



CENTRE OF
DECOMMISSIONING
AUSTRALIA

Understanding the Opportunity for Local Disposal and Recycling Pathways

Executive Summary

October 2022



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Introduction —

Australia's oil and gas industry has been operating for decades and an increasing degree of infrastructure is approaching the end of its productive life. CODA was established as a joint initiative between NERA (National Energy Resources Australia) and BHP Petroleum, Chevron Australia, Esso Australia, Santos, Vermillion and Woodside to deliver a transformational approach to late-life asset planning and decommissioning execution. To provide long term support to the growth of Australia's decommissioning sector CODA registered as an independent not for profit in late 2021.

In 2021, CODA sanctioned three projects to establish a foundation understanding of opportunities for collaboration, innovation, and efficiency in decommissioning that support the CODA objectives. These projects are:

1. Understanding the opportunity for local disposal and recycling pathways;
2. A global review of decommissioning planning and execution of learnings; and
3. Development of a decommissioning innovation and technology roadmap.

This report summarises the outcomes of the Understanding the opportunity for local disposal and recycling pathways Project.

This work seeks to assess local disposal and recycling pathways for decommissioning the Australian oil and gas offshore inventory. The study is centred on three objectives:

1. **Assess the decommissioning 'demand'.** Develop an inventory of the typologies and quantities of the equipment and materials requiring disposal.
2. **Assess the Australian disposal 'supply'.** Understand the existing waste disposal and recycling facilities, capability and capacity along with potential growth opportunities.
3. **Evaluate the feasibility of a 100% local disposal solution or, alternatively, maximise in-country solutions.** Consolidate 'supply' and 'demand' to identify gaps and develop intervention strategies for further implementation.

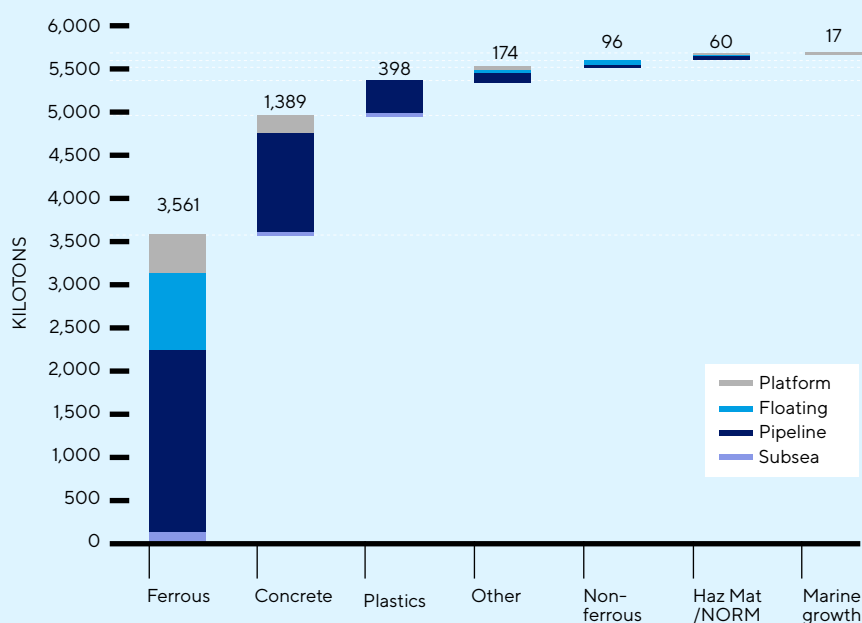


Figure 1 | Material inventory by typology

Demand assessment

A material inventory estimate was developed using norms from other jurisdictions based on delivered projects (e.g. North Sea). The inventory was organised by material types, location and phasing of the operations to determine a realistic, workable estimate of the quantities to be disposed over time.

It was estimated that there are approximately 5,695 kilotons of decommissioning material that will require disposal on the base case premise of full removal of all infrastructure. The inventory is dominated by steel (3,560 kilotons) and concrete (1,390 kilotons). 67% of the disposal mass (3,800 kilotons) comes from removal of the pipeline infrastructure, specifically gas export trunklines and intrafield pipelines.

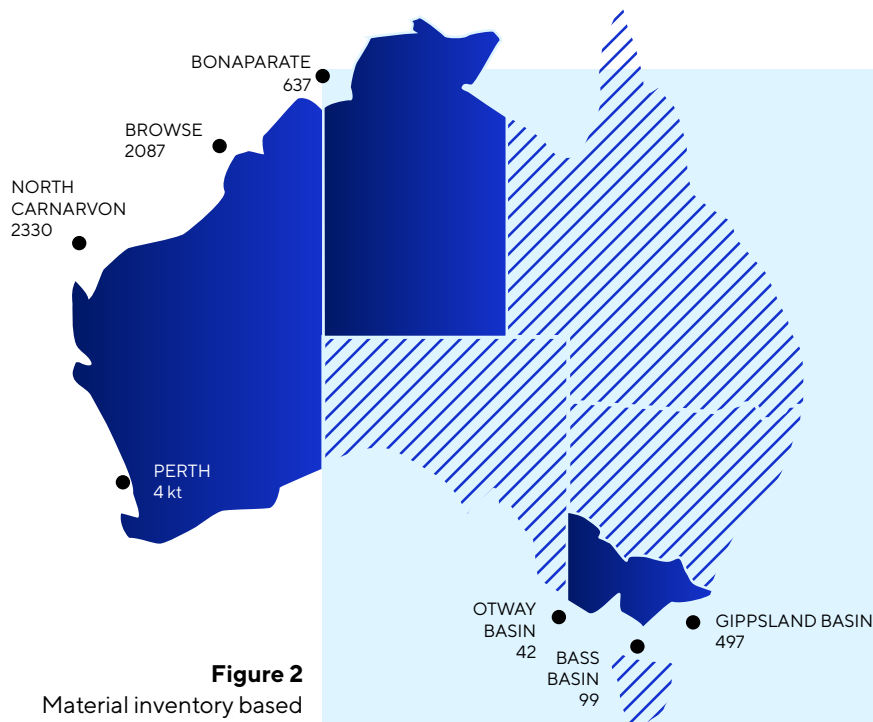


Figure 2
Material inventory based on location (kilotons)

Demand is led by WA (89% of total mass) across three key basins (Northern Carnarvon, Browse and Bonaparte), followed by VIC (Gippsland, 9% of total mass).

WA accounts for 92% of the pipeline disposal mass and 100% of the floating facilities.

The disposal demand volume may be greatly reduced should in-situ decommissioning alternatives be accepted for specific facility components such as export pipeline or concrete structures.

It is estimated that a receiving capacity of approximately 600 kilotons every 5 years (or 120 kilotons per annum) will be required to dispose the entire offshore material inventory. This was determined using the CODA's decommissioning project timeline determined during the 2020 Decommissioning Liability study¹ based upon Operator's input. This estimate is to be considered only indicative being based on a preliminary project phasing and excludes peaks in 2030 and 2060. These peaks relate to the removal of the major pipelines, such as the gas export trunklines associated to the onshore Liquefied Natural Gas (LNG) plants and the intrafield pipelines.

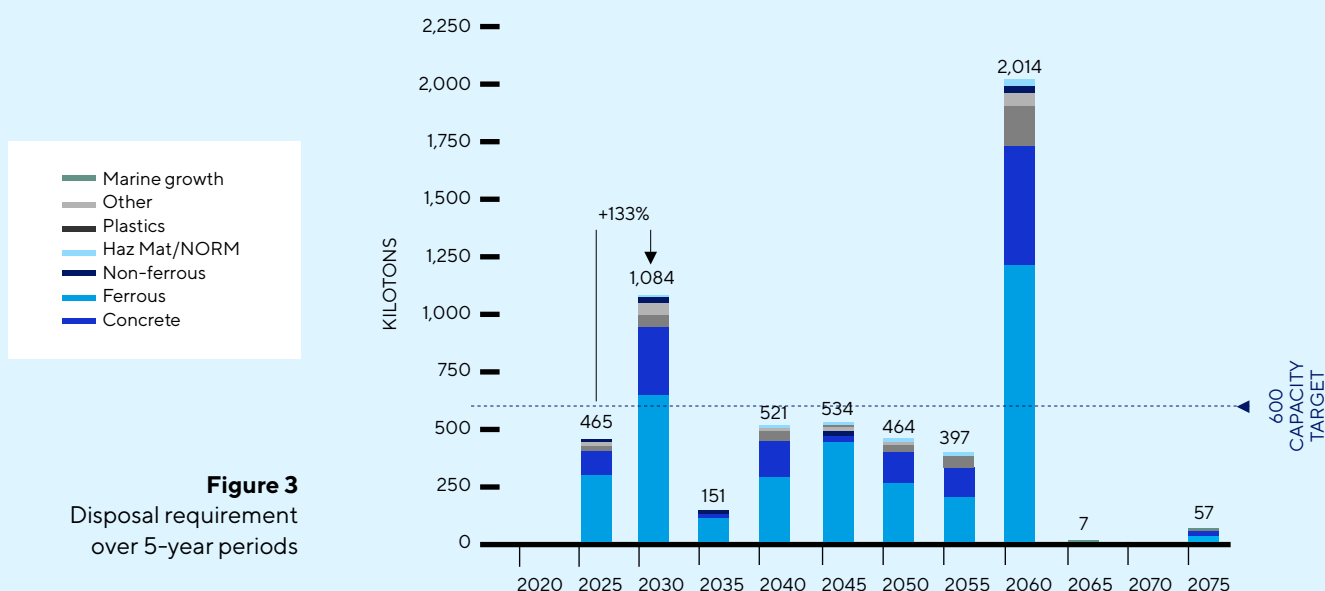


Figure 3
Disposal requirement over 5-year periods

¹ <https://www.decommissioning.org.au/our-studies/offshore-oil-and-gas-decommissioning-liability-australia/>

Supply assessment

A market engagement process was conducted to assess the capability and capacity of the domestic disposal value chain and understand its ability to meet the demand related to the decommissioning of the offshore oil and gas infrastructure. The process spanned across four-months and relied on an online questionnaire addressing:

- Disposal capability and capacity in Australia; and
- Market sentiment towards offshore decommissioning.

The engagement was based on the contribution of 35 companies out of the 64 initially identified, providing a representative and balanced respondents’ basket. This included international and local companies with established disposal facilities in Australia or with a demonstrated interest in investing in Australia. The questionnaire response rate of 55% is reflective of a strong interest in the offshore decommissioning.

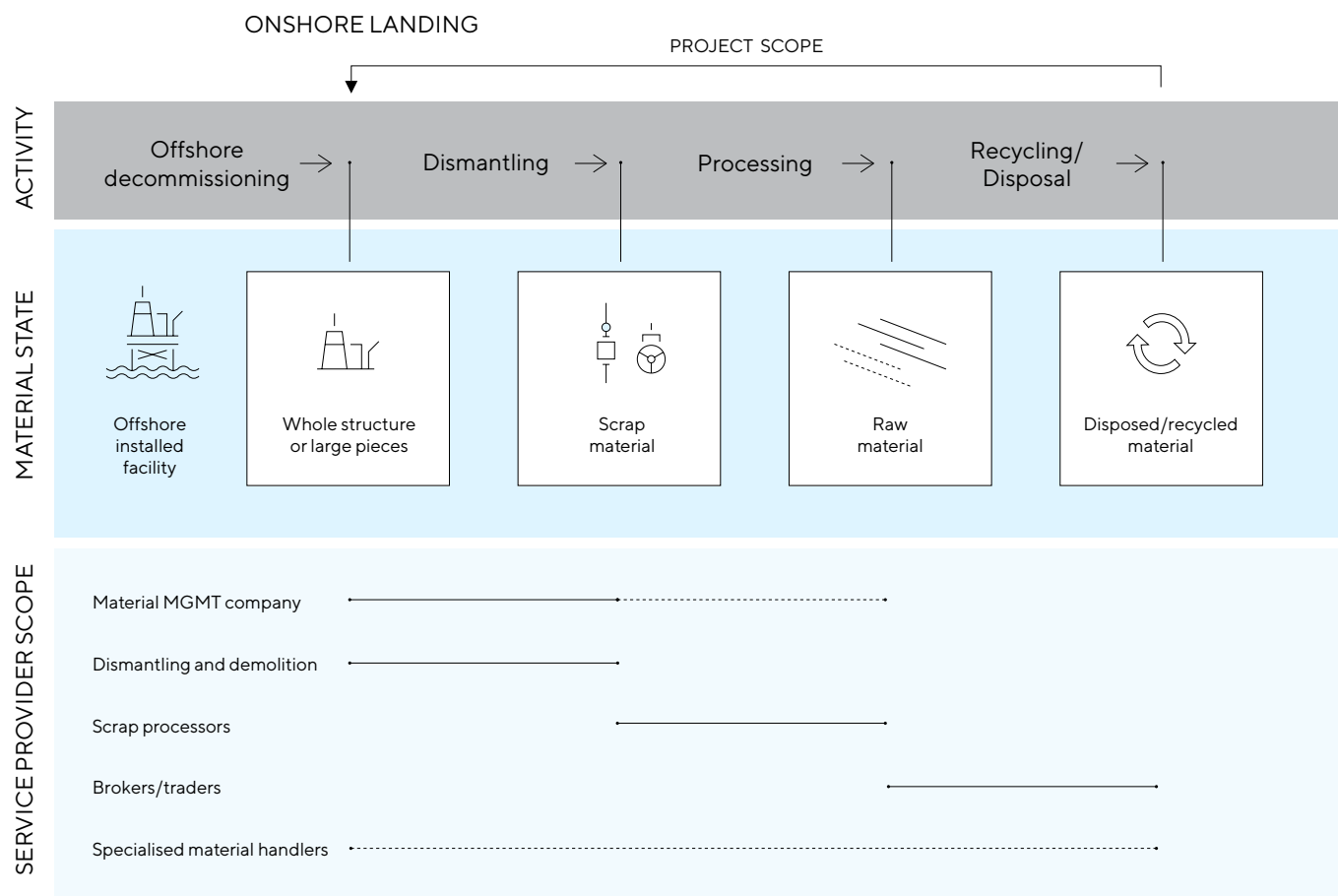


Figure 4 I Disposal value chain

Capability and capacity results are presented below through dashboards (Figures 5, 6 & 7) by disposal phase: dismantling, processing and recycling/disposal and further analysed by region: Western (WA and NT) and Eastern (SA, VIC, NSW and QLD).

KEY STATS

27

Facilities

1.2M_{TPA}

Capacity

1.4M_{M2}

Footprint

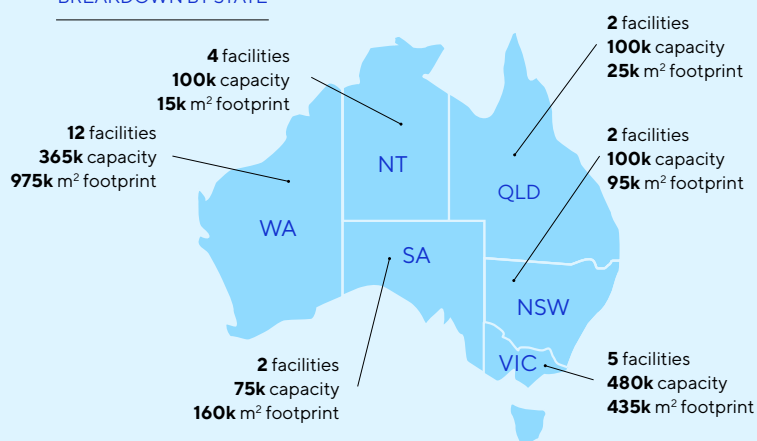
MATERIALS ACCEPTED

100% Ferrous
100% Non-Ferrous
85% Concrete
85% Plastic
81% Hazmat/Norms
19% Other

MATERIALS MEANS OF IMPORT

78% Road/Truck
30% Quayside/ Ship
7% Dry dock

BREAKDOWN BY STATE



OWNERSHIP

55% OWNED AND OPERATED, **15%** OPERATED IN PARTNERSHIP, **30%** SUBCONTRACTED OR OTHER

Figure 5 | Dismantling dashboard

KEY STATS

38

Facilities

4.1M_{TPA}

Capacity

1.2M_{M2}

Footprint

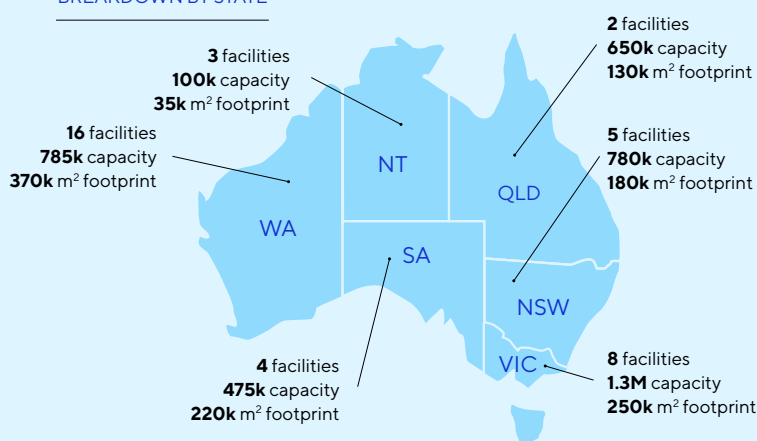
MATERIALS ACCEPTED

92% Ferrous
86% Non-Ferrous
41% Concrete
51% Plastic
51% Hazmat/Norms
5% Other

MATERIALS MEANS OF IMPORT

97% Road/Truck
5% Quayside/ Ship
3% Dry dock

BREAKDOWN BY STATE



OWNERSHIP

92% OWNED AND OPERATED, **8%** OPERATED IN PARTNERSHIP, **0%** SUBCONTRACTED OR OTHER

Figure 6 | Processing dashboard

KEY STATS

23

Facilities

2.1M_{TPA}

Capacity

1.0M_{M2}

Footprint

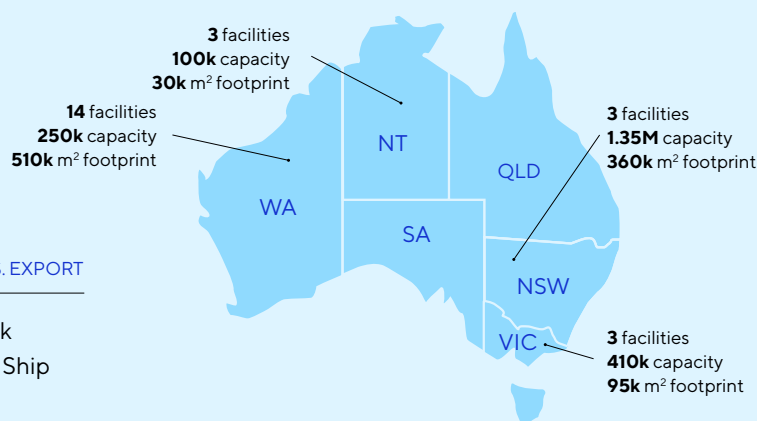
MATERIALS ACCEPTED

87% Ferrous
83% Non-Ferrous
52% Concrete
30% Plastic
43% Hazmat/Norms
9% Other

MATERIALS MEANS OF IMPORT VS. EXPORT

87% vs. 91% Road/Truck
22% vs. 17% Quayside/ Ship
13% vs. 9% Other

BREAKDOWN BY STATE



OWNERSHIP

70% OWNED AND OPERATED, **21%** OPERATED IN PARTNERSHIP, **9%** LEASED OR OTHER

Figure 7 | Recycling/disposal dashboard



Gap analysis

Processing capacity dominates the disposal service offering. The governing execution model is based on domestic dismantling and processing with most of the recycling assumed to be occurring abroad. Large structures are currently dismantled directly in field, i.e. in their respective installed location, rather than in dedicated facilities. This approach won't be suitable for offshore facilities. Key figures:

- The domestic dismantling capacity is 1.2 mtpa across 27 facilities and 11 service providers. WA and VIC facilities have strategic locations nearby the major offshore basins, with limited facilities offering quayside access.
- The processing capacity is 4.1 mtpa across 38 facilities and 17 service providers. The majority (78%) is located in the eastern states. Market is dominated by two contractors which hold over 60% of the total domestic processing capacity.
- The recycling/disposal capacity is 2.1 mtpa across 23 facilities and 12 service providers. Recycling capacity is considerably low in WA being only 32% of the State's processing capacity.

The questionnaire also appraised the market sentiment regarding the offshore disposal opportunity and associated future investment plans. Key outcomes are:

- Service providers showed confidence that most of the disposal work will be performed domestically.
- Major infrastructure gaps are around dismantling and specialist services such as Naturally-Occurring Radioactive Materials (NORMs) and other hazardous materials.
- There is an absence of prime contractors offering integrated decommissioning turnkey capability.
- 80% of respondents have plans to grow their footprint in Australia.
- Few respondents valued partnerships or the development of centralised, multi-contractor facilities.
- A guaranteed disposal work stream is seen as the strongest enabler to drive investment decisions.

The relationship between the decommissioning annual demand (total 160 kilotons per annum) and the total capacity (>1 mtpa) would suggest that the disposal of the offshore infrastructure could be managed domestically. However, the following considerations apply:

- The assessed capacity represents the total available capacity; the survey did not address the facilities utilisation and spare ullage.
- In the Western region, where the majority of the offshore infrastructure resides, the offshore disposal demand represents 30% of the total dismantling capacity and 40% of the total recycling capacity.
- The ability of the assessed dismantling facilities to receive and handle large offshore infrastructure (e.g. 5,000+ tons topsides, large jackets, floaters) is unproven. Limited facilities offer sea access.
- Finally, this analysis excludes the onshore infrastructure tonnage which will likely overlap with the offshore demand, further tightening the supply / demand gap.

A scenario mapping exercise was performed based on a Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis. The spectrum of potential disposal solutions related to the Australian offshore decommissioning ranges as follows:

- 100% abroad disposal (dismantling, processing and recycling)
- Domestic dismantling and shared processing / recycling, majority executed abroad
- Domestic dismantling and shared processing / recycling, majority executed domestically
- 100% domestic disposal (dismantling, processing and recycling).

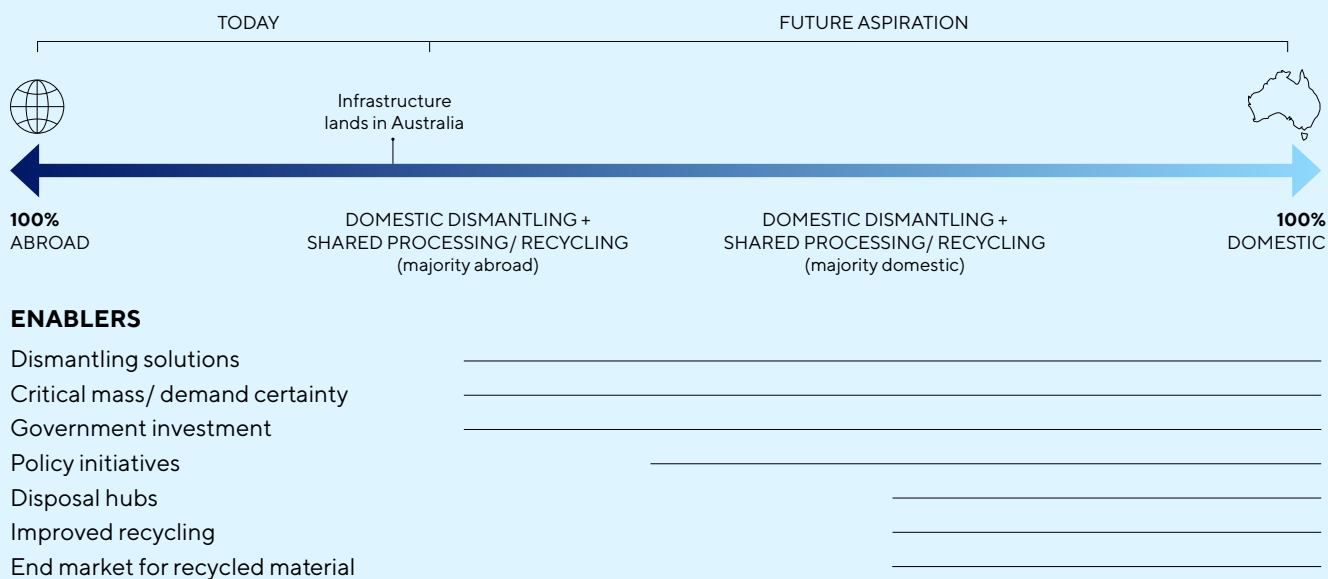


Figure 8 | Disposal scenarios

Today's industry is still leaning on overseas solutions, with limited cases of small infrastructure dismantled domestically prior to export for recycling. A shift to more domestically focused solutions relies on the following key enablers:

- **Dismantling facilities suited to accept offshore structures:** these are essential to trigger any domestic disposal opportunities allowing infrastructure to land in Australia and maximise use of the existing domestic processing and recycling plants.
- **'Critical mass' workload by project clustering:** development of a 'suitably sized' project base to set off dedicated decommissioning offerings, including disposal.
- **Government investment and policy initiatives** aimed at stimulating the market and improve the competitiveness of the domestic disposal offering.



Way forward

The path to a domestic disposal solution requires time and initiatives of various nature. This study is a first step to frame the disposal challenge and determine a path to an Australian-led alternative. The following activities are recommended as a follow-on:

- Deep dive analysis of the port import facilities to understand current constraints as well as potential upgrade or expansion opportunities.
- Develop decommissioning project case studies based on diverse and distinct offshore infrastructure to assess disposal solutions in detail through transparent engagement with selected service providers.
- Evaluate the disposal cost base across the value chain (i.e. dismantling, processing and recycling) for competitiveness considering the transport saving benefits against an overseas solution.
- Gap assessment between domestic regulation and OECD to determine potential barriers to a domestic disposal aspiration considering potential legislation changes and their effects.
- Establish a disposal contractor forum to facilitate systematic industry engagement.
- Develop and maintain a decommissioning project timeline with industry support to identify future project critical mass.
- Market analysis of specialist recycling and disposal facilities, e.g. NORMs, hazardous materials and plastics.
- Advocate research and development on disposal solutions for specific materials, e.g. plastics or NORMs.

CODA will build on this report to explore questions and opportunities associated with the type of facilities and support services required for different waste streams. Understanding that different infrastructure types have different waste management needs is key for Government and the market, noting that the waste profile will change over time based on decommissioning plans. Consideration should be given to what these facilities look like and what capability is required.

Further reading

Executive summaries of the accompanying reports in this series as well as other CODA materials can be accessed via the CODA website at www.decommissioning.org.au.

The full version of this report as well as the other reports in the series is available to CODA partner members. To find out more email contact@decommissioning.org.au or visit the CODA website at www.decommissioning.org.au