FOUNDATION PROJECT 3.7

CRC TiME
Transformations in Mining Economies

Comparative Closure:

Assessing the biophysical closure challenges of different mining methods

Different mining methods present unique biophysical challenges on the surface and underground that impact closure outcomes and post-mining land use. In addition, stakeholders are increasingly expecting further consideration of environmental, social, and governance (ESG) issues. As such, factors including the ability to close a site, reuse the land and contribute to community aspirations need to be considered in the early stages of mine closure planning.

KEY FINDINGS

- **The novel approaches tended to have lower risk perception but higher unknowns due to current uncertainty and knowledge silos.**
- **Surface mining: the risk of open-cast mining was rated slightly higher than that that of open-pit mining.**
- **Underground mining: is anticipated to have surface subsidence and water pollution risks.**
- **In-place mining: water pollution (affecting the subsurface aquifers), subsidence and ground movements, and water consumption, were considered the greatest risks associated with this mining method.**

This project compared the biophysical impacts of conventional and novel mining methods to support a business case for closure that encourages the adoption of new mining approaches. The three novel in-place approaches assessed in this study were in-situ recovery, in-mine recovery, and in-line mining.

THE CHALLENGE

Conventional mining methods often require large open pits, voids underground, and large tailings footprints. Novel mining methods have the potential to reduce the environmental footprint and capital costs of mine operations and influence closure outcomes. Yet these new methods apply alternative technologies that have their own biophysical challenges.

THE OPPORTUNITY

To identify critical risks associated with various mining methods, experts rated the three different methods against 22 factors – including biological effects, effects on land use by First Nations, hazards and effects on humans, rehabilitation costs and water use – to determine their critical impact. The resultant matrix helped compare biophysical impacts of novel mining approaches with the more traditional mining methods (e.g., open-pit mining, underground stope mining, and cave mining) as they affect closure and post-mining land use.

OUTCOMES

This project helped to enhance the current understanding of the relationship between mining methods, closure and post-mine land use. Findings suggested that knowledge of the biophysical risks is highly siloed, and experience in one method does not assist in understanding risks in others. Transformational opportunities were identified to determine future CRC TiME activities to support mining methods with improved closure outcomes.

NEXT STEPS

The potential for risk reduction and improved mine closure remains, whereby novel mining methods could be developed into practical operational solutions to benefit the industry and communities.

Further work was proposed to compare closure options for conventional and novel approaches using digital twin case studies based on real operations. This will help to build confidence in mining companies to trial methods and support communities and regulators to better understand the implications.

PROJECT PARTNERS

Mining3; CSIRO; Curtin University; Iluka

PROJECT REPORTS

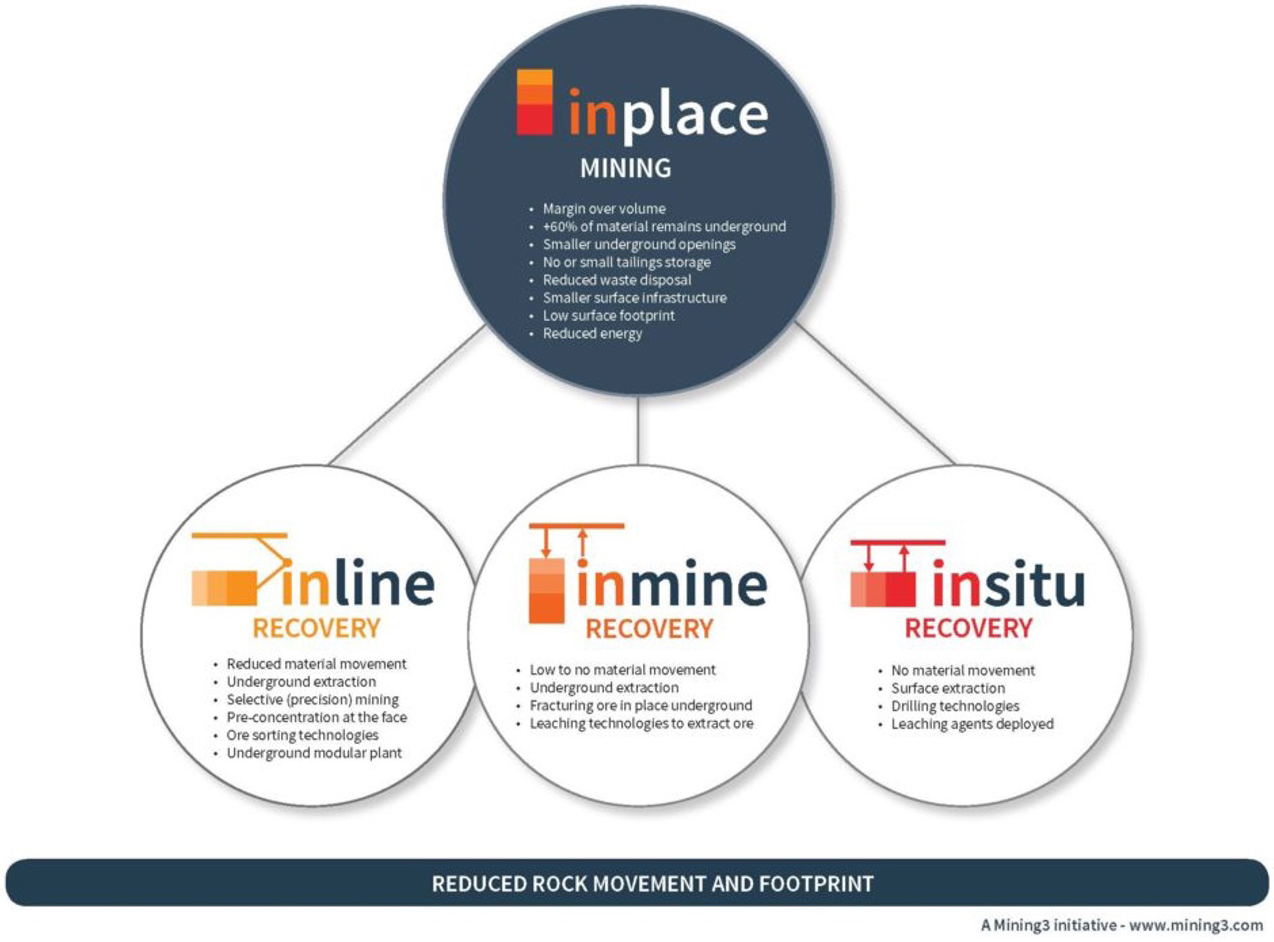
REVIEW FULL REPORT

Fathi Salmi, E, Costa Picorelli, R & Sellers, EJ 2022, 'Investigating the biophysical challenges associated with mine closure in different mining methods', in AB Fourie, M Tibbett & G Boggs (eds), Mine Closure 2022: 15th International Conference on Mine Closure, Australian Centre for Geomechanics, Perth, pp. 539-556, https://doi.org/10.36487/ACG_repo/2215_38

Sellers, EJ, Costa Picorelli, R & Fathi Salmi, E (2022), Comparative Closure: Assessing the biophysical closure challenges of different mining methods. Mining3 report.

CONTACT

E info@crctime.com.au **T +61 (08) 9263 9805**



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.

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