



Australian Government
Department of Industry,
Science and Resources

Australia's Offshore Resources Decommissioning Roadmap

December 2024

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Acknowledgement of Country

Australia's Offshore Resources Decommissioning Roadmap was developed on Aboriginal and Torres Strait Islander lands. We pay our respects to First Nations peoples, their elders and ancestors who have and always will care for our land, seas, waterways, and communities. First Nations people are custodians of the lands and waters where decommissioning activities may take place.

The Australian Government is committed to improving how First Nations people can be heard and represented in decisions that impact them.

We thank First Nations people for their ongoing guardianship and commitment to the Country that we live and work on today.

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December 2024

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The purpose of this publication is to outline the Australian Government's approach to grow an Australian decommissioning industry.

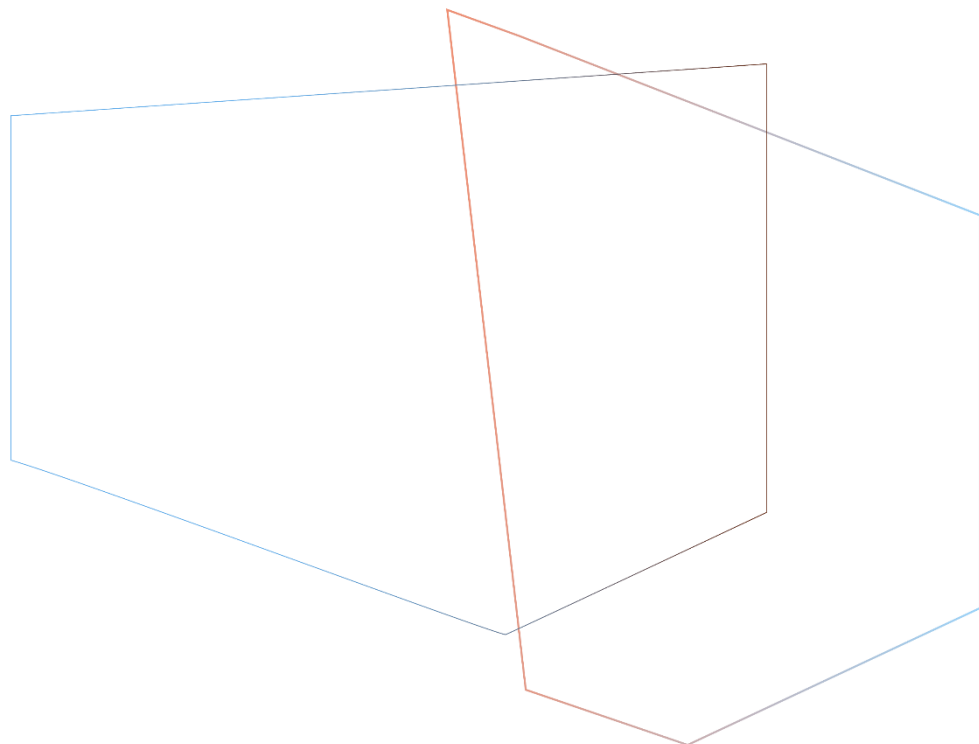
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Minister's foreword

Australia's offshore resources decommissioning roadmap outlines the Albanese Government's plan to position Australia as a leading jurisdiction for the decommissioning of our offshore energy infrastructure. A competitive offshore decommissioning industry that invests in sustainable jobs, and is backed by strong environmental, social and governance protections, will help support a Future Made in Australia.

The resources and energy industry will spend an estimated \$60 billion to decommission offshore oil and gas infrastructure over the next 5 decades. This figure will grow as Australia builds our offshore wind industry.

This roadmap sets out a path for Australia to:

- maximise the amount of decommissioning activity that happens domestically
- improve the efficiency and transparency of planned decommissioning activities
- grow Australia's industrial capability in decommissioning and materials management
- create safe, high-quality jobs to service a growing decommissioning industry, and
- ensure that industry undertakes its decommissioning obligations in a timely, safe, and environmentally responsible way.

This roadmap provides a pathway for Australian governments, industry, unions, workers, and the community to scale up a local decommissioning industry together—one that maximises benefits for the Australian economy and our environment.

An Australian decommissioning industry can be part of our economic transformation as we move to net zero. It can support new jobs for our skilled offshore workforce and attract new investment for Australian businesses. It can also grow domestic industrial capabilities while supporting the circular economy. This industry will play a key role in the continued protection of our marine environment by ensuring Australia continues to meet the robust environmental standards under Australian and international law.

The foundations of an Australian decommissioning industry have been laid. We have the skills and expertise to underpin a world-class decommissioning industry, backed by strong regulatory settings.

Part of the Australian Government's approach to decommissioning is to establish an Offshore Decommissioning Directorate. The directorate will work with industry, research institutions, the workforce, First Nations groups, unions, and local communities to:

- encourage collaboration between all levels of government, international jurisdictions, and organisations involved in decommissioning
- improve transparency across the decommissioning pipeline to help businesses plan their investment decisions
- be a trusted partner and advisor on decommissioning policy matters that cut across governments, the industry, and the broader supply chain
- further strengthen our regulatory frameworks to give the community confidence that decommissioning will always remain the responsibility of the offshore industry, and
- ensure that decommissioning industry activities complement the Australian Government's Future Made in Australia agenda.

The roadmap has been informed by extensive consultation. I would like to recognise the significant contribution by all that helped to develop this roadmap. I look forward to continuing to work closely with the community to realise Australia's offshore decommissioning potential.

The Hon Madeleine King MP

Minister for Resources and Minister for Northern Australia



Australia's Offshore Resources Decommissioning Roadmap

Decommissioning is the final stage in the offshore energy production lifecycle. As offshore facilities reach the end of their productive life, the leftover infrastructure must be stripped apart and removed. The estimated cost to decommission these facilities is \$60 billion over the next 5 decades (Wood Mackenzie 2020). A small number of decommissioning projects have been completed in the past 20 years. However, the volume of future decommissioning activity is expected to increase significantly in the next 30 years. Some of the infrastructure in the Gippsland Basin offshore Victoria will be the first to be decommissioned this decade.

This roadmap is the Australian Government's plan to create an efficient and sustainable domestic decommissioning industry. The roadmap is intended to be an enduring framework to guide future policy decisions. It will ensure that we maximise the national benefits to the Australian community from planned offshore decommissioning activity.

CSIRO estimates the decommissioning and resource recovery value chain could create more than 3,500 new jobs. It can draw on the existing skills and expertise of our offshore resources sector workforce (CSIRO 2024a). A strong decommissioning industry will also create more opportunities in regional areas and attract new investment for Australian businesses.

Australia can build on our existing strengths to underpin an efficient, competitive, and sustainable decommissioning industry. Our strengths include:

- an educated workforce with strong engineering and science skills that can address challenges in the initial planning, preparation, and coordination stages for large-scale decommissioning projects
- existing metal and concrete recycling facilities that can scrap and recycle offshore material
- a skilled offshore resources sector workforce that can help to scale up a domestic decommissioning industry as the oil and gas sector moves towards the energy transition.

A safe and environmentally responsible industry

An Australian decommissioning industry is an opportunity to both embed circular economy principles across our onshore and offshore industries and to reduce our emissions.

The offshore resources industry has environmental and legal obligations under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act). This includes when oil and gas projects reach the end of production. These obligations require companies to remove property and restore the environment in a timely, safe and environmentally responsible way.

Australia's legislative and regulatory requirements ensure that any risks to the marine environment and marine users are appropriately regulated and compliant with our international obligations. Offshore resources companies must plan and provide for the removal of all property unless alternative arrangements are approved by the regulator. The roadmap does not change these policy settings and industry must continue to ensure it meets all decommissioning obligations in full.

The role for government

A national roadmap is needed to seize the estimated \$60 billion economic opportunity.

This roadmap outlines steps the Australian Government will take to coordinate, guide policy and set clear regulatory expectations to underpin a successful Australian decommissioning industry.

Many industry stakeholders across the decommissioning supply chain have told us that individual companies alone cannot overcome barriers to create an efficient and effective decommissioning industry. This accords with the experience of comparable countries with established decommissioning industries like the United Kingdom (UK) and Norway.

To implement the national roadmap, a dedicated Offshore Decommissioning Directorate will be established within the Department of Industry, Science and Resources. The directorate will work with industry, unions, state and territory governments, First Nations groups, international organisations and local communities to help build an Australian decommissioning industry.

In an Australian context, the directorate will focus on the most pressing issues identified by stakeholders in the course of developing this national roadmap. This work will include facilitating cooperation between industry, the Australian Government, and state and territory governments to drive efficient decommissioning outcomes between companies. The directorate will also work across government to put in place necessary policies that maximise the contribution of decommissioning to the Australian economy.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) is responsible under the OPGGS Act for regulating safety and environmental approvals in Commonwealth waters to ensure best-practice safety and environmental outcomes are preserved. The directorate will work with NOPSEMA where there are opportunities to support and clarify regulatory processes.

The directorate will also work with industry and the community to develop a suite of regulatory and policy reforms. These reforms will help ensure the risks and liabilities of decommissioning offshore infrastructure remain the responsibility of industry.

Action areas

The Australian Government will implement the following overarching actions to support the development of an Australian offshore decommissioning industry:

1. Make decommissioning more efficient

- Establish intergovernmental agreements with state and territory governments to enhance cooperation between all levels of government on decommissioning policy.
- Develop an updated decommissioning cost estimate, a first step in benchmarking decommissioning costs, that will inform government priorities, support competition, efficiency, and innovation across the decommissioning value chain.
- Support coordination and planning with industry on upcoming decommissioning activity to create efficiencies and reduce costs without compromising environmental protections.

2. Improve visibility of the decommissioning pipeline and safeguard the marine environment

- Improve industry decommissioning reporting requirements and enhance transparency across the pipeline of decommissioning activity to help businesses plan investment decisions.
- Implement new guidance to improve regulatory certainty for the community and for industry, including guidance on the removal of offshore infrastructure.
- Develop rigorous financial assurance reforms to ensure industry prepares for decommissioning and to give the community confidence that industry is managing its decommissioning obligations responsibly.
- Continue to progress the review of Australia's offshore environmental management framework to ensure it is fit for purpose and reflects best practice. This work includes clarifying consultation requirements for offshore petroleum activities.
- Consider policy options to identify, monitor, and remediate plugged wells that are seeping.

3. Be a trusted partner and advisor to industry, communities and the workforce

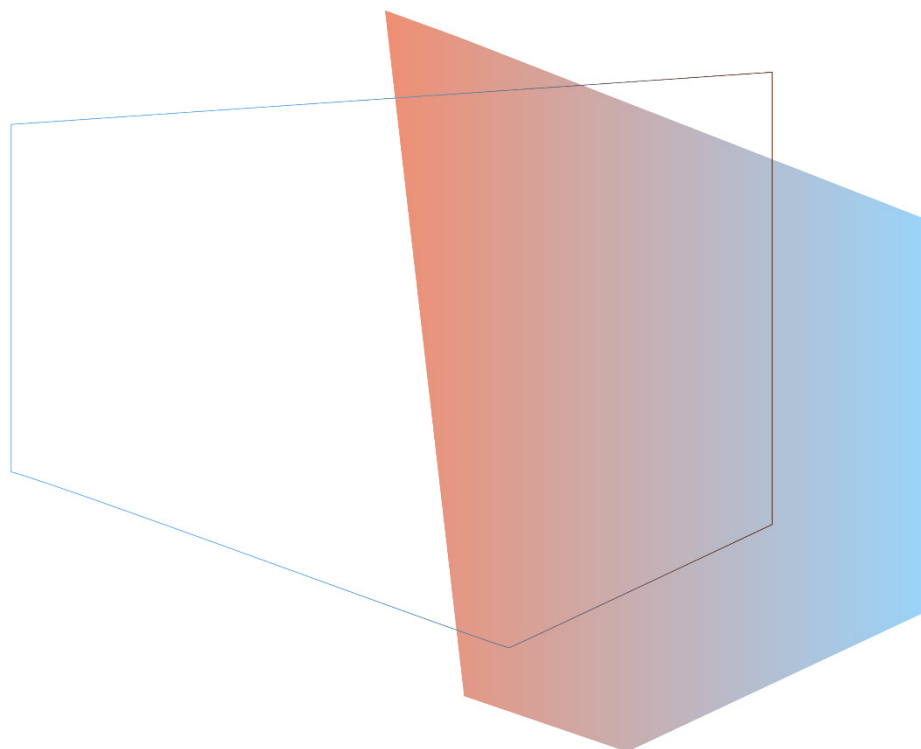
- Deepen engagement with advanced offshore decommissioning jurisdictions, including the UK and Norway, to ensure Australia emulates international best practice.
- Pursue an appropriate level of benefit sharing to ensure that First Nations groups and industry are partners in the transition to net zero.
- Coordinate with the Net Zero Economy Agency where decommissioning, as part of the net zero transformation, could benefit from more community engagement and participation.

4. Drive alignment between government programs to support an offshore decommissioning industry

- Support industry to connect with government funding bodies to ensure the decommissioning industry can identify financing opportunities to increase their participation across the entire supply chain.
- Ensure government-led decommissioning activity, such as the Northern Endeavour, prioritises investment opportunities and local content requirements for Australian businesses where possible.
- Work with the decommissioning industry to identify industry and government mechanisms to finance supporting infrastructure, where needed.
- Work with states and territories to link decommissioning industry participants with green metals manufacturers, and promote onshore value-adding opportunities for decommissioning offshore infrastructure.

5. Support a skilled, diverse and safe offshore decommissioning workforce

- Continue to review Australia's offshore safety frameworks to protect the work health and safety of workers in the offshore safety resources sector, including those working on offshore decommissioning.
- Work with unions, industry, and the local community, with state governments and with Jobs and Skills Councils to ensure a skilled workforce is developed to support a growing offshore decommissioning industry.



1. Understanding Australia's decommissioning value chain

Australia's decommissioning value chain spans both onshore and offshore activities. There are a wide range of different businesses involved in the many separate activities that make up the decommissioning value chain, including:

- planning, preparing, contracting, and securing the necessary approvals
- securely plugging oil and gas wells and removing hundreds of kilometres of pipelines and flow lines from the sea floor
- dismantling steel structures, with large production decks, embedded in the sea floor and removing floating oil and gas producing facilities and their anchors
- transporting these materials to ports and dismantling yards, recycling steel, plastics and other materials, and sorting, treating, and safely disposing of waste materials.

Value chain

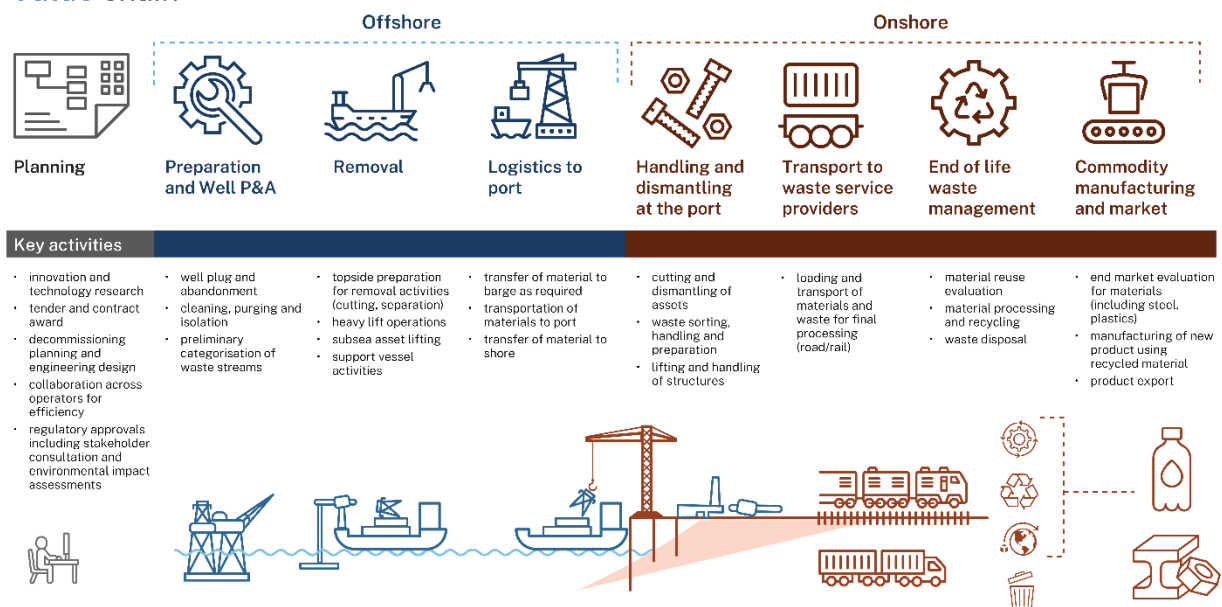


Figure 1: Australian offshore oil and gas decommissioning value chain (KPMG 2023)

Northern Territory and Western Australia



35
platforms



6,076 km
pipelines and
static umbilicals



483
subsea lifts



11
floating
facilities



120
flexible risers and
dynamic umbilicals



548
wells to be plugged
and abandoned

Victoria



22
platforms



2,089 km
pipelines and
umbilicals



52
subsea lifts



6
flexible risers and
dynamic umbilicals



460
wells to be plugged
and abandoned

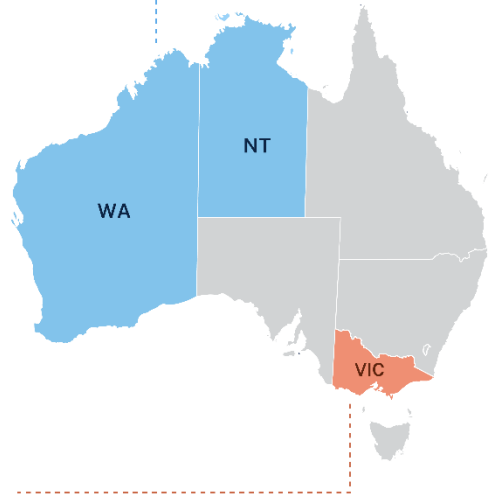


Figure 2: Australia’s offshore decommissioning landscape (NOPSEMA 2023a)

Eighty-nine per cent of the total mass of decommissioning projects will be offshore north of Western Australia. The Gippsland Basin in eastern Victoria has 9% of material to be decommissioned with the rest in the Otway and Bass Basins. There are also some pipelines and wells in waters offshore the Northern Territory. In the decades ahead, offshore wind infrastructure will also need to be maintained, replaced, and decommissioned as that industry scales up.

The Centre for Decommissioning Australia (CODA) estimates there is roughly 5,695 kilotons of offshore infrastructure that will need to be removed in Australia’s offshore areas. This is mostly steel and concrete (CODA 2022b). Australia’s offshore infrastructure to be decommissioned includes:

- 1,008 wells
- 57 fixed facilities (with supports to the seabed)
- 11 floating facilities (including floating, production, storage and offloading facilities)
- 4,960 km of pipelines (taking oil or gas from a production area to onshore processing or distribution areas)
- 1,700 km of flowlines (transferring oil, gas or other liquids in a production area)
- 1,500 km of static umbilicals (bundled tubes and cables for control services and production substances)
- 535 subsea structures (wellhead production systems and supporting subsea systems and equipment)
- 120 flexible risers and dynamic umbilicals (from subsea production areas to surface infrastructure) (CODA 2023).

The pipeline of decommissioning activity in Australia stretches out to 2060 and beyond, and will grow as the offshore wind industry scales up over time. Initially, the offshore Gippsland and North Carnarvon Basins will have decommissioning costs of around \$11 billion to 2032. Additional decommissioning peaks are expected in 2033–2037 and 2043–2047 as large projects reach the end of their productive life.

Potential decommissioning pipeline

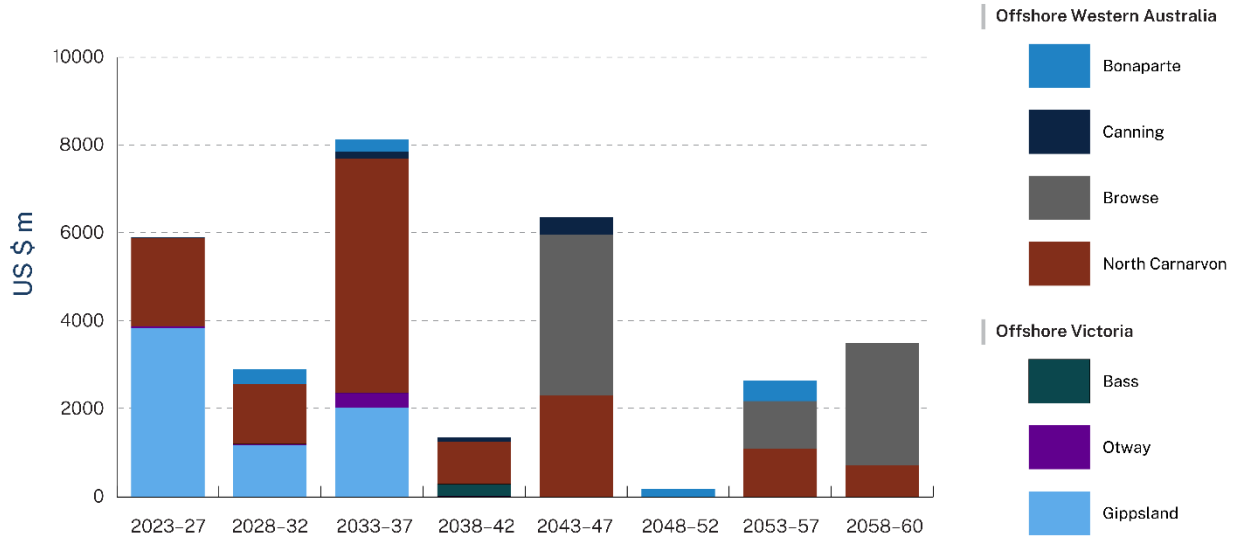


Figure 3: Potential decommissioning pipeline in Australia from 2023 to 2060 (Wood Mackenzie n.d.)

Spotlight: Northern Endeavour

The Northern Endeavour is a 274-metre floating production storage and offloading (FPSO) facility. The Australian Government took responsibility for the decommissioning of the Northern Endeavour after the liquidation of its owner. This includes associated Laminaria and Corallina oil fields in the Timor Sea, 550 km north-west of Darwin. The government is now the owner of the FPSO, all associated assets and is responsible for its safe disposal.

The Northern Endeavour is a large-scale decommissioning project in Australia where the government has direct responsibility for the activity. The onshore components of its decommissioning journey will, where possible, take place in Australia. This will help grow the local industry in advance of further industry decommissioning projects in the future.

The government is setting a best practice standard for decommissioning. Costs for the decommissioning of the Northern Endeavour are recovered from a levy on the oil and gas industry.

The government recognises that the decommissioning of the Northern Endeavour presents a unique opportunity. It allows for industry to work with the government on a project of strategic and environmental significance. Australian industry will play a major role in the plugging and abandonment of the wells and/or the removal and management of the subsea infrastructure in future phases of decommissioning. This includes the recycling process for decommissioning waste, while applying the principles of product stewardship and the circular economy.

The Northern Endeavour is a valuable learning experience for our regulatory regime. Important reforms in 2022 gave government greater oversight of companies looking to enter or leave the regime. They expanded the circumstances in which a former titleholder or related party could be called back to take responsibility for decommissioning.

2. Australia's strategic strengths and growth opportunities in decommissioning

Decommissioning is capital intensive and needs detailed planning and execution. Decommissioning activity also needs a range of specialist and often very large offshore vessels and rigs. As in other jurisdictions, most costs in a decommissioning project occur offshore. These costs include well plugging and abandonment as well as removing large offshore facilities, like jackets and topsides, from the marine environment (Norwegian Offshore Directorate 2019). To undertake this work, an experienced workforce, the right vessels available at the right time, and a culture of safety and environmental stewardship are needed.

Australia is well positioned to scale up a decommissioning industry because of the strength of our existing offshore industries. Upstream activities like planning and well plugging and abandonment are key strengths. Manoeuvring and installing large-scale offshore infrastructure, as well as operating safely and efficiently in the marine environment, are areas of competitive advantage.

In these areas, Australia can apply its already significant experience and expertise to support a sustainable decommissioning industry (KPMG 2023). Other areas represent opportunities to grow Australia's capabilities, such as through increased innovation in end-of-life material management.

Workforce

Australia has a skilled domestic workforce with extensive experience in the oil and gas industry. Research commissioned for this roadmap demonstrates the majority of the existing workforce can re-deploy and re-skill for decommissioning projects to support Australia's energy transition (CSIRO 2024a). However, it may be difficult to attract and keep a workforce due to competition with an emerging renewables sector (KPMG 2023).

Vessels

Australia is distant from most global decommissioning markets where there are vessels and specialty equipment (KPMG 2023). Australia does not host the vessels for doing heavy decommissioning offshore and must import them. Local availability for heavy lift and specialist vessels is unlikely to be a strategic opportunity and can be best managed through importation and collaboration. However, there are opportunities for the domestic workforce to crew and support these activities (CSIRO 2024a). Our limited market for offshore decommissioning vessels at present makes it costly to bring these assets into Australian waters for uncoordinated campaigns or single decommissioning projects.

Infrastructure

Offshore decommissioning in Australia will be an inherently regional activity, with work clustered in south-east and north-west Australia. The south-east of Australia will also host significant offshore wind generation in future. Constructing offshore renewables could overlap with decommissioning and increase competition for infrastructure and capability, including ports, which requires careful management and coordination. There is no port perfect for all decommissioning activity types, which may necessitate modifications in future to service decommissioning demand.

Waste management and recycling

Australia has a domestic recycling industry that can play a major role in the waste management phase of offshore decommissioning. It also has a mature concrete recycling market that services the construction and demolition industries.

Australia’s recycling and waste management industries are generally well placed to manage decommissioned materials appropriately. However, there are some critical knowledge gaps that, if addressed, could improve outcomes. This includes innovation on the impact of contaminants on the environment and ecosystems, possibilities to develop new recycling pathways and technologies, and more efficient cleaning and waste management processes.

Reuse and repurposing of materials supports a circular economy, minimising carbon emissions. It can also supply materials to connected industries, for example, construction of offshore renewable energy infrastructure or use in other civil and construction projects.

Research capabilities

Australia has innovative products and technologies that can create an opportunity for global exports to other decommissioning markets. There is potential for Australia to be a significant contributor to the global decommissioning market by creating new innovative products and services (KPMG 2023). The offshore oil and gas industry is an active adopter of digital and emerging technologies that can reduce environmental impact and drive efficiencies. Industry is driving commercially viable innovations at early stages of the value chain. However, there is an opportunity for further innovation downstream in areas such as waste management, recycling, and environmental outcomes (ATSE 2024).

Australia’s strengths and growth opportunities

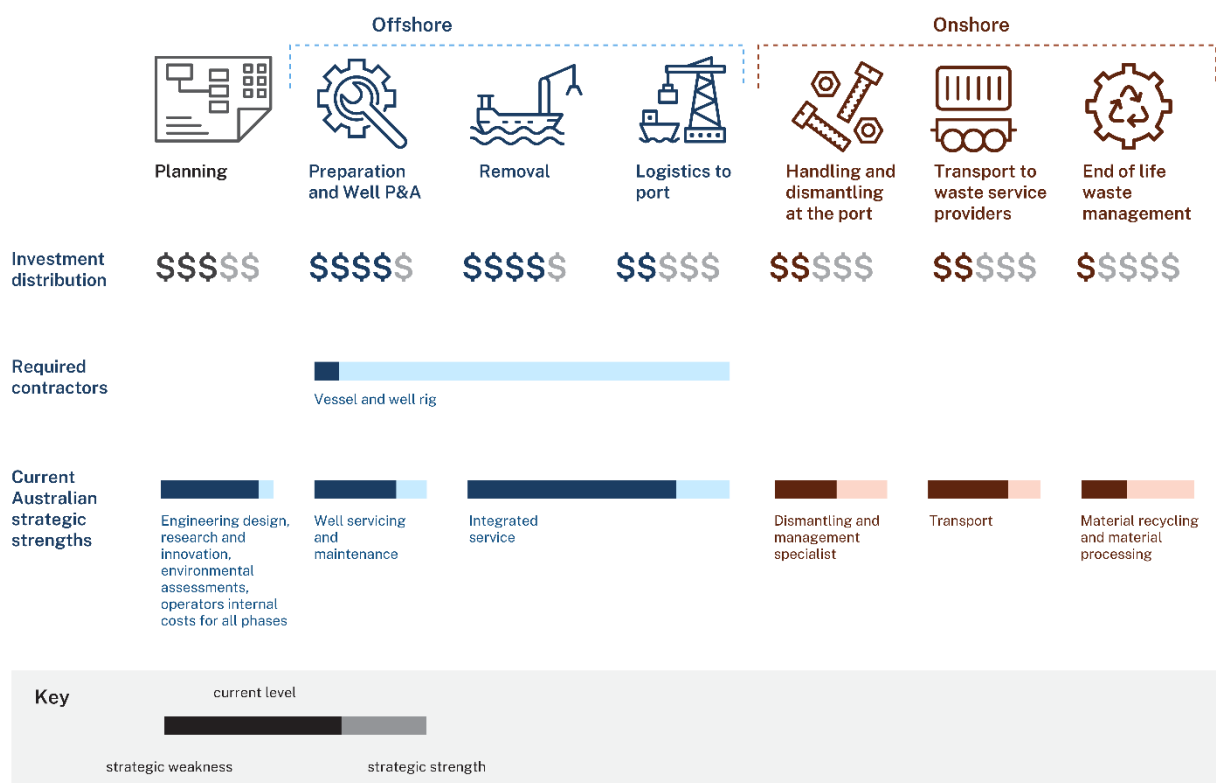


Figure 4: Australia’s strategic strengths and growth opportunities in decommissioning (KPMG 2023)

3. A regulatory framework to protect the environment and attract investment

Australia's legislation governing offshore petroleum and greenhouse gas storage activities is the OPGGS Act. It regulates exploration and recovery of petroleum activities and greenhouse gas storage activities in Commonwealth waters. Industry must ensure that all decommissioning activities are compliant with Australia's regulations. This includes early planning for decommissioning, and carrying out decommissioning activities in a timely, safe and environmentally responsible way.

The regulatory environment governing offshore decommissioning involves navigating many different pieces of federal and state legislation, and requirements under international law. Businesses participating in the decommissioning value chain therefore need to consider many different pieces of legislation that come into play when decommissioning.

Navigating regulatory complexity

The regulatory environment as it applies to decommissioning and downstream processing can be complex for companies that have not completed a decommissioning activity before.

Research commissioned to inform this roadmap shows that complexities in interpreting and complying with regulatory and legal requirements can create delays and more costs (CSIRO 2024a). For example, some infrastructure, such as pipelines, can cross jurisdictional boundaries from Commonwealth into state and territory waters. This can require multiple approvals in different jurisdictions.

This regulatory complexity bolsters the case for a coordination function within government to drive alignment and efficiency across the industry. Up until now Australia has lacked a holistic, end-to-end view of decommissioning including how it interacts with different jurisdictional needs.

In some circumstances, industry collaboration can generate efficiencies that lead to faster, more cost-effective decommissioning without compromising environmental and safety outcomes. There are examples where different operators have collaborated to bring heavy lift vessels from the Northern Hemisphere to Australia or collaborated on maintenance activities creating economies of scale. The Australian Competition and Consumer Commission (ACCC) can grant exemptions for behaviour that otherwise may breach competition law, where conduct does not substantially lessen competition or has a net public benefit.

First Nations regulatory impacts involve considering the *Native Title Act 1993*, along with Commonwealth and state and territory culture and heritage protection legislation, particularly if environmental risks might impact cultural and heritage sites. Industry must protect Indigenous cultural and intellectual property through all project stages.

Overview of regulation internationally and in Australia

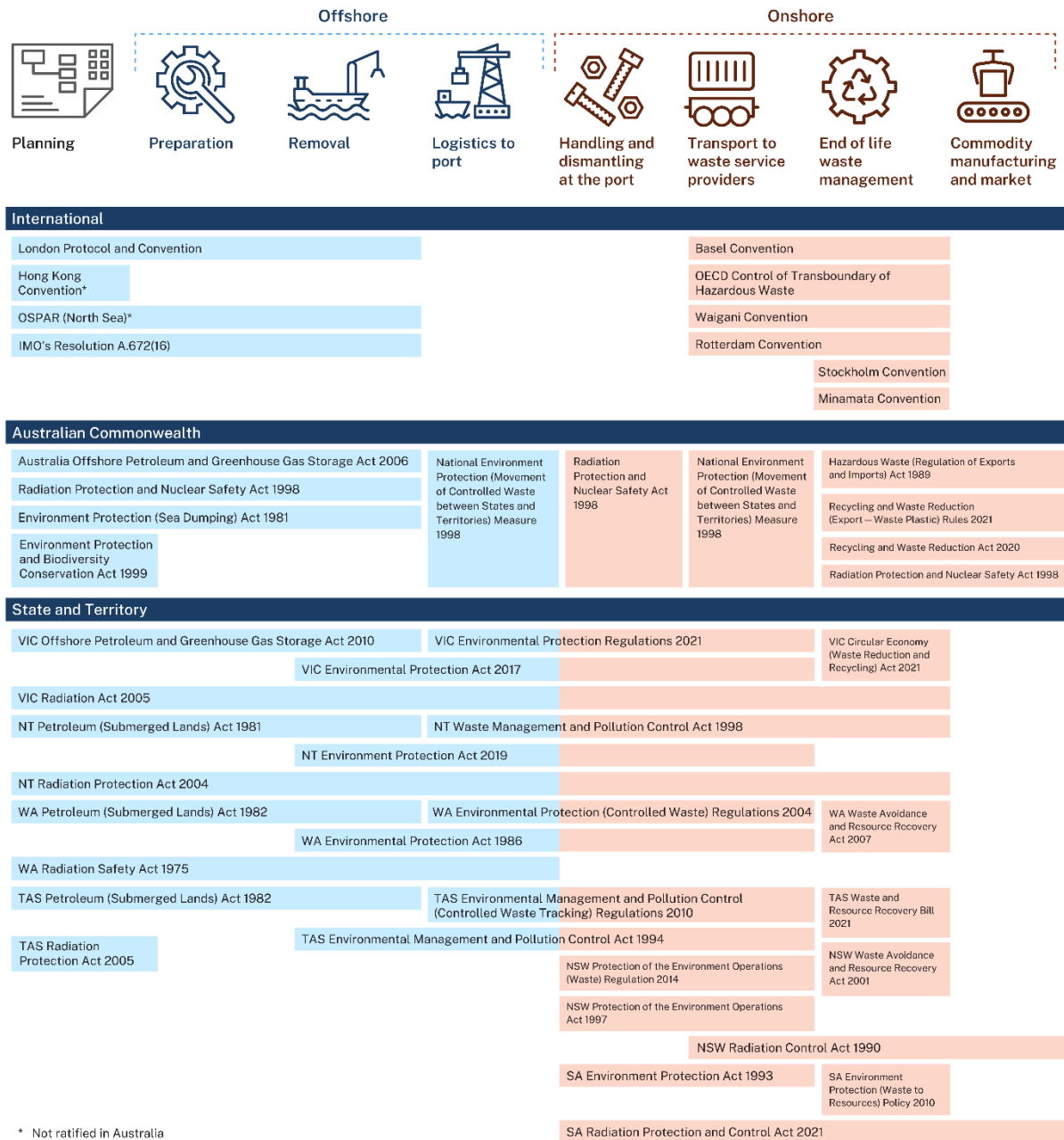


Figure 5: Overview of international, Commonwealth and state/territory laws and regulations across the decommissioning value chain (KPMG 2023)¹

Making our regulatory settings stronger

As decommissioning activity continues to increase, it is critical that all companies operating offshore have sufficient funds to meet the costs and liabilities of decommissioning oil and gas projects. The government is considering additional reforms to ensure that the oil and gas industry appropriately fund and execute their decommissioning obligations.

¹ Additional detailed regulatory mapping will occur in 2024–25.

NOPSEMA is responsible for regulating the plugging and abandonment of wells. NOPSEMA engage with titleholders to ensure this process is done appropriately, and that any environmental impacts are as low as reasonably practical. The government is working in collaboration with NOPSEMA and other relevant agencies to assess any risks posed by the rare occurrence of plugged and abandoned wells that may be seeping.

The government is considering what policy options are available to identify, monitor, and remediate any seeping plugged wells. This analysis will consider international learnings, best practice, and initiatives that could be further applied to the Australian regulatory regime. There will be robust engagement with stakeholders on any policy options considered.

The government is working to strengthen existing requirements for offshore decommissioning planning throughout a project's life, and to place financial assurance obligations on individual titleholders. These reforms will increase transparency across the decommissioning value chain and strengthen the government's ability to monitor the financial and operational health of offshore titleholders. The reforms will ensure that titleholders retain the financial capacity to meet their decommissioning obligations into the future as required under law. This is integral to social licence in the sector.

The government is also reviewing Australia's offshore environmental management framework. The review will recommend improvements to our offshore environmental management regime in Commonwealth waters. It will make sure the regime is fit for purpose in a decarbonising economy, reflects best practice for offshore environmental management, is consistent with reforms to our national environmental laws, and is consistent with Australia's international obligations for emissions and sustainable development.

Actions

To support a regulatory framework that helps protect the environment and attract investment in decommissioning the Australian Government will:

- continue to progress the review of Australia's offshore environmental management framework to ensure it is fit for purpose and reflects best practice, including for decommissioning activities
- implement new guidance to improve regulatory certainty for the community and for industry, including guidance on the removal of offshore infrastructure
- support the decommissioning industry through work by the Offshore Decommissioning Directorate to:
 - enhance transparency across the pipeline of planned decommissioning activity to help businesses plan investment decisions
 - establish intergovernmental agreements with state and territory governments to enhance cooperation and collaboration between all levels of government on decommissioning policy
 - develop an updated decommissioning cost estimate that will benchmark costs, inform government priorities, and support competition and greater efficiency across the decommissioning value chain
 - engage with planned industry activity to help create efficiencies and reduce costs without compromising environmental protections
 - develop rigorous financial assurance reforms to ensure industry is prepared for decommissioning and to give the community confidence that industry is managing its decommissioning obligations responsibly
 - deepen engagement with advanced offshore decommissioning jurisdictions, including the UK and Norway, to ensure Australia emulates international best practice.

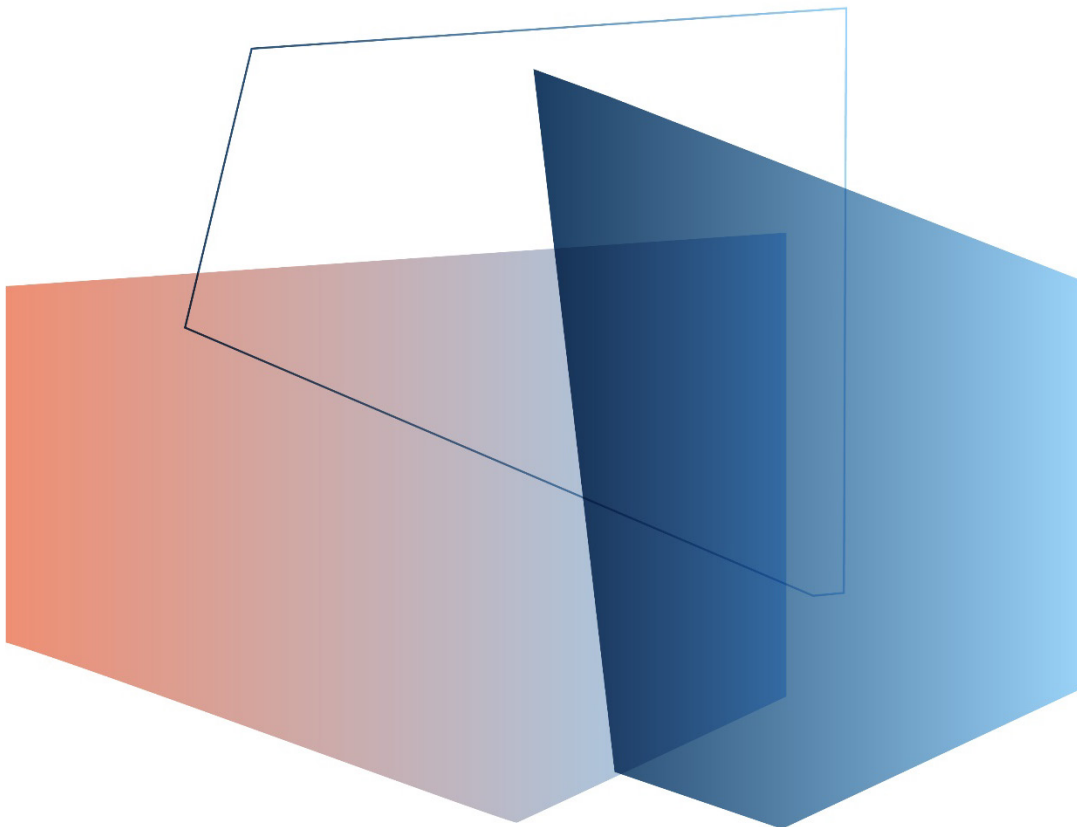
Spotlight: North Sea Transition Authority

The North Sea Transition Authority (NSTA) is the regulator for the oil and gas, offshore hydrogen, and carbon storage industries in the UK. Working with government, industry, and other regulators, the NSTA aims to reduce emissions and support the transition to net zero while aiding the UK's energy security.

The NSTA has also influenced the sector to share lessons and adopt best practice. These efforts were critical to reducing the total cost estimate for decommissioning all remaining offshore oil and gas infrastructure in the UK by £15 billion between 2017 and 2021.

The success of the authority is based on collaborative, practical industry engagement processes and the setting of clear expectations. The NSTA works closely with other regulators to ensure they align on shared visions and values, while also building trust and relationships with industry. This helps to give stakeholders a complete view of the opportunities and challenges in decommissioning planning and delivery.

The Australian Government considers models such as the NSTA to be a best-practice approach to support decommissioning and this has influenced the initial design of the Offshore Decommissioning Directorate. The directorate will have some similarities with the NSTA, such as focusing on driving coordination across industry and improving visibility of the pipeline of decommissioning work.



4. Partnering with First Nations people and local communities

First Nations engagement and benefits sharing

The Australian Government acknowledges and respects the unique relationship First Nations peoples and communities have with the environment including land, sea, waterways, flora and fauna.

The Commonwealth and states and territories have committed to Closing the Gap Target 15. This aims to protect Aboriginal and Torres Strait Islander people's legal rights or interests on land and sea.

First Nations communities are connected with the land and water of their Country, and decommissioning activities both offshore and onshore may affect them. Where appropriate, the benefits gained from growing a decommissioning industry should also be shared with First Nations people, businesses, and communities where projects are taking place.

Relevant First Nations stakeholders must have the opportunity to fully engage in decommissioning processes, including being closely consulted ahead of any activity commencing.

The Offshore Environment Regulations require titleholders to undertake genuine consultation with people who may be affected by their projects over their lifecycle. Genuine and appropriate engagement for First Nations groups in impacted places begins with identifying relevant First Nations stakeholders and engaging as early as possible.

Genuine engagement with First Nations communities supports meaningful discussion on access to land and local employment and business opportunities, skills development and community investment.

First Nations communities need a culturally sensitive consultation process to make informed decisions. This will support improved outcomes for First Nations communities and support targets and outcomes under the National Agreement on Closing the Gap.

Mechanisms that encourage strong industry partnerships and benefits sharing with local communities further strengthens genuine partnership and engagement. This includes building a shared understanding of the aspirations of First Nations communities and the economic opportunities presented by decommissioning activities. For example, working with industry to set targets for First Nations employment, use of First Nations businesses or equity sharing.

Partnering with local communities

Australian research carried out by the National Decommissioning Research Initiative (NDRI) found varied community views on decommissioning activity. It is clear the community wants to ensure that offshore infrastructure is removed safely, and that the marine environment is protected (NDRI 2022).

Communities located close to offshore oil and gas regions were particularly likely to have a lot of interest in disposal options. This includes how offshore infrastructure could be brought safely onshore and decommissioned.

Government policies and processes should address the needs of those directly impacted by decisions related to decommissioning activity. If not well managed, some aspects of decommissioning may negatively impact local communities. Understanding local community perspectives helps the decommissioning industry to meet social expectations.

For example, increased road transport to move decommissioned material and workers can raise concerns with safety, more emissions, poor air quality and road conditions, and increased traffic volume (CSIRO 2024b). The decommissioning industry can learn from other large-scale operations to minimise these impacts by working directly with local communities.

It is also the case that capturing the estimated \$60 billion in economic activity can deliver new investment into local businesses that service the decommissioning supply chain, supporting sustainable, high-quality jobs in regional and remote locations.

Actions

To ensure local communities and First Nations people are engaged in and benefit from decommissioning activity, the Australian Government will:

- as part of the Offshore Environmental Management Review, consider options to clarify consultation requirements for offshore petroleum activities, including decommissioning activities, to clarify how consultation should occur with Traditional Owners, First Nations peoples and communities, local communities, businesses, the workforce, and other stakeholders
- promote benefit sharing opportunities, where appropriate, to ensure that First Nations people and industry are partners in the transition to net zero. This includes new job opportunities, improved education programs, and direct community investment
- support the work of the National Indigenous Australians Agency and broader government efforts to achieve the Closing the Gap targets
- support the decommissioning industry to engage First Nations people and local communities through actions of the Offshore Decommissioning Directorate to:
 - facilitate industry engagement with the Northern Australia Infrastructure Facility, which supports projects that deliver public benefit to the north through new jobs, regional income, business for local suppliers and Indigenous employment opportunities
 - coordinate with the Net Zero Economy Agency where decommissioning, as part of the net zero transformation, could benefit from greater community understanding and support.

5. Optimising infrastructure opportunities and availability

A cost-competitive and sustainable Australian offshore decommissioning industry requires access to appropriate vessels and infrastructure (CSIRO 2024a).

Australian offshore oil and gas projects – while not large in number in the global context – encompass a wide array of facility types. This diversity of structure size and composition adds complexity to decommissioning – not just offshore, but once material comes onshore for further processing.

Downstream of direct offshore decommissioning activities sits an array of infrastructure and capabilities that are used for the onshore parts of the decommissioning activity. This includes physical infrastructure in and around ports. It includes the shipping channels and turning basins for the types of vessels bringing material to shore. It also includes recycling capabilities and the ability to safely handle, store, and dispose of a range of waste streams.

There are 5 main attributes for ports needed for decommissioning:

- proximity to offshore infrastructure to be decommissioned
- berth types
- laydown area availability near the port
- proximity and impact to communities
- proximity to material recycling and end-of-life handling facilities (KPMG 2023).

The needed infrastructure at ports depends on the removal method and whether infrastructure comes onshore in small or large pieces. Decommissioning vessels vary in beam, length and draft, and have different berthing needs. This means there is not a one-size-fits-all approach that will be suitable to every company undertaking decommissioning activities.

The choice of port is determined by the needs of offshore oil and gas operators, contractors and port operators who will undertake the decommissioning activity. They will make their decisions based on a combination of regulatory, economic, physical and social considerations (KPMG 2023). Port access may also be constrained by competition from existing and emerging uses. Existing mining and offshore oil and gas operational activities, export opportunities, defence, civil engineering projects and potential offshore wind projects all compete for port access.

Australia has existing ports infrastructure in areas adjacent to the main offshore oil and gas production areas in the north-west and south-east of Australia. Research commissioned to support this roadmap evaluated the port infrastructure needs for decommissioning activities in the south-east of Australia and offshore Northern Territory. It considered these needs against ports in the region (KPMG 2023). CODA has commissioned similar analysis on infrastructure offshore Western Australia (CODA 2024b). Both analyses found that no port has all the attributes needed to handle all the types and size of materials from offshore decommissioning. However, there are sufficient ports to host many decommissioning activities without substantial modifications.

Ports that are unsuitable to accept large vessels may need modifications for a ‘piece-small’ removal approach. For example, where offshore facilities are deconstructed at sea with small modules transported to relevant ports (KPMG 2023). Temporary dismantling facilities at decommissioning ports could improve efficiency in processing, transport and export of decommissioned materials. Where decommissioning vessels cannot approach a port, barges can also play a supporting role by transferring materials (KPMG 2023). It may also be viable for temporary or semi-permanent facilities at existing ports to fill some of the gaps. The exact needs for additional or modified port facilities must be determined on a case-by-case basis in conjunction with decisions on the removal of infrastructure and how it will be handled onshore (KPMG 2023).

Access to heavy lift vessels will also be critical. On current availability, decommissioning planning needs to consider lead times of up to 3 years as these vessels work all over the world. This underscores the need for industry and governments to work together far in advance to support future decommissioning activities (CSIRO 2024a).

There is a role for government in working with industry to help coordinate planned investment activities, including managing competing demands on infrastructure. Coordinating planned activities, and encouraging collaboration across the industry, can help to create efficiencies and reduce costs to industry in the aggregate. As seen with the UK's NSTA, a coordination mechanism can help to generate investment and efficiencies. The NSTA has supported the UK's offshore industry in cost-effective decommissioning, having delivered £15 billion worth of savings to the overall estimate for remaining infrastructure between 2017 and 2022. It has also facilitated 95% of decommissioning contracts being awarded to UK-based organisations between April 2023 and March 2024 (NSTA 2024).

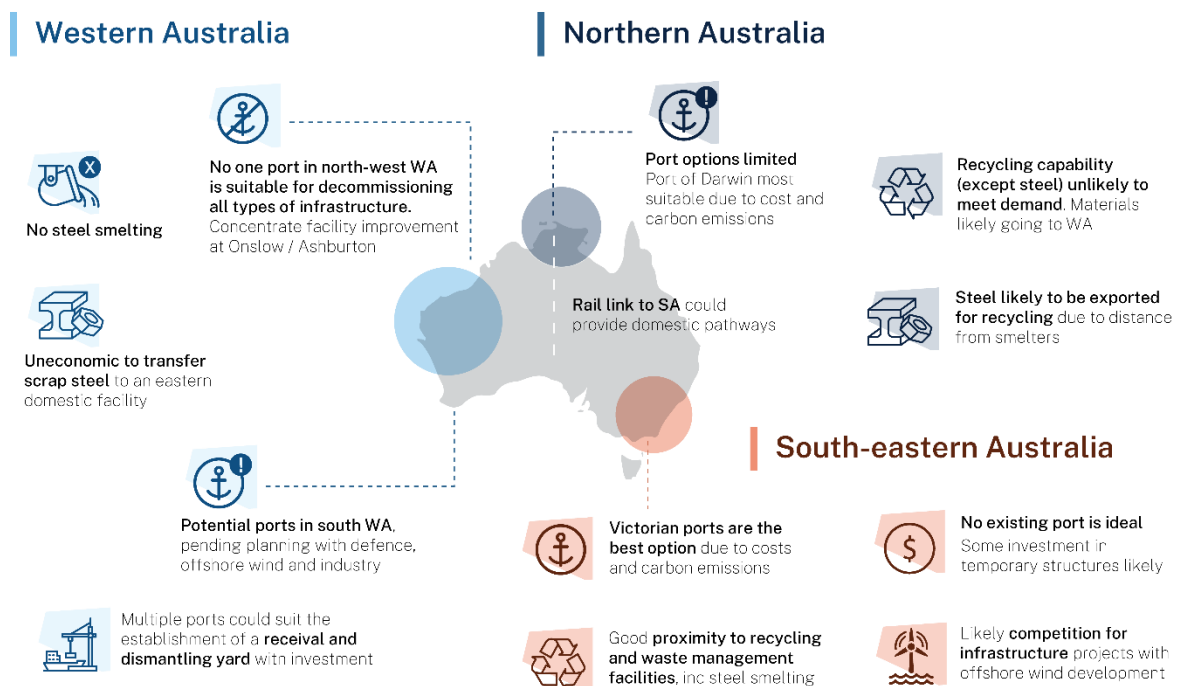


Figure 6: Summary of key decommissioning considerations in each oil and gas producing region (CSIRO 2024a; CODA 2024b; KPMG 2023)

Actions

To support access to infrastructure, the Australian Government, through the Offshore Decommissioning Directorate, will:

- work with state and territory governments and industry to support cooperation on decommissioning activity, such as infrastructure and access to infrastructure-related programs and priorities, including by:
 - working with industry to ensure that commercially operated ports are aware of the importance and potential of multi-user facilities and that decommissioning needs to be considered as part of port developments
 - enabling industry to collaborate across decommissioning projects by aligning activity and coordinating vessel and other infrastructure access
 - working with the Department of Climate Change, Energy, the Environment and Water (DCCEEW) on the intersection of offshore wind and offshore decommissioning.
- work with the decommissioning industry, where needed, to identify industry and government mechanisms to finance supporting infrastructure.

6. Supporting new jobs and investment in responsible recycling and waste management

For every job in landfill there are 3 jobs in recycling (Access Economics 2009). Australia’s recycling industry also provides one in every 142 jobs in the domestic economy (AEAS 2023). Decommissioning will produce a significant volume of recyclable, as well as potentially reusable, materials, including steel, concrete and plastic. The majority of this material will need to be brought onshore for processing, which can support jobs and investment into Australian businesses.

There are also opportunities to embed sustainability principles and drive demand for recycled materials. For every tonne of scrap that is used for steel production, Australia avoids 1.5 tonnes of carbon dioxide emissions (KPMG 2023). When managed responsibly and sustainably, a domestic decommissioning industry will help deliver outcomes against the government’s circular economy framework.

Material management

Under a base case of full removal, about 5,695 kilotons of decommissioning material removed from offshore oil and gas facilities and projects in Australia will need management through recycling, disposal, or storage (CODA 2022b). To process the scale of decommissioned material there needs to be capacity to receive around 120 kilotons of material each year (CODA 2022b). This material includes around:

- 3,500 kilotons of steel
- 1,400 kilotons of concrete
- 400 kilotons of plastics
- 60 kilotons of hazardous material including naturally occurring radioactive materials (NORMs) (CODA 2022b).

Material inventory by typology

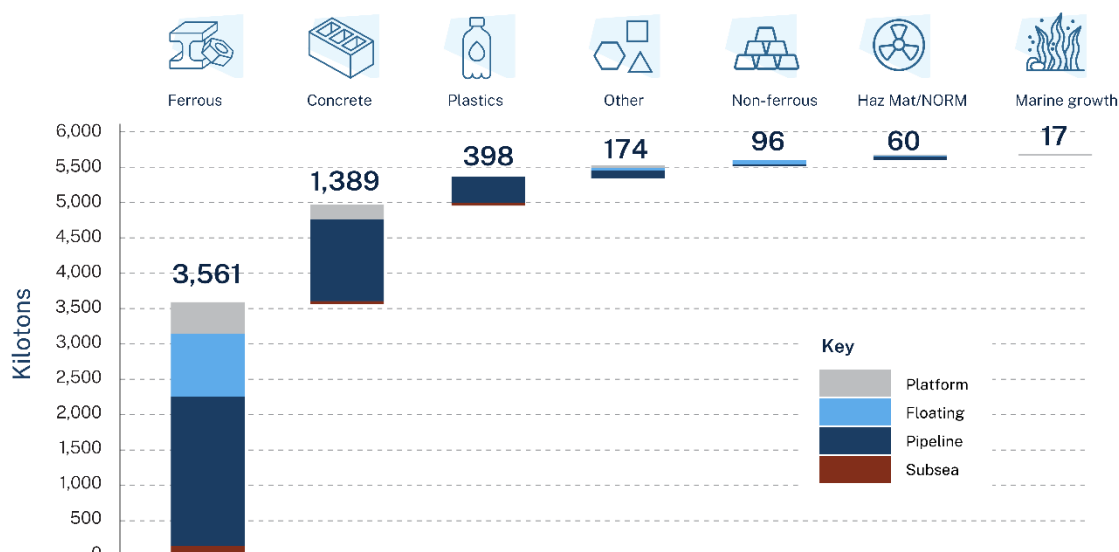


Figure 7: Estimated total inventory of materials from Australian decommissioned infrastructure by typology (CODA 2022b)

The recycling and waste management phase of decommissioning poses significant innovation opportunities for Australia. There are gaps in understanding the impact of contaminants on the environment and ecosystems, the possibilities for recycling pathways and technologies, and for more efficient cleaning and waste management processes (ATSE 2024).

The sheer volume of material that needs to be recycled and reused in the future provides opportunities to increase the size of Australia’s downstream recycling and waste management industry. Firms are already building capacity to manage more recycled materials coming from decommissioning as well as accelerating commitments to build a circular economy. Ongoing developments within industry, including advancements in recycling technology, are likely to see recycling capacity for concrete and plastics expand in the future (KPMG 2023).

Recycled steel could increasingly be used as a feedstock for steel mills as new electric arc furnaces come online with the transition to lower emissions and green steel. Australia’s steel industry employs over 100,000 people, with a skew to regional areas, and generates \$29 billion in annual revenue (ASI 2023). Stakeholders have noted industry forecasts suggest a significant increase in the demand for processed scrap steel and a large amount of steel required for Australia’s renewable energy transition. Decommissioned oil and gas infrastructure is one possible source.

The Australian Government is investing \$250 million in new and upgraded recycling infrastructure through the Recycling Modernisation Fund. The Fund will see over \$1 billion of investment in recycling infrastructure, with contributions from the states and territories and industry. The government’s support for a circular economy will provide important signals to industry on the expectation to manage materials responsibly. It will also drive demand and supply for recycling services.

Materials and potential pathways



Figure 8: Materials predicted to be returned to shore for reuse, recycling, or disposal in Australia across a projected time frame of 2023–2060 and indicative material management pathways (CODA 2022b; CSIRO 2024a).

Embedding circular economy principles

Titleholders and those contracted to do decommissioning have a social responsibility and regulatory requirements to appropriately manage the resulting material and waste. Steel, plastic and concrete are all recyclable. Recycling offshore oil and gas infrastructure at end of life, particularly steel, is the model in overseas jurisdictions conducting decommissioning. In Norway, as much as 98% of steel from offshore decommissioning is recyclable (France24 2022). Plastics recycling is possible but more difficult with many different types of polymers all needing their own recycling pathways.

Spotlight: Supporting responsible recycling

The Australian Government's National Waste Policy provides a national framework for waste and resource recovery in Australia. The 2019 National Waste Policy Action Plan sets a target of recovering 80% of all waste by 2030.

The Recycling Modernisation Fund is a national initiative that is expanding Australia's capacity to sort, process and remanufacture glass, plastic, tyres, paper, and cardboard.

The National Reconstruction Fund supports 7 priority areas of the Australian economy including renewable and low emission technologies (inclusive of recycling and resource recovery).

Domestic reprocessing of steel, plastics and concrete is the preferred pathway. Technical needs, capacity, transport costs and export markets all factor into material management considerations (CSIRO 2024a). Industry incorporating circular economy principles in decommissioning projects will support life extension of infrastructure and reuse, and promote domestic material management (CSIRO 2024a).

NOPSEMA recognises that the removal of offshore infrastructure can have potential impacts on coastal and onshore environments. To manage these impacts, NOPSEMA takes a stewardship approach (NOPSEMA 2023b). This means titleholders need to show that they have considered the indirect impacts of the activity, including the waste pathway. Once infrastructure reaches Australian state waters and land other regulations apply, such as those on hazardous waste. Disposal and storage are the dominant approaches for hazardous wastes needing permanent management, including naturally occurring radioactive materials.

Actions

To support responsible recycling and waste management outcomes, the Australian Government will:

- work with states and territories to link decommissioning industry participants with green metals manufacturers, and promote onshore value-adding opportunities for decommissioning offshore infrastructure
- support the decommissioning industry through actions by the Offshore Decommissioning Directorate to:
 - develop and deliver research and guidance on key waste management and recycling needs in decommissioning, including research innovation opportunities in decommissioning and investigating mercury standards in decommissioned material
 - link into opportunities under existing government initiatives on recycling and waste management.

7. Building a skilled, diverse, and safe offshore decommissioning workforce

Australia’s offshore resources sector workforce is preparing for decommissioning. This workforce built Australia’s offshore resources industry from the ground up. Many of those same skill sets will be needed to support the establishment of a sustainable Australian offshore decommissioning industry.

A strong decommissioning industry will create opportunities in regional areas and attract new investment for Australian businesses across the decommissioning value chain both offshore and onshore.

CSIRO estimates the decommissioning and resource recovery value chain could create more than 3,500 new jobs (CSIRO 2024a). The Australian Academy of Technology and Engineering (ATSE) also found there are career transition opportunities for existing oil and gas workers in decommissioning and renewable energy production given the similar skill profiles (ATSE 2024). This applies not just to the existing workforce that operates on offshore platforms and vessels. Skill and experience across project planning and management, along with jobs that require expertise in demolition and scrapping, will all be needed to support an Australian offshore decommissioning industry. The same skillset will also be needed to decommission offshore wind infrastructure in the decades ahead. There is a sense of optimism in the sector on the ability to access the necessary workforce. However, there are emerging challenges that will need to be planned for and managed (KPMG 2023).

Sixty per cent of skills and job roles in oil and gas have high or good overlap with offshore wind construction and operation, and a further 31% have partial overlap (Star of the South n.d.). With many future decommissioning projects occurring in regional areas where labour demand is surging, managing the availability of skilled workers will be important to sustain a decommissioning industry. The below figure sets out areas where capabilities and skills will have particular crossovers with other industries.

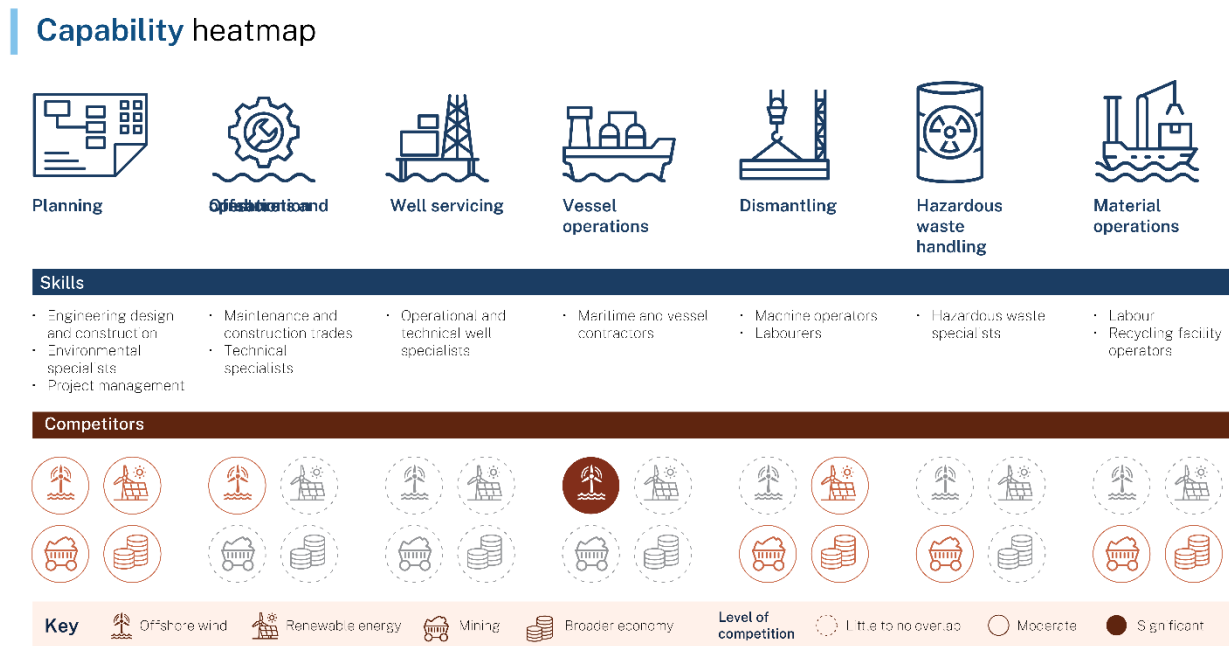


Figure 9: Capability competition heatmap (KPMG 2023)

Providers are looking to existing workforces to fill demand. This is because the nature of the expected decommissioning activity has peaks and troughs across the pipeline. It is also because the decommissioning sector is likely to need fewer workers than oil and gas production. The capabilities at the front end of decommissioning activities are consistent with existing operations and can be transitioned. They include:

- engineering
- project and environmental planning
- well plugging and abandonment expertise
- skill sets in the oil and gas sector (KPMG 2023).

The limited decommissioning activity in Australia to date means that the ability to transition, upscale and upskill a workforce capability is unproven (CODA 2024a). Challenges in attracting new workers to decommissioning include:

- perception of negative environmental impacts of the oil and gas industry
- more remote work
- lack of innovation
- perceived gender and diversity imbalances (KPMG 2023).

Diversity in decommissioning

Women are underrepresented in all roles in oil and gas extraction, except for clerical and administrative staff (79%). Men made up 90% of CEO roles in the oil and gas sector in 2022–23, which is higher than the wider workforce rate of 78% (WGEA n.d.). Employment in the oil and gas sector in Australia is about 25% women (ABS 2024).

With an existing workforce that is mainly male aged between 35 and 50, it is important to increase the pool of younger workers, and improve the diversity of the workforce, to sustain a domestic decommissioning industry (KPMG 2023).

First Nations people make up about 3% of the oil and gas workforce, which is comparable to broader population trends (KPMG 2023). In remote and regional areas, First Nations workers are better represented in industries relevant to decommissioning. This includes construction labour, machine and stationary plant operators, road and rail drivers, and specialist managers. There are opportunities to grow the First Nations workforce in roles such as program or project administrators, drillers and waterside workers. These roles have low First Nations representation, but training in these areas will support employment in the decommissioning sector (CSIRO 2024a).

Worker safety in offshore decommissioning

NOPSEMA is Australia's independent expert safety regulator for offshore resources activities and has a strong track record. However, offshore decommissioning is a relatively new activity in a high-hazard industry. In building a sustainable decommissioning industry in Australia, the first and most important priority is to ensure that our people working across the value chain are safe at work.

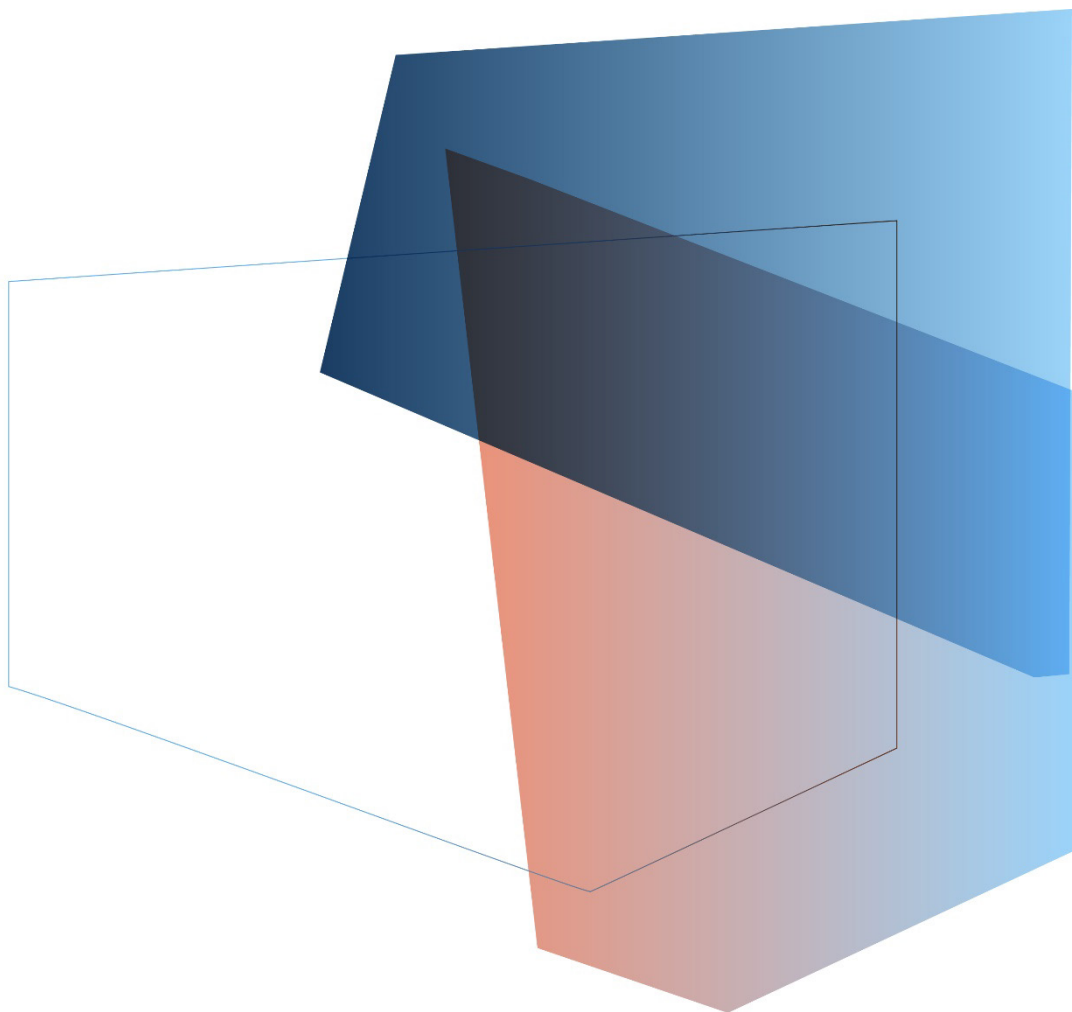
The Australian Government is implementing improvements to our offshore safety frameworks, including by improving worker protections against discrimination and coercion, and expanding the definition of health in Australia's offshore legislation to include physical and psychological health. The government will also amend existing safety regulations to strengthen reporting obligations in relation to sexual harassment.

As part of its commitment to continually improve our offshore safety frameworks, the Australian Government will ensure our existing offshore safety frameworks remain fit for purpose. This includes looking for further opportunities to harmonise the offshore petroleum safety regime with our national Work Health and Safety laws where it would achieve equal or better safety outcomes, including for those working on decommissioning.

Actions

To help build a skilled, safe, and diverse decommissioning workforce, the Australian Government will:

- continue to review Australia’s offshore safety frameworks to identify opportunities to harmonise with National Work Health and Safety laws, where appropriate
- support development of a decommissioning workforce through actions by the Offshore Decommissioning Directorate to:
 - provide advice and guidance on skills, and workforce barriers and opportunities
 - support the decommissioning industry and workforce to link into existing jobs and skills initiatives, such as Jobs and Skills Councils, to ensure that skills needs are addressed where appropriate.



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Appendix 1: Summary of relevant regulations

Offshore Petroleum and Greenhouse Gas Storage

Section 572 of the OPGGS Act places duties on titleholders for maintenance and removal of structures, equipment and property bought onto title. Section 572 (3) states:

A titleholder must remove from the title area all structures that are, and all equipment and other property that is, neither used nor to be used in connection with the operations:

- a. *in which the titleholder is or will be engaged; and*
- b. *that are authorised by the permit, lease, licence or authority.*

NOPSEMA is the independent statutory authority that regulates health and safety, structural well integrity and environmental management for offshore petroleum, established under the OPGGS Act.

Titleholders are required to submit Environment Plans (EPs) to NOPSEMA. They are required to have that EP accepted by NOPSEMA before starting any activity, such as exploration, production, and decommissioning. These plans need to be revised and updated every 5 years.

Titleholders can seek a deviation from the requirement to remove property. This is assessed by NOPSEMA case by case. In limited circumstances, it may be permissible for titleholders to leave property in-situ, rather than removing it, where equal or beneficial environmental outcomes can be achieved while meeting safety and all other applicable requirements under the OPGGS Act and regulations, and other applicable laws. In these instances, an environment plan must show that the proposed arrangement reduces environmental impacts and risks to as low as reasonably practicable and to an acceptable level, and is consistent with the principles of ecologically sustainable development.

Sea Dumping

The *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act) regulates:

- loading and dumping of waste² at sea
- any creation of artificial reef in Australian waters.

The Sea Dumping Act protects Australia's oceans from waste and pollution dumped at sea.

Where a titleholder is seeking to dump or abandon oil and gas infrastructure in-situ, they may also need a sea dumping permit.

The final decision to grant or refuse an application to dump or abandon property and infrastructure under the Sea Dumping Act sits with the Minister for the Environment and Water.

Environment Protection and Biodiversity Conservation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. The Minister for Environment and Water endorsed NOPSEMA's process as a program that meets the requirements of part 10 of the EPBC Act. The minister also made a class approval for all actions which follow NOPSEMA's endorsed program, negating the need for these actions to undergo individual assessment under the EPBC Act. The class

² Waste for this purpose includes the disposal of carbon dioxide into a sub-seabed geological formation.

approval covers all petroleum activities and greenhouse gas activities subject to a few exceptions.³ One of the actions covered includes decommissioning activities in Commonwealth waters.

The EPBC Act applies if there is a likelihood of an impact on a matter of national environmental significance. A referral may still be required for activities that occur outside the title area if actions are:

- not covered by NOPSEMA's program
- likely to have a significant impact on a matter of national environmental significance.

International Regulations

London Convention and Protocol

The London Protocol is a modern form of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972. Australia ratified this convention in 1981 with the *Environment Protection (Sea Dumping) Act 1981*. The London Protocol aims to protect and preserve the marine environment from all sources of pollution and take effective measures to prevent, reduce, and eliminate pollution caused by dumping of wastes or other matter at sea.

Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Waste is an international treaty that ensures hazardous waste is dealt with appropriately. Australia ratified the treaty in 1992. It was implemented in domestic legislation through the *Hazardous Waste (Regulation of Exports and Imports) Act 1989* (Hazardous Waste Act). This requires that entities have a permit to export from, import to and transit waste through Australia.

Minamata Convention

The Minamata Convention on Mercury is an international treaty that seeks to protect human health and the environment from anthropogenic (caused by humans) emissions and releases of mercury and mercury compounds. Australia ratified the Minamata Convention in 2021.

Hong Kong Convention

The Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships will enter into force on 26 June 2025. Australia has not yet acceded to the Convention.

Other conventions and treaties

Other conventions and treaties that will influence decommissioning include the United Nations Convention on the Law of the Sea, and Australia's bilateral treaties with countries such as Indonesia and Timor-Leste.

³ The specific exceptions are listed in the [Minister's Approval](#).

Appendix 2: Comparative assessment of ports

This comparative assessment was produced by CSIRO and only includes selected ports.

| Port | Proximity to assets | Yard facilities | Sea accessibility | Supply chain proximity | Permitting | Likely vessels and projects serviced | Main freight tasks and comments |
|-------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Darwin, NT | Bonaparte Timor Sea | 10 ha sealed hardstand 4 ha cargo transit shed for dry bulk cargo handling Container wash down area Quarantine and customs onsite (with waste disposal) | 865 m quay line Length overall (LOA): 150–265 m (cargo berths) Draught: 11 m | Road transport required for material management and disposal | Third party waste disposal Chemical washing not permitted Dangerous Goods Approved Arrangements (Biosecurity) | Marine support vessels, some HLV Pipelines, subsea equipment, and piece small projects Potential for piece large projects to be determined | Multi-cargo including livestock, bulk export Underutilised |
| Onslow, WA | Bonaparte Browse Canning North Carnarvon | 3.1 ha hardstand (not sealed) Heavy lift jetty 180 t crawler crane Logistics support | LOA: 120 m Draught: 7.6 m | Road transport required for material management and disposal | Third party waste disposal Prescribed Premises Dangerous Goods Radiation Licence | Marine support vessels, pipe lay vessels Pipelines, subsea equipment, and piece small projects | Common-use (predominantly resources and recreational) |

| Port | Proximity to assets | Yard facilities | Sea accessibility | Supply chain proximity | Permitting | Likely vessels and projects serviced | Main freight tasks and comments |
|----------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Henderson, WA⁴ | Perth Basin (small proportion) | 50 ha sealed and serviced multi-use area 300 t load out crane 99 x 53 m floating dock with 12,000 t lifting capacity 512 wheeled transporter (4,500 t transfer capacity) Co-located subsea oil and gas centre of excellence | LOA: 200 m Draught: 10.97 m | Co-located dismantling and manufacturing Road transport required for material management and disposal | Third party waste disposal Chemical washing not permitted Prescribed Premises Dangerous Goods Approved Arrangements (Biosecurity) | Marine support vessels, pipe lay vessels, some HLV. Pipelines, subsea equipment, and piece small projects. Potential for piece large projects | Shipbuilding and manufacturing, fabrication, assembly and maintenance requirements of the marine, defence, energy and resource industries |
| Whyalla, SA | Bass Gippsland Otway | 100–150 t lift cranes 3,000 m ² hardstand 10,000 m ² open workshops | LOA: 90–>170 m Draught: 7.02 m | 6 ha adjacent manufacturing complex Co-located steel reprocessing Regional material management supply chains Rail and road access | Third party waste disposal Dangerous Goods Approved Arrangements (Biosecurity) | Marine support vessels, pipe lay vessels, some HLV Pipelines, subsea equipment, and piece small projects Potential for piece large projects | Minerals and ore export, manufacturing, and fabrication Undergoing development |

⁴ The Commonwealth and WA Government have signed a Cooperation Agreement which provides a foundation for collaboration to establish a Commonwealth-owned Defence Precinct at Western Australia's Henderson shipyard.

| Port | Proximity to assets | Yard facilities | Sea accessibility | Supply chain proximity | Permitting | Likely vessels and projects serviced | Main freight tasks and comments |
|-------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Bonython, SA | Bass Gippsland Otway | Under development | Draught: 9.9 m | Co-located steel reprocessing Regional manufacturing Regional material management supply chains Rail and road access | Third party waste disposal Dangerous Goods Approved Arrangements (Biosecurity) | Pipelines, subsea equipment, and piece small projects Potential for piece large projects | Minerals and ore export, manufacturing, and fabrication Fuel distribution and fractionation Planned for green hydrogen export |
| Barry Beach, VIC | Bass Gippsland Otway | 1.82 ha hardstand transport yard 1 ha hardstand laydown 2 ha fully enclosed warehouse 13 x 8 m wash down bay 22" 100K ft/lb computerised torque turn services Workshop jib crane capacity (3 off swing jib @ 1.5 t) Workshop overhead crane (capacity 20 t) Fabrication workshop | LOA: 200 m Draught: 3.4 m | Regional material management supply chains | Third party waste disposal Dangerous Goods | Marine support vessels, pipe lay vessels, some HLV Pipelines, subsea equipment, and piece small projects | Servicing marine and energy industries |

| Port | Proximity to assets | Yard facilities | Sea accessibility | Supply chain proximity | Permitting | Likely vessels and projects serviced | Main freight tasks and comments |
|----------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Geelong, VIC | Bass Gippsland Otway | 12 ha 15 berths, 2 precincts Co-located storage sheds Washdown area Dry bulker loader Heavy lift cranes | LOA: 213–275 m Draught: 10.8 m | Regional material management supply chains | Third party waste disposal Dangerous Goods Approved Arrangements (Biosecurity) | Pipelines, subsea equipment, and piece small projects Potential for piece large projects | Dry and liquid bulk export, passenger vessels |
| Hastings, VIC | Bass Gippsland Otway | 6 ha | LOA: 400 m Draught: 15 m | Regional material management supply chains | Third party waste disposal Dangerous Goods | Pipelines, subsea equipment, and piece small projects Potential for piece large projects | Proposal for offshore wind hub development – not approved Servicing marine and energy industries Planned upgrade for servicing incoming offshore oil and gas decommissioning projects (industry-led) |
| Bell Bay, TAS | Bass Gippsland Otway | 9.63 ha Co-located fabrication (Bell Bay Industrial Precinct) | Deep water port LOA: 95–180 m Draught: 11 m | Marine and road transport required for material management and disposal | Third party waste disposal Approved Arrangements (Biosecurity) Environmental management policies in place | Marine support vessels, pipe lay vessels, some HLV Pipelines, subsea equipment, and piece small projects. | Servicing marine and energy industries |

Appendix 3: Material management opportunities and barriers overview

The below is an analysis of the main material streams from decommissioned infrastructure. There are other smaller categories of waste, such as non-ferrous metals, fabrics, and batteries, which will also need appropriate management.

Steel

Australian scrap steel has a high recycling rate of close to 90%. Of the total Australian scrap steel recycled:

- about 51% is used as feedstock in Australian steel mills for steel manufacturing
- 49% is exported for recycling overseas (KPMG 2023).

There are limits to how much recycled scrap steel Australian mills can accept at present. Australia's scrap steel processing and smelting capacity is in south-eastern Australia with no current smelting capacity in Western Australia (KPMG 2023). Scrap metal is generally processed close to its collection point given the costs of transport (CSIRO 2024a). This raises challenges around the overall economic viability of domestically recycling decommissioned scrap steel from other regions, especially Western Australia (KPMG 2023).

Investment and technological improvements can address these limitations, and there are signs that this is occurring. The Australian steel industry has prioritised use of recycled scrap steel as an enabler of its decarbonisation pathway (KPMG 2023). Steel from decommissioned oil and gas projects could provide a supply for new green steel projects, opening up more opportunities for the onshore components of decommissioning to occur in Australia.

The competitiveness of onshore processing will likely depend on multiple factors such as transport costs and market demand. Export remains an important avenue for processing scrap steel. It is sometimes the most financial pathway for recycling Australian scrap steel. Export markets see Australian scrap steel as high quality, and generally offer higher prices than domestic markets (KPMG 2023).

A mix of both domestic recycling and export is likely to be necessary for processing decommissioned scrap steel. Measures that improve domestic processing capacity, if developed in close proximity to decommissioning, can reduce the amount of scrap steel being exported (CSIRO 2024a). Given the lower emissions intensity of recycling scrap steel, increasing domestic processing can support the transition to net zero and the growth of a green metals industry in Australia.

Concrete

There are well established markets in Australia for recycled concrete, with more than 80% of concrete recycled and innovative concrete recycling solutions coming to market (KPMG 2023). The capacity of the domestic construction and demolition waste recycling market is significant and estimated at 10,500 kilotons per year (KPMG 2023). It is therefore enough to accommodate the expected volumes of concrete from the offshore decommissioning industry, noting that costs may still be a factor (KPMG 2023). There are also concrete recycling facilities within a reasonable distance of most expected decommissioning ports. Port adjacent recycling and use of concrete aggregate will reduce emissions. Transport costs should not pose a significant barrier to recycling concrete from oil and gas projects (KPMG 2023). Areas of higher population see cheaper concrete recycling due to the higher demand for aggregate (KPMG 2023). The presence of extra materials such as reinforcing steel and fibres, as well as long-term exposure to seawater, may impact how much of the concrete from decommissioned materials is recyclable.

Plastics

There are many different plastics used in offshore infrastructure. High density polyethylene (HDPE) is one of the predominant types, with common uses in construction, pipes, and fittings.

In July 2021, Australia banned the export of unprocessed mixed polymer scrap plastics. Plastics processed into clean pellets or flakes can be exported. In 2020–21, Australia exported 35% of its recycled plastic. Domestic demand for recycled HDPE is expected to increase by 54% between 2021 and 2040 (Blue Environment 2022). HDPE is one of the most exported plastics in Australia because of high global prices (KPMG 2023).

In 2020–21, 17.9% of scrap HDPE was recycled (Blue Environment 2022). Exporting HDPE is likely the most economic pathway for recycling Australian scrap HDPE because of global prices. However, domestically recycling HDPE is best from an emissions perspective (KPMG 2023). Given the low proportion of plastics in decommissioned material there is an opportunity for industry to absorb this in existing capacity (KPMG 2023). As industry takes on advanced recycling techniques this will increase efficiency and provide cost reductions, enabling greater onshore uptake by Australian industry (KPMG 2023).

Before it can be recycled, scrap plastic from decommissioned infrastructure needs to be broken into smaller pieces and separated from other material. Given the proximity of some hazardous materials to plastic materials in offshore infrastructure, processing scrap plastic for recycling will also need to manage contamination risks (KPMG 2023). Some plastics may need decontamination before recycling.

The current sorting and cutting processes for scrap plastics at the port can be inefficient and risk contamination by hazardous waste (KPMG 2023).

Most polymer reprocessing facilities are in New South Wales and Victoria, with smaller sectors in Queensland, Western Australia, and South Australia. Materials recovered from the north-west may therefore see higher transport costs and emissions if plastics from decommissioning are processed domestically (CSIRO 2024a).

Hazardous waste

Disposal or storage are the dominant approaches for managing hazardous wastes. Hazardous wastes need to be handled appropriately and according to hazardous waste management regulations to ensure worker, community, and environmental safety. Ports receiving such material will need appropriate infrastructure to handle, clean, and manage such waste (KPMG 2023).

The export of hazardous wastes is regulated under both international and domestic law. In Australia, onshore hazardous waste management falls under the jurisdiction of state and territory governments. This increases regulatory complexity where hazardous waste from decommissioned material needs to travel across state borders. There are regulatory and legislative arrangements set up by each state and territory and at the federal level for managing hazardous wastes.

Contamination of other decommissioned materials such as plastics with hazardous waste increases the likelihood of material ending up in intractable waste facilities. Without decontamination, there is little to no option for future reuse or recycling (KPMG 2023).

Waste classification and management directives are the jurisdiction of state and territory governments. Stakeholders have noted that the complexity of the waste management regulatory ecosystem is challenging. Particularly noted were challenges associated with the transboundary movement of NORMs, mercury, and other contaminated waste (CSIRO 2024a).

