

Nurturing creativity and innovation in mine transition planning

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Abstract

Mine closure planning involves a titanic effort that requires corporate structure to deliver, while mining transition responds to a community's needs and culture by providing opportunities for continued use of the land and an extension of livelihoods. The conundrum between closure and transition is that corporate structure is rigid around its mission and beset by cost and risk while transition requires creativity, flexibility and long-term considerations including nurturing. This paper recognises the fact that many great examples of mine site repurposing were actually completed after the mine site closed and were initiated by creative people, often from a local community, who had nothing to do with the mining operations or organisation. To embed creativity in mine closure planning requires not only leadership but also meaningful engagement, vision development and setting the right standards. The paper draws on the authors' experiences in working in regeneration and explores how creativity can be embedded within mine closure planning by reference to global cases and experiences both within and outside of the mining industry.

Keywords: just transition and planning, vision development, stakeholder participation/engagement, art and nurture

1 Introduction

Conventional good practice mine closure planning, when properly implemented, produces post-mining landscapes that are safe, stable and non-polluting (and sometimes 'sustainable'). However, to meet the challenges of large-scale, regional mine closures in the near to medium term, and the opening of many new mines with high expectations for environmental, social and governance performance from stakeholders, more progressive thinking and delivery are necessary to meet the hopes of a just transition and the generation of new environmental, social, economic and cultural values from old mine sites.

To better reflect the mindset that is required, Whitbread-Abrutat (2024) emphasises that the term 'transition planning' rather than 'closure planning' will be used throughout this paper. Two essential ingredients in advancing progressive transition planning are 'creativity' and 'innovation'. This paper examines the challenge of transitioning from conventional mine closure (transition) planning to more creative and innovative systems. It contrasts a conventional risk-averse, process-driven corporate mindset which focuses on safely and cost-effectively decommissioning sites with the need for a visionary, community- and creativity-led approach that – innovatively – transforms mine sites into vibrant, multi-functional spaces. It identifies lessons from successful examples on the ground and suggests recommendations for augmenting the good practice that already exists. Throughout, the paper draws on key examples mainly from the recent book *102 Things to Do with a Hole in the Ground* (Whitbread-Abrutat & Lowe 2024), as well as regeneration examples from beyond the mining sector.

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2 What are creativity and innovation?

Although closely related through the development and execution of novel ideas, there are differences between creativity and innovation. These two activities are well articulated online, e.g. by Acar (2022), and there are many definitions depending on perspective, with none set in stone.

2.1 Creativity

As articulated by Whitbread-Abrutat (2024), “UNCTAD [United Nations Conference on Trade and Development] (2008) describes creativity as “...the formulation of new ideas and the application of these ideas to produce original works of art and cultural products, functional creations, scientific inventions and technological innovations” and says, “The word ‘creativity’ is associated with originality, imagination, inspiration, ingenuity and inventiveness”. At a fundamental level it is simultaneously “an inner characteristic of individuals to be imaginative and express ideas; associated with knowledge, these ideas are the essence of intellectual capital”. Put simply, creativity is an essential and intrinsic human characteristic related to thinking and problem solving, generating beauty and deriving meaning that brings together novelty, invention and new associations. There are myriad quotes that highlight and summarise what creativity is and what it does. Here are some:

Creativity is the opposite of routine. (unattributed)

Creativity is intelligence having fun. (misattributed to Einstein!)

Creativity is putting your imagination to work. (Robinson & Aronica 2015)

Creativity is the process of having original ideas that have value. (ibid.)

2.2 Innovation

Implementing the outcomes of creative thinking is the essence of innovation; it is the execution of a novel idea to generate value and social change and can be considered as ‘applied creativity’ – the ‘doing’.

As highlighted by Boggs et al. (2022), innovation around mine closure has tended to focus on relevant technological developments. This rather neglects the practices that address other aspects of transition planning and implementation, such as local community and stakeholder participation, redefining post-mining cultural aspects and reconnection to place, early economic diversification, and joining up natural environmental aspects, etc.

2.3 Why it matters

The disruption caused when mining ends is complex and the dynamic change can be overwhelming, even when much of this change is predictable and can, therefore, be planned for. Conventional closure planning often fails to engender this mindset, limiting development of new, optimal ideas and their successful implementation. Generating a creative mindset during transition planning will enable novel responses to new and unexpected change.

Creativity lies beyond simply artistic and aesthetic expression, as is commonly perceived. It occurs as the precursor to innovation and, when successful, involves a complex interaction with leadership, collaboration, testing and a willingness to challenge conventions. When implemented well, such ideas can effectively harness resources that might otherwise be wasted and restore community pride and economic vibrancy.

2.4 Regulatory environment

In this paper we espouse that creativity can come from anywhere, but it is our experience that it is usually from outside conventional mining company and government circles, mainly because of the various obstacles that engrain conventional thinking to managing post-mining risks, coupled with institutional and disciplinary barriers. That is not to say that these stakeholder groups should not promote creative approaches. Creativity is not derived from regulation, but from creative responses to post-mining risks and issues. A strong

regulatory environment is essential to ensuring that closure is done well and that appropriate outcomes are achieved. Creativity is an overlay and not a substitute for regulation, although regulators should seek to understand how creative processes can develop alternate solutions.

3 Limitations in conventional practice that discourage creativity and innovation

Creativity and innovation are clearly important elements in delivering successful outcomes, but transition planning can be stymied by seeing ‘closure’ simply through a corporate or regulatory lens. Closure/transition is a classic wicked problem as defined by Rittel & Webber (1973), with many different and competing elements being part of the problem. Solutions must firstly satisfy the needs of a site in relation to safety and stability (both physical and chemical). As practice has evolved from this basic precept, goals around social transition and nature positive outcomes have become more relevant.

Some factors that limit the inclusion of creativity and innovation include:

- transition planning undertaken late in the life of mine (LOM), with insufficient time available for nurturing creative thinking
- the use of off-the-shelf solutions to satisfy a tick box approach to closure, i.e. a limited post-closure vision that presents a grassy mound and a pit lake as the best solution
- a focus on meeting regulatory requirements and inflexibility in a regulator to accept approaches that depart from the norm
- limitations in knowledge and expertise amongst those responsible for transition planning, and industry ‘barriers’ to learning from the wider regeneration economy
- stakeholders with low expectations – particularly local communities that have not been engaged properly and which have limited levels of aspiration after having being disappointed over many years by mining companies and governments
- a company’s appetite for risk and a lack of knowledge in relation to the likely outputs and elements that constrain opportunities, including trust in allowing creatives to deliver
- knowing how to scale an excellent but small idea from a local community into a large-scale transformative project and, also, scaling a small organisation to function and deliver
- enabling the flexibility to creatively go beyond the regulatory minimum.

Conventional transition planning usually exists within a rigid corporate structure where people do the jobs in front of them – they manage risk and are often firefighting several issues that need to be addressed. They deal with those things and bring a site towards closure, carrying out the rehabilitation work that is required. But investment in creativity requires a leap of faith and an acknowledgement that there are some risks that potentially may not be overcome, and that some things will fail, but that these risks are worth taking because they will be offset by the beneficial outcomes that could be generated.

4 Enabling factors for creative and innovative outcomes

There is a growing number of positive stories about mine transition outcomes that highlight the transformative regeneration of sites that support new futures for communities, many of which are presented in Pearman (2009) and Whitbread-Abrutat & Lowe (2024). These examples show that collectively we know how to:

- transform legacy sites into educational charities, building social enterprises and tourist attractions
- create a vision and deliver world-class resorts
- provide positive legacy creation through innovative legal and shareholder mechanisms

- deliver sustainable regeneration driven through government involvement
- utilise innovative approaches to rehabilitation, creating a springboard for future economic stimulus and/or nature-positive outcomes
- contain circular solutions that bring waste streams to economic uses
- have planned reclamation that fits with a regenerative masterplan and repurposing
- provide a catalyst for economic rebirth at a regional scale.

Although all sites are unique and a wide variety of solutions have been brought to bear, ERM (in an unpublished review of global repurposing opportunities) has determined seven broad themes where creativity and innovation have been applied and have acted as enabling factors for success. These themes are:

1. leadership and facilitation
2. having a vision based on a 'consensus of needs'
3. innovative liability transfer mechanisms
4. development of opportunity (creating and exploiting)
5. understanding of the asset base and its value to others
6. development of formalised stakeholder relationships, partnerships and working groups
7. owner pump primer (limited) investment to highlight the opportunity and kickstart any repurposing process.

Nurturing an idea or a creative process requires mining companies (and also regulators) to cede some control (or for 'unusual suspects'¹ or 'mavericks' to take some initiative) to facilitate creative assistance in developing better (seamless) mining transition. Given that many great examples of post-mining transition have resulted not from the actions of miners but rather later intervention by others, the opportunity here is to bring this process forward into closure and reform closure planning as a true transition process. Space is required for creative thinking within the closure process, allowing for not only the formulation of ideas, the Henderson Sustainability Challenge² (Rush 2020) being an example, but also horizon scanning to spot and grasp available opportunities. Recognition also needs to be given to the fact that if external stakeholders have come with ideas, these may be small groups or individuals with little capacity for delivery and long-term management. Support may be required to develop these and generate confidence within the mining company that these are reliable partners of good standing.

Kuzyk et al. (2023) argues that the development of a post-mining vision needs to be framed as a business imperative, with project proponents being forced to consider how major projects influence the wellbeing of current and future generations, and impact not just the environment but also society and the economy over extended timescales. There is a need to embed creativity (and flexibility) into the governmental planning-consenting/regulatory process and with those involved. Importantly, flexibility is needed as the context and drivers change over the LOM period (usually decades). At the 2023 Creating Value from Closure workshop in Reno, Nevada, the United States, ERM argued that there is a need to continue challenging the closure vision by changing the scope in line with updated expectations and identification of partner organisations, and re-aligning social programs to foster (or engage with) leaders who can take the land and continue the transition over the coming decades. One such vision is presented for Ukraine in Hesketh et al. (2023).

¹ An 'unusual suspect' – an unconventional thinker unconnected to the mining industry who convened experts from diverse fields (architecture, engineering, horticulture, performance and visual arts) to repurpose a mining site into an internationally renowned attraction and engine for socio-economic regeneration (Whitbread-Abrutat & Lowe 2024; Smit 2001).

² A competition organised by Climax Molybdenum with the Colorado School of Mines asking students to think outside the box about the company's Colorado assets and their future after eventual mineral depletion.

The potential outcomes of innovation and creativity need to be anticipated. An ecosystem approach (Hesketh et al. 2024) provides an indication of potential outputs and constraining factors, but the approach also needs to be tested on the ground. This latter point is exemplified by Anglo American's Kumba Iron Ore mine in South Africa's Northern Cape province, which is catalysing the economic diversification of this remote region to reduce local dependency on the mine very many years before closure is planned – this is social transition in action. Using the mine's convening capabilities, resources and capital, a range of agribusinesses are being developed that are testing and piloting crops and systems while facilitating new skills and knowledge for local people to support these new opportunities.

Within Schloz's 10 principles for a post-mining landscape (Schloz 2010), the use of resources, fostering an identity, generating pictures and allowing for creativity and innovation are important elements in creating a transformative environment for the development of eastern Germany's Lusatian Lakeland on expansive swathes of heavily disturbed former lignite mining landscapes. The International Building Exhibition (IBA) Fürst-Pückler-Land, set up by the federal government, ran between 2000 and 2010. IBAs are a century-old German invention for exploring, testing and nurturing creative approaches to socio-economic, environmental, and cultural urban and regional regeneration on a large-scale. The enormous pit voids have been reinvented as a system of interconnected recreational lakes, while the remade ground hosts a range of after uses. To encourage reconnections between the new landscapes and surrounding people, several creative installations have been built to act as anchor points and convening spaces within the landscape, such as the Rusty Nail (Figure 1) and the iconic, 200-metre-long, 80-metre-high, 11,000-tonne F60 repurposed overburden conveyor with its strong sense of industrial heritage (Figure 2). Such installations paint pictures with their viewpoints over the evolving landscape while also linking to the past.



Figure 1 The Rusty Nail installation and viewpoint at the nexus of several cycle routes where three pit lakes meet, with views from the top (source: Peter Whitbread-Abrutat)

The usual post-mining fate for machinery as massive as the F60 was to be unceremoniously – but spectacularly – blown apart with explosives, thus ending the presence and sense of place imparted by the decades-long tenure of these towering giants. The F60 was saved by forward-thinking enthusiasts led by local community representatives and a landscape architect who appreciated the symbolism of the link with the past but also its potential role in pointing towards a new future for the region. Investigations by the German Institute for Tourism Research addressed many of the outstanding questions around saving, moving and repurposing it into a tourism destination, which ultimately persuaded local political leaders that saving the machine would be worthwhile (Whitbread-Abrutat & Lowe 2024).



Figure 2 Composite panorama image of the 200-metre-long, 80-metre-high F60 overburden conveyor now repurposed as an industrial heritage visitor attraction, with views from the top (source: Peter Whitbread-Abrutat)

A non-mining example includes the re-use of former steel works basements at The Works, Ebbw Vale in South Wales (BBC 2006) as outdoor classrooms, climbing walls and theatre spaces. At Ebbw Vale, the use of basements only came about via a eureka moment as they had initially been seen as a significant and costly development constraint; an issue that was resolved by having a wider audience thinking about the problem.

Circular concepts spring beyond repurposing buildings and structures to reinventing waste water and mineral wastes. Two University of Ohio (USA) professors – an artist and an engineer – collaborated to produce high-quality artists' pigments from the precipitated iron oxide ochres found at the True Town Seep – Ohio's largest abandoned coal mine acid drainage seep. This collaboration has grown into a commercial-scale process, funded by the US government, to treat all the water issuing from the seep to produce ochrous pigments that feed into American industry to colour a range of products from cosmetics to concrete. Currently the majority of the approximately 200,000 tonnes of this pigment used in industry is imported from overseas (Whitbread-Abrutat & Lowe 2024).

Amongst myriad innovations in the development of the UK's Eden Project, 80,000 tonnes of artificial soils were created from locally available secondary materials, namely waste silica sand from the local china clay industry and composted waste materials. These growth media support the impressive educational gardens formed in a repurposed 160-year-old china clay quarry that attract about one million people annually (Whitbread-Abrutat 2024).

There are also examples of the re-use of mine water for irrigating crops in South Africa, where a carefully monitored, commercial-scale demonstration site in a water-scarce area has been successfully irrigated for five cropping seasons with untreated circum-neutral mine water, and where potable water and water for fish farming have also been provided (Annandale et al. 2023).

Real collaboration is about meaningful participation and a constructive philosophy. Stakeholders ('unusual suspects') need to be brought into the visioning process to imagine what life after mining could look like and,

through this process, partner with local government, potential investors (as appropriate), social and environmental stakeholders, and (not least) communities. This is not a static process but rather dynamic response to both the changing stakeholder environment and the development of ideas as these mature and are better formulated as local impacts and benefits become more apparent.

4.1 Creativity to provide connection and repair

On the one hand mining can provide a long-term disconnection for communities from their land, but it can also provide a sense of purpose and cement the concept of ‘who we are as people’. In both cases, engagement around a transition from mining needs to build a sense of place, that is “the emotive bonds and attachments people develop or experience in particular locations and environments...It is also used to describe the distinctiveness or unique character of particular localities and regions” (Foote & Azaryahu 2009). This is explored further in Whitbread-Abrutat (2025).

4.2 Creative leadership

Creative leadership, which trades on innovation, risk taking and collaboration, is required to foster teams that can develop ideas, learn lessons from failure, push boundaries to strategically take risks and drive execution with the vision of an end goal. Many of the global best practice case studies for regeneration, including the Eden Project, the Coed Darcy development in south Wales and many others, have required a special spirit to doggedly push the boundaries and achieve great outcomes.

The Eden Project’s development was a visionary initiative led by an ‘unusual suspect’ – an unconventional thinker unconnected to the mining industry who convened experts from diverse fields (architecture, engineering, horticulture, performance and visual arts) to repurpose a mining site into an internationally renowned attraction and engine for socio-economic regeneration (Whitbread-Abrutat & Lowe 2024; Smit 2001).

At Coed Darcy, a sea change in thinking provided the creative turnaround of an old oil refinery where innovative financing (such as reverse auctioning liabilities) and collaborative efforts with universities, public trusts and creative professionals turned a high-risk asset into a promising redevelopment project for housing, higher education and recreation. This sea change cut against the usual pattern of developing studies and following actions to minimise liability, instead recognising that third-party organisations could provide efficiencies in resolving these liabilities and, if appropriate controls were put in place, risk could be successfully transferred.

Thinking outside the box and deciding to do something completely different and groundbreaking, such as Zip World’s inspired repurposing of former slate quarries in north Wales to generate a viable business from adrenaline recreational pursuits, requires a special entrepreneurial spirit (Whitbread-Abrutat & Lowe 2024). But who are the ‘unusual suspects’ that drive such change, and how can they be identified in advance and their involvement nurtured and managed to manage the risks that come along with this type of creative thinking?

5 Conclusion and recommendations

To unlock the wicked problem of mine transition planning – or at least maximise the benefits that closure could bring – and provide a successful transition to a new future, creativity needs to assume a central role in the process. Many fascinating examples justify this approach, but what is less apparent is the creative effort that has been required to develop these results.

Creativity needs to respond to a site’s local and regional context, determine the (potential) asset base and how it could be used as an anchor for delivering a successful transition, and understand that stakeholders will have different perspectives and interests, and can provide a view on what the area needs and potential influencing factors.

Creative solutions require:

- understanding of the pathway to an end goal
- a broad view of the opportunities
- engagement with and understanding of the asset base
- building a dialogue with stakeholders to create a (shared) vision that sells.

In some instances the process to develop ideas will require nurturing to grow an embryonic next user.

The following recommendations would provide opportunities to build creativity into mine closure/transition planning:

- Understand the world outside of the fence-line i.e. the local and regional context, and the needs in an ever-changing world.
- Enable meaningful participation by stakeholders i.e. have this as an exchange of ideas and do not be dismissive of what you do not understand. Allow reconnection with the land and utilise a sense of place.
- Facilitate participation with the 'unusual suspects'.
- Plan with ambition i.e. have goals and determine an exit, but also understand what a positive legacy is.

Mine transition planning is an inherently complex and often undervalued process, historically dominated by regulatory, technical, and risk-averse systems and processes that focus on safe closure and liability reduction. While this procedural rigour is necessary, it is often insufficient to meet the transition challenges when a mine ends. The challenge – and opportunity – lies in reconceptualising mine closure as a platform for regional regeneration, community revitalisation and the creation of new identities rooted in creativity, innovation and collaboration. In this context, nurturing creativity becomes not a luxury but a necessity.

This paper has considered many mining and non-mining examples that illustrate the transformative potential of creative transition – from pit voids turned into lake lands and adrenaline parks to cultural hubs born from post-industrial infrastructure. However, such outcomes remain exceptions, not the rule. Too often, promising ideas fail to become reality due to systemic constraints: limited planning timeframes, rigid regulatory norms, siloed expertise, insufficient risk appetite and a lack of genuine stakeholder participation.

To shift this paradigm, the mining sector must adopt a more expansive and inclusive model of mine transition that embeds creative thinking from the outset. This means not only recognising creativity as a practical tool for unlocking social and economic value but also fostering the conditions that allow it to emerge, thrive and scale. At its best, creativity in transition planning is about imagining new futures and establishing the processes, partnerships and mindsets that can bring them to life.

Context is everything: creativity must be place-based, stakeholder-driven and opportunity-responsive. It must engage a wide and unusual cast of actors – from artists to engineers and ecologists, and regulators to entrepreneurs and elders – who understand the land, the people and the potential. It also requires the traditional drivers of closure planning (companies and regulators) perhaps to cede some control in carefully structured ways: not walking away but stepping aside to allow others to lead where appropriate while still facilitating, funding or enabling innovation where needed.

To that end, the following eight recommendations are offered for the nurturing of creativity in mine transition planning (note that these are not mutually exclusive):

- Begin early and continue through the LOM by engraining creative thinking into transition planning at the earliest stages of mine development. Avoid relegating closure/transition to the final years of operation when flexibility, budgets and time are limited. Adopt a long-term vision that sees closure/transition not as the end but as the mid-point in the lifecycle of a site – an opportunity to repurpose and regenerate rather than simply rehabilitate.

- Engage the ‘unusual suspects’ by striving beyond conventional stakeholder lists to identify and involve ‘unusual suspects’ – local artists, youth groups, social innovators, small-scale entrepreneurs – who can bring fresh perspectives and offer meaningful contributions to reimagining a site’s future. These groups often have latent ideas but traditionally lack access to or legitimacy within conventional planning processes.
- Co-create a shared vision rooted in place by developing a post-mining vision through meaningful community participation. Again, ‘context is everything’ and a rooted sense of place can be a powerful catalyst for transition. Visioning exercises, participatory mapping and storytelling can help uncover locally grounded aspirations and inform the development of actionable plans.
- Facilitate risk-tolerant leadership and collaboration by cultivating leaders (within companies, governments and communities) who are willing to take calculated risks and test new ideas during the LOM. Encourage partnerships with organisations skilled in regeneration, such as social enterprises, universities, cultural institutions and non-government organisations, to test and iterate new uses for post-mining landscapes.
- Establish creative funding and support mechanisms such as transition innovation funds or community development accounts that can seed creative projects, provide start-up capital for pilot initiatives or match external regeneration grants. These funds can be used to support capacity building, training and the incubation of local groups capable of delivering creative outcomes, and to provide seed corn funding to test new ideas.
- Enable flexible regulatory routes by working with regulators to create adaptive pathways that allow innovative approaches to meet closure obligations. Regulatory flexibility should not mean lowering standards but rather acknowledging alternative ways of achieving safe, sustainable and socially beneficial outcomes. This could include provisional licences, trial zones or phased compliance structures.
- Use the mine as a convener and platform. During the operational phase, use the mine to leverage its convening power, logistical and service infrastructure, corporate networks and finance to bring people together, host competitions, support experimental design exercises or sponsor community-led planning processes. The company can serve as a facilitator and enabler, even if it will not be the long-term owner of the repurposed site.
- Capture and celebrate creativity visibly by making it tangible early in the process. Murals, installations, prototype public spaces and events can provide visible signs of transformation and generate momentum for further change. Such visible signs of change can inspire broader buy-in, attract external interest, and foster a renewed sense of identity and optimism in communities affected by mining.

By adopting these recommendations for nurturing creativity, mining companies, host governments and communities can together redefine the purpose and potential of mine closure/ transition; rather than simply fulfilling compliance obligations, transition planning can become a powerful, inclusive and visionary force for not only heal repairing the land but as a creative foundation for the next vibrant chapter in the story of the landscape.

Ultimately, creative transition is not about adding art on top of engineering. It is about weaving innovation, collaboration and imagination into the figurative bedrock, or DNA, of post-mining landscapes. With the right mindset, tools and leadership, the end of mining can mark the beginning of something extraordinary.

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