

# Planning the end from the beginning: embedding stakeholder engagement in post-mining land use decisions

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## Abstract

*For mine planning to be truly successful, it must go beyond considering operational efficiencies. Decisions must also consider an end land use vision that's been informed and supported by local communities. By addressing community needs from the outset, mining projects can deliver meaningful economic, social, and environmental benefits both during operations and long after closure. Integrating stakeholder input early in permitting and planning phases aligns mine site layouts and closure strategies with broader community development objectives, helping to meet immediate and long-term needs. This paper explores how early and sustained stakeholder engagement can shape post-mining land use plans that are grounded in the values and priorities of mine-affected communities, while also being realistically achievable.*

*Early involvement of stakeholders including youth, regulatory authorities, and community leaders, encourages open dialogue from the onset, captures evolving of community aspirations, and fosters shared decision-making. This inclusive process builds trust and strengthens local support. Through workshops, consultations, and collaborative planning, communities contribute local knowledge, helping to anticipate challenges and co-develop innovative, context sensitive solutions. This approach mitigates potential conflicts during project implementation and establishes a foundation for sustainable communities long after mine closure.*

*Experience demonstrates that early and transparent collaboration transforms mine planning into a mutually beneficial process, improving both operational performance and the realisation of meaningful post-mining land use. The approach presented in this paper offers a practical model for integrating stakeholder feedback into strategic end land use planning decisions, promoting resilient landscapes and long-term community partnerships. Proactive engagement strategies not only reduce post-mining risks, but also support local economic development and environmental restoration, contributing meaningfully to the global discourse on sustainable mining practices.*

**Keywords:** *mine closure planning, stakeholder engagement, participatory planning, Indigenous engagement, post-mining land use, economic transition, cultural heritage, social impact assessment*

## 1 Introduction

Mining is, by nature, a temporary land use activity. Once resource extraction ends, mine sites and surrounding communities face significant environmental, social, and economic transitions. Historically, closure planning was an end-of-mine life exercise focused primarily on technical rehabilitation, but in recent years, it has evolved to recognise the equal importance of social considerations, particularly stakeholder involvement in shaping closure outcomes and influencing post-mining land uses. This shift is driven by increasing expectations from communities, governments, and investors for transparency, accountability, and long-term value creation beyond the life of mine. Compared to the availability of data on global mineral

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reserves and their future demands, only little is known about the state of mine closure, as well as their impacts on the livelihoods and future economic prospects (Bainton & Holcombe 2018; Streit et al. 2021). Disasters such as the collapse of the Brumadinho Dam in Brazil in 2019 or the blasting of 46,000-year-old rock shelters at Juukan Gorge in 2020 highlight that topics on social impacts, mine closure and subsequent use of post-mining landscapes cannot be neglected under any circumstances (Commonwealth of Australia 2020; Hopkins & Kemp 2021; Owen et al. 2020; Streit et al. 2021; Yameogo 2022). Closure planning is no longer a back-end task. It is a strategic process that must begin early and be continuously adapted.

Drawing from industry guidance, academic research, and applied closure planning experience, this paper outlines a process-driven approach to end land use planning that emphasises co-design, transparency, and adaptability. Central to this approach is the critical role of stakeholder engagement in securing community support for meaningful post-mining outcomes. The paper examines how stakeholder input can be effectively integrated throughout the mining life cycle, with particular focus on its influence on closure visioning, land use decisions, and long-term planning outcomes for mining companies and the communities where they operate. By linking engagement activities to key decision points and closure milestones, it offers a practical framework for aligning stakeholder values with early operational planning. This underscores the need for early and ongoing planning, not as a parallel process but as an integrated foundation that evolves alongside the mine. Proactively embedding engagement from the outset ensures that closure considerations are not only responsive but also anticipatory, helping to de-risk future decisions and build enduring trust with stakeholders.

## 2 Evolving standards and the rise of inclusive closure planning

Industry best practices now emphasise the need for integrated closure strategies that reflect not only engineering feasibility, but also social, cultural, and ecological values. This evolution in closure planning reflects a global industry consensus on the critical role of social performance and sustainable value creation. International guidance, including the International Council on Mining and Metals (ICMM) *Integrated Mine Closure: Good Practice Guide*, the Global Industry Standard on Tailings Management (GISTM), ISO 21795 (International Organization for Standardization 2021) on mine closure and reclamation, the International Finance Corporation (IFC) Performance Standards (2012) and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP): Framework for the rights of Indigenous Peoples globally (2021) all reinforce the role of inclusive engagement across the mine life cycle. These frameworks promote alignment between stakeholder expectations, corporate responsibility, and regulatory requirements. They also highlight the risks of inadequate planning such as loss of trust, legal liabilities, and land use conflicts post-closure.

While most major mining companies have committed to upholding leading industry standards, closure planning still tends to receive less emphasis and fewer resources than the development and operational phases of mining. As a result, mine closure strategies (although evolving) are often developed in silos, with a continued focus on technical remediation while important social and cultural dimensions remain unaddressed. Even in cases where companies have significant progress in stakeholder engagement and the integration of social considerations, many strategies still fall short of fully understanding stakeholder priorities or recognising the long-term consequences of early-stage decisions. The social implications of mining have led to growing scrutiny on the industry's social performance and its ability to engage with and respect the rights and interests of local communities. Stakeholders are increasingly demanding greater transparency and disclosure, and deeper involvement in decision-making to ensure risks on social and host communities are properly understood and assessed. This growing demand for inclusion highlights the need to re-examine how decisions are made in closure planning, and whose voices are heard in shaping the future of post-mining land uses.

## 3 The role of stakeholders in mine closure decision-making

Power and access to decision-making plays an important role in closure and post-mining land use planning. These dynamics determine whose perspectives are prioritised, how benefits are distributed, and whether

negative impacts are acknowledged and addressed. Communities, particularly those directly affected by mining, hold deep knowledge, lived experience, and insights that are relevant to every aspect of closure planning. For this reason, it is essential that they are not merely consulted but actively participate in decision-making throughout the closure process (Crossley 2023).

Recent global shifts toward the recognition of Indigenous rights have led to greater inclusion of Indigenous and local communities in decision-making through mechanisms such as impact benefit agreements, land claim agreements, and participatory environmental and social impact assessments. While these tools help mitigate impacts and inequities during mine development and operations, their application to closure remains limited, especially in addressing long-term post-mining challenges. When done well, community engagement can result in co-learning between parties, centres community needs and values, builds a sense of ownership, and increases social acceptability of mine closure plans. It also strengthens social impact assessments (SIAs) and enhances long-term planning for social and environmental outcomes (Monosky & Keeling 2021a).

The growing emphasis on social transition planning in closure guidelines reflects a recognition that this gap must be addressed. Transition planning should begin early in the mine life and continue throughout operations, in parallel with activities like progressive reclamation. Supporting long-term socio-economic development, particularly initiatives that help workers and communities adapt to life beyond mining, is fundamental to building community resilience. Ultimately, engaging stakeholders early and effectively not only empowers mine-affected communities but also helps shape meaningful post-mining land use plans that reflect their values and priorities. The following section explores participatory tools and approaches that can support this engagement in practice.

## 4 Stakeholder engagement methodologies and tools

Effective stakeholder engagement is essential to mine closure planning. It promotes informed decision-making, mutual understanding, social acceptance, conflict resolution, enhanced social performance, and the development of strategies for long-term sustainable post-mining solutions. Meaningful stakeholder and community engagement for mine closure ensures voices are heard, community needs are identified, and appropriate impact prevention, mitigation, and mine closure plans are developed and implemented (Crossley 2023). The following section outlines practical methodologies that build on both international best practices and lessons from field applications. The approach outlined below is designed to be iterative, context-specific, and measurable.

### 4.1 Early stakeholder identification and mapping

Stakeholder identification and mapping must occur early and be continuously revisited throughout the mine life, as priorities often evolve over time. What matters to communities during operations may shift significantly by the time closure approaches. Stakeholder mapping can be defined as a process that (Reed et al. 2009):

1. defines aspects of a social and natural phenomenon affected by a decision or action
2. identifies individuals, groups and organisations who are affected by or can affect those parts of the phenomenon
3. prioritises these individuals and groups for involvement in the decision-making process.

The goal is to gather insights into stakeholders' interests, expectations, influence, concerns, and potential impacts to inform effective and tailored engagement strategies and decision-making for various stakeholder groups including communities. Using geographic information system (GIS) tools, community registries and participatory mapping enhances the precision in stakeholder mapping and highlights spatial relationships to mine impacted areas. Social baseline studies can also support this effort, capturing demographic data, economic dependencies, and cultural ties.

Stakeholder identification approaches can also vary based on regulatory and cultural contexts. For example, in Canada, the *Impact Assessment Act* (Government of Canada 2019) requires early identification of Indigenous rights-holders and specific protocols for Crown consultation and consent. In contrast, Chile’s environmental permitting system focuses on participatory processes led by municipal governments, where local neighbourhoods and municipalities play a more central role. In Australia, stakeholder mapping often integrates Indigenous land use agreements and considers traditional owner governance structures from the outset. These jurisdictional nuances shape who is recognised as a stakeholder, how engagement is initiated, and what rights or expectations exist around participation in closure planning.

## 4.2 Co-design of engagement plans

Stakeholders should be engaged as co-creators of the engagement process itself. Collaborative planning sessions can help define communication preferences, feedback mechanisms, and meeting frequencies. The engagement plan should function as a living document, co-developed with community representatives, and regularly updated, with clear timelines, milestones, and accountability mechanisms. Guidance from standards such as the ICMM *Integrated Mine Closure: Good Practice Guide* and IFC Performance Standards provides frameworks for designing inclusive and adaptive engagement processes and plans. These standards also encourage the co-development of roles and responsibilities, transparent grievance procedures, and iterative engagement practices that evolve alongside the project. By following these principles, mining companies can develop engagement plans that are not only technically sound but also socially legitimate and locally grounded.

## 4.3 Community visioning workshops and iterative closure planning

Scenario-based engagement tools such as visioning workshops enable communities to co-develop preferred closure outcomes. These workshops help elicit community values, explore options for post-mining land use, and identify risks and trade-offs. Integrating polling tools, maps, or visual aids helps increase accessibility, especially for non-technical stakeholders. Common outputs can include prioritised land use options, identification of restoration resources or cultural amenities, publicly accessible summary reports, and community scorecards that track progress and are updated regularly. However, successful visioning is not a one-off event. It must be embedded within an iterative engagement process that revisits and refines shared priorities over time (Figure 1).



**Figure 1 Participatory closure planning cycle**

This iterative model builds trust, allows stakeholder concerns to evolve alongside project stages, and both guides and anchors closure decisions around shared goals. Mines that have successfully carried out scenario or visioning workshops include the Ranger Uranium Mine in Australia where workshops with the Mirarr traditional owners influenced decisions on landform recontouring and integration of cultural values, aligned with free, prior and informed consent (FPIC) principles (Smith 2016; Lawrence 2022). Similarly, at Leigh Creek in South Australia, visioning sessions that were facilitated through the Upper Spencer Gulf and Outback Taskforce, led to a community-supported masterplan. This masterplan included ecotourism amenities, heritage trails, and small business spaces. Another example is the Red Dog mine in Alaska where a series of internal and external workshops, including closure planning sessions with NANA Regional Corporation representatives and community meetings in Noatak and Kivalina, helped incorporate stakeholder priorities into the formal reclamation plans (Teck Alaska Incorporated 2009). These examples highlight how structured, participatory processes can be instrumental in aligning technical planning with stakeholder aspirations and strengthens shared ownership of closure outcomes.

## 4.4 Social impact assessments and regulatory alignment

SIAs are structured processes used to identify, analyse and manage social consequences, both positive and negative, of mine development and closure. SIAs typically assess how affects people's lives and livelihoods including economic shifts, cultural heritage risks, community health and psychosocial impacts, service access, and land use change. Historically, SIAs have been regulated as a one-off, single-point-in-time, assessment undertaken during the project approvals process (Esteves et al. 2017; Getty & Morrison-Saunders 2020). However, given that mine operations often span several decades, SIAs processes should be revisited throughout the mine life to reflect changing conditions, evolving community perspectives and emerging risks. When conducted as part of a participatory process, SIAs serve as valuable tools for informing the development of social closure plans or community transition plans.

SIA processes are often mandated by regulators such as the Canadian Nuclear Safety Commission (CNSC) and South Africa's Department of Mineral Resources and Energy (DMRE). They are also increasingly informed by stakeholder input and aligned with public consultation requirements. When co-developed with local governments and community organisations, these plans enhance relevance, improve transparency, and support a more successful transition beyond mining.

## 4.5 Digital engagement and visualisation

The use of digital tools can help improve community understanding and increase participation. Tools such as GIS dashboards, closure scenario simulations, and interactive visualisations help make technical content, including closure content, accessible. Plain language summaries, fact sheets in local languages, and short explainer videos support broader community inclusion. Importantly, feedback from these tools should be incorporated into ongoing planning, enabling closure strategies to evolve in response to changing community concerns, preferences, or environmental conditions. This iterative approach, known as adaptive management, helps maintain closure plans that are relevant, flexible, and responsive over time.

A practical example of this approach is South Africa's mine closure risk and opportunity atlas, developed by researchers at the University of Cape Town and the Water Research Commission. This publicly accessible, GIS-based tool integrates spatial data on environmental, social, and economic risks associated with mine closure. It allows users, including community members, regulators, and planners, to explore site-specific vulnerabilities and opportunities through interactive maps and risk ratings (Water Research Commission 2024). By enabling communities to visualise risks and contribute to post-closure planning in a meaningful way, tools like this exemplify how digital platforms can support inclusive engagement and strengthen adaptive closure management.

## 4.6 Collaborative monitoring and feedback mechanisms

Stakeholder engagement should not end with the submission of a closure plan. Post-closure success relies on ongoing communication and shared monitoring responsibilities. Tools such as community-led monitoring groups, transparent performance dashboards, and periodic town halls can help track the implementation of closure activities. Documenting lessons learned through regular engagement reporting supports institutional memory and fosters long-term trust. Embedding these practices throughout the mine life cycle allows companies to better align closure strategies with community development goals. The combination of co-designed planning, transparent communication, and adaptive monitoring contributes to measurable outcomes such as job creation, cultural site preservation, and ecological restoration.

# 5 Discussion: applying participatory planning in practice

## 5.1 Participatory planning tools and processes

Participatory planning actively involves stakeholders in envisioning and designing post-mining land use. Rather than companies deciding unilaterally, these processes treat community members, Indigenous

peoples, regulators, and other parties as partners in closure planning. Common tools include focus groups, community surveys, and multi-stakeholder forums. The aim is to gather diverse perspectives, identify stakeholder values and concerns, and co-create closure pathways that reflect community aspirations.

One foundational step is stakeholder mapping to identify all relevant groups and their level of interest, influence, and vulnerability (Table 1). For example, Pan et al. (2024) describe constructing a stakeholder matrix for a mine rehabilitation project in the Philippines to ensure both internal stakeholders (e.g. site staff, regulators) and external stakeholders (e.g. Indigenous leaders, NGOs, residents) were systematically identified. Those most affected, such as traditional landowners and nearby villages, were categorised as ‘manage closely’, informing an engagement strategy prioritising early and sustained collaboration.

**Table 1 Example stakeholder map: integrated mine closure planning**

Stakeholder group	Interest/concerns	Influence/power	Engagement approach
Indigenous peoples/traditional owners	Cultural heritage, land return, free, prior and informed consent (FPIC), environmental health, livelihoods	High (with legal and moral authority)	Co-design, FPIC, visioning workshops, cultural criteria integration
Local communities/town residents	Jobs, economic transition, water quality, land use post-closure	Medium–high	Community closure visioning, newsletters, public meetings
Environmental regulators	Compliance, environmental liability, water quality, biodiversity, long-term monitoring	High	Formal submissions, site visits, iterative consultation
Mining company/operator	Liability reduction, cost efficiency, stakeholder trust, closure certification	High	Internal workshops, stakeholder alignment, strategic communications
NGOs/civil society	Transparency, biodiversity protection, Indigenous rights	Medium	Reports, joint forums, collaborative monitoring initiatives
Local government and regional authorities	Infrastructure, tax base, post-mining land use	Medium	Planning sessions, interagency working groups
Academia/researchers	Access to data, long-term monitoring, innovation in closure methods	Low–medium	Research partnerships, data-sharing agreements
Investors/shareholders	Environmental, social, and governance (ESG) performance, reputational risk, cost containment	Medium–high	ESG disclosures, risk briefings, assurance processes

## 5.2 Regulatory foundations and social closure components

Many jurisdictions require social elements within closure plans. For example, the South African DMRE mandates a social and labour plan (SLP), which includes post-closure economic transition strategies. In Canada, the CNSC requires closure plans to assess socio-economic impacts and include Indigenous and public consultation under the *Impact Assessment Act* (Government of Canada 2019). These frameworks emphasise that closure is not just a technical activity, but a socio-political process requiring transparency, documentation, and proof of participatory methods.

### 5.3 Social impact assessments and regulatory drivers

SIAs are a critical tool for understanding how mine closure will affect people's lives. Once treated as static, one-time requirements during permitting, SIAs are increasingly recognised as living processes that must evolve with the mine life cycle and adapt to shifting community priorities and emerging risks. In progressive jurisdictions such as Canada and South Africa, regulatory frameworks now mandate regular updates to SIAs. For instance, Canada's Impact Assessment Act requires meaningful and ongoing Indigenous and public consultation, while South Africa's DMRE requires submission of SLPs to support long-term socio-economic transition. These evolving frameworks underscore the growing role of SIAs as both diagnostic tools and decision-making guides throughout the closure process. When properly integrated, SIAs not only shape mitigation strategies and transition planning; they also play a pivotal role in informing post-mining land use planning. By identifying how people use land, access resources, and value their environment, SIAs provide essential insights for aligning closure strategies with long-term community land use visions. To maximise their effectiveness, SIAs should not be siloed from stakeholder engagement strategies. Instead, they must be fully integrated into closure planning and implementation, with the following practical recommendations:

- SIAs should draw from and feed into stakeholder mapping and analysis; so the right voices are being captured, particularly those of vulnerable, underrepresented, or disproportionately affected groups.
- Conduct comprehensive social baseline studies during early project phases to benchmark indicators such as livelihood dependence, cultural resource use, and access to services. These baselines are essential for measuring social closure outcomes over time.
- SIA findings should directly inform the creation of Social Closure Plans and Community Transition Plans, which outline mitigation measures, timelines, and responsibilities. These documents must be revisited and updated regularly in partnership with local stakeholders.
- Post-closure success requires robust monitoring of socio-economic indicators such as job placement rates, out-migration, land re-use, or community satisfaction. These indicators should be linked to closure performance metrics and reported transparently.
- SIA findings and updates should be communicated in plain language and local formats, including visual tools, summary sheets, or explainer videos. This ensures understanding across diverse community audiences and builds trust in the process.
- Where possible, communities should participate in tracking social performance. Models such as independent monitoring committees, community development boards, or participatory evaluations can ensure responsiveness and accountability.

SIAs are not just compliance documents. They are essential instruments for adaptive, community-informed mine closure and land use planning. By identifying and responding to changing social conditions throughout the mining life cycle, SIAs help ensure closure strategies remain relevant, inclusive, and socially just. They also play a critical role in ensuring that post-mining land continues to support community wellbeing for generations to come.

### 5.4 Monitoring and feedback loops

While SIAs provide the foundation for anticipating impacts, it is the ongoing monitoring of social performance that determines how well these plans are implemented and adapted. Companies that maintain continuous dialogue with stakeholders through grievance mechanisms, investment programs, or employment tracking, foster stronger relationships and more effective closure delivery (Esteves et al. 2017; Franks et al. 2014). Community-led monitoring can also directly shape closure outcomes. For instance, at the Ranger Uranium Mine, concerns identified through Indigenous monitoring influenced the redesign of tailings cover systems. Similarly, at Canada's Giant Mine, feedback from Indigenous and community-led monitoring helped shape the long-term site-wide closure objectives framework and informed development of a perpetual care plan.

While meaningful engagement and social change takes time, these experiences highlight the value of adaptive management (Paul et al. 2022). Feedback mechanisms like town halls, performance dashboards, or participatory evaluations help keep closure plans accountable and responsive to changing conditions. Social performance monitoring bridges the gap between planning and implementation, anchoring closure in transparency, trust, and long-term community stewardship.

## **6 Global case studies of stakeholder engagement informing land use outcomes**

Real-world case studies from different mining jurisdictions provide valuable insights into how stakeholder engagement can shape successful post-mining land use outcomes. In this section, we highlight several examples that demonstrate effective practices in participatory closure planning, as well as the diversity of contexts and approaches. Each case study underscores unique aspects of stakeholder engagement, from culturally sensitive approaches to economic regeneration initiatives.

### **6.1 Case study 1: USA – internal alignment as a foundation for external engagement**

As part of advancing a closure execution plan, a mining operation in the USA convened a two-day internal visioning workshop to align site and corporate teams on the closure direction and objectives. This preparatory step increased internal confidence (25% improvement in readiness survey scores) and created a unified closure vision, which was later used to guide external consultations. Local stakeholders noted improved clarity and transparency during follow-up engagement, and several community-prioritised items were formally integrated into the closure objectives (ERM 2025).

### **6.2 Case study 2: Australia – coordinated community transition planning**

At Leigh Creek in South Australia, the government-led Upper Spencer Gulf and Outback Taskforce coordinated iterative engagement sessions with residents, traditional owners, and local businesses. The outcome was a collaboratively developed masterplan for the post-mine landscape, which incorporated ecotourism, heritage trails, and small business infrastructure (Centre for Social Responsibility in Mining 2021). This approach demonstrated how broad stakeholder input and staged engagement can result in a community-endorsed transition strategy.

### **6.3 Case study 3: Canada – strengthening trust through transparent communications**

A global mining company redeveloping a lithium project in Canada implemented a strategic communications campaign to improve stakeholder relations. Tailored messaging across newsletters, social media, and public materials increased community understanding and trust, evidenced by a 20% rise in stakeholder confidence and reduced opposition during permitting. The effort highlighted the importance of clear, consistent communications in maintaining social license (ERM 2024).

### **6.4 Case study 4: Australia – integrating Indigenous criteria into closure planning**

At the Ranger Uranium Mine, the Mirarr traditional owners worked directly with planners to embed cultural priorities into closure design. This co-development led to revisions of landform recontouring, and tailings cover systems, aligning outcomes with FPIC and Indigenous-defined criteria (Brady et al. 2021). The process reinforced the value of integrating traditional knowledge and co-management into closure decision-making.

These case studies are summarised in Table 2 below and collectively illustrate the importance of internal alignment, transparent communications, Indigenous inclusion, and iterative planning. Each underscore how participatory approaches can lead to more locally relevant, socially accepted, and sustainable post-mining outcomes.

**Table 2 Stakeholder engagement case study comparison**

Engagement focus	Stakeholders involved	Key outcomes	Notable tools/approaches
Internal visioning to build readiness for external engagement	Corporate/site staff, local communities	Unified closure vision, improved internal confidence, community-prioritised inputs	Internal workshops, survey feedback, phased engagement
Iterative, multi-stakeholder community planning	Traditional owners, residents, businesses	Community-endorsed masterplan with diverse land uses	Taskforce facilitation, phased planning sessions
Strategic communications to build trust and reduce opposition	Community members, Indigenous reps, regulators	Improved trust, 20% rise in confidence index, smoother permitting	FAQs, social media, multi-platform messaging
Indigenous co-development of closure criteria	Mirarr traditional owners, planners	Redesigned closure plan aligned with Indigenous criteria and free, prior and informed consent (FPIC)	FPIC, Indigenous-defined criteria, co-management

## 7 Embedding Indigenous knowledge and cultural criteria in closure social transition in closure practices

Evidence from case studies and regulatory guidance demonstrates that integrating Indigenous traditional knowledge, including traditional ecological knowledge, into mine closure planning enhances both ecological outcomes and cultural relevance. Indigenous communities contribute unique insights into local ecosystems, such as wildlife migration patterns, hydrological cycles, and culturally significant plant species. Successful applications have included elder-guided revegetation strategies and the identification of areas designated for natural regeneration based on spiritual or heritage values.

### 7.1 Regulatory encouragement of co-application

In Canada, regulatory frameworks increasingly encourage the co-application of Indigenous knowledge and scientific data in closure design. For example, collaborative planning processes at several northern mine sites have demonstrated improved rehabilitation success through co-developed criteria and culturally guided monitoring programs. These approaches reflect a growing recognition that Indigenous worldviews, when meaningfully integrated, contribute to more resilient and site-appropriate closure outcomes.

### 7.2 Addressing barriers to Indigenous participation

Multiple barriers to meaningful Indigenous engagement were identified, despite formal consultation frameworks:

- Legacies of colonialism and unconsented development continue to fuel distrust. Case examples, such as early land return or support for cultural initiatives prior to final closure, were identified as effective in building trust.
- Capacity differences remain a concern. Examples such as the Giant Mine closure process showed the value of independent, community-selected technical review committees funded to support informed participation.

- Existing legal frameworks often lack mechanisms for Indigenous consent. However, innovative approaches are emerging, including the engagement of Indigenous ranger programs by regulators to contribute to closure inspections and approvals.
- Closure can negatively impact Indigenous economies reliant on mining employment. Some operations are negotiating the redirection of closure-related financial assurances (e.g. lease bond returns) into community trusts to support post-closure development.

## 8 Managing socio-economic transition for post-mining communities

One of the greatest challenges in mine closure is managing the socio-economic transition for workers, local businesses, and the wider community. Mines often form the economic backbone of regions, providing jobs, procurement opportunities, infrastructure, and indirect stimulus. When a mine closes, the risk is a domino effect of job losses, declining local services, reduced population, and community decline (the dreaded 'ghost town' scenario).

Stakeholder engagement is at the heart of economic transition planning: workers and communities need to be part of developing and implementing solutions. This section outlines key strategies including workforce re-skilling and employment diversification, land repurposing for new industries, and development partnerships, all underscored by examples where these have been successfully applied.

### 8.1 Workforce re-skilling and social transition programs

Workforce transition is often the most immediate socio-economic issue. A mine's closure can directly eliminate hundreds or thousands of jobs triggering a ripple effect of unemployment, skilled labour out-migration, and broader social disruption. Recognising this, closure planning now includes dedicated workforce retraining and re-skilling initiatives (Asia-Pacific Economic Cooperation 2018). These programs are enhanced, relevant, and more successful if developed in collaboration with employees, labour unions, local educational institutions, and government employment agencies (International Council on Mining and Metals [ICMM] 2019). Several key strategies can be used including:

- Skills assessments and career counselling: well ahead of closure, companies conduct surveys to understand workers' skills, interests, and aptitudes for other industries (ICMM 2019). Counselling sessions help workers map their skills to emerging opportunities (e.g. a haul truck driver might transition to operating heavy equipment in construction or agriculture).
- Training partnerships: companies often partner with technical colleges or government programs to offer courses (sometimes onsite) in high-demand skills (World Bank 2018). For example, training coal miners to become solar panel technicians or heavy equipment mechanics to work in civil construction. In South Africa and Australia, some mines have offered portable skills training like welding, plumbing, or commercial driving licenses to help workers find jobs elsewhere.
- Certification and accreditation: where possible, ensuring that any training leads to recognised qualifications that improve employability (Franks et al. 2012).
- Entrepreneurship support: some miners take severance packages and start small businesses (McMahon & Moreira 2014). Companies can facilitate this by providing small business training, seed funding or micro-loans, and linking aspiring entrepreneurs to markets or incubation programs.

## 8.2 Land repurposing and economic diversification

Post-mining land repurposing emerged as a viable strategy to maintain economic activity and community vitality. Evidence showed that repurposing is most effective when initiated well before closure and guided by multi-stakeholder feasibility assessments. Examples include:

- Infrastructure re-use: former mine sites with road access, power, and water have been evaluated for conversion into renewable energy hubs, industrial parks, or agriculture-based ventures (Ural & Demir 2018).
- Regulatory flexibility: jurisdictions permitting the redirection of financial assurance funds toward repurposing initiatives were more likely to realise successful transitions. In several cases, land tenure was successfully adapted to support new uses, contingent on community support and a clearly communicated vision (Boulay & Bouffard 2017).
- Land tenure adaptation: adapting land tenure frameworks to support post-mining land uses can be essential for successful economic diversification and community revitalisation. Regulatory systems that allow for reclassification or transfer of land – from industrial or restricted use to community, agricultural, or conservation purposes – enable local stakeholders to actively participate in and benefit from land repurposing initiatives. This often requires coordinated action between mining companies, governments, and affected communities to redefine land access rights and align them with shared post-closure goals (Bainton & Holcombe 2018; McLellan et al. 2019).

## 9 Conclusion

The legacy of a mine is no longer judged solely by profits it generates during operation, but by the condition of the land and the wellbeing of communities after closure. In this context, effective stakeholder engagement has become the cornerstone of both socially responsible and technically sound mine closure. Historically treated as an afterthought, mine closure has now moved to the forefront of concern for governments, regulators, and impacted communities, driven by the rising number of mines nearing closure and the visible consequences of past mismanagement. Many legacy sites still bear scars of environmental degradation, economic disruption, and community decline. In response, international standards emphasise early planning, inclusive engagement, and culturally appropriate approaches to rehabilitation.

To evaluate closure success, leading jurisdictions and multilateral organisations increasingly track indicators such as land use continuity, stakeholder satisfaction, ecological restoration progress, and infrastructure repurposing. Frameworks like the *ICMM Integrated Closure Framework: Good Practice Guide*, *IFC Performance Standards*, and the *United Nations Declaration on the Rights of Indigenous Peoples* (United Nations 2017) reinforce the importance of co-authored solutions and long-term governance are essential. Sustained success hinges not only on robust design but on accountable delivery. Post-closure governance structures such as multi-stakeholder monitoring boards, environmental trusts, or community development corporations can help maintain transparency, adaptive management, and enduring social and environmental outcomes. These approaches align closely with ICMM-endorsed principles for responsible mine closure.

The transition from operation to closure is both technically complex and socially transformative. While it may mark an ending, it can also be a new beginning toward ecological renewal, cultural continuity, and economic diversification. When stakeholders are engaged as long-term partners and stewards, the end of mining can serve as a platform for lasting, inclusive value.

This paper has demonstrated that meaningful engagement, when embedded throughout the mine life cycle, leads to more resilient, community-supported closure outcomes. Core themes explored include the importance of early and sustained engagement, tailored approaches, Indigenous leadership, and integrated strategies for economic transition. Real-world examples show how co-designing closure visions, using technology to enhance transparency, and maintaining adaptive feedback loops can reduce conflict and unlock shared benefits. As global sustainability expectations intensify, these practices will only grow in

relevance and importance. Practitioners, regulators, and communities are encouraged to build on these insights, contributing to a legacy of mine closure defined not by abandonment, but by collaboration, renewal and enduring trust.

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