CRC TiME
Transformations in Mining Economies

SUBMISSION TO PRODUCTIVITY COMMISSION INTERIM REPORT ON OPPORTUNITIES IN THE CIRCULAR ECONOMY

11 April 2025

Overview

Realising the greatest benefits from the Circular Economy depends on maximising value from development of Australia's minerals resources – before, during and after operations.

This extends beyond the minerals themselves to maximising long-term value from significant industry and regional infrastructure established to support mining operations.

However, as the Productivity Commission noted, most attention has been given to maximising value – including by embedding Circular Economy principles – during the mine development and operational phases.

This is changing.

Innovative proposals for post-mine land, infrastructure and waste use (post-mine asset use) are capturing public, government, investor and industry attention.

These range from proposals to re-process mine wastes to extract remaining critical minerals to use of mine land to host renewable energy or recreation infrastructure.

Such opportunities are forming part of broader regional diversification strategies.

Concurrently, the end of production at several major mines and planned near-term completion at others has highlighted the need for clear mechanisms to enable the transfer of mine housing, energy and other infrastructure to local owners where appropriate.

As an emerging area, work continues to understand how to best optimise outcomes in the context of post-mine asset use. Central to this is how to balance different economic, social and environmental goals.

What is becoming clear is the importance of shifting from a site-by-site to regional review when assessing benefits and trade-offs and building consensus on desirable, feasible and viable post-mine options.

New frameworks, tools and approaches are being developed and tested to enable regional scale approaches.

From a CRC TiME perspective, this includes work with partners to develop and pilot collaborative planning approaches, ways of understanding and managing regional effects and assessing and accounting for natural capital. Additionally, development of a multistakeholder and rightsholders participation framework to guide repurposing of mine sites will commence shortly.

A Business Case Evaluation Tool to assess transformative post-mine land use options, PMLU opportunity digital atlas and regional employment forecasting tool complements this suite.

There is a strong case to prioritise clarification of repurposing pathways and support appropriate investment opportunities in post mine asset use.

Almost 240 Australian mines were projected to close by 2040, with early consideration of post-mine options key to realising opportunities for value generation and leverage the $4-$8 billion annual spend on mine closure.

At the same time, governments are working to unlock new critical minerals investment.

Delays in clarifying pathways for-post-mine land and asset use and repurposing, consideration of how to leverage industry investment and targeted innovation investment risks missing the window to position for long-term value.

Introduction

The Cooperative Research Centre for Transformations in Mining Economies (CRC TiME) is pleased to contribute further to the Productivity Commission's inquiry into opportunities in the Circular Economy.

In doing so, we acknowledge the Commission's leadership in highlighting the potential for post-mine land, infrastructure and waste use (also known as post-mine land use or repurposing) to unlock environmental as well as social and economic value under appropriate conditions.

Our submission makes four overarching recommendations to inform the Commission's final report to government.

These are:

1. **Ensuring that post-mine land use planning is embedded** in critical minerals, regional and other economic plans.
2. **Clarifying pathways** to enable the transition of assets to next use and test novel technologies where appropriate. This could include supporting development of guidance, such as principles, to support policy and regulatory considerations.
3. **Supporting regional planning processes** to ensure inclusive, locally-specific approaches by drawing on emerging tools, guidance and frameworks. Focus should be given to enabling Traditional Owner and First Nations leadership.
4. **Championing Australian innovation,** including supporting development of the national mine closure solutions industry. There is opportunity to leverage our mine closure challenge to unlock global opportunities for local, Indigenous and Australian enterprises.

Our submission is intentionally brief, signposting work underway or planned that relates to the Commission's inquiry.

This includes research that will help address knowledge gaps identified in the Interim Report.

About CRC TiME

We are an independent research organisation bringing together diverse partners to help reimagine and transform what happens when mining ends, for the better.

Central to this is how decisions across mine life affect what is possible in the future: socially, economically and environmentally.

Since establishment in 2020, our work has helped reshape understanding of mine closure and post-mine transitions through a collective investment of $30 million across 46 projects.

We are supported by the Australian Government Department of Industry, Science and Resources Cooperative Research Centre Program and the financial and in-kind contributions of more than 75 partners.

Visit www.crctime.com.au for more information.

Future strategies

Recommendation 1:

Ensure post-mine land use planning is embedded in industry, regional and economic strategies and plans.

The Australian, Queensland, Victorian, New South Wales and Western Australian Governments are implementing strategies to secure local benefits from increasing global demand for critical minerals. The Northern Territory Government has signaled its intention to support the sector's growth.

Most strategies recognise the potential to unlock economic value and address environmental legacies through re-processing of tailings and other wastes to extract remaining minerals.

Yet, there are few explicit references to planning for post-mine asset use despite the substantial investments in regional and industry infrastructure required to develop new critical minerals projects.

Incorporating post-mine land use planning in future iterations of these strategies would support early and comprehensive assessment of opportunities to support regional diversification as well as other goals. It would also support predictability for mine operators.

Strategies could highlight that post-mine transitions can occur during the life of an operation through realisation of progressive opportunities. The Stawell Underground Physics Lab in Victoria and Lake Kepawari in Western Australia are powerful examples.[1]

Public-private partnerships offer potential to unlock new uses. Bodies such as the Northern Australia Infrastructure Facility as well as state and Territory abandoned mine remediation funds are well-placed to explore emerging pathways.

The Greater Whitsunday Alliance's 2024 METS Revenue Diversification Strategy demonstrates how post-mine land use can be incorporated into a regional economic strategy.

Based on a comprehensive assessment of the region's strengths, the strategy identifies post-mining land use as one of seven priority sectors.

It notes revenue generation opportunities for the region's mining equipment, technology and services (METS) enterprises through delivery of technology, goods and services for mine closure and transitions as well as repurposing.

The Geoscience Australia Australian Atlas of Re-Mining Potential is an example of another way that governments can support planning. The Mine Waste Atlas provides public, accessible pre-competitive information for investors, communities, regional planners and other entities.

Extracted from the Greater Whitsunday Alliance METS Revenue Diversification Strategy.

[1] See the 'Post-Mining Land Uses' report for case studies.

Regulatory pathways

Recommendation 2:

Clarifying regulatory pathways for repurposing, deployment of novel technologies and transfer of residual risk to create opportunities for post mine investment.

Gaining a clear national picture

It is timely to undertake a national assessment of state, territory and Commonwealth laws to identify specifically regulatory constraints to post-mine asset use, including use of new technologies to reduce waste and generate further value.

The 2022 'Mapping the regulation of mine closure' report examined the Western Australian, Victorian and Queensland mine closure regimes, noting ambiguity.

It noted a distinct regulatory gap exists for the regulation of repurposing of mine sites and highlighted the need to consider regulatory mechanisms that could be employed to incentivise progressive transitions towards repurposed mine sites post-closure. A case study of proposed repurposing of former mine site in south west Western Australian highlights these challenges.[2]

It is important the assessment scope be broad to consider matters relevant to both:

- post-mine land use; and
- testing and deployment of novel technologies.

At a minimum, this could include occupational health and safety, public health, the environment and product safety. Understanding linkages to regional planning policies are also key.

As an example, a recent CRC TiME report examining the potential for mine water to cultivate algae for global markets as well as to support carbon sequestration and other environmental benefits identified four categories of relevant regulation. These related to land use (including Indigenous land use agreements, mining license conditions and commercial arrangements), environmental permits and compliance (including waste, waste and rehabilitation), health and safety and biodiversity and ecosystem protection.[3]

Such analysis could also consider regulatory pathways from different perspectives, such as that of mine operator (focused on the path to relinquishment), the future owner or manager of assets (focused on management of residual risk, for example) and post-mine investors (focused on opportunities to create value from repurposing).

Opportunity to support future analysis

The national assessment could draw key CRC TiME project to beginning this year.

One will review tenure arrangements in Western Australia, Queensland and New South Wales to understand how these enable and constrain diversification, including reviewing Western Australian Diversification Lease effectiveness. Case studies and leading practice tenure principles will be produced.

Another project is considering a key barrier to post-mine asset use via a desktop study of global best practice on the identification and quantification of residual risk and its final transfer to subsequent land or asset owners and users.

National Mine Closure and Transition Principles

As outlined below, we plan to work with partners to develop national mine closure and transitions principles, an overarching framework and relinquishment pathway roadmap.

Signpost 1: National mine closure and transition principles, framework and guidance and relinquishment roadmap

> Work is underway by CRC TiME establish a Steering Group to guide development of leading practice principles and a supporting framework tailored to the needs of policy makers and regulators.
>
> This approach draws on lessons from the successful development of the CRC Care National Remediation Framework.

[2] 'La, Hamblin, Aa Gardner and Yb Haigh, '*Mapping the regulation of mine closure',* CRC TiME Limited, Perth, 2022.

[3] A.Ha.Kaksonen, Jb Ayre, Kc Schipper, Ma Ginige, Mc Edraki, K.Y.A Cheng, Ld ,Trevaskis, D.a Purcell, Nb Moheimani, Jc Wolf, P Bahri, A.b & B.c Hankamer, *'Stage 1 report: Project 3.15: Algae-based technologies for improved environmental outcomes and sustainable post-mining futures,'* CRC TiME Limited, Perth, 2025.

The framework – endorsed via the Heads of the EPA Forum – provides a ‘nationally harmonised approach’, guided by a philosophy and supported by modules and guidelines for remediation and management of contaminated sites.

Its flexibility supports use by states, territories and the Commonwealth, noting differentiated responsibilities.

The principles are intended to bring together leading practice and emerging knowledge on critical issues relating to mine closure and transitions, including residual risk, collaborative planning, relinquishment and Traditional Owner and regional engagement.

This will be complemented by a roadmap to document leading practice approaches to relinquishment of a mine lease to next manager.

Regional planning

Recommendation 3:

Supporting regional planning

There is a growing view that the process of mine closure and transition should be framed around what's next, rather than the end of the mining lifecycle.[4]

This requires new ways of engaging, which are often in tension with current regulatory approaches that are usually site-focused and proponent-led.

These issues, and why these arrangements are in place, are noted in the Interim Report.

For brevity, we focus below on new ways of supporting regional planning processes in the context of post-mine asset use and repurposing.

Enabling collaborative planning

If well-designed, collaborative regional planning processes may support shared understanding, coordination and meaningful contributions by Traditional Owners, community members and other groups about post-mine land, infrastructure and waste use. This is expected to be critical to building community confidence.

Various new tools and frameworks being developed and piloted by CRC TiME and partners will support collaborative planning for post-mine asset use and repurposing.

These are:

- **Natural capital assessment and accounting**, which aims to provide a clearer picture over time of how best to balance regional and cross-use of water, carbon, soil and biodiversity assets and services. Supported by the Department of Climate Change, Energy, the Environment and Water, CRC TiME and CSIRO delivered an Australian-first suite of resources to support adoption of Natural Capital Accounting in the mining sector in 2024. A new tranche is expected to include strategies to connect to regional plans.
- **a Regional cumulative effects assessment and management** toolkit to apply a systematic approach to understanding how cultural, social, environmental and economic effects arising from mine closure accumulate and can be managed. A pilot to test a collaborative governance model to undertaking RCEAM is planned for 2026.
- **a Business Case Evaluation approach.** A new tool to evaluate social, cultural, natural and economic value and trade-offs of different post-mine land use options is in development by enviroMETS and CRC TiME, with Queensland pilots planned.
- **a regional employment forecasting tool** currently being tested in the Bowen Basin, Queensland and Bell Bay, Tasmania. It will support regional economic scenario planning.
- **a multistakeholder and rightsholder approach to repurposing of mine sites** will be developed.

New national guidance

A practical way to support regional planning processes in this context is for the Commonwealth to support development of a refreshed and broadened Australian Leadership for Sustainable Development Handbook series. The highly successful series was last updated almost a decade ago.

A new handbook could focus on regional planning processes, expanding on updated mine closure and community development guidance and reflecting changing community expectations.

The guide could include case studies from collaborative processes underway across Australia, including in the Latrobe Valley to identify viable, feasible and desirable options for mine land. It could also draw on forthcoming ICMM guidance to support socio-economic transitions through multi-stakeholder models.[5]

We would welcome the opportunity to work with the Australian Government to update this suite.

[4] Cooperative Research Centre for Transformations in Mining Economies, *'Foundations of post-mining transitions'*, CRC TiME, Perth, 2023.

[5] CRC TiME was a Research Partner on this project.

Australian innovation

Recommendation 4:

Champion Australian innovation, including growth of the national mine closure solutions industry.

Landmark analysis released in 2023 estimated annual expenditure on mine closure and rehabilitation activities at almost 240 Australian mines could exceed $4 billion annually to 2040.[6]

As noted in the *'Enabling mine closure and transitions: Opportunities for Australian industry'* report this presents significant potential for innovative local, Indigenous and Australian mining equipment, technology and services enterprises. Leveraging the domestic challenge of mine closure was also seen as a way of creating export pathways.

Importantly, the report highlighted technology, equipment and services were required across four established and emerging categories, including in the Circular Economy (see below).

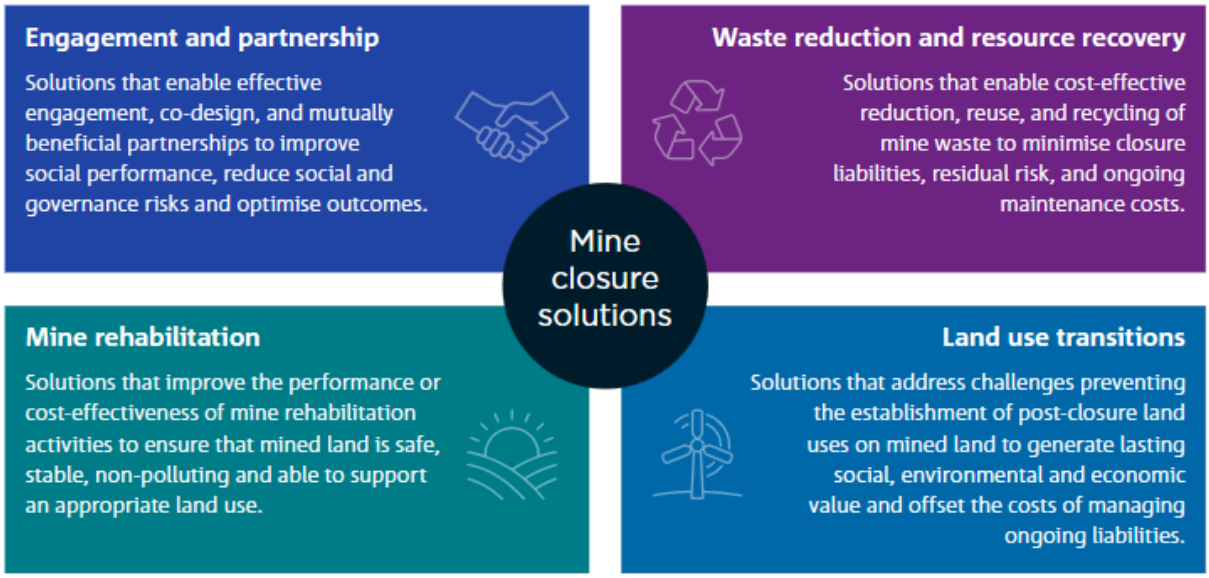
11 enabling actions to unlock the sector's potential were proposed, with five targeted towards governments.

These are relevant in the context of the Circular Economy, notably the importance of increasing visibility of mine closure and transition opportunities, supporting new ways of valuing social and environmental outcomes and addressing regulatory barriers to testing of novel technologies and solutions.

Noted in the report is the role governments in promoting Australian expertise globally, helping to connect to new market opportunities.

In the context of the Circular Economy and repurposing, CRC TiME considers there potential to learn from the approach of governments to growth of the offshore decommissioning sector.

In December 2024, the Australian Government released the Offshore Decommissioning Roadmap, setting out actions to apply circular economy principles and maximise economic value from required decommissioning activities.



[6] CSIRO, '*Enabling mine closure and transitions: Opportunities for Australian industry,*' Prepared for CRC TiME, Australia, 2023.