility
Westmore Muchea Landfill	Chittering	Wheatbelt	C&D recovery facility
Westmore Muchea Landfill	Chittering	Wheatbelt	Inert landfill
AAA Metal Recycling	Kwinana	Metro	Scrap metal recovery facility
AMC Metal Recyclers	Karratha	Pilbara	Scrap metal recovery facility
AMC Metal Recyclers	Karratha	Pilbara	Scrap metal recovery facility
AMC Metal Recyclers	Karratha	Pilbara	Plastic recovery facility

Premises name	Local government area	Western Australian region	Infrastructure plan category
A to Z Recycling	Wanneroo	Metro	Scrap metal recovery facility
Washingtons Earthmoving	Armadale	Metro	C&D recovery facility
Earthcare Recycling	Cockburn	Metro	C&D recovery facility
Soft Landing Mattress Recycling	Wanneroo	Metro	Specialist waste facility
Total Green Recycling	Canning	Metro	MRF
Cowara Contractors	Augusta-Margaret River	South West	C&D recovery facility
Downer Gosnells Asphalt Plant	Gosnells	Metro	C&D recovery facility
Richardson Road Landfill Site	Harvey	South West	Putrescible landfill
WA Recycling Resource Recovery Centre	Swan	Metro	C&D recovery facility
CLAW Environmental	Canning	Metro	Plastic recovery facility
4M Waste	Swan	Metro	Rubber/tyre recovery facility
Dalwallinu West Refuse Site	Dalwallinu	Wheatbelt	Putrescible landfill
Kalannie Landfill	Dalwallinu	Wheatbelt	Putrescible landfill
Pithara Landfill	Dalwallinu	Wheatbelt	Putrescible landfill
Wubin Landfill	Dalwallinu	Wheatbelt	Putrescible landfill
Buntine Landfill	Dalwallinu	Wheatbelt	Putrescible landfill
Wyndham Landfill Site	Wyndham-East Kimberley	Kimberley	Putrescible landfill
Nungarin Refuse Disposal Site	Nungarin	Wheatbelt	Putrescible landfill
Mukinbudin Landfill Site	Mukinbudin	Wheatbelt	Putrescible landfill
Jerramungup Waste Management Facility	Jerramungup	Great Southern	Putrescible landfill
Morawa Public Waste Management Facility	Morawa	Mid West	Putrescible landfill
Warralakin Waste Management Facility	Westonia	Wheatbelt	Putrescible landfill
Kojonup Landfill Site	Kojonup	Great Southern	Putrescible landfill
Highbury Waste Disposal Site	Narrogin	Wheatbelt	Putrescible landfill

Premises name	Local government area	Western Australian region	Infrastructure plan category
Kalannie Sanitary Landfill Site	Dalwallinu	Wheatbelt	Putrescible landfill
Wyalkatchem Refuse Disposal Site	Wyalkatchem	Wheatbelt	Putrescible landfill
Needilup Waste Management Facility	Jerramungup	Great Southern	Putrescible landfill
Gairdner Waste Management Facility	Jerramungup	Great Southern	Putrescible landfill
Beacon Refuse Disposal Site	Mount Marshall	Wheatbelt	Putrescible landfill
Bodallin Waste Management Facility	Yilgarn	Wheatbelt	Putrescible landfill
Bullfinch Landfill	Yilgarn	Wheatbelt	Putrescible landfill
Moorine Rock Waste Management Facility	Yilgarn	Wheatbelt	Putrescible landfill
Williams Refuse Site	Williams	Wheatbelt	Putrescible landfill
Wickepin Waste Management Facility	Wickepin	Wheatbelt	Putrescible landfill
Yealering Refuse Site	Wickepin	Wheatbelt	Putrescible landfill
Harrismith Waste Management Facility	Wickepin	Wheatbelt	Putrescible landfill
Bokerup Waste Management Facility	Cranbrook	Great Southern	Putrescible landfill
Cranbrook Industrial Waste Management Facility	Cranbrook	Great Southern	Putrescible landfill
Gnowangerup Waste Management Facility	Gnowangerup	Great Southern	Putrescible landfill
Trayning Refuse Disposal Site	Trayning	Wheatbelt	Putrescible landfill
Yelbeni Refuse Disposal Site	Trayning	Wheatbelt	Putrescible landfill
Kununoppin Refuse Disposal Site	Trayning	Wheatbelt	Putrescible landfill
Rocky Gully Waste Management Facility	Plantagenet	Great Southern	Putrescible landfill
Ongerup Waste Management Facility	Gnowangerup	Great Southern	Putrescible landfill
Borden Waste Management Facility	Gnowangerup	Great Southern	Putrescible landfill
Paynes Find Landfill Site	Yalgoo	Mid West	Putrescible landfill
Coolgardie Waste Disposal Facility	Coolgardie	Goldfields	Putrescible landfill
Westonia Refuse Site	Westonia	Wheatbelt	Putrescible landfill
Amery Refuse Site	Dowerin	Wheatbelt	Putrescible landfill

Premises name	Local government area	Western Australian region	Infrastructure plan category
Konnogorring Refuse Site	Goomalling	Wheatbelt	Putrescible landfill
Nannup Putrescible Landfill	Nannup	South West	Putrescible landfill
Menzies Rubbish Disposal Site	Menzies	Goldfields	Putrescible landfill
Kookynie Rubbish Disposal Site	Menzies	Goldfields	Putrescible landfill
Sandstone Refuse Site	Sandstone	Mid West	Putrescible landfill
Cue Refuse Site	Cue	Mid West	Putrescible landfill
Binnu Waste Mgmt Facility	Northampton	Mid West	Putrescible landfill
Port Gregory Waste Mgmt Facility	Northampton	Mid West	Putrescible landfill
Goomalling Town Refuse Site	Goomalling	Wheatbelt	Putrescible landfill
Three Springs Landfill Site	Three Springs	Mid West	Putrescible landfill
Munglinup Waste Disposal Site	Esperance	Goldfields	Putrescible landfill
Boyup Brook Putrescible Landfill	Boyup Brook	South West	Putrescible landfill
Cape Riche Waste Management Facility	Albany	Great Southern	Putrescible landfill
Pingrup Tip	Kent	Great Southern	Putrescible landfill
Nyabing Waste Disposal Facility	Kent	Great Southern	Putrescible landfill
Peaceful Bay Waste Management Facility	Denmark	Great Southern	Putrescible landfill
Quairading Waste Management Facility	Quairading	Wheatbelt	Putrescible landfill
Dumbleyung Landfill Site	Dumbleyung	Wheatbelt	Putrescible landfill
Kukerin Landfill Site	Dumbleyung	Wheatbelt	Putrescible landfill
Wagin Waste Management Facility	Wagin	Wheatbelt	Putrescible landfill
Lowden Waste Mgmt Facility	Donnybrook-Balingup	South West	Putrescible landfill
Mumballup Waste Mgmt Facility	Donnybrook-Balingup	South West	Putrescible landfill
Leonora Waste Facility	Leonora	Goldfields	Putrescible landfill
Lake King Rubbish Tip	Lake Grace	Wheatbelt	Putrescible landfill
Varley Rubbish Tip	Lake Grace	Wheatbelt	Putrescible landfill
Brookton Landfill	Brookton	Wheatbelt	Putrescible landfill

Premises name	Local government area	Western Australian region	Infrastructure plan category
Wandering Rubbish Tip	Wandering	Wheatbelt	Putrescible landfill
Windy Harbour Tip	Manjimup	South West	Putrescible landfill
Nabawa Waste Management Facility	Chapman Valley	Mid West	Putrescible landfill
Beaufort River Waste Management Facility	Woodanilling	Great Southern	Putrescible landfill
Dandaragan Waste Management Facility	Dandaragan	Wheatbelt	Putrescible landfill
Yalgoo Landfill	Yalgoo	Mid West	Putrescible landfill
Whim Creek Landfill	Karratha	Pilbara	Putrescible landfill
Boxwood Waste Management Facility	Jerramungup	Great Southern	Putrescible landfill
Bencubbin Landfill Site	Mount Marshall	Wheatbelt	Putrescible landfill
Eastern Districts Regional Waste Management Site	Kondinin	Wheatbelt	Putrescible landfill
Bullaring Tip	Corrigin	Wheatbelt	Putrescible landfill
Dudinin Rubbish Tip	Kulin	Wheatbelt	Putrescible landfill
Coorow Town Tip	Coorow	Mid West	Putrescible landfill
Coorow Coastal Tip	Coorow	Mid West	Putrescible landfill
Kalumburu Landfill	Wyndham-East Kimberley	Kimberley	Putrescible landfill
Gascoyne Junction Waste Disposal Site	Upper Gascoyne	Gascoyne	Putrescible landfill
Narembeen Landfill	Narembeen	Wheatbelt	Putrescible landfill
Drysdale River landfill	Wyndham-East Kimberley	Kimberley	Putrescible landfill
Bruce Rock Waste Management Facility	Bruce Rock	Wheatbelt	Putrescible landfill
Kwinana WTE Project Co	Kwinana	Metro	Waste-to-energy
Blue Phoenix Bottom Ash Treatment Facility	Kwinana	Metro	Bottom ash treatment facility
Swan Waste Solutions	Chittering	Wheatbelt	C&D recovery facility
Badgingarra Waste Facility	Dandaragan	Wheatbelt	Putrescible landfill
Shire of Koorda Landfill	Koorda	Wheatbelt	Putrescible landfill
Fernview Landfill	Gingin	Wheatbelt	Putrescible landfill

Premises name	Local government area	Western Australian region	Infrastructure plan category
East Rockingham Waste to Energy Facility	Rockingham	Metro	Waste-to-energy
East Rockingham Bottom Ash Treatment Facility	Rockingham	Metro	Bottom ash treatment facility
Richgro Composting Facility	Boddington	Wheatbelt	Organics recovery facility
Pilbara Regional Waste Management Facility	Ashburton	Pilbara	C&D recovery facility
Pilbara Regional Waste Management Facility	Ashburton	Pilbara	Inert landfill
Pilbara Regional Waste Management Facility	Ashburton	Pilbara	Class IV disposal facility
Pilbara Regional Waste Management Facility	Ashburton	Pilbara	Used tyre storage
FTR Operations	Cockburn	Metro	Scrap metal recovery facility
Wannamal Rd Organics Pty Ltd	Gingin	Wheatbelt	Organics recovery facility
Cougar Sand Supplies	Waroona	Peel	C&D recovery facility
Poly Pipe Recycling	Swan	Metro	Plastic recovery facility
Sell & Parker Pty Ltd	Port Hedland	Pilbara	Scrap metal recovery facility
Hampton Transport Services Pty Ltd	Kalgoorlie-Boulder	Goldfields	Used tyre storage
Barbagello Raceway	Wanneroo	Metro	C&D recovery facility
Giacci Recycling	Rockingham	Metro	Scrap Metal Recovery Facility
Innawonga	Ashburton	Pilbara	REMS
Ngurawaana	Ashburton	Pilbara	REMS
Youngaleena	Ashburton	Pilbara	REMS
Jundaru (Peedamulla Station)	Ashburton	Pilbara	REMS
Wakathuni	Ashburton	Pilbara	REMS
Ardyaloon	Broome	Kimberley	REMS
Beagle Bay	Broome	Kimberley	REMS

Premises name	Local government area	Western Australian region	Infrastructure plan category
Billard	Broome	Kimberley	REMS
Bindurrk	Broome	Kimberley	REMS
Bobieding	Broome	Kimberley	REMS
Budgarjook	Broome	Kimberley	REMS
Bulgin	Broome	Kimberley	REMS
Burrguk	Broome	Kimberley	REMS
Carnot Springs	Broome	Kimberley	REMS
Chile Creek	Broome	Kimberley	REMS
Djaradjung	Broome	Kimberley	REMS
Djugarargyn	Broome	Kimberley	REMS
Djulburd	Broome	Kimberley	REMS
Embulgun	Broome	Kimberley	REMS
Frazier Downs	Broome	Kimberley	REMS
Gambarnum	Broome	Kimberley	REMS
Gnylmarung	Broome	Kimberley	REMS
Goojar Goonjool	Broome	Kimberley	REMS
Goolarrgon	Broome	Kimberley	REMS
Goombading	Broome	Kimberley	REMS
Goombaragin	Broome	Kimberley	REMS
Gullaweed	Broome	Kimberley	REMS
La Djardarr	Broome	Kimberley	REMS
Loongabid	Broome	Kimberley	REMS
Mercedes Cove	Broome	Kimberley	REMS
Middle Lagoon	Broome	Kimberley	REMS
Milargoon	Broome	Kimberley	REMS
Munget	Broome	Kimberley	REMS
Ngamakoon	Broome	Kimberley	REMS

Premises name	Local government area	Western Australian region	Infrastructure plan category
Nyah Nygah	Broome	Kimberley	REMS
Pender Bay	Broome	Kimberley	REMS
Rolah	Broome	Kimberley	REMS
Tappers Inlet	Broome	Kimberley	REMS
Wanamulnyndong	Broome	Kimberley	REMS
Bayulu	Derby-West Kimberley	Kimberley	REMS
Looma	Derby-West Kimberley	Kimberley	REMS
Wangkatjungka	Derby-West Kimberley	Kimberley	REMS
Djugerari	Derby-West Kimberley	Kimberley	REMS
Gillaroong	Derby-West Kimberley	Kimberley	REMS
Imintji	Derby-West Kimberley	Kimberley	REMS
Jimbalakudunj	Derby-West Kimberley	Kimberley	REMS
Joy Springs	Derby-West Kimberley	Kimberley	REMS
Kadjina	Derby-West Kimberley	Kimberley	REMS
Karnparrmi	Derby-West Kimberley	Kimberley	REMS
Koorabye	Derby-West Kimberley	Kimberley	REMS
Kupungarri	Derby-West Kimberley	Kimberley	REMS
Muludja	Derby-West Kimberley	Kimberley	REMS
Ngalingkadji	Derby-West Kimberley	Kimberley	REMS
Ngumpan	Derby-West Kimberley	Kimberley	REMS

Premises name	Local government area	Western Australian region	Infrastructure plan category
Ngurtuwarta	Derby-West Kimberley	Kimberley	REMS
Pandanus Park	Derby-West Kimberley	Kimberley	REMS
Yakanarra	Derby-West Kimberley	Kimberley	REMS
Bidan (Bedunburra)	Derby-West Kimberley	Kimberley	REMS
Biridu	Derby-West Kimberley	Kimberley	REMS
Galamanda	Derby-West Kimberley	Kimberley	REMS
Galeru Gorge	Derby-West Kimberley	Kimberley	REMS
Mingalkala	Derby-West Kimberley	Kimberley	REMS
Warralong	East Pilbara	Pilbara	REMS
Ringer Soak	Halls Creek	Kimberley	REMS
Ganinyi	Halls Creek	Kimberley	REMS
Girriyoowa	Halls Creek	Kimberley	REMS
Kupartiya	Halls Creek	Kimberley	REMS
Moongardie	Halls Creek	Kimberley	REMS
Yiyili	Halls Creek	Kimberley	REMS
Bawoorrooga	Halls Creek	Kimberley	REMS
Mimbi	Halls Creek	Kimberley	REMS
Rb River Junction	Halls Creek	Kimberley	REMS
Tirralintji	Halls Creek	Kimberley	REMS
Yulumbu	Halls Creek	Kimberley	REMS
Yulga Jinna	Meekatharra	Mid West	REMS
Wandanooka	Mullewa	Mid West	REMS
Pia Wadjari	Murchison	Mid West	REMS

Premises name	Local government area	Western Australian region	Infrastructure plan category
Blackstone	Ngaanyatjarraku	Goldfields	REMS
Jameson	Ngaanyatjarraku	Goldfields	REMS
Wannarn	Ngaanyatjarraku	Goldfields	REMS
Warakurna	Ngaanyatjarraku	Goldfields	REMS
Warburton	Ngaanyatjarraku	Goldfields	REMS
Wingellina	Ngaanyatjarraku	Goldfields	REMS
Marta Marta	Port Hedland	Pilbara	REMS
Punju Njamal	Port Hedland	Pilbara	REMS
Yandeyarra	Port Hedland	Pilbara	REMS
Jinparinya	Port Hedland	Pilbara	REMS
Mingalatharndoo	Roebourne	Pilbara	REMS
Weymul	Roebourne	Pilbara	REMS
Burringurrah	Upper Gascoyne	Gascoyne	REMS
Kutkububba	Wiluna	Mid West	REMS
Windidda	Wiluna	Mid West	REMS
Kalumburu	Wyndham-East Kimberley	Kimberley	REMS
Dodnun	Wyndham-East Kimberley	Kimberley	REMS
Doon Doon	Wyndham-East Kimberley	Kimberley	REMS
Guda Guda	Wyndham-East Kimberley	Kimberley	REMS
Ngallagunda	Wyndham-East Kimberley	Kimberley	REMS
Cockatoo Springs	Wyndham-East Kimberley	Kimberley	REMS
Emu Creek	Wyndham-East Kimberley	Kimberley	REMS
Four Mile	Wyndham-East Kimberley	Kimberley	REMS

Premises name	Local government area	Western Australian region	Infrastructure plan category
Garlburang	Wyndham-East Kimberley	Kimberley	REMS
Geboowama	Wyndham-East Kimberley	Kimberley	REMS
Jimbilum	Wyndham-East Kimberley	Kimberley	REMS
Kandiwal	Wyndham-East Kimberley	Kimberley	REMS
Molly Springs	Wyndham-East Kimberley	Kimberley	REMS
Munthanmar	Wyndham-East Kimberley	Kimberley	REMS
Ribinyung Dawang (Mud Springs)	Wyndham-East Kimberley	Kimberley	REMS
Woolerregerberleng	Wyndham-East Kimberley	Kimberley	REMS
Yirralalem	Wyndham-East Kimberley	Kimberley	REMS
Processing Site Asphalt Recyclers Australia Pty Ltd	Swan	Metro	C&D recovery facility
Processing Site Asphalt Recyclers Australia Pty Ltd	Swan	Metro	C&D recovery facility
Remondis Osborne Park	Stirling	Metro	MRF
BGC Hazelmere Industrial Complex	Swan	Metro	C&D recovery facility
Bencubbin Refuse Disposal Site	Mount Marshall	Wheatbelt	Putrescible landfill
Popanyinning Waste Management Facility	Cuballing	Wheatbelt	Putrescible landfill
Brajkovich Salvage Yard	Swan	Metro	C&D recovery facility
Gemec Environmental Consultants		Mid West	Inert landfill
GoGo Station Inert Landfill		Kimberley	Inert landfill
Sandy Ridge		Goldfields	Class IV disposal facility
Sandy Ridge		Goldfields	Class V disposal facility

Premises name	Local government area	Western Australian region	Infrastructure plan category
Chairay Sustainable Plastic Company		Metro	Plastic recovery facility
Complete Tyre Solutions		Unspecified	Rubber/tyre recovery facility
D&M Waste Management	Karratha	Pilbara	Plastic recovery facility
D&M Waste Management		Metro	Plastic recovery facility
Great Southern Landfill		Wheatbelt	Putrescible landfill
Kariyarra - Tyrecycle	Port Hedland	Pilbara	Rubber/tyre recovery facility
Pact Group Holdings & Cleanaway		Metro	Plastic recovery facility
Suez Pulp Mill		Metro	Cardboard paper recovery facility
Tyrecycle		Metro	Rubber/tyre recovery facility

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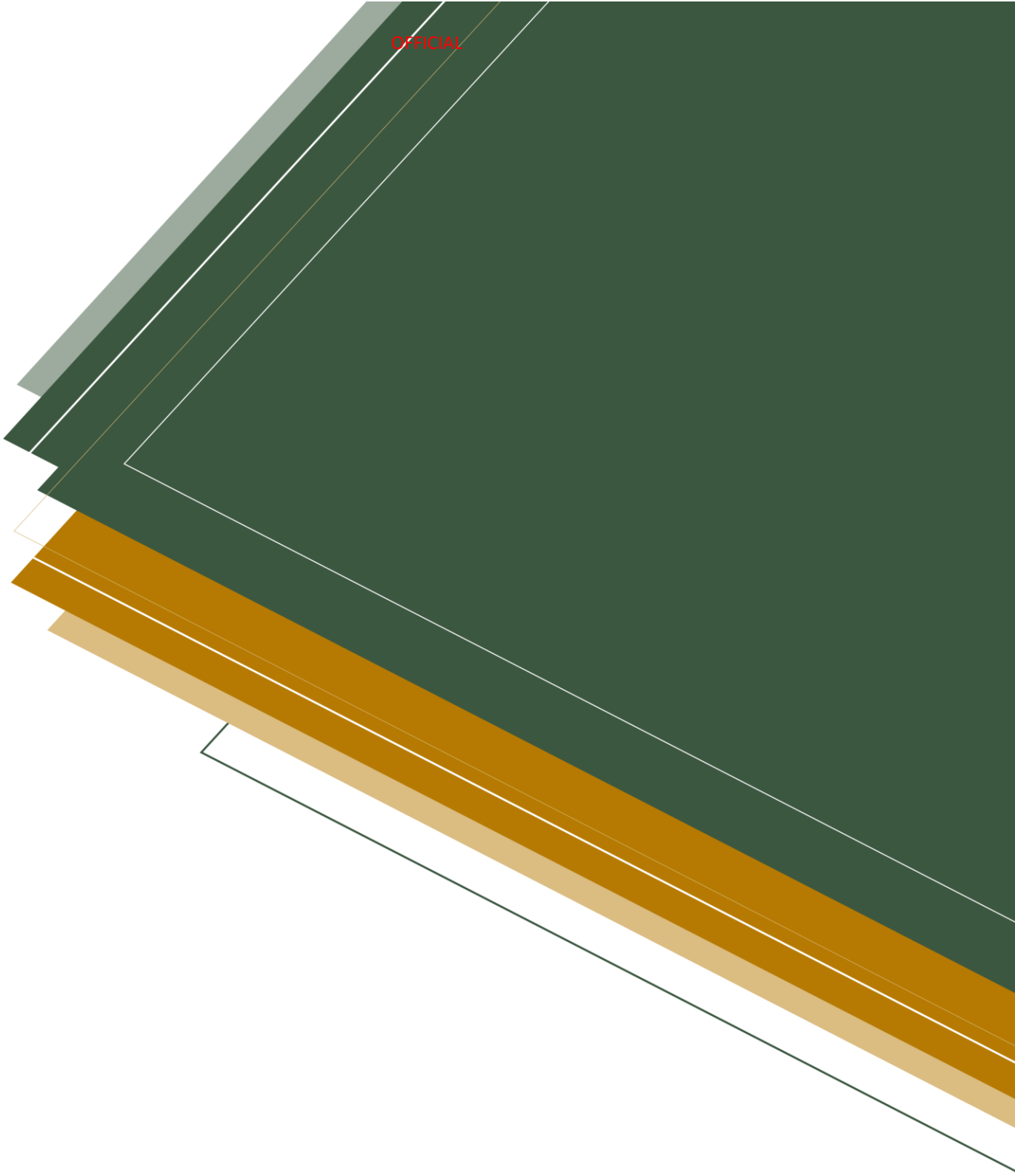

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