

Planning For Post-Mining Land Uses: A Strategy to Avoid a Potential Global Crisis?

Planificación de usos del suelo post-mineros: ¿Una estrategia para evitar una posible crisis global?

 **Fiona Haslam McKenzie**
University of Western Australia
Australia
fiona.haslam-mckenzie@uwa.edu.au

 **Natalie Brown**
University of Western Australia
Australia
natalie.brown@uwa.edu.au

Abstract

Globally, mining activities occupy large land footprints, during and after active operation. Few mine sites are fully rehabilitated, and even less are re-purposed for other uses. Consequently, there are large tracts of land and wasted assets, that could otherwise be used for productive purposes if post-mining land uses were viewed as an investment in the future rather than an insurmountable risk. Strategies for mined land and asset re-use are economically and socially important but there is no single agreed approach to best practice in mine closures, or the planned transition of a mining economy to other activities. Governments generally adopt a regulatory role, expecting industry to lead rehabilitation and re-purposing of mined land, with disappointing outcomes. However, in some examples where government has collaborated with industry and communities, there have been beneficial social and economic outcomes which serve as potential templates for global reform. This paper will discuss why mine relinquishment and re-purposing is difficult to achieve. Strategies being developed in Australia which seek to facilitate more timely mine closure and land re-purposing for alternative productive uses will be presented.

Keywords: Mine closure, Post-mining land uses, Land re-purposing, Regional economic development, Industry diversification, Path dependency

Resumen

A nivel mundial, las actividades mineras ocupan grandes extensiones de tierra, tanto durante su operación como después de ella. Pocos sitios mineros son completamente rehabilitados, y aún menos son reconvertidos para otros usos. En consecuencia, existen amplias áreas de tierra y activos desaprovechados que podrían destinarse a fines productivos si los usos del suelo posteriores a la minería se consideraran una inversión a futuro, en lugar de un riesgo insuperable. Las estrategias para la reutilización de tierras y activos mineros son económica y socialmente importantes, pero no existe un enfoque único consensuado de buenas prácticas en el cierre de minas ni en la transición planificada de una economía minera hacia otras actividades.

En general, los gobiernos adoptan un rol regulador, esperando que la industria lidere la rehabilitación y reconversión de las tierras mineras, con resultados decepcionantes. Sin embargo, en algunos casos en los que el gobierno ha colaborado con la industria y las comunidades, se han logrado resultados sociales y económicos beneficiosos que pueden servir como modelos para una reforma global. Este trabajo analizará por qué la cesión y reconversión de minas son difíciles de lograr. Asimismo, se presentarán estrategias desarrolladas en Australia que buscan facilitar un cierre de minas más oportuno y la reconversión de tierras hacia usos productivos alternativos.

Palabras Clave: Cierre de minas, usos del suelo post-minero, reconversión del suelo, desarrollo económico regional, diversificación industrial, dependencia de trayectoria.

Introduction

Mining resources has been undertaken for millennia and much has been made about the role of mining as a catalyst for social and economic wellbeing and progress (Haslam McKenzie, 2016; Langton, 2015; National Indigenous Australians Agency, 2022). Less well, formally, documented is the disproportionate impact of mining when it is undertaken irresponsibly, creating unsafe working conditions and causing harm to people and wildlife that depend on natural resources such as water, air and soil. International attention is calling out poor practices and markets are induced to avoid companies whose corporate social responsibility practices are unacceptable or even absent. Mine closure and management of mined land, whether being actively mined or not, is beginning to emerge as part of the responsible mining agenda with the World Bank (2021), Intergovernmental Forum on Mining Minerals, and Sustainable Development and the International Council on Mining and Metals (ICMM) (2025) recognising the potential long-term physical, social and economic risks of not closing mines responsibly but also emphasising the necessary planning for responsible, integrated closure initiatives. These peak organisations are advocating for companies and governments to not only ensure mined land and the associated infrastructure are safe, stable and non-polluting, but to consider how these assets can and will be sustainably used post mining.

Globally, it is difficult to know just how many mines are active, abandoned or in care and maintenance (unproductive) status. Using satellite images, researchers can calculate above-ground mines, including buffer areas, tailings dams, dumps, pits and water ponds (Maus *et al.*, 2020; Tang & Werner, 2023), however this is indicative only and do not identify undergrounds mines. Nonetheless, using this method, mining in Australia and China occupies the largest areas of land, with Australia's mining characterised by fewer, but very large mines, occupying large land footprints. As noted by Maus *et al.* (2020, p.1) mapping mined land is a 'crucial indicator of environmental pressure, which is closely associated with a range of negative impacts, including fragmentation and degradation of ecosystems and biodiversity loss'. Consequently, there are large tracts of land and wasted assets, including infrastructure that could otherwise be used for productive purposes.

In Australia, the number of mines which are inactive or abandoned is 'guess-timated' to be about 90,000, including many gold diggings from the nineteenth century, active long before rehabilitation or restoration protocols were in place. Many of these continue to leach poisoned water, harmful chemicals and surrounding land is affected by erosion and acid mine drainage. State and local governments are now largely responsible for these historic polluted mining legacies. Globally, few mines are rehabilitated, and even less are re-purposed for other uses. Tang and Werner's (2023) study estimate there are, using remote sensing, 66,000 sq kilometres of abandoned mines globally, including waste rock dumps, pits, water (storage and pits), processing infrastructure and leach pads. The US accounts for approximately 500,000 abandoned mines, 10,000 in Canada, 12,000 in China and 1500 in the UK (Tang & Werner, 2023). In Australia, since 2000, most mining companies are legally obligated to plan for closure and demonstrate their sustainable development commitment to all stakeholders (Hamblin, Gardner, & Haigh, 2022). (Some mines operating in Western Australia under a State Agreement¹ are exempted from these obligations under the terms of their Agreement, Brown, 2023). Regulations, such as the payment of a mine rehabilitation bond prior to commencement of mining, and more recently, mine rehabilitation funds, have been put in place by all Australian mining jurisdictions to ensure

¹ A State Agreement is a legal arrangement between a state government and a company outlining mutual obligations for the development of a large-scale, long-term project that requires significant investment and commitment from the proponent. These agreements are typically ratified by an Act of Parliament, giving them the force of law and allowing the project to proceed under the terms specified within the agreement, sometimes bypassing or modifying standard state laws.

companies cannot avoid such site rehabilitation obligations by going into liquidation. Most commentators suggest however, the bonds are grossly inadequate and instead, companies are encouraged by government, through the provision of incentives, to progressively rehabilitate throughout the mine life.

There are more than 350 active mines in Australia (Geoscience Australia, 2025) but there are possibly as many in 'care and maintenance' status (Pepper *et al* 2021, p 2) although the data is scant. (Official estimates range between 206 and 972 mines in care and maintenance across Australia). In summary then, relatively little is known about mines that have been active but are not currently, whether they are in official 'care and maintenance' status, closed, abandoned, under rehabilitation or deemed rehabilitated. This is not only an Australian problem. Globally, the number of mines and land formerly part of a mine license (including buffer land) that have been classified fully rehabilitated and subsequently relinquished for other uses is miniscule for a variety of reasons but mostly because of the difficulties involved in closing a mine and concerns about transfer of residual liability for sites (Measham *et al.*, 2024).

Given that a substantial number of mines, particularly those producing coal and other thermal products, will likely close in the next two decades, successful and responsible mine closure and relinquishment is an urgent challenge. Not only is it environmentally damaging and an economic and social waste of land, infrastructure and other assets, the socio-economic opportunity costs are immeasurable.

Understanding why relinquishment is difficult to achieve

Relinquishment of rehabilitated, post-mining, land is the 'north star' outcome, meaning that the government and its regulators are satisfied that the post-mining land has been sufficiently well rehabilitated; that it is safe, stable so that the mining proponent can be released from liability for residual and unforeseen risk. The risk attaches to the tenure, so the proponent may be liable if they hold the underlying tenure, but if another entity such as government (crown land) or a private person (eg freehold or pastoral lease) holds the underlying tenure, then legislative frameworks in each state of Australia broadly hold that the proponent is liable regardless of whether they still hold the tenement,² and therefore they are responsible for risks associated with the land that was previously mined.

To date, mine closure, rehabilitation and working towards relinquishment are activities viewed by companies and governments as a significant cost, rather than an investment in the future and new potential socio-economic opportunities. Measham *et al.* (2024) note that a key reason mine closure has a poor track record is that closure costs are often underestimated. "Gaining reliable data on the extent to which closure costs are underestimated can be difficult. Whether it is the way that companies provision for closure or the basis that governments use for estimating financial assurance bonds" (Measham *et al.*, 2024, p.2), there is evidence that closure costs have been substantially underestimated and this has made closure more difficult to achieve (Dunow & Kalisch, 2022; Purtill & Littleboy, 2023). Consequently, regulators have been hesitant to release mining companies from their commitments.

Concerns about a lack of transparency regarding closure plans and poor governance structures that support local communities, especially First Nations peoples, after a mine ceases operations have also hindered plans for repurposing and ultimate relinquishment of mined land (Horowitz *et al.*, 2018; Scambary, 2013).

² For example, the *Mining Act 1978* (WA) s 114B continues to impose liability on the proponent after the forfeiture or surrender of the tenement.

The residual liabilities and unforeseen physical and social risks impede progress without satisfactory assurances that the environmental risks associated with mining legacies will be adequately met by the industry. While government, the mining and finance industries seek solutions to adequately honour long term financial commitments through financial assurance systems (Bocking & Fitzgerald, 2012), governments are also reforming regulations to ensure post-mining planning occurs with local stakeholders at the earliest possible opportunity. Western Australian environmental reforms in 2020 require progressive rehabilitation and mine closure plans to be determined with key stakeholders, identifying the closure and residual risks and their management as well as also identifying the capacities of the land, post mining (Mills, 2022). However, the regulatory enforcement mechanisms are relatively weak and it is easier for some companies to move to 'care and maintenance' status and essentially 'push the can down the road' without penalty (Pepper, Hughes, & Hague, 2021). Increasingly it falls to peak industry organisations such as the ICMM or funding agencies to exert pressure on companies to practise corporate social responsibility and/or to have access to funds for expansion or commercial opportunities (Australian Sustainable Finance Institute, Farming for the Future, & Foundation, 2024). Consequently, governance structures and regional development policies regarding post-mining land use guidelines are disconnected and sometimes ambiguous. There is no clear regulatory pathway to transition land to next use and communities and governments are hesitant to engage in post mining land use projects without clarity, particularly with regard to residual risk. This results in a piecemeal approach and lost economic opportunities, and potentially profound impacts within mining-dominated regions.

With an increasingly knowledgeable community and investor base "that is acutely aware of the impact that mining can have on issues that they are interested in, leading to increased scrutiny of operational and business practices" (Maybee, Lilford, & Hitch, 2023, p.1), companies cannot afford to dismiss their corporate social responsibility regarding mine closure and post mine planning. Ernst and Young (2022) identified that the top three risks facing mining companies in 2022 were all environmental, social and governance (ESG) related. Consequently, peak industry organisations such as the ICMM have invested considerable resources to assist companies to look beyond financial assurances and focus on how to achieve optimal post-mining transition by repurposing sites and delivering improved social and economic outcomes in collaboration with a variety of stakeholders (International Council on Mining and Metals (ICMM), 2025). The ICMM is advocating for industry to work towards a legacy of land assets that have a sustainable future that can transition the community and economy to a robust post-mining landscape.

Viewing mine closure and relinquishment differently

To date globally, governments have generally adopted a regulatory role and expected industry to not only lead the rehabilitation and re-purposing of redundant mining land, but also to spearhead next uses of mined land, with, as noted above, disappointing outcomes. Generally governments take the view that mining companies have made considerable profits from mineral assets and it is therefore their responsibility to not only clean up after themselves but also prepare with their stakeholders for a post-mine future (Everingham, 2007; Foran, Ackerman, & Barber, 2024; Heisler & Markey, 2014). However, in the few examples where government has had more than an oversight role and been involved and collaborated with industry and communities during the planning of repurposing a mine site, there have been beneficial social and economic outcomes.

Two Australian case studies have the potential to serve as templates for global reform in how mining land could be 'de-risked' and repurposed. They are illustrative and opportunistic examples of re-purposed mine-sites, rather than guided by regulation. Nonetheless, they underscore the cost, but also the broader opportunities gained by planning for a future beyond mining. Both case

studies have transitioned from mine sites to other uses in the last decade, although the planning and process of transitioning took decades, hampered by a lack of regulation, significant social, economic and environmental rehabilitation costs and insecurities regarding future, unknown liabilities. In the first example, a state government committed to testing the possibility of repurposed mine land, driven by the likely closure of hundreds of local mines in the next century and the considerable public pressure to change the legislative and regulatory arrangements for post-mining land uses. The other example was more serendipitous, with a determined local municipal government, a co-operative mining company, and the promise of ground breaking science coming together to re-purpose an almost exhausted minesite.

The research was undertaken over a three year period (2019-2022) using government, media and scientific reports. Subsequently, 32 one on one interviews were undertaken with state and municipal government decision-makers, trade union and industry representatives, and community members from both sites. These interviews were recorded and subsequently analysed to understand how the re-purposing occurred, why it was successful, the regulatory frameworks that had to be navigated, and the ultimate outcomes for all stakeholders.

Case Study 1 Lake Kepwari Collie Western Australia

Lake Kepwari is located near the small town of Collie in the South West of Western Australia where a deep coal mining pit was rehabilitated by the company and subsequently repurposed as a popular recreational lake in close collaboration with the Western Australian government. Rehabilitation and re-purposing was accelerated after the coal pit was flooded by a severe weather event that flushed the pit. Collie is the only coal mining town in Western Australia, and importantly, is the sole source of coal powered electricity for the capital city Perth (population 2.2 million). The repurposing of the pit, formerly known as Western Five, was an example of the company fulfilling its statutory, rehabilitation commitments, however, without considerable government intervention and investment, the rehabilitated pit would not have reached “transformative status” (Beer *et al.*, 2022).

Politically, fossil fuel-dependent energy sources have become increasingly socially and politically unpopular and the state government announced in 2016 that coal production will cease in 2029. The town of Collie and the trade unions foresaw a grim future without coal-related employment. As an aside, in a region with few lakes or recreational facilities, local people had lobbied for a redundant coal pit to be rehabilitated as a lake for decades but the mine and company were struggling to maintain viability and could not commit to doing more than was required by regulation. Western Five was closed in 1995 and after lengthy rehabilitation by the company, and the flushing event in 2011, it was repurposed as Lake Kepwari by the State government. It is now a publicly accessible, deep lake, and sufficiently healthy for active recreation including swimming, boating and fishing. The mining tenement was ultimately relinquished, and the site returned to the Department of Biodiversity and State Attractions (WA) in 2021. Lake Kepwari was the ‘headline’ repurposed asset; in addition to their significant contribution to the repurposing of Western Five, now Lake Kepwari, the State government spearheaded a comprehensive ‘just-transition’ program. It convened a working group comprised of local industry, union leaders, local government and community representatives, which together developed The Just Transition Plan (Department of Premier and Cabinet, 2020) to drive change for a more sustainable future.

Government subsequently underwrote job creation opportunities, skills and capacity building (approximately \$1billion) (Department of Jobs Tourism Science and Innovation & Department of Primary Industries and Regional Development, 2020), including government services, and supported significant local investment through incentivising and attracting new business ventures based on innovation and new technologies to the community. These new businesses include a

remote vehicular training centre, a medical supplements business and the repurposing of another former coal pit as a car racetrack. These ventures have attracted new people to the town while also employing former mine workers thus diversifying the local profile and economy from one wholly dependent on coal and power production (Beer *et al.*, 2022), recreating the town as a 'tourist and new technologies town', rather than a 'coal town'. The local government, the trade unions and the town of Collie have embraced the changes and the opportunities and consequently, Lake Kepwari has become a showcase for progress (Goods & Ellem, 2024).

Case study 2 The Stawell Underground Physics Laboratory

A second example of government collaboration and local leadership was in Stawell, Victoria. The Stawell Gold Mine (SGM), located in the small town of Stawell (population ~ 6000) 240km west of Melbourne in Victoria, was slated to closed in 2014. The company regularly communicated with local representatives particularly the local government authority regarding the imminent closure of the mine which at its peak had directly employed 400 people with many other local businesses supporting the industry. As company plans proceeded for the mine closure, local stakeholders actively sought ideas for re-purposing the underground mine and maintaining local employment.

Simultaneously, physicists from the Italian Laboratori Nazionali del Gran Sasso were seeking a southern hemisphere location for a deep cavern in a rock-protected location to conduct experiments for the potential detection of dark matter, the mysterious substance thought to make up to 80% of matter in the universe. Local government representatives advocated for the Stawell Underground Physics Laboratory (SUPL) at the local, Commonwealth and Victorian state government levels. Recognising the potential for foreign investment and the promotion of science, technology engineering and mathematics (STEM) industry, negotiations quickly escalated beyond the local government level to State and Federal levels. Considerable funds from all levels of Australian government and international sources were invested to fund the established of the SUPL, opening in 2022. The SGM also played an integral role. The company committed to excavating the necessary underground cavern one kilometre below ground, and maintaining mining assets such as adequate underground ventilation, electrical and fibre-optic infrastructure, vehicular access and water management (Beer *et al.*, 2022) to facilitate the transition from deep mining to a safe, sophisticated underground science laboratory.

During the transformation of the SUPL the local stakeholders worked together to pivot local businesses, promoting services that would not only support SUPL but also facilities for tourists and visiting scientists, research students and potentially, scientific tourists from around the world for extended periods. In addition, working with local schools and universities, the town's leadership has highlighted potential future employment opportunities for those interested in STEM. This had a marked impact with approximately 30% increase in local student uptake in STEM subjects, further consolidating local commitment to the SUPL initiative (Beer *et al.*, 2022).

The State and Federal governments played important roles The governments' engagement facilitated the international and diplomatic agreements, provided some financial investment and the necessary environmental regulations to satisfy the re-purposing of the laboratory.

Theoretical frameworks

From a theoretical perspective, diversification away from dependence on a single primary resource has been advocated for decades, however the temptation to exhaust a relatively inexpensive resource that underpins local economies and then look to government intervention when markets collapse or the resource runs out has been shown to be socially and economically destructive. 'The Staples Trap' was conceptualised by Canadian Innes (1933), who observed the

deleterious impacts of an over-reliance on a single primary resource, leading to widespread economic vulnerabilities and a hindrance to economic diversification. As noted by Ellem and Tonts (2017, p. 3) “long before others addressed the ‘resource curse’, [Innis] pointed to a ‘staples trap’ in which institutional arrangements reinforced resource dependence as governments became financially tied to the revenue generated by the sector”. Consequently, it is often difficult to wean governments off resource dependence, as it is in their interests to promulgate the benefits of new resource developments, thus boosting government coffers through royalties and other trade income. Dependency theory built on this scholarship (Prebisch, 1950) demonstrates a spiral of dependence inducing economic path dependence, with dire outcomes as declining terms of trade for raw commodities, or exhaustion of resources, means communities with no alternative economic substitutes, are left behind to deal with expensive infrastructure, environmental degradation and economic legacies (Van Assche, Gruezmacher, & Deacon, 2020). The outcomes of this scenario are socially, environmentally and economically deleterious for local industries, communities and government.

Implementing new forms of governance to mitigate dependency and consequently impeding the spiral of decline and mendicancy are economically and socially important. Evolutionary Economic Geography (EEG) provides a useful perspective, suggesting that the evolution of the local economy is strongly influenced by geography, temporal and spatial scales (Markey, Halseth, Ryser, Argent, & Boron, 2019) and the path trajectories of the economy are strongly influenced by local assets and history linked to place (Martin & Sunley, 2014). Changes to existing path trajectories, from deeply entrenched locked-in economic pathways, to more entrepreneurial and innovation-driven pathways are often linked to place-based economic development strategies rather than centralised, top-down policies (Boschma, 2017).

In economies such as Australia which are dominated by resource extraction and the associated dependence on the considerable royalties, it is timely to consider a post-mining landscape with path renewal based on new strategic plans. It is clear however, that the Staples Trap and the likely dependency and government mendicancy should be avoided, and hence, preparation and planning for post-mining land uses, long before a mine closes, is critically important.

The case studies demonstrate the catalytic effect when government is actively involved in the promotion and facilitation of mine repurposing. While the investment by the respective governments in the SUPL was nowhere near the scale of that invested by the Western Australian government in Collie, the importance of government lobbying, representation and assistance in planning cannot be underestimated. Both case studies also stand out for the local commitment to the possibilities associated with repurposing of the mine sites, the whole of community collaboration and planning for post-mining land uses.

Indirectly, the involvement of government in the two case studies de-risked the post mining land uses. However, it is not realistic to expect that government can do this for every post-mining repurposing plan but it is evident, by lack of progress, that new governance models have to be considered to support both mine operators and third-party post mining developers to achieve innovative productive post-mining land use outcomes. The current blockages that inhibit innovative post-mining land use, most of which are centred around risk, hinder progress on mine closure and re-purposing of land, and potentially infrastructure, left behind by mining. Government has, as shown by the case studies, a role to play, not necessarily underwriting the innovation and land transformation, as was the case in Collie, but to implement place-based governance models that incentivise innovation and diversification.

Alternative governance solutions

In a quest to break the risk nexus and encourage local decision makers and private investors to drive alternative economic pathways, such as the outcomes at both Stawell and Collie, the Western Australian government is seeking to change the land tenure arrangements associated with mining activities to allow third-party security and access to engage in a post mining land use currently under a mining lease. While tenure arrangements vary across the Australian state jurisdictions, there are similarities in the principles of land access and tenure for both mining and potential post-mining land uses, and currently these limit third parties engaging in projects that repurpose mined land.

In Australia, a mining lease itself is not the equivalent of land ‘tenure’ — mining leases are commonly referred to as a production licence. Mining legislation grants tenements over the underlying tenure that allow for exploration, and mine development and extraction of the resource (exploration licences and mining leases). The mining lease (or other tenement) co-exists with the underlying land tenure and that tenure will generally be held by the mining company, the state, or a third party. The inability to establish alternative tenure to repurpose mine sites has been the primary justification for default tenure arrangements that require the rehabilitation of the mine-site to the pre-mining land use of the existing underlying tenure. Often, high impact mine-sites are not suitable to return to the pre-mining land use but current tenure options limit repurposing the entire site for an alternative purpose (Measham *et al* 2024).

The amendments to the Western Australian Land Administration Act 1997 (WA) (‘Land Administration Act’) in 2023 has created a pathway to resolve the tenure constraints so that multiple land-uses can co-exist. The Western Australian government included a new form of tenure, a diversification lease in the Land Administration Act, by enacting the Land and Public Works Legislation Amendment Act 2023 (WA). This new type of non-exclusive lease tenure allows for single or multiple diversified broadscale land uses.

A diversification lease can be granted by the Minister for Lands over unallocated crown (public) land or through an excision from another tenure grant (for example, a pastoral lease with the consent of the pastoral lessee) to undertake a different purpose or use of the land. A diversification lease could include multiple concurrent uses including: the commercial grazing of authorised stock, horticulture, tourism, Traditional Owners’ economic development and land management, environmental conservation projects, renewable energy and carbon farming. A diversification lease will **co-exist** with other rights granted under other legislation, such as a mining tenement, water licence, or rights under the Native Title Act (1993) (Cth).

The diversification lease tenure option presents an opportunity to work through the remaining hurdles, assess risk more systematically and develop the business case for post-mining land use repurposing projects that can assist the transition to post-mining land uses (PMLU). It is anticipated the diversification lease option will provide the necessary new governance models to enable other users of the land to assess the risks of mined land and weigh up the opportunities and challenges of using that land. Simultaneously, the mining company will continue to honour their rehabilitation and socio-economic commitments in the agreed, regulated, mine closure plan. It is also expected that a mining company can ‘ring fence’ potential risks or costly rehabilitation activities while an alternative land user can get on with their venture outside the mine rehabilitation processes.

Internationally, interest in the Western Australian Diversification Lease legislative reforms has been piqued as a potential for alternative productive uses of land that has been previously mined, while at the same time, NOT absolving the mining companies from their rehabilitation responsibilities. It is anticipated that residual risks from mining and its rehabilitation will be

identified earlier and addressed more presciently; thus accelerating timelines for ultimate relinquishment. Relinquishment of land from mining rights and tenements is the ultimate goal for both governments and companies; absolving them from ongoing responsibility but also repurposing otherwise unproductive land for other uses.

Conclusion

The scale of likely mine closures in the coming decades is hard to assess but we know that it is likely to be a significant problem of wasted resources, not only in Australia but globally. However, unless new governance models are devised that not only ensure mining companies honour their rehabilitation commitments but also provide comfort to both governments and potential next users of post-mining land through better management of risk, then vast areas of land will continue to be unproductive and tied up for the foreseeable future.

This paper has explored two case studies in Australia where government has actively pursued productive and successful post-mining repurposing. The Western Australian government in the first case study invested in supporting the rehabilitation of a coal pit and repurposing it for a recreational lake. However, the majority of the significant investment was assisting the local workforce to transition away from coal mining and to attract both government and private business to a community almost wholly dependent on a mono-economy. The second case study in Victoria, Australia, received government investment but not on nearly the scale of that in Western Australia. Government assisted in trade and diplomacy negotiations to attract and establish a globally significant science laboratory, strongly supported and activated by the local community.

This is not to say that government does not have a critical role, but rather than leading the repurposing activities, government can effectively facilitate creative post-mining land uses and wherever possible, enable next-users to utilise redundant infrastructure and other assets left behind by mining for conservation, commercial and productive uses, such as was the example in the Stawell case study.

Despite the identified challenges, the potential to transition out of path dependent economic arrangements with new industries, technologies and clusters of local entrepreneurs together with supportive local communities is possible with innovative governance initiatives. The Western Australian Diversification Lease is seeking to break the impasse and provide opportunities for new economic pathways driven by local stakeholders, rather than depending on government to take the lead. It is anticipated that diversification away from dependence on a single primary resource and exploration of new, sustainable uses of redundant minesites provides communities with alternative economic substitutes – a counter to the deleterious effects of the Staples Trap. Other jurisdictions are closely observing the outcomes of this new legislative framework to assess its adaptability in other settings.

References

- Australian Sustainable Finance Institute, Farming for the Future, & Minderoo Foundation. (2024). *How financial institutions are approaching nature*. <https://static1.squarespace.com/static/6182172c8c1fdb1d7425fd0d/t/6673aa038bef9318d23da74c/1718856261594/NCAG+Insights+Report+FINAL+PROOF+1.1-compressed.pdf>
- Beer, A., Haslam McKenzie, F., Weller, S., Davies, A., Ziemiński, M., Holmes, K., & Keenan, J. (2022). *Post-mining land uses*.

- Bocking, K., & Fitzgerald, P. (2012). Management and financing of post-closure liabilities. En *Proceedings of the Seventh International Conference on Mine Closure (Mine Closure 2012)*.
- Boschma, R. (2017). Relatedness as driver of regional diversification: A research agenda. *Regional Studies*, 51(3), 351–364.
- Brown, N. (2023). Pilbara Iron Ore State Agreements and mine closure regulation. *Australian Resources and Energy Law Journal*, 42(2).
- Department of Jobs, Tourism, Science and Innovation, & Department of Primary Industries and Regional Development. (2020). *Collie futures: Collie investment prospectus*. https://www.wa.gov.au/system/files/2021-10/2107-067_Collie%20Prospectus-Web-1.pdf
- Department of Premier and Cabinet. (2020). *Collie's just transition plan*. https://www.wa.gov.au/system/files/2020-12/Collies%20Just%20Transition_09%20December%202020_web.pdf
- Dunow, T., & Kalisch, B. (2022). The high cost of poor closure estimates. En *Proceedings of the 15th International Conference on Mine Closure (Mine Closure 2022)*. https://doi.org/10.36487/ACG_repo/2215_88
- Ellem, B., & Tonts, M. (2017). The global commodities boom and the reshaping of regional economies: The Australian experience. *Australian Geographer*, 49(3), 383–395. <https://doi.org/10.1080/00049182.2017.1388761>
- Ernst & Young. (2022). *Top 10 business risks and opportunities for mining and metals in 2022*. https://www.ey.com/en_gl/mining-metals/top-10-business-risksand-opportunities-for-mining-and-metals-in-2022
- Everingham, J. (2007). Towards social sustainability of mining. *Greener Management International*, 57, 91–103.
- Foran, T., Ackerman, F., & Barber, M. (2024). Values in post-mining regional transition: A political–economic regime approach, with insights from Australia. *The Extractive Industries and Society*, 20. <https://doi.org/10.1016/j.exis.2024.101523>
- Geoscience Australia. (2025). *Australian mineral facts*. <https://www.ga.gov.au/education/minerals-energy/australian-mineral-facts>
- Goods, C., & Ellem, B. (2024). An improbable driver of “just transitions”? Union power in the coal heartland of Western Australia’s energy shift. *Energy Research & Social Science*, 117, 103721. <https://doi.org/10.1016/j.erss.2024.103721>
- Hamblin, L., Gardner, A., & Haigh, Y. (2022). *Mapping the regulatory framework of mine closure*.
- Haslam McKenzie, F. (2016). Boom: Boon or doom? En S. Biermann, D. Olaru, & V. Paul (Eds.), *Planning boomtown and beyond* (pp. 2–26). UWA Publishing.
- Heisler, K., & Markey, S. (2014). Navigating jurisdiction: Local and regional strategies to access economic benefits from mineral development. *The Canadian Geographer*, 58(4), 457–468.
- Horowitz, L., Keeling, A., Lévesque, F., Rodon, T., Schott, S., & Thériault, S. (2018). Indigenous peoples’ relationships to large-scale mining in post/colonial contexts: Toward multidisciplinary comparative perspectives. *The Extractive Industries and Society*, 5, 404–414.
- International Council on Mining and Metals (ICMM). (2025). *Handbook on multi-stakeholder approaches to socio-economic transitions in mining*. <https://www.icmm.com/en-gb/guidance/social-performance/2025/multistakeholder-approaches-socio-economic-transitions>
- Langton, M. (2015). *From conflict to co-operation: Transformations and challenges in the engagement between Australian minerals industry and Australian Indigenous peoples*. <https://minerals.org.au>
- Markey, S., Halseth, G., Ryser, L., Argent, N., & Boron, J. (2019). Bending the arc of the staples trap: Negotiating rural resource revenues in an age of policy incoherence. *Journal of Rural Studies*, 67, 25–36.

- Martin, R., & Sunley, P. (2014). On the notion of regional economic resilience: Conceptualization and explanation. *Journal of Economic Geography*. <https://doi.org/10.1093/jeg/lbu015>
- Maus, V., Giljum, S., Gutschlhofer, J., da Silva, D., Probst, M., Gass, S., *et al.* (2020). A global-scale dataset of mining areas. *Scientific Data*, 7, 289. <https://doi.org/10.1038/s41597-020-00624-w>
- Maybee, B., Lilford, E., & Hitch, M. (2023). Environmental, social and governance (ESG) risk, uncertainty, and the mining life cycle. *The Extractive Industries and Society*, 14, 101244. <https://doi.org/10.1016/j.exis.2023.101244>
- Measham, T., Walker, J., Haslam McKenzie, F., Kirby, J., Williams, C., D'Urso, J., *et al.* (2024). Beyond closure: A literature review and research agenda for post-mining transitions. *Resources Policy*, 90. <https://doi.org/10.1016/j.resourpol.2024.104859>
- Mills, L. N. (2022). Getting closure? Mining rehabilitation reform in Queensland and Western Australia. *The Extractive Industries and Society*, 11, 1–12. <https://doi.org/10.1016/j.exis.2022.101097>
- National Indigenous Australians Agency. (2022). *National roadmap for Indigenous skills, jobs and wealth creation*. <https://www.niaa.gov.au>
- Pepper, M., Hughes, M., & Hague, Y. (2021). Loophole or lifeline. *The Extractive Industries and Society*, 8(3). <https://doi.org/10.1016/j.exis.2021.01.014>
- Prebisch, R. (1950). *The economic development of Latin America and its principal problems*. United Nations.
- Purtill, J., & Littleboy, A. (2023). More and better mine rehabilitation: Lessons from Queensland. En *World Mining Congress 2023*.
- Scambray, B. (2013). *My country, mine country: Indigenous people, mining and development contestation in remote Australia*.
- Tang, L., & Werner, T. (2023). Global mining footprint mapped from high-resolution satellite imagery. *Communications Earth & Environment*, 4, 134. <https://doi.org/10.1038/s43247-023-00805-6>
- Van Assche, K., Gruezmacher, M., & Deacon, L. (2020). Land use tools for tempering boom and bust: Strategy and capacity building in governance. *Land Use Policy*, 93. <https://doi.org/10.1016/j.landusepol.2019.05.013>
- World Bank. (2021). *Mine closure: A toolbox for governments*. <https://documents1.worldbank.org>

Acknowledgement:

The authors of this paper undertook the research for this paper through the Co-operative Research Centre for Transformation in Mining Economies (CRC TiME). The support of the Australian Government through the Cooperative Research Centre Program is acknowledged.

About the authors

Fiona Haslam McKenzie is Professor Fiona Haslam McKenzie works at the University of Western Australia, participating in the Socio-economic research program for the Co-operative Research Centre for Transformation in Mining Economies, based in Western Australia. She also serves as the Deputy Director of Healing Country, an Aboriginal-lead research centre. Her work focuses on regional economic development with extensive experience in population and socio-economic change, mining and the oil and gas industries, housing, and the analysis of remote, regional and urban socio-economic indicators. She currently holds several board positions.

First author

Natalie Brown has extensive experience in the law and legal and regulatory frameworks. Her expertise is mining law and mining regulation. Natalie has taught at the University of Western Australia since 2010 after completing a PhD at UWA Law School on mining and water rights in the Pilbara region, which required analysis and collation of archival State records. Post her PhD she has regularly published and presented on mining, water, and closure issues, and is well recognised for her expertise in mining State agreements. She has previously engaged in collaborative research with CRC TiME on mine closure regulation.

Second author