

Beginning with the end in mind: Submission – Australia’s Critical Minerals Industry Discussion Paper

February 2023



CRC  **TIME**
Transformations in Mining Economies

Introduction

One of the most important lessons from the development of Australia’s traditional resources is the need to plan and act across a mine’s life for what happens after mining ends.

Mining is Australia’s largest industry, a significant source of national, state and territory income, a driver of national and regional business investment and broader economic activity. It is also often the economic backbone of mining regions, a major source of local infrastructure and a significant employer, source of local skills and capability development and key contracting partner.¹

Yet, while many mines extend over generations, all mines are based on finite resources and will eventually come to the end of operational life.² Even planned or expected closures create significant social and economic headwinds.

Changes over a mine’s life – such as the shift from construction to operations and impacts of commodity price fluctuations – can also cause significant flow-on effects.

And, while important progress has been made in addressing environmental risks and impacts from mining, major challenges remain. The scale of new minerals development required to achieve global decarbonisation reinforces the need for new and better solutions to sustainably manage mine wastes, pit lakes and other legacy environmental challenges.³

In addition, industry is working to meet increased environmental, social and governance (ESG) expectations. First Nations and regional communities have greater influence on how operations occur, and investors, customers and financiers are sharpening focus on ESG performance.

Beginning with the end in mind – that is, focusing on accruing long-term positive outcomes for people, communities, nature and the mining and mining equipment, technology and services sector – provides a valuable frame as Australia seeks to leverage its critical minerals advantage.

An evidence-based approach

Established in 2020 through the Australian Government’s flagship innovation and research program, CRC TiME (Cooperative Research Centre Transformations in Mining Economies) brings together diverse stakeholders to reimagine and dramatically transform mine closure and post-mine social, economic and environmental transitions.⁴

Our remit includes examining policy settings to understand how to improve post-mine outcomes for regional and First Nations communities, the environment and industry.⁵

Some overarching findings from CRC TiME’s foundational research are particularly relevant to the discussion questions posed in the Critical Minerals Industry - Discussion Paper.

This submission aims to inform the Commonwealth’s consultation by highlighting key messages and making six recommendations for the strategy. It also signposts upcoming or ongoing research.

Recommendations align with the [National Transformation Principles](#) and Australia’s [Nature Positive Plan](#).

CRC TiME would welcome the opportunity to provide further information.

¹ See Minerals Council of Australia, [2023-24 Pre-Budget Submission](#), MCA, Canberra, 2 February 2023.

² A. Beer, F. Haslam-McKenzie, S. Weller, A. Davies, C. Cote, M. Ziemski, K. Holmes and J. Keenan, [Post-mining land uses](#), CRC TiME Limited, Perth, 2022, p. 9.

³ International Energy Association, [The role of critical minerals in the clean energy transition](#), IEA, 2021, p. 192.

⁴ ACIL Allen, [Cooperative Research Centres Program: Impact Evaluation](#), prepared for the Australian Government Department of Industry, Science, Energy and Resources, November 2021, p. vii.

⁵ See [CRC TiME 2021-24 Strategic Plan](#) and Impact Framework.

About CRC TiME

CRC TiME is part of the Australian Government's world-leading Cooperative Research Centre Program.

Established in 2020, we are proud to be part of nation's innovation ecosystem, working alongside other CRCs to drive transformative change on industry-defined challenges for the benefit of Australia and all Australians.⁶

[Our purpose](#) is to connect Australia's best researchers with the mining and mining equipment, technology and services industry, regional and First Nations organisations and governments to reimagine and help transform for the better what happens after mining ends.⁷

Communities preparing for a future transition – whether now or in decades – are at the centre of what we do.

Focused on complex challenges

Our [research agenda](#) tackles some of the most complex mine closure and post-mine transition challenges.⁸

This includes regional economic development, social and cultural dimensions of mine closure, law and policy (tenure, disconnections between mine closure and regional development policy), barriers to future land use, risk, investment expectations, stronger First Nations partnerships and outcomes, operational planning and evaluation.⁹

Through this work, CRC TiME aims to contribute to a future with fewer abandoned mine sites, increased certainty for all, diversified and equitable regional economies, continued investment in Australia resources, new commercial opportunities and improved natural systems.¹⁰

Impact Objectives

Our diverse partnership has identified five overarching Impact Objectives:

1. Mines are closed in ways that deliver social, economic and environmental value.
2. Closed sites are repurposed to enable faster transition to diverse and resilient economies.
3. Mine closure business solutions drive new commercial and/or regional opportunities.
4. Continued investment in Australian resources.
5. Policy, decision and management systems reduce risks to people, communities, the environment and industry.

Our diverse partnership

We are fortunate to operate with the support of the Commonwealth and more than 75 mining and mining equipment, technology and service industry, research sector, government and First Nations and regional community partners.

The University of Western Australia and University of Queensland host us.

CRC TiME strives for genuine First Nations Inclusion. Board-endorsed [First Nations Inclusion Principles](#) guide our work and we recently established an independent First Nations Advisory to challenge, inform and shape our priorities.

Our unique engagement model means that partners in the Bowen Basin, Latrobe Valley, the Pilbara, south west Western Australia, South Australia and other regions inform, shape and directly benefit from our work.

Further information is available at www.crctime.com.au.

⁶ Department of Industry, Science and Resources, [Investing in Australia's mining and energy future](#), Australian Government, viewed 1 February 2023.

⁷ See Cooperative Research Centre for Transformations in Mining Economies, [Strategic Plan 2021-24](#), CRC TiME, Perth, 2021.

⁸ Cooperative Research Centre for Transformations in

Mining Economies, [Research Prioritisation Plan 2021-24](#), CRC TiME, Perth, 2021.

⁹ Ibid.

¹⁰ Cooperative Research Centre for Transformations in Mining Economies, [Strategic Plan 2021-24](#), CRC TiME, Perth, 2021.

Key messages

A complex challenge

As global decarbonisation accelerates, increased demand for Australia's critical minerals presents enormous economic opportunity. At the same time, the scale and speed of likely development could present social, economic, environmental and governance challenges.¹¹

Unless managed well, our research shows that challenges accumulate over mine life.¹²

A driving factor is that mine closure is usually seen as a proponent-led responsibility, focused largely on return of the site to prior state. This limits dialogue and engagement on what is possible – and how risks, opportunities and impacts are understood and managed. It also does not recognise interconnected benefits, effects and impacts over mine life, creating uncertainty for all – including industry.

Coordinating with regional and First Nations communities across mine life

Our research shows that *coordinated, strategic and ongoing planning and action at a regional scale* supports improved long-term outcomes.

Effects are often cumulative and interconnected, especially when more than one mine operates in a region, meaning whole-of-community response is required.¹³ While recognition of cumulative environmental effects has advanced, a better understand cumulative cultural, social and economic effects over mine life is needed to plan.

Recognising this, CRC TiME is advancing development of a Regional Cumulative Effects Framework. This will include understanding how Indigenous-led and focused effects assessments can enable First Nations communities to drive their own opportunities and support management of cultural, social and economic risks.¹⁴ It is especially important given the scale of the Indigenous Estate in Australia.¹⁵

Case studies, tools and resources will be valuable for critical minerals developments.

Early planning for better outcomes

Planning for an eventual post-mine social and economic transition should begin as early as possible – ideally before development of a new mine or basin – to leverage and capitalise on mining-related economic opportunities as they occur. It is especially important as decisions and investments made before development and during operations – by all stakeholders – affect what is possible after mining ends.

CRC TiME is working to develop new frameworks so regions can leverage economic gains to build transition capacity for long-term sustainable growth.

Unlocking new commercial opportunities from mine wastes and closure

A priority for CRC TiME is quantifying and identifying new ways of extracting economic value from mine wastes, repurposing of mined land and infrastructure for renewable energy generation, tourism and biodiversity conservation and rehabilitation activities. The potential is huge - particularly for local and First Nations communities and businesses.

Research will begin in early 2023.

Global leadership and CRC advantage

Australia is well-placed to position itself as a global leader in post-mine outcomes, leveraging its investment in the CRC TiME and broader research and innovation ecosystem.

The CRC program has delivered for Australia and all Australians since its establishment by the Hawke Government. Further harnessing mining and energy-related CRCs to drive innovation across the critical minerals value chain is a substantial opportunity.

¹¹ See International Energy Association, [The role of critical minerals in the clean energy transition](#), IEA, 2021.

¹² See G. Boggs, T. Measham, A. Littleboy & F. Haslam-McKenzie, *Transformation for positive post mine futures*, Australia Centre for Geomechanics, Perth, 2022, p. 52-53.

¹³ L. Sinclair, J. Pope, S. Holcombe. L. Hamblin, D.

Pershke, R.J Standish, M.E Kragt, F. Haslam-McKenzie, V. Subroy and R. E Young, [Towards a framework for regional cumulative impact assessment](#), CRC TiME Limited, Perth, 2022, Australia, p. 9.

¹⁴ Ibid, p.31.

¹⁵ Ibid, p. 31.

Recommendations

Recommendation 1:

Incorporate post-mine transitions as a focus area.

Recommendation 2:

Encourage ongoing regional-scale and coordinated environmental, social and economic planning and action to support positive long-term resilience and manage risks and impacts.

Recommendation 3

Recognise CRC TiME's focus on supporting consistently high post-mine transitions processes and outcomes nationally.

Recommendation 4:

Foster the growth of a specialist mining, equipment and technology sector focused on extracting value from mine wastes, mine rehabilitation and asset repurposing.

Recommendation 5:

Harness the collective impact of Cooperative Research Centres focused on mining, energy and decarbonisation to unlock innovation and improve outcomes.

Recommendation 6:

Ensure First Nations and regional communities can access tailored, independent information to fully participate in critical minerals development processes.

Recommendation 1: Incorporate post-mine transitions as a strategy focus area.

In its leadership role, the Australian Government can reinforce the importance of post-mining transitions being considered early, strategically and collaboratively as critical minerals development accelerates.

Incorporating this focus could:

- signal the importance of seeking to leverage economic opportunities for long-term community and regional economic resilience, including by First Nations communities. This builds on the approach articulated in the National Transformation Principles.¹⁶
- encourage new ways of thinking about mine closure, including how to unlock commercial opportunities from wastes and mine closure activities, particularly for regional and First Nations businesses.
- further facilitate knowledge-sharing, data sharing and leading practice to support consistently high-quality processes and outcomes and improve stakeholder certainty, including industry certainty.
- recognise post-mine social and economic transitions are a shared activity, requiring collaboration between mine operators, regional and First Nations communities, governments, suppliers and contractors and others.
- recognise increasing expectations by regional and First Nations communities, investors, financiers and others about social and economic as well as environmental transitions.¹⁷
- recognise how post-mine environmental outcomes can support Australia's Nature Positive aspirations.

These focuses recognise the Commonwealth's distinct responsibilities as well as opportunities to support advances in leading practice nationally.

¹⁶ National Cabinet, [National Transformation Principles](#), Department of Prime Minister and Cabinet, 9 December 2022.

Recommendation 2: Recognise work underway to support consistently high post-mine transitions processes and outcomes nationally.

Over time, CRC TiME's work will provide a strong evidence base to inform policy, practice and processes to improve certainty for all and strengthen post-mine outcomes.

While states and territories are primarily responsible for resources and environmental matters, the Commonwealth could support knowledge-sharing and facilitation.

Work underway or planned by CRC TiME will:

- clarify definitions for core mine closure and post-mine transition terms in a policy context.
- propose new policy frameworks to address barriers to repurposing mined land for new uses. These will consider how to appropriately address risk, provide certainty for industry and improve availability of mined land and infrastructure for new purposes, such as renewable energy generation.
- result in an Australian business case, roadmap and case studies for Natural Capital Accounting (NCA) mining sector. Australian Government-funded and delivered in partnership with CSIRO, Curtin University and Murdoch University, the project will show how NCA can inform decision-making, improve on-site biodiversity conservation and contribute to regional and national scale nature positive outcomes.
- deliver new frameworks to support regions to realise long-term, sustained and equitable benefits from new mine development and mining activity.
- provide case studies on regional cumulative effects assessments, including lessons from Indigenous-led cumulative effects assessment processes in Canada

¹⁷ G. Boggs, T. Measham, A. Littleboy & F. Haslam-McKenzie, *Transformation for positive post mine futures*, Australia Centre for Geomechanics, Perth, 2022, p. 52-53.

and potential applicability in Australia.

- provide First Nations communities with opportunities to define their own research objectives and provide information to inform their decision-making.
- provide new knowledge, tools and guidance to address some of the most significant mine closure challenges, including management of acid mine drainage and pit lakes.
- consider options to facilitate data sharing, including proposing shared data infrastructure needs.

Recommendation 3: Encourage ongoing regional-scale and coordinated planning to support positive long-term resilience and manage risks and impacts.

Mining brings with it significant jobs, training and development and business opportunities. Yet, how to harness these opportunities for long-term economic resilience in regions and communities remains a challenge.

Recognising mining infrastructure as significant regional assets

It may seem unusual to be raising post-mine land use in a strategy focused on maximising responsible new critical minerals development. Mines and mining-related infrastructure are *significant regional assets*, and there are many examples globally – and nationally – of this infrastructure being repurposed post-operations for new community, environmental or commercial purposes.¹⁸ Yet there remains ‘limited understanding of the economic and social potential embedded in former mines.’¹⁹

Foundational CRC TiME research examined why this is, identifying barriers such as policy settings focusing on return to prior state (usually through site rehabilitation).

While these requirements were implemented to reduce environmental impact and the risk of

abandoned assets, it limits how existing assets may be used.

Encouraging early, ongoing regional-scale planning to harness economic and social benefits arising from new critical minerals development provides opportunity to:

- support early identification of policy and regulatory barriers that may inhibit repurposing
- fully consider potential repurposing options in consultation with mine owners
- develop new and complementary opportunities from existing infrastructure
- address the cyclical nature of commodity markets, which create uncertainty.
- ensure operators have certainty and clarity and can address questions regarding cost and management.²⁰

Regions in control

Many communities, including key mining regions and First Nations communities, gained significant employment, training, business and income benefits during the most recent mining construction boom. However, while sustaining higher incomes than in comparable areas, the transition from mine construction to operations phase led to considerable economic challenges in some regions.

While economic activity has or is expected to surge again – including activity associated with critical minerals development – many communities are also aware of the need to take concurrent steps to prepare for the future transitions. To support this, CRC TiME is working with several regions to develop evidence-based tools to enable them to prepare for future changes. These will be relevant to other regions preparing for critical minerals development.

Other relevant work underway includes development of:

- an analytical framework to enable

¹⁸ A. Beer, F. Haslam-McKenzie, S. Weller, A. Davies, C. Cote, M. Ziemski, K. Holmes and J. Keenan, [Post-mining land uses – a literature review](#), CRC TiME Limited, Perth, 2021, pp. 9-13.

¹⁹ A. Beer, F. Haslam-McKenzie, S. Weller, A. Davies, C.

Cote, M. Ziemski, K. Holmes and J. Keenan, [Post-mining land uses](#), CRC TiME Limited, Perth, 2022, p. 77.

²⁰ Ibid, p. 78.

individual regions to identify transition capacity drivers and regional resilience components

- tools to support communities to identify and consider potential future development scenarios
- case studies on regional effects to support improved understanding and management. This will include case studies to show Indigenous-led Cumulative Impact Assessments can support decision-making.

Once complete, the Commonwealth could share and promote these evidence-based resources to regions where critical minerals development is underway or planned.

Recommendation 4: Foster the growth of a specialist mining, equipment and technology sector focused on extracting value from mine wastes, mine rehabilitation and asset repurposing.

Focus on the circular economy provides significant potential to consider how mining wastes can be used as inputs for new commercial purposes.²¹ At the same time, Australia's commitment to positive post-mine environmental outcomes presents opportunity to further develop the sector providing rehabilitation, revegetation and specialist technical services.

This presents particular opportunities for regional and First Nations, including Traditional Owners' businesses. There are numerous examples of Indigenous-owned and regional businesses providing exceptional mine rehabilitation, seeding and other services.

Furthermore, CRC TiME foundational research showed the potential for repurposing of mining-related infrastructure for new commercial, community and environmental

uses.

CRC TIME is commissioning the first national study to understand the economic value of a mine closure solutions industry. It will map activity across the value chain of three categories of activity:

- Extracting value from mine wastes, including materials recovery, alternative uses and reprocessing of tailings.
- Improving rehabilitation outcomes, including geotechnical activities and managing contaminations.
- Establishing post-mining land uses, such as renewable energy and energy storage, recycling, agriculture and tourism.

Once complete, the study is expected to provide a compelling case for the Australian Government to profile and support growth of the specialist mine closure solutions industry. Doing so concurrently to critical minerals sector development would support further incorporation of opportunities into planning.

Recommendation 5: Ensure First Nations and regional communities can access tailored, independent information to fully participate in critical minerals development processes

Mine closure is a fundamental part of the mining lifecycle. And while planning and work to support a positive post-mine transition is undertaken across mine life, many decisions before development and during approvals processes shape what is possible when mining ends.

Information asymmetry, resourcing disparity and complex processes can limit the ability of First Nations and regional communities to meaningfully participate in consultation, negotiation and agreement-making processes.²²

It can also limit the ability of local businesses, First Nations landholders and communities

²¹ A. Parbhakar-Fox, *A (critically) wasted opportunity*, Sustainable Minerals Institute, SMI, viewed 6 February 2023.

²² G. Boggs, T. Measham, A. Littleboy & F. Haslam-

McKenzie, *Transformation for positive post mine futures*, Australia Centre for Geomechanics, Perth, 2022, p. 58.

and others to capitalise on commercial opportunities, including those involved in mine closure such as land rehabilitation.

There is a role for governments to develop independent, high quality and tailored information about critical minerals development, risks and opportunities and consultation and approval processes.

Recommendation 6: Harness the collective impact of Cooperative Research Centres focused on mining, energy and decarbonisation to unlock innovation and improve outcomes.

CRC TiME proudly works alongside other energy and resources sector-focused CRCs.

In 2022, Decarbonisation and Mining and Energy Networks were formed by these CRCs to drive further commercialisation, innovation and development opportunities through improved coordination.

Hosted by Cooperative Research Australia, the networks could provide a useful mechanism for the Australian Government to test new ideas and connect across the research and innovation ecosystem.