

# Exploring the issues in mine closure planning

Over the next 25 years, 50 per cent of Australia's current mines are expected to close. Subsequently, a stream of post-mine land use transitions is proposed. These mine closures and potential transitions will have major environmental, economic, and social impacts, particularly in regional Aboriginal and Torres Strait Islander communities where mining activities are centralised.

## KEY FINDINGS

When planning for post-mining land uses, many issues and root problems revolve around Mine Closure Plans (MCPs) having various components, each with their own documents that change over time. The following further issues stem from this major problem and need to be addressed:

- **Regulation inconsistency.** There are knowledge gaps among regulatory bodies. They find it difficult to manage, monitor and update mine closure processes for many mines, plus generate reports for their controls, coupled with a lack of regulatory integration flexibility. There needs to be a consistent, clear, and unambiguous set of legislative criteria that focuses on outcomes.
- **Lack of education.** There are disconnects and uncertainties for mine operators regarding the development of concise MCPs, assessing novel alternative land uses, and estimating intangible values related to unintended consequences or lost opportunity cost of alternative land uses. Consistent education for successful mine closure and regional economic transition is required.
- **No adaptive management through learning.** Lessons from stakeholder input, processes, and knowledge base integration are not currently translated into actionable improvements in regulatory enforcement and management. To do so would help with meeting shifting social requirements over the long term.
- **Lack of knowledge integration.** Industry and mine operators suggested key issues centre on process, resources, technology, and "revolving stakeholder doors" (changing stakeholder expectations, reshaping of demographics) plus failure to retain stakeholder engagement across the mining lifecycle. The development of a dynamic and intelligent knowledge-based system, which serves as a decision support to address all MCP issues, should be investigated.



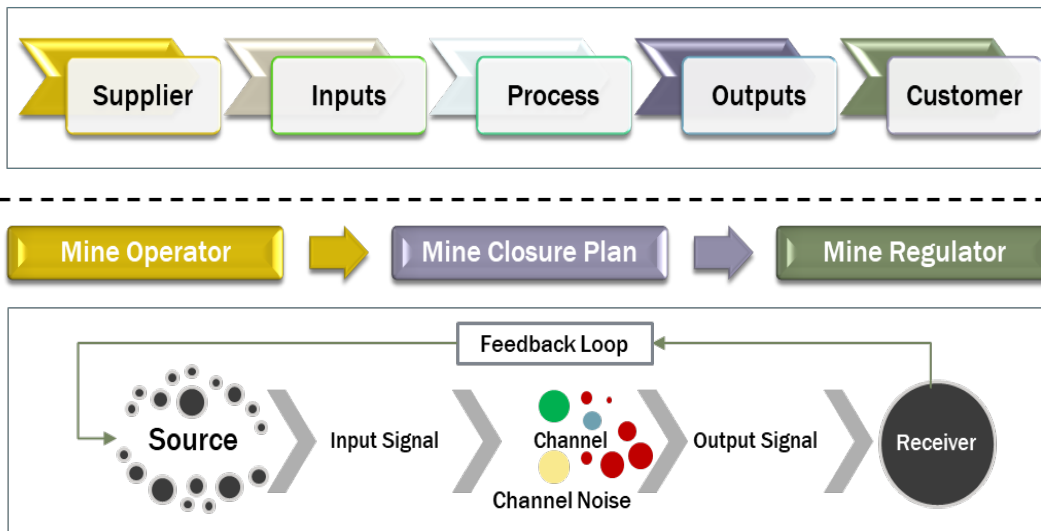
Mine closure planning (MCP) determines what remains after the mine closes and is essential for all mines to have to gain an operating license. Unfortunately, several issues inhibit MCP in this complex and evolving space. This CRC TiME foundation project used a robust hybrid Complex Adaptive Systems (CAS) framework to investigate and understand key closure planning issues that inhibit the realisation of mine closure plans to help facilitate the transition to post-mining economies.

## THE CHALLENGE

There is currently a major disconnect between MCPs and what occurs during their execution, meaning the potential for post-mining opportunities is being lost. A key issue is the cost estimate for post-mining alternatives, due to changes in deposit knowledge, mine ownership, regulatory requirements and requirements from external stakeholders.

Other fundamental challenges include: carriers in biophysical challenges (refer Foundation Project 3.7); regional planning challenges (refer Foundation Project 1.1); long-term post-mining regulatory enforcement, management, and uncertainty of social requirements; little integration between key stakeholders, key inputs, process, and mechanisms to act as a feedback loop for improvement; diverse regulatory focuses, lack of a consistent and clear set of legal requirements, and lack of flexibility in regulation integration; and knowledge gaps for mine operators in assessing novel alternative land use and quantifying the intangible impacts such as consequences of improper execution or the 'what ifs'.

## CAS Framework 1 – Supply Chain System (SIPOC)



## CAS Framework 2 – Communication System

### THE OPPORTUNITY

Through CRC TiME, the opportunity exists to identify, explore and remove MCP barriers, and better integrate the procedures, resources, and technology, to ensure the outputs are effectively managed. Value and liability, accountability and responsibility, and uncertainty and time lapse, all impact MCP and the outcomes it achieves. Conceptualising mine closure as a Complex Adaptive Systems (CAS) will help investigate the key issues that need to be addressed, with opportunity stemming from the following three steps:

- Step 1: Comprehensive literature review for evidence of best practice and to list the key MCP issues.
- Step 2: Analysis of MCP issues using a hybrid CAS systems approach.
- Step 3: Industry and regulator consultations and expert opinion (using a survey/questionnaire).

### OUTCOMES

Current standalone CAS frameworks do not adequately address challenges from the perspective of value, liability, accountability, responsibility, and uncertainty over time.

CRC TiME identified the need for further research to develop an integrated knowledge-based toolkit for effective control and collaborative management of MCP – supporting the social license to operate from local communities.

Such a toolkit could help to achieve consistent regulation that focusses on outcomes; improve the enforcement and management of regulations that also meet shifting social

requirements over the long term; and closing knowledge gaps in the mine operator space to ensure the successful closing of mines. Ultimately it is the first step to driving the mine closure outcomes and change needed to facilitate the transition to post-mining economies.

### PROJECT PARTNERS

Deswik Mining Consultants (Australia); Western Australian Department of Mines, Industry Regulation and Safety; OZ Minerals; BHP; Newmont; Queensland Department of Environment and Science – Environmental Services and Regulation; Western Australian Department of Mines, Industry Regulation and Safety – Resource and Environmental Compliance Division; Northern Australia Department of Industry, Science, Energy and Resources (DISER-NT) – Major Projects Division; Rio Tinto

### PROJECT PUBLICATIONS

#### REVIEW FULL REPORT

- 1) Dzakpata et al. (2021). Exploring Mine Closure Planning Issues in Australia- A Hybrid Complex Adaptive Systems Framework. The International Journal of Mining, Reclamation and Environment (in Progress).
- 2) Dzakpata et al, (2021). Exploring The Issues in Mine Closure Planning. CRC TiME Limited, Perth, Australia.

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## ABOUT US

The Cooperative Research Centre for Transformations in Mining Economies is part of Australia's national innovation ecosystem. Our diverse partnership brings scale, collaboration and coordinated investment to tackle the most complex mine closure and post-mine transition challenges. Together we're rethinking what's possible to improve outcomes for people, communities, the environment and industry.

We acknowledge the traditional custodians across all the lands on which we live and work, and we pay our respects to Elders both past and present.